100008216

FINAL

Technical Memorandum
Identification and Sampling of Water Supply Wells Within and Immediately Adjacent to Off-Site 1,4-Dioxane Plume

To: Linda Kiefer, EPA

Cc: Sarah Teschner, Bruce Peterman, Dustin McNeil, Steve Richtel, Dave Wilmoth, Paul Rosasco, Lyn Brill, Chris Carlson

From: Tim Shangraw

Subject: Compliance with 2017 Five-Year Review Recommendation and USEPA March 15, 2018 Requirements to Identify and Sample Private/Municipal Supply Wells Within and Immediately Adjacent to the Off-Site 1,4-Dioxane Plume, Lowry Landfill Superfund Site

Date: June 3, 2020

Background

Recommendation Number 4 of the September 2017 *Fourth Five-Year Review Report for the Lowry Landfill Superfund Site, Arapahoe County, Colorado* (USEPA, 2017) (page 34) states the following:

OU(s): 1 Issue Category: Remedy Performance
Issue: Private or municipal wells are located within the Murphy Drainage downgradient of the Site. Four of these wells are located within the footprint of the 1,4-dioxane plume and one well is located immediately adjacent to the plume.

Recommendation: Sample these wells and analyze for 1,4-dioxane. Based on the results, implement appropriate remedial actions.

On behalf of the City and County of Denver, Chemical Waste Management, Inc., and Waste Management of Colorado, Inc., collectively Work Settling Defendants (WSDs), Engineering Management Support, Inc. (EMSI) and Tri-County Health Department (TCHD) responded to this recommendation in a Memorandum to Mr. Les Sims and Ms. Linda Kiefer entitled *Evaluation of Private Wells Identified as an Issue in the 2017 Five Year Review, dated March 5, 2018, Rev June 1, 2020).* That Memorandum addressed the four subject wells, among others, and concluded that the only active private or municipal supply wells within or immediately adjacent to the footprint of the off-Site 1,4-dioxane

---

FINAL

plume are the two private wells – one owned by the [redacted] that is completed between 357 and 545 feet below ground surface (bgs), and one owned by the [redacted] that is completed between 400 and 600 feet bgs. Their locations relative to the of-Site 1,4-dioxnae plume are shown on Figure 1. Both wells have been sampled since 2006 and 1,4-dioxane has never been detected in either well. All other private or municipal supply wells located within or immediately adjacent to the 1,4-dioxane plume have been abandoned and cannot be sampled. TCHD, with support from the WSDs, will continue sampling the two active supply wells for 1,4-dioxane using the most recent, applicable analytical methods.

Then in a letter from USEPA to the WSDs dated March 15, 2018, EPA required the following:

IV. OU1 Issue 4, Four North End Wells Located Within 1,4-Dioxane footprint

> "The WSDs indicate that steps have been taken and that three wells are abandoned, no longer in use/being abandoned, and used for groundwater monitoring by the City of Aurora. Any well that has not been permanently abandoned to date should be sampled even if use is nonexistent or limited unless there is some type of prohibition in place to prevent such an action. For the wells that have been abandoned, please clarify if closure was performed in accordance with Rule 16 of the Colorado Division of Water Resources Regulation 2 CCR 402-2.
>
> EPA looks forward to reviewing the Technical Memorandum (TM) regarding this issue (*referring to the March 5, 2018, Rev June 1, 2020) Memorandum discussed above*). Please provide a work plan detailing how potential at-risk-receptors will be effectively identified and addressed. Additionally, please incorporate the content of the TM into the work plan and specify the most recent analytical method used to analyze 1,4-dioxane in residential wells, including the Method Detection Limit (MDL) and Practical Quantitation Limit (PQL) associated with this method."

In the May 22, 2018 Lowry Landfill Technical meeting, EPA clarified that monitoring wells are not potential exposure pathways, and hence monitoring wells identified in the WSDs March 5, 2018, Rev June 1, 2020 memo do not need to be sampled.

Objectives

The objectives of this Technical Memorandum are to:

1) Respond to the Recommendation in the *Fourth Five-Year Review Report for the Lowry Landfill Superfund Site*, regarding sampling and analyzing four wells located within and immediately adjacent to the 1,4-dioxane plume for 1,4-dioxane, and implementing appropriate remedial actions;

FINAL

2) Clarify if closure of abandoned wells was performed in accordance with Rule 16 of the 2CCR 402-2; and

3) Provide a Work Plan for detailing how potential at-risk-receptors will be effectively identified and addressed. The Work Plan will incorporate the most recent analytical method to analyze 1,4-dioxane to lowest MDLs and PQLs applicable to Site groundwater.

The following paragraphs address these Objectives.

Objective #1: Sample Private or Municipal Wells for 1,4-Dioxane

On May 14, 2018 and May 23, 2019, the [redacted] and [redacted] wells were sampled for 1,4-dioxane and parameters indicative of well integrity. The samples were analyzed for 1,4-dioxane using EPA Method 8260 SIM with Isotope Dilution by ChemSolutions, LLC. 1,4-dioxane was not detected in either well down to an MDL of 0.15 ug/L. Field screening results for well integrity indicated the wells are in acceptable conditions (personal communication between T. Shangraw (EMSI) and L.R. Wagner (TCHD)). Laboratory analytical results are presented in Appendix A. Going forward, the appropriate actions are continued identification of future at-risk-receptors and continued voluntary sampling of these wells for 1,4-dioxane and well integrity parameters.

Objective #2: Clarify Closure of Abandoned Wells

Closure of three private wells within or immediately adjacent to the 1,4-dioxane plume (Figure 1) was field-verified and photo-documented in the *Evaluation of Private Wells Identified as an Issue in the 2017 Five Year Review, dated March 5, 2018, Rev June 1, 2020.* Additional field verification and photo-documentation of the [redacted] well (well 2082 on Figure 1) was conducted in May 2018 and concluded that the well had been grouted to approximately 14 feet bgs. Such photo-documentation was presented to USEPA in a Technical Meeting on May 22, 2018. Consequently, none of the abandoned wells could be sampled. Abandonment records for the three subject wells are not available in the Colorado Division of Water Resources well database, so abandonment in accordance with Rule 16 of the 2CCR 402-2 could not be confirmed. TCHD is working with property owners to gain compliance with this Rule.

Objective #3: Provide a Work Plan for Identifying Future At-Risk-Receptors and Incorporate the Most Recent 1,4-Dioxane Analytical Method

As described in the *Evaluation of Private Wells Identified as an Issue in the 2017 Five Year Review, dated March 5, 2018, Rev June 1, 2020,* off-Site well identification and sampling are being performed in accordance with TCHD's Work Plan for Identification and Sampling of Off-Site Wells. An updated version of that Work Plan that incorporates the most recent analytical method for 1,4-dioxane is presented in Appendix B.

FINAL

and Sampling of Off-Site Wells. An updated version of that Work Plan that incorporates the most recent analytical method for 1,4-dioxane is presented in Appendix B.

Conclusions

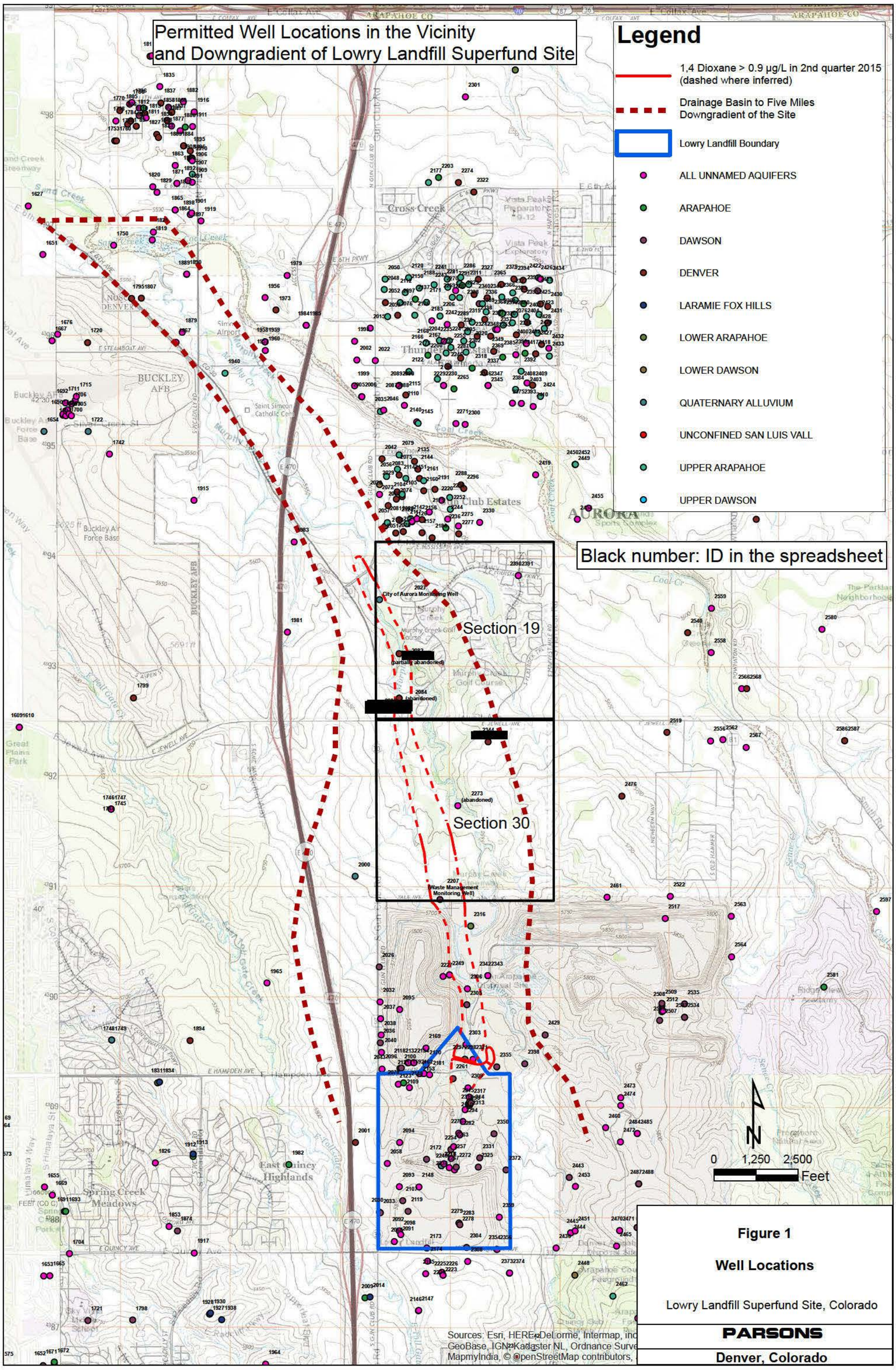
1) WSDs have responded to the *September 2017 Fourth Five-Year Review Report for the Lowry Landfill Superfund Site, Arapahoe County, Colorado (USEPA, 2017)* recommendation to sample private or municipal water supply wells within and immediately adjacent to the off-Site 1,4-dioxane plume. Since sampling began in 2006, 1,4-dioxane has never been detected in these wells, including the most recent sampling event in May 2018 and May 2019. Based on these sampling results, remedial action is not warranted at this time. WSDs and TCHD will continue to identify future at-risk-receptors within and immediately adjacent to the off-Site plume, and continue voluntary, annual sampling of these wells to provide residents assurance that their water supply are not impacted by the North End plume. These activities will be conducted in accordance with WSDs' and TCHD's Work Plan presented in Appendix B.
2) WSDs have responded to Item IV of USEPA's March 15, 2018 letter requiring clarification of closure of abandoned wells, and preparation of a Work Plan to identify future at-risk-receptors and sample these wells for 1,4-dioxane using the most current and appropriate analytical method (Appendix B of this TM).

Approval:

Linda Kiefer, EPA Project Manager — **Date** 6/26/2020

Attachments

Figure 1: Well Locations
Appendix A: May 2018 and May 2019 1,4-Dioxane Analytical Results from [redacted] and [redacted] Wells
Appendix B: Updated Work Plan



S:\ES\MajProj\LWRYLNFL\DATABASE\GIS\Well_PermitSearch.mxd lxh 2/28/2018

APPENDIX A

2018 and 2019 Analytical Results
For [redacted] and [redacted] Wells

25923 Gateway Drive
Golden, Colorado 80101

P. Rosasco (303) 808-7227
T. Shangraw (303) 619-5179

ChemSolutions

7388 S. Revere Parkway, Suite 805
Centennial, CO 80112
303.771.5570

CASE NARRATIVE

Project ID: PAR376
Lowry Environmental Protection/Cleanup Trust
May 23, 2018

1. Samples were analyzed for 1,4-Dioxane by EPA Method 8260 SIM.

2. The project consisted of 2 aqueous samples.

3. Samples were received at 1°C on 5/15/18.

4. All standards are NIST traceable and were used within their recommended shelf life.

5. The samples were analyzed within the established hold times.

6. All standard operating procedures were followed.

7. All initial and continuing calibration criteria were met.

8. The method blank associated with the extraction batch was below the reporting limits for all analytes.

9. All laboratory quality control sample criteria were met.

The data contained in the following report have been reviewed and approved by:

John Graves
Laboratory Director
ChemSolutions LLC

Reporting Qualifiers

ChemSolutions LLC
Sample Summary
Project ID: PAR376

Client Project ID: Lowry Environmental Protection/Cleanup Trust

Lab ID	Sample ID	Matrix	Date Sampled	Date Received
PAR376[redacted]	[redacted]	Aqueous	5/14/2018	5/15/2018
PAR376_[redacted]	[redacted]	Aqueous	5/14/2018	5/15/2018

ChemSolutions LLC
Sample Results
Project ID: PAR376

Client Sample ID: [redacted]
Client Project ID: Lowry Environmental Protection/Cleanup Trust
Lab ID: PAR376_[redacted]
Sample Matrix: Aqueous

Date Sampled: 5/14/18
Date Received: 5/15/18

ANALYTE	Concentration	Reporting Limit	SMDL	Units	Dilution Factor	Date Analyzed	EPA Method	Prep Method	Qualifier
1,4- Dioxane	ND	0.90	0.15	ug/L	1	5/22/2018	8260 SIM	5030C	

Internal Standard Area = 4495

ND=Not detected

ChemSolutions LLC
Sample Results
Project ID: PAR376

Client Sample ID: [redacted]
Client Project ID: Lowry Environmental Protection/Cleanup Trust
Lab ID: PAR376_[redacted]
Sample Matrix: Aqueous

Date Sampled: 5/14/18
Date Received: 5/15/18

ANALYTE	Concentration	Reporting Limit	SMDL	Units	Dilution Factor	Date Analyzed	EPA Method	Prep Method	Qualifier
1,4- Dioxane	ND	0.90	0.15	ug/L	1	5/22/2018	8260 SIM	5030C	

Internal Standard Area = 3946

ND=Not detected

ChemSolutions LLC
Method Blank Results
Project ID: PAR376

Sample ID: Blank
Client Project ID: Lowry Environmental Protection/Cleanup Trust
Sample Matrix: Aqueous

ANALYTE	Concentration	Reporting Limit	SMDL	Units	Dilution Factor	Date Analyzed	EPA Method	Prep Method	Qualifier
1,4- Dioxane	ND	0.90	0.15	ug/L	1	5/22/2018	8260 SIM	5030C	

Internal Standard Area = 4600

ND=Not detected

ChemSolutions LLC
Laboratory Control Sample Results
Project ID: PAR376

Sample ID: LCS
Client Project ID: Lowry Environmental Protection/Cleanup Trust
Sample Matrix: Aqueous

EPA Method 8260 SIM Date Analyzed: 5/22/18

ANALYTE	LCS SPIKE	% RECOVERY	UNITS	QC Limits
1,4-Dioxane	5.22	104	ug/L	75-125

Internal Standard Area = 5074

ChemSolutions LLC
Matrix Spike Results
Project ID: PAR376

Client Sample ID: NA
Client Project ID: Lowry Environmental Protection/Cleanup Trust
Lab ID: PAR375_MW105-WD

EPA Method 8260 SIM Date Analyzed: 5/22/18

ANALYTE	MATRIX SPIKE	% RECOVERY	MATRIX SPIKE DUP	% RECOVERY	RPD	UNITS	QC Limits	RPD Limit
1,4-Dioxane	5.71	114	5.00	100	13.26	ug/L	75-125	20

Sample Concentration = ND
MS Internal Standard Area = 3623
MSD Internal Standard Area = 3447

ChemSolutions

7388 S. Revere Parkway, Suite 805
Centennial, CO 80112
303.771.5570

DATA PACKAGE
PARSONS
LOWRY ENVIRONMENTAL PROTECTION/CLEANUP TRUST

Project ID PAR376

CONTENTS

Sample Data 2
Quality Control Data 6
Initial Calibration 14
Calibration Verifications 25
Tunes 28
Sequence Logs 30

Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\3\DATA\052218\
Data File : PAR018.D
Acq On : 22 May 2018 5:21 pm
Operator : LT
Sample : 10mL [redacted] -1
Misc : PAR376
ALS Vial : 16 Sample Multiplier: 1

Quant Time: May 23 08:13:53 2018
Quant Method : C:\MSDCHEM\3\METHODS\DX052218.M
Quant Title : 1,4 Dioxane by EPA 8260C/SIM
QLast Update : Tue May 22 13:36:09 2018
Response via : Initial Calibration

Internal Standards	R.T.	QIon	Response	Conc Units	Dev(Min)
1) 1,4 Dioxane-D4 (IS)	12.751	96	4495	25.00 ug/L	0.00
Target Compounds					Qvalue
2) 1,4 Dioxane	12.813	88	17m	0.07 ug/L	

(#) = qualifier out of range (m) = manual integration (+) = signals summed

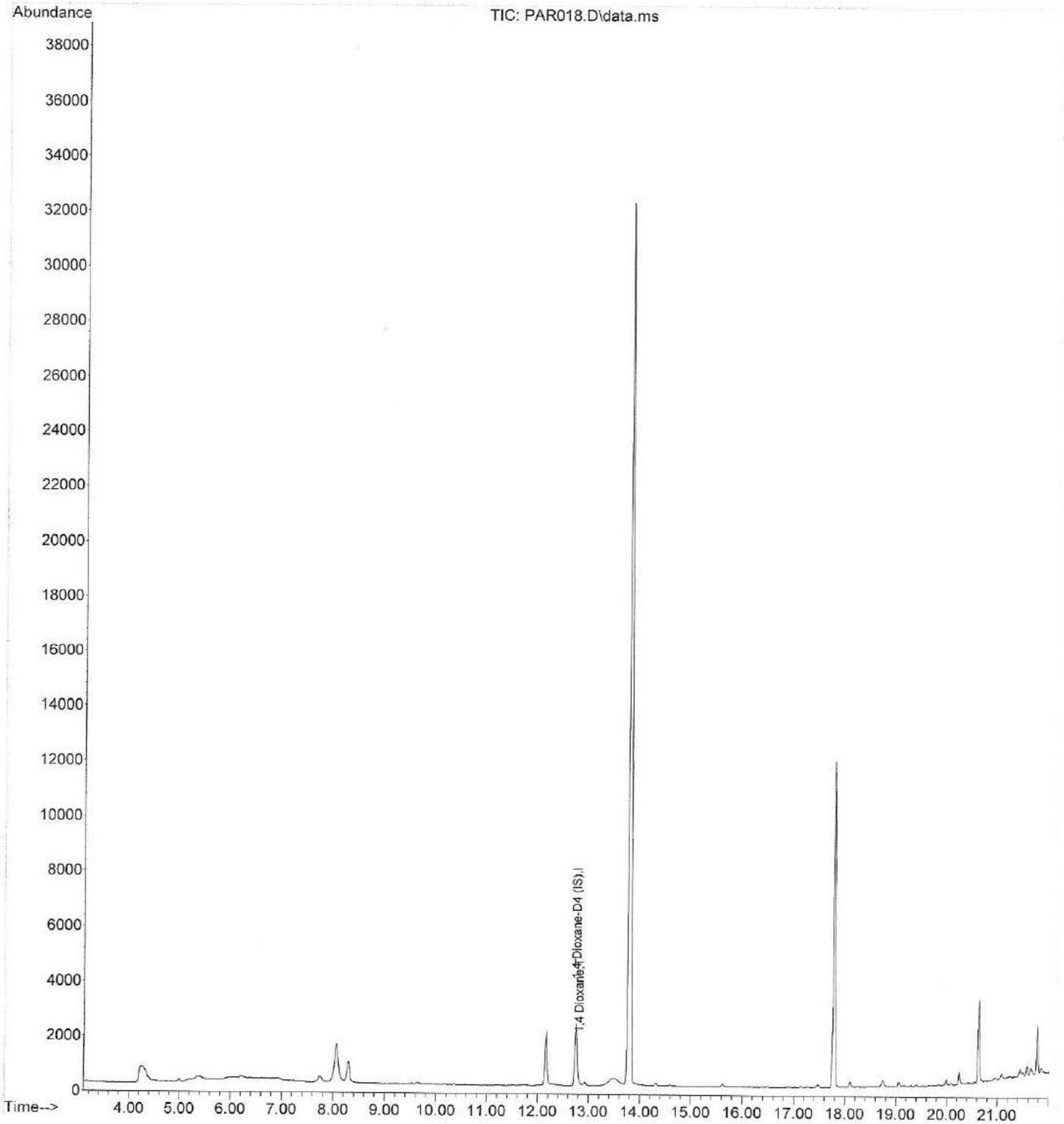
ND

4

Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\3\DATA\052218\
Data File : PAR018.D
Acq On : 22 May 2018 5:21 pm
Operator : LT
Sample : 10mL [redacted] -1
Misc : PAR376
ALS Vial : 16 Sample Multiplier: 1

Quant Time: May 23 08:13:53 2018
Quant Method : C:\MSDCHEM\3\METHODS\DX052218.M
Quant Title : 1,4 Dioxane by EPA 8260C/SIM
QLast Update : Tue May 22 13:36:09 2018
Response via : Initial Calibration



Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\3\DATA\052218\
Data File : PAR019.D
Acq On : 22 May 2018 5:49 pm
Operator : LT
Sample : 10mL [redacted] -1
Misc : PAR376
ALS Vial : 17 Sample Multiplier: 1

Quant Time: May 22 18:11:24 2018
Quant Method : C:\MSDCHEM\3\METHODS\DX052218.M
Quant Title : 1,4 Dioxane by EPA 8260C/SIM
QLast Update : Tue May 22 13:36:09 2018
Response via : Initial Calibration

Internal Standards	R.T.	QIon	Response	Conc Units	Dev(Min)
1) 1,4 Dioxane-D4 (IS)	12.751	96	3946	25.00 ug/L	0.00
Target Compounds					Qvalue
2) 1,4 Dioxane	12.797	88	12	0.05 ug/L #	4

(#) = qualifier out of range (m) = manual integration (+) = signals summed

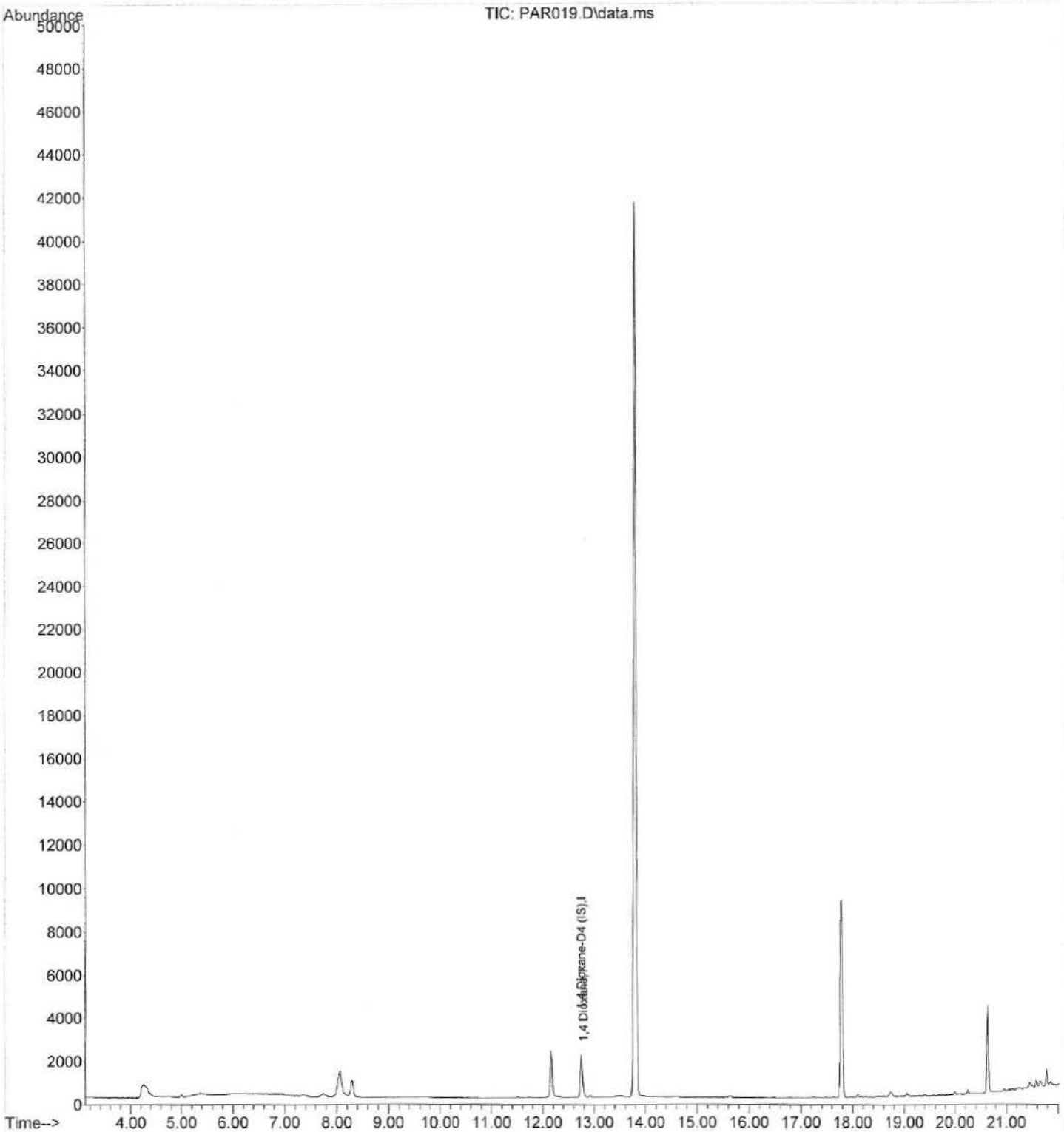
ND

LY

Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\3\DATA\052218\
Data File : PAR019.D
Acq On : 22 May 2018 5:49 pm
Operator : LT
Sample : 10mL [redacted] -1
Misc : PAR376
ALS Vial : 17 Sample Multiplier: 1

Quant Time: May 22 18:11:24 2018
Quant Method : C:\MSDCHEM\3\METHODS\DX052218.M
Quant Title : 1,4 Dioxane by EPA 8260C/SIM
QLast Update : Tue May 22 13:36:09 2018
Response via : Initial Calibration



Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\3\DATA\052218\
Data File : BLK012.D
Acq On : 22 May 2018 2:35 pm
Operator : LT
Sample : 10mL Blank #3
Misc : PAR375-378 LT 5/22/18
ALS Vial : 11 Sample Multiplier: 1

Quant Time: May 22 14:57:45 2018
Quant Method : C:\MSDCHEM\3\METHODS\DX052218.M
Quant Title : 1,4 Dioxane by EPA 8260C/SIM
QLast Update : Tue May 22 13:36:09 2018
Response via : Initial Calibration

Internal Standards	R.T.	QIon	Response	Conc Units	Dev(Min)
1) 1,4 Dioxane-D4 (IS)	12.758	96	4600	25.00 ug/L	0.00
Target Compounds					Qvalue
2) 1,4 Dioxane	12.789	88	29	0.11 ug/L #	65

(#) = qualifier out of range (m) = manual integration (+) = signals summed

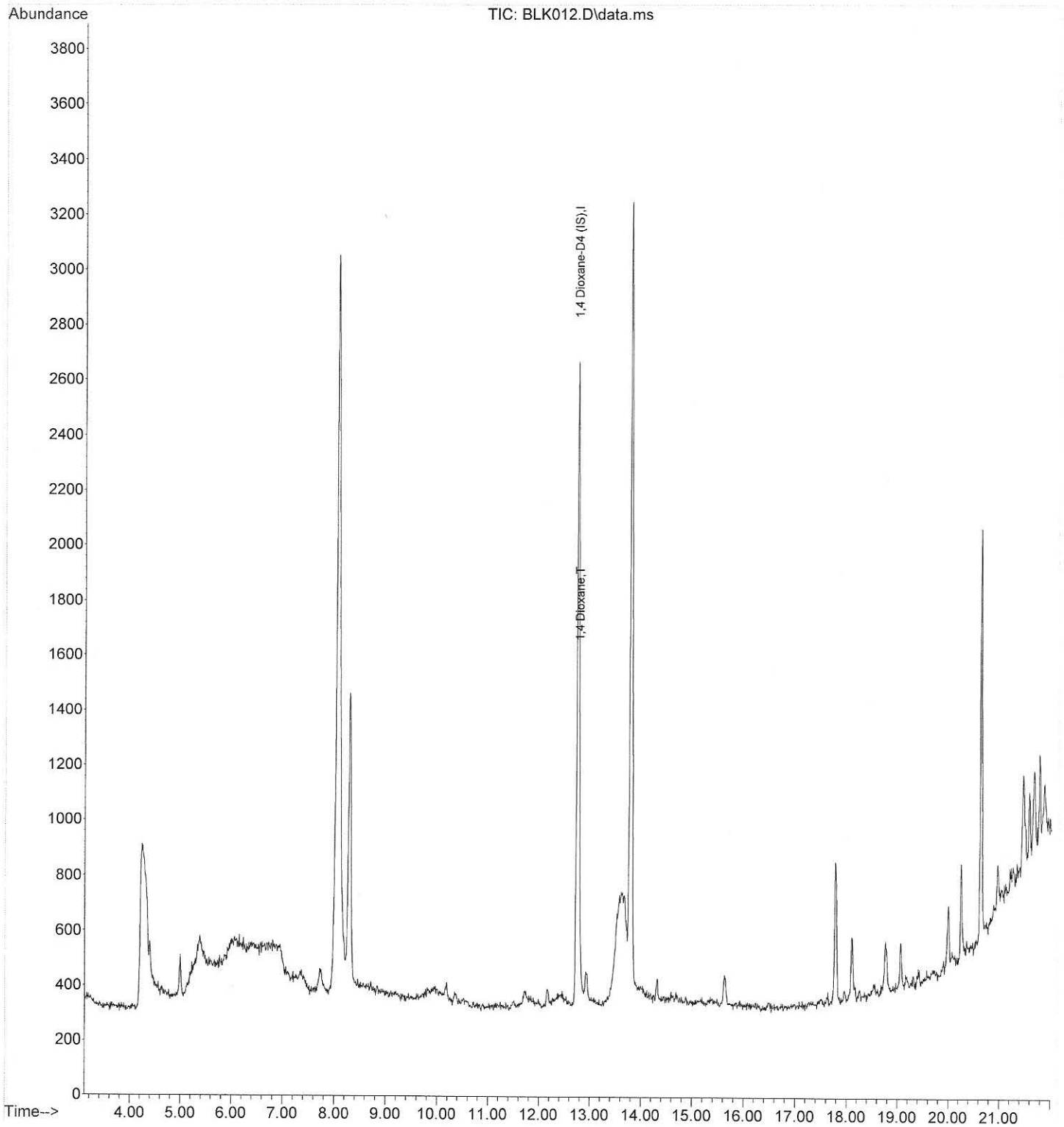
ND

LT

Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\3\DATA\052218\
Data File : BLK012.D
Acq On : 22 May 2018 2:35 pm
Operator : LT
Sample : 10mL Blank #3
Misc :
ALS Vial : 11 Sample Multiplier: 1

Quant Time: May 22 14:57:45 2018
Quant Method : C:\MSDCHEM\3\METHODS\DX052218.M
Quant Title : 1,4 Dioxane by EPA 8260C/SIM
QLast Update : Tue May 22 13:36:09 2018
Response via : Initial Calibration



Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\3\DATA\052218\
Data File : ICAL06.D
Acq On : 22 May 2018 11:51 am
Operator : LT
Sample : 5ug/L Dioxane ICAL
Misc : 5uL 10ppm/10mL (5/20/18)
ALS Vial : 5 Sample Multiplier: 1

Quant Time: May 23 08:20:45 2018
Quant Method : C:\msdchem\3\METHODS\DX052218.M
Quant Title : 1,4 Dioxane by EPA 8260C/SIM
QLast Update : Tue May 22 13:36:09 2018
Response via : Initial Calibration

Internal Standards	R.T.	QIon	Response	Conc Units	Dev(Min)
1) 1,4 Dioxane-D4 (IS)	12.758	96	5074	25.00 ug/L	0.00
Target Compounds					**Qvalue**
2) 1,4 Dioxane	12.797	88	1472	5.22 ug/L	90

(#) = qualifier out of range (m) = manual integration (+) = signals summed

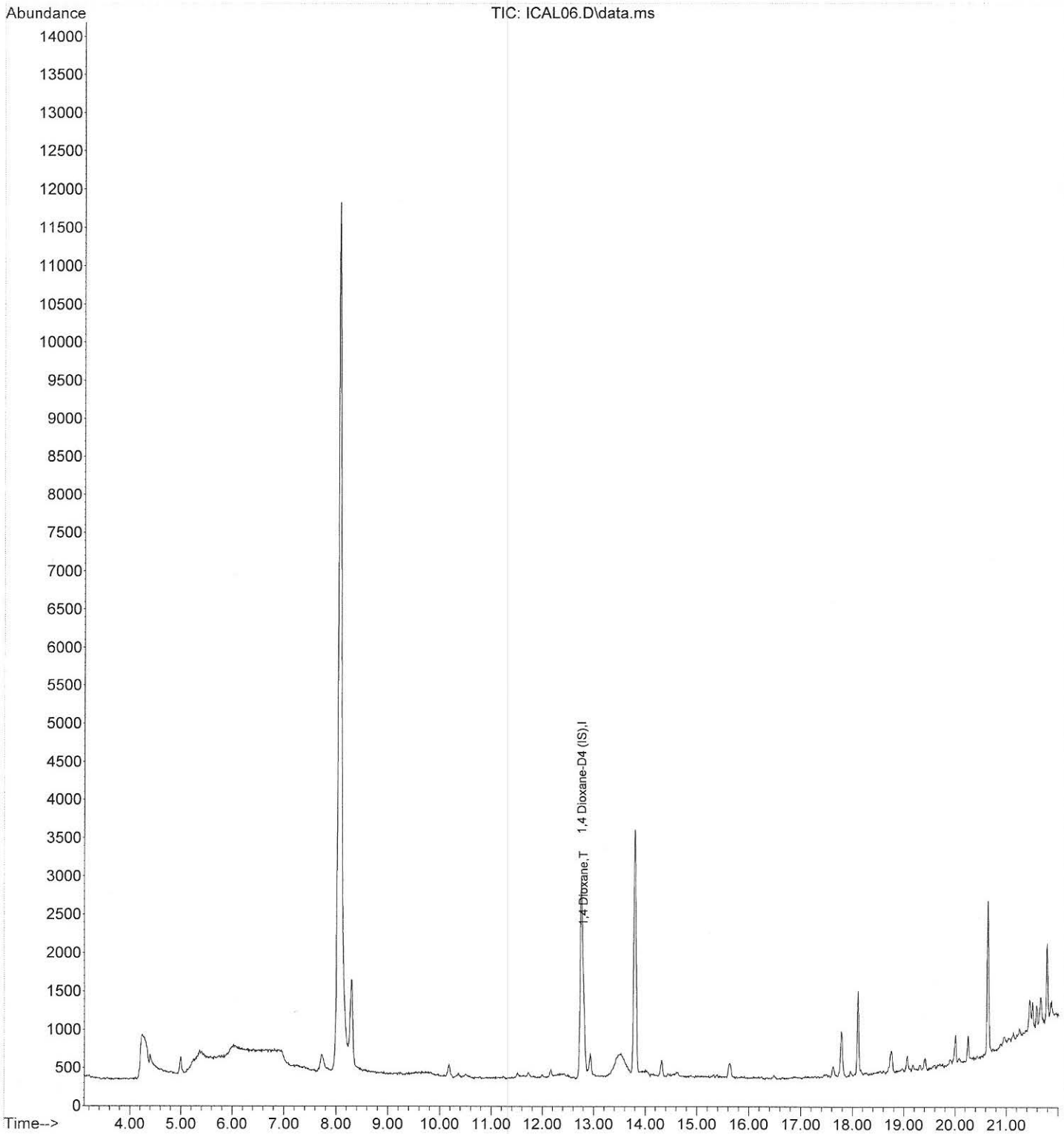
5.0ug/L LCS
5.22ug/L recovered, 104%.

LY

Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\3\DATA\052218\
Data File : ICAL06.D
Acq On : 22 May 2018 11:51 am
Operator : LT
Sample : 5ug/L Dioxane ICAL
Misc : 5uL 10ppm/10mL (5/20/18)
ALS Vial : 5 Sample Multiplier: 1

Quant Time: May 23 08:20:45 2018
Quant Method : C:\msdchem\3\METHODS\DX052218.M
Quant Title : 1,4 Dioxane by EPA 8260C/SIM
QLast Update : Tue May 22 13:36:09 2018
Response via : Initial Calibration



Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\3\DATA\052218\
Data File : PAR023.D
Acq On : 22 May 2018 7:39 pm
Operator : LT
Sample : 10mL MS MW105-WD -2
Misc : 5uL 10ppm/10mL (5/20/18) PAR375
ALS Vial : 21 Sample Multiplier: 1

Quant Time: May 22 20:01:08 2018
Quant Method : C:\MSDCHEM\3\METHODS\DX052218.M
Quant Title : 1,4 Dioxane by EPA 8260C/SIM
QLast Update : Tue May 22 13:36:09 2018
Response via : Initial Calibration

Internal Standards	R.T.	QIon	Response	Conc Units	Dev(Min)
1) 1,4 Dioxane-D4 (IS)	12.750	96	3623	25.00 ug/L	0.00
Target Compounds					Qvalue
2) 1,4 Dioxane	12.804	88	1148	5.71 ug/L	89

(#) = qualifier out of range (m) = manual integration (+) = signals summed

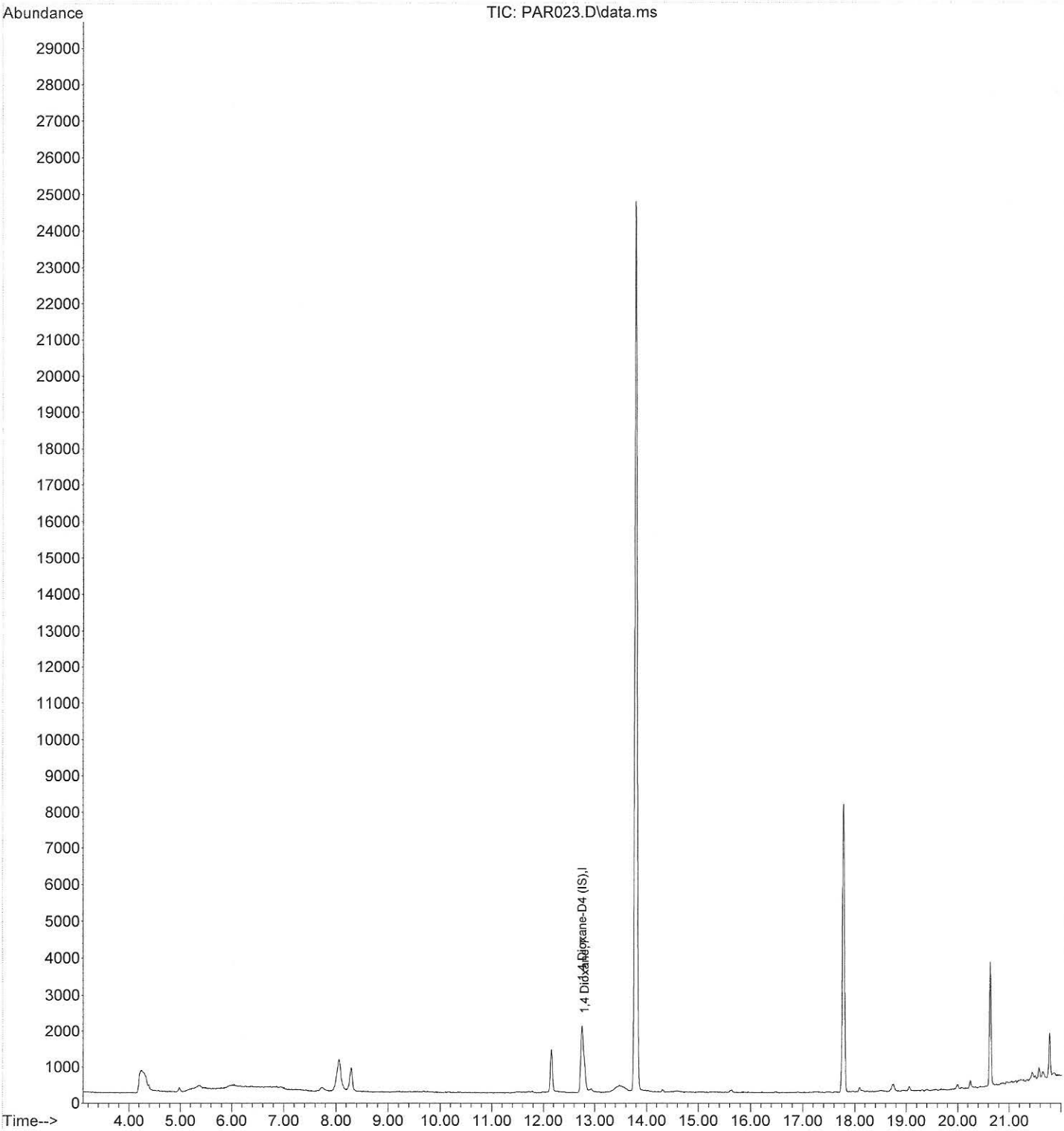
Sample=ND
5.0ug/L spike
5.7ug/L recovered, 114%

LY

Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\3\DATA\052218\
Data File : PAR023.D
Acq On : 22 May 2018 7:39 pm
Operator : LT
Sample : 10mL MS MW105-WD -2
Misc : 5uL 10ppm/10mL (5/20/18) PAR375
ALS Vial : 21 Sample Multiplier: 1

Quant Time: May 22 20:01:08 2018
Quant Method : C:\MSDCHEM\3\METHODS\DX052218.M
Quant Title : 1,4 Dioxane by EPA 8260C/SIM
QLast Update : Tue May 22 13:36:09 2018
Response via : Initial Calibration



Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\3\DATA\052218\
Data File : PAR024.D
Acq On : 22 May 2018 8:06 pm
Operator : LT
Sample : 10mL MSD MW105-WD -2
Misc : 5uL 10ppm/10mL (5/20/18) PAR375
ALS Vial : 22 Sample Multiplier: 1

Quant Time: May 23 08:16:45 2018
Quant Method : C:\MSDCHEM\3\METHODS\DX052218.M
Quant Title : 1,4 Dioxane by EPA 8260C/SIM
QLast Update : Tue May 22 13:36:09 2018
Response via : Initial Calibration

Internal Standards	R.T.	QIon	Response	Conc Units	Dev(Min)
1) 1,4 Dioxane-D4 (IS)	12.750	96	3447m	25.00 ug/L	0.00
Target Compounds					Qvalue
2) 1,4 Dioxane	12.796	88	957m	5.00 ug/L	

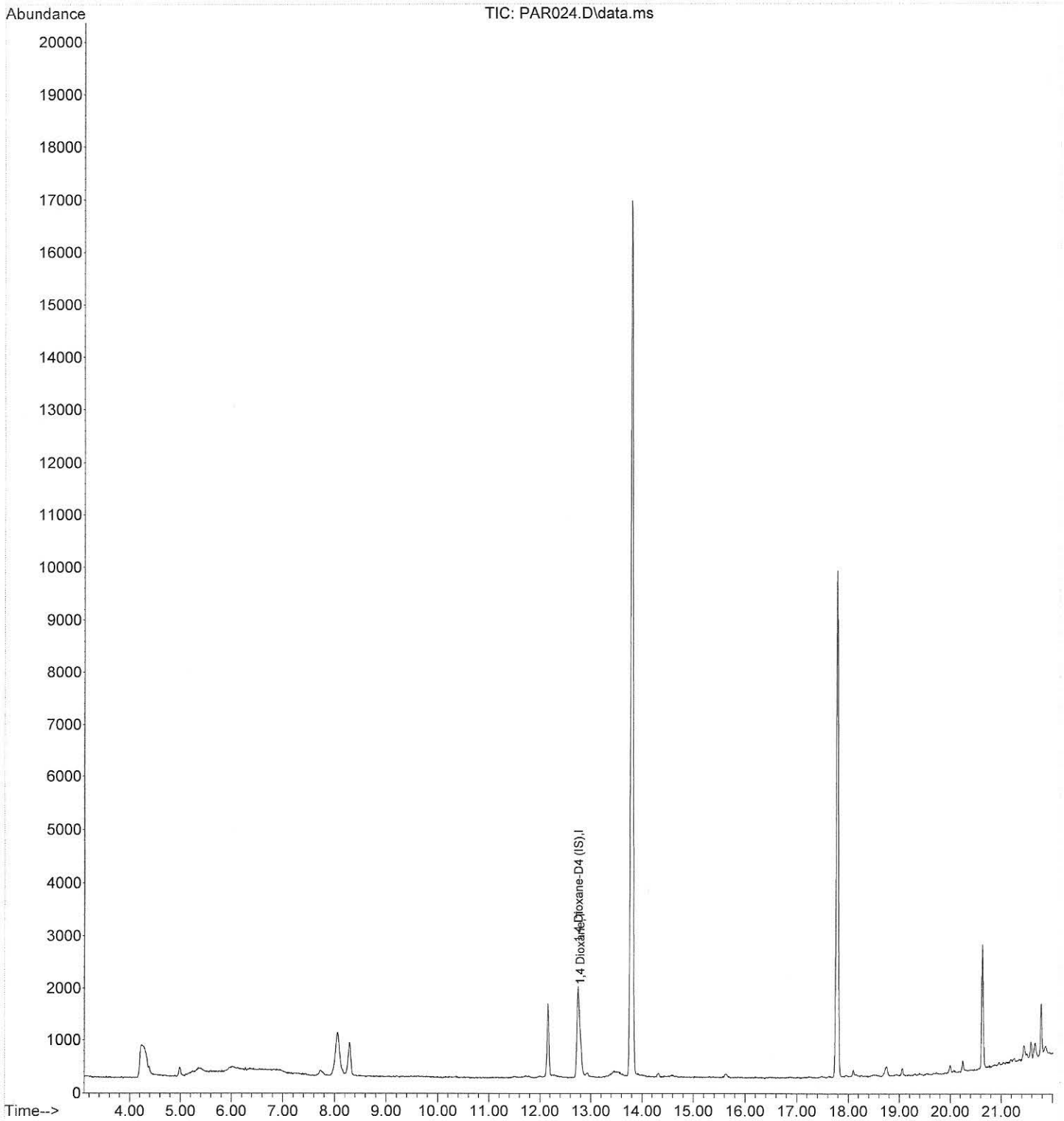
(#) = qualifier out of range (m) = manual integration (+) = signals summed

Sample = ND
5.0ug/L spike
5.00ug/L recovered, 100%.

Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\3\DATA\052218\
Data File : PAR024.D
Acq On : 22 May 2018 8:06 pm
Operator : LT
Sample : 10mL MSD MW105-WD -2
Misc : 5uL 10ppm/10mL (5/20/18) PAR375
ALS Vial : 22 Sample Multiplier: 1

Quant Time: May 23 08:16:45 2018
Quant Method : C:\MSDCHEM\3\METHODS\DX052218.M
Quant Title : 1,4 Dioxane by EPA 8260C/SIM
QLast Update : Tue May 22 13:36:09 2018
Response via : Initial Calibration



Response Factor Report Instrument #1

Method Path : C:\msdchem\3\METHODS\
Method File : DX052218.M
Title : 1,4 Dioxane by EPA 8260C/SIM
Last Update : Tue May 22 13:36:09 2018
Response Via : Initial Calibration

Calibration Files
1 =ICAL05.D 2 =ICAL06.D 3 =CCV003.D 4 =ICAL07.D 5 =ICAL08.D
6 =ICAL09.D

Compound	1	2	3	4	5	6	Avg	%RSD
1) I 1,4 Dioxane-D4 (IS)	----------ISTD----------							
2) T 1,4 Dioxane	1.804	1.451	1.352	1.197	1.277	1.250	1.388	15.98

(#) = Out of Range

less than 20%.

OT

Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\3\DATA\052218\
Data File : ICAL05.D
Acq On : 22 May 2018 11:23 am
Operator : LT
Sample : 0.8ug/L Dioxane LCS
Misc : 4uL 10ppm/50mL (5/20/18)
ALS Vial : 4 Sample Multiplier: 1

Quant Time: May 22 12:45:14 2018
Quant Method : C:\msdchem\3\METHODS\DX052218.M
Quant Title : 1,4 Dioxane by EPA 8260C/SIM
QLast Update : Tue May 22 12:44:45 2018
Response via : Initial Calibration

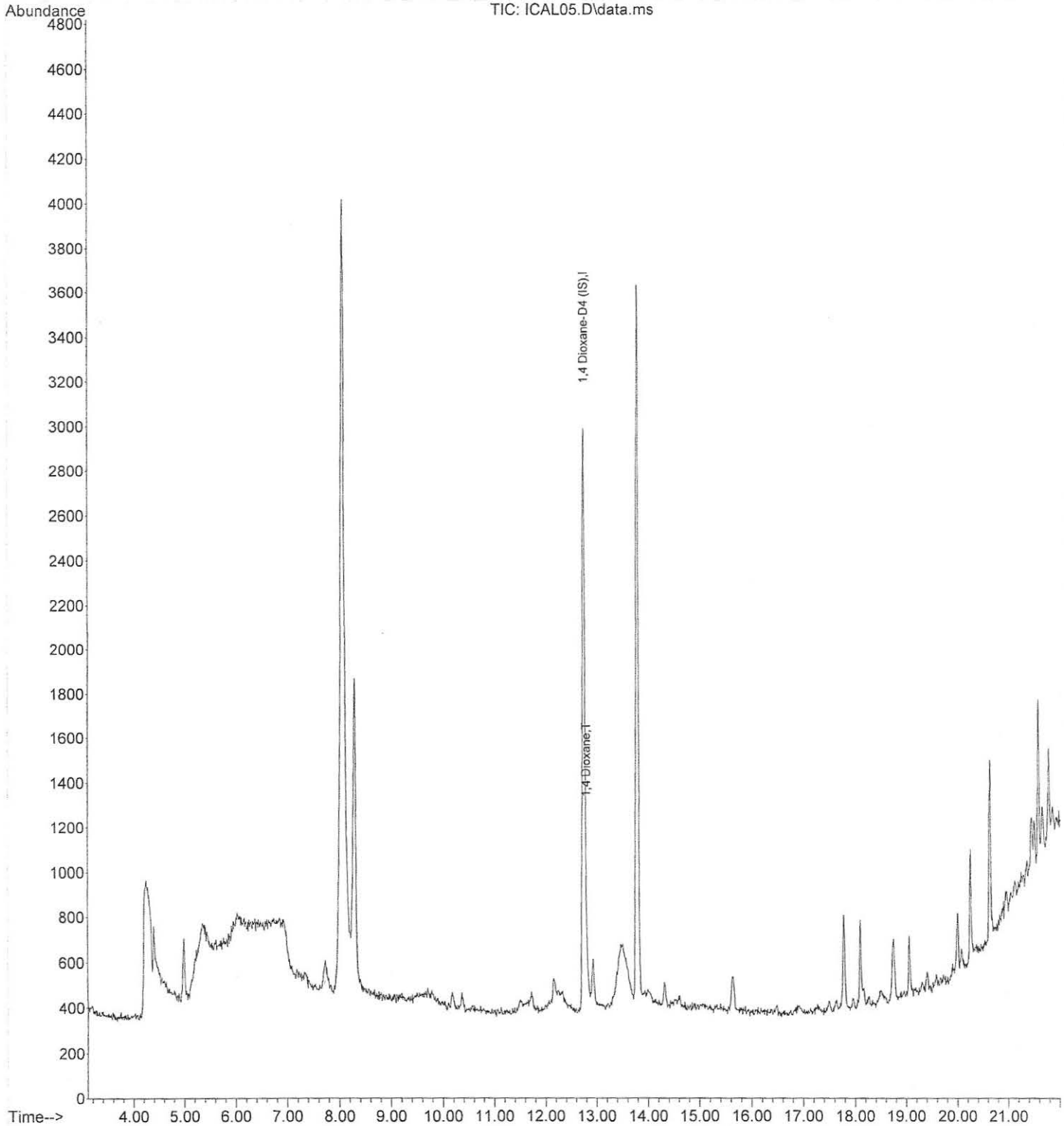
Internal Standards	R.T.	QIon	Response	Conc Units	Dev(Min)
1) 1,4 Dioxane-D4 (IS)	12.750	96	5318	25.00 ug/L	0.00
Target Compounds					**Qvalue**
2) 1,4 Dioxane	12.804	88	307m	0.99 ug/L	

(#) = qualifier out of range (m) = manual integration (+) = signals summed

Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\3\DATA\052218\
Data File : ICAL05.D
Acq On : 22 May 2018 11:23 am
Operator : LT
Sample : 0.8ug/L Dioxane LCS
Misc : 4uL 10ppm/50mL (5/20/18)
ALS Vial : 4 Sample Multiplier: 1

Quant Time: May 22 12:45:14 2018
Quant Method : C:\msdchem\3\METHODS\DX052218.M
Quant Title : 1,4 Dioxane by EPA 8260C/SIM
QLast Update : Tue May 22 12:44:45 2018
Response via : Initial Calibration



Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\3\DATA\052218\
Data File : ICAL06.D
Acq On : 22 May 2018 11:51 am
Operator : LT
Sample : 5ug/L Dioxane ICAL
Misc : 5uL 10ppm/10mL (5/20/18)
ALS Vial : 5 Sample Multiplier: 1

Quant Time: May 22 12:13:24 2018
Quant Method : C:\MSDCHEM\3\METHODS\DX052218.M
Quant Title : 1,4 Dioxane by EPA 8260C/SIM
QLast Update : Tue May 08 13:10:11 2018
Response via : Initial Calibration

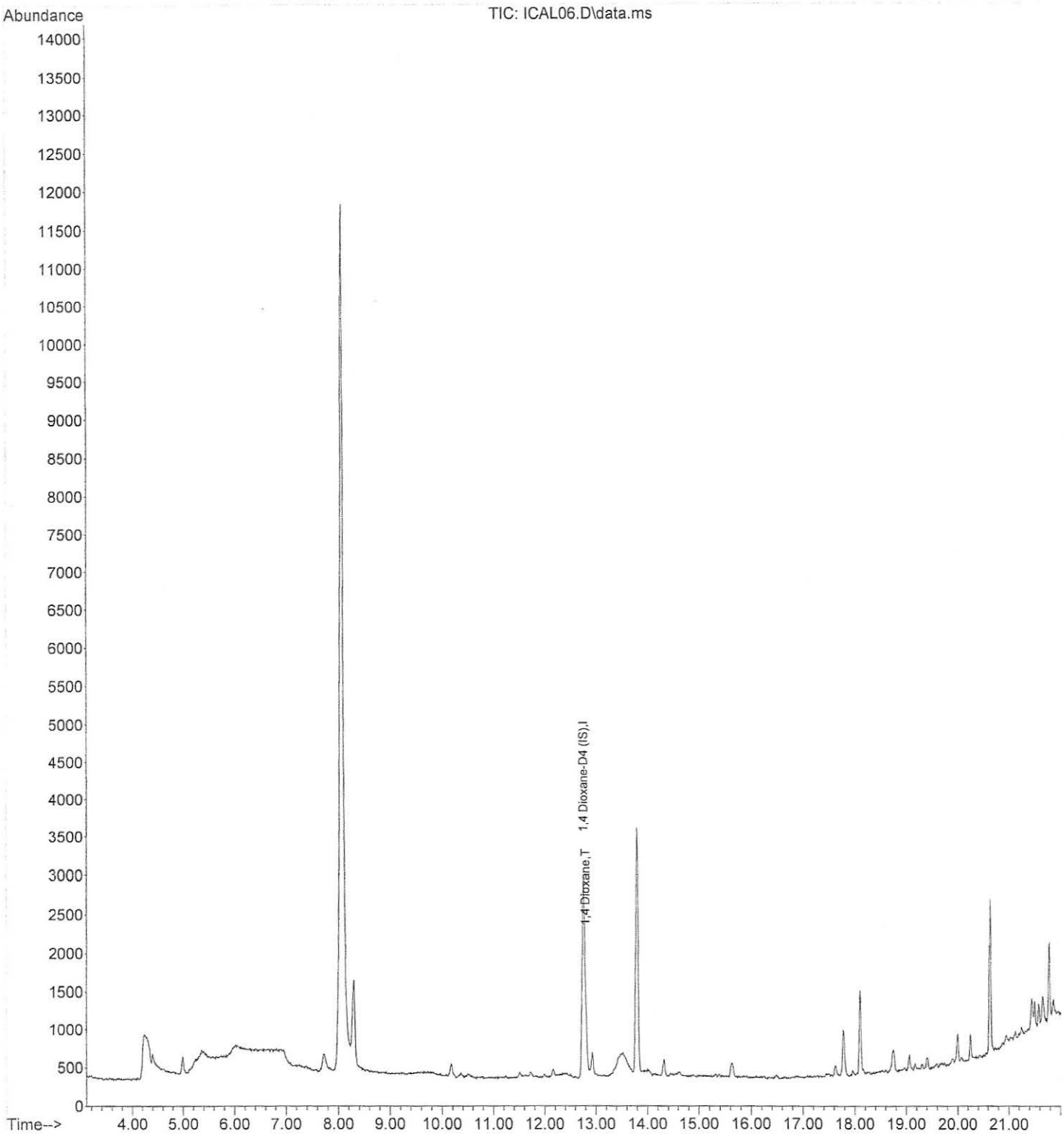
Internal Standards	R.T.	QIon	Response	Conc Units	Dev(Min)
1) 1,4 Dioxane-D4 (IS)	12.758	96	5074	25.00 ug/L	-0.02
Target Compounds					Qvalue
2) 1,4 Dioxane	12.797	88	1472	5.16 ug/L	90

(#) = qualifier out of range (m) = manual integration (+) = signals summed

Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\3\DATA\052218\
Data File : ICAL06.D
Acq On : 22 May 2018 11:51 am
Operator : LT
Sample : 5ug/L Dioxane ICAL
Misc : 5uL 10ppm/10mL (5/20/18)
ALS Vial : 5 Sample Multiplier: 1

Quant Time: May 22 12:13:24 2018
Quant Method : C:\MSDCHEM\3\METHODS\DX052218.M
Quant Title : 1,4 Dioxane by EPA 8260C/SIM
QLast Update : Tue May 08 13:10:11 2018
Response via : Initial Calibration



Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\3\DATA\052218\
Data File : ICAL07.D
Acq On : 22 May 2018 12:18 pm
Operator : LT
Sample : 50ug/L Dioxane ICAL
Misc : 5uL 100ppm/10mL (5/20/18)
ALS Vial : 6 Sample Multiplier: 1

Quant Time: May 22 12:40:54 2018
Quant Method : C:\MSDCHEM\3\METHODS\DX052218.M
Quant Title : 1,4 Dioxane by EPA 8260C/SIM
QLast Update : Tue May 08 13:10:11 2018
Response via : Initial Calibration

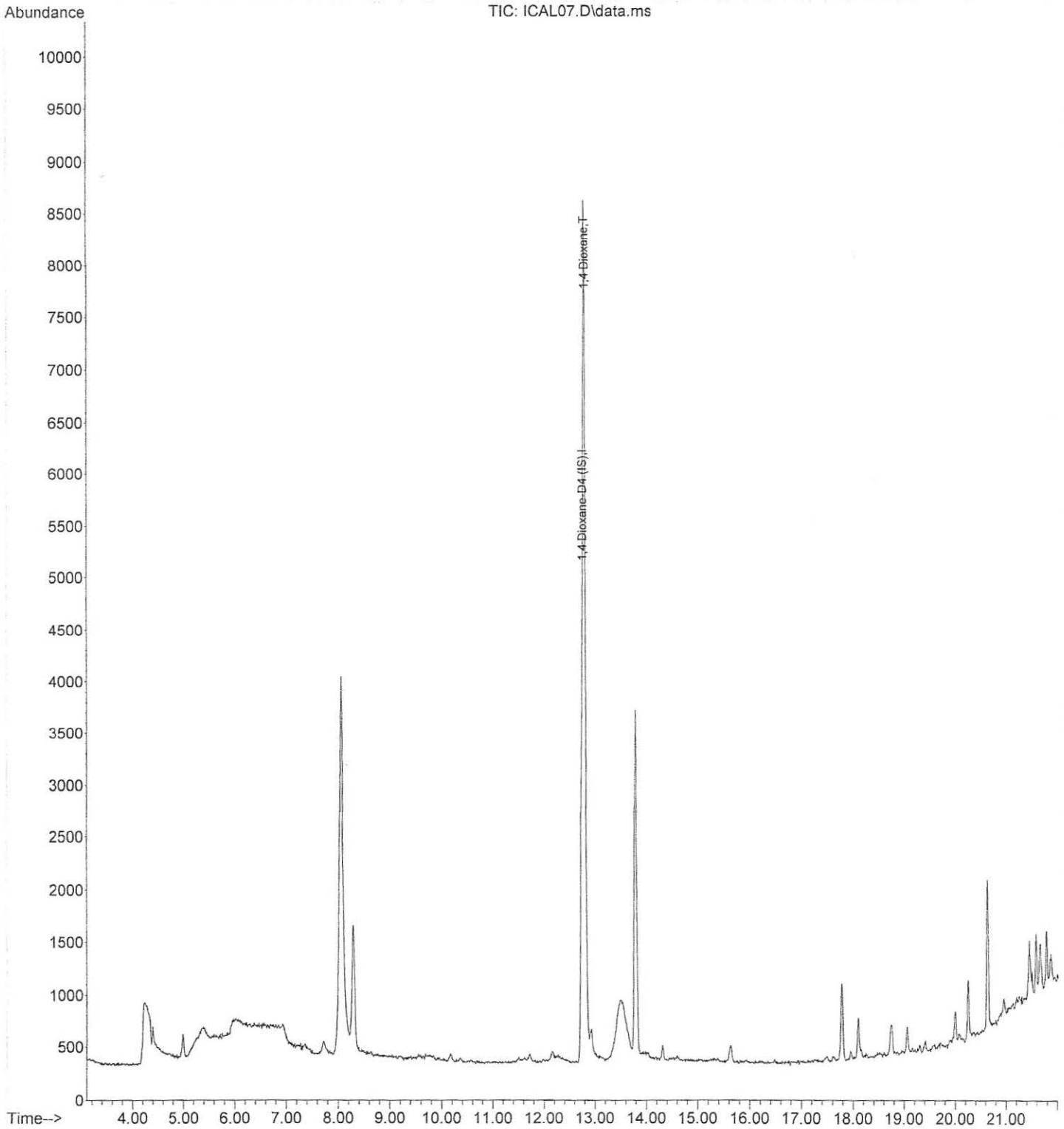
Internal Standards	R.T.	QIon	Response	Conc Units	Dev(Min)
1) 1,4 Dioxane-D4 (IS)	12.758	96	6103	25.00 ug/L	-0.02
Target Compounds					Qvalue
2) 1,4 Dioxane	12.804	88	14607	42.56 ug/L	87

(#) = qualifier out of range (m) = manual integration (+) = signals summed

Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\3\DATA\052218\
Data File : ICAL07.D
Acq On : 22 May 2018 12:18 pm
Operator : LT
Sample : 50ug/L Dioxane ICAL
Misc : 5uL 100ppm/10mL (5/20/18)
ALS Vial : 6 Sample Multiplier: 1

Quant Time: May 22 12:40:54 2018
Quant Method : C:\MSDCHEM\3\METHODS\DX052218.M
Quant Title : 1,4 Dioxane by EPA 8260C/SIM
QLast Update : Tue May 08 13:10:11 2018
Response via : Initial Calibration



Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\3\DATA\052218\
Data File : ICAL08.D
Acq On : 22 May 2018 12:46 pm
Operator : LT
Sample : 100ug/L Dioxane ICAL
Misc : 10uL 100ppm/10mL (5/20/18)
ALS Vial : 7 Sample Multiplier: 1

Quant Time: May 22 13:08:25 2018
Quant Method : C:\MSDCHEM\3\METHODS\DX052218.M
Quant Title : 1,4 Dioxane by EPA 8260C/SIM
QLast Update : Tue May 22 12:45:20 2018
Response via : Initial Calibration

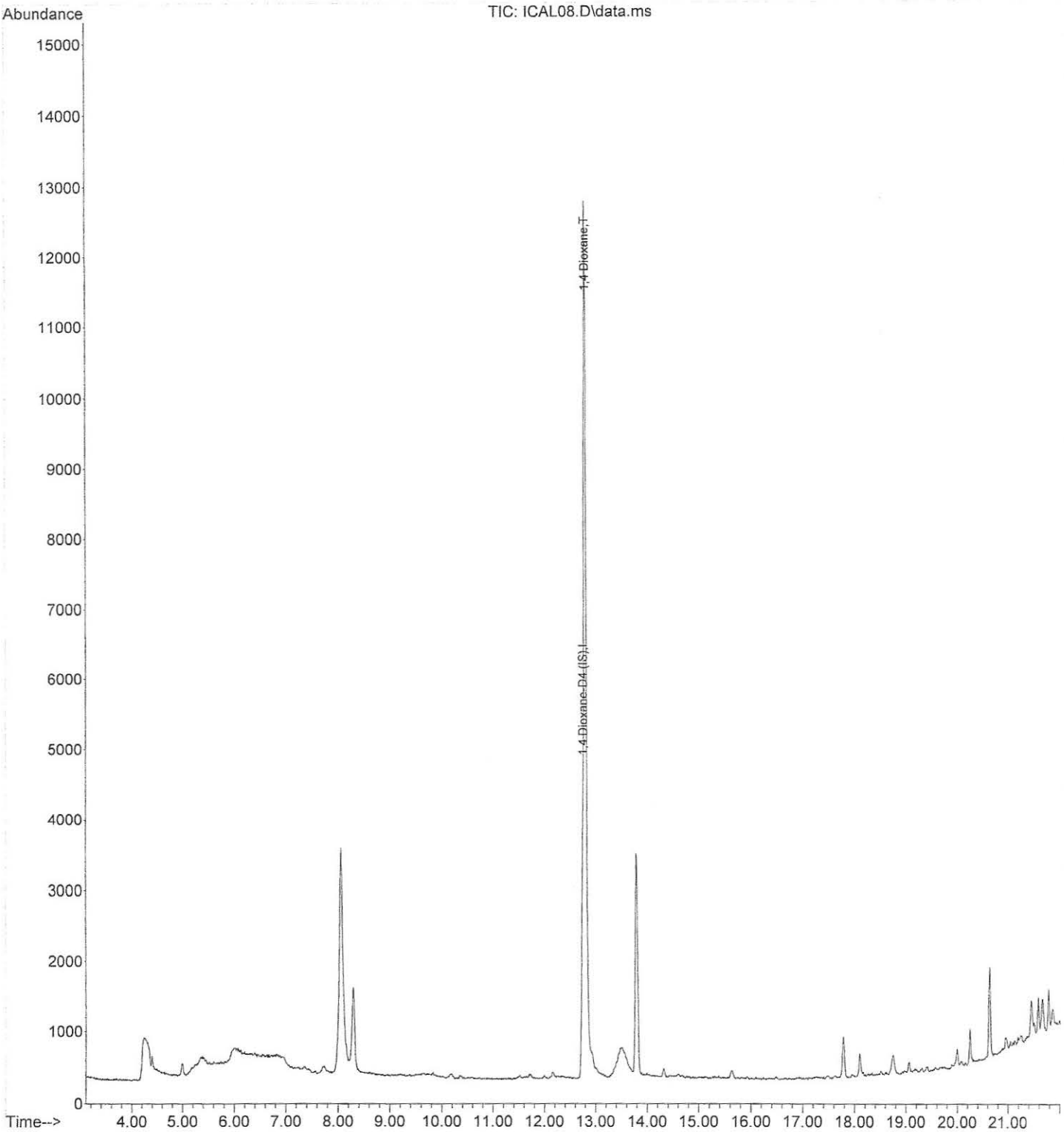
Internal Standards	R.T.	QIon	Response	Conc Units	Dev(Min)
1) 1,4 Dioxane-D4 (IS)	12.751	96	4658	25.00 ug/L	0.00
Target Compounds					**Qvalue**
2) 1,4 Dioxane	12.805	88	23798	88.04 ug/L	86

(#) = qualifier out of range (m) = manual integration (+) = signals summed

Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\3\DATA\052218\
Data File : ICAL08.D
Acq On : 22 May 2018 12:46 pm
Operator : LT
Sample : 100ug/L Dioxane ICAL
Misc : 10uL 100ppm/10mL (5/20/18)
ALS Vial : 7 Sample Multiplier: 1

Quant Time: May 22 13:08:25 2018
Quant Method : C:\MSDCHEM\3\METHODS\DX052218.M
Quant Title : 1,4 Dioxane by EPA 8260C/SIM
QLast Update : Tue May 22 12:45:20 2018
Response via : Initial Calibration



Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\3\DATA\052218\
Data File : ICAL09.D
Acq On : 22 May 2018 1:13 pm
Operator : LT
Sample : 200ug/L Dioxane ICAL
Misc : 20uL 100ppm/10mL (5/20/18)
ALS Vial : 8 Sample Multiplier: 1

Quant Time: May 22 13:35:49 2018
Quant Method : C:\MSDCHEM\3\METHODS\DX052218.M
Quant Title : 1,4 Dioxane by EPA 8260C/SIM
QLast Update : Tue May 22 12:45:20 2018
Response via : Initial Calibration

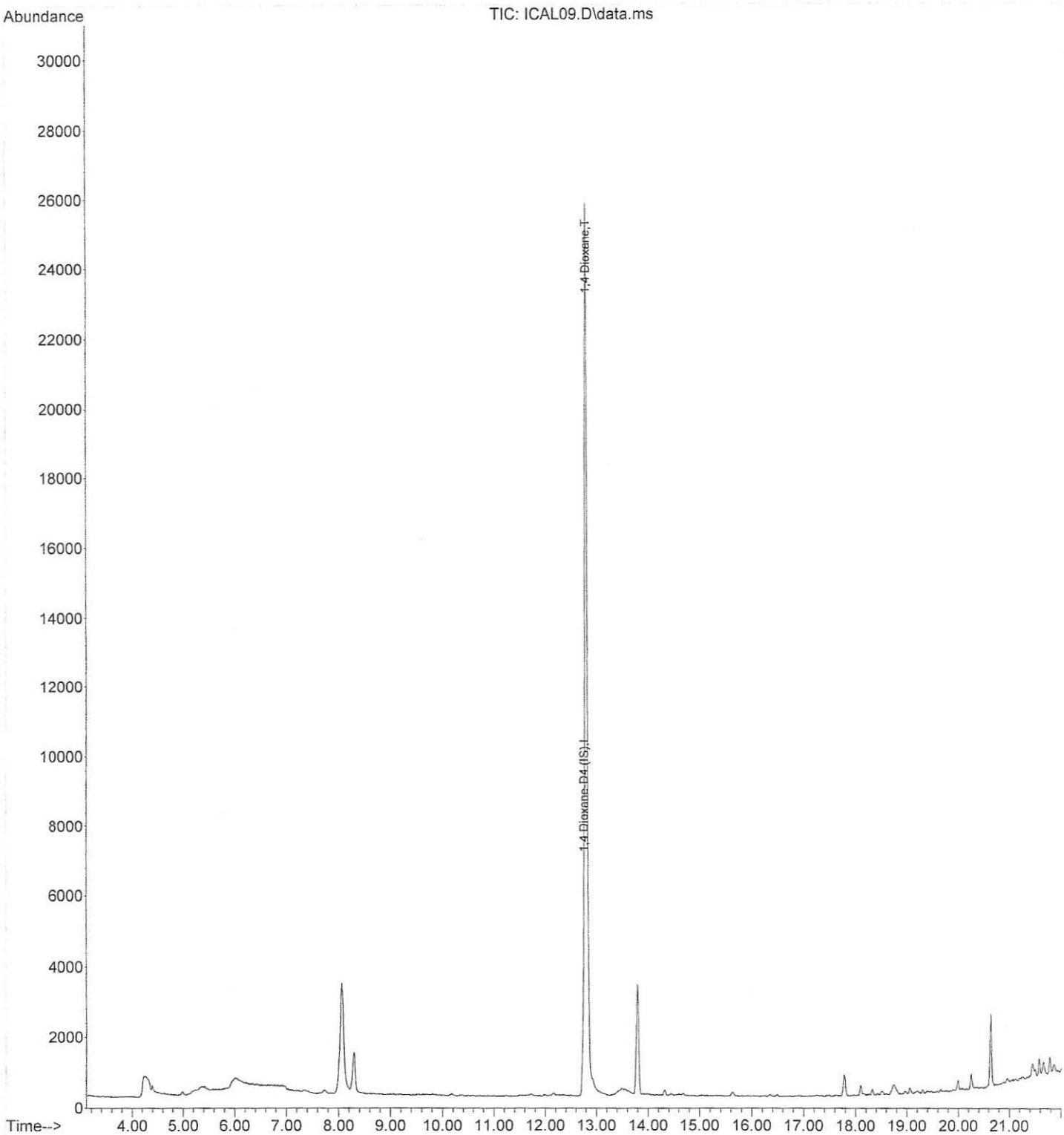
Internal Standards	R.T.	QIon	Response	Conc Units	Dev(Min)
1) 1,4 Dioxane-D4 (IS)	12.751	96	4863	25.00 ug/L	0.00
Target Compounds					**Qvalue**
2) 1,4 Dioxane	12.805	88	48645	172.38 ug/L	87

(#) = qualifier out of range (m) = manual integration (+) = signals summed

Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\3\DATA\052218\
Data File : ICAL09.D
Acq On : 22 May 2018 1:13 pm
Operator : LT
Sample : 200ug/L Dioxane ICAL
Misc : 20uL 100ppm/10mL (5/20/18)
ALS Vial : 8 Sample Multiplier: 1

Quant Time: May 22 13:35:49 2018
Quant Method : C:\MSDCHEM\3\METHODS\DX052218.M
Quant Title : 1,4 Dioxane by EPA 8260C/SIM
QLast Update : Tue May 22 12:45:20 2018
Response via : Initial Calibration



Evaluate Continuing Calibration Report

Data Path : C:\msdchem\3\DATA\052218\
Data File : CCV011.D
Acq On : 22 May 2018 2:08 pm
Operator : LT
Sample : 20ug/L 2nd Source Dioxane CCV
Misc : 4uL 50ppm/10mL (2/28/18)
ALS Vial : 10 Sample Multiplier: 1

Quant Time: May 22 14:30:37 2018
Quant Method : C:\MSDCHEM\3\METHODS\DX052218.M
Quant Title : 1,4 Dioxane by EPA 8260C/SIM
QLast Update : Tue May 22 13:36:09 2018
Response via : Initial Calibration

Min. RRF : 0.000 Min. Rel. Area : 50% Max. R.T. Dev 0.50min
Max. RRF Dev : 25% Max. Rel. Area : 150%

	Compound	AvgRF	CCRF	%Dev	Area%	Dev(min)
1 I	1,4 Dioxane-D4 (IS)	1.000	1.000	0.0	72	0.00
2 T	1,4 Dioxane	1.388	1.252	9.8	66	0.00

(#) = Out of Range SPCC's out = 0 CCC's out = 0

2nd Source CCV
less than 30%.

UY

Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\3\DATA\052218\
Data File : CCV011.D
Acq On : 22 May 2018 2:08 pm
Operator : LT
Sample : 20ug/L 2nd Source Dioxane CCV
Misc : 4uL 50ppm/10mL (2/28/18)
ALS Vial : 10 Sample Multiplier: 1

Quant Time: May 22 14:30:37 2018
Quant Method : C:\MSDCHEM\3\METHODS\DX052218.M
Quant Title : 1,4 Dioxane by EPA 8260C/SIM
QLast Update : Tue May 22 13:36:09 2018
Response via : Initial Calibration

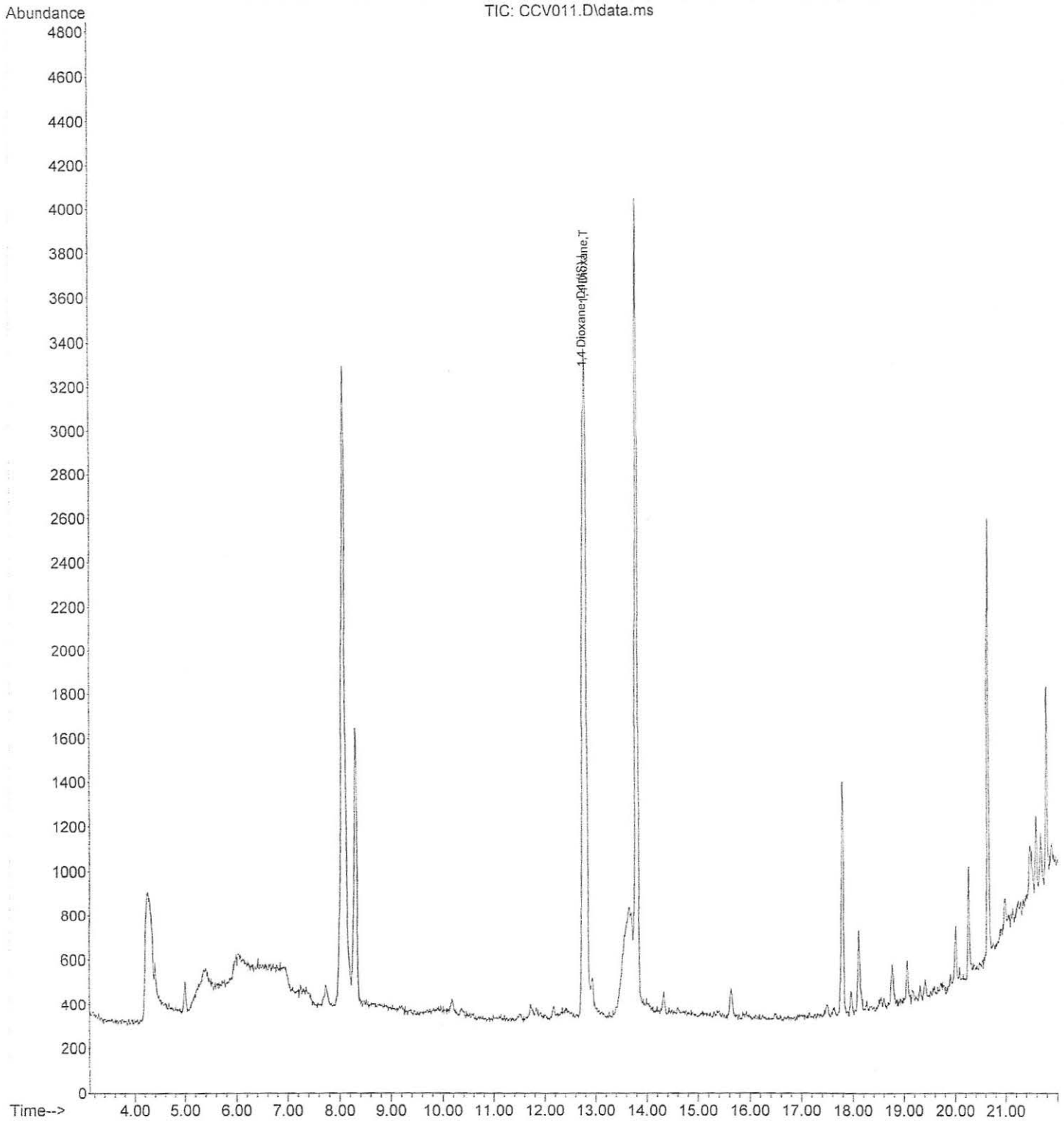
Internal Standards	R.T.	QIon	Response	Conc Units	Dev(Min)
1) 1,4 Dioxane-D4 (IS)	12.751	96	4924	25.00 ug/L	0.00
Target Compounds					**Qvalue**
2) 1,4 Dioxane	12.805	88	4932	18.03 ug/L	86

(#) = qualifier out of range (m) = manual integration (+) = signals summed

Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\3\DATA\052218\
Data File : CCV011.D
Acq On : 22 May 2018 2:08 pm
Operator : LT
Sample : 20ug/L 2nd Source Dioxane CCV
Misc : 4uL 50ppm/10mL (2/28/18)
ALS Vial : 10 Sample Multiplier: 1

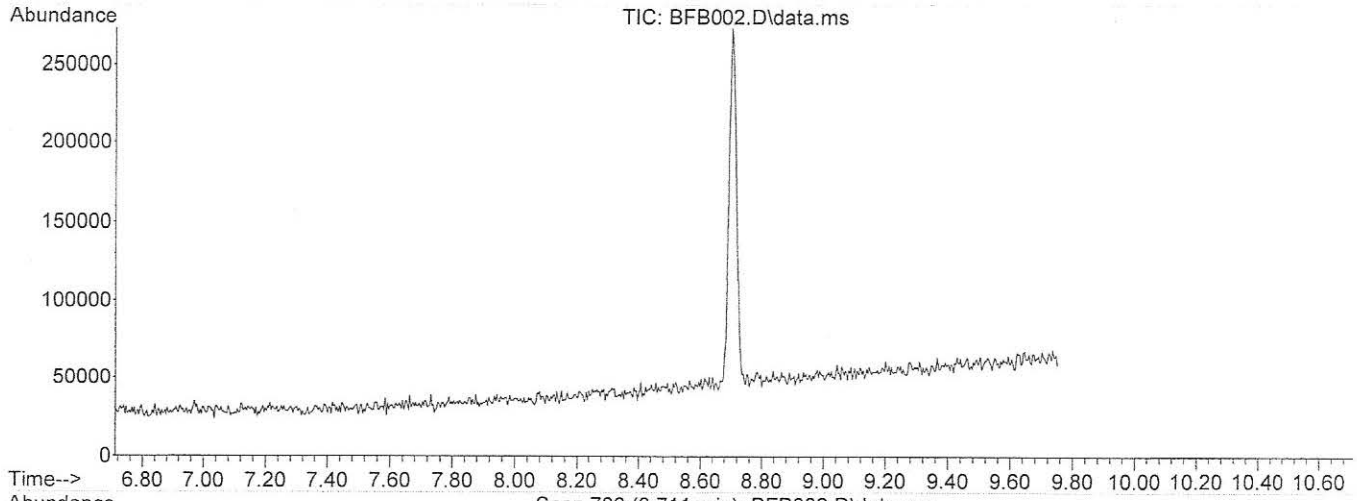
Quant Time: May 22 14:30:37 2018
Quant Method : C:\MSDCHEM\3\METHODS\DX052218.M
Quant Title : 1,4 Dioxane by EPA 8260C/SIM
QLast Update : Tue May 22 13:36:09 2018
Response via : Initial Calibration

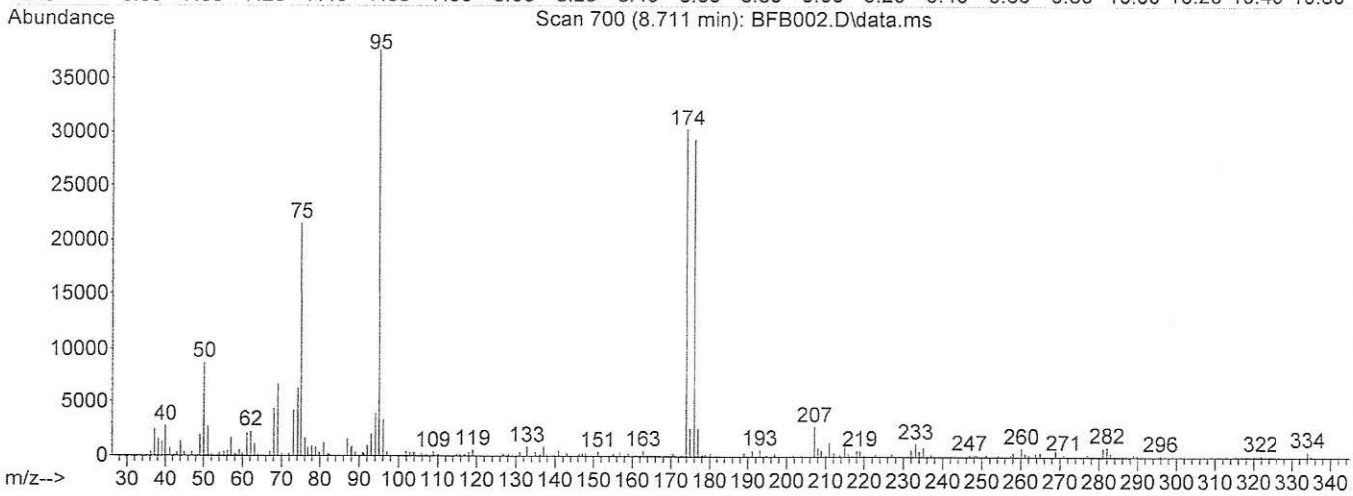


Data Path : C:\msdchem\3\DATA\052218\
Data File : BFB002.D
Acq On : 22 May 2018 8:33 am
Operator : LT
Sample : 50ng BFB
Misc :
ALS Vial : 1 Sample Multiplier: 1

Integration File: rteint.p

Method : C:\msdchem\3\METHODS\DX050818.M
Title : 1,4 Dioxane by EPA 8260C/SIM
Last Update : Tue May 08 13:10:11 2018





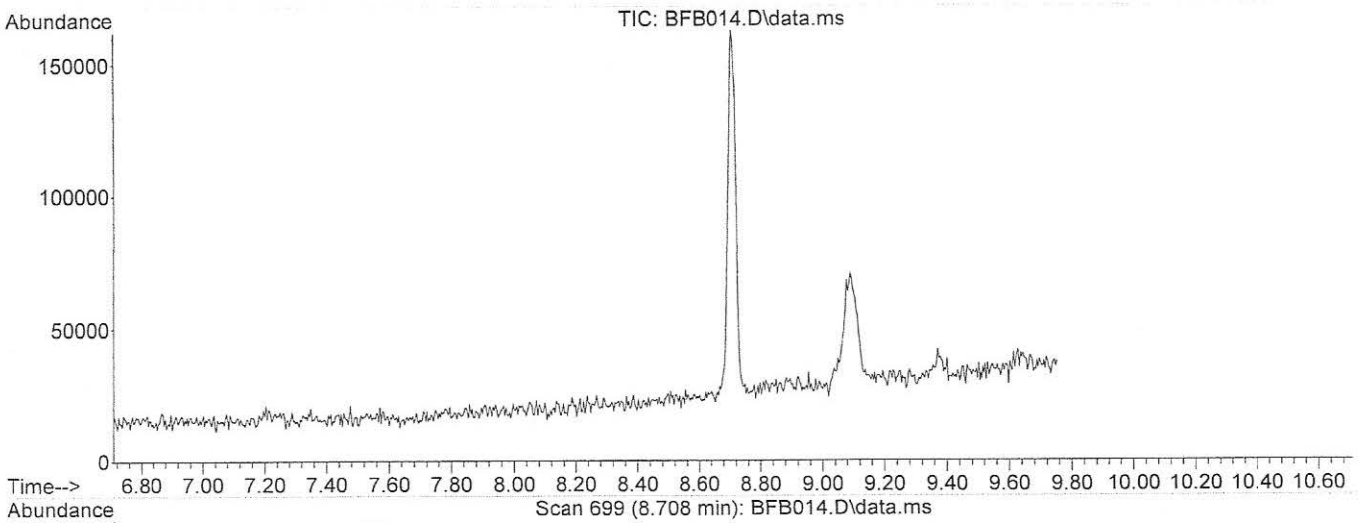
Spectrum Information: Scan 700

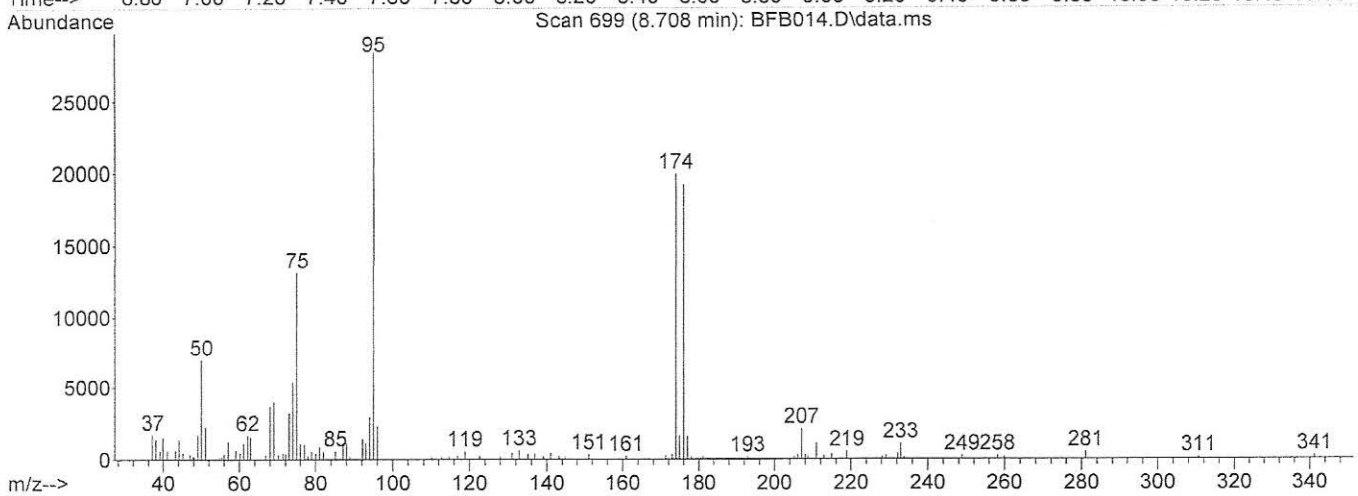
Target Mass	Rel. to Mass	Lower Limit%	Upper Limit%	Rel. Abn%	Raw Abn	Result Pass/Fail
50	95	15	40	23.4	8770	PASS
75	95	30	60	57.5	21552	PASS
95	95	100	100	100.0	37512	PASS
96	95	5	9	8.9	3338	PASS
173	174	0.00	2	0.0	0	PASS
174	95	50	100	80.8	30320	PASS
175	174	5	9	8.5	2580	PASS
176	174	95	101	96.8	29360	PASS
177	176	5	9	8.9	2600	PASS

Data Path : C:\msdchem\3\DATA\052218\
Data File : BFB014.D
Acq On : 22 May 2018 3:28 pm
Operator : LT
Sample : 50ng BFB
Misc :
ALS Vial : 1 Sample Multiplier: 1

Integration File: rteint.p

Method : C:\msdchem\3\METHODS\DX052218.M
Title : 1,4 Dioxane by EPA 8260C/SIM
Last Update : Tue May 22 13:36:09 2018





Spectrum Information: Scan 699

Target Mass	Rel. to Mass	Lower Limit%	Upper Limit%	Rel. Abn%	Raw Abn	Result Pass/Fail
50	95	15	40	24.9	7073	PASS
75	95	30	60	46.3	13122	PASS
95	95	100	100	100.0	28368	PASS
96	95	5	9	8.0	2271	PASS
173	174	0.00	2	1.6	323	PASS
174	95	50	100	70.1	19896	PASS
175	174	5	9	8.2	1626	PASS
176	174	95	101	96.5	19192	PASS
177	176	5	9	8.4	1607	PASS

Sequence Name: C:\msdchem\3\sequence\052218.S
Comment:
Operator: LT
Data Path: C:\MSDCHEM\3\DATA\052218\
Instrument Control Pre-Seq Cmd:
Data Analysis Pre-Seq Cmd:

Instrument Control Post-Seq Cmd:
Data Analysis Post-Seq Cmd:

Method Sections To Run
(X) Full Method
( ) Reprocessing Only

On A Barcode Mismatch
(X) Inject Anyway
( ) Don't Inject

Line			Sample Name/Misc Info		
1)	Sample	1	BFB001	BFB	50ng BFB
2)	Sample	1	BFB002	BFB	50ng BFB
3)	Sample	1	BLK002	DX052218	10mL Blank #1
4)	Sample	2	CCV003	DX052218	20ug/L Dioxane ICAL
5)	Sample	3	BLK004	DX052218	10mL Blank #1
6)	Sample	4	ICAL05	DX052218	0.8ug/L Dioxane LCS
7)	Sample	5	ICAL06	DX052218	5ug/L Dioxane ICAL
8)	Sample	6	ICAL07	DX052218	50ug/L Dioxane ICAL
9)	Sample	7	ICAL08	DX052218	100ug/L Dioxane ICAL
10)	Sample	8	ICAL09	DX052218	200ug/L Dioxane ICAL
11)	Sample	9	BLK010	DX052218	10mL Blank #2
12)	Sample	10	CCV011	DX052218	20ug/L 2nd Source Dioxane CCV
13)	Sample	11	BLK012	DX052218	10mL Blank #3
14)	Sample	12	BLK013	DX052218	10mL Blank #4
15)	Sample	1	BFB014	BFB	50ng BFB
16)	Sample	13	PAR015	DX052218	10mL MW105-WD -1
17)	Sample	14	PAR016	DX052218	10mL MW157-WD -1
18)	Sample	15	PAR017	DX052218	10mL MW156-WD -1
19)	Sample	16	PAR018	DX052218	10mL REED -1
20)	Sample	17	PAR019	DX052218	10mL NG -1
21)	Sample	18	PAR020	DX052218	10mL BM-15E2 -1
22)	Sample	19	PAR021	DX052218	10mL MW151-WD -1
23)	Sample	20	PAR022	DX052218	10mL MW62-WDR -1
24)	Sample	21	PAR023	DX052218	10mL MS MW105-WD -2
25)	Sample	22	PAR024	DX052218	10mL MSD MW105-WD -2
26)	Sample	23	PAR025	DX052218	10mL B-313 -1
27)	Sample	24	PAR026	DX052218	10mL MP-001 -1
28)	Sample	25	PAR027	DX052218	10mL MP-001 -1
29)	Sample	26	PAR028	DX052218	10mL TP-3340 -2
30)	Sample	27	PAR029	DX052218	10mL TP-3340 -2
31)	Sample	28	PAR030	DX052218	10X Dltn TP-3300 -2
32)	Sample	29	PAR031	DX052218	10X Dltn TP-3300 -2
33)	Sample	30	PAR032	DX052218	20X Dltn TP-3320 -2
34)	Sample	31	PAR033	DX052218	20X Dltn TP-3320 -2
35)	Sample	32	PAR034	DX052218	500X Dltn TP-3310 -1
36)	Sample	33	PAR035	DX052218	500X Dltn TP-3310 -1

PPR3746

Chain of Custody

PARSONS **1776 LINCOLN SUITE 600** **DENVER, CO 80203** **(303) 831-8100 FAX (303) 831-8208** **CONTACT: LYN BRILL** **PROJECT: LOWRY ENVIRONMENTAL PROTECTION/CLEANUP TRUST** **2ND QTR 2018**	**CHAIN OF CUSTODY #** **515201894** **LAB: CHEMSOLUTIONS** **CONTACT: John Graves**

SAMPLE ID	DATE	TIME	MATRIX
[redacted]	5-14-18	1015	AQ
[redacted]	5-14-18	1140	AQ

SUITE DESCRIPTION:

Analysis requested for the sample points listed.	Container(s) Volume, Type & Preservatives	Field Filtered
(8260SIM) Isotope Dilution for 1,4-Dioxane	3x40ml vial HCL & Cool ≤ 4° C	No

Special Instructions/Conditions of Receipt:

Custody seal intact
1°C
Samples in good condition

Turn Around Required
☐ 24 Hours ☐ 48 Hours ☐ 7 Days ☐ 14 Days ☐ 21 Days **X** Other **STD**

1. Relinquished By	Date	Time	1. Received By	Date	Time
R Boyle **Randy Boyle**	5/15/18	1430	Lindsey Lacco	5/15/18	1430
2. Relinquished By	Date	Time	2. Received By	Date	Time
3. Relinquished By	Date	Time	3. Received By	Date	Time

Sample shipment: Courier

White-Return to Parsons with report: Yellow-Stays with sample: Pink-Field Copy

ChemSolutions

7388 S. Revere Parkway, Suite 805
Centennial, CO 80112
303.771.5570

CASE NARRATIVE

Project ID: PAR552
Lowry Environmental Protection/Cleanup Trust
June 6, 2019

1. Samples were analyzed for 1,4-Dioxane by EPA Method 8260 SIM.

2. The project consisted of 2 aqueous samples.

3. Samples were received at 1°C on 5/24/19.

4. All standards are NIST traceable and were used within their recommended shelf life.

5. The samples were analyzed within the established hold times.

6. All standard operating procedures were followed.

7. All initial and continuing calibration criteria were met.

8. The method blank associated with the extraction batch was below the reporting limits for all analytes.

9. All laboratory quality control sample criteria were met.

The data contained in the following report have been reviewed and approved by:

John Graves
Laboratory Director
ChemSolutions LLC

Reporting Qualifiers

ChemSolutions LLC
Sample Summary
Project ID: PAR552

Client Project ID: Lowry Environmental Protection/Cleanup Trust

Lab ID	Sample ID	Matrix	Date Sampled	Date Received
PAR552[redacted]	[redacted]	Aqueous	5/23/2019	5/24/2019
PAR552_[redacted])	[redacted]	Aqueous	5/23/2019	5/24/2019

ChemSolutions LLC
Sample Results
Project ID: PAR552

Client Sample ID [redacted]
Client Project ID: Lowry Environmental Protection/Cleanup Trust
Lab ID: PAR552[redacted]
Sample Matrix: Aqueous

Date Sampled: 5/23/19
Date Received: 5/24/19

ANALYTE	Concentration	Reporting Limit	SMDL	Units	Dilution Factor	Date Analyzed	EPA Method	Prep Method	Qualifier
1,4- Dioxane	ND	0.90	0.15	ug/L	1	6/1/2019	8260 SIM	5030C	

Internal Standard Area = 1637

ND=Not detected

ChemSolutions LLC
Sample Results
Project ID: PAR552

Client Sample ID: [redacted]
Client Project ID: Lowry Environmental Protection/Cleanup Trust
Lab ID: PAR552_[redacted]
Sample Matrix: Aqueous

Date Sampled: 5/23/19
Date Received: 5/24/19

ANALYTE	Concentration	Reporting Limit	SMDL	Units	Dilution Factor	Date Analyzed	EPA Method	Prep Method	Qualifier
1,4- Dioxane	ND	0.90	0.15	ug/L	1	6/1/2019	8260 SIM	5030C	

Internal Standard Area = 1839

ND=Not detected

ChemSolutions LLC
Method Blank Results
Project ID: PAR552

Sample ID: Blank
Client Project ID: Lowry Environmental Protection/Cleanup Trust
Sample Matrix: Aqueous

ANALYTE	Concentration	Reporting Limit	SMDL	Units	Dilution Factor	Date Analyzed	EPA Method	Prep Method	Qualifier
1,4- Dioxane	ND	0.90	0.15	ug/L	1	6/1/2019	8260 SIM	5030C	

Internal Standard Area = 1689

ANALYTE	Concentration	Reporting Limit	SMDL	Units	Dilution Factor	Date Analyzed	EPA Method	Prep Method	Qualifier
1,4- Dioxane	0.18	0.90	0.15	ug/L	1	6/2/2019	8260 SIM	5030C	

Internal Standard Area = 1945

ND=Not detected

ChemSolutions LLC
Laboratory Control Sample Results
Project ID: PAR552

Sample ID: LCS
Client Project ID: Lowry Environmental Protection/Cleanup Trust
Sample Matrix: Aqueous

EPA Method 8260 SIM Date Analyzed: 6/1/19

ANALYTE	LCS SPIKE	% RECOVERY	UNITS	QC Limits
1,4-Dioxane	4.83	96.6	ug/L	75-125

Internal Standard Area = 1680

ChemSolutions LLC
Matrix Spike Results
Project ID: PAR552

Client Sample ID: [redacted]
Client Project ID: Lowry Environmental Protection/Cleanup Trust
Lab ID: PAR552_[redacted]

EPA Method 8260 SIM Date Analyzed: 6/1-6/2/19

ANALYTE	MATRIX SPIKE	% RECOVERY	MATRIX SPIKE DUP	% RECOVERY	RPD	UNITS	QC Limits	RPD Limit
1,4-Dioxane	4.46	89.2	4.58	91.6	2.65	ug/L	75-125	20

Sample Concentration = ND
MS Internal Standard Area = 1779
MSD Internal Standard Area = 1924

ChemSolutions

7388 S. Revere Parkway, Suite 805
Centennial, CO 80112
303.771.5570

DATA PACKAGE
PARSONS
LOWRY ENVIRONMENTAL PROTECTION/CLEANUP TRUST

Project ID PAR552

CONTENTS

Sample Data 2
Quality Control Data 6
Initial Calibration 16
Calibration Verifications 32
Tunes 35
Sequence Logs 37

Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\5\Data\060119\
Data File : PAR005.D
Acq On : 1 Jun 2019 11:06 am
Operator : JG
Sample : 10mL [redacted]-1
Misc : PAR552
ALS Vial : 5 Sample Multiplier: 1

Quant Time: Jun 01 11:27:51 2019
Quant Method : C:\msdchem\5\Method\DX052019.M
Quant Title : 1,4 dioxane in water by 8260C SIM, 10mLs sample, FMon May 20 14:01:08 2019
QLast Update : Mon May 20 14:01:08 2019
Response via : Initial Calibration

Internal Standards	R.T.	QIon	Response	Conc Units	Dev(Min)
1) 1,4 Dioxane-D4 (IS)	6.663	96	1637	25.00 ug/L	0.00

Target Compounds					Qvalue
2) 1,4 Dioxane	6.709	88	8m	0.10 ug/L	

(#) = qualifier out of range (m) = manual integration (+) = signals summed

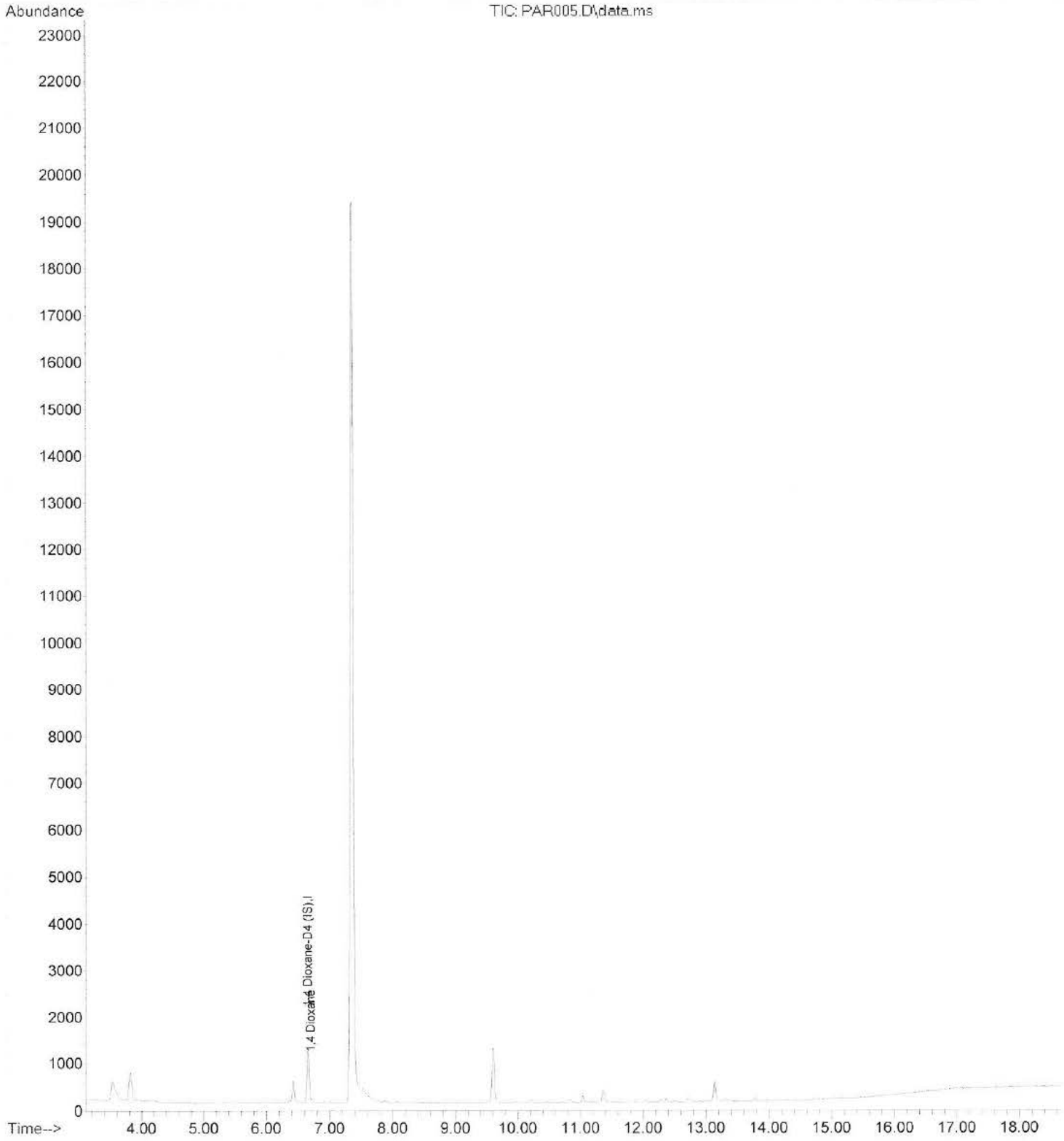
ND

QS

Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\5\Data\060119\
Data File : PAR005.D
Acq On : 1 Jun 2019 11:06 am
Operator : JG
Sample : 10mL [redacted]-1
Misc : PAR552
ALS Vial : 5 Sample Multiplier: 1

Quant Time: Jun 01 11:27:51 2019
Quant Method : C:\msdchem\5\Method\DX052019.M
Quant Title : 1,4 dioxane in water by 8260C SIM, 10mLs sample, FMon May 20 14:01:08 2019
QLast Update : Mon May 20 14:01:08 2019
Response via : Initial Calibration



Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\5\Data\060119\
Data File : PAR007.D
Acq On : 1 Jun 2019 11:55 am
Operator : JG
Sample : 10mL [redacted]-1
Misc : PAR552
ALS Vial : 7 Sample Multiplier: 1

Quant Time: Jun 01 12:13:44 2019
Quant Method : C:\MSDCHEM\5\METHOD\DX052019.M
Quant Title : 1,4 dioxane in water by 8260C SIM. 10mLs sample. FMon May 20 14:01:08 2019
QLast Update : Mon May 20 14:01:08 2019
Response via : Initial Calibration

Internal Standards	R.T.	QIon	Response	Conc Units	Dev(Min)
1) 1,4 Dioxane-D4 (IS)	6.665	96	1839	25.00 ug/L	0.00
Target Compounds					Qvalue
2) 1,4 Dioxane	6.703	88	12	0.13 ug/L #	24

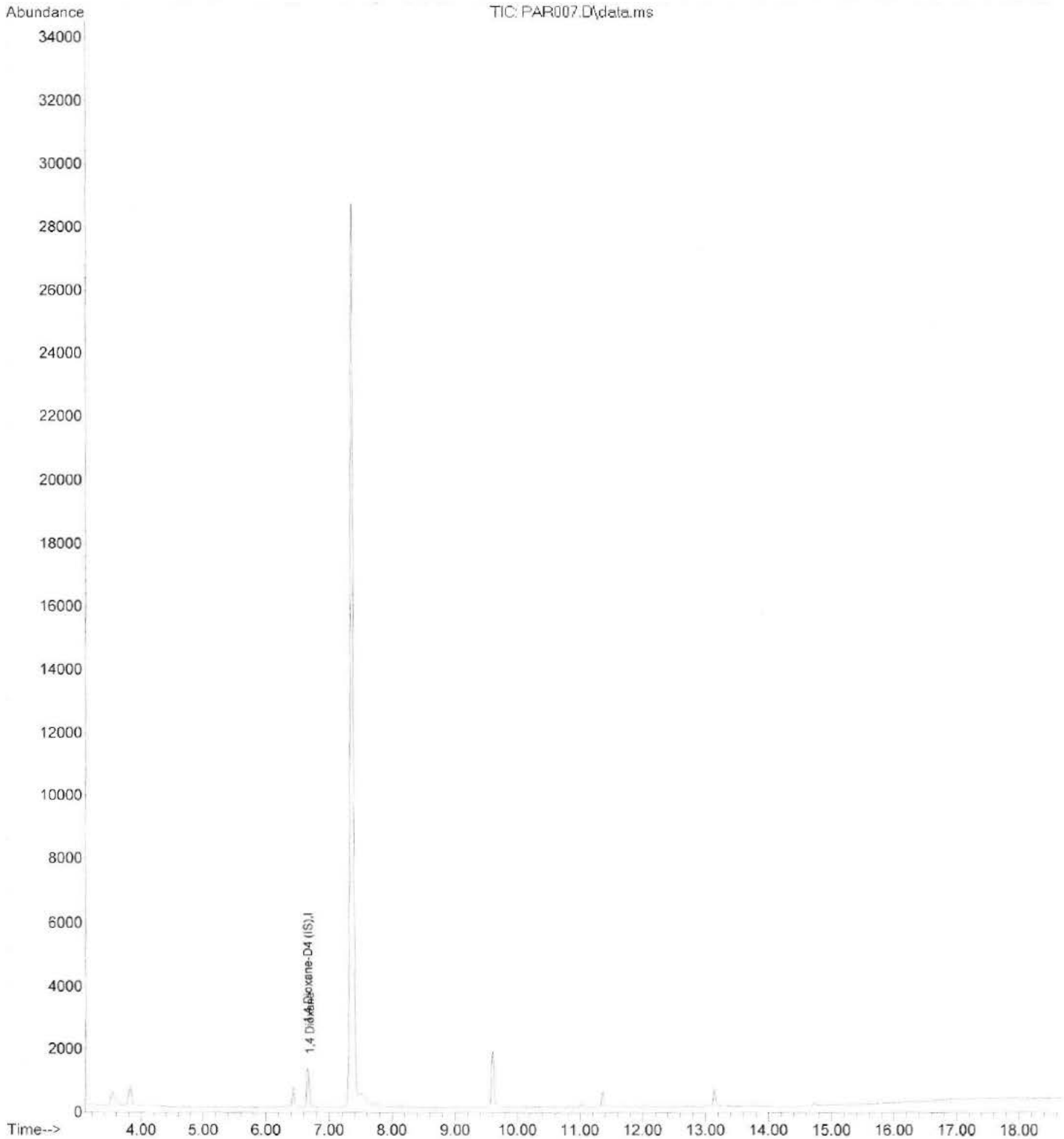
(#) = qualifier out of range (m) = manual integration (+) = signals summed

ND

Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\5\Data\060119\
Data File : PAR007.D
Acq On : 1 Jun 2019 11:55 am
Operator : JG
Sample : 10mL [redacted]-1
Misc : PAR552
ALS Vial : 7 Sample Multiplier: 1

Quant Time: Jun 01 12:13:44 2019
Quant Method : C:\MSDCHEM\5\METHOD\DX052019.M
Quant Title : 1,4 dioxane in water by 8260C SIM, 10mLs sample, FMon May 20 14:01:08 2019
QLast Update : Mon May 20 14:01:08 2019
Response via : Initial Calibration



Quantitation Report (QT Reviewed)

Data Path : C:\MSDCHEM\5\DATA\060119\Snapshot\
Data File : BLK004.D
Acq On : 1 Jun 2019 10:38 am
Operator : JG
Sample : 10mL Blank #2
Misc : PAR551-554, PWT019
ALS Vial : 4 Sample Multiplier: 1

Quant Time: Jun 01 10:46:26 2019
Quant Method : C:\msdchem\5\Method\DX052019.M
Quant Title : 1,4 dioxane in water by 8260C SIM, 10mLs sample, FMon May 20 14:01:08 2019
QLast Update : Mon May 20 14:01:08 2019
Response via : Initial Calibration

Internal Standards	R.T.	QIon	Response	Conc Units	Dev(Min)
1) 1,4 Dioxane-D4 (IS)	6.663	96	1689	25.00 ug/L	0.00
Target Compounds					Qvalue
2) 1,4 Dioxane	6.717	88	11m	0.13 ug/L	

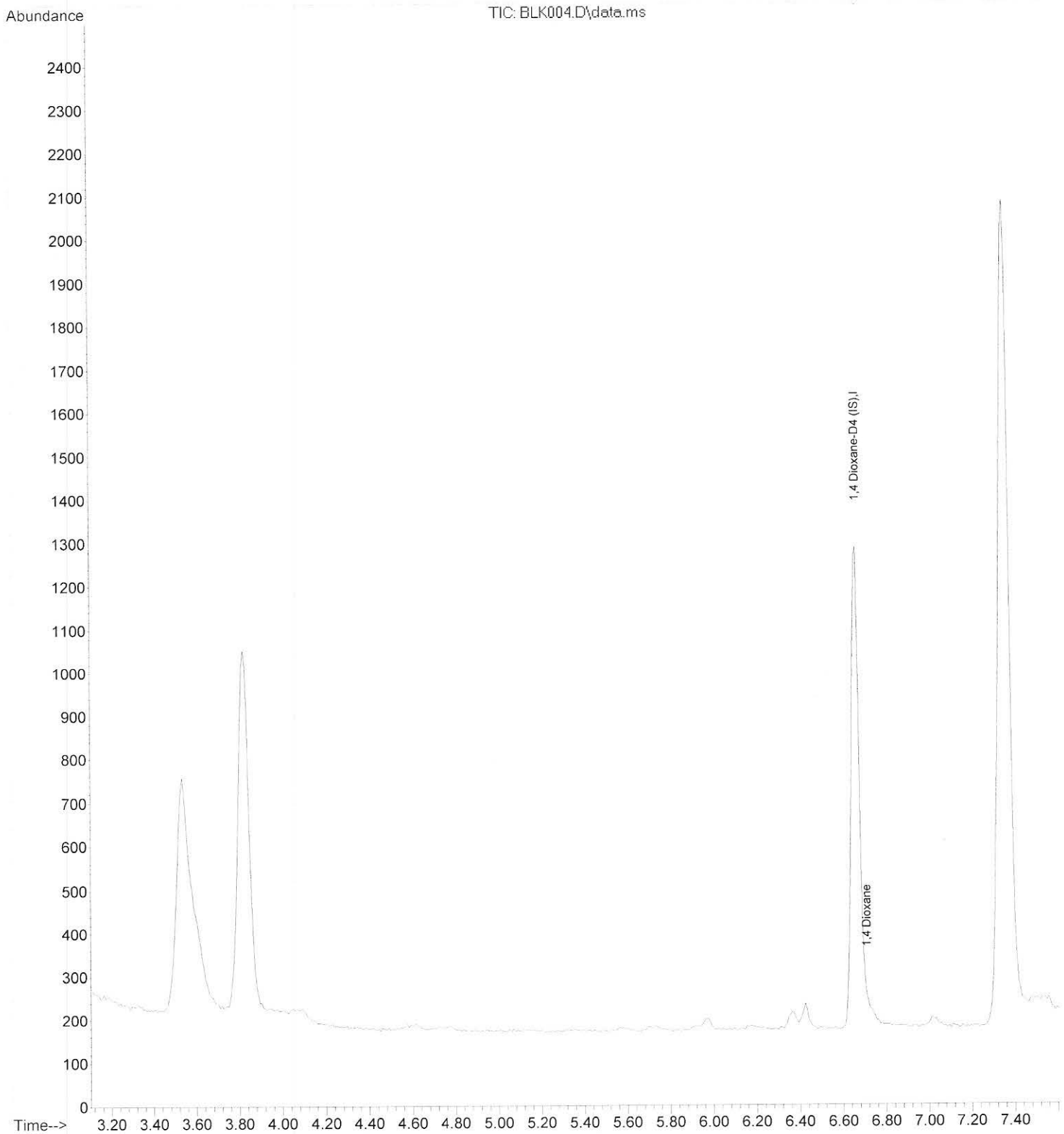
(#) = qualifier out of range (m) = manual integration (+) = signals summed

ND
DL

Quantitation Report (QT Reviewed)

Data Path : C:\MSDCHEM\5\DATA\060119\Snapshot\
Data File : BLK004.D
Acq On : 1 Jun 2019 10:38 am
Operator : JG
Sample : 10mL Blank #2
Misc : PAR551-554, PWT019
ALS Vial : 4 Sample Multiplier: 1

Quant Time: Jun 01 10:46:26 2019
Quant Method : C:\msdchem\5\Method\DX052019.M
Quant Title : 1,4 dioxane in water by 8260C SIM, 10mLs sample, FMon May 20 14:01:08 2019
QLast Update : Mon May 20 14:01:08 2019
Response via : Initial Calibration



Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\5\Data\060119\
Data File : BLK028.D
Acq On : 2 Jun 2019 12:30 pm
Operator : JG
Sample : 10mL Blank #1
Misc :
ALS Vial : 28 Sample Multiplier: 1

Quant Time: Jun 02 12:51:31 2019
Quant Method : C:\MSDCHEM\5\METHOD\DX052019.M
Quant Title : 1,4 dioxane in water by 8260C SIM, 10mLs sample, FMon May 20 14:01:08 2019
QLast Update : Mon May 20 14:01:08 2019
Response via : Initial Calibration

Internal Standards	R.T.	QIon	Response	Conc Units	Dev(Min)
1) 1,4 Dioxane-D4 (IS)	6.657	96	1945	25.00 ug/L	0.00

Target Compounds					Qvalue
2) 1,4 Dioxane	6.718	88	18m	0.18 ug/L	

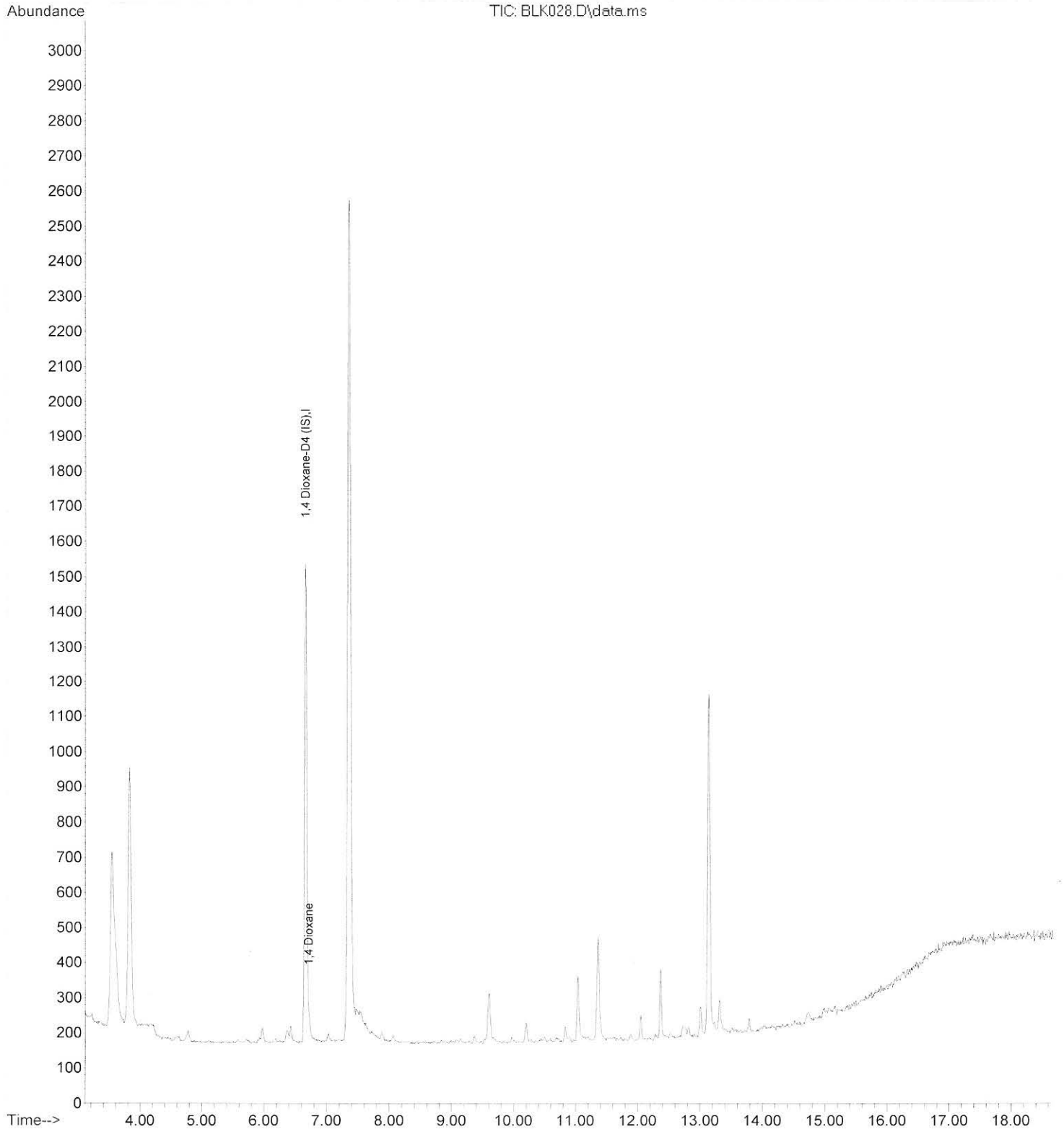
(#) = qualifier out of range (m) = manual integration (+) = signals summed

0.18 ug/L J

Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\5\Data\060119\
Data File : BLK028.D
Acq On : 2 Jun 2019 12:30 pm
Operator : JG
Sample : 10mL Blank #1
Misc :
ALS Vial : 28 Sample Multiplier: 1

Quant Time: Jun 02 12:51:31 2019
Quant Method : C:\MSDCHEM\5\METHOD\DX052019.M
Quant Title : 1,4 dioxane in water by 8260C SIM, 10mLs sample, FMon May 20 14:01:08 2019
QLast Update : Mon May 20 14:01:08 2019
Response via : Initial Calibration



Quantitation Report (Not Reviewed)

Data Path : C:\MSDCHEM\5\DATA\060119\Snapshot\
Data File : LCS003.D
Acq On : 1 Jun 2019 10:12 am
Operator : JG
Sample : 5ug/L Dioxane ICAL/LCS
Misc : 5uL 10ppm/10mL (2/19/19)
ALS Vial : 3 Sample Multiplier: 1

Quant Time: Jun 01 10:23:18 2019
Quant Method : C:\msdchem\5\Method\DX052019.M
Quant Title : 1,4 dioxane in water by 8260C SIM, 10mLs sample, FMon May 20 14:01:08 2019
QLast Update : Mon May 20 14:01:08 2019
Response via : Initial Calibration

Internal Standards	R.T.	QIon	Response	Conc Units	Dev(Min)
1) 1,4 Dioxane-D4 (IS)	6.664	96	1680	25.00 ug/L	0.00
Target Compounds					**Qvalue**
2) 1,4 Dioxane	6.726	88	407	4.83 ug/L	99

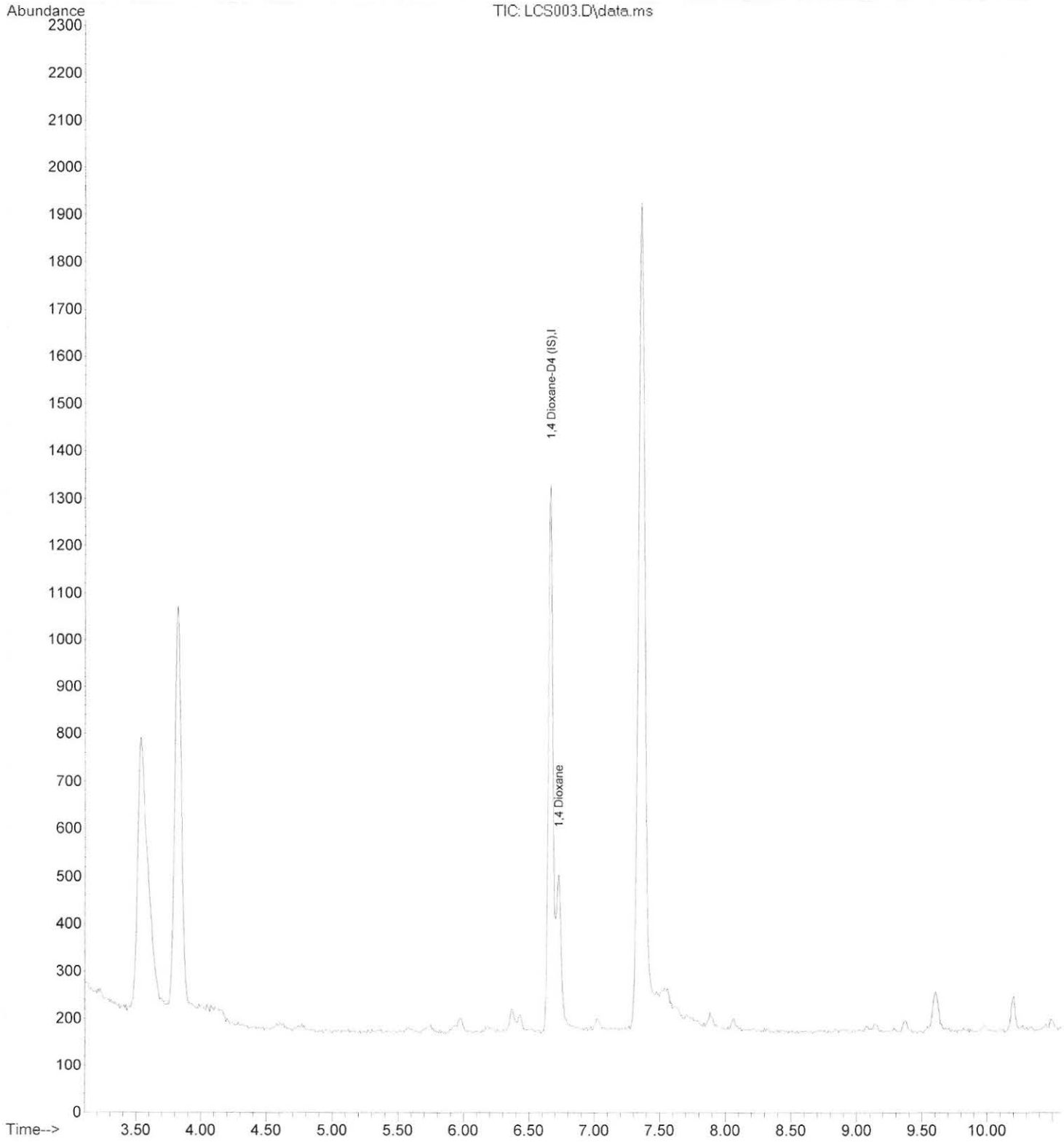
(#) = qualifier out of range (m) = manual integration (+) = signals summed

5.00 ug/L Spike
4.83 ug/L Recovered
DA

Quantitation Report (Not Reviewed)

Data Path : C:\MSDCHEM\5\DATA\060119\Snapshot\
Data File : LCS003.D
Acq On : 1 Jun 2019 10:12 am
Operator : JG
Sample : 5ug/L Dioxane ICAL/LCS
Misc : 5uL 10ppm/10mL (2/19/19)
ALS Vial : 3 Sample Multiplier: 1

Quant Time: Jun 01 10:23:18 2019
Quant Method : C:\msdchem\5\Method\DX052019.M
Quant Title : 1,4 dioxane in water by 8260C SIM, 10mLs sample, FMon May 20 14:01:08 2019
QLast Update : Mon May 20 14:01:08 2019
Response via : Initial Calibration



Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\5\Data\060119\
Data File : PAR027.D
Acq On : 2 Jun 2019 12:06 pm
Operator : JG
Sample : 10mL MS [redacted]-3
Misc : 5uL 10ppm/10mL (2/19/19) PAR552
ALS Vial : 27 Sample Multiplier: 1

Quant Time: Jun 02 12:25:03 2019
Quant Method : C:\MSDCHEM\5\METHOD\DX052019.M
Quant Title : 1,4 dioxane in water by 8260C SIM, 10mLs sample, FMon May 20 14:01:08 2019
QLast Update : Mon May 20 14:01:08 2019
Response via : Initial Calibration

Internal Standards	R.T.	QIon	Response	Conc Units	Dev(Min)
1) 1,4 Dioxane-D4 (IS)	6.663	96	1799	25.00 ug/L	0.00
Target Compounds					Qvalue
2) 1,4 Dioxane	6.725	88	403	4.46 ug/L	85

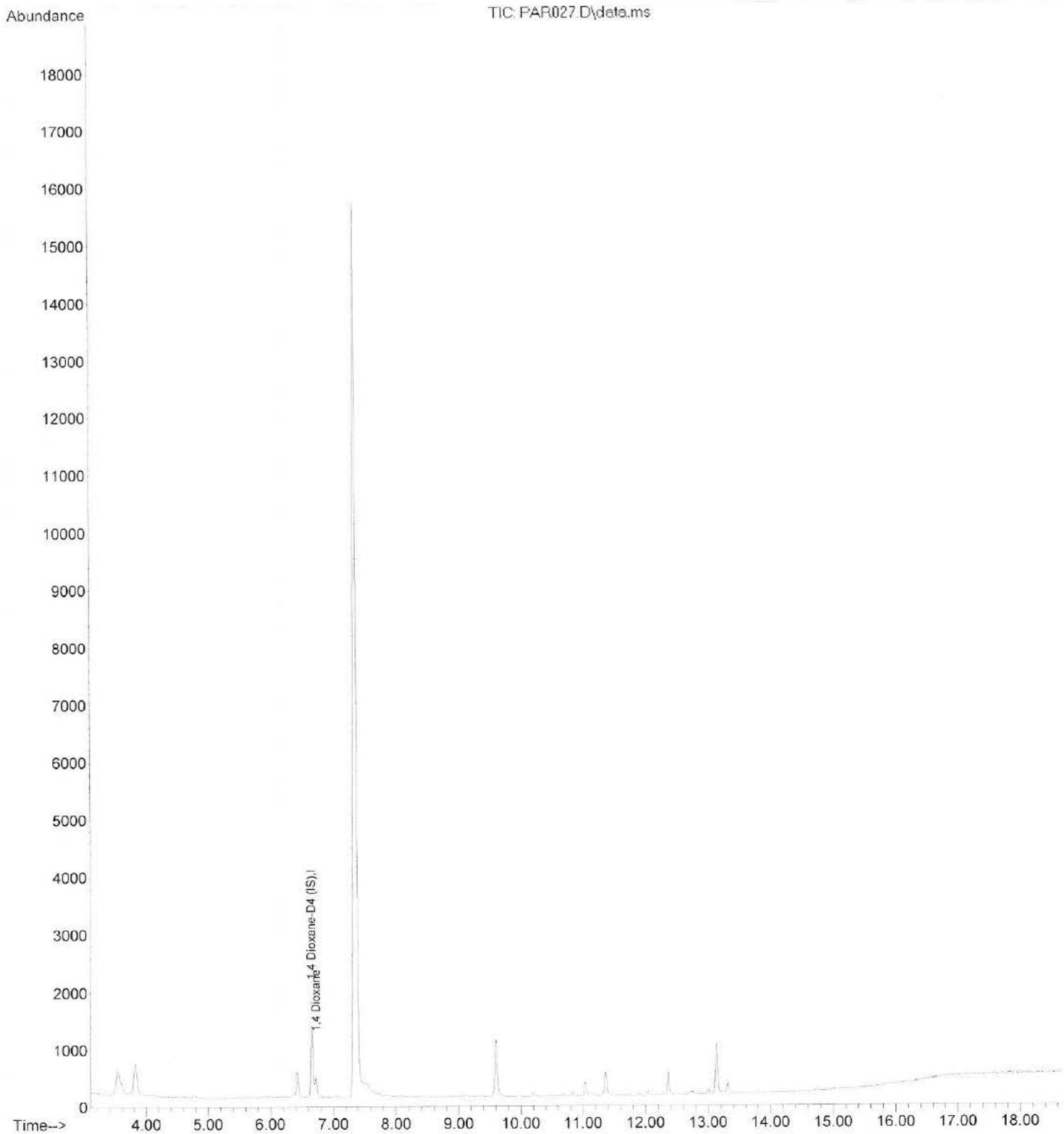
(#) = qualifier out of range (m) = manual integration (+) = signals summed

5.00 ug/L spike
sample result = ND
4.46 ug/L Recovered

Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\5\Data\060119\
Data File : PAR027.D
Acq On : 2 Jun 2019 12:06 pm
Operator : JG
Sample : 10mL MS [redacted]3
Misc : 5uL 10ppm/10mL (2/19/19) PAR552
ALS Vial : 27 Sample Multiplier: 1

Quant Time: Jun 02 12:25:03 2019
Quant Method : C:\MSDCHEM\5\METHOD\DX052019.M
Quant Title : 1,4 dioxane in water by 8260C SIM, 10mLs sample, FMon May 20 14:01:08 2019
QLast Update : Mon May 20 14:01:08 2019
Response via : Initial Calibration



Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\5\Data\060119\
Data File : PAR013.D
Acq On : 1 Jun 2019 2:24 pm
Operator : JG
Sample : 10mL MSD [redacted]-2
Misc : 5uL 10ppm/10mL (2/19/19) PAR552
ALS Vial : 13 Sample Multiplier: 1

Quant Time: Jun 01 14:43:14 2019
Quant Method : C:\MSDCHEM\5\METHOD\DX052019.M
Quant Title : 1,4 dioxane in water by 8260C SIM, 10mLs sample, FMon May 20 14:01:08 2019
QLast Update : Mon May 20 14:01:08 2019
Response via : Initial Calibration

Internal Standards	R.T.	QIon	Response	Conc Units	Dev(Min)
1) 1,4 Dioxane-D4 (IS)	6.655	96	1924	25.00 ug/L	0.00
Target Compounds					**Qvalue**
2) 1,4 Dioxane	6.725	88	442	4.58 ug/L	97

(#) = qualifier out of range (m) = manual integration (+) = signals summed

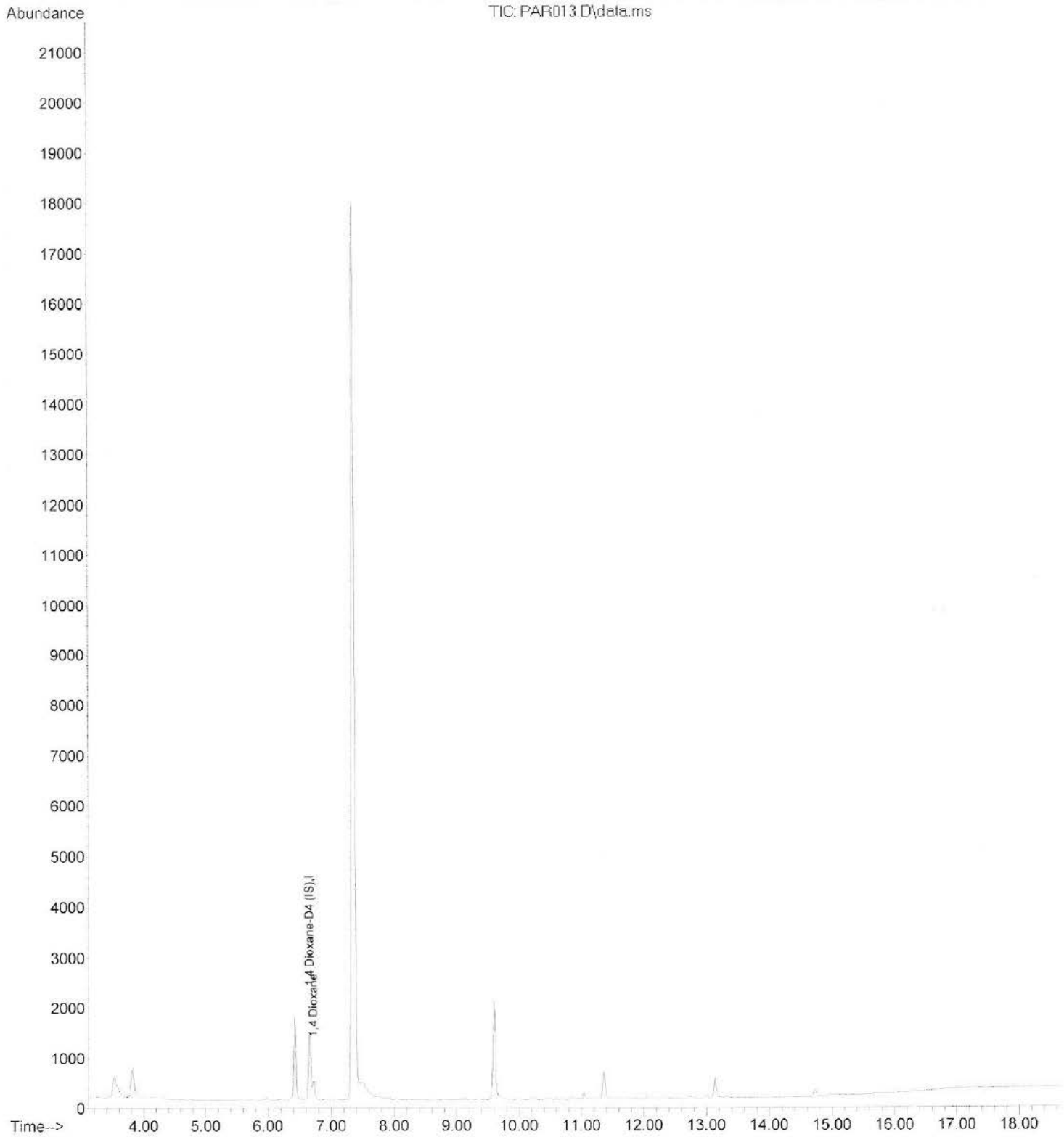
4.58 ug/L

JA

Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\5\Data\060119\
Data File : PAR013.D
Acq On : 1 Jun 2019 2:24 pm
Operator : JG
Sample : 10mL MSD [redacted]2
Misc : 5uL 10ppm/10mL (2/19/19) PAR552
ALS Vial : 13 Sample Multiplier: 1

Quant Time: Jun 01 14:43:14 2019
Quant Method : C:\MSDCHEM\5\METHOD\DX052019.M
Quant Title : 1,4 dioxane in water by 8260C SIM, 10mLs sample, FMon May 20 14:01:08 2019
QLast Update : Mon May 20 14:01:08 2019
Response via : Initial Calibration



Response Factor Report Instrument #5

Method Path : C:\msdchem\5\Method\
Method File : DX052019.M
Title : 1,4 dioxane in water by 8260C SIM, 10mLs sample, FMon May 20 14:01:08 2019
Last Update : Mon May 20 14:01:08 2019
Response Via : Initial Calibration

Calibration Files
1 =ICAL04.D 2 =ICAL05.D 3 =ICAL011.D 4 =ICAL06.D 5 =ICAL07.D 6 =ICAL08.D

Compound	1	2	3	4	5	6	Avg	%RSD
1) I 1,4 Dioxane-D4 (IS)	----------ISTD----------							
2) 1,4 Dioxane	1.336	1.108	1.528	1.190	1.154	1.210	1.254	12.32

(#) = Out of Range

Less than 20%.

VM

Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\5\Data\052019\
Data File : ICAL04.D
Acq On : 20 May 2019 10:29 am
Operator : LT
Sample : 10mL 0.8ug/L Dioxane ICAL
Misc : 4uL 10ppm/50mL (2/19/19)
ALS Vial : 4 Sample Multiplier: 1

Quant Time: May 20 10:54:39 2019
Quant Method : C:\MSDCHEM\5\METHOD\DX052019.M
Quant Title : 1,4 dioxane in water by 8260C SIM, 10mLs sample, FWed Apr 24 14:39:22 2019
QLast Update : Wed Apr 24 14:39:22 2019
Response via : Initial Calibration

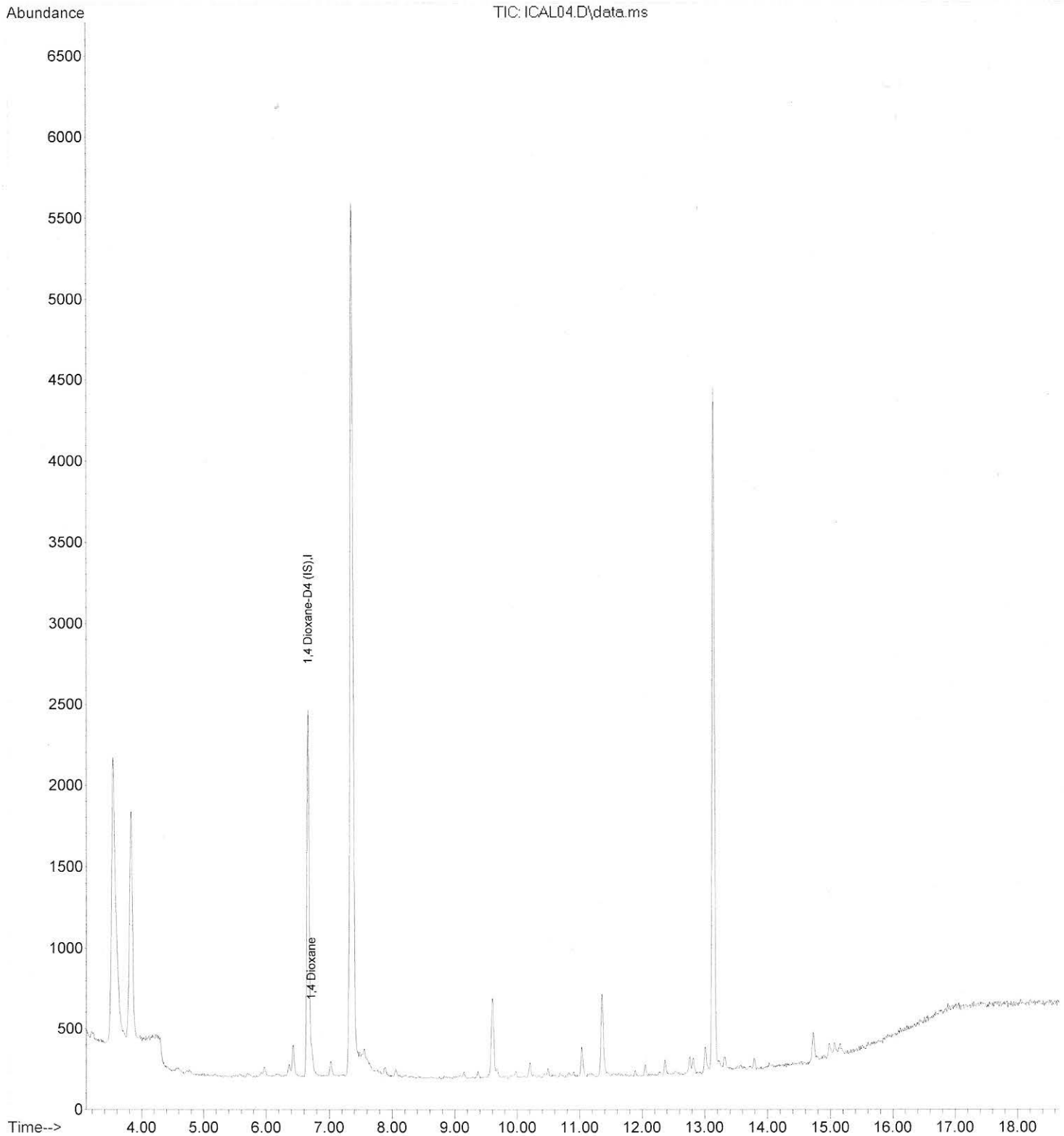
Internal Standards	R.T.	QIon	Response	Conc Units	Dev(Min)
1) 1,4 Dioxane-D4 (IS)	6.662	96	3298	25.00 ug/L	0.00
Target Compounds					**Qvalue**
2) 1,4 Dioxane	6.723	88	141m	0.82 ug/L	

(#) = qualifier out of range (m) = manual integration (+) = signals summed

Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\5\Data\052019\
Data File : ICAL04.D
Acq On : 20 May 2019 10:29 am
Operator : LT
Sample : 10mL 0.8ug/L Dioxane ICAL
Misc : 4uL 10ppm/50mL (2/19/19)
ALS Vial : 4 Sample Multiplier: 1

Quant Time: May 20 10:54:39 2019
Quant Method : C:\MSDCHEM\5\METHOD\DX052019.M
Quant Title : 1,4 dioxane in water by 8260C SIM, 10mLs sample, FWed Apr 24 14:39:22 2019
QLast Update : Wed Apr 24 14:39:22 2019
Response via : Initial Calibration



Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\5\Data\052019\
Data File : ICAL05.D
Acq On : 20 May 2019 10:54 am
Operator : LT
Sample : 5ug/L Dioxane ICAL
Misc : 5uL 10ppm/10mL (2/19/19)
ALS Vial : 5 Sample Multiplier: 1

Quant Time: May 20 16:04:39 2019
Quant Method : C:\msdchem\5\Method\DX052019.M
Quant Title : 1,4 dioxane in water by 8260C SIM, 10mLs sample, FMon May 20 14:01:08 2019
QLast Update : Mon May 20 14:01:08 2019
Response via : Initial Calibration

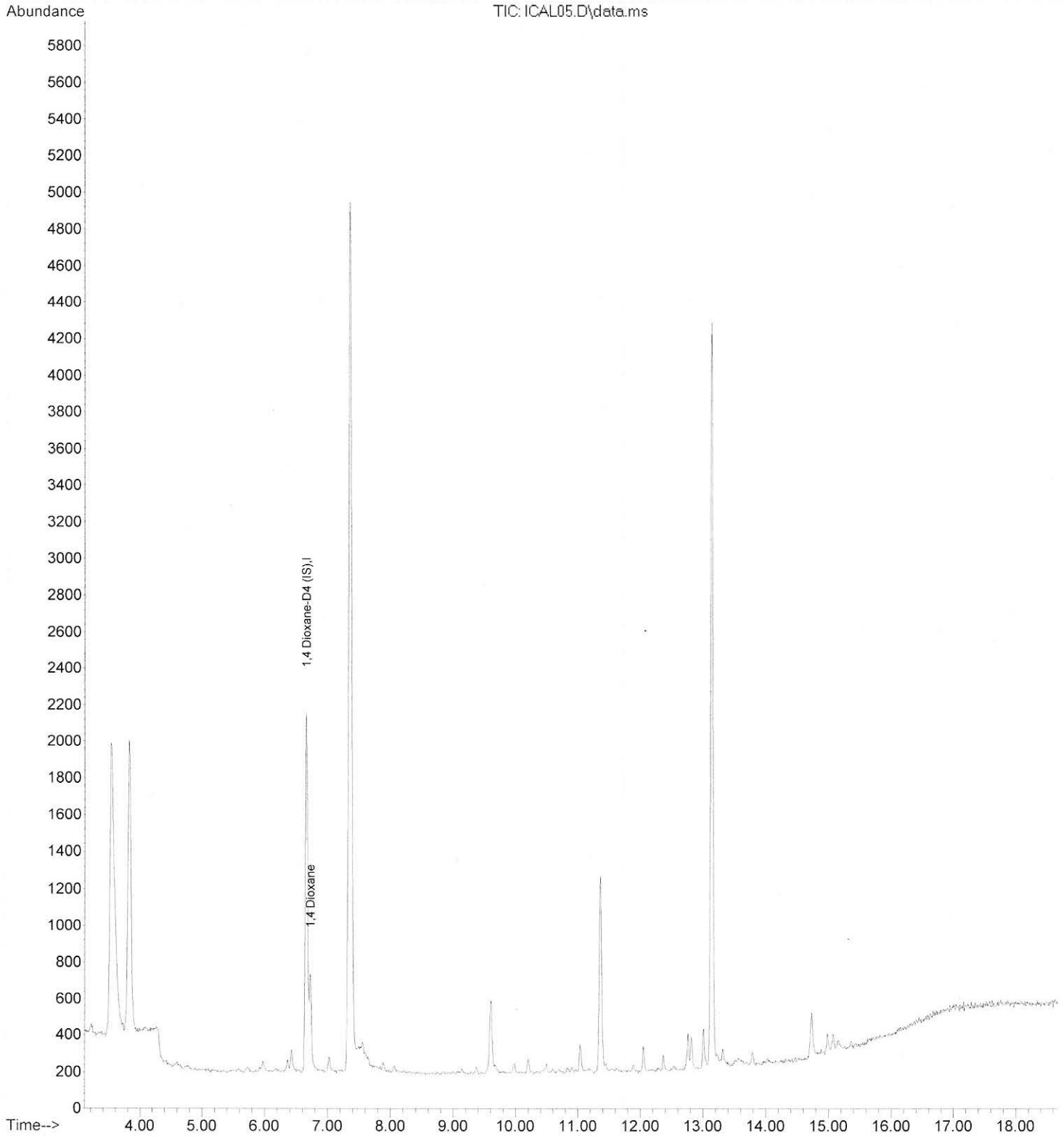
Internal Standards	R.T.	QIon	Response	Conc Units	Dev(Min)
1) 1,4 Dioxane-D4 (IS)	6.663	96	2939	25.00 ug/L	0.00
Target Compounds					Qvalue
2) 1,4 Dioxane	6.725	88	651	4.41 ug/L	96

(#) = qualifier out of range (m) = manual integration (+) = signals summed

Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\5\Data\052019\
Data File : ICAL05.D
Acq On : 20 May 2019 10:54 am
Operator : LT
Sample : 5ug/L Dioxane ICAL
Misc : 5uL 10ppm/10mL (2/19/19)
ALS Vial : 5 Sample Multiplier: 1

Quant Time: May 20 16:04:39 2019
Quant Method : C:\msdchem\5\Method\DX052019.M
Quant Title : 1,4 dioxane in water by 8260C SIM, 10mLs sample, FMon May 20 14:01:08 2019
QLast Update : Mon May 20 14:01:08 2019
Response via : Initial Calibration



Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\5\Data\052019\
Data File : ICAL011.D
Acq On : 20 May 2019 1:26 pm
Operator : LT
Sample : 20ug/L Dioxane ICAL
Misc : 2uL 100ppm/5mL (2/19/19)
ALS Vial : 2 Sample Multiplier: 1

Quant Time: May 20 13:45:05 2019
Quant Method : C:\MSDCHEM\5\METHOD\DX042419.M
Quant Title : 1,4 dioxane in water by 8260C SIM, 10mLs sample, FWed Apr 24 14:39:22 2019
QLast Update : Wed Apr 24 14:39:22 2019
Response via : Initial Calibration

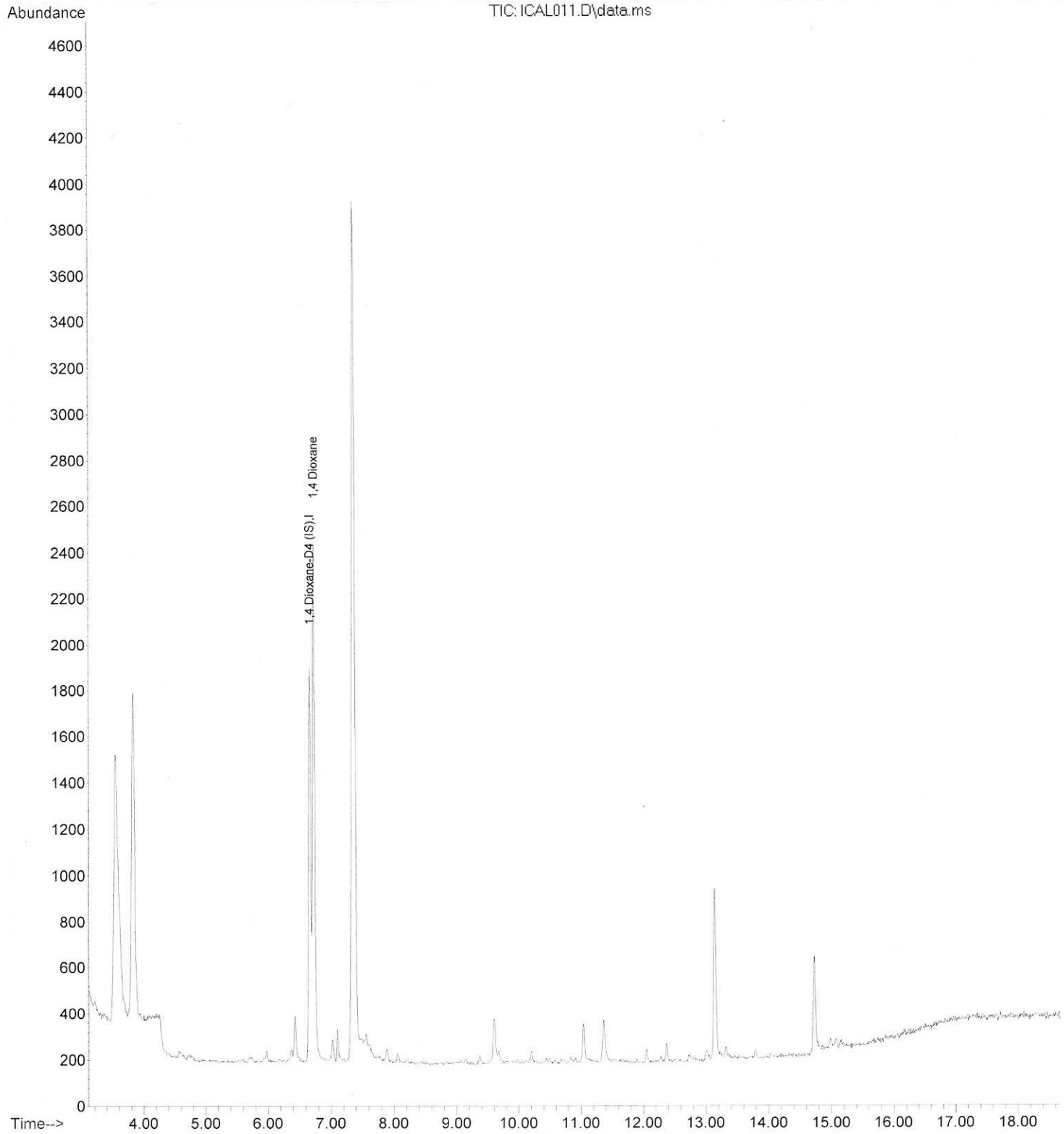
Internal Standards	R.T.	QIon	Response	Conc Units	Dev(Min)
1) 1,4 Dioxane-D4 (IS)	6.661	96	2388	25.00 ug/L	0.00
Target Compounds					Qvalue
2) 1,4 Dioxane	6.723	88	2920	23.49 ug/L	98

(#) = qualifier out of range (m) = manual integration (+) = signals summed

Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\5\Data\052019\
Data File : ICAL011.D
Acq On : 20 May 2019 1:26 pm
Operator : LT
Sample : 20ug/L Dioxane ICAL
Misc : 2uL 100ppm/5mL (2/19/19)
ALS Vial : 2 Sample Multiplier: 1

Quant Time: May 20 13:45:05 2019
Quant Method : C:\MSDCHEM\5\METHOD\DX042419.M
Quant Title : 1,4 dioxane in water by 8260C SIM, 10mLs sample, FWed Apr 24 14:39:22 2019
QLast Update : Wed Apr 24 14:39:22 2019
Response via : Initial Calibration



Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\5\Data\052019\
Data File : ICAL06.D
Acq On : 20 May 2019 11:19 am
Operator : LT
Sample : 50ug/L Dioxane ICAL
Misc : 5uL 100ppm/10mL (2/19/19)
ALS Vial : 6 Sample Multiplier: 1

Quant Time: May 20 11:37:54 2019
Quant Method : C:\MSDCHEM\5\METHOD\DX052019.M
Quant Title : 1,4 dioxane in water by 8260C SIM, 10mLs sample, FWed Apr 24 14:39:22 2019
QLast Update : Wed Apr 24 14:39:22 2019
Response via : Initial Calibration

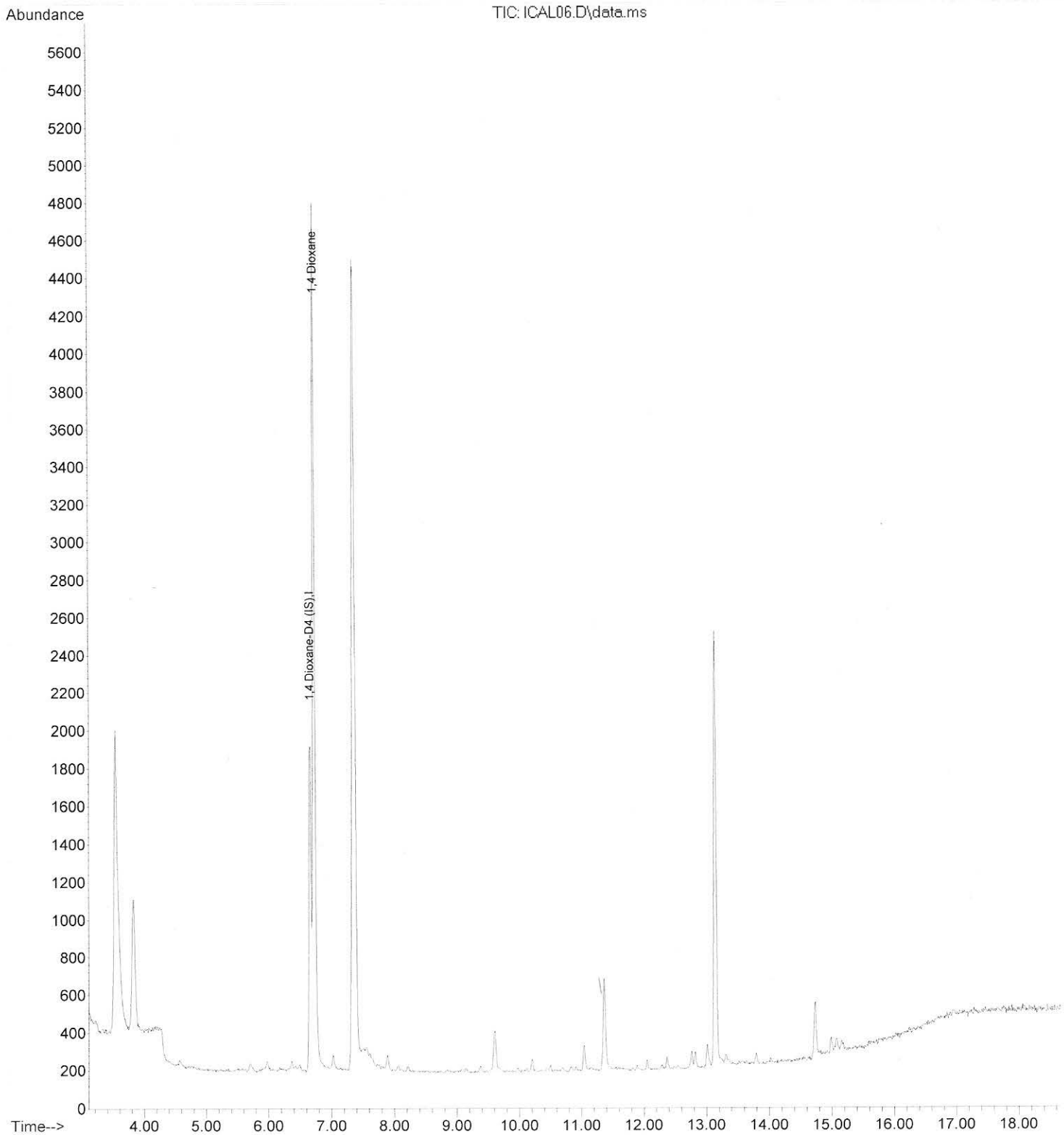
Internal Standards	R.T.	QIon	Response	Conc Units	Dev(Min)
1) 1,4 Dioxane-D4 (IS)	6.662	96	2591	25.00 ug/L	0.00
Target Compounds					Qvalue
2) 1,4 Dioxane	6.724	88	6168	45.74 ug/L	97

(#) = qualifier out of range (m) = manual integration (+) = signals summed

Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\5\Data\052019\
Data File : ICAL06.D
Acq On : 20 May 2019 11:19 am
Operator : LT
Sample : 50ug/L Dioxane ICAL
Misc : 5uL 100ppm/10mL (2/19/19)
ALS Vial : 6 Sample Multiplier: 1

Quant Time: May 20 11:37:54 2019
Quant Method : C:\MSDCHEM\5\METHOD\DX052019.M
Quant Title : 1,4 dioxane in water by 8260C SIM, 10mLs sample, FWed Apr 24 14:39:22 2019
QLast Update : Wed Apr 24 14:39:22 2019
Response via : Initial Calibration



Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\5\Data\052019\
Data File : ICAL07.D
Acq On : 20 May 2019 11:44 am
Operator : LT
Sample : 100ug/L Dioxane ICAL
Misc : 10uL 100ppm/10mL (2/19/19)
ALS Vial : 7 Sample Multiplier: 1

Quant Time: May 20 12:02:52 2019
Quant Method : C:\MSDCHEM\5\METHOD\DX052019.M
Quant Title : 1,4 dioxane in water by 8260C SIM, 10mLs sample, FWed Apr 24 14:39:22 2019
QLast Update : Wed Apr 24 14:39:22 2019
Response via : Initial Calibration

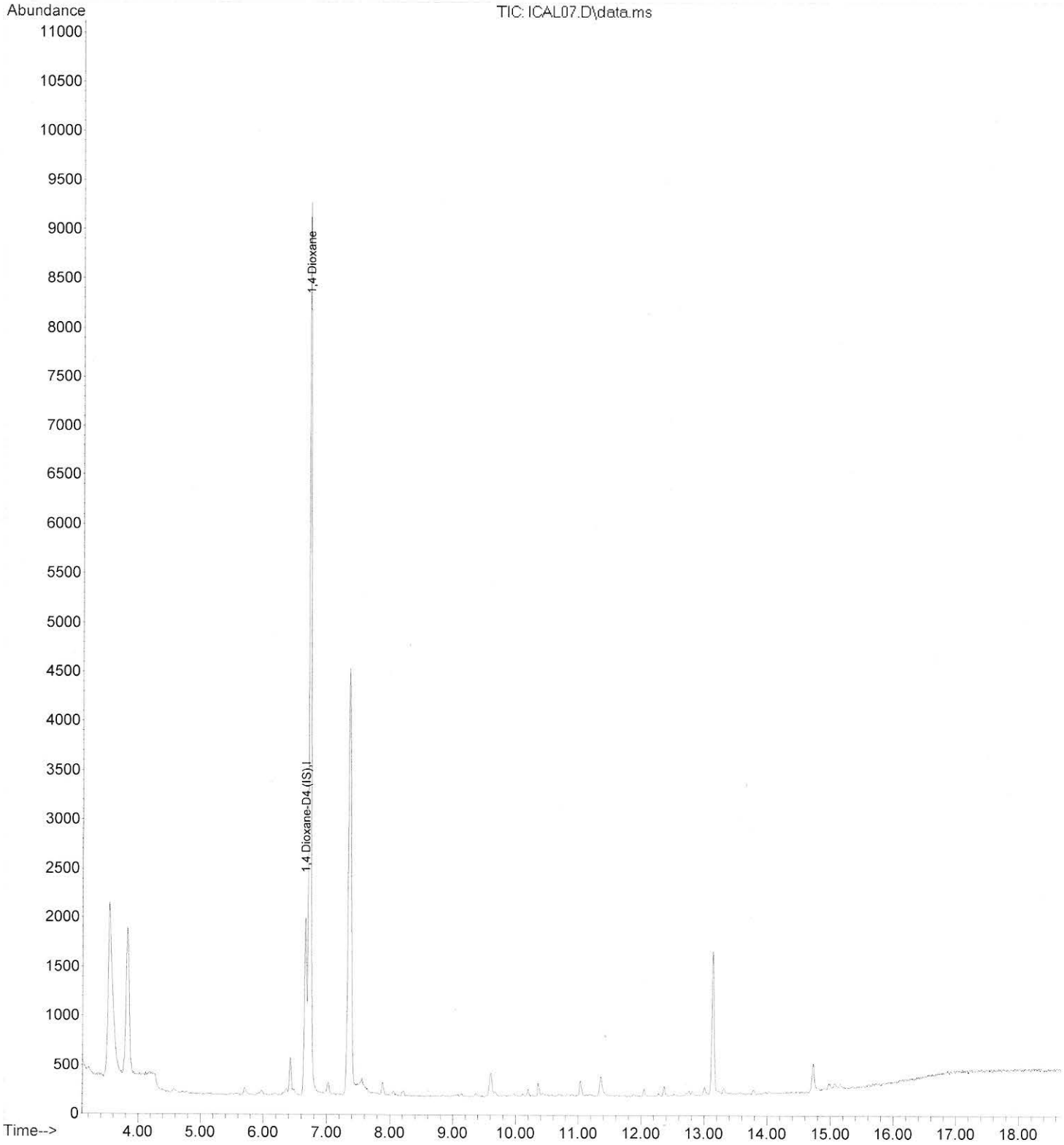
Internal Standards	R.T.	QIon	Response	Conc Units	Dev(Min)
1) 1,4 Dioxane-D4 (IS)	6.662	96	2633	25.00 ug/L	0.00
Target Compounds					**Qvalue**
2) 1,4 Dioxane	6.724	88	12156	88.71 ug/L	96

(#) = qualifier out of range (m) = manual integration (+) = signals summed

Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\5\Data\052019\
Data File : ICAL07.D
Acq On : 20 May 2019 11:44 am
Operator : LT
Sample : 100ug/L Dioxane ICAL
Misc : 10uL 100ppm/10mL (2/19/19)
ALS Vial : 7 Sample Multiplier: 1

Quant Time: May 20 12:02:52 2019
Quant Method : C:\MSDCHEM\5\METHOD\DX052019.M
Quant Title : 1,4 dioxane in water by 8260C SIM, 10mLs sample, FWed Apr 24 14:39:22 2019
QLast Update : Wed Apr 24 14:39:22 2019
Response via : Initial Calibration



Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\5\Data\052019\
Data File : ICAL08.D
Acq On : 20 May 2019 12:08 pm
Operator : LT
Sample : 200ug/L Dioxane ICAL
Misc : 20uL 100ppm/10mL (2/19/19)
ALS Vial : 8 Sample Multiplier: 1

Quant Time: May 20 12:27:01 2019
Quant Method : C:\MSDCHEM\5\METHOD\DX052019.M
Quant Title : 1,4 dioxane in water by 8260C SIM, 10mLs sample, FWed Apr 24 14:39:22 2019
QLast Update : Wed Apr 24 14:39:22 2019
Response via : Initial Calibration

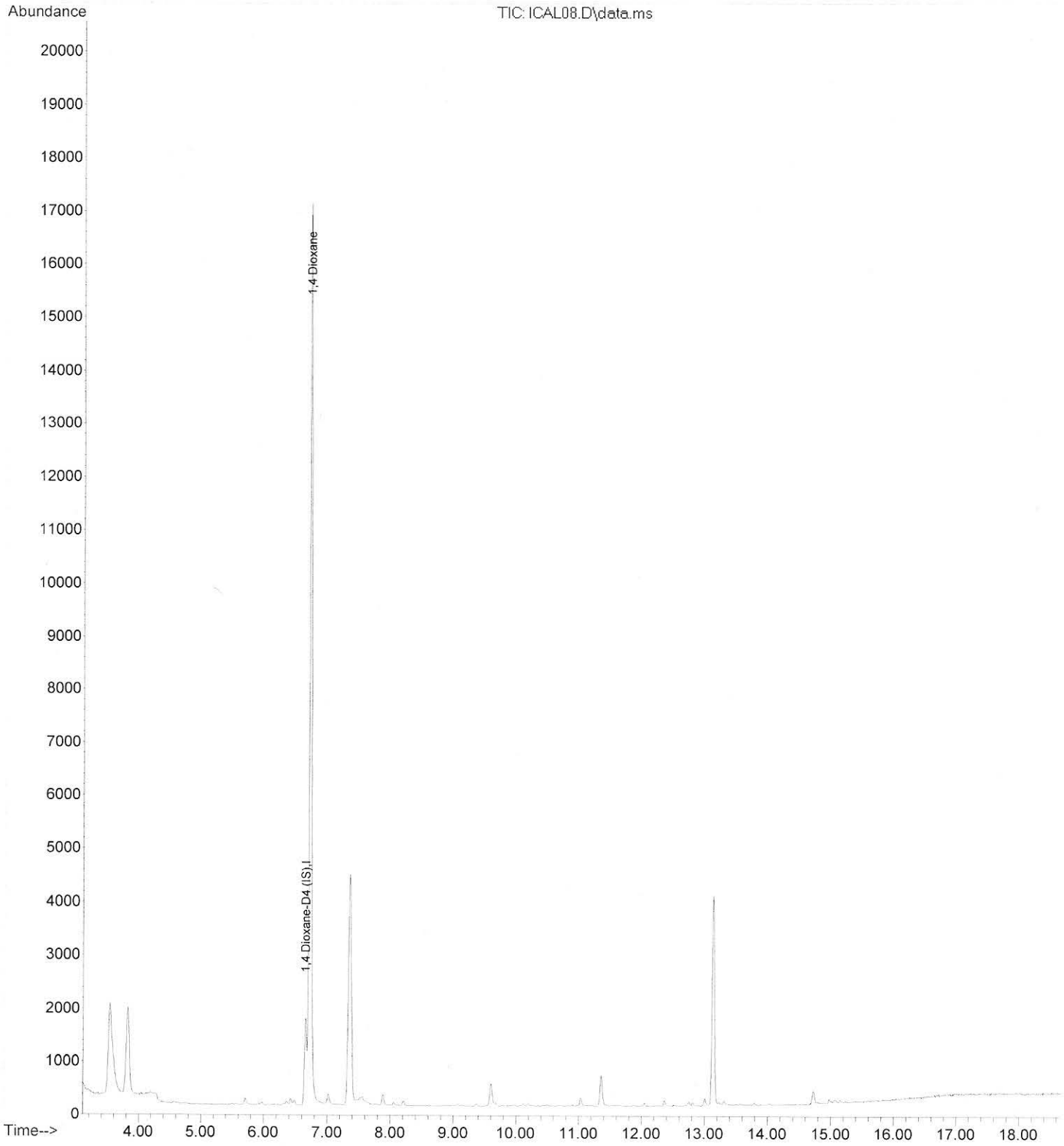
Internal Standards	R.T.	QIon	Response	Conc Units	Dev(Min)
1) 1,4 Dioxane-D4 (IS)	6.663	96	2381	25.00 ug/L	0.00
Target Compounds					**Qvalue**
2) 1,4 Dioxane	6.724	88	23048	185.99 ug/L	97

(#) = qualifier out of range (m) = manual integration (+) = signals summed

Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\5\Data\052019\
Data File : ICAL08.D
Acq On : 20 May 2019 12:08 pm
Operator : LT
Sample : 200ug/L Dioxane ICAL
Misc : 20uL 100ppm/10mL (2/19/19)
ALS Vial : 8 Sample Multiplier: 1

Quant Time: May 20 12:27:01 2019
Quant Method : C:\MSDCHEM\5\METHOD\DX052019.M
Quant Title : 1,4 dioxane in water by 8260C SIM, 10mLs sample, FWed Apr 24 14:39:22 2019
QLast Update : Wed Apr 24 14:39:22 2019
Response via : Initial Calibration



Evaluate Continuing Calibration Report

Data Path : C:\msdchem\5\Data\060119\
Data File : CCV002.D
Acq On : 1 Jun 2019 9:48 am
Operator : JG
Sample : 20ug/L Dioxane ICAL
Misc : 2uL 100ppm/5mL (2/19/19)
ALS Vial : 2 Sample Multiplier: 1

Quant Time: Jun 01 10:06:50 2019
Quant Method : C:\MSDCHEM\5\METHOD\DX052019.M
Quant Title : 1,4 dioxane in water by 8260C SIM, 10mLs sample, FMon May 20 14:01:08 2019
QLast Update : Mon May 20 14:01:08 2019
Response via : Initial Calibration

Min. RRF : 0.000 Min. Rel. Area : 50% Max. R.T. Dev 0.50min
Max. RRF Dev : 25% Max. Rel. Area : 150%

	Compound	AvgRF	CCRF	%Dev	Area%	Dev(min)
1 I	1,4 Dioxane-D4 (IS)	1.000	1.000	0.0	75	0.00
2	1,4 Dioxane	1.254	1.180	5.9	58	0.00

(#) = Out of Range SPCC's out = 0 CCC's out = 0

less than 20%

JJ

Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\5\Data\060119\
Data File : CCV002.D
Acq On : 1 Jun 2019 9:48 am
Operator : JG
Sample : 20ug/L Dioxane ICAL
Misc : 2uL 100ppm/5mL (2/19/19)
ALS Vial : 2 Sample Multiplier: 1

Quant Time: Jun 01 10:06:50 2019
Quant Method : C:\MSDCHEM\5\METHOD\DX052019.M
Quant Title : 1,4 dioxane in water by 8260C SIM, 10mLs sample, FMon May 20 14:01:08 2019
QLast Update : Mon May 20 14:01:08 2019
Response via : Initial Calibration

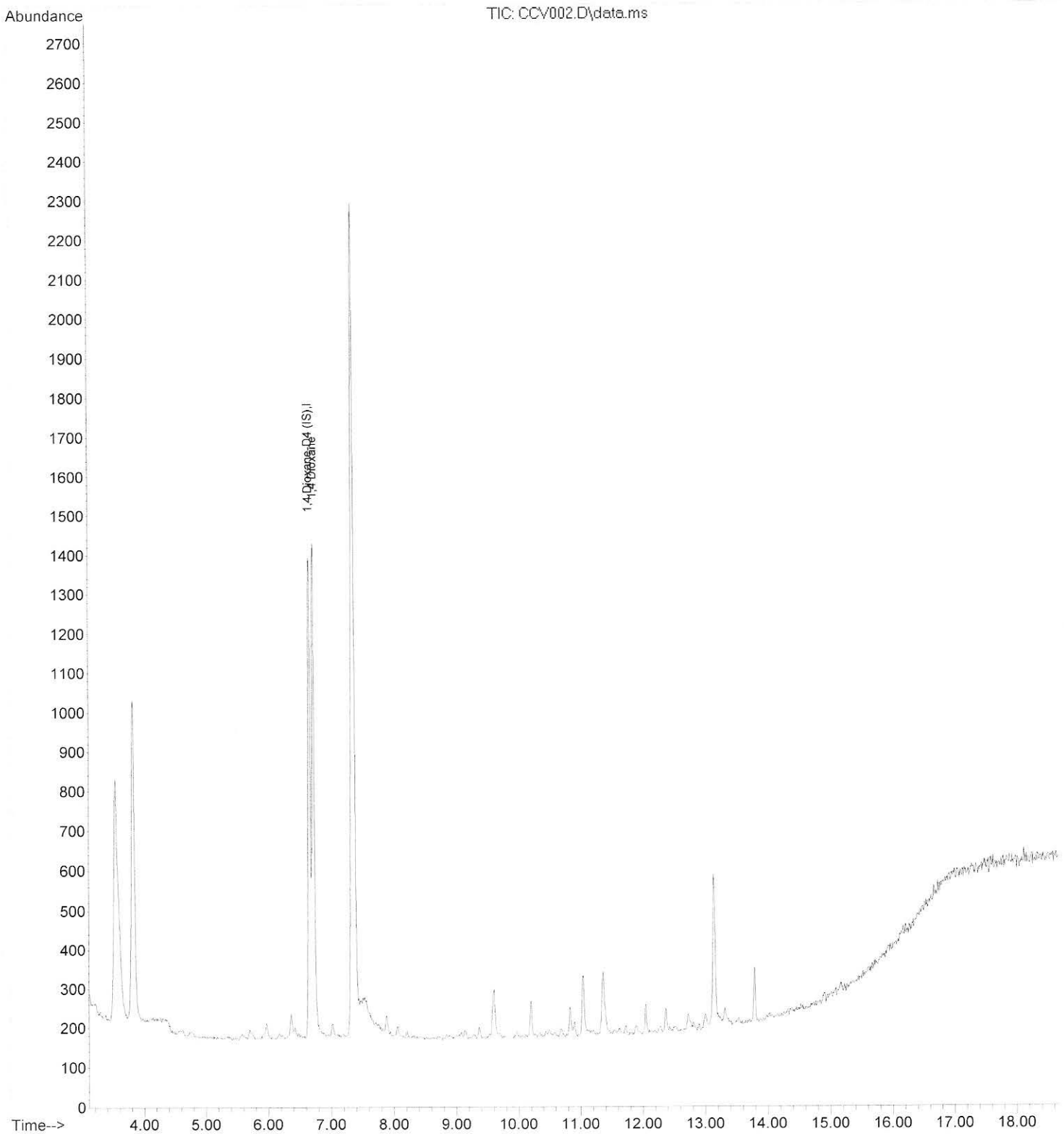
Internal Standards	R.T.	QIon	Response	Conc Units	Dev(Min)
1) 1,4 Dioxane-D4 (IS)	6.664	96	1793	25.00 ug/L	0.00
Target Compounds					Qvalue
2) 1,4 Dioxane	6.726	88	1693	18.82 ug/L	96

(#) = qualifier out of range (m) = manual integration (+) = signals summed

Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\5\Data\060119\
Data File : CCV002.D
Acq On : 1 Jun 2019 9:48 am
Operator : JG
Sample : 20ug/L Dioxane ICAL
Misc : 2uL 100ppm/5mL (2/19/19)
ALS Vial : 2 Sample Multiplier: 1

Quant Time: Jun 01 10:06:50 2019
Quant Method : C:\MSDCHEM\5\METHOD\DX052019.M
Quant Title : 1,4 dioxane in water by 8260C SIM, 10mLs sample, FMon May 20 14:01:08 2019
QLast Update : Mon May 20 14:01:08 2019
Response via : Initial Calibration



Evaluate Continuing Calibration Report

Data Path : C:\msdchem\5\Data\060119\
Data File : CCV026.D
Acq On : 2 Jun 2019 11:41 am
Operator : JG
Sample : 20ug/L Dioxane ICAL
Misc : 2uL 100ppm/5mL (2/19/19)
ALS Vial : 26 Sample Multiplier: 1

Quant Time: Jun 02 12:00:15 2019
Quant Method : C:\MSDCHEM\5\METHOD\DX052019.M
Quant Title : 1,4 dioxane in water by 8260C SIM, 10mLs sample, FMon May 20 14:01:08 2019
QLast Update : Mon May 20 14:01:08 2019
Response via : Initial Calibration

Min. RRF : 0.000 Min. Rel. Area : 50% Max. R.T. Dev 0.50min
Max. RRF Dev : 25% Max. Rel. Area : 150%

	Compound	AvgRF	CCRF	%Dev	Area%	Dev(min)
1 I	1,4 Dioxane-D4 (IS)	1.000	1.000	0.0	85	0.00
2	1,4 Dioxane	1.254	1.201	4.2	67	0.00

(#) = Out of Range SPCC's out = 0 CCC's out = 0

less than 20%

JG

Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\5\Data\060119\
Data File : CCV026.D
Acq On : 2 Jun 2019 11:41 am
Operator : JG
Sample : 20ug/L Dioxane ICAL
Misc : 2uL 100ppm/5mL (2/19/19)
ALS Vial : 26 Sample Multiplier: 1

Quant Time: Jun 02 12:00:15 2019
Quant Method : C:\MSDCHEM\5\METHOD\DX052019.M
Quant Title : 1,4 dioxane in water by 8260C SIM, 10mLs sample, FMon May 20 14:01:08 2019
QLast Update : Mon May 20 14:01:08 2019
Response via : Initial Calibration

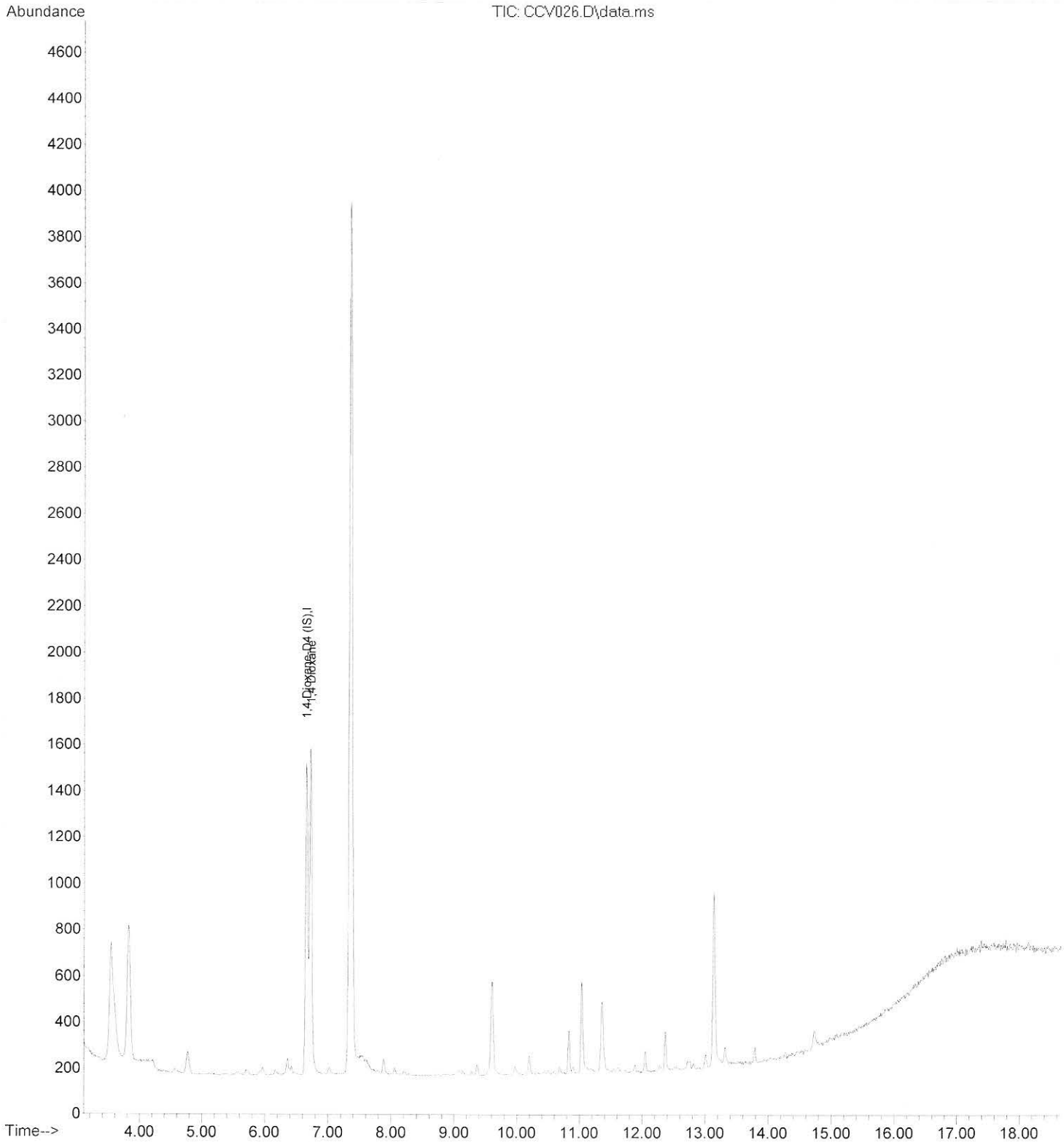
Internal Standards	R.T.	QIon	Response	Conc Units	Dev(Min)
1) 1,4 Dioxane-D4 (IS)	6.656	96	2035	25.00 ug/L	0.00
Target Compounds					**Qvalue**
2) 1,4 Dioxane	6.725	88	1955	19.15 ug/L	99

(#) = qualifier out of range (m) = manual integration (+) = signals summed

Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\5\Data\060119\
Data File : CCV026.D
Acq On : 2 Jun 2019 11:41 am
Operator : JG
Sample : 20ug/L Dioxane ICAL
Misc : 2uL 100ppm/5mL (2/19/19)
ALS Vial : 26 Sample Multiplier: 1

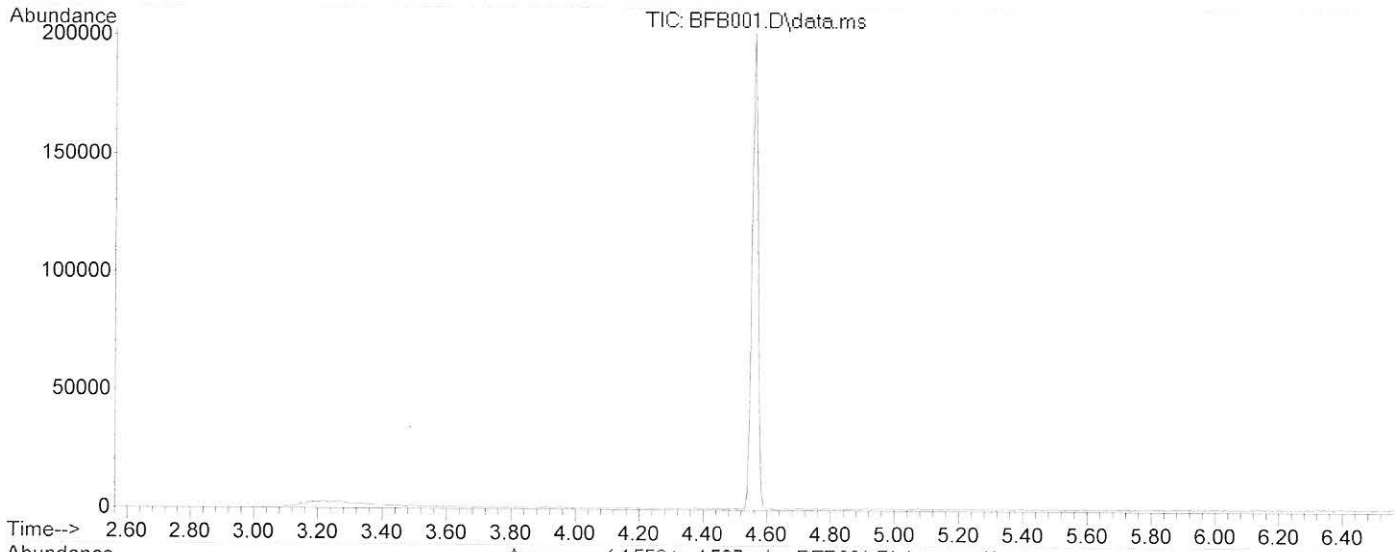
Quant Time: Jun 02 12:00:15 2019
Quant Method : C:\MSDCHEM\5\METHOD\DX052019.M
Quant Title : 1,4 dioxane in water by 8260C SIM, 10mLs sample, FMon May 20 14:01:08 2019
QLast Update : Mon May 20 14:01:08 2019
Response via : Initial Calibration

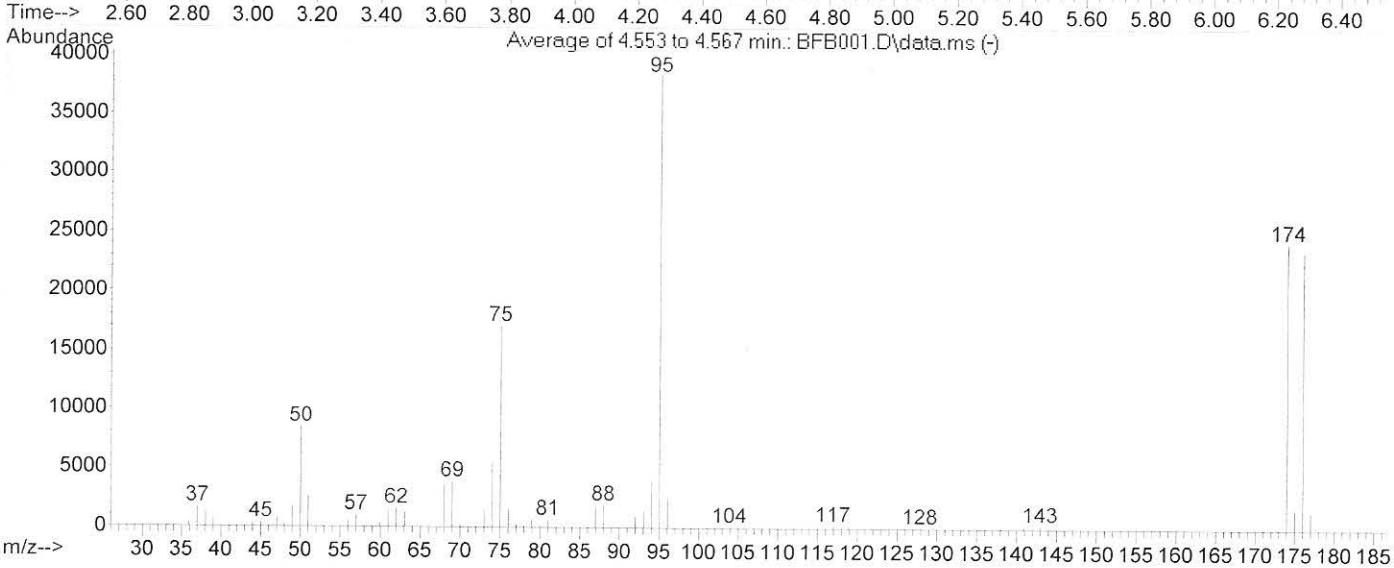


Data Path : C:\msdchem\5\Data\060119\
Data File : BFB001.D
Acq On : 1 Jun 2019 8:56 am
Operator : JG
Sample : 50ng BFB
Misc : Split = 35:1
ALS Vial : 1 Sample Multiplier: 1

Integration File: rteint.p

Method : C:\msdchem\5\Method\BW052819.M
Title : BTEXNM/SLCT VOA in Water by EPA8260C
Last Update : Tue May 28 08:05:19 2019





AutoFind: Scans 205, 206, 207; Background Corrected with Scan 199

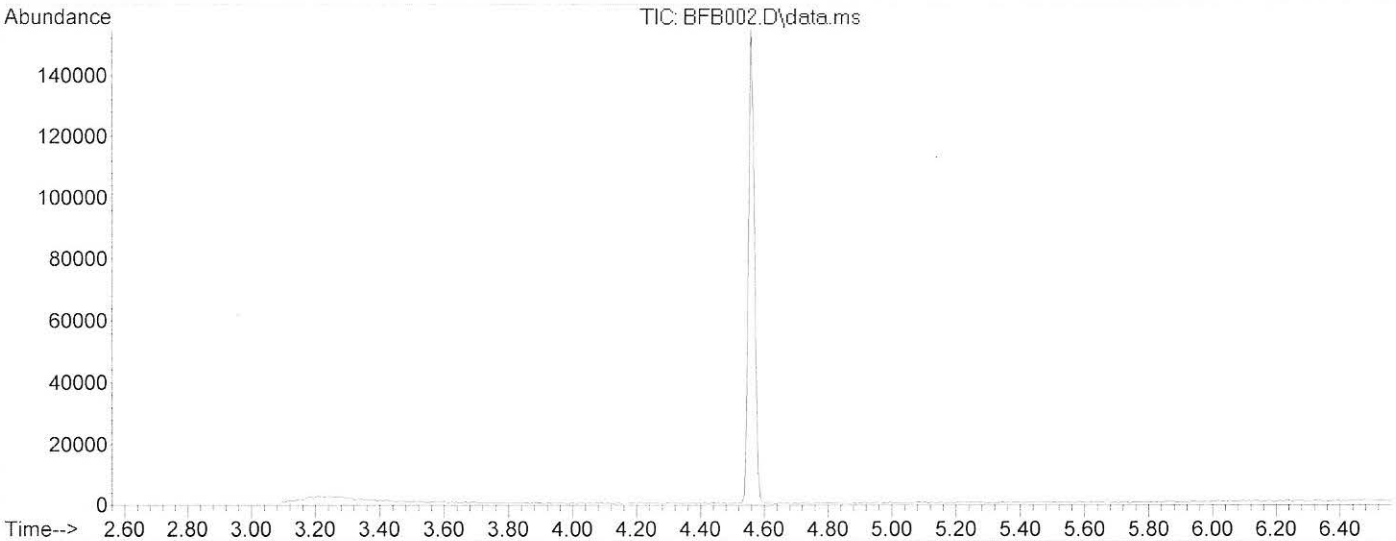
Target Mass	Rel. to Mass	Lower Limit%	Upper Limit%	Rel. Abn%	Raw Abn	Result Pass/Fail
50	95	15	40	21.9	8398	PASS
75	95	30	60	44.3	16998	PASS
95	95	100	100	100.0	38336	PASS
96	95	5	9	6.4	2458	PASS
173	174	0.00	2	0.2	57	PASS
174	95	50	100	63.1	24197	PASS
175	174	5	9	7.1	1707	PASS
176	174	95	101	97.2	23509	PASS
177	176	5	9	6.3	1477	PASS

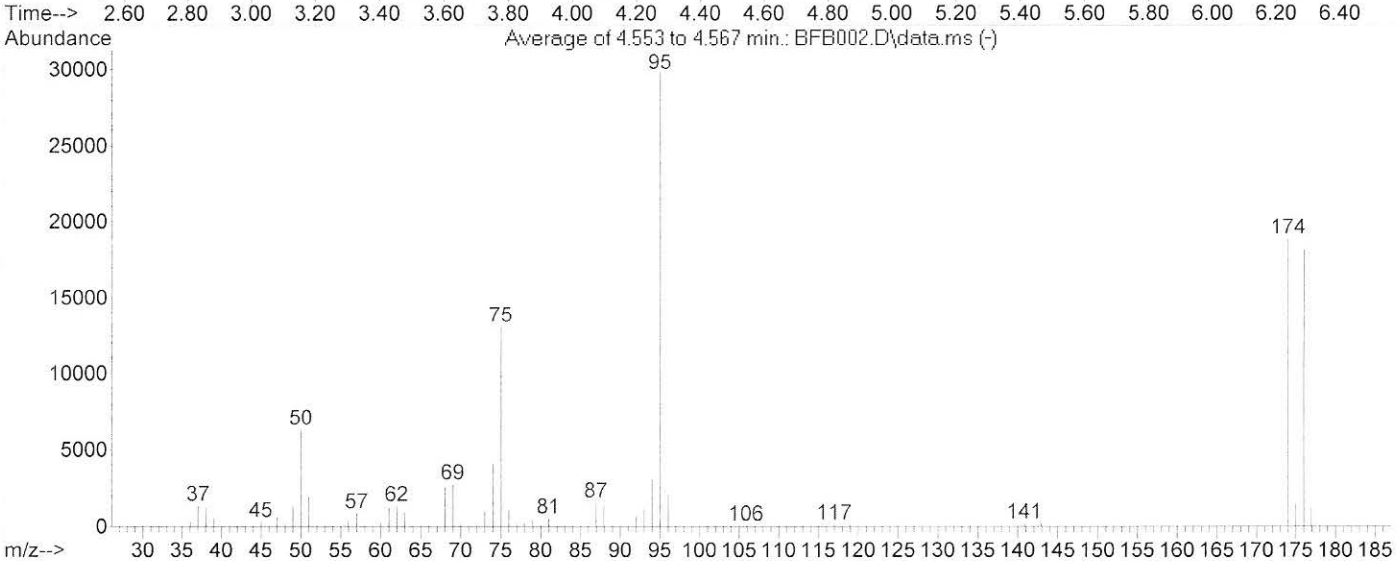
BFB

Data Path : C:\MSDCHEM\5\DATA\060119\Snapshot\
Data File : BFB002.D
Acq On : 2 Jun 2019 11:10 am
Operator : JG
Sample : 50ng BFB
Misc : Split = 35:1
ALS Vial : 1 Sample Multiplier: 1

Integration File: rteint.p

Method : C:\msdchem\5\Method\DX052019.M
Title : 1,4 dioxane in water by 8260C SIM, 10mLs sample, FMon May 20 14:01:08 2019
Last Update : Mon May 20 14:01:08 2019





AutoFind: Scans 205, 206, 207; Background Corrected with Scan 199

Target Mass	Rel. to Mass	Lower Limit%	Upper Limit%	Rel. Abn%	Raw Abn	Result Pass/Fail
50	95	15	40	21.2	6326	PASS
75	95	30	60	43.8	13057	PASS
95	95	100	100	100.0	29784	PASS
96	95	5	9	6.7	2009	PASS
173	174	0.00	2	0.0	0	PASS
174	95	50	100	63.2	18813	PASS
175	174	5	9	7.5	1416	PASS
176	174	95	101	96.3	18115	PASS
177	176	5	9	6.3	1150	PASS

Sequence Name: C:\msdchem\5\Sequence\060119.S
Comment:
Operator: JG
Data Path: C:\MSDCHEM\5\DATA\060119\
Instrument Control Pre-Seq Cmd:
Data Analysis Pre-Seq Cmd:

Instrument Control Post-Seq Cmd:
Data Analysis Post-Seq Cmd:

Method Sections To Run
(X) Full Method
( ) Reprocessing Only

On A Barcode Mismatch
(X) Inject Anyway
( ) Don't Inject

Line			Sample Name/Misc Info		
1)	Sample	1	BFB001	BFB	50ng BFB
2)	Sample	1	BLK001	DX052019	10mL Blank #1
3)	Sample	2	CCV002	DX052019	20ug/L Dioxane ICAL
4)	Sample	3	LCS003	DX052019	5ug/L Dioxane ICAL/LCS
5)	Sample	4	BLK004	DX052019	10mL Blank #2
6)	Sample	5	PAR005	DX052019	10mL REED-1
7)	Sample	6	PWT006	DX052019	10mL REED-0519-01-1
8)	Sample	7	PAR007	DX052019	10mL PINGLE(NG)-1
9)	Sample	8	PWT008	DX052019	10mL NG-0519-01-1
10)	Sample	9	PWT009	DX052019	10mL MW179-UDEN-0519-01-1
11)	Sample	10	PWT010	DX052019	10mL MW176-DEN-0519-01-1
12)	Sample	11	PWT011	DX052019	10mL MW141-WD-0519-01-1
13)	Sample	12	PAR012	DX052019	10mL MS REED-2
14)	Sample	13	PAR013	DX052019	10mL MSD REED-2
15)	Sample	14	PWT014	DX052019	10mL MW129-WD-0519-01-1
16)	Sample	15	PAR015	DX052019	10mL TP-730-1
17)	Sample	16	PAR016	DX052019	10mL TP-730-1
18)	Sample	17	PAR017	DX052019	10mL TP-3340-1
19)	Sample	18	PAR018	DX052019	10mL TP-3340-1
20)	Sample	19	PAR019	DX052019	10mL PTP-20-1
21)	Sample	20	PAR020	DX052019	10X Dltn TP-3300-1
22)	Sample	21	PAR021	DX052019	10X Dltn TP-3300-1
23)	Sample	22	PAR022	DX052019	50X Dltn TP-3320-1
24)	Sample	23	PAR023	DX052019	50X Dltn TP-3320-1
25)	Sample	24	PAR024	DX052019	500X Dltn TP-3310-1
26)	Sample	25	PAR025	DX052019	500X Dltn TP-3310-1
27)	Sample	1	BFB002	BFB	50ng BFB
28)	Sample	26	CCV026	DX052019	20ug/L Dioxane ICAL
29)	Sample	27	PAR027	DX052019	10mL MS REED-3
30)	Sample	28	BLK028	DX052019	10mL Blank #1
31)	Sample	29	PAR029	DX052019	10mL TP-3340-2
32)	Sample	31	PAR030	DX052019	50X Dltn TP-3320-2
33)	Sample	32	PAR031	DX052019	10mL PTP-20-2

~~PAR532~~
PAR552 JM
5/24/19

Chain of Custody

PARSONS **1776 LINCOLN SUITE 600** **DENVER, CO 80203** **(303) 831-8100 FAX (303) 831-8208** **CONTACT: LYN BRILL** **PROJECT: LOWRY ENVIRONMENTAL PROTECTION/CLEANUP TRUST**	**CHAIN OF CUSTODY #** **524201962** **LAB: CHEMSOLUTIONS** **CONTACT: John Graves**

SAMPLE ID	DATE	TIME	MATRIX
[redacted]	5-23-19	0958	AQ
[redacted]	5-23-19	1119	AQ

SUITE DESCRIPTION:

Analysis requested for the sample points listed.	Container(s) Volume, Type & Preservatives	Field Filtered
(8260SIM) Isotope Dilution for 1,4-Dioxane	3x40ml vial HCL & Cool ≤ 4° C	No

Special Instructions/Conditions of Receipt:
* Samples are aerated due to collecting samples from a garden spigot.

Samples rec'd in good condition.
Custody seal intact.
1°C

Turn Around Required
☐ 24 Hours ☐ 48 Hours **X** 5 Days ☐ 14 Days ☐ 21 Days ☐ Other _____

1. Relinquished By	Date	Time	1. Received By	Date	Time
Ryan Carlson **Ryan Carlson**	5/24/19	1230	Lina Graves	5/24/19	1230
2. Relinquished By	Date	Time	2. Received By	Date	Time
3. Relinquished By	Date	Time	3. Received By	Date	Time

Sample shipment: Courier

White-Return to Parsons with report: Yellow-Stays with sample: Pink-Field Copy

APPENDIX B

Updated Work Plan

25923 Gateway Drive
Golden, Colorado 80101

P. Rosasco (303) 808-7227
T. Shangraw (303) 619-5179

Updated Work Plan
for
Identifying and Sampling Future-At-Risk Water Supply Wells Within and Immediately Adjacent to Off-Site 1,4-Dioxane Plume Lowry Landfill Superfund Site

Prepared by TCHD and WSDs

March 2006 (Updated June 2020)

Results from ongoing investigations and sampling of groundwater north of the Lowry Landfill Superfund Site (Lowry) have enabled an approximation of the lateral and longitudinal extent of 1,4-dioxane in shallow groundwater to a practical quantitation limit of 0.9 ug/L, as shown on Figure 1. The vertical limit of this plume is in the process of being delineated, but based on its absence in four unweathered bedrock wells in Section 31, including two wells along Yale Avenue (well B-201 at <0.15 ug/L in May 2016, and MW06-BD at <0.5 ug/L in April 2006), which are screened between 63 and 117 feet bgs, the vertical limit north of Section 31 is expected to be less than about 70 feet bgs. The direction of shallow groundwater flow is generally northward into Section 30, T5S, R65W, as illustrated on the figure.

Groundwater from deeper wells on the Superfund Site (upper Denver wells typically screened between 150 and 250 feet bgs and Lignite wells typically screened between 250 and 300 feet bgs) have not detected 1,4-dioxane (down to a method detection limit of 0.15 ug/L and a practical quantification limit of 0.9 ug/L).

The objectives of this work plan are therefore to:

1) Determine if private wells within the potential groundwater flowpath two miles north of Section 31 (from the location of the detections) have been impacted by 1,4-dioxane, and

2) Assess general water chemistry from those private wells to help evaluate the integrity of the private wells.

The work proposed in the following paragraphs will be performed by professional engineers and scientists from the Tri-County Health Department (TCHD) in collaboration with professional engineers and scientists associated with the Lowry Landfill Superfund Site.

The work to be performed is grouped into the following four tasks:

Task 1) Identification of Wells to be Sampled
Task 2) Selection of Analytical Parameters
Task 3) Collection and Analysis of Samples
Task 4) Evaluation and Reporting of Results

Each task is described below:

Task 1 – Identification of Wells to be Sampled

Well records from the State Engineer's database are reviewed every 5 years for the six sections north, northeast, and northwest of Section 31, T4S, R65W, including: Section 19, T4S, R65W; Section 20, T4S, R65W; Section 29, T4S, R65W; Section 30, T4S, R65W; Section 24, T4S, R66W; and Section 25, T4S, R66W. The six sections were selected as the most likely to be potentially impacted by groundwater migrating north from the DADS/Lowry property. If contaminants are likely to have moved further, additional well identification will be required in the future.

The State Engineer's well records will initially be screened for well locations within the Murphy Creek drainage boundary shown on Figure 1, and for wells located within and immediately adjacent to the 1,4-dioxane plume shown on Figure 1 (to be updated annually). Subsequent screens will involve:

- If the well records indicate the well was permitted, but not actually drilled.
- If the database contains duplicate records of the same well.
- If the well has been abandoned. Field reconnaissance is needed for this assessment.

Owners of supply wells within and immediately adjacent to the 1,4-dioxane plume shown on Figure 1 that pass this successive screening will be contacted for permission to inspect and sample their wells. Information about well construction, date of installation, type and duration of use, and general condition of the wells will also be requested. If permission to inspect and sample the wells is granted, field technicians will be mobilized to the well sites to inspect the physical condition of the wellheads (if visible from the surface) and record general information about the wells such as location of the wells relative to surface drainages, buildings, driveways, roads, septic systems, buried culverts, and/or utility lines. The closest access point to each wellhead for sampling will also be noted.

Well owners will be contacted by TCHD and representatives from TCHD and the Superfund site will perform inspections collectively.

Task 2 – Selection of Analytical Parameters

Samples from wells of interest wells will be analyzed for 1,4-dioxane by ChemSolutions, LLC or Pace Analytical Services, LLC using EPA SW-8260 SIM with Isotope Dilution and field parameters consisting pH, specific conductivity, fluoride, nitrate, and temperature with HACH analyzers.

Task 3 – Collection and Analysis of Samples

Based on the results of the site inspection from Task 1, and if permission is granted to sample the wells, a sampling crew comprised of representatives from Lowry, with oversight from TCHD,

will mobilize to sample the wells. Sampling protocol described in TCHD's *Groundwater Sampling Procedure – Routine Sampling*, which is attached to this work plan, will be followed, except that samples will only be collected for the analytical parameters discussed above in Task 2. Duplicate samples for 1,4-dioxane will be collected from both wells for analysis by ChemSolutions, LLC or Pace Analytical Services, LLC. Wells with samples indicating the presence of 1, 4-dioxane will be evaluated and may be considered for future sampling. Sample handling will be performed in accordance with Parsons' Standard Operation Procedure P-006, which is included in Appendix B of *Revision 2, Groundwater Monitoring Plan (EMSI, 2018)* and incorporated here by reference.

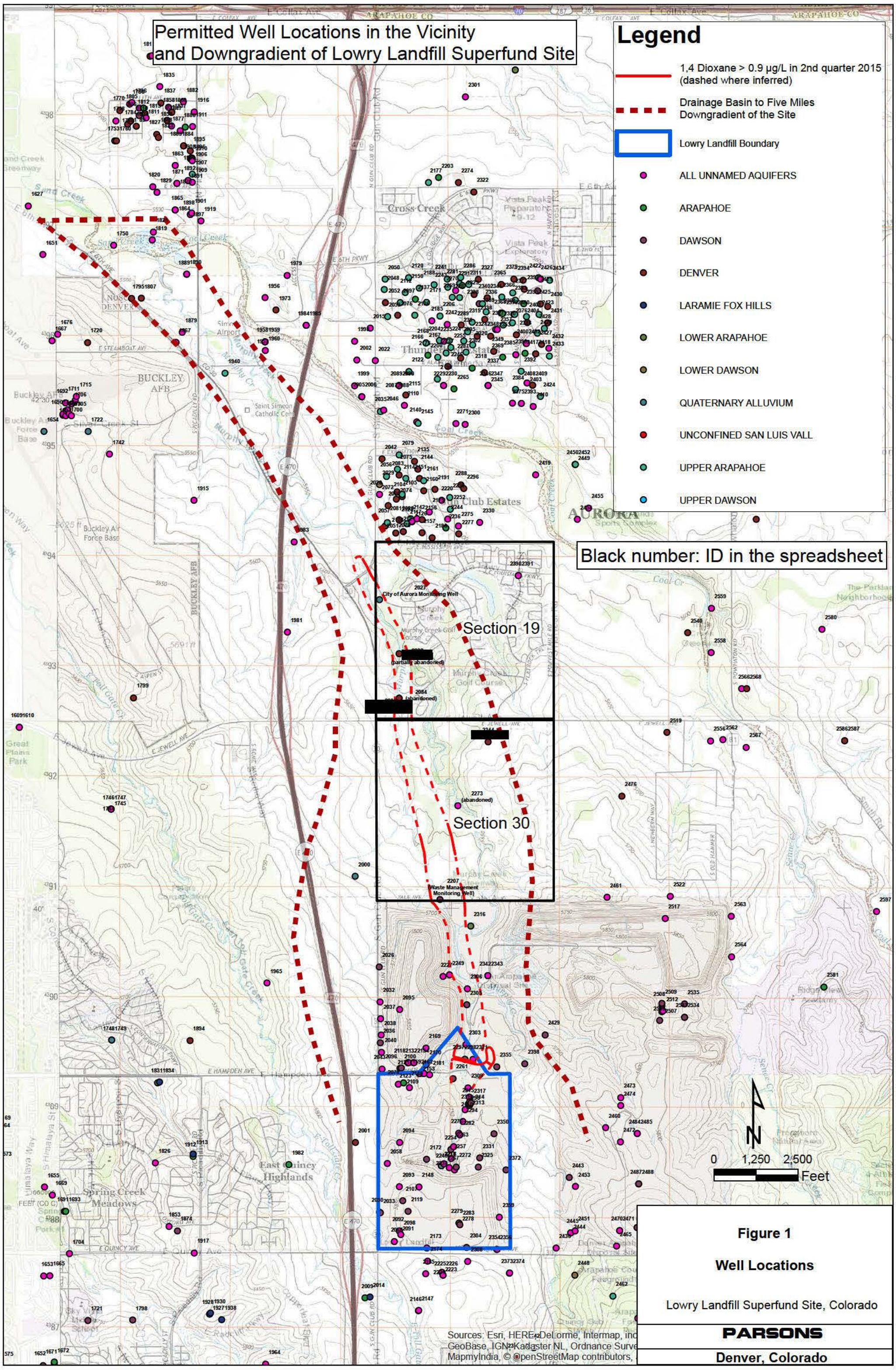
Task 4 – Evaluation and Reporting of Results

Analytical results will be validated in accordance with the Quality Assurance Project Plan (QAPP) presented in Appendix A of *Revision 2, Groundwater Monitoring Plan (EMSI, 2018)*. Validated analytical results will then be compared to Lowry Landfill groundwater performance standards. Results for total dissolved solids (TDS), which does not have a performance standard, will be compared to the secondary drinking water standard of 500 mg/L, and hardness relative to drinking water criteria will be also assessed. An indication of high TDS and/or high hardness will be indicative poor well construction because overlying water bearing units exhibit higher TDS and hardness than the water bearing unit(s) screened by the private wells for potable use. Field parameter results will be reviewed for stability to assure that the well waters sampled are representative of groundwater produced from the well.

A summary report will then be prepared that contains a narrative describing validated analytical results with comparison to pertinent performance standards. The report will also contain laboratory analytical reports, data validation reports, and copies of sampling records, field notes and observations. A technical memorandum will be distributed to the well owners, WSDs, EPA, and CDPHE following the annual sampling event.

References

Engineering Management Support, Inc. (EMSI), 2018, Revision 2, Groundwater Monitoring Plan, Lowry Landfill Superfund Site, August 16, 2018.



S:\ES\MajProj\LWRYLNFL\DATABASE\GIS\Well_PermitSearch.mxd lxh 2/28/2018

ATTACHMENT

TCHD Groundwater Sampling Procedure-Routine Sampling

The project Supervisor will prepare a daily schedule of field activities and is responsible for providing a prepared sample cooler, a sample kit, sampling paperwork, and other equipment for each sampling team. Each sample cooler will contain extra sample containers. Each sample will be tested for hardness, conductivity, fluoride, and nitrate at the TCHD office. Sampling paperwork, equipment, sample bottles with labels, a copy of the Health and Safety Plan with emergency phone numbers, pens, property files, business cards, a mobile phone and camera will be on site.

Upon arrival at the well site, the following procedures will be followed:

1. Before sample collection owner/residents permission will be obtained.

2. Samples are to be collected directly from the sampling spigot (hose removed), at a low flow rate to avoid agitating samples.

3. Certified sample containers will be used.

4. To fill, hold a clean poly bottle or glass bottle at a 45-degree angle underneath the water stream. Fill the bottle to the top to minimize aeration. When the sample bottle in completely full, replace the clean cap on the bottle.

5. Label the sample bottle with a routine sample label appropriately filled out. Information in the label should include the well I.D. number, the Julian date, military time, and the sampler's full signature.

6. Take photos of the well head and sampling location if none are available in the file. If photos are taken, make a note of the photo number on the sample label.