CITY OF GREENSBORO AMENDED SPECIAL ORDER BY CONSENT
EMC SOC WQ S19-010 YEAR ONE REPORT: May 1, 2021 – April 30, 2022
Submitted June 13, 2022

The original Special Order by Consent ("SOC") between the City of Greensboro ("City") and the Environmental Management Commission ("EMC") was signed in March 2021 with an effective date of May 1, 2021. The initial and primary goal of this SOC is that the City's T. Z. Osborne Water Reclamation Facility ("TZO") effluent discharge "will not cause concentrations of 1,4-dioxane in downstream drinking water supplies to exceed the EPA health advisory concentration of 35 µg/l." An Amended SOC was signed on November 22, 2021 with an effective date of December 1, 2021. The North Carolina Department of Environmental Quality, Division of Water Resources ("Department", "DWR") is responsible for oversight of the SOC.

Special Order by Consent ("SOC") Year One Report Table of Contents:

- Introduction and Summary
- Background Information
- Required Information from SOC Section 2.(c.)(9):

"In addition to any other reporting required by the Department, no later than forty five (45) calendar days after the end of Year One, the City shall submit to the Department a written report on the Year One activities and post on the City's Water Resources Department website. The report may be submitted by hard copy or electronic means and must contain the following (at a minimum):

i. Summary of the City's investigation results [outlined in 2(c)(1)].

ii. Summary of any potential (new) industrial or commercial flows to the collection system [outlined in 2(b)].

iii. Any oversight activities [outlined in 2(c)(2), 2(c)(3) and 2(c)(8)].

iv. Public education outreach plan [outlined in 2(c)(5)].

v. A table of all monitoring results for 1,4-dioxane collected during the SOC Year One.

vi. In the case of noncompliance with the Year One SOC Compliance Value, a statement of the reason(s) for noncompliance, remedial action(s) taken, and a statement on the extent to which subsequent dates or times for accomplishment of listed activities may be affected.

vii. Based on Year One data and any follow-up monitoring activities including IU inspections and oversight and City of Greensboro split sample data, determine the following and provide a summary to the Department:
   - Long-term achievable effectiveness of source reduction efforts and resulting T.Z. Osborne WWTP effluent reductions
   - Industrial contributions
   - Domestic contributions
   - Commercial contributions
   - Surface and drinking water contributions"

- Data Appendices

- INTRODUCTION AND SUMMARY

The focus of the original SOC Sampling Plan (approved by NCDEQ on May 26, 2021) was to collect, compile, and evaluate 1,4-dioxane data in order to: determine sector contributions from domestic, commercial, drinking water; determine landfill contribution; revisit insignificant trunklines from the City's 2015 study; calculate a mass-balance; and, revisit TZO internal wastestreams and North Buffalo Transfer Pump Station.

The June 30, 2021 Compliance Value exceedance was an unforeseen event that caused the City to re-evaluate the initial assumptions and focus of the SOC sampling. Based on the 1,4-dioxane reductions achieved as a result of the 2015 study, the City did not expect or plan to be tracking another major source or conducting additional extensive trunkline and surveillance activities. The original Sampling Plan included 25 sites, while the Amended Sampling Plan for Year One included 60 sites. The City has also voluntarily sampled an additional 12 sites that were not listed in either Sampling Plan.

The Amended 36-month SOC between the City and NCDEQ includes: a comprehensive source study, a public awareness program, continued collaboration/oversight of indirect sources of 1,4-dioxane, TZO effluent compliance values, annual reports, and civil penalties for noncompliance with SOC requirements.

During Year One of the SOC, the City collected over 915 samples and the commercial laboratory 1,4-dioxane testing costs alone for Year One exceeded $124,000.

- BACKGROUND INFORMATION

Background: Greensboro TZO Facility Information:

The City of Greensboro currently has one wastewater treatment plant, the T. Z. Osborne Water Reclamation Facility, located in McLeansville NC. The North Buffalo WWTP [NPDES NC0024325] was decommissioned in October 2017. All wastewater is treated at TZO and the North Buffalo site is now a flow transfer pump station. Flow from the North Buffalo transfer station enters after the TZO influent sampling point, so samples and transfer station flows are still taken at the North Buffalo Influent in order to accurately determine loading to the TZO facility.

T. Z. Osborne Water Reclamation Facility Information	
NPDES Permit NC0047384	Issued July 1, 2014 Expired June 30, 2019 (Administratively Extended by NCDEQ)
Design Capacity:	56 Million Gallons Per Day
Detention Time @ 56MGD	~ 32 hours
Service Area:	Entire City of Greensboro; parts of Guilford County ~1650 miles of wastewater collection system lines 105,000$^+$ connections (~8000 non-domestic)
Number of SIUs:	29 (21 Categorical; 8 SIU due to flow only)
Average Effluent Flow CY 2021:	33.4 MGD
Receiving Waters:	South Buffalo Creek (WS-V/NSW)→ Buffalo Creek → Reedy Fork Creek → Haw River → Jordan Lake → Cape Fear River
% Effluent at 7Q10 Flow:	97.6% [calculated by DEQ]

TZO includes the following wastewater treatment process train:

influent wastewater receiving station
mechanical bar screens
influent wet well pumps
optional 8.0 MG flow equalization tanks (2 tanks: 3.5 and 4.5 MGD)
optional equalization tank at North Buffalo Transfer station (3.0 MGD)
aerated grit tanks
air scrubbing system for odor control
phosphorus removal by chemical addition and precipitation
primary clarifiers
5-stage Biological Nutrient Removal (BNR) activated sludge process
secondary clarifiers
tertiary filters (cloth media filters)
disinfection with sodium hypochlorite
dechlorination with sodium bisulfite
reaeration cascade and flow measurement

The following solids treatment and disposal train is located at TZO:

sludge receiving/blending tanks
gravity sludge thickeners
thickened sludge holding tanks
Centrifuges
(2) fluidized bed incinerators
ash clarifier
ash press
incinerator ash disposal at dedicated municipal landfill site

<u>Background: Previous Greensboro Study re: 1,4-dioxane</u>

Results from the EPA Third Unregulated Contaminant Monitoring Rule (UCMR3) conducted from 2013-2015, brought increased concern about 1,4-dioxane levels in the Cape Fear River Basin. In March 2015, the City voluntarily developed a 1,4-dioxane source identification and reduction plan to address elevated levels of 1,4-dioxane found below the TZO effluent discharge. Greensboro had a unique situation at that time, with 2 interconnected wastewater treatment facilities (North Buffalo and T. Z. Osborne). However, initial trunkline collection system monitoring eliminated the North Buffalo facility as the source, so the focus moved to the TZO collection system lines.

Within 6 months, trunkline monitoring identified an SIU, Shamrock Environmental, as a significant source of 1,4-dioxane. Meetings were held with the company and they agreed to *voluntarily* address the discharge of 1,4-dioxane from their facility. Shamrock ultimately researched, engineered, tested, and installed a multi-million dollar proprietary advanced wastewater pretreatment system that significantly reduced the 1,4-dioxane discharged to the TZO facility, and in turn, significantly reduced the 1,4-dioxane discharged from the TZO facility.

The 2015 study indicated 1,4-dioxane: can be successfully measured in composite wastewater samples using the EPA solid waste method; is not removed by conventional activated sludge treatment processes; does not partition into sludge; does not volatilize; and does not appear to have impacted TZO Whole Effluent Toxicity.

<u>Background: 1,4-dioxane Sampling and Analytical Method</u>

EPA Method 624.1 (40 CFR Part 136 wastewater method) was used for all aqueous 1,4-dioxane samples in Year One. EPA Method 8270C SIM (Solid Waste Method) was used for the following sites: aeration tank, dewatered sludge cake, incinerator scrubber/centrate, and domestic septage.

Although EPA Method 624.1 indicates a grab sample should be collected, 1,4-dioxane is not volatile, and concentrations in composite samples are expected to be stable. Composite samplers were used extensively in the SOC Sampling Plan in order to gather comprehensive information on the contributions from the various sectors. It would have been virtually impossible to track discharges, identify sources, and determine actual loadings from grab sample results.

The City used two commercial laboratories certified by NCDEQ to conduct 1,4-dioxane analyses: Meritech Inc. and Pace Laboratories. Both labs were used for 1,4-dioxane eDMR split analyses and both were used in the initial 2015 study. The Practical Quantitation Level (PQL) or Reporting Level (RL) for the 2 certified laboratories are as follows: Meritech <1 µg/l and Pace <2 µg/l. Note: PQLs indicated are based on assumption that no dilution of the sample was needed due to elevated concentrations, matrix interference, or to prevent damage to lab equipment. If a sample requires dilution, the PQL would be adjusted accordingly. Some elevated PQLs were reported by the commercial laboratories during the Year One sampling, particularly from industrial discharges, which are more likely to cause/create matrix interferences.

- REQUIRED INFORMATION FROM SOC SECTION 2.(c.)(9):

i. Summary of the City's investigation results [outlined in 2(c)(1)]

1. The original SOC Sampling/Monitoring Plan ("SP") was provided to NCDEQ for approval at Quarterly Meeting #1 held May 19, 2021. The Sampling Plan included:
    - Sampling and analysis at previously identified (2015-2016) wastewater collection system trunkline junction locations, including the North Buffalo Pump Station, as well as sampling of industrial trunklines, domestic trunklines, commercial trunklines, and all City drinking water sources.
2. In response to the SOC Settlement Agreement, the SOC Sampling Plan was amended 12-2-2021, after being submitted to and approved by DWR. (Sites with an asterisk* were added to the amended SP document.) The amended SOC Sampling Plan includes the following 60 sites:
    - 7 TZO facility sites (SP sites 1-6)
    - 7 Collection System Industrial trunkline sites (SP sites 7-12A)
    - 6 Collection System Domestic/Commercial trunkline sites (SP sites 13-17A)
    - 5 Greensboro Drinking water sources sites (SP sites 18-22)
    - 4 Other sites: City landfill leachate, septage, Haw River Arm Jordan Lake*, Pittsboro Haw River Raw Water intake* (SP sites 23-26)
    - 32 Significant Industrial User ("SIU") sites* (SP sites 27-58) Note: SIU sampling was officially added to the SP in December 2021 but the City began direct SIU sampling several months previous.

ii. Summary of any potential (new) industrial or commercial flows to the collection system [outlined in 2(b)].

The City of Greensboro Significant Industrial User (SIU) Wastewater Discharge Permit Application was modified (in 2019) to include 1,4-dioxane as a site-specific pollutant of concern and was added to the Priority Pollutant checklist on page 14 of the application. The checklist requires the applicant to certify if 1,4-dioxane is: Present at Facility, Absent at Facility, Present in Wastewater Discharge, Absent in Wastewater Discharge.

The SIU Permit Application Instructions also include the following: *"Note: The City of Greensboro added 1,4-Dioxane…as [a] site-specific Priority Pollutant. The City has a Special Order by Consent with NCDEQ to address 1,4-dioxane discharges to the sanitary sewer system. New or proposed SIUs must provide detailed information on the presence or absence of 1,4-dioxane in their wastewater discharge prior to and as a condition of SIU permit issuance. Further details will be provided by the IWS during the permitting process."*

1. Several Significant Industrial User Wastewater Discharge Permit Applications were provided to potential new dischargers during SOC Year One, but no completed applications have been received by the City Industrial Waste Section as of the date of this report.
2. No new SIU Permits were issued during SOC Year One (5-1-2021 to 4-30-2022).

iii. Any oversight activities [outlined in 2(c)(2), 2(c)(3) and 2(c)(8)].

Following the June 30, 2021 exceedance, a letter was drafted and sent to all SIUs and permitted IUs to request a review of their processes to determine if they could be a contributor of 1,4-dioxane to the collection system.

If any direct SIU sampling results were >100 µg/l, the industry was immediately required to begin source investigation, tracking, and identification via additional sampling, evaluation, and possible source identification including:

- Conduct Safety Data Sheet survey of raw materials
- Review chemistry of any product wastestreams
- Investigate production records/internal wastestreams
- Identify potential significant sources of 1,4-dioxane
- Prepare response for City to use in evaluating next steps

The City identified nine SIUs during Year One with discharge concentrations of 1,4-dioxane >100 µg/l. Inspections of these facilities was increased from once/year to three times/year. The City's investigations and inspections relating to slug plans did not indicate that 1,4-dioxane was being stored on site as a raw material or a final product.

In response to the November 3, 2021 event, an email was sent and a meeting held with all 6 SIUs from Patton Trunkline with previous results ≥ 15 µg/l (Ecolab, Lanxess, Elastic Fabrics, Precision Fabrics, Shamrock-Patton, and Vertellus). For the first week following the meeting, each were required to collect and retain daily composite samples and run analysis for 1,4-dioxane. For each week after, and until further notice, these facilities were required to continue to collect and retain daily composites and send a weekly composite for 1,4-dioxane analysis.

On January 21, 2022, a draft of the City's Contaminants of Emerging Concern (CEC) Policy and proposed Enforcement Response Plan (ERP) modifications was send to all SIUs and permitted IUs. The CEC Policy became effective February 1, 2022 and was provided to each SIU and IU along with a Local Pollutant Allocation Document (LPAD) for 1,4-dioxane. This is a Daily Maximum mass-based allocation specific to each SIU/IU. For any facility with multiple regulated discharge pipes, the allocation is based on the total combined discharge of process wastewater from the facility. The document requires that at no point shall the combined discharge from ALL permitted pipes exceed the mass-based allocation. Enforcement for exceedance(s) of this CEC LPAD are based solely on the loading from each SIU/IU and is NOT contingent upon an exceedance of the T.Z. Osborne effluent daily maximum SOC compliance value for 1,4-dioxane.

The City's Enforcement Response Plan was updated to incorporate enforcement remedies for any SIU/IU that exceeds its LPAD for 1,4-dioxane. The modified ERP was submitted to NC DEQ Pretreatment Unit on March 1, 2022 for review and approval. To date, approval is still pending.

iv. Public Education Outreach Plan [outlined in 2(c)(5)].

The City is committed to keeping the public, individual, commercial and industrial users of the Greensboro wastewater system, NCDEQ, and downstream drinking water utilities informed about the activities associated with the Special Order by Consent and 1,4-dioxane.

This plan was developed to meet the requirements of the Special Order by Consent ("SOC") between the North Carolina Environmental Management Commission and the City of Greensboro ("City") with applicability toward individual, commercial and industrial users of City Water Resources Department services. In summary, this plan will educate the public on understanding risks, products that contain a significant level of 1,4-dioxane, raw materials that may contribute to 1,4-dioxane creation, and ways the public can help reduce and/or eliminate their contribution of 1,4-dioxane to the City's wastewater system.

Year One Outreach Activities:

The City's first priority was to make all relevant information regarding the SOC readily available to the public, including sampling data, Quarterly Meeting notes, and other documents.

Prior to eDMR submittal deadlines, the following data is provided via email to over 70 individuals (currently 17 from NCDEQ, 12 downstream drinking water utilities, and other interested parties): T.Z. Osborne effluent eDMR data, Pittsboro Drinking Water Plant data, and receiving stream data from 2 locations. Data spreadsheets from each of the emails are also posted/updated on the City of Greensboro website. This voluntary effort ensures all interested parties have direct communication from the City concerning recent 1,4-dioxane data.

The City of Greensboro 2021 Annual Sewer Report, required by NCDEQ, included a section devoted to 1,4-dioxane and the Special Order by Consent, including links to the City's 1,4-dioxane website updates. The report was submitted to NCDEQ on March 1, 2022, was posted on the City website, and copies of the report are available to residents at several Water Resources Department locations.

The following information/ documents were posted on the City of Greensboro website during Year One to inform the general public and other interested parties:

- Original Special Order by Consent (effective May 1, 2021)
- Original SOC Sampling Plan (dated 5-26-2021)
- SOC Settlement Agreement (dated 11-22-2021)
- Amended Special Order by Consent (effective 12-1-2021)
- Amended SOC Sampling Plan (dated 12-1-2021)
- City/NCDEQ SOC Quarterly Meeting Summaries posted after review and approval by DWR staff:
  - 1st Quarterly Meeting held: May 19, 2021
  - 2nd Quarterly Meeting held: September 8, 2021
  - 3rd Quarterly Meeting held: November 23, 2021
  - 4th Quarterly Meeting held: February 16, 2022

- City of Greensboro SIU Wastewater Discharge Permit Application, SIU Permit Application Instructions (including site-specific 1,4-dioxane requirements)
- T. Z. Osborne electronic Discharge Monitoring Reports/eDMR (from Jan 2021 to present)
- T. Z. Osborne Results from 2019 NCDEQ Study: 1,4-dioxane and PFAS data
- Source Investigation, Evaluation, and Survey Document for Industrial Users
- City of Greensboro Contaminants of Emerging Concern (CEC) Policy (dated 2-1-2022)
- 5-Day Reports for SOC Compliance Value Exceedance Events
  - June 30, 2021
  - November 3, 2021
  - April 5, 2022

Year Two and Year Three Outreach Activities:

The above website and email activities from Year One will be continued in Years Two and Three.

The priorities for Years Two and Three will be to educate the public on the calculated risks associated with 1,4-dioxane, products that contain a significant level of 1,4-dioxane, and raw materials that may contribute to 1,4-dioxane creation during chemical reactions. The City will develop and implement a public awareness campaign using public access television and multimedia outlets.

The Greensboro Public Access Television Station (GTN) will be utilized to further inform our water customers, commercial, industrial and domestic, about 1,4-dioxane and the City's continued efforts to address this contaminant of emerging concern. The campaign will include three Public Service Announcements (PSA), with the audience being the commercial, industrial and domestic customer groups. Production of this campaign will start the summer of 2022 and should be available on GTN by fall 2022. The City will also produce one commercial to air on GTN during Year Two.

In addition to the GTN public awareness campaign, the City Industrial Waste staff will provide detailed updated information on 1,4-dioxane as part of its annual Industry Day meeting. The Industry Day meeting is a mandatory meeting with all Greensboro Significant Industrial Users and permitted Industrial Users.

The City will also develop a water bill insert with pertinent information on 1,4-dioxane to encourage all customers to access the City website for additional information.

City of Greensboro Industrial Waste and Laboratory staff have presented information to various technical and professional organizations concerning the City's approach to 1,4-dioxane source identification, investigation and reduction in the collection system.

v. <u>A table of all monitoring results for 1,4-dioxane collected during the SOC Year One.</u>

Year One Data (May 1, 2021 – April 30, 2022) supporting the following tables/summaries are included in this submittal as Appendices A through E:

Background information on data, data review, and calculations for the following summaries:

- Sample counts herein record split samples as a separate result and separate sample
- In calculating averages, BDL values were used directly (rather than ½ detect or zero), as long as the PQL reported was <1 or <2. In instances of elevated PQLs, only the range of the results has been reported in the summaries.
- Neither of the commercial laboratories used by the City for 1,4-dioxane analyses have the analytical capacity to conduct "Rush" (24-hour) analyses on all samples, so as of the date of this report, only the TZO effluent eDMR sample and the Patton Trunkline surveillance samples are being sent for rush analysis. Additional sites are sent for rush analyses in response to any Compliance Value Exceedance.

1. SOC Sampling Plan Sites 1-26 (28 sites): City of Greensboro Sampling/Analyses [Data for Sites 1-24 in Appendix A]

SP#	WWTP Site & Sample Type		1,4-Dioxane µg/l: #Samples, Range, Average			Description
1	TZO Influent	C	52	1.55- 580^	24.0	TZO NPDES Influent Sampler
2	North Buffalo Influent	C	23	(20 <1 and 3 <2)	All BDL	NB NPDES Influent Sampler
3G	TZO Effluent [Appendix B]	G	106	1.54 – 823^	32.7	eDMR Grab for compliance
3C	TZO Effluent Weekly Composite	C	11	5.14 – 547*	87.6	Volumetric composite for NCDEQ
4	TZO Aeration Tank	G	4	<2 – 5.5	3.8	Effluent end of tank (Cell M)
5	Dewatered Sludge Cake (ug/kg)	C	4	<8.3 - <38.2	All BDL	Operations Composite samples
6	Incinerator Scrubber/Centrate	G	4	<2 – 5.7	3.6	Discharge to influent wet well

**June 30, 2021 event ^November 3, 2021 event + April 5, 2022 event*

The TZO Influent (SP#1) and North Buffalo Influent (SP#2) 24-hour composite samples were used to investigate any correlation between the trunkline monitoring samples and trunkline surveillance samples. In addition, the results and corresponding flows will be used in mass-balance calculations. The TZO Influent sample is analyzed weekly to track 1,4-dioxane concentrations entering the TZO facility.

TZO effluent <u>grab</u> samples (SP#3G) are collected weekly (per SOC requirement) and results are reported on the TZO eDMR submitted to NCDEQ. All grab TZO effluent samples are split and sent to 2 different commercial laboratories for analysis. The split sample results are averaged to obtain the eDMR value, that is then compared to the applicable SOC daily maximum Compliance Value. Three daily maximum exceedances were recorded during Year One.

The TZO effluent weekly composite sample (SP#3C) is the volumetric composite the City agreed to collect and retain for potential use by NCDEQ. The samples are retained until TZO eDMR grab sample results for the week are received. If the eDMR grab sample for the week is in compliance, the weekly composite is discarded. If the eDMR grab sample for the week is not in compliance, the weekly composite is sent for rush analysis to confirm elevated levels in the TZO influent.

SP#s 4, 5, 6 are associated with the TZO activated sludge and solids handling processes and were selected in order to verify the results of initial study that indicated 1,4-dioxane does not partition to solids/sludge. The results confirmed the 2015 study information.

SP#	Industrial Trunkline & Sample Type		1,4-Dioxane µg/l: #Samples, Results, Average			Description
7	IND TL 1: Patton	C	4	2.3, 3.12, 5.96, 8.9	5.07	Includes 7 SIUs
8	IND TL 2: Arlington	C	4	2.46, 3.2, 6.29, 6.81	4.69	Includes 6 SIUs
9	IND TL 3: Reedy Fork	C	4	66.2, 102, 109, 125	101	Includes 4 SIUs
10	IND TL 4: Airport	C	4	1.3, 1.8, <2, 2.6	1.9	Includes 5 SIUs
11	IND TL 5: Whitsett	C	4	<2, <2, 1.24, 2.49	1.9	Includes 4 SIUs
12	IND TL 6: North Buffalo	C	4	<1, 1.23, 1.69, <2	1.48	Includes 3 SIUs
12A	IND TL 7: Radar Road	C	2	<50, <2	All BDL	Includes 2 SIUs

SP#s 7-12A include discharges from Significant Industrial Users (SIUs), as indicated in the table above, as well as smaller industrial users. As defined by EPA, SIUs include those industrial facilities that discharge 25,000 gpd, or more, of process wastewater as well as SIUs subject to Federal Categorical Pretreatment Standards, who may or may not meet the EPA flow criteria. The total flow permitted to SIUs in Greensboro is 3.67 MGD. Because one SIU discharges directly to TZO, the total of SIUs in chart above does not correspond to total number of permitted SIUs.

Sampling at these sites served/serves two primary purposes:

1. To conduct source identification; and
2. To generate mass-balance data for the industrial sector (as required during SOC Year Two).

Per the approved SOC sampling plan, these site were sampled quarterly and each have four corresponding results in the table above. However, SP#12A is an exception. When selecting the industrial trunkline sampling locations, it was thought that two SIUs, Gilbarco and HAECO, were captured at SP#10 IND TL 4: Airport. However, further investigation by Water Reclamation and Engineering staff determined that was not the case. Therefore, SP#12A IND TL 7: Radar Road was added to the sampling plan during the third quarter of Year One and was only sampled for Quarters 3 and 4.

During SOC Year One, if trunkline sampling results were >100 µg/l, the City immediately began source investigation/tracking/ identification via additional sampling, evaluation, and SIU source notification. Ultimately, the scheduled, quarterly monitoring of the trunklines, required by the SOC, did not lead to the detection of additional, significant contributors of 1,4-dioxane during Year One.

SP#	Domestic/Commercial Trunkline & Sample Type		1,4-Dioxane µg/l: #Samples, Range, Average			Description
13	Dom/Com TL 1: Wesley Long	C	4	<1, 1.26, 1.48, <2	1.4	Hospital and commercial
14	Dom/Com TL 2: A&T University	C	4	1.33, <2, <2, <1	1.58	University and commercial
15	Dom/Com TL 3: Bessemer	C	4	<1, <1, <2, <2	1.5	Commercial
16	Dom TL 4: Willoughby Blvd	C	4	1.05, 1.32, <2, <1	1.34	Domestic only
17	Dom TL 5: Shelby Dr. (MH36216)	C	5	2.56/2.12, 1.27, <2, <2,	2.06	Domestic/Industrial
17A	Dom/Com 5: Shelby Dr. (MH29176)	C	3	1.57, 1.69, 2.38	1.88	Domestic/Commercial

SPs #13-17 are considered uncontrollable/uncontrolled sources and used to determine typical concentrations of 1,4-dioxane in various commercial and domestic/residential areas. Loadings will be used in mass-balance and HWA uncontrollable/uncontrolled calculations.

SPs #13-15 are commercial while SPs #16-17 are considered domestic wastewater. The majority of the flow (90%) to TZO is considered uncontrollable/uncontrolled.

Shelby Drive was split into SP 17 and 17A when the City realized the initial sampling point contained the Airport trunkline and domestic discharge. The original Shelby domestic manhole was MH36216. Water Reclamation and Engineering staff reviewed the maps in GIS and the domestic site was moved to MH29176 and separated from industrial flow.

Although no contribution significant enough to cause a Year One SOC exceedance at TZO was found, the domestic/commercial concentrations must be included in mass balance calculations, and taken into consideration for any final NPDES limit Greensboro may receive. Research conducted in New York indicates 1,4-dioxane can be found in a variety of personal care products, including baby products, shampoos, detergents and body washes, and could be the source of the small concentrations the City found in this sector.

https://www.citizenscampaign.org/whats-new-at-cce/2019/4/2/environmental-group-says-65-of-80-household-products-containnbsp14-dioxane

SP#	Drinking Water Site & Sample Type		1,4-Dioxane µg/l: #Samples, Range, Average			Description (Total 33.26 MGD)
18	Drinking Water 1: Townsend	G	4	<1, <1, <1, <2	All BDL	City of Greensboro – 16.9 MGD
19	Drinking Water 2: Mitchell	G	4	<1, <1, <1, <2	All BDL	City of Greensboro – 6.49 MGD
20	Drinking Water 3: PTRWA	G	12	1.3, 2.0, 1.8, 1.2, 2.8, 1.6, 1.1, <2, <2, <2, <2, <2	1.8	Randleman Lake – 6.84 MGD
21	Drinking Water 4: Burlington	G	4	<1, <1, <1, <2	All BDL	City of Burlington – 2.04 MGD
22	Drinking Water 5: Reidsville	G	4	<1, <1, <1, <2	All BDL	City of Reidsville – 0.99 MGD

SOC Sampling Plan Sites #18-22 include all the drinking water sources to TZO. The City of Greensboro has five drinking water sources that ultimately discharge to the TZO facility. Two of the drinking water facilities are wholly owned/operated by the City of Greensboro (Mitchell, Townsend) and Greensboro is a partner (51%) in the Piedmont Triad Regional Water Authority (PTRWA) that owns/operates the Randleman Lake facility. Greensboro contracts to purchase finished drinking water daily from two other municipalities, Burlington and Reidsville.

An average of ~33.26 MGD of potable water is provided to Greensboro Water Resources Department customers daily from the five drinking water sources with the approximate daily contributions as follows: Lake Townsend 51%, Mitchell 20%, PTRWA 20%, City of Burlington 6%, and Reidsville 3%.

Data from UCMR3 conducted from 2013-2015 indicated sites #18, #19, #21, #22 did not have 1,4-dioxane detections, while site #20 (PTRWA) did have detectable concentrations. All five sites were included in the current Greensboro SOC study to determine the contributions from drinking water sources.

The pretreatment program would consider drinking water sources as uncontrolled/uncontrollable. Loading from the drinking water sector is an important calculation and will be used in subsequent mass-balance, headworks analysis calculations, and future discussions of the TZO facility long term-achievable effluent concentrations.

SP#	Other Sites & Sample Type		1,4-Dioxane µg/l: #Samples, Range, Average			Description
23	Landfill Leachate	G	7	71, 62, 60, 50, 61, 55, 32	55.9	City of Greensboro Landfill
24	Domestic Septage	G	4	<2, <2, <2, <2	All BDL	Hauled Waste Accepted at TZO
25	Haw River Arm Jordan Lake	G	24	<1.0 – 8.76* (12 <1)	1.98	Below Pittsboro intake [Data in Appendix C]
26	Pittsboro Raw Water Intake	C	36	<1 – 43.9^	3.8	1st drinking water intake below TZO [Data in Appendix D]
	Pittsboro Raw Water Intake	G	48	<1 - 93.6*	11.9	

**June 30, 2021 event ^November 3, 2021 event + April 5, 2022 event*

The City owns the Greensboro White Street landfill (SP#23), an active Municipal Solid Waste (MSW) landfill that originally opened in the 1940s. The landfill consists of three units: Phase I, an unlined pre-regulated unit that closed in 1978; Phase II (ID No. ES-2), an unlined regulated unit that closed in 1998 but has an active construction and demolition debris (C&D) landfill operating on top of the closed landfill; and Phase III, a regulated Subtitle-D lined unit. Phase III stopped accepting MSW in 2006, but remains an active landfill that is currently permitted to accept less than 8,000 tons of waste, specifically sewage sludge incineration ash from the TZO facility. The landfill also has an active composting operation. Leachate from Phase III is collected and pumped to two 300,000 gallon above ground storage/equalization tanks that allow for the restricted discharge of the collected leachate (less than <25,000 gpd) to the TZO facility. Leachate data will be used in the 1,4-dioxane mass-balance calculations and headworks analysis loadings.

The City of Greensboro accepts over 4 million gallons per year of domestic septage at the TZO facility. Data from SP#24 will be used to calculate the septage loading for mass-balance purposes, as well as headworks analysis. The data from this site once again indicates that 1,4-dioxane does not partition into solids as all of the samples results were <2 µg/l.

SP#25 is a grab sample taken from the Haw River Arm of Jordan Lake at DEQ Site CPF055C. The sample is collected by Meritech Laboratory, is below the Pittsboro Drinking Water Intake, and will be used to provide data for downstream utilities and to monitor the goal of the SOC. Note: This site includes discharges from several other municipal WWTPs.

SP#26 is the Town of Pittsboro Haw River Drinking Water Plant Intake. Weekly composite and/or grab samples are collected by Pittsboro staff, couriered by the commercial laboratory, with "Rush" results reported to both Pittsboro and the City. Greensboro covers the cost of all of these analyses. Additional sampling is conducted immediately after a TZO compliance Value Exceedance. Note: This site includes discharges from other municipal WWTPs. Rush results allow the Town of Pittsboro to respond quickly in making treatment decisions in mitigating elevated 1,4-dioxane concentrations.

2. SOC Direct SIU Direct Sampling Sites 27–58: City of Greensboro Sampling/Analyses [Data in Appendix E]
   Data collected by City (2 consecutive quarters Sep-Nov 2021, Dec 2021-Feb 2022)
   Summary of self-monitoring data by selected SIUs is in Section 5

SP#	SIU, Sample Type, # Samples			1,4-Dioxane µg/l SOC Year One: 2 Qtrs	Trunkline	Industry Description
27	Aramark	C	3	All <5	Arlington	Industrial Laundry
28	Chemol	C	4	<50, <100, <100, <100	Arlington	Organic Chemical Manufacturing
29	Ecolab	C	7	<50, 93/48, 83, 67, <100, 73	Airport	Soap & Detergent Manufacturing
30	Elastic Fabrics	C	2	19, <20	Patton	Textile Manufacturing
31	Evonik 01	C	2	<2, <2	Arlington	Polymer & Surfactant Manufacturing
32	Evonik 02	C	2	126, 27	Arlington	Polymer & Surfactant Manufacturing
33	Express Container	C	2	5.2, <20	Airport	Transportation Equipment Cleaning
34	GILBARCO	C	2	<2 <2	Radar Road	Metal Finishing
35	GSO Industrial Platers 01	C	2	1.74, <2	North Buffalo	Job Shop Electroplater (<10,000 gpd)
36	GSO Industrial Platers 02	C	2	1.26, <2	Patton	Job Shop Electroplater (<10,000 gpd)
37	HAECO	C	2	<2, <2	Radar Road	Metal Finishing
38	IQE	C	2	<2, <2	Airport	Electrical & Electronic Components
39	ITG (Lorillard)	C	2	<2, <2	North Buffalo	Tobacco Products Manufacturing
40	Lanxess	C	2	15, <2	Patton	Organic Chemical Manufacturing
41	Machine Specialties	C	2	<2, <2	Whitsett	Metal Finishing
42	Procter & Gamble BS 01	C	7	(5 <1), <10, <2	Reedy Fork	Pharmaceutical Manufacturing
43	Procter & Gamble BS 02	C	7	(5 <1), (1 < 10), 14.4	Reedy Fork	Pharmaceutical Manufacturing
44	Procter & Gamble Swing	C	3	5.8, 2.1, <2	Airport	Pharmaceutical Manufacturing
45	Parker Metal Finishing	C	2	<2, <2	Arlington	Job Shop Electroplater (<10,000 gpd)
46	Piedmont Plating	C	2	<1, <100	Direct to TZO	Metal Finishing
47	Precision Fabrics	C	3	52, 37, <50	Patton	Textile Manufacturing
48	PRECOR	C	2	<2, <2	Whitsett	Metal Finishing
49	QORVO	C	2	<2, <2	Airport	Electrical & Electronic Components

SP#	SIU, Sample Type, # Samples			1,4-Dioxane µg/l SOC Year One: 2 Qtrs	Trunkline	Industry Description
50	Qualicaps	C	2	<10, <2	Whitsett	Gelatin Capsule Manufacturing
51	Shamrock BS 01 (PT system)	C	3	956, 286, 5.3	Reedy Fork	Centralized Waste Treatment
52	Shamrock BS 02	C	4	159, 322, 1040, 92	Reedy Fork	Centralized Waste Treatment
53	Shamrock Patton	C	2	32, 7	Patton	Transportation Equipment Cleaning
54	Solenis	C	2	6.9, <100	Arlington	Polymer & Chemical Manufacturing
55	Triad Anodizing 02	C	2	<2, <2	North Buffalo	Job Shop Electroplater (<10,000 gpd)
56	United Metal	C	2	3.24, <100	Arlington	Metal Finishing
57	Vertellus	C	3	220, 38.5, 819	Patton	Organic Chemical Manufacturing
58	ZINK	C	2	<10, <2	Whitsett	Thermal Imaging Product Mfg

The City's proactive, voluntary efforts to identify/address the source of 1,4-dioxane to TZO began in early 2015. The City developed and implemented a comprehensive 1,4-dioxane source identification sampling plan that included both POTWs and collection system trunkline monitoring. Initial study sampling started in March 2015 and Shamrock Environmental, an SIU, was identified as a major source in October 2015. From March 2015-October 2015 the TZO effluent averaged 126.4 µg/l.

Once notified, the SIU immediately developed and implemented a source identification and control program. This resulted in a significant financial impact to them from extensive source identification testing and turning away clients with the potential to add 1,4-dioxane to their system. From February 2016 through January 2020 the TZO effluent averaged 59.6 µg/l, a 52% reduction.

The SIU voluntarily continued their reduction efforts through engineering investigations that included bench and pilot-scale testing of various treatment and removal technologies. The final multi-million dollar proprietary pretreatment system was voluntarily installed by the SIU in 2020 with final optimization in 2021.

Because the City had discovered this major SIU source in 2015 and 1,4-dioxane discharge levels had been addressed by the SIU's voluntary source-reduction efforts, the June 30, 2021 exceedance event was unexpected. During the timeframe of the June 2021 exceedance, negotiations were underway for settlement of objections against the SOC. In August 2021, as part of the SOC Settlement Agreement negotiations, the City agreed to conduct 1,4-dioxane composite sampling and analyses for each of the 32 SIU discharges once in two consecutive quarters in all three years of the SOC.

SIU Sampling Points 27 through 58 were added to the SOC Sampling Plan in September 2021 and are in the Amended Sampling Plan dated December 2, 2021. The first round of sampling was completed by November 15, 2021 and the second quarter SIU sampling for Year One was conducted December 2021 through February 2022. The results of this sampling for Year One are summarized in the table above.

When sampling detected 1,4-dioxane at concentrations >100 µg/l, the SIU was required to complete a "City of Greensboro 1,4-Dioxane Source Investigation, Evaluation, and Survey". This required the following actions by the SIU:

- Conduct Safety Data Sheet survey of raw materials
- Review chemistry of any product wastestreams
- Investigate production records/internal wastestreams
- Identify potential significant sources of 1,4-dioxane
- Prepare response for City to use in evaluating next steps

The City identified nine SIUs during Year One with discharge concentrations of 1,4-dioxane >100 µg/l. Inspections of these facilities was increased from once/year to three times/year. In response to November 3 event, an email was sent and a meeting held with all 6 SIUs from Patton Trunkline with previous results ≥ 15 µg/l (Ecolab, Lanxess, Elastic Fabrics, Precision Fabrics, Shamrock-Patton, and Vertellus). For the first week following the meeting, each were required to collect and retain daily composite samples and run analysis for 1,4-dioxane. For each week after, and until further notice, these facilities were required to continue to collect and retain daily composites and send a weekly composite for 1,4-dioxane analysis. The summary of SIU self-monitoring results is provided in section 5 of the data summaries.

Ultimately, the City's monitoring of individual SIUs required by the Amended SOC, did not lead directly to the detection of additional, significant contributors of 1,4-dioxane during Year One. However, valuable information was obtained from these samples and several data trends were noted:

- All Electroplating (40 CFR 413) and Metal Finishing (40 CFR 433) facility wastestreams were essentially BDL on all samples
- Aside from the Centralized Waste Treatment (CWT) facility (40 CFR 437), Organic Chemicals, Plastics, and Synthetic Fibers, (OCPSF), manufacturing facilities (40 CFR 414) had the highest discharge concentrations.
- Despite extensive efforts by commercial laboratories, several discharges/wastestreams consistently had matrix interferences resulting in elevated PQLs. The elevated PQLs often rendered the data useless for the purposes of the investigative efforts and the SOC.

3. Voluntary City Sampling - Not in Sampling Plan [Data in Appendix D]
   Other Data: Pittsboro Drinking water plant sites/tanks

SP#	Sites & Sample Type		1,4-Dioxane µg/l: #Samples, Range, Average			Description
+	Pittsboro Finished Water	G	60	<1 – 49.8^	5.6	------
+	Pittsboro Horton Tank	G	33	1.2 – 19.3^	7.2	200,000 gallons
+	Pittsboro Standpipe	G	33	< 1 – 43.3^	7.7	500,000 gallons
+	Pittsboro Million Gallon Tank	G	33	1.1 – 33.1^	8.3	850,000 gallons

+ Extra sampling conducted by City – Sites not in SP but are listed in SOC Compliance Value Exceedance SOP

**June 30, 2021 event* ^*November 3, 2021 event* ° *April 5, 2022 event*

In addition to the Pittsboro Drinking Water Intake sample listed in the SOC Sampling Plan, four additional sites at the Drinking Water Plant were sampled extensively after TZO Compliance Value Exceedances. Data from these sites provided monitoring of the finished water in the various holding tanks and allowed the water plant staff to respond to elevated values.

Samples from these sites were collected by Pittsboro staff, couriered by the commercial laboratory, with “Rush” results reported to both Pittsboro and the City. Greensboro covers the cost of all of these analyses and the sampling conducted at these sites after a TZO Compliance Value Exceedance continues until the Town of Pittsboro staff make the call to revert back to sampling only the Haw River Intake site and finished water.

4. Extra 1,4-Dioxane Sampling [Data in Appendix A]
   Trunkline Surveillance Sampling

In response to SOC Compliance Value Exceedance events, additional continuous sampling was conducted at certain industrial trunklines. Composite samplers were placed at the following trunklines and operated 24/7, with composite samples collected/samplers maintained twice per week (typically on Monday and Friday of each week). All semi-weekly samples collected are retained until TZO effluent data is received, but not all surveillance samples are analyzed.

It should be noted that composite samplers have remained at Patton, Arlington, Airport and Bryan Park every day since the November 3, 2021 event. Until April 6, 2022, samples from Patton and Arlington trunklines were sent once/week for rush analysis (48-hour turnaround time) to ensure timely notification on elevated results. Since April 6, only Patton trunkline samples are sent once/week for rush analysis. *A total of 208 trunkline surveillance samples have been collected and retained since then.* As indicated below, 84 of the samples were analyzed for 1,4-dioxane.

SP#	Surveillance Sites & Sample Type		1,4-Dioxane µg/l: #Analyses, Range, Average			Description
+	Patton Trunkline Surveillance	C	31	<2 – 369^	23.5	Includes 7 SIUs
+	Arlington Trunkline Surveillance	C	24	< 2 – 32	7.53	Includes 6 SIUs
+	Airport Trunkline Surveillance	C	6	1.34 – 4.48	2.59	Includes 5 SIUs
+	Bryan Park Manhole Surveillance	C	22	5 - 610	322.8	Shamrock BS 01/02

+ *Extra sampling conducted by City – Surveillance sampling not in SP- some are in SOC Compliance Value Exceedance SOP*

**June 30, 2021 event   ^November 3, 2021 event   ° April 5, 2022 event*

The City's response to trunkline surveillance concentrations takes into consideration the % flow contribution of each trunkline to the TZO plant. The flow contributions are as follows: Patton - 35%, Arlington - 4%, Airport - 12.5% (included in Patton), Reedy Fork - 4.2% (includes Bryan Park manhole)

5. SIU Self-Monitoring Sampling Results
   SIUs With At Least One sample >100 µg/l
   SIUs Patton Trunkline >15 µg/l

SP#	SIU, Sample Type, # Samples			1,4-Dioxane µg/l	Trunkline
28	Chemol	C	11	789, 30, <100, <10, 154, 1230, 282, 178, 873, 575, 292 (Also internal process sampling)	Arlington
29	Ecolab (↑PQLs from foam)	C	39	108, 77, 64, 748, 161, 102 (17 <100, 2 <200, 12 <1000, 2 <2000)	Airport
30	Elastic Fabrics	C	13	135, 10, 18, 26, 16, 31, 23, 73, 19 (4 <10)	Patton
32	Evonik 02	C		Internal raw materials sampling	Arlington
40	Lanxess	C	32	21 Detections: 6.9 – 36, 200° (11 < 10)	Patton
47	Precision Fabrics	C	25	128, 55, 56, 53, 97, 94, 127, 54, 94 (15 <100, 1 <200),	Patton
51	Shamrock BS 01 (PT)	C	64	Daily Composite Samples Retained Weekly Composite Analyzed - Avg. 377	Reedy Fork
52	Shamrock BS 02	C	19	Daily Composite Samples Retained Weekly Composite Analyzed - Avg. 228	Reedy Fork
53	Shamrock Patton	C	23	14 Detections 2.7 – 48.1 All others BDL	Patton
57	Vertellus	C	20	29, 582, 1240, 309, 310, 436, 143, 868 (12 <100)	Patton

**June 30, 2021 event ^November 3, 2021 event ° April 5, 2022 event*

Note: Shamrock BS 01 and 02 had been collecting daily/weekly samples prior to the SOC since they had previously been identified as a significant source. After the November 3 event, 5 Patton Trunkline SIUs with a result >15 µg/l were required to begin collecting and retaining daily and weekly composite samples as well, and have the weekly composite analyzed.

6. Creeks/Surface Water Sampling – Above and Below TZO Effluent Discharge [Data in Appendix F]
Note: Creeks are listed in geographic order from TZO effluent discharge outfall location

SP#	Creek Sites & Sample Type		1,4-Dioxane µg/l: # Samples, Range		Description
+	Old 70 Bridge	G	19	2.1, 3.0, 2.4, 2.7 (15 <2)	South Buffalo Creek above TZO
+	Harvest Road Bridge	G	2	13.3^, 16.7^	South Buffalo Creek below TZO
+	McLeansville Road Bridge	G	4	470*, 5.73, 17.7^, 17.8^	Buffalo Creek (confluence of North and South Buffalo Creeks)
+	Huffine Farm Road Bridge	G	1	15.6^	Buffalo Creek (before confluence with Reedy Fork Creek)
+	Highway 61 Bridge	G	26	406*, 5.73, 25^, 2.7, 4.2, 2.6, 5.8°, 4.0, 2.5, 3.1, 2.5 (15 <2)	Reedy Fork Creek before confluence with Haw (only TZO)
+	Highway 62 Bridge	G	7	152*, 3.16, 99.9^, 10.9^, 25.1°, <2, <2	Haw River (includes discharges from other WWTPs)

+ Extra sampling conducted by City – Sites not listed in SP, but are included in City SOP for Exceedance Event

**June 30, 2021 event ^November 3, 2021 event ° April 5, 2022 event*

The City is attempting to acquire as much information as possible concerning impact to downstream utilities, including flow times between the TZO outfall and the Town of Pittsboro Haw River Drinking Water Intake.

For this reason, sampling began at South Buffalo Creek above TZO (Old 70 Bridge) in February 2022. It should be noted that there were detections in several samples from the Old 70 Bridge site, which is *above* the TZO effluent outfall.

Along with that sample, laboratory staff began collecting Reedy Fork Creek, before confluence with the Haw River (Hwy 61 Bridge), to help monitor downstream concentrations and impacts. Highway 61 is an extra sample collected by the City on a weekly basis and *only includes* the TZO effluent discharge.

The City developed a SOC Compliance Value Exceedance SOP that includes creek sampling at Harvest Road Bridge, McLeansville Road Bridge, Highway 61 Bridge and Highway 62 Bridge for any value over 105 µg/l. This will help estimate when elevated concentrations may reach the Town of Pittsboro, the first drinking water utility downstream that pulls from the Haw River.

Please note in the chart above that all high values occurred in conjunction with a Compliance Value exceedance at TZO.

vi. SOC Compliance Value Exceedances in Year One

1. June 30, 2021 Exceedance [615 µg/l]
   Notification from outside laboratory of high value on July 1, 2022. The first split sample result from Pace for June 30 was 543 µg/l. Meritech's value was 687 µg/l for an average of 615 µg/l.
   - Notified DEQ and all downstream utilities by phone and email
   - Collected a TZO eDMR effluent grab sample for rush analysis.
   - Sampled three downstream creek locations for rush analysis (split with DEQ).
   - Sent weekly composites for 2 previous weeks and daily effluent composite samples from 7/2 through 7/9 for split analysis.
   - Notified Shamrock Environmental to run all daily composites for Pipe 01 and 02. NOTE - Shamrock was determined not to be the cause of this exceedance.
   - Greensboro covered daily Town of Pittsboro raw intake water plant samples and finished water plant samples during this high discharge event.
   - The TZ Osborne WWTP effluent grab sample (eDMR) collected Wednesday 7/7 was 11.5 µg/l. This result indicated the exceedance did not continue into the next week, as the value was back in compliance and in-line with recent TZO effluent concentrations.

   The City had been sampling trunklines quarterly according to the SOC sampling plan approved by DEQ. Due to this event, it was decided to have samplers set up on the main trunklines 24/7 so additional samples would help locate any additional sources.

   In response to this event, direct SIU composite samples were collected by the City of Greensboro and analyzed for 1,4-dioxane for screening purposes. Two SIUs (other than Shamrock) had confirmed concentrations >100 µg/l and both were notified and source investigations were conducted. Greensboro also developed a Source Reduction memo for any SIU/discharger found to be above 100 µg/l. The following sampling plan additions were made: Direct individual SIU sampling and analysis of all 29 SIUs for 1,4-dioxane, and three new surveillance sampling locations were added. Due to this event, the City also developed an SOC Compliance Value Exceedance SOP In September of 2020, Arcadis completed a $20,000 Sewer Travel Time Study for SIUs and IUs. The travel times for all of the industries were estimated using the existing calibrated model. Wet weather travel times were calculated using 2, 5 and 10 year design storms as used during calibration. This study includes dry weather and wet weather flows. This flow time model information was very useful in subsequent elevated trunkline concentration investigations. The SIU/IU flow times ranged from 1.2 hours to 27.7 hours.

   After an extensive investigation, the source of the June 30, 2021 1,4-dioxane exceedance could not be determined.

   Based on the SOC compliance value exceedance, the City received a penalty demand letter and was assessed a stipulated penalty of $1000 in November 2021. This payment was made within the 30-day requirement.

2. November 3, 2021 Exceedance [823 µg/l]
   Notification from outside laboratory of high value on November 8, 2022. The first split sample result from Pace for November 3 was 767 µg/l. The Meritech result was received 11/9/2021 with a value of 879 µg/l. The average for the Wednesday November 3, 2021 TZO eDMR grab sample was 823 µg/l.
   - Notified DEQ and all downstream utilities.
   - Collected and sent all samples required by the SOC Compliance value exceedance SOP for analysis.
   - Greensboro covered daily Town of Pittsboro raw intake water plant samples and finished water plant samples during this high discharge event.
   - Notified Shamrock Environmental to run all daily composites for Pipe 01 and 02 for 10/28 - 11/5 and review operations for 11/1-11/5. NOTE - Shamrock was not the cause of this exceedance.
   - Sent the 11/1-11/5 composite surveillance samples from Patton, Arlington and Bryan Park trunklines.
   - Surveillance samples indicate the Patton trunkline was the likely source of the high discharge. Greensboro staff investigated industries that discharge to that trunkline. Although we believe we found the trunkline with the source of the high discharge, we did not find the industry itself. Therefore the City held a mandatory meeting with those SIUs.
   - The mandatory meeting for SIUs on the Patton trunkline was held at 10:30 am on November 12, 2021. All of these SIUs were required to collect daily composite samples from Saturday, November 13th through Friday, November 19 (if discharging) and send all daily composites for analysis. Starting November 20th and continuing until further notice, all these SIUs will be required to collect and retain a daily composite sample and send a weekly composite (made from the daily samples) out for analysis.
   - The TZ Osborne WWTP effluent grab sample (eDMR) collected Monday 11/8 was 12.9 µg/l. This result indicated the exceedance did not continue into the next week, as the 11/8 value was back in compliance and in-line with recent TZO effluent concentrations.
   - Based on the SOC compliance value exceedance, the City received a penalty demand letter and was assessed a stipulated penalty of $1000 in February 2022. This payment was made within the 30 day requirement.

3. April 5, 2022 Exceedance [47.1 µg/l]
   Notification from outside laboratory of high value on April 6, 2022 from "Rush" analysis. The first split sample result from Pace for April 5 was 52.2 µg/l. Second result from Meritech received April 8 of 45.4 µg/l. The average for both was 47.1 µg/l.
   - Notified DEQ and all downstream utilities.
   - Collected and sent all samples required by the SOC Compliance Value Exceedance SOP for analysis.
   - Greensboro covered daily Town of Pittsboro raw intake water plant samples and finished water plant samples during this high discharge event.
   - Instructed Shamrock to have all Pipe 01 and Pipe 02 daily composites from 3/29/2022 through 4/4/2022 and to send out weekly composites for Pipe 01 and Pipe 02 for 3/27/2022 through 4/2/2022 for *RUSH* analysis. They were asked to conduct a review of the facility's operations from 3/27/2022 through 4/2/2022. NOTE - Shamrock was not the cause of this exceedance.
   - Surveillance samples, sent out weekly with eDMR samples, indicate the Patton trunkline was the likely source of the high discharge due to the percent of its contribution to TZ Osborne's influent flow.
   - Five industries on that trunkline required to send weekly composite for 3/27-4/2 for rush analysis. (Ecolab, Elastic Fabrics, Lanxess, Precision Fabrics and Vertellus)
   - Results from Lanxess indicate they were the source of the exceedance. Their weekly composite was 15,200 µg/l.
     - Based on daily and weekly results and their source investigation evaluation, Lanxess has identified a product that generated 1,4-dioxane as an unintended reaction by-product during the production process.
     - SDS review of raw materials in this product did not indicate 1,4-dioxane
     - Raw materials used in the product have been sent to laboratory for analysis
     - They typically only produce this product once per year.
     - They also identified a sister product that they manufacture only 1-2 times per year that may also generate 1,4-dioxane as an unintended by-product. They will conduct lab scale testing on this product as well.
     - Lanxess contacted their Global Production Manager to discuss next steps. Manufacture of the suspected products at the Greensboro facility has been halted until further notice.
   - The TZO average effluent grab sample (eDMR) collected Wednesday 4/6/2022 was 19.3 µg/l. This result indicated the exceedance did not continue into the next week, as the 4/6 value was back in compliance.
   - Based on the SOC compliance value exceedance, the City received a penalty demand letter on June 8, 2022 and was assessed a stipulated penalty of $1000 A check order has been issued and this payment will be made within the 30-day requirement.

Full 5-Day Reports submitted to NCDEQ re: each Compliance Value Exceedance event are posted on the City of Greensboro website at:
https://www.greensboro-nc.gov/departments/water-resources/wastewater-system/1-4-dioxane-updates/sampling-results

vii. Determine the following and provide a summary to the Department:

- Long-term achievable effectiveness of source reduction efforts and resulting T.Z. Osborne WWTP effluent reductions

Since 1,4-dioxane is not removed by conventional wastewater treatment processes, source reduction has always been the focus of the City's efforts to reduce TZO effluent concentrations. During the initial sampling phase of the 2015 1,4-Dioxane Study, the TZO effluent (composite samples) averaged 126 µg/l. During SOC Year One, the TZO effluent (52 eDMR grab samples) averaged 32.7 µg/l, a 74.0% reduction. If the three Compliance Value exceedances are removed from the SOC Year One data set, the TZO (eDMR grab samples) effluent averaged 4.99 µg/l, a 96% reduction from 2015 effluent concentrations. The City's commitment to source reduction has been espoused by the Greensboro industrial community, making these reductions achievable and sustainable.

- Industrial Contributions

Industrial contributions by permitted SIUs were determined by direct sampling of SIUs by the City, and are included in section v. 2. Only nine of the 32 sampling sites recorded a value >100 µg/l and 17 sites recorded BDL/<2 µg/l on both samples. The total actual SIU flow to TZO averages 2.0 MGD (~6% of influent flow). Two significant industrial sources were identified: one has installed pretreatment to reduce 1,4-dioxane discharges, and the other has stopped the manufacture of all products thought to generate 1,4-dioxane until further notice. The City continues to work with the 7 other SIUs with values >100 µg/l.

- Domestic contributions

The average concentration of composite samples taken from the purely domestic trunkline (Willoughby Boulevard neighborhood) was 1.34 µg/l. The estimated uncontrollable/uncontrolled flow from the last headworks analysis (HWA) conducted by the City of Greensboro was 28.9 MGD. The uncontrolled flow includes domestic connections (~97,000) as well as commercial connections (~8,000), but does not include permitted flows from SIUs. When a 1,4-dioxane HWA is conducted the "uncontrolled loading" concentration used will likely be a combination of domestic data and commercial data collected during Year One.

- Commercial contributions

SOC sampling plan sites selected for this sector included various commercial and non-domestic discharges, including a hospital, university, shopping mall, restaurants, etc. The average concentration from these sites was 1.59 µg/l. The estimated uncontrollable/uncontrolled flow from the last headworks analysis (HWA) conducted by the City of Greensboro was 28.9 MGD. The uncontrolled flow includes domestic connections (~97,000) as well as commercial connections (~8,000), but does not include permitted flows from SIUs. When a 1,4-dioxane HWA is conducted the "uncontrolled loading" concentration used will likely be a combination of domestic data and commercial data collected during Year One.

- Drinking water contributions

Data from the five Greensboro drinking water sources indicates that only PTRWA (Randleman Lake) finished water had detectable concentrations of 1,4-dioxane. The highest value detected from grab samples taken at the PTRWA inter-connect with the City of Greensboro was 2.8 µg/l. The PTRWA plant provides ~20% of the Greensboro drinking water, with an estimated daily flow of 6.8 MGD. The source of the 1,4-dioxane contamination in Randleman Lake may be the old Seaboard Chemical site and/or the old High Point landfill.

Data Appendices:

Appendix A: 1,4-Dioxane Data Sampling Plan Sites #1-24 (except 3G)
Appendix B: 1,4-Dioxane Data Sampling Plan Site #3G
Appendix C: 1,4-Dioxane Data Sampling Plan Site 25
Appendix D: 1,4-Dioxane Data Sampling Plan Site 26 (and other Pittsboro Water Plant sites)
Appendix E: 1,4-Dioxane Data Sampling Plan Sites #27-58 SIUs (City/SIU Self-Monitoring)
Appendix F: 1,4-Dioxane Data Surface Water Samples (not in Sampling Plan)

Related SOC documents with additional detailed information have been previously submitted to NCDEQ and are available on the City of Greensboro website, including current Amended SOC document, Amended SOC Sampling Plan, Quarterly Meeting Notes, 5-Day Reports for all three Compliance Value Exceedance events, etc.

https://www.greensboro-nc.gov/departments/water-resources/wastewater-system/1-4-dioxane-updates

Appendix A: 1,4-Dioxane Data Sampling Plan Sites #1-24 (except 3G)

DATE	TZO INF 24 comp	N.B. INF 24 Comp	TZO Aeration Tanks	TZO Sludge Cake (mg/kg)	Scrubber Bldg.	Patton Trunk	Arlington Trunk	Reedy Fork Trunk	Bryan Park MH 16066	Indus. #4 Airport	Indus. #5 Whitsett	Indus. #6 N.B. Trunk	Indus. #7 Radar Rd (Gilbarco, Haeco)	Wesley Long	A&T University	Bessemer Elementary School	Willoughby Boulevard	Shelby Drive	DW : Townsend	DW : Mitchell	DW : PTRWA	D. W. Burlington	D. W. Reidsville	Landfill Leachate	Septage	TZO EFFLUENT
	1	2	4	5	6	7	8	9		10	11	12	12A	13	14	15	16	17	18	19	20	21	22	23	24	3C
(ug/l) unless marked other >	TZO Reclamation Sites					TZO Collection Sys. Industrial								TZO Collection Sys. Domestic/Commercial					Drinking Water Sources					Other		
Frequency	Weekly	Monthly from qtrly	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly	Surveillance	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly	Monthly	Quarterly	Quarterly	6x/Year	Feb / May /Aug / Nov	
QUARTER ONE																		1.57								
MAY,JUN,JUL																		1.69								
5/5/2021	4.82	< 1.0																2.38								
5/12/2021	16.3	< 1.0																								
5/19/2021	14.9	< 1.0																								
5/26/2021	14.3	< 1.0																			1.34					
6/2/2021	2.91	< 1.0																								
6/9/2021	51	< 1.0											*Added after Qtr. One*													
6/16/2021	14.6	< 1.0																								
6/21/2021			< 2.04	< 8.3	< 2.04																			70.9	<2.04	
6/23/2021	14.8	< 1.0												< 1.00	1.33		1.05									**86.9**
6/30/2021	90.9	< 1.0																			1.99					**547**
7/7/2021	18	< 1.0						114	610																	
7/8/2021								134																		
7/5 - 7/9/2021								99.3																		
7/9/2021									560							< 1.00										
7/9/21 - 7/12/21								58.6	111																	
7/12/2021								45.2	322																	
7/14/2021	13.7	< 1.0						91.1	533										< 1.0	< 1.0	1.76	< 1.0	< 1.0			
7/15/2021								97.7	467																	
7/19/2021									327																	
7/21/2021	19.4	< 1.0				5.96	6.29		5																	
7/22/2021								102		1.8	2.49	< 1														
7/22 -7/26/21									8.74																	
7/23/2021																										
7/28/2021	25.3	< 1.0																								
7/27 - 7/30																		2.56 / 2.12								
QUARTER TWO																										
AUG,SEPT,OCT																										
8/4/2021	33.5																									
8/11/2021	23.6																									
8/9 -8/12/21						5.95	3.51		458																	
8/12 -8/16/21						8.9	6.81		544																	
8/17/2021								125																		
8/18/2021	13.6								327										< 1.0	< 1.0	1.19	< 1.0	< 1.0	62.1		
8/24/2021							< 20																			
8/25/2021	12.9		5.5	<35.9	5.7																				<2.0	
8/31/2021															<2.00											
9/1/2021	13.5								404	1.34	1.24	1.23														
8/31 - 9/2/2021									404																	
9/8/2021	3.73	< 1.0																								
9/10 -9/14/21						3.88	2.44		308																	
9/15/2021	12.4	< 1.0																								
9/21/2021														1.26			1.32				2.77			60.1		
9/22/2021	15																									
9/29/2021	9.88																									
9/24 - 10/1/2021									379																	
10/6/2021	13.4	< 1.0																								
10/13/2021	22.9																									
10/20/2021	9.47															1.00										
10/26/2021																		1.27								
10/28/2021	65.1																									
10/26 - 10/29/21									347																	
QUARTER THREE																										
10/29 - 11/1/2021									393																	
11/1 -11/5/21						369	< 10																			
11/2 - 11/5/2021									454																	
11/3/2021	580	< 1.0																								
11/5 -11/8/21									54.9																	
11/8/2021																			< 1.0	< 1.0		< 1.0	< 1.0			
11/5 -11/9/21						68.9	5.58																			
11/9/2021														1.48							1.57			49.7		**32**
11/9 -11/12/21						41	< 2		10.3																	**67.5**
11/10 -11/12/21										4.48 /4.46																**18.3**
11/12 -11/15/21						3.84																				
11/14 -11/19/21																										**5.14**
11/15 -11/19/21						3.84		109		3.52																
11/17/2021	15.2		3.6	< 38.2	3.2																				< 2.0	
11/19-11/22/21						3.12	2.46		312	2.64																
11/24/2021	3.72																									
11/29/2021									27.6		< 2	1.69	< 50													
11/30/2021	2.84																									
12/2/2021																					1.1					
12/7/2021	3.1																									
12/7 - 12/9/21															< 2.0											
12/10/2021						3.3																				
12/10 - 12/13/2021						2.8	3		144																	

Appendix A: 1,4-Dioxane Data Sampling Plan Sites #1-24 (except 3G)

DATE	TZO INF 24 comp	N.B. INF 24 Comp	TZO Aeration Tanks	TZO Sludge Cake (mg/kg)	Scrubber Bldg.	Patton Trunk	Arlington Trunk	Reedy Fork Trunk	Bryan Park MH 16066	Indus. #4 Airport	Indus. #5 Whitsett	Indus. #6 N.B. Trunk	Indus. #7 Radar Rd (Gilbarco, Haeco)	Wesley Long	A&T University	Bessemer Elementary School	Willoughby Boulevard	Shelby Drive	DW : Townsend	DW : Mitchell	DW : PTRWA	D. W. Burlington	D. W. Reidsville	Landfill Leachate	Septage	TZO EFFLUENT
	1	2	4	5	6	7	8	9		10	11	12	12A	13	14	15	16	17	18	19	20	21	22	23	24	3C
(ug/l) unless marked other >	TZO Reclaimation Sites					TZO Collection Sys. Industrial								TZO Collection Sys. Domestic/Commercial					Drinking Water Sources					Other		
12/14/2021	4.11	< 2.0																								
12/15/2021																					< 2			61.3		
12/17/2021						3.9	5.1																			
12/20/2021						2.3	10.1																			
12/21/2021	7.73																< 2.0									
12/22/2021						< 2	< 2																			
12/28/2021	3.13					9	8.2																			
1/4/2022	2.55	< 1.0				3.8																				
1/11/2022	3.2	< 1.0																								
1/10 - 1/14/22						6	8.6																			
1/19/2022	6.39																									
1/14 - 1/19/22						4.3	3.9																			
1/20/2022																< 2.0										
1/25/2022	4.37																				< 2			55.3		
1/24 - 1/27/2022						20.6	32											< 2.0								
1/27 - 1/28/22						6.1	12.6																			
QUARTER FOUR FEB,MAR,APR																										
2/1/2022	2.84	< 1.0																								
2/4/2022						< 2	4.5																			
2/8/2022	2.14																									
2/9/2022			4.1	< 37.6	3.5																				< 2.0	
2/14/2022						8.1	3																			
2/14 - 2/15/22															< 1.0											
2/15/2022	5.29																									
2/18/2022																					< 2					
2/21/2022						2.6	< 2																			
2/22/2022	2.62																									
2/25 - 2/28/2022						2.2	2.1																			
3/1/2022	2.64	< 1.0																			< 2					
3/1 - 3/3/22									284								< 1.0									
3/4 - 3/7/22										< 2																
3/8/2022	3.28					2.3	3.2	66.2				< 2	< 2						< 2.0	< 2.0		< 2.0	< 2.0	32		
3/9 - 3/11/22											< 2															
3/11 - 3/14/2022						< 2	21.9																			
3/15/2022	3.32																									
3/21/2022						4.2	16.1																			
3/22/2022	1.55																									
3/24/2022														< 2.0												
3/25 - 3/28/2022						2	4.4																			
3/29/2022	3.42																									
4/1/2022																										133
4/4/2022						95.1	2.6	94.2	599	2.2											< 2					
4/5/2022	7.78	< 2.0																								
4/6/2022	14.1																									37.9
4/7/2022																										18.2
4/8/2022																										11.5
4/11/2022						2.6	6.4																			5.7
4/12/2022	3.38																									
4/14/2022																< 2.0										
4/18/2022						3.1																				
4/19/2022	4.5																									
4/22/2022						25.8				< 2																
4/25/2022						88.5				< 2																
4/26/2022	5.3																	< 2.0								
4/29/2022						2.5				< 2																

APPENDIX B: SPECIAL ORDER BY CONSENT YEAR ONE REPORT							
City of Greensboro NPDES eDMR/SOC Self-Monitoring: T. Z. Osborne WWTP Effluent 1,4-Dioxane Grab Sample Data (in ug/l or parts per billion)							
Week	**Sample Date**	**eDMR Report Value**	**<**	**Lab #1 (Pace)**	**<**	**Lab #2 (Meritech)**	**COMMENTS**
1	**5/5/2021**	**4.71**		4.6		4.82	**SOC effective 5-1-2021 requires weekly grab sampling by City of Greensboro**
2	**5/12/2021**	**6.86**		6.6		7.12	
3	**5/19/2021**	**11.0**		11.5		10.5	
4	**5/26/2021**	**7.76**		7.1		8.42	
5	**6/2/2021**	**2.73**		3.1		2.35	
6	**6/9/2021**	**20.4**		21.9		18.9	
7	**6/16/2021**	**4.18**		4.0		4.36	
8	**6/23/2021**	**3.93**		3.7		4.15	
9	**6/30/2021**	**615**		543		687	NCDEQ WSRO & downstream utilities notified of SOC exceedance -NOV/NOI received 9-1-21
10	**7/7/2021**	**9.8**		8.1		11.5	
11	**7/14/2021**	**4.8**		4.3		5.38	
12	**7/21/2021**	**5.1**		4.5		5.74	
13	**7/28/2021**	**8.2**		6.7		9.75	
14	**8/4/2021**	**10.1**		8.5		11.6	
15	**8/11/2021**	**6.6**		6.1		7.13	
16	**8/18/2021**	**5.1**		4.6		5.63	
17	**8/25/2021**	**5.4**		5.0		5.84	
18	**9/1/2021**	**5.3**		5.2		5.35	
19	**9/8/2021**	**1.95**	<	2.0		1.9	*< value recorded as PQL to calculate average*
20	**9/15/2021**	**4.5**		4.1		4.94	
21	**9/22/2021**	**7.2**		8.2		6.13	**Pace ran sample twice-2nd run 4.6 Qualified-Run out of hold time due to laboratory fire
22	**9/29/2021**	**3.4**		3.0		3.75	
23	**10/6/2021**	**4.5**		4.2		4.80	
24	**10/13/2021**	**5.7**		3.9		7.56	
25	**10/20/2021**	**3.7**		4.0		3.38	
26	**10/28/2021**	**4.3**		5.1		3.43	
27	**11/3/2021**	**823**		767		879	Data received 11/8-WSRO and downstream water utilities notified 11/8-Press release 11/8
28	**11/8/2021**	**12.5**		12.0		12.9	
29	**11/17/2021**	**2.97**		3.4		2.54	
30	**11/24/2021**	**4.85**		4.9		4.79	
31	**11/30/2021**	**1.96**	<	2.0		1.92	*< value recorded as PQL to calculate average*
32	**12/7/2021**	**2.92**		2.7		3.13	
33	**12/14/2021**	**1.98**		2.0		1.96	
34	**12/21/2021**	**2.59**		3.0		2.18	
35	**12/28/2021**	**1.56**	<	2.0		1.12	*< value recorded as PQL to calculate average*
36	**1/4/2022**	**1.54**	<	2.0		1.07	*< value recorded as PQL to calculate average*
37	**1/11/2022**	**3.03**		3.0		3.05	
38	**1/19/2022**	**2.93**		2.9		2.95	
39	**1/25/2022**	**2.73**		2.7		2.75	
40	**2/1/2022**	**1.92**	<	2.0		1.83	*< value recorded as PQL to calculate average*
41	**2/8/2022**	**2.58**		2.4		2.76	
42	**2/15/2022**	**4.51**		4.5		4.52	
43	**2/22/2022**	**2.70**		2.7		2.7	
44	**3/1/2022**	**2.44**		2.3		2.58	
45	**3/8/2022**	**2.20**	<	2.0		2.40	*< value recorded as PQL to calculate average*
46	**3/15/2022**	**1.97**		2.3		1.64	
47	**3/22/2022**	**2.43**		2.6		2.26	
48	**3/29/2022**	**2.29**		2.2		2.37	
49	**4/5/2022**			52.2			Rush result of 52.2 received 4/6-WSRO and downstream water utilities notified 4/6
	4/5/2022	**47.1**		55.7		38.5	Duplicates requested from both labs: Pace 52.2/59.1= 55.7 - Meritech 25.9/51.1 = 38.5
	4/6/2022	**19.3**		22.1		16.4	Extra TZO eDMR effluent sample taken per Elevated Effluent Value SOP
50	**4/12/2022**	**2.52**		2.8		2.24	
51	**4/19/2022**	**2.45**		2.5		2.39	
52	**4/26/2022**	**3.72**		2.7		4.73	
	AVERAGE	**32.73**					
	*** Did not Meet QA/QC and was not used in eDMR average*						
	^Laboratory data not yet received by City of Greensboro at time of submittal						
	Pace and Meritech are both State-certified to analyze wastewater samples for 1,4-dioxane using EPA approved method 624.1						
	Pace Laboratory PQL = 2.0 ug/l; Meritech Laboratory PQL = 1.0 ug/l						
	eDMR = Discharge Monitoring Report submitted monthly to NCDEQ						
	SOC = Special Order by Consent EMC SOC WQ S19-010 [SOC Year One Compliance Value = 35 ug/l effective 12-1-2021]						
	SOC = Special Order by Consent EMC SOC WQ S19-010 [SOC Year Two Compliance Value = 31.5 ug/l effective 5-1-2022]						
	SOC YEAR ONE REPORT						

APPENDIX C: SOC YEAR ONE REPORT - SOC Sampling Plan Site #25

City of Greensboro 1,4-Dioxane Study at NCDEQ Sampling Site CPF055C

Semi-monthly sampling and analyses conducted by state-certified commercial contract laboratory

EPA Approved Method 624.1 used for grab sample analyses (from 40 CFR Part 136)

Sample Date		1,4-Dioxane in ug/l (ppb)		
5/3/2021			1.10	
5/26/2021		<	1.00	
6/16/2021			1.63	
6/28/2021			1.02	
				6-30-2021 TZO Effluent = 615 ug/l 1,4-dioxane
7/19/2021			8.76	
7/29/2021			4.35	
8/14/2021			1.80	
8/30/2021		<	1.00	
9/8/2021		<	1.00	
9/27/2021			1.13	
10/11/2021		<	1.00	
10/28/2021		<	1.00	
				11-3-2021 TZO Effluent = 823 ug/l 1,4-dioxane
11/15/2021		<	1.00	
11/29/2021			5.28	
12/14/2021			2.04	
12/27/2021			1.63	
1/14/2022		<	1.00	
1/31/2022		<	1.00	
2/11/2022		<	1.00	
2/28/2022		<	1.00	
3/15/2022		<	1.00	
3/30/2022		<	1.00	
				4-5-2022 TZO Effluent = 47.1 ug/l 1,4-dioxane
4/11/2022			4.87	
4/22/2022			1.83	

Sampling site is below Pittsboro in upper Haw River Arm of Jordan Lake

Note: Sampling site includes all upper Haw River NPDES dischargers

APPENDIX D: Special Order by Consent Year One Report													
Town of Pittsboro 1,4-Dioxane Drinking Water Plant Data (in ug/l)													
		SOC Sampling Plan Site #26				City Extra Analyses (Not in Sampling Plan)							
DATE	<	Haw River "Raw" Intake Composite	<	Haw River "Raw" Intake Grab	<	Finished Water Grab	<	Horton Tank Grab	<	Standpipe Grab	<	Million Gallon Tank Grab	COMMENTS
7/1/2021			<	1.0									TZO CV Exceedance on 6/30 = 615 ug/l
7/2/2021				76.5									
7/3/2021				2.5									
7/4/2021				38.2									
7/5/2021				43.7									
7/6/2021				93.6									
7/7/2021				26.5		40.9							
7/8/2021				11.9		19.3							
7/9/2021								7.97		36.7		26.7	
7/13/2021				2.3		2.49							
7/14/2021								16.2		2.54		17.3	
7/15/2021				1.8		2.1							
7/16/2021				2.15		1.85		8.54		2.8		9.6	
7/17/2021				2.71		2.1							
7/18/2021				1.28		2.36							
7/19/2021				2.3		1.75		6.89		2.09		6.04	
7/20/2021			<	1.0		1.83							
7/21/2021								7.7		1.57		6.06	
7/23/2021			<	1.0	<	1							
7/24/2021			<	1.0	<	1							
7/25/2021			<	1.0	<	1							
7/26/2021								4.78	<	1		2.7	
8/31-9/2, 2021		1.08											
9/4-7. 2021		1.27											
9/8-14, 2021		1.73											
9/22-28, 2021	<	1.0											
10/27-11/2, 2021		2.8											
11/3-7, 2021		1.07											TZO CV Exceedance on 11/3 = 823 ug/l
11/8/2021			<	1.0	<	1.00		2.09		1.3		1.61	
11/9/2021				1.1		1.02							
11/8-11, 2021		1.18											
11/10/2021				2.0	<	1.00							
11/11/2021				3.7		1.6							
11/12/2021				9.8		4.08		2.19		1.18		1.09	
11/15/2021				28.2		16.8		3.5		8.2		4.6	
11/11-15, 2021		14.2											
11/15-17/2021		43.9											
11/17/2021				80.7		37.6		4.21		24.3		14.7	
11/18/2021				50.5		46.3		11.5		43.3		18.2	
11/19/2021				34.1	*	49.8		3.1	*	30.1		17.1	*Qualified-Surrogate recovery exceeds limit
11/22/2021				7.7		15.5		10.9		30.4		33.1	
11/17-22, 2021		6.95											
11/23/2021				7.6		9.25		7.3		15.7		31.2	
11/24/2021				6.6		6.5		19.3		7.44		16.9	
11/22-24, 2021		24.0											
11/24-28, 2021		3.92											
11/29/2021				2.7		3.68		17		7.99		11.8	
11/30/2021				2.7		2.99		16.9		3.53		10.4	
12/2/2021				1.8		2.07		14.6		2.35		5.27	
12/3/2021				1.5		1.56		12.8		1.77		3.73	
11/29-12/3, 2021		1.73											
12/6/2021				1.1		1.33		9.09		2.23		2.27	
12/7/2021				1.2		1.32		8.33		1.7		2.29	
12/8/2021				1.3		1.29		6.81		1.7		2.58	
12/9/2021				1.6		1.56		4.43		1.78		1.91	
12/4-9, 2021		1.35											
12/10/2021				1.3		1.31		1.82		1.43		1.67	
12/13/2021				1.3		1.4		7.94		1.46		1.6	
12/14/2021				1.7		1.19		4.99		1.38		1.15	
12/15/2021				1.3		1.52		3.99		1.25		1.06	
12/-13-17, 2021		1.2											
12/10-14, 2021		1.20											
12/15-20, 2021		1.10											
12/21/2021					<	1.00							
12/21-28, 2021		1.32											
12/29/2021						1.02							
12/29/21-1/1/22	<	1.0											
1/5/2022					<	1.0							
1/6-11, 2022	<	1.0											
1/12/2022					<	1.0							
1/12-18, 2022	<	1.0											
1/19/2022					<	1.0							
1/19-23, 2022	<	1.0											
1/26/2022						1.15							
1/24-2/2, 2022	<	1.0											
2/2/2022					<	1.0							
2/2-2/9, 2022	<	1.0											
2/9/2022					<	1.0							
2/10-2/16, 2022	<	1.0											
2/17/2022					<	1.0							
2/17-2/23, 2022	<	1.0											
2/23/2022					<	1.0							
3/2/2022					<	1.0							No composite sample taken by Pittsboro
3/2-3/8, 2022	<	1.00											
3/9/2022					<	1.0							
3/9-3/14, 2022	<	1.00											
3/16/2022					<	1.0							
3/14-3/21, 2022	<	1.0											
3/23/2022					<	1.0							
3/21-3/27, 2022	<	1.0											
3/30/2022					<	1.0							
3/28-4/2, 2022		1.32											
4/3-4/8, 2022		6.31											TZO CV Exceedance on 4/5 = 47.1 ug/l
4/6/2022						5.1							
4/7/2022			<	1.0		6.1							
4/8/2022			<	1.0		11.9							
4/11/2022			<	1.0		4.9		1.23		6.02		4.79	
4/12/2022			<	1.0		1.97		1.56		4.62		4.97	
4/9-4/13, 2022		1.91											
4/13/2022						1.30		1.65		1.36		4.49	
4/14/2022								5.42		3.76		3.23	
4/18/2022			<	1.0	<	1.0		1.94		1.23		1.66	
4/14-19, 2022	<	1.0											
4/20/2022			<	1.0	<	1.0		2.06		1.0		1.43	
4/20-24, 2022	<	1.0											
4/27/2022					<	1.0							
4/25-5/2, 2022	<	1.0											
YEAR ONE REPORT		Intake Comp.		Intake Grab		Finished		Horton		Standpipe		Million Gallon	
Count		36		48		60		33		33		33	243

Appendix E 1,4-Dioxane Data Sampling Plan Sites #27-58 SIUs (City/SIU Self-Monitoring)

DATE	SOC WK #		Aramark	Chemol	Ecolab	Elastic Fabrics	Evonik -01	Evonik -02	Express Container	Gilbarco	Greensboro Ind Pltr - 01	Greensboro Ind Pltr - 02	Haeco	IQE	ITG Brands	Lanxess	Machine Specialties	Parker Metal	Piedmont Platers	Precision Fabrics	Precor	P & G swing	P & G BS - 01	P & G BS - 02	Qorvo	Qualicaps	Shamrock P065-01	Shamrock P065-02	Shamrock P068 Patton	Solenis	Triad Anodizing	United Metal	Vertellus	Zink
(ug/l)		Have Samplers	P051	P049	P078	P003	P021-01	P021-02	P069	P033	P020-01	P021-02	P048	P077	P004	P025	P070	P028	P075	P011	P076	P005	P031-01	P031-02	P073	P055	P065-01	P065-02	P068	P074	P029-02	P040	P002	P043
7/7 - 7/12/21	Year One / Quarter One (Sept. thru Nov. 2021)																						<1.0 (5x)	<1.0 (5x)	< 1.0		98.8	466						
7/13/2021																												367	31.8					
7/14/2021																												196						
7/15/2021																											15.1	159						
7/20/2021							< 2.0																											
7/22/2021								126																						6.85				
7/27/2021					< 50																													
8/2/2021									5.15																									
8/3/2021																						5.8												
8/17/2021					108																													
8/18/2021															1.42																			
8/24/2021					< 50																													
8/25/2021					70.25																													
8/26/2021					82.5											15.4																		
9/8/2021																	< 1.0								< 1.0									
9/10/2021						19.1														52.2														
9/14/2021					67						1.74		< 1.0	< 1.0					< 1.0															
9/14/21 - 9/16/21			< 2	789	< 50																													
9/16/2021										< 2.0		1.26						< 1.0			< 2.0													
9/18/21 - 9/22/21																																	220	
9/22/2021																																3.24		
9/23/2021																															<2.0			
9/28/2021				< 50																														
9/29/2021				< 100																37.1		2.08												
9/30/2021				< 100																														
10/1/2021			< 5																															
10/5/2021					< 100																													
10/11/2021																											956							
10/12/21 - 10/14/21																										< 10.0								< 10.0
10/21/2021																																	38.5	
10/22/2021																																	< 10	
10/26/2021					77																							322						
11/1 - 11/4/2021				30.2																			< 10.0	< 10.0									28.5	
11/2/2021				< 100				22.2																										
11/12 - 11/13/21		High Patton Trunk 1-4 Response - ECOLAB, EFA, PFG, Lanxess, Shamrock Pat., Vertellus				< 10		91.7																									< 100	
11/13 - 11/14/21					< 100	< 10										287.0				< 100									< 50				< 100	
11/13 - 11/18/21					63.9																													
11/15/2021					< 100	< 10														< 100													< 100	
11/16/2021					< 100											27.60				< 100									< 50				< 100	
11/17/2021					< 100	< 10										19.10				< 100									< 200				582	
11/18/2021					< 100	135.00										10.7				128									< 50				< 100	
11/19/2021					< 100											23.2				< 100									< 50				< 100	
11/20/2021					< 100	10.1										94.9													< 100				< 100	
11/21/2021					< 2000																													
11/22/2021					< 2000											13.6													< 100					
11/21 - 11/24/21																				< 100									< 100				1,240	
11/22 - 11/27/21						18																							4.2					
11/20 - 11/25/21					< 200																													
11/20 - 11/27/21					748																													
11/23/21 - 11/29/21																12																		
11/28 - 12/3/21																				< 100														
12/4/2021																				< 50														
11/27 - 12/4/21					161																								8.1					
11/30 - 12/6/21																13.6																		
12/6 - 12/10/21																				54.5														
12/7 - 12/13/21																< 10																		
12/8 - 12/9/21															< 2.0											< 2.0								
12/9 to 12/10/21																																		< 2.0
12/13/2021																	< 2.0																	
12/14/2021			< 2			< 20														55.7														
12/14 - 12/20/21																< 10																		
12/15/2021																																	819	
12/16/2021														< 2.0											< 2.0									
12/12/21 - 12/17/21																				< 50														
12/19/2021																													2.8					
12/20/2021													< 2.0																					
12/21/2021																		< 2.0			< 2.0													
12/19 - 12/22/21																				52.5														
12/20 - 12/21/21									< 20.0																									
12/20 - 12/26/21																													3.2				< 50	
12/21 - 12/23/21																10																		
12/28/2021										< 2.0																								
12/29/2021											< 2.0	< 2.0															286	1040						
12/30/2021																															< 2.0			
12/27 - 12/31/21																													2.8				< 50	
12/26 - 12/31/21					< 500															< 100														
12/29 - 12/31/21																9.8																		

Appendix E 1,4-Dioxane Data Sampling Plan Sites #27-58 SIUs (City/SIU Self-Monitoring)

Quarter Two (Dec 2021 thru Feb. 2022) City must contact all industries with values > 100 ug/l

DATE (ug/l)	SOC WK # (Have Samplers)	Aramark P051	Chemol P049	Ecolab P078	Elastic Fabrics P003	Evonik -01 P021-01	Evonik -02 P021-02	Express Container P069	Gilbarco P033	Greensboro Ind Pltr - 01 P020-01	Greensboro Ind Pltr - 02 P021-02	Haeco P048	IQE P077	ITG Brands P004	Lanxess P025	Machine Specialties P070	Parker Metal P028	Piedmont Platers P075	Precision Fabrics P011	Precor P076	P & G swing P005	P & G BS - 01 P031-01	P & G BS - 02 P031-02	Qorvo P073	Qualicaps P055	Shamrock P065-01	Shamrock P065-02	Shamrock P068 Patton P068	Solenis P074	Triad Anodizing P029-02	United Metal P040	Vertellus P002	Zink P043
1/5 - 1/6/22																					< 2					5.3	91.8	7.0					
1/6 - 1/7/22																						< 2.0	14.4										
1/2 - 1/7/22				< 1000															97														
1/3 - 1/9/22																												7.1				< 50	
1/4/ - 1/10/22															< 10																		
1/10 - 1/11/22				72.5																													
1/12/2022															< 2																< 100		
1/8 - 1/15/22				< 1000																													
1/9 - 1/14/2022																			< 100														
1/10 - 1/16/2022																												< 100					
1/13/2022						< 2.0	27.3																										
1/14/2022																		< 100.0											< 100.0				
1/18/2022			< 10												6.9																		
1/18/2022			< 100																														
1/17 - 1/24/22			154																									8.8					
1/15/ - 1/21/22				< 1000																													
1/18 - 1/21/2022																			< 200														
1/23 - 1/28/22				< 1000																								2.7					
1/24 - 1/28/22															184				< 100														
1/25/2022			1230																														
1/26/2022			282																														
1/28/2022			178																														
1/30 - 2/5/22																			< 100														
2/1 - 2/6/22															22.0													6.3					
1/29 - 2/5/22				< 1000																													
2/6 - 2/12/22				< 1000															< 100														
2/7 - 2/13/22															< 10													11.6					
2/14 - 2/20/22																												9.4					
2/12 - 2/19/22				< 1000																													
2/13 - 2/18/22																			< 100														
2/15/2022															< 10																		
2/21 - 2/27/22																												48.1					
2/22/2022															< 10																		
2/20 - 2/26/22				< 1000															93.5														
2/28/2022															< 10																		
3/7/2022															< 10													2.7					
2/26 - 3/5/22				< 1000																													
2/27 - 3/4/22																			127														
3/6 - 3/12/22				< 1000															53.5													< 50	
3/7 - 3/11/22				< 1000											< 10																		
3/14 - 3/18/22															< 10																		
3/21 - 3/25/22			873	< 200											< 10																		
3/21/2022			575																														
3/30 - 4/4/22															15200																		
3/27 - 4/2/22				102															94													309	
3/29/2022																										47.8	235						
3/30/2022															14700											945	87.6						
3/31/2022															36200											1580	94.1						
4/1/2022															10900											703	399						
4/2/2022																										410	546						
4/3/2022																										362	445						
4/4/2022			292												1080											60	536						
4/6/2022																												13.1					
4/11 - 4/15/22					26																												
4/18 - 4/23/22				< 100															< 50													310	
4/19 - 4/25/22															68																		
4/17/2022																																436	
4/18/2022																																143	
4/20/2022					15.5																												
4/21/2022					30.9																											868	
4/23/2022					22.7																												
4/25/2022					73.2																												
4/26/2022					19.2																												
4/26 - 5/3/22															22.4																		

APPENDIX F: SOC YEAR ONE REPORT Greensboro 1,4-Dioxane Receiving Stream Monitoring (in ug/l or ppb)													
Sample Date		South Buffalo Creek at		South Buffalo Creek		Buffalo Creek at		Buffalo Creek at		Reedy Fork Creek at		Haw River at	COMMENTS
	<	Old 70 Highway Bridge	<	at Harvest Rd Bridge	<	McLeansville Rd Bridge	<	Huffine Farm Rd Bridge	<	Highway 61 Bridge	<	Highway 62 Bridge	
7/1/2021						470				406		152	TZO CV Value Exceedance on 6/30 = 615 ug/l
7/14/2021						5.73				5.73		3.16	
11/8/2021				13.3		17.7		15.6		25		99.9	TZO CV Value Exceedance on 11/3 = 823 ug/l
11/12/2021				16.7		17.8						10.9	
12/9/2021										2.7			
12/16/2021	<	2.0							<	2.0			
12/22/2021	<	2.0							<	2.0			
12/30/2021	<	2.0								4.2			
1/6/2021	<	2.0							<	2.0			
1/13/2022	<	2.0							<	2.0			
1/20/2022	<	2.0							<	2.0			
1/27/2022		2.1							<	2.0			
2/3/2022	<	2.0							<	2.0			
2/10/2022	<	2.0							<	2.0			
2/17/2022		3.0							<	2.0			
2/24/2022	<	2.0							<	2.0			
3/2/2022	<	2.0							<	2.0			
3/10/2022	<	2.0							<	2.0			
3/17/2022	<	2.0							<	2.0			
3/24/2022	<	2.0							<	2.0			
3/31/2022		2.4								2.6			
4/6/2022										5.8		25.1	TZO CV Value Exceedance on 4/5 = 47.1 ug/l (Results received 4/6)
4/7/2022										4.0			
4/11/2022										2.5	<	2.0	
4/14/2022		2.7								3.1			
4/21/2022	<	2.0							<	2.0			
4/28/2022	<	2.0								2.5	<	2.0	
SOC YEAR ONE		Grab Sample Location		Grab Sample Location		Grab Sample Location		Grab Sample Location		Grab Sample Location		Grab Sample Location	
REPORT		ABOVE TZO EFF		BELOW TZO EFF		BELOW TZO EFF		BELOW TZO EFF		BELOW TZO EFF		BELOW TZO EFF	
				Before Confluence with		at Confluence of North		Before Confluence with		Before Confluence		After Confluence	
				North Buffalo Creek		and South Buffalo Creeks		Reedy Fork Creek		With Haw River		With Haw River	