HAMPDEN ENVIRONMENTAL TRUST
COMMITTEE MEETING

<u>Thursday May 27, 2021</u>

1:00 P.M.

HAMPDEN TOWN OFFICE

AMENDED AGENDA

1. Call to Order

2. Approval of Meeting Minutes – January 7, 2021

3. Review of financial statements from Institutional Trustee (Bangor Savings Bank)

4. Review of proposed FY21 costs for reimbursement or payment from Environmental Trust, Income
    a. General Fund payments for Stormwater Management totaling $1,238.40

5. Pine Tree Landfill 2020 Annual Report Discussion

6. Website update

7. Set date for next meeting

8. Adjourn

HAMPDEN ENVIRONMENTAL TRUST
COMMITTEE MEETING

Thursday January 7, 2021

1:00 P.M.

HAMPDEN TOWN OFFICE

MINUTES

1. Call to Order

   Meeting called to order at 1:07 pm

2. Approval of Meeting Minutes – September 24, 2020

   Councilor Jarvi moved that the meeting minutes from September 24, 2020 be approved, and it was seconded by Kerry Woodbury. Unanimous 2-0-0.

3. Review of financial statements from Institutional Trustee (Bangor Savings Bank)

   There was no discussion on the financial statements.

4. Review of proposed FY21 costs for reimbursement or payment from Environmental Trust Principal

   a. General Fund payments for landfill post-closure monitoring totaling $6,555.00.

   Councilor Jarvi moved that the Environmental Trust Committee reimburse the Town's General Fund from the Environmental Trust Principal account $6,555.00; Kerry Woodbury seconded the motion. Unanimous 2-0-0.

5. Review of proposed FY21 costs for reimbursement or payment from Environmental Trust, Income

   a. General Fund payments for Stormwater Management totaling $13,128.54

   Kerry Woodbury moved that the Environmental Trust Committee reimburse the Town's General Fund from the Environmental Trust Income account $13,128.54; Councilor Jarvi seconded the motion. Unanimous 3-0-0.

6. Set date for next meeting

The Environmental Trust Committee agreed that the next meeting will be held on May 13, 2021 at 1:00 pm.

7. Adjourn

The Environmental Trust meeting adjourned at 1:43 pm.

Bangor Savings Bank
Wealth Management

P.O. Box 930, Bangor, ME 04402

Account Summary

Statement of Value and Activity

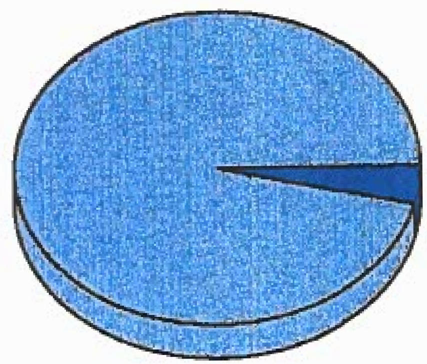
December 1, 2020 - December 31, 2020

Market Value Reconciliation

	This Period	1/1/20 to 12/31/20
Beginning Market Value	**$594,092.44**	**$809,930.67**
Additions	$0.00	$0.00
Distributions	$2,944.26	-$235,736.01
Income	$1,375.27	$13,713.66
Non Cash Asset Changes	$0.00	$0.00
Change in Market Value	-$717.55	$9,786.10
Ending Market Value	**$597,694.42**	**$597,694.42**
Realized Gains/Losses	$0.00	-$2,348.17

Asset Allocation Summary

	Asset Class	Balance
96%	Fixed Income	$573,746.50
4%	Cash and Equivalents	$23,947.92
100%	**Total Assets Value**	**$597,694.42**

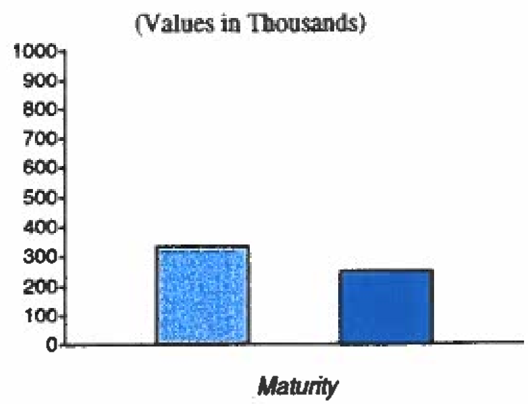


0003786 - 0500293

Statement of Value and Activity

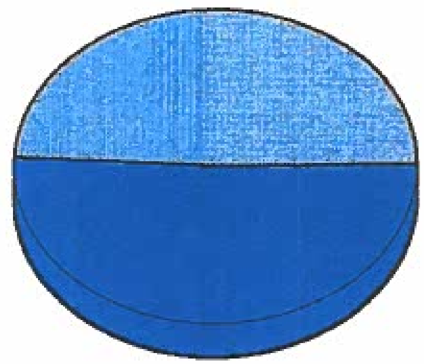
December 1, 2020 - December 31, 2020

Bond Maturity Schedule



		Bond Maturity	Market Value
■	57%	Less than 1 year	$328,844.00
■	43%	1 to 5 years	$244,902.50
	0%	5 to 10 years	$0.00
	0%	10 to 15 years	$0.00
	0%	15 to 20 years	$0.00
	0%	20 + years	$0.00
	100%	**Total**	**$573,746.50**

Bond Quality Summary



		Quality Rating	Market Value
	0%	AAA	$0.00
■	49%	AA	$279,662.50
	0%	A	$0.00
	0%	BBB	$0.00
■	51%	Other	$294,084.00
	100%	**Total**	**$573,746.50**

Bangor Savings Bank
Wealth Management

P.O. Box 930, Bangor, ME 04402

Account Summary

Statement of Value and Activity

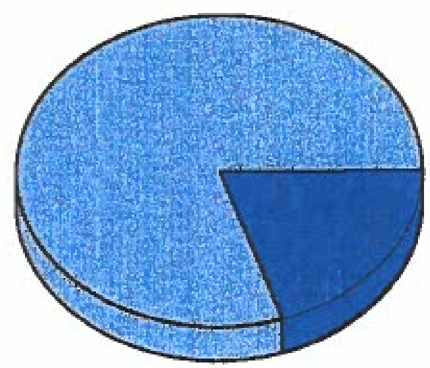
December 1, 2020 - December 31, 2020

Market Value Reconciliation

	This Period	*1/1/20 to 12/31/20*
Beginning Market Value	**$2,875,732.46**	**$2,819,472.14**
Additions	$0.00	$0.00
Distributions	-$5,654.62	-$59,209.34
Income	$4,574.20	$55,750.09
Non Cash Asset Changes	$0.00	$0.00
Change in Market Value	-$3,455.05	$55,184.10
Ending Market Value	**$2,871,196.99**	**$2,871,196.99**
Realized Gains/Losses	$0.00	-$7,547.00

Asset Allocation Summary

	Asset Class	*Balance*
80%	Fixed Income	$2,305,593.10
20%	Cash and Equivalents	$565,603.89
100%	**Total Assets Value**	**$2,871,196.99**



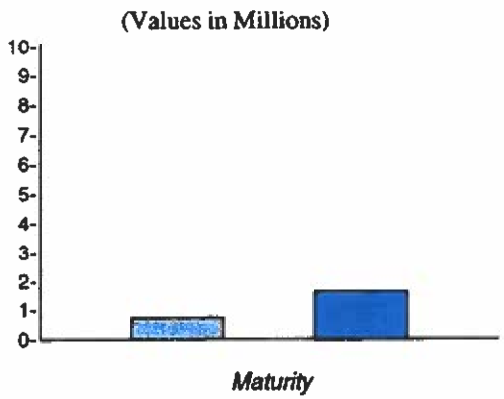
0003772 - 0500293

Portfolio Analysis

Statement of Value and Activity

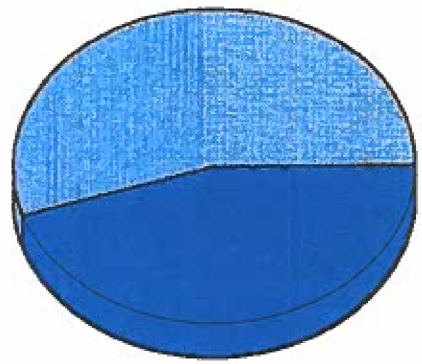
December 1, 2020 - December 31, 2020

Bond Maturity Schedule



	Bond Maturity	Market Value
29%	Less than 1 year	$667,233.10
71%	1 to 5 years	$1,638,360.00
0%	5 to 10 years	$0.00
0%	10 to 15 years	$0.00
0%	15 to 20 years	$0.00
0%	20 + years	$0.00
100%	**Total**	**$2,305,593.10**

Bond Quality Summary



	Quality Rating	Market Value
0%	AAA	$0.00
55%	AA	$1,257,093.10
0%	A	$0.00
0%	BBB	$0.00
45%	Other	$1,048,500.00
100%	**Total**	**$2,305,593.10**

Bangor Savings Bank
Wealth Management

P.O. Box 930, Bangor, ME 04402

Account Summary

Statement of Value and Activity

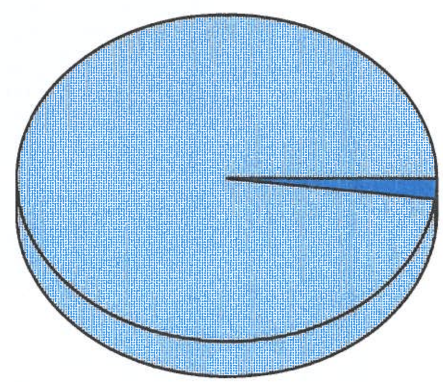
January 1, 2021 - January 31, 2021

Market Value Reconciliation

	This Period	1/1/21 to 1/31/21
Beginning Market Value	**$597,694.42**	**$597,694.42**
Additions	$0.00	$0.00
Distributions	-$11,563.36	-$11,563.36
Income	$0.19	$0.19
Non Cash Asset Changes	$0.00	$0.00
Change in Market Value	-$844.40	-$844.40
Ending Market Value	**$585,286.85**	**$585,286.85**
Realized Gains/Losses	$0.00	$0.00

Asset Allocation Summary

	Asset Class	Balance
98%	Fixed Income	$572,902.10
2%	Cash and Equivalents	$12,384.75
100%	**Total Assets Value**	**$585,286.85**



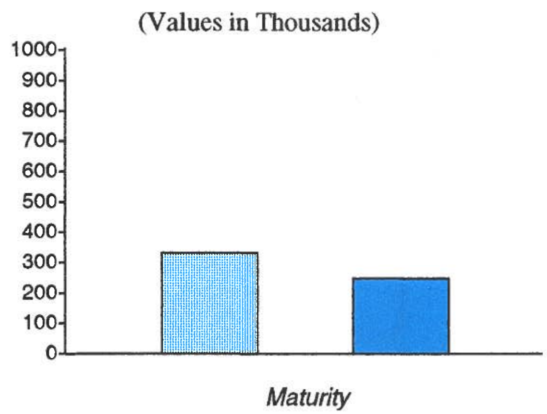
0001532 - 0500161

Portfolio Analysis

Statement of Value and Activity

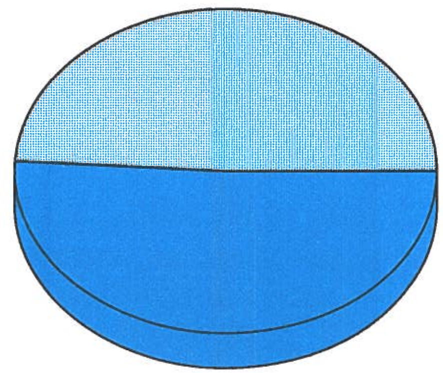
January 1, 2021 - January 31, 2021

Bond Maturity Schedule



		Bond Maturity	Market Value
▒	57%	Less than 1 year	$328,484.00
■	43%	1 to 5 years	$244,418.10
	0%	5 to 10 years	$0.00
	0%	10 to 15 years	$0.00
	0%	15 to 20 years	$0.00
	0%	20 + years	$0.00
	100%	**Total**	**$572,902.10**

Bond Quality Summary



		Quality Rating	Market Value
	0%	AAA	$0.00
▒	49%	AA	$279,335.00
	0%	A	$0.00
	0%	BBB	$0.00
■	51%	Other	$293,567.10
	100%	**Total**	**$572,902.10**

0001532 - 0500161

Bangor Savings Bank
Wealth Management

P.O. Box 930, Bangor, ME 04402

Account Summary

Statement of Value and Activity

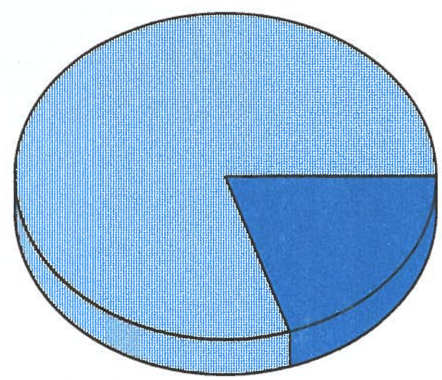
January 1, 2021 - January 31, 2021

Market Value Reconciliation

	This Period	1/1/21 to 1/31/21
Beginning Market Value	**$2,871,196.99**	**$2,871,196.99**
Additions	$0.00	$0.00
Distributions	-$8,120.18	-$8,120.18
Income	$1,565.18	$1,565.18
Non Cash Asset Changes	$0.00	$0.00
Change in Market Value	-$4,064.20	-$4,064.20
Ending Market Value	**$2,860,577.79**	**$2,860,577.79**
Realized Gains/Losses	$0.00	$0.00

Asset Allocation Summary

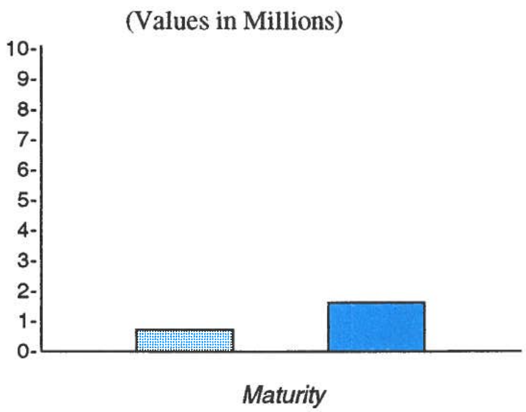
	Asset Class	Balance
80%	Fixed Income	$2,301,716.90
20%	Cash and Equivalents	$558,860.89
100%	**Total Assets Value**	**$2,860,577.79**



Statement of Value and Activity

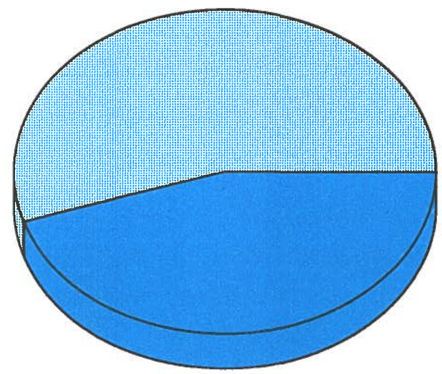
January 1, 2021 - January 31, 2021

Bond Maturity Schedule



	Bond Maturity	Market Value
29%	Less than 1 year	$666,355.40
71%	1 to 5 years	$1,635,361.50
0%	5 to 10 years	$0.00
0%	10 to 15 years	$0.00
0%	15 to 20 years	$0.00
0%	20 + years	$0.00
100%	**Total**	**$2,301,716.90**

Bond Quality Summary



	Quality Rating	Market Value
0%	AAA	$0.00
55%	AA	$1,255,553.90
0%	A	$0.00
0%	BBB	$0.00
45%	Other	$1,046,163.00
100%	**Total**	**$2,301,716.90**

0001537 - 0500161

Bangor Savings Bank

Wealth Management

P.O. Box 930, Bangor, ME 04402

Account Summary

Statement of Value and Activity

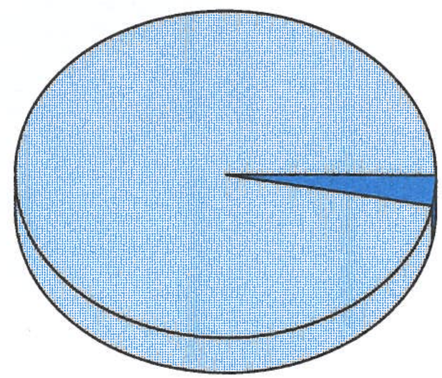
February 1, 2021 - February 28, 2021

Market Value Reconciliation

	This Period	*1/1/21 to 2/28/21*
Beginning Market Value	**$585,286.85**	**$597,694.42**
Additions	$0.00	$0.00
Distributions	$5,958.92	-$5,604.44
Income	$750.20	$750.39
Non Cash Asset Changes	$0.00	$0.00
Change in Market Value	-$1,377.50	-$2,221.90
Ending Market Value	**$590,618.47**	**$590,618.47**
Realized Gains/Losses	$0.00	$0.00

Asset Allocation Summary

	Asset Class	*Balance*
97%	Fixed Income	$571,524.60
3%	Cash and Equivalents	$19,093.87
100%	**Total Assets Value**	**$590,618.47**

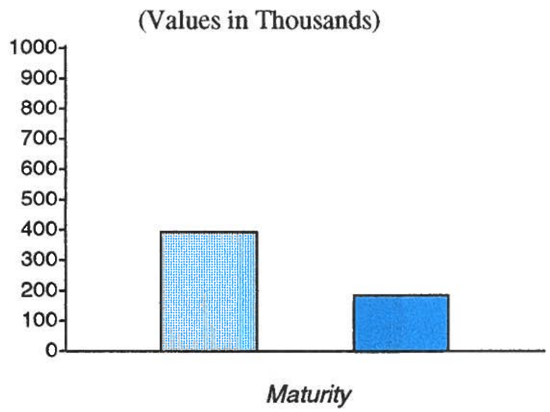


0001610 - 0500159

Statement of Value and Activity

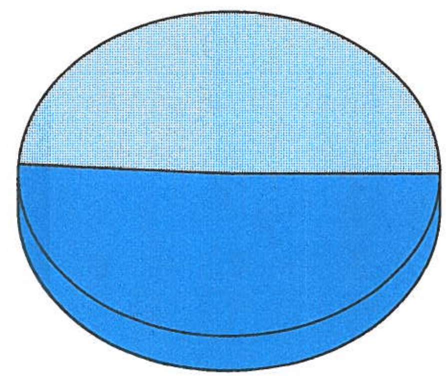
February 1, 2021 - February 28, 2021

Bond Maturity Schedule



	Bond Maturity	Market Value
68%	Less than 1 year	$389,531.60
32%	1 to 5 years	$181,993.00
0%	5 to 10 years	$0.00
0%	10 to 15 years	$0.00
0%	15 to 20 years	$0.00
0%	20 + years	$0.00
100%	**Total**	**$571,524.60**

Bond Quality Summary



	Quality Rating	Market Value
0%	AAA	$0.00
49%	AA	$278,947.50
0%	A	$0.00
0%	BBB	$0.00
51%	Other	$292,577.10
100%	**Total**	**$571,524.60**

0001610 - 0500159

Bangor Savings Bank

Wealth Management

P.O. Box 930, Bangor, ME 04402

Account Summary

Statement of Value and Activity

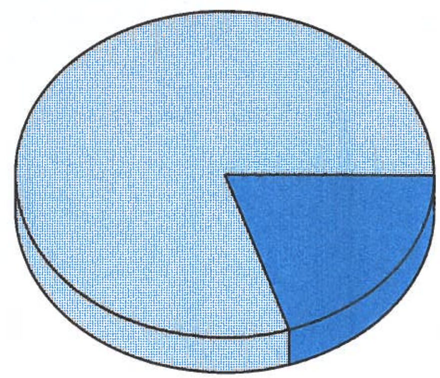
February 1, 2021 - February 28, 2021

Market Value Reconciliation

	This Period	1/1/21 to 2/28/21
Beginning Market Value	**$2,860,577.79**	**$2,871,196.99**
Additions	$0.00	$0.00
Distributions	-$5,958.92	-$14,079.10
Income	$5,958.92	$7,524.10
Non Cash Asset Changes	$0.00	$0.00
Change in Market Value	-$9,694.25	-$13,758.45
Ending Market Value	**$2,850,883.54**	**$2,850,883.54**
Realized Gains/Losses	$0.00	$0.00

Asset Allocation Summary

	Asset Class	Balance
80%	Fixed Income	$2,292,207.15
20%	Cash and Equivalents	$558,676.39
100%	**Total Assets Value**	**$2,850,883.54**

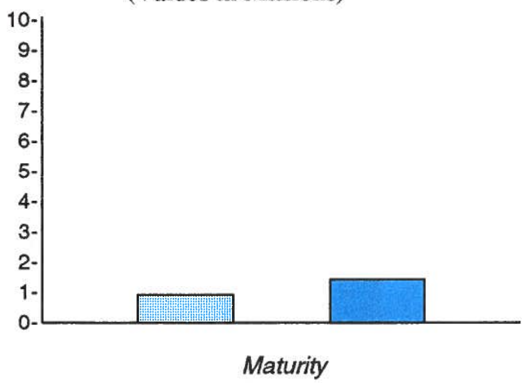


0001616 - 0500159

Statement of Value and Activity

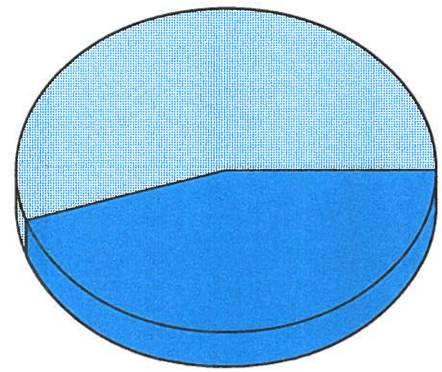
February 1, 2021 - February 28, 2021

Bond Maturity Schedule



	Bond Maturity	Market Value
38%	Less than 1 year	$870,077.40
62%	1 to 5 years	$1,422,129.75
0%	5 to 10 years	$0.00
0%	10 to 15 years	$0.00
0%	15 to 20 years	$0.00
0%	20 + years	$0.00
100%	**Total**	**$2,292,207.15**

Bond Quality Summary



	Quality Rating	Market Value
0%	AAA	$0.00
55%	AA	$1,251,765.15
0%	A	$0.00
0%	BBB	$0.00
45%	Other	$1,040,442.00
100%	**Total**	**$2,292,207.15**

0001616 - 0500159

Bangor Savings Bank
Wealth Management

P.O. Box 930, Bangor, ME 04402

Account Summary

Statement of Value and Activity

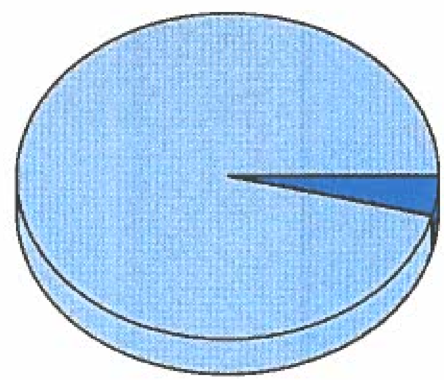
March 1, 2021 - March 31, 2021

Market Value Reconciliation

	This Period	1/1/21 to 3/31/21
Beginning Market Value	**$590,618.47**	**$597,694.42**
Additions	$0.00	$0.00
Distributions	$5,283.55	-$320.89
Income	$1,718.87	$2,469.26
Non Cash Asset Changes	$0.00	$0.00
Change in Market Value	-$989.30	-$3,211.20
Ending Market Value	**$596,631.59**	**$596,631.59**
Realized Gains/Losses	$0.00	$0.00

Asset Allocation Summary

	Asset Class	Balance
96%	Fixed Income	$570,535.30
4%	Cash and Equivalents	$26,096.29
100%	**Total Assets Value**	**$596,631.59**



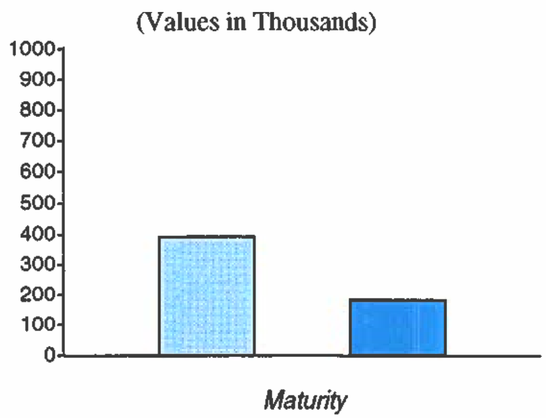
0004871 - 0500398

Portfolio Analysis

Statement of Value and Activity

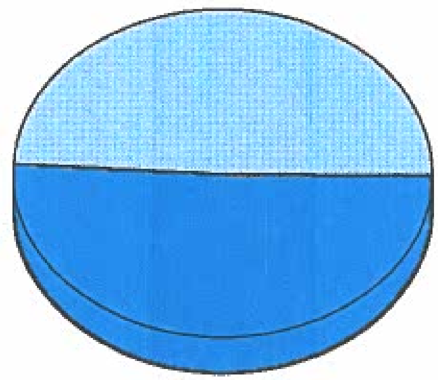
March 1, 2021 - March 31, 2021

Bond Maturity Schedule



	Bond Maturity	Market Value
68%	Less than 1 year	$388,956.05
32%	1 to 5 years	$181,579.25
0%	5 to 10 years	$0.00
0%	10 to 15 years	$0.00
0%	15 to 20 years	$0.00
0%	20 + years	$0.00
100%	**Total**	**$570,535.30**

Bond Quality Summary



	Quality Rating	Market Value
0%	AAA	$0.00
49%	AA	$278,542.75
0%	A	$0.00
0%	BBB	$0.00
51%	Other	$291,992.55
100%	**Total**	**$570,535.30**

0004871 - 0500398

Bangor
Savings Bank
Wealth Management

Box 930, Bangor, ME 04402

Account Summary

Statement of Value and Activity

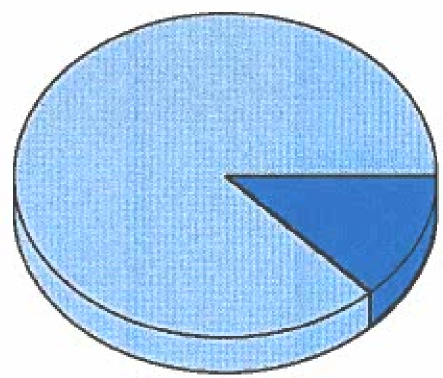
March 1, 2021 - March 31, 2021

ket Value Reconciliation

	This Period	1/1/21 to 3/31/21
ning Market Value	**$2,850,883.54**	**$2,871,196.99**
ns	$0.00	$0.00
ıtions	-$7,878.46	-$21,957.56
ɘ	$6,803.61	$14,327.71
ısh Asset Changes	$0.00	$0.00
ıe in Market Value	-$6,811.35	-$20,569.80
g Market Value	**$2,842,997.34**	**$2,842,997.34**
ed Gains/Losses	$0.00	$0.00

Asset Allocation Summary

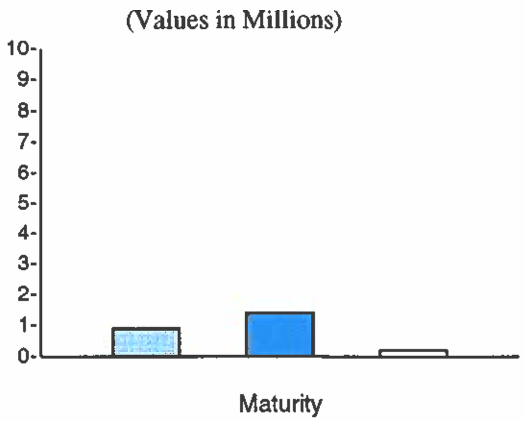
	Asset Class	Balance
87%	Fixed Income	$2,475,517.70
13%	Cash and Equivalents	$367,479.64
100%	**Total Assets Value**	**$2,842,997.34**



Statement of Value and Activity

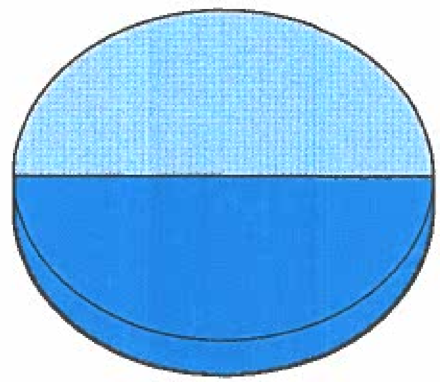
March 1, 2021 - March 31, 2021

Bond Maturity Schedule



	Bond Maturity	Market Value
35%	Less than 1 year	$868,594.20
57%	1 to 5 years	$1,418,111.50
8%	5 to 10 years	$188,812.00
0%	10 to 15 years	$0.00
0%	15 to 20 years	$0.00
0%	20 + years	$0.00
100%	**Total**	**$2,475,517.70**

Bond Quality Summary



	Quality Rating	Market Value
0%	AAA	$0.00
50%	AA	$1,249,144.20
0%	A	$0.00
0%	BBB	$0.00
50%	Other	$1,226,373.50
100%	**Total**	**$2,475,517.70**

Bangor Savings Bank
Wealth Management

P.O. Box 930, Bangor, ME 04402

Account Summary

Statement of Value and Activity

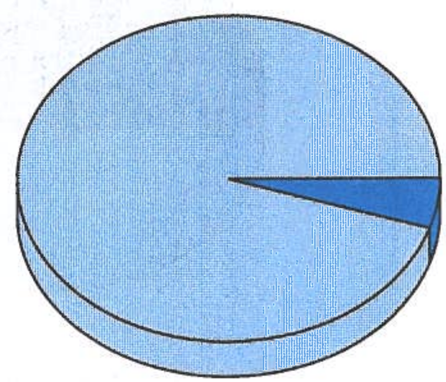
April 1, 2021 - April 30, 2021

Market Value Reconciliation

	This Period	*1/1/21 to 4/30/21*
Beginning Market Value	**$596,631.59**	**$597,694.42**
Additions	$0.00	$0.00
Distributions	$2,478.15	$2,157.26
Income	$746.86	$3,216.12
Non Cash Asset Changes	$0.00	$0.00
Change in Market Value	-$587.10	-$3,798.30
Ending Market Value	**$599,269.50**	**$599,269.50**
Realized Gains/Losses	$0.00	$0.00

Asset Allocation Summary

	Asset Class	*Balance*
95%	Fixed Income	$569,948.20
5%	Cash and Equivalents	$29,321.30
100%	**Total Assets Value**	**$599,269.50**



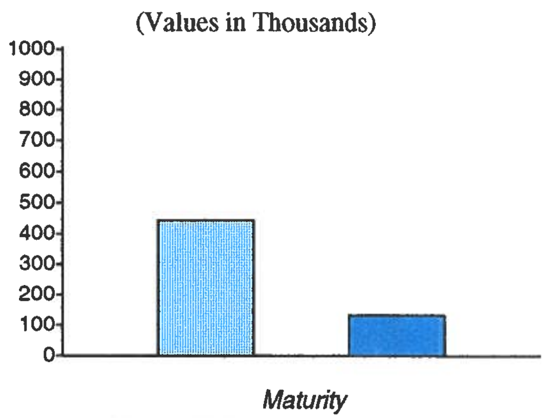
0001797 - 0500160

Portfolio Analysis

Statement of Value and Activity

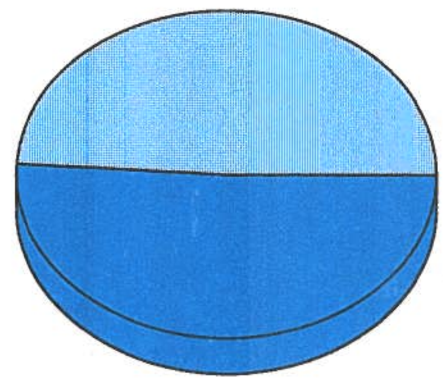
April 1, 2021 - April 30, 2021

Bond Maturity Schedule



	Bond Maturity	Market Value
77%	Less than 1 year	$439,101.70
23%	1 to 5 years	$130,846.50
0%	5 to 10 years	$0.00
0%	10 to 15 years	$0.00
0%	15 to 20 years	$0.00
0%	20 + years	$0.00
100%	**Total**	**$569,948.20**

Bond Quality Summary



	Quality Rating	Market Value
0%	AAA	$0.00
49%	AA	$278,155.00
0%	A	$0.00
0%	BBB	$0.00
51%	Other	$291,793.20
100%	**Total**	**$569,948.20**

0001797 - 0500160

Bangor Savings Bank
Wealth Management

P.O. Box 930, Bangor, ME 04402

Account Summary

Statement of Value and Activity

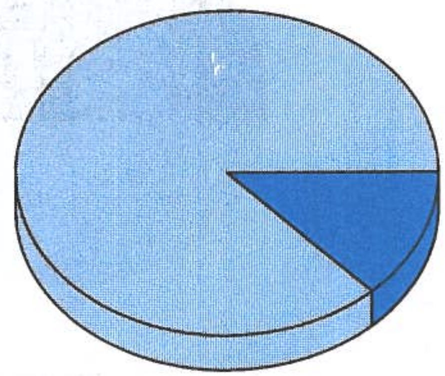
April 1, 2021 - April 30, 2021

Market Value Reconciliation

	This Period	*1/1/21 to 4/30/21*
Beginning Market Value	**$2,842,997.34**	**$2,871,196.99**
Additions	$0.00	$0.00
Distributions	-$2,478.15	-$24,435.71
Income	$2,478.15	$16,805.86
Non Cash Asset Changes	$0.00	$0.00
Change in Market Value	-$214.40	-$20,784.20
Ending Market Value	**$2,842,782.94**	**$2,842,782.94**
Realized Gains/Losses	$0.00	$0.00

Asset Allocation Summary

	Asset Class	*Balance*
87%	Fixed Income	$2,475,469.30
13%	Cash and Equivalents	$367,313.64
100%	**Total Assets Value**	**$2,842,782.94**

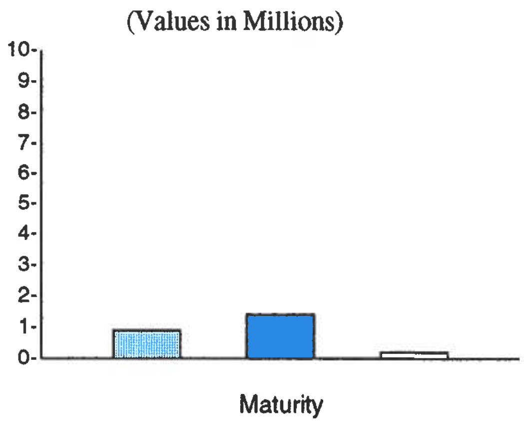


0001803 - 0500160

Statement of Value and Activity

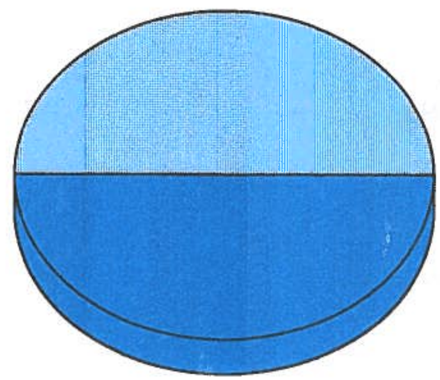
April 1, 2021 - April 30, 2021

Bond Maturity Schedule



		Bond Maturity	***Market Value***
	35%	Less than 1 year	$867,101.80
	57%	1 to 5 years	$1,417,491.50
	8%	5 to 10 years	$190,876.00
	0%	10 to 15 years	$0.00
	0%	15 to 20 years	$0.00
	0%	20 + years	$0.00
	100%	**Total**	**$2,475,469.30**

Bond Quality Summary



		Quality Rating	***Market Value***
	0%	AAA	$0.00
	50%	AA	$1,247,355.30
	0%	A	$0.00
	0%	BBB	$0.00
	50%	Other	$1,228,114.00
	100%	**Total**	**$2,475,469.30**

0001803 - 0500160

Eligible Costs Incurred, Proposed for Environmental Trust Reimbursement for FY21 | **Source of Proposed Reimbursement**

Date	Invoice #	Paid	Vendor	Purpose	Expense	Category of Stormwater Management Cost: Maintenance	Compliance Documentation	Supplies	Contracted Services	Training/ Travel	Principal	Income	Receipt	Date to Env. Trust	Account #
07/02/20	3541	07/20/20	Whitmore Contracting, Inc	Western Ave. Parking	$ 30,591.00	$ 30,591.00						$ 30,591.00	Y	9/24/2020	3-767-00
07/31/20	3655	08/17/20	Whitmore Contracting, Inc	Pool Parking Lot	$ 1,127.00	$ 1,127.00						$ 1,127.00	Y	9/24/2020	3-767-00
08/03/20	27055	08/06/20	Plymouth Engineering, Inc.	Rec. Parking Lot	$ 400.00				$ 400.00			$ 400.00	Y	9/24/2020	3-767-00
08/05/20	E183178	08/17/20	Donovan Equip. Co.,Inc.	2020 Jet/Vac Truck reimb	$ 116,456.48			$ 116,456.48				$ 116,456.48	Y	9/24/2020	2-220-00
08/05/20	E183178	08/17/20	Donovan Equip. Co.,Inc.	2020 Jet/Vac Truck reimb	$ 71,043.52			$ 71,043.52				$ 71,043.52	Y	9/24/2020	01-48
09/08/20	27122	09/14/20	Plymouth Engineering, Inc.	Rec. Parking Lot	$ 843.13				$ 843.13			$ 843.13	Y	9/24/2020	3-767-00
09/14/20	5753930	09/21/20	Everett J. Prescott Inc.	Ditch Erosion	$ 127.62	$ 127.62						$ 127.62	Y	9/24/2020	01-48
09/08/20	5760590	09/16/20	Everett J. Prescott Inc.	Cascade Grate MDOT	$ 213.92	$ 213.92						$ 213.92	Y	1/7/2021	10-10-22-05
09/30/20	2020-927	10/06/20	SEE, Inc.	Engineering Consulting	$ 12,362.45		$ 12,362.45					$ 12,362.45	Y	1/7/2021	10-10-22-20
10/28/20	68002050	11/04/20	Dirigo Materials	Ditching Material	$ 151.38			$ 151.38				$ 151.38	Y	1/7/2021	10-10-22-01
11/05/20	1004783	11/17/20	Sargent Materials		$ 400.79			$ 400.79				$ 400.79	Y	1/7/2021	10-10-22-01
01/06/21	2703	01/19/21	Drumlin Environmental LLC	Technical Consultant	$ 6,555.00						$ 6,555.00		Y	1/7/2021	10-10-22-05
CURRENT ITEMS:															
04/22/21	5850870	04/28/21	Everett J. Prescott Inc.	Pipe for Culverts	$ 1,238.40			$ 1,238.40				$ 1,238.40	Y	5/13/2021	10-10-22-01

	1-351-00	R 01-48
	$ 6,555.00	$ 234,955.69
YTD reimbursed to General Fund:		$ 233,717.29
Total Proposed for Reimbursement to General Fund 05/27/2021		**$ 1,238.40**
Total Proposed in Current Fiscal Year for Reimbursement to General Fund:		**$ 234,955.69**

	YTD	Deposit to:	
Total from Principal	$ 6,555.00	1-351-11	HCB
Total from Income	$ 234,955.69	R 01-48	Env Tr Rev
Budgeted revenue	$ 187,000.00	*FY21 Town Budget*	
Remaining budgeted revenue (FY21)	$ (47,955.69)		

Source: Wanda Libbey, CED Administrative Assistant *Updated 5/11/2021*

SEE CONDITIONS OF SALE AND PAYMENT TERMS ON REVERSE

PAGE NO.	1
INVOICE NO.	5850870
INVOICE DATE	4/22/21
PACKING SLIP NO.	5850870
CUSTOMER NO.	1343
WAREHOUSE	210

Everett J. Prescott Inc.
32 Prescott Street
P.O. Box 600
Gardiner, Me. 04345-0600

WATER • WASTEWATER • STORMWATER SOLUTIONS

ORIGINAL INVOICE

REMIT TO > TEAM EJP Bangor, ME.
E.J. PRESCOTT INC.
P.O. BOX 350002
BOSTON, MA 02241-0502

WAREHOUSE > TEAM EJP Bangor, ME.
101 Target Circle
Target Industrial Park
Bangor, ME 04401-0000
Telephone: 207-990-5000

SOLD TO >
TOWN OF HAMPDEN MAINE
106 WESTERN AVENUE
HAMPDEN, ME 04444

SHIP TO >
Customer Pickup

CUSTOMER P.O. NO.	JOB NAME	JOB NO.	SLS.	DATE DUE	DATE SHIPPED	SHIPPING METHOD
VICTOR	STOCK		HSE	5/22/21	4/22/21	Pickup

LINE	PRODUCT NUMBER AND ITEM DESCRIPTION	U/M	QUANTITY	UNIT PRICE	EXTENDED AMOUNT
1	78250 1 12 ASTM PE PIPE SOLID (IB)	FT	120	10.32	1,238.40

Acct. No. 10-30-22-01
Date 4-28-21
Initials [illegible]
Description Stormwater

PLEASE USE THE REMIT TO ADDRESS BELOW TO MAIL YOUR PAYMENT FOR FASTEST CREDIT TO YOUR ACCOUNT.

THANK YOU FOR YOUR BUSINESS!

AMOUNT	1,238.40
TAX	.00

Item 5

2020 WATER QUALITY REPORT
PINE TREE LANDFILL
HAMPDEN, MAINE

Prepared for

NEW ENGLAND WASTE SERVICES OF MAINE, INC.

April 2021

STATE OF MAINE
ERIK M. CLAPP
GE595
GEOLOGIST
4/16/2021

4 Blanchard Road
P.O. Box 85A
Cumberland, Maine 04021
Phone: 207.829.5016 smemaine.com

SME
SEVEE & MAHER ENGINEERS

ENVIRONMENTAL • CIVIL • GEOTECHNICAL • WATER • COMPLIANCE

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2020 WATER QUALITY REPORT
PINE TREE LANDFILL
HAMPDEN, MAINE

1.0 INTRODUCTION

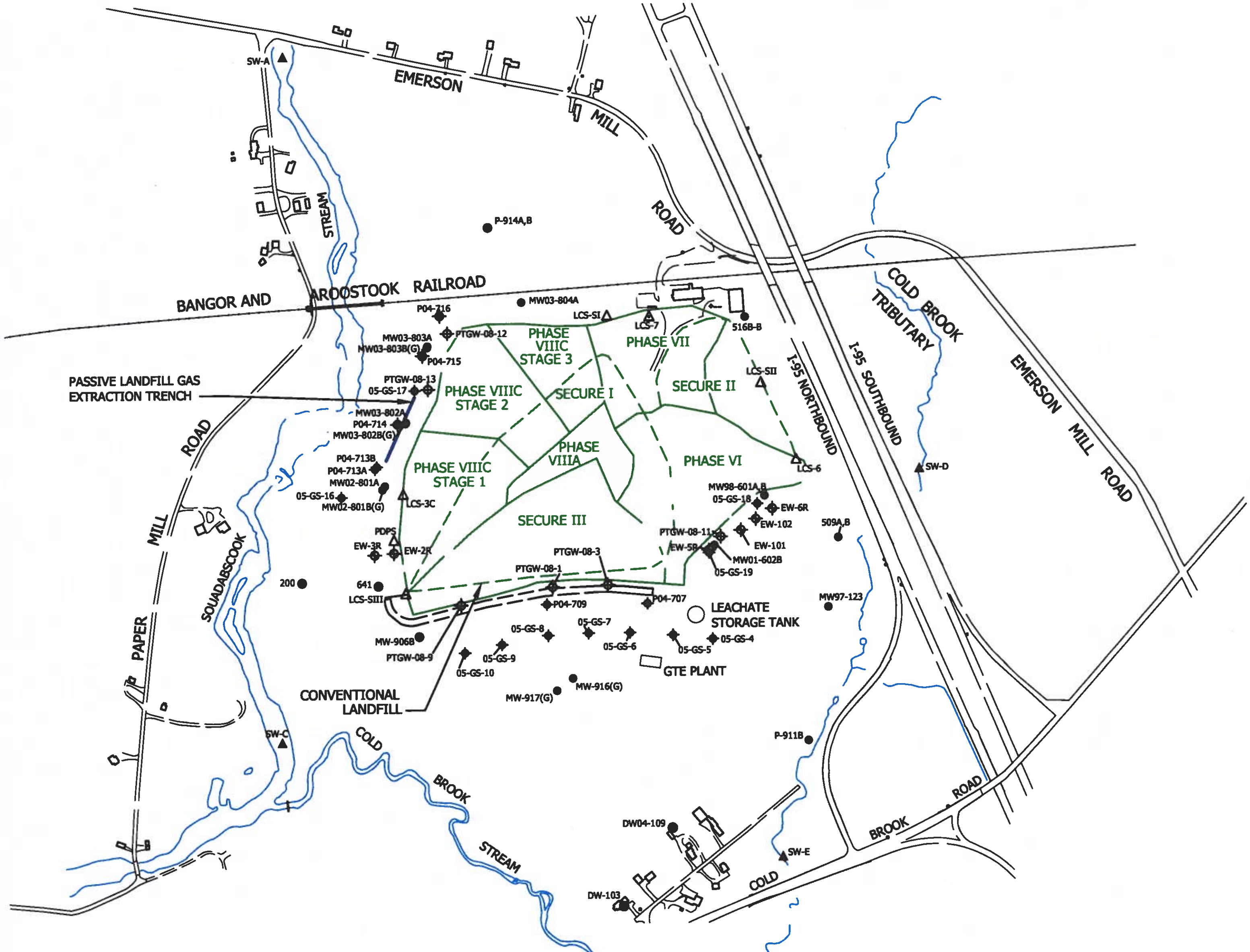
This report provides an overview of the 2020 environmental monitoring of the closed Pine Tree Landfill (PTL or "site") in Hampden, Maine. The facility is owned by New England Waste Services of Maine, Inc. (NEWSME). The site operated for 34 years between 1975 and 2009 for the disposal of municipal solid waste (MSW) and special wastes in four licensed landfills. Final closure of the site was completed over a three-year period with the construction of a composite final cover in three phases beginning in 2008. The final closure of the site was completed in 2010. As part of the final Maine Department of Environmental Protection (MEDEP) closure order MEDEP #S-001987-WN-HC-N, hereinafter referred to as the Department Closure Order, the MEDEP approved a post-closure Environmental Monitoring Plan (EMP)[1] prepared by Sevee & Maher Engineers, Inc. (SME) for the PTL on behalf of NEWSME. Post-closure monitoring began at the site in 2011. The post-closure EMP reflects the knowledge of site geologic and hydrogeologic conditions and the knowledge of influence of existing site facilities on site water quality developed during numerous site investigations and evaluations, as summarized in the site-wide closure plan.[2]

The post-closure EMP specified a reduction in sampling frequency from triannual to biannual after the initial five years of post-closure sampling (i.e., 2011 through 2015); 2020 marked the fifth year of biannual sampling at the site for years 2016 through 2020. The reduction in sampling frequency, as well as several other modifications to the monitoring program, were approved by MEDEP in March 2016.[3]

Figure 1-1 illustrates the site features, the post-closure EMP monitoring locations, and the areas of the four licensed landfills at the site (i.e., the Conventional Landfill and the Secure I, Secure II, and Secure III Landfills). The objectives of the post-closure EMP include:

- To routinely characterize groundwater, surface water, and leachate at the PTL during the post-closure period to monitor the performance of the landfill's final cover systems;
- To monitor the effectiveness of intermediate and long-term corrective actions that have been implemented at the PTL site to address leachate and landfill gas generated by the Conventional Landfill; and

[1] SME, 2011. Post-Closure Environmental Monitoring Plan, Pine Tree Landfill, Hampden, Maine, May 2011.
[2] SME, 2007. Site-Wide Closure Plan, Pine Tree Landfill, Hampden, Maine, March 2007.
[3] SME, 2011 (Revised 2016). Post-Closure Environmental Monitoring Plan, Pine Tree Landfill, Hampden, Maine, May 2011 (Revised March 2016).



N

LEGEND

- ● GROUNDWATER MONITORING WELL/ RESIDENTIAL GROUNDWATER WELL
- ▲ SURFACE WATER MONITORING LOCATION
- GAS EXTRACTION WELL
- GROUNDWATER EXTRACTION WELL
- △ LEACHATE MONITORING LOCATION
- SURFICIAL GAS MONITORING LOCATION
- (G) GROUNDWATER MONITORING LOCATIONS MONITORED FOR LANDFILL GAS

250 0 500 FEET

FIGURE 1-1
SITE FEATURES
PINE TREE LANDFILL
HAMPDEN, MAINE

SME
SEVEE & MAHER
ENGINEERS

DWG: ANNUAL REPORT LMN: SITE FEATURES CTB: AnnualReport REV: 4/13/2021

\\fileserver\c\sSev\ACAD\AnnualReport.dwg, 4/13/2021 9:15:34 AM, sjm

- To evaluate the site's conformance with the threshold criteria established for the site groundwater over the post-closure period in order to demonstrate successful corrective action, as defined during the Department's review of the site-wide closure plan and included in the Department Closure Order. The water quality threshold criteria are:
    - Off-site groundwater quality:
        - Tested water quality parameters below applicable groundwater United States Environmental Protection Agency (U.S.EPA) Maximum Contaminant Levels (MCLs) and Maine Maximum Exposure Guidelines (MEGs),
        - The 95 percent upper confidence level for specific conductance at off-site private water supply wells below 400 micromhos per centimeter (μmhos/cm), and
        - Dissolved methane at off-site private water supply wells less than 700 micrograms per liter (μg/L).
    - On-site groundwater quality:
        - Specific conductance at on-site monitoring locations less than 500 μmhos/cm.
    - Off-site surface water quality:
        - Off-site surface water quality meets existing water quality classification standard.

2020 was the tenth year of post-closure monitoring at the site in accordance with the post-closure EMP, which represents 33 percent of the 30-year post-closure monitoring period. The 2020 water quality generally indicates improvement during post-closure monitoring at the landfill; these improvements are supported by decreasing trends for multiple water quality parameters at multiple sampling locations and in various directions of groundwater flow away from the landfill. In the ten years of post-closure monitoring, many of these improvements are attributed to the continued and enhanced corrective actions at the site (i.e., completion of closure and operation of the groundwater extraction system and landfill gas extraction system). The site is relatively early in its 30-year post-closure monitoring period (i.e., one-third way through). While it is too soon to evaluate the ultimate effectiveness of closure in terms of achieving the post-closure threshold criteria given in the Department Closure Order, there are overall trends toward improvements in groundwater quality in the ten years of post-closure monitoring at the PTL. Several monitoring locations are either achieving or very close to achieving the threshold criteria. Additionally, multiple monitoring locations proximate to the Conventional Landfill indicate improvement to groundwater quality emanating from the Conventional Landfill.

Prior to final closure of the PTL (i.e., during 2010), only one of the 22 on-site groundwater monitoring wells met the on-site groundwater quality threshold criterion of specific conductance values less than 500 μmhos/cm during only one of the three annual monitoring events. During 2020, there were three on-site groundwater monitoring wells with specific conductance values less than 500 μmhos/cm during one or more monitoring events (i.e., MW01-602B, MW-906B, and 200). Monitoring locations MW03-802A, 509A, 916, and 917 have also previously had one or more specific conductance measurement values of less than 500 µmhos/cm during post-closure monitoring (i.e., since 2011), but had specific conductance values above 500 µmhos/cm during 2020.

Many of the on-site monitoring locations show signs of water quality improvement with respect to specific conductance value trends. Fourteen of the twenty-two on-site monitoring locations have lower annual mean concentrations in 2020 than at the start of closure in 2008. In general, the groundwater monitoring wells to the northeast, east, south, and southeast of the PTL continue to show lower specific conductance values compared to the start of closure in 2008, while groundwater monitoring wells to the southwest and west show an overall increase in specific conductance values since that time. Decreasing specific conductance values for monitoring locations located proximate to the perimeter of the Conventional Landfill are of particular significance because they are indicative of improvement to groundwater quality emanating from the Conventional Landfill.

For the second consecutive year (i.e., in 2019 and 2020), DW04-109 has met all three of its off-site post-closure threshold criteria. Both off-site monitoring wells had dissolved methane concentrations well below the threshold criterion of 700 µg/L in 2020. MW-916 and MW-917, which are located slightly beyond the site property boundaries, also met the off-site groundwater quality threshold criterion for dissolved methane in 2020.

The 2020 surface water data continues to show that there are no adverse effects from landfill operations on water quality in Souadabscook Stream or the Cold Brook Stream tributary. There were no Maine Freshwater Criterion Continuous Concentration (MFCCC) exceedances from surface water locations during 2020 water quality monitoring events for the parameters analyzed.

Substantial groundwater quality improvements with respect to dissolved methane concentrations have occurred during the first ten years of post-closure monitoring at both on-site and off-site groundwater monitoring locations. Dissolved methane concentrations provide an indication of the effectiveness of the landfill gas migration corrective actions on groundwater quality. In 2020, the methane concentrations reported at all eight on-site monitoring locations show substantial improvement to concentrations reported in 2008.

2.0 2020 SITE ACTIVITIES

This section gives a brief description of the 2020 PTL environmental monitoring activities, annual site precipitation, and the 2020 corrective action activities.

2.1 2020 Environmental Monitoring Activities

The 2020 environmental monitoring activities included two water quality sampling events that were completed by SME in April and October. In 2020, the post-closure water quality monitoring program included sampling groundwater at 22 on-site groundwater monitoring wells, on-site and off-site surface water at four monitoring locations, groundwater at two residential area wells, two landfill leachate locations, and the perimeter drain of the Conventional Landfill (i.e., PDPS). These post-closure monitoring locations are outlined in Table 3-1 in the post-closure EMP revised in March 2016. The frequency of monitoring and the components of the analytical program vary by monitoring location and are outlined in Table 3-2 and Table 3-3 in the post-closure EMP. After each monitoring event, the water quality data were forwarded to the MEDEP in its electronic data deliverable (EDD) format. The EMP also identifies sampling at 23 gas monitoring points around the landfill; samples were obtained at these locations by NEWSME in March 2020, May 2020, July 2020, and December 2020.

Supplemental sampling was completed during 2020 as recommended by SME and MEDEP at MW03-802B and MW03-803A to investigate increasing parameter concentrations in these wells.

The results of the 2020 environmental monitoring activities are discussed in Sections 3.0 through 3.4. Further sections of this report discuss: (1) the results of the leachate leak detection monitoring in 2020 (Section 4.0); (2) the data validation and laboratory quality control (Section 5.0); and (3) the results of the landfill perimeter gas monitoring in 2020 (Section 6.0).

2.2 2020 Precipitation

Based on National Climatic Data Center (NCDC) climatological data from the Bangor International Airport, the annual precipitation near the PTL was 37.60 inches during 2020. The 2020 annual precipitation was 4.33 inches below normal for the Bangor International Airport. Monthly precipitation totals ranged from a low of 0.28 inches in September 2020 to a maximum of 5.22 inches in November 2020.

2.3 2020 Groundwater Extraction Well and Perimeter Drain Activities

During 2020, NEWSME operated six groundwater extraction wells identified as EW-2R, EW-3R, EW-5R, EW-6R, EW-101, and EW-102. The locations of the extraction wells are shown on Figure 1-1. The purpose of operating the extraction wells is to capture groundwater outside of and downgradient of both the south and northeast edges of the Conventional Landfill. These areas are in the principal directions of groundwater flow away from the landfills and, as a result, have historically been among the locations most impacted by leachate from the Conventional Landfill. In addition to the groundwater extraction wells, groundwater is pumped from the perimeter drain of the Conventional Landfill at the PDPS. The groundwater removed from the extraction wells and PDPS is collected in the on-site leachate storage tank and is either recirculated into the Secure III Landfill as part of the approved post-closure leachate recirculation program or is pumped via the Hermon sewer to the Bangor wastewater treatment plant. In 2020, the majority of the leachate produced was pumped to the Bangor wastewater treatment plant (8,723,714 gallons) and a small amount recirculated into the landfill (169,316 gallons).

As discussed in more detail below, EW-2R and EW-5R did not operate in 2019 and EW-3R operated for a very limited time (i.e., 5 gallons pumped in January 2020) prior to being taken off-line for repairs. Extraction wells EW-2R and EW-3R were returned to service in March 2020 and EW-5R was returned to service in April 2020.

Extraction wells EW-2R and EW-3R and the PDPS are used to intercept shallow groundwater outside of the south edge of the Conventional Landfill. As shown in Table 2-1, the total volume of water pumped from the south side of the Conventional Landfill at EW-2R, EW-3R, and PDPS in 2020 was approximately 4,630,214 gallons. For comparison, the total volume pumped from EW-2R, EW-3R, and the PDPS in 2019 was approximately 4,189,334 gallons.

TABLE 2-1

SOUTH EDGE EXTRACTION WELL PUMPING

South Edge Extraction Wells	Volume Pumped in 2020 (Gallons)
EW-2R	434,696
EW-3R	384,128
PDPS	3,811,390
TOTAL	4,630,214

Less groundwater was pumped from the PDPS during 2020 (3,811,390 gallons) compared to 2019 (4,189,329 gallons), which is attributed to the lower precipitation total in 2020 (37.60 inches) compared to 2019 (52.00 inches). The combined pumping total of 818,824 gallons from EW-2R and EW-3R in 2020 (March 2020 through December 2020) is a return to higher annual total flows compared to their inactivity in 2019 and their combined total extraction flow of 265,776 gallons in 2018. The combined 2020 total extraction flow for EW-2R and EW-3R was the greatest pumped from these locations since 1,121,000 gallons were pumped in 2013. As discussed in Section 3.1.2, greater extraction rates during closure and early into the post-closure period (e.g., an average of 1,203,394 gallons pumped per year from 2010 through 2013) compared to more recent years prior to 2020 (e.g., an average of 363,920 gallons pumped per year from 2014 through 2019) appears to correlate with groundwater quality trends at some south PTL groundwater monitoring locations during these periods. Optimizing groundwater extraction from

EW-2R and EW-3R (as well as at the PDPS and other groundwater extraction wells at the PTL) during the remainder of closure will play a key role in achieving the PTL on-site threshold criteria.

Extraction wells EW-5R, EW-6R, EW-101, and EW-102 are used to intercept groundwater along the northeast corner of the site. EW-5R is screened in overburden sand located directly above the bedrock, while EW-6R, EW-101, and EW-102 are all screened across the sand and gravel and just into bedrock. The total volume of water pumped from the northeast side of the Conventional Landfill in 2020 was 2,291,583 gallons, as shown in Table 2-2. For comparison, the total volume pumped from the northeast side of the Conventional Landfill in 2019 was approximately 834,551 gallons.

TABLE 2-2

NORTHEAST CORNER EXTRACTION WELL PUMPING

Northeast Corner Extraction Wells	Volume Pumped in 2020 (Gallons)
EW-5R	594,734
EW-6R	695,478
EW-101	367,156
EW-102	634,215
TOTAL	**2,291,583**

The combined pumping total of 2,291,583 gallons from the northeast PTL extraction wells in 2020 (April 2020 through December 2020) is a return to higher annual total flows compared to the past few years (e.g., a combined total extraction flow of 834,555 gallons in 2019). The combined 2020 total extraction flow for northeast extraction wells was the greatest pumped from these locations since a comparable combined extraction flow of 2,328,767 gallons were pumped in 2016. As discussed in Section 3.1.1, greater extraction rates during closure and early into the post-closure period (e.g., an average of 2,800,227 gallons pumped per year from 2010 through 2016) compared to more recent years prior to 2020 (e.g., an average of 1,345,182 gallons pumped per year from 2017 through 2019) appears to correlate with groundwater quality trends at some northeast PTL groundwater monitoring locations during these periods. Optimizing groundwater extraction from EW-5R, EW-6R, EW-101, and EW-102 (as well as at the PDPS and other groundwater extraction wells at the PTL) during the remainder of closure will play a key role in achieving the PTL on-site threshold criteria.

2.4 2020 Landfill and External Landfill Gas Extraction System Activities and Leachate Recirculation Program

Landfill gas is collected from both the Conventional Landfill and the Secure III Landfill using a combination of gas collection trenches, gas extraction wells, and gas collection connections to various leachate collection locations. Extracted landfill gas is used at the landfill's gas-to-energy (LFGTE) plant, which was constructed at the PTL site and began operations in early 2008. Details of the landfill gas extraction are provided in the facility's Landfill Gas Monitoring Evaluation.

To enhance gas production during the post-closure period, NEWSME maintains an active leachate recirculation program in the Secure III Landfill. The leachate is recirculated from the on-site leachate storage tank. Condensate from the LFGTE plant knock out pot was re-piped into the leachate recirculation infrastructure in 2015. During 2020, a total of 169,316 gallons of leachate and condensate was recirculated into the Secure III facility. This is a reduction from the 355,488 gallons recirculated in 2019. Due to limited staffing and a lower demand for additional gas at the LFGTE, the entire volume of leachate approved in the 2020 Recirculation Plan was not applied. Further details of the leachate recirculation program are provided in the facility's Post-Closure Leachate Recirculation Annual Report.

In addition to the continued operation of the active gas collection system within the Conventional Landfill and the Secure III Landfill, NEWSME monitors, and operates when appropriate, the six external landfill gas extraction wells located outside of the east and southwest perimeter of the landfill. The east wells are installed on the east side of Secure III and the Conventional Landfill. The east external landfill gas extraction wells are identified as PTGW-08-1, PTGW-08-3, PTGW-08-9, and PTGW-08-11; their locations are shown on Figure 1-1. Gas extraction from these wells controls and limits gas migration from the landfill towards the east. Additionally, passive landfill gas extraction continued at the vents that were installed in a trench southwest of the landfill with a length of approximately 400 feet and a depth below ground surface ranging from approximately 8 to 14 feet. Two gas extraction wells, PTGW-08-12 and PTGW-08-13, are installed on the southwest side of the site directly adjacent to the Secure III Landfill boundary. Their locations are shown on Figure 1-1.

The external landfill gas extraction wells were monitored periodically throughout 2020 using a GEM2000 multi-gas meter. Gas has not been extracted from PTGW-08-3 during the post-closure monitoring period, including 2020, because of the lack of landfill gas at this location. Gas was extracted from PTGW-08-9 briefly at the start of post-closure monitoring in 2011, but has not been extracted since then, including during 2020, because the volumetric percentage of methane gas in the well is low (approximately 0.3 percent methane average in 2020).

External landfill gas was extracted from PTGW-08-1 in 2020, with an average methane content of approximately 51.5 percent by volume. The total landfill gas extracted from this well in 2020 was 11.7 Million Standard Cubic Feet (MSCF). Based on the reported average methane percent and total flow, a total of about 126 tons of methane were removed from PTGW-08-1 in 2020. The average of annual total landfill gas extracted from this well during post-closure from 2011 through 2020 is approximately 184 tons per year.

External landfill gas was extracted from PTGW-08-11 in 2020, with an average methane content of approximately 29.3 percent by volume. The total landfill gas extracted from this well in 2020 was 0.6 MSCF. Based on the reported average methane percent and total flow, a total of about 4 tons of methane were removed from PTGW-08-11 in 2020. The average of annual total landfill gas extracted from this well during post-closure from 2011 through 2020 is approximately 20 tons per year.

External landfill gas was extracted from PTGW-08-12 in 2020, with an average methane content of approximately 20.3 percent by volume. The total landfill gas extracted from this well in 2020 was 1.8 MSCF. Based on the reported average methane percent and total flow, a total of about 8 tons of methane were removed from PTGW-08-12 in 2020. The average of annual total landfill gas extracted from this well during post-closure from 2011 through 2020 is approximately 7 tons per year.

External landfill gas was extracted from PTGW-08-13 in 2020, with an average methane content of approximately 10.9 percent by volume. The total landfill gas extracted from this well in 2020 was 1.4 MSCF. Based on the reported average methane percent and total flow, a total of about 3 tons of methane were removed from PTGW-08-13 in 2020. The average of annual total landfill gas extracted from this well during post-closure from 2011 through 2020 is approximately 4 tons per year.

3.0 2020 WATER QUALITY EVALUATION

Post-closure monitoring began at the site in 2011. This section compares the 2020 water quality monitoring results to the post-closure threshold criteria given in the Department Closure Order and uses other approaches used historically to evaluate water quality at the site. These threshold criteria are intended to be achieved over the course of the entire 30-year post-closure period. This must be kept in mind when evaluating the 2020 water quality data, which is ten years (i.e., 33 percent) into the closure period. The post-closure threshold criteria are shown below, along with descriptions of additional methods of post-closure monitoring data evaluation.

Post-Closure Threshold Criteria

The post-closure water quality threshold criteria are:

- Off-site groundwater quality:
    - Water quality parameters below applicable groundwater MCLs and MEGs;
    - The 95 percent upper confidence level for specific conductance at off-site private water supply wells below 400 µmhos/cm;[4] and
    - Dissolved methane at off-site private water supply wells less than 700 µg/L.
- On-site groundwater quality:
    - Specific conductance at on-site monitoring locations less than 500 µmhos/cm.
- Off-site surface water quality:
    - Off-site surface water quality meets existing water quality classification standard.

2020 and Historical Water Quality Data

Historical water quality data from 2008 through 2020 is included in Appendix A of this report for the sampling locations and parameters discussed in this report (i.e., closure and post-closure monitoring). A summary sheet for each monitoring location is provided in Appendix B which includes: (1) a description of the monitoring location; (2) a summary of the 2020 data for monitored parameters; (3) the historical range of values for monitored parameters; and (4) the mean and standard error of the mean for monitored parameters. For each off-site post-closure monitoring location and surface water monitoring location, the sheet also identifies the parameters that exceed applicable State of Maine water quality standards (i.e., MEGs, MCLs, and MFCCCs).

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[4] Since water quality improvements are anticipated for all monitoring locations over the full course of the 30-year post-closure monitoring period, the calculation of the 95 percent upper confidence level for specific conductance is made using the most recent data from the past five years. The five-year period is suitable for demonstrating whether or not a location has met the criterion for a sustained period.

Mann-Kendall Trend Analyses

Water quality trends are not part of the Department Closure Order threshold criteria; however, they are useful when evaluating changes in water quality over time. Mann-Kendall analyses were run for the site water quality data to screen for statistically significant changes in water quality parameter concentrations over time. The Mann-Kendall analysis was chosen because it is nonparametric and is not sensitive to outliers, missing data, and non-detects. The Mann-Kendall test was run for analyzed parameters, except for volatile organic compounds (VOCs), with a 0.05 Type-I error (i.e., 95 percent confidence level). For this evaluation, we consider a statistically significant trend to be one in which the potential Type-I error is less than 0.05.

Mann-Kendall trend analyses were run for the site data over two time periods: five years back from the end of 2020 and three years back from the end of 2020. The three-year timeframe is suitable for evaluating recent changes in water quality related to site operations (e.g., site corrective actions such as groundwater extraction wells and gas extraction wells). The five-year timeframe is suitable for clearly identifying ongoing water quality trends during post-closure monitoring. Trends identified over short periods may also be due to natural phenomena, such as drought or rainfall periods, that need to be considered when reviewing the monitoring data.

Discussion of trends in the water quality data is generally limited to increasing or decreasing trends of multiple parameters (three or more) at one sampling location. Since 2020 was the tenth year of the 30-year post-closure period, the trend analyses are a quantitative means of assessing post-closure water quality trends over the early years (i.e., the first third) of the post-closure monitoring period. The trends must be considered in conjunction with the hydrogeologic setting of the site, on-site closure and post-closure activities, off-site activities, and the anticipated changes in site groundwater redox conditions as a result of the closure. It is also important to note that due to the nature of the monitoring program, where different locations have a different list of monitoring parameters and different parameters have different monitoring frequencies, the Mann-Kendall results cannot necessarily be compared by location. Rather, they should be considered individually by location.

The full results of Mann-Kendall analyses are included in Appendix C. The results are also discussed throughout Section 3.0 as they relate to relative positions of monitoring locations around the landfill.

Arsenic Concentrations

Site-wide arsenic concentrations were reported at notably lower values at most monitoring locations starting in October 2016. The presence of arsenic in groundwater at the PTL is attributed to a number of redox driven reactions that occur as the site adjusts to: (1) covering the landfill and cutting off recharge to the waste mass; and (2) the mixing of leachate emanating from under a closed, unlined landfill with groundwater. The presence of arsenic in groundwater surrounding the PTL is consistent with other landfills that have been documented in literature.[5] The 2020 arsenic monitoring results are discussed throughout Section 3.0 as they relate to relative positions of monitoring locations around the landfill.

On-Site Post-Closure Specific Conductance and Dissolved Methane Data Summary

On-site groundwater quality changes are assessed here by comparison of 2020 specific conductance values and dissolved methane concentrations to values reported in 2008, when landfill closure activities began at the PTL, and values reported last year (i.e., from 2019) to assess the more recent water quality changes (see Table 3-1).

Changes in specific conductance values give a general sense of the changes in the total amount of dissolved constituents in the groundwater. Fourteen of the twenty-two on-site PTL monitoring locations have lower annual mean concentrations in 2020 than at the start of closure in 2008. Ten of the twenty-two on-site PTL monitoring locations have lower annual mean concentrations in 2020 than in 2019, with an average decrease of 154 μmhos/cm. This is fewer than the nineteen on-site PTL monitoring locations with lower annual mean concentrations in 2019 than in 2018 (i.e., from the previous year's evaluation). While fewer wells show improvement than the previous year, the average decrease (154 μmhos/cm) in those 10 wells is generally greater than the average increase (75 μmhos/cm) observed in the 12 wells that showed higher specific conductance in 2020 than in 2019.

In general, the groundwater monitoring wells to the south, southeast, and east of the PTL continue to show lower specific conductance values compared to the start of closure in 2008, while groundwater monitoring wells to the southwest and west show an overall increase in specific conductance values since that time. Specific conductance values have decreased since the start of closure in 2008 at all of the northeast monitoring locations with the exception of MW97-123. As discussed in Section 3.1.1, the specific conductance values at MW97-123 have decreased since the start of post-closure monitoring in 2011. The annual average specific conductance value at the north monitoring location (516B-B) was somewhat higher in 2020 compared to the start of closure in 2008, but has generally been stable during closure and during post-closure through 2020.

Dissolved methane concentrations provide an indication of the effectiveness of the landfill gas migration corrective actions on groundwater quality. In 2020, the methane concentrations reported at all eight on-site monitoring locations showed substantial improvement to concentrations reported in 2008.

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[5] e.g., Law-wai, 2001, *Mobilization and Transport of Arsenic by Landfill Leachates and Contamination of Groundwater at Winthrop, Maine*, Department of Earth and Environmental Engineering, Columbia University; and Harte, et. al, 2012, *Heterogeneous redox conditions, arsenic mobility, and groundwater flow in a fractured-rock aquifer near a waste repository site in New Hampshire, USA*. Hydrogeology Journal, DOI 10.1007/210040-012-0844-4.

TABLE 3-1

SUMMARY OF SPECIFIC CONDUCTANCE AND DISSOLVED METHANE RESULTS

Monitoring Location		Specific Conductance (µmhos/cm)				Dissolved Methane (µg/L)			
		2020 Range	2019 Range	2008 Mean	Historical Maximum*	October 2020	October 2019	2008 Mean	Historical Maximum*
Northeast Wells	MW97-123	932 – 1,425	1,347 – 1,350	1,171 [3]	1,834	NA			
	509A	820 – 1,091	800 – 1,063	965 (2007) [1]	1,234	NA			
	509B	829 – 1,093	789 – 1,098	969 (2007) [1]	1,249	Dissolved Methane Removed From Sampling Program in 2016			
	P-911B	**702** – 855	854 – 938	1,028 (2007) [1]	1,249	NA			
	MW98-601A	**1,789** – 1,882	1,969 – 2,069	2,202 [3]	4,140	NA			
	MW98-601B	1,117 – 1,497	1,144 – 1,283	1,338 [3]	2,840	NA			
	MW01-602B	459 – 631	389 – 676	3,057 [3]	5,770	NA			
South Wells	MW-906B	373 – 423	364 – 381	563 [3]	1,882	Dissolved Methane Removed From Sampling Program in 2016			
	200	436 – 595	585 – 611	760 [3]	2,270	NA			
	641	912 – 983	780 – 815	1,890 [3]	6,520	510	20 U	1,193 [3]	3,290
	MW02-801A	1,932 – 2,378	2,381 – 2,551	4,330 [3]	6,490	270	330	1,863 [3]	4,300
	MW02-801B	**667** – 2,626	1,618 – 2,429	2,191 [3]	5,850	NA			
	MW03-802A	842 – 845	512	852 [3]	1,168	260	26	4,720 [3]	9,010
	MW03-802B	804 – 1,242	1,004 – 1,154	1,003 [3]	1,587	2,200	1,400	3,230 [3]	6,740
	MW03-803A	1,600 – 1,764	1,526 – 1,759	1,037 [3]	1,867	58	32	1,353 [3]	3,570
	MW03-803B	1,535 – **1,591**	1,462 – 1,469	1,118 [3]	1,591	360	1,600	4,317 [3]	7,660
	MW03-804A	773 – 925	823 – 832	746 [3]	1,190	NA			
North Wells	516B-B	1,004 – 1,080	1,050 – 1,076	947 [3]	1,169	NA			
East Wells	MW-916	607 – 617	750 – 854	1,068 [3]	1,848	20 U	120	7,850 [3]	13,200
	MW-917	772 – 948	872 – 916	1,346 [3]	1,920	53	50	6,313 [3]	10,000
West Wells	P-914A	895 – 976	877 – 934	736 [3]	1,072	NA			
	P-914B	884 – 963	824 – 920	617 [3]	971	NA			

Notes:
Numbers in superscript indicate the number of samples taken during the respective year; bold values represent new historical minimum or maximum values.
* Historical maximum values from sampling date ranges that vary by location; sampling date ranges for each well are included on the Water Quality Summary Reports included in Appendix B.
NA Not Applicable

Section 3.1 presents an evaluation of the on-site PTL groundwater quality during 2020. Further evaluation of water quality at the site is provided for: (1) groundwater quality at off-site residential area wells included in the site EMP (Section 3.2); (2) water quality at surface water monitoring locations around the PTL (Section 3.3); and (3) leachate monitoring locations (Section 3.4).

3.1 2020 On-Site Groundwater Quality Evaluation

Below are discussions of the 2020 PTL groundwater quality at monitoring wells, which are grouped based on their locations on-site with respect to the site's principal groundwater flow directions and/or landfill gas migration flow pathways. Monitoring results are compared to the site's post-closure threshold criteria established in the Department Closure Order.

3.1.1 Northeast On-Site Monitoring Locations

Monitoring locations northeast of the PTL are positioned in one of the two principal groundwater flow pathways away from the PTL. Groundwater quality northeast of the PTL is monitored by wells MW98-601A, MW98-601B, and MW01-602B, which are proximate to the northeast perimeter of the landfill; and by MW97-123, 509A, 509B, and P-911B, which are more distant from the landfill. Monitoring locations 509A, P-911B, MW98-601A, MW98-601B, and MW01-602B are monitored for field parameters, while MW97-123 and 509B are monitored for field parameters and sampled for a broader list of detection monitoring parameters. Groundwater quality data from northeast monitoring locations have historically exhibited influence from Conventional Landfill leachate and gas migration and site operations related to the secure landfills.

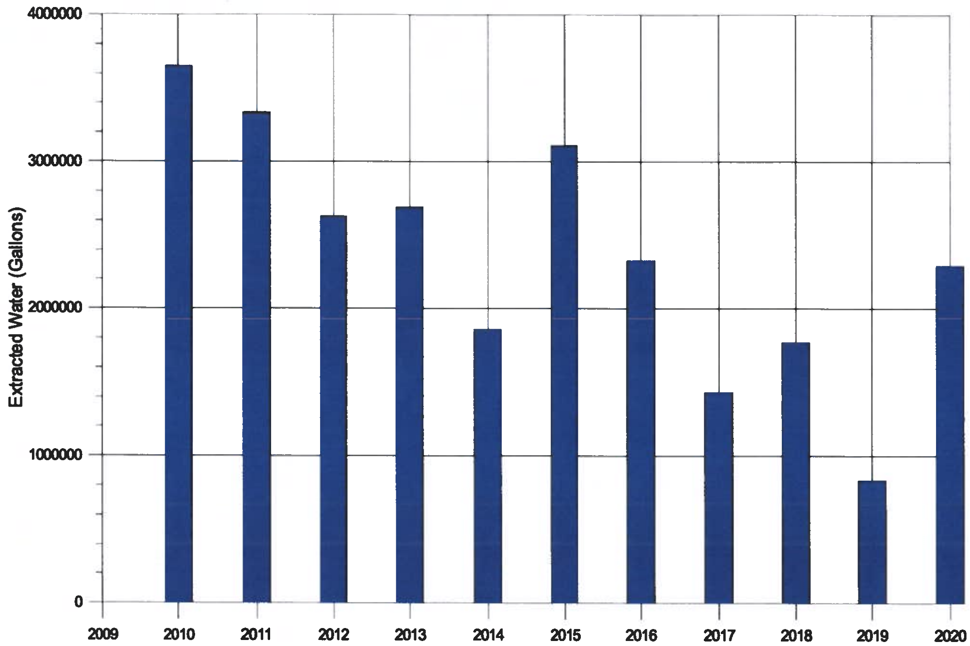
Corrective Activities

Corrective activities northeast of the landfill currently include groundwater extraction from four wells (EW-5R, EW-6R, EW-101, and EW-102) proximate to the perimeter of the Conventional Landfill and gas extraction from well PTGW-08-11, located outside of the Conventional Landfill. About 2,291,583 gallons of water were extracted from the northeast groundwater extraction wells in 2020 and about 4 tons of methane are estimated to have been removed from PTGW-08-11 in 2020.

Total annual groundwater extraction from EW-5R, EW-6R, EW-101, and EW-102, since the first full year that all four of these wells operated together in 2010, is shown on Figure 3-1. The combined pumping total of 2,291,583 gallons from the northeast PTL extraction wells in 2020 (April 2020 through December 2020) is a return to higher annual total flows compared to the past few years (e.g., a combined total extraction flow of 834,555 gallons in 2019). The combined 2020 total extraction flow for northeast extraction wells was the greatest pumped from these locations since a comparable combined extraction flow of 2,328,767 gallons was pumped in 2016.

FIGURE 3-1

GROUNDWATER PUMPED FROM NORTHEAST EXTRACTION WELLS
EW-5R, EW-6R, EW-101, AND EW-102



Greater extraction rates during closure and early into the post-closure period (compared to more recent years prior to 2020 (i.e., an average of 2,800,227 gallons pumped per year from 2010 through 2016 compared with 1,345,182 gallons pumped per year from 2017 through 2019) appears to correlate with groundwater quality trends at some northeast PTL groundwater monitoring locations during these periods. Optimizing groundwater extraction from EW-5R, EW-6R, EW-101, and EW-102 (as well as at the PDPS and other groundwater extraction wells at the PTL) during the remainder of closure will play a key role in achieving the PTL on-site threshold criteria.

Specific Conductance

Table 3-1 provides a relative assessment of specific conductance values for the northeast monitoring locations during 2020 compared to historical data from the previous year, at the start of landfill closure activities (i.e., 2008), and the historical maximum detection results at each well. Mean annual specific conductance values were lower at groundwater monitoring locations during 2020 than at the start of closure in 2008 by 82 percent at MW01-602B, by 24 percent at P-911B, and by 17 percent at MW98-601A. Specific conductance values have generally been stable at groundwater monitoring locations 509A, 509B, and MW98-601B, with slightly lower annual mean values in 2020 compared to at the start of closure in 2008 (i.e., in the order of 1 to 2 percent decreases). The mean of annual specific conductance values at MW97-123 increased by 1 percent during 2020 compared to the start of closure in 2008; however, the mean of annual specific conductance values at MW97-123 in 2020 has decreased by 33 percent since the start of post-closure monitoring in 2011.

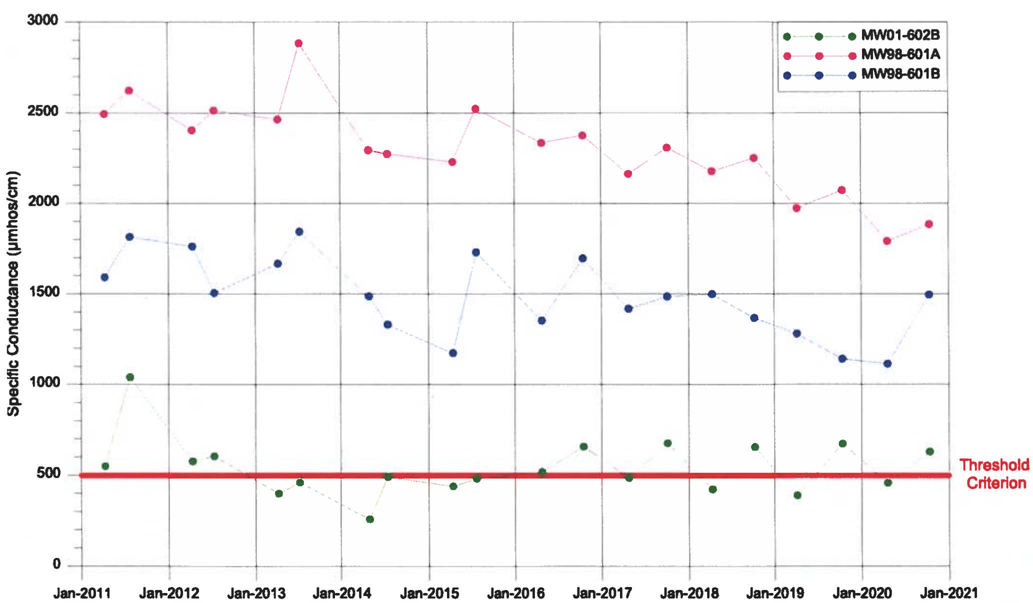
The specific conductance values measured at P-911B during the October 2020 monitoring event (702 µmhos/cm) and MW98-601A during the April 2020 monitoring event (1,789 µmhos/cm) were new historical minimum values. The remaining specific conductance values measured at the northeast monitoring locations during 2020 were within their respective historical ranges.

The post-closure threshold value for specific conductance in on-site groundwater is 500 µmhos/cm. At northeast on-site groundwater monitoring locations, this threshold was met at MW01-602B (459 µmhos/cm) in April 2020. The October 2020 specific conductance value at MW01-602B and the specific conductance values at the rest of the on-site northeast monitoring locations during 2020 were over the on-site post-closure threshold value of 500 µmhos/cm.

Post-closure specific conductance values at the monitoring locations proximate to the northeast perimeter of the Conventional Landfill are shown on Figure 3-2.

FIGURE 3-2

SPECIFIC CONDUCTANCE
NORTHEAST ON-SITE MONITORING LOCATIONS (LANDFILL PERIMETER)



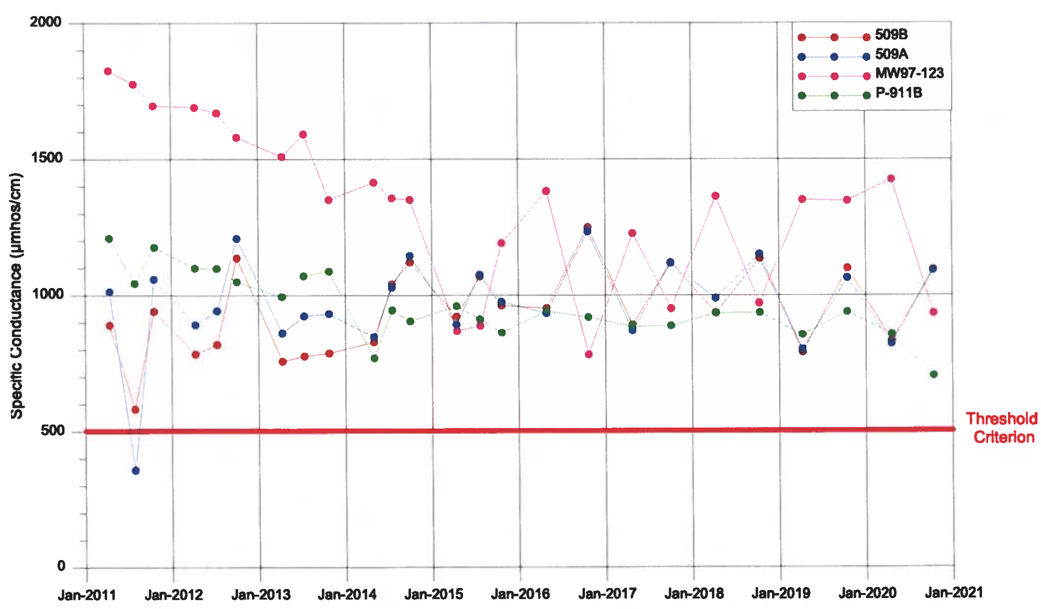
Specific conductance values at MW01-602B, which is located in close proximity to the northeast perimeter of the Conventional Landfill and extraction well EW-5R, have been stable and intermittently below the on-site threshold value of 500 µmhos/cm from 2013 through 2020. Visual review of the specific conductance values at MW98-601A and MW98-601B shows that they are gradually decreasing. This includes a statistically significant decreasing trend (95 percent confidence level) for specific conductance at MW98-601A over the past five years. These decreases are of particular significance because MW98-601A and MW98-601B are located between the Conventional Landfill and EW-6 and are indicative of improvement to groundwater quality emanating from the Conventional Landfill.

Future optimization of groundwater extraction from EW-5R, EW-6R, EW-101, and EW-102 will serve to both: (1) accelerate capture of the finite influences on water quality from the northeast side of the Conventional Landfill; and (2) serve as a hydraulic barrier between the Conventional Landfill and groundwater further downgradient from it (e.g., groundwater monitoring at MW97-123, 509A, 509B, and P-911B).

Post-closure specific conductance values at monitoring locations further downgradient from the northeast perimeter of the Conventional Landfill (i.e., at MW97-123, 509A, 509B, and P-911B) are shown on Figure 3-3. Specific conductance values at these locations do not have statistically significant increasing or decreasing trends (95 percent confidence level) over the past three or five years.

FIGURE 3-3

SPECIFIC CONDUCTANCE
NORTHEAST ON-SITE MONITORING LOCATIONS (DISTANT FROM LANDFILL)



Specific conductance values at monitoring locations 509A and 509B have been rather stable during the first ten years of post-closure monitoring. Based on the proximity of 509A and 509B to the site facilities, this may be associated with landfill influences; however, the presence of Interstate 95 and other upgradient site activity in close proximity to these wells needs to be considered when reviewing the water quality data.

Specific conductance values at MW97-123 generally decreased during the first few years of post-closure monitoring (i.e., 2011 through 2014), but these decreases have mostly ceased since that time. Similarly, specific conductance value decreases at P-911B during the first few years of post-closure monitoring (i.e., 2011 through 2014) were followed by rather stable values through 2018. Specific conductance values have since resumed decreasing at P-911B, with a new historical minimum value of 702 µmhos/cm in October 2020. These trends correlate with the generally declining total volume of groundwater extracted from the four wells located proximate to the northeast perimeter of the Conventional Landfill during post-closure monitoring through 2019 (see Figure 3-1). Despite the more recent stable specific conductance trends, 2020 annual mean specific conductance values at MW97-123 and P-911B have decreased since the start of post-closure monitoring (i.e., in 2011) by 33 percent and 32 percent, respectively.

The combined 2020 total groundwater extraction flow for northeast extraction wells, 2,291,583 gallons, was the greatest pumped from these locations since a comparable combined extraction flow of 2,328,767 gallons was pumped in 2016. The 2020 resurgence in groundwater extraction from northeast extraction wells EW-5R, EW-6R, EW-101, and EW-102 and future optimization of groundwater extraction from these wells is expected to improve groundwater quality at the northeast groundwater monitoring locations and aid in achieving the PTL on-site threshold criteria at those locations.

Trend Analysis

A summary of the results of the statistically significant increasing and decreasing trends (95 percent confidence level) identified by the Mann-Kendall analyses is presented in Table 3-2 for northeast monitoring locations. The full results of the Mann-Kendall analyses are included in Appendix C.

The only statistically significant trend (95 percent confidence level) for specific conductance at northeast monitoring locations was for a five-year decreasing trend at MW98-601A.

There is a statistically significant decreasing trend (95 percent confidence level) for arsenic at MW97-123 for the past five years.

TABLE 3-2

SUMMARY OF MANN-KENDALL ANALYSES AT NORTHEAST MONITORING WELLS

Monitoring Location	Decreasing Trends						Increasing Trends					
	3-Year			5-Year			3-Year			5-Year		
	Multiple Parameters with Trend [1]	Specific Conductance	Dissolved Methane	Multiple Parameters with Trend [1]	Specific Conductance	Dissolved Methane	Multiple Parameters with Trend [1]	Specific Conductance	Dissolved Methane	Multiple Parameters with Trend [1]	Specific Conductance	Dissolved Methane
MW97-123	No	No	NS	No	No	NS	No	No	NS	Yes (3) organic carbon, iron, pH	No	NS
509A	-	No	NS	-	No	NS	-	No	NS	-	No	NS
509B	No	No	NS	No	No	NS	No	No	NS	No	No	NS
P-911B	-	No	NS	-	No	NS	-	No	NS	-	No	NS
MW98-601A	-	No	NS	-	Yes	NS	-	No	NS	-	No	NS
MW98-601B	-	No	NS	-	No	NS	-	No	NS	-	No	NS
MW01-602B	-	No	NS	-	No	NS	-	No	NS	-	No	NS

Notes:
1 Number of parameters with trend shown in parenthesis for analyses with three or more trends (95 percent confidence level). Locations monitored for field parameters only are not assessed for multiple (three or more) parameters.

NS – parameter not analyzed for a specific location
I – insufficient sample data points for analyses

Detection Monitoring Parameters

MW97-123 and 509B are monitored for a broad list of detection monitoring parameters. 509A, MW98-601A, and MW98-601B are monitored for field parameters only. The results of 2020 detection monitoring at MW97-123 and 509B are summarized in Appendix B and are discussed below.

Despite the recent statistically significant increasing trends (95 percent confidence level) for three parameters at monitoring location MW97-123 (see Table 3-2), many detection monitoring parameter values in 2020 remain lower compared to those at the start of post-closure monitoring in 2011. Parameters with overall lower values in 2020 than in 2011 at MW97-123 include specific conductance (33 percent decrease), arsenic (an approximate 85 percent decrease), calcium (40 percent decrease), sodium (25 percent decrease), total dissolved solids (36 percent decrease), magnesium (33 percent decrease), manganese (32 percent decrease), potassium (17 percent decrease), sulfate (59 percent decrease), bicarbonate (15 percent decrease), and chloride (45 percent decrease). The overall water quality improvements at MW97-123 occurred primarily between 2011 and 2015.

The detection monitoring parameters have remained stable over the first ten years of post-closure monitoring at monitoring location 509B. There are not multiple parameters (i.e., three or more) with statistically significant increasing or decreasing trends (95 percent confidence level) over the past three years or five years at monitoring location 509B.

Arsenic

At the northeast on-site monitoring locations, arsenic concentrations are measured twice annually at monitoring locations 509B and MW97-123. Arsenic concentrations detected at these monitoring locations since October 2016 have generally been considerably lower than the arsenic concentrations detected in and prior to April 2016. A summary of 2020 arsenic concentrations at northeast on-site monitoring locations is provided in Table 3-3. These monitoring results are consistent with the generally site-wide lower arsenic values observed since October 2016, as discussed earlier in Section 3.0.

TABLE 3-3

ARSENIC CONCENTRATIONS AT NORTHEAST ON-SITE MONITORING LOCATIONS

Monitoring Well	Concentration (mg/L)		
	April 2020	October 2020	2016 Annual Maximum
509B	0.005 U	0.005	0.063
MW97-123	0.006	0.005 U	0.078

Notes:
U = not detected above indicated laboratory reporting limit

3.1.2 South On-Site Monitoring Locations

Monitoring locations south (i.e., southeast, south, and southwest) of the PTL are positioned in one of the two principal groundwater flow pathways away from the landfill. Groundwater quality south of the landfill is monitored by wells MW-906B, 641, and 200 to the southeast; MW02-801A, MW02-801B, MW03-802A, and MW03-802B directly south of the landfill; and MW03-803A, MW03-803B, and MW03-804A southwest of the landfill. During the post-closure period, monitoring locations MW02-801B and MW03-804A are monitored only for field parameters and monitoring locations MW03-802B and MW03-803A are monitored only for field parameters and dissolved methane. The remaining wells are tested for a broader list of detection monitoring parameters. Supplemental sampling parameters were also completed during 2020 as part of an investigation recommended by SME and MEDEP at MW03-802B and MW03-803A. These wells have exhibited increases for multiple parameters prior to and during the post-closure monitoring program. This was the fifth consecutive year of sampling for supplemental parameters at these locations. A discussion of the results of the supplemental sampling at MW03-802B and MW03-803A is provided later in this section, which includes recommendations for continued supplemental sampling in 2021 based on the supplemental data collected since 2016.

Corrective Actions

Corrective actions south of the landfill currently include groundwater extraction and landfill gas extraction. Groundwater quality data from wells south of the landfill have historically exhibited influence from Conventional Landfill leachate and landfill gas migration and site operations related to the secure landfills. Locations of corrective activities associated with the wells south of the landfills include: (1) the perimeter drain, which collects groundwater at the toe of the Conventional Landfill; (2) two groundwater extraction wells (i.e., EW-2R and EW-3R) that are operated proximate to wells located south and southeast of the Secure III Landfill; and (3) the passive landfill gas extraction trench and two landfill gas extractions wells (i.e., PTGW-08-12 and PTGW-08-13) proximate to the monitoring wells located south and southwest of the Secure III Landfill.

The south/southwest side of the landfill has been one of the principal directions of landfill gas migration from the Conventional Landfill. NEWSME monitors and operates the two perimeter extraction wells, PTGW-08-12 and PTGW-08-13, on the southwest side of the landfill. Additionally, passive landfill gas extraction continues at the vents that were installed in a trench southwest of the landfill. As shown on Table 3-1, groundwater quality with respect to dissolved methane concentrations has substantially improved at the dissolved methane sampling locations south of the landfill (i.e., 641, MW02-801A, MW03-802A, MW03-802B, MW03-803A, and MW03-803B). The decreases in dissolved methane concentrations have resulted in a statistically significant decreasing trend (95 percent confidence level) for the past five years at monitoring location MW02-801A. Mean annual dissolved methane concentrations have decreased since the start of closure activities at the PTL in 2008 by approximately 57 percent at monitoring location 641, 86 percent at MW02-801A, 94 percent at MW03-802A, 32 percent at MW03-802B, 96 percent at MW03-803A, and 92 percent at MW03-803B. These decreasing methane concentrations are likely attributed to:

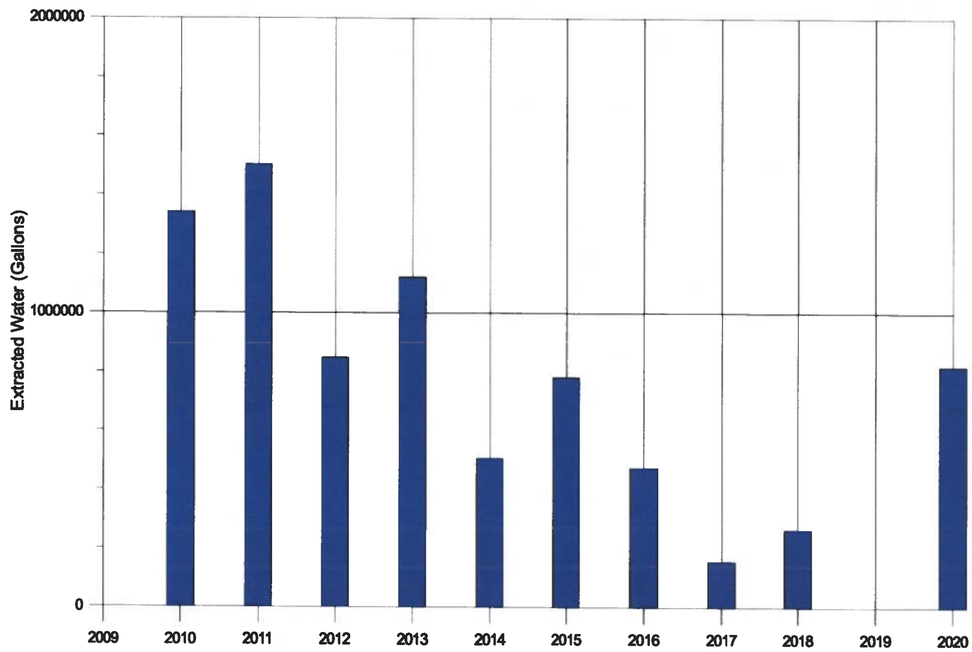
1. the overall decrease in methane generated by the Conventional Landfill, as observed in a general site-wide trend of decreasing methane concentrations detected at the various monitoring points (see Section 6.0);
2. the removal of methane from the passive landfill gas extraction trench; and
3. the removal of methane from gas extraction wells PTGW-08-12 (8 tons of methane removed during 2020) and PTGW-08-13 (3 tons of methane removed during 2020).

Corrective activities south of the landfill also includes groundwater extraction from the PDPS and from two wells (EW-2R and EW-3R) proximate to the perimeter of the Conventional Landfill. Approximately 3,811,390 gallons of water were extracted from the PDPS in 2020. Approximately 818,824 gallons of water were extracted from the south groundwater extraction wells in 2020.

Total annual groundwater extraction from EW-2R and EW-3R is shown on Figure 3-4, with data since the first full year that these two wells operated together in 2010. The combined pumping total of 818,824 gallons from the south PTL extraction wells in 2020 (March 2020 through December 2020) is a return to higher annual total flows compared to their inactivity in 2019 and their combined total extraction flow of 265,776 gallons in 2018. The combined 2020 total extraction flow for EW-2R and EW-3R was the greatest pumped from these locations since 1,121,000 gallons were pumped in 2013.

FIGURE 3-4

**GROUNDWATER PUMPED FROM SOUTH EXTRACTION WELLS
EW-2R AND EW-3R**



Greater extraction rates during closure and early into the post-closure period (i.e., an average of 1,203,394 gallons pumped per year from 2010 through 2013) compared to more recent years prior to 2020 (i.e., an average of 363,920 gallons pumped per year from 2014 through 2019) appears to correlate with groundwater quality trends at some south PTL groundwater monitoring locations during these periods. Optimizing groundwater extraction from EW-2R and EW-3R (as well as at the PDPS and other groundwater extraction wells at the PTL) during the remainder of closure will play a key role in achieving the PTL on-site threshold criteria.

Specific Conductance

Table 3-1 provides a relative assessment of specific conductance values for the south monitoring locations during 2020 compared to historical data from the previous year, at the start of landfill closure activities (i.e., 2008), and the historical maximum detection results at each well. Six of the ten south monitoring locations had 2020 mean specific conductance values that were lower than the mean values at the start of landfill closure activities in 2008. It is notable that the improvements are observed at monitoring wells located southeast and directly south of the PTL (i.e., MW-906B, 200, 641, MW02-801A, MW02-801B, and MW03-802A), which located close to extraction wells EW-2R and EW-3R. The increases in specific conductance values since 2008 have occurred at MW03-802B and monitoring locations southwest of the PTL (i.e., MW03-803A, MW03-803B, and MW04-804A), farther from extraction locations.

Mean specific conductance values were lower at four of the ten south wells during 2020 compared to 2019. In comparison to the previous year's evaluation, mean specific conductance values were lower at eight of the ten south wells during 2019 compared to 2018. The fewer monitoring locations with lower mean specific conductance values during 2020 compared to 2019 is likely attributed to EW-2R and EW-3R being offline during 2019 and through late March 2020 due to repairs and on-site improvement projects.

Mean specific conductance values were lower during 2020 than 2019 at groundwater monitoring locations 200 (14 percent decrease), MW02-801A (13 percent decrease), MW02-801B (19 percent decrease), and MW03-802B (5 percent decrease). Mean specific conductance values increased during 2020 compared to 2019 at groundwater monitoring locations MW-906B (7 percent increase), 641 (19 percent increase), MW03-802A (65 percent increase), MW03-803A (2 percent increase), MW03-803B (7 percent increase), and MW03-804A (3 percent increase).

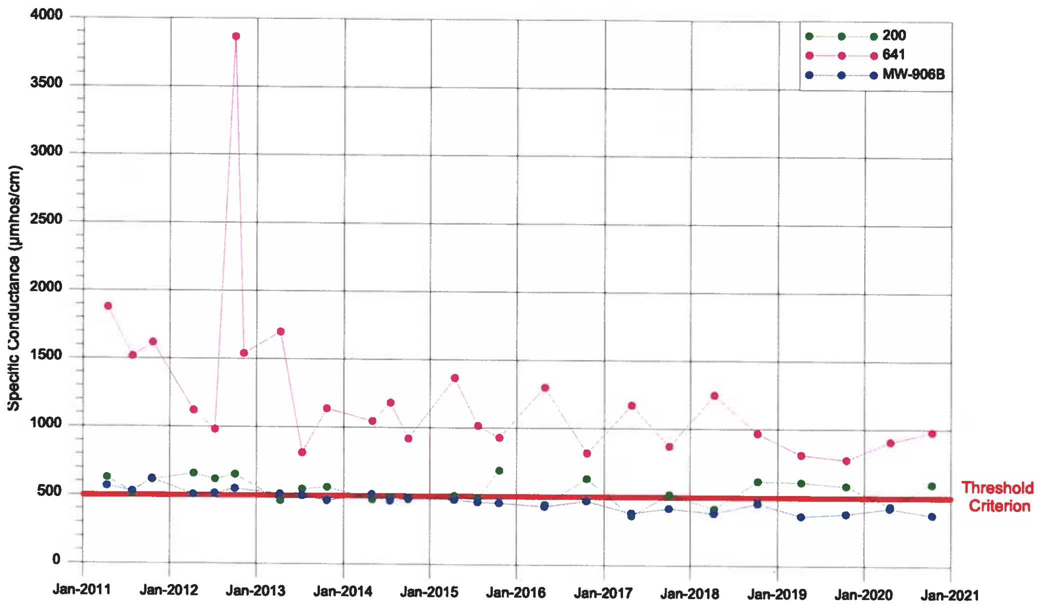
The specific conductance value measured at MW02-801B during the October 2020 monitoring event (667 µmhos/cm) was a new historical minimum value. The specific conductance value measured at MW03-803B during the October 2020 monitoring event (1,591 µmhos/cm) was a new historical maximum value. The remaining specific conductance values measured at the south monitoring locations during 2020 were within their respective historical ranges.

The post-closure threshold value for specific conductance in on-site groundwater is 500 µmhos/cm. At south on-site groundwater monitoring locations, this threshold was met at: (1) MW-906B in April 2020 (423 µmhos/cm) and October 2020 (373 µmhos/cm); and (2) monitoring location 200 in April 2020 (436 µmhos/cm). The specific conductance values at the rest of the on-site south monitoring locations were over the on-site post-closure threshold value during 2020.

Post-closure specific conductance values at the monitoring locations proximate to the southeast perimeter of the Conventional Landfill are shown on Figure 3-5.

FIGURE 3-5

SPECIFIC CONDUCTANCE
SOUTH ON-SITE MONITORING LOCATIONS (SOUTHEAST LOCATIONS)



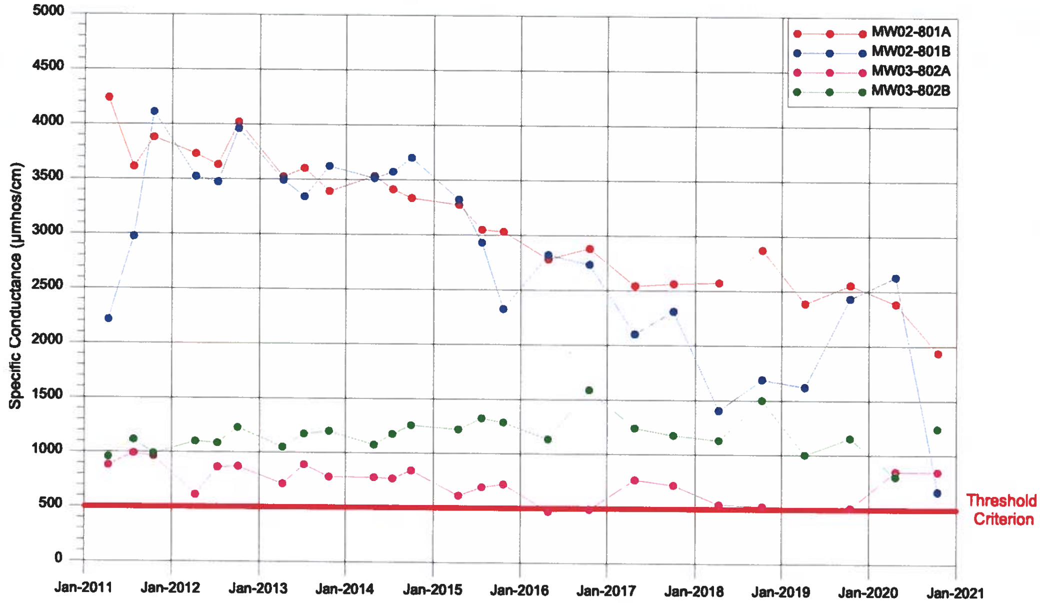
The specific conductance values at MW-906B have been under the threshold value for specific conductance in on-site groundwater since July 2014. During the post-closure monitoring period, the specific conductance values at monitoring location 200 have periodically been under the threshold value for specific conductance in on-site groundwater since 2013.

Specific conductance values at monitoring location 641 remain above the post-closure threshold of 500 µmhos/cm. Although specific conductance values were higher in 2020 compared to 2019, they have generally declined during post-closure monitoring. Monitoring location 641 is in proximity to south extraction wells EW-2R and EW-3R (see Figure 1-1). The greater specific conductance values at monitoring location 641 in 2020 compared to 2019 are likely associated with the inactivity of EW-2R and EW-3R during 2019 and through late March 2020. Extraction wells EW-2R and EW-3R resumed operation in late March 2020 and pumped 818,824 gallons through December 2020. Groundwater quality improvements are expected at monitoring location 641 with continued operation of the south extraction wells.

Post-closure specific conductance values at the monitoring locations more directly south of the perimeter of the Conventional Landfill are shown on Figure 3-6.

FIGURE 3-6

SPECIFIC CONDUCTANCE
SOUTH ON-SITE MONITORING LOCATIONS (DIRECTLY SOUTH LOCATIONS)



Monitoring locations MW02-801A and MW02-801B historically have had the highest specific conductance values at the PTL, but they have shown significant decreases over the first ten years of post-closure monitoring. Mean 2020 specific conductance values at monitoring locations MW02-801A and MW02-801B have decreased from mean 2011 specific conductance values by 45 percent and 47 percent, respectively. Monitoring location MW02-801B has a new historical minimum specific conductance value (667 µmhos/cm) in October 2020, which is a significant decrease from the specific conductance value measured in April 2020 (2,626 µmhos/cm). Monitoring location MW02-801B is in proximity to south extraction wells EW-2R and EW-3R (see Figure 1-1) and both MW02-801B and the south extraction wells are screened in the shallow overburden. Review of Figure 3-6 shows a correlation between the specific conductance trend from 2018 through 2020 at MW02-801B and the inactivity of EW-2R and EW-3R during 2019 and through late March 2020. The resumed operation of extraction wells EW-2R and EW-3R in late March 2020 resulted in the resumed trajectory of specific conductance decreases at MW02-801B. The specific conductance values at MW02-801B have now steadily decreased from 4,110 µmhos/cm in October 2011 to a value rapidly approaching the on-site threshold criteria of 500 µmhos/cm in October 2020.

It is significant that the south extraction wells do not serve as a cutoff between the Conventional Landfill and MW02-801A and MW02-801B. The groundwater sampled from MW02-801A and MW02-801B emanates from the south side of the Conventional Landfill and improving groundwater quality at these monitoring locations is indicative of improvement to groundwater quality emanating from the south side of the Conventional Landfill. Future optimization of groundwater extraction from EW-2R and EW-3R will serve to both: (1) accelerate capture of the finite influences on water quality from the south side of the Conventional Landfill to further improve water quality in downgradient areas; and (2) serve as a hydraulic barrier between the Conventional Landfill and groundwater further downgradient from it (e.g., groundwater at monitoring location 200).

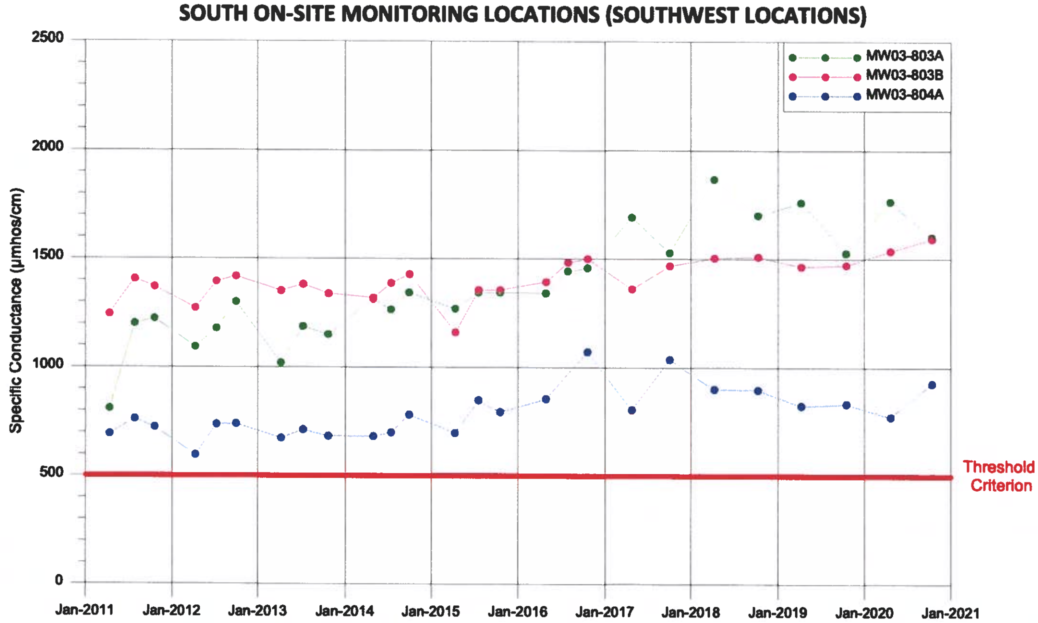
At monitoring location MW03-802A, specific conductance values have decreased during post-closure monitoring. The mean specific conductance value at MW03-802A for 2018 through 2019 was 526 µmhos/cm, which is just above the on-site post-closure threshold. The mean of specific conductance values measured during 2020 at MW03-802A (844 µmhos/cm) rebounded from the past two years but remained lower than the 2011 mean specific conductance value of 941 µmhos/cm at the start of post-closure monitoring.

At MW03-802B, specific conductance values generally increased for the first six years of post-closure monitoring (i.e., from 2011 through 2016). Specific conductance values have since steadily decreased from a 2016 mean of 1,361 µmhos/cm to a 2020 mean of 1,023 µmhos/cm. Monitoring location MW03-802B, which is currently being investigated with supplemental sampling, is discussed further later in this section.

Post-closure specific conductance values at the monitoring locations southwest of the perimeter of the Conventional Landfill are shown on Figure 3-7.

FIGURE 3-7

SPECIFIC CONDUCTANCE
SOUTH ON-SITE MONITORING LOCATIONS (SOUTHWEST LOCATIONS)



Specific conductance values have generally increased since the start of post-closure monitoring at monitoring locations MW03-803A, MW03-803B, and MW03-804A. Specific conductance values have five-year statistically significant increasing trends (95 percent confidence level) at MW03-803A and MW03-803B. These trends visually appear to be stabilizing over the past three years, which is supported by the lack of statistically significant increasing trends (95 percent confidence level) at these locations over the past three years. The 2020 mean specific conductance value at MW03-803A of 1,682 µmhos/cm has decreased from the April 2018 historical maximum value of 1,867 µmhos/cm. Monitoring location MW03-803A is currently being investigated with supplemental sampling and is discussed further later in this section. At MW03-803B, there was a new historical maximum specific conductance value of 1,591 µmhos/cm in October 2020.

At MW03-804A, specific conductance values generally increased for the first six years of post-closure monitoring (i.e., from 2011 through 2016). Specific conductance values have since steadily decreased from a 2016 mean of 962 µmhos/cm to a 2020 mean of 849 µmhos/cm.

Trend Analysis

A summary of the results of the statistically significant increasing and decreasing trends (95 percent confidence level) identified by the Mann-Kendall analyses are presented in Table 3-4 for south monitoring locations. The full results of the Mann-Kendall analyses are included in Appendix C.

TABLE 3-4

SUMMARY OF MANN-KENDALL ANALYSES AT SOUTH MONITORING WELLS

Monitoring Location	Decreasing Trends						Increasing Trends					
	3-Year			5-Year			3-Year			5-Year		
	Multiple Parameters with Trend [1]	Specific Conductance	Dissolved Methane	Multiple Parameters with Trend [1]	Specific Conductance	Dissolved Methane	Multiple Parameters with Trend [1]	Specific Conductance	Dissolved Methane	Multiple Parameters with Trend [1]	Specific Conductance	Dissolved Methane
MW-906B	No	No	NS	No	No	NS	No	No	NS	No	No	NS
200	No	No	NS	No	No	NS	No	No	NS	Yes (3) organic carbon, pH, potassium	No	NS
641	No	No	I	No	No	No	No	No	I	No	No	No
MW02-801A	Yes (4) specific conductance, magnesium, sodium, potassium	Yes	I	Yes (7) specific conductance, dissolved methane, magnesium, nickel, total dissolved solids, sodium, potassium	Yes	Yes	No	No	I	No	No	No
MW02-801B	-	No	NS	-	No	NS	-	No	NS	-	No	NS
MW03-802A	No	No	I	No	No	No	No	No	I	No	No	No
MW03-802B	-	No	I	No	No	No	-	No	I	No	No	No
MW03-803A	-	No	I	No	No	No	-	No	I	No	Yes	No
MW03-803B	No	No	I	No	No	No	No	No	I	Yes (4) specific conductance, potassium, sodium, magnesium	Yes	No
MW03-804A	-	No	NS	-	No	NS	-	No	NS	-	No	NS

Notes:

1 Number of parameters with trend shown in parenthesis for analyses with three or more trends (95 percent confidence level). Locations monitored for field parameters only are not assessed for multiple (three or more) parameters.

NS – parameter not analyzed for a specific location
I – insufficient sample data points for analyses

There is a statistically significant decreasing trend (95 percent confidence level) for arsenic at monitoring location MW03-803A for the past five years.

The Mann-Kendall results indicate improvements to groundwater quality south of the Conventional Landfill at MW02-801A over the past three years and five years.

Detection Monitoring Parameters

MW02-801B and MW03-804A are monitored for field parameters only, as specified in the post-closure EMP. Monitoring locations MW-906B, 200, 641, MW02-801A, MW03-802A, and MW03-802B are monitored for a broad list of detection monitoring parameters. During 2020 and since 2016, supplemental sampling was completed as part of an investigation recommended by SME and MEDEP at MW03-802B and MW03-803A, which have exhibited increases for multiple parameters prior to and during the post-closure monitoring periods. In addition to the monitoring of field parameters and dissolved methane specified in the post-closure EMP, these wells were sampled for a broader list of detection parameters, including VOCs, in October 2020. The results of 2020 detection monitoring locations south of the Conventional Landfill are summarized in Appendix B and are discussed below.

Southeast Monitoring Locations: Multiple parameters at monitoring locations 200, 641, and MW-906B have generally steady decreases during the first ten years of post-closure monitoring. At monitoring location 200, the parameters that have lower annual mean values in 2020 compared to at the start of post-closure monitoring in 2011 include specific conductance (12 percent decrease), arsenic (33 percent decrease), sodium (31 percent decrease), total dissolved solids (19 percent decrease), magnesium (38 percent decrease), manganese (12 percent decrease), sulfate (55 percent decrease), and bicarbonate (7 percent decrease).

At monitoring location 641, the parameters that have lower annual mean values in 2020 compared to at the start of post-closure monitoring in 2011 include specific conductance (43 percent decrease), methane (73 percent decrease), arsenic (72 percent decrease), calcium (29 percent decrease), sodium (58 percent decrease), total dissolved solids (43 percent decrease), magnesium (41 percent decrease), manganese (27 percent decrease), potassium (65 percent decrease), sulfate (44 percent decrease), bicarbonate (30 percent decrease), chloride (70 percent decrease), iron (77 percent decrease), and organic carbon (25 percent decrease).

At monitoring location MW-906B, the parameters that have lower annual mean values in 2020 compared to at the start of post-closure monitoring in 2011 include specific conductance (31 percent decrease), arsenic (an approximate 50 percent decrease), calcium (19 percent decrease), sodium (42 percent decrease), total dissolved solids (28 percent decrease), manganese (42 percent decrease), sulfate (21 percent decrease), and chloride (55 percent decrease).

Directly South Monitoring Locations: Multiple parameters at monitoring locations MW02-801A and MW03-802A have generally steady decreases during the first ten years of post-closure monitoring. At monitoring location MW02-801A, the parameters that have lower annual mean values in 2020 compared to at the start of post-closure monitoring in 2011 include specific conductance (45 percent decrease), methane (81 percent decrease), arsenic (50 percent decrease), calcium (25 percent decrease), sodium (48 percent decrease), total dissolved solids (41 percent decrease), magnesium (35 percent decrease), manganese (41 percent decrease), potassium (40 percent decrease), bicarbonate (31 percent decrease), chloride (53 percent decrease), iron (58 percent decrease), organic carbon (50 percent decrease), cobalt (≥38 percent decrease), lead (≥63 percent decrease), and nickel (52 percent decrease).

At monitoring location MW03-802A, the parameters that have lower annual mean values in 2020 compared to at the start of post-closure monitoring in 2011 include specific conductance (10 percent decrease), methane (96 percent decrease), arsenic (≥85 percent decrease), sodium (31 percent decrease), magnesium (65 percent decrease), potassium (50 percent decrease), sulfate (≥56 percent decrease), bicarbonate (52 percent decrease), and iron (93 percent decrease).

South monitoring location MW03-802B, which is currently being investigated with supplemental sampling, is further discussed later in this section.

Southwest Monitoring Locations: MW03-803B is the shallow southwest monitoring location paired with deeper monitoring location MW03-803A. Groundwater quality during the first ten years of post-closure monitoring at MW03-803B is characterized by a set of parameters with increasing values and a set of parameters with decreasing values.

The parameters at MW03-803B that have higher annual mean values in 2020 compared to the start of post-closure monitoring in 2011 include specific conductance (17 percent increase), sodium (34 percent increase), magnesium (101 percent increase), potassium (74 percent increase), chloride (266 percent increase), iron (32 percent increase), and turbidity (493 percent increase).

The parameters at MW03-803B that have lower annual mean values in 2020 compared to at the start of post-closure monitoring in 2011 include methane (93 percent decrease), arsenic (90 percent decrease), manganese (63 percent decrease), bicarbonate (19 percent decrease), cobalt (68 percent decrease), and nickel (87 percent decrease).

Monitoring location MW03-803A, which is currently being investigated with supplemental sampling, is further discussed later in this section.

Supplemental Monitoring at MW03-802B and MW03-803A: 2020 was the fifth year of supplemental sampling at MW03-802B and MW03-803A. The supplemental sampling at these locations was initiated to investigate increasing specific conductance values during the early to mid-2010s. In most cases, the supplemental sampling parameters were previously included in routine sampling prior to post-closure monitoring. The supplemental sampling results from 2016 through 2020 confirm many of the detection monitoring parameters at MW03-802B and MW03-803A, which had previously not been sampled since 2010, have increased since the start of the post-closure monitoring period. One or more VOCs were detected above their respective laboratory reporting limits at MW03-802B and MW03-803A in 2020, which are summarized later in this section.

The noted increases in parameter concentrations at MW03-802B and MW03-803A likely signify groundwater quality impacts from a condition in the landfill cover on the southwest side of the landfill identified by NEWSME on June 21, 2016. Leachate was noted to be draining from several defects in the cover onto the soils surrounding the landfill. The length of time that this condition existed is unknown. This condition was reported to the MEDEP on the same day; NEWSME then removed the visually impacted soils and repaired the cover during the week of July 10, 2016.

The noted leachate seeps from the cover defects may have been associated with the leachate recirculation program. Approximately 2,615,975 gallons of leachate and condensate was recirculated into the Secure III Landfill in 2016, which followed the approximately 4,256,525 gallons recirculated in 2015. Since then, less leachate has been recirculated into the Secure III Landfill with consecutively decreasing volumes of approximately 1,296,813 gallons (2017), 371,428 gallons (2018), 355,488 gallons (2019), and 169,316 gallons (2020).

MW03-803B and MW03-804A, which are also located on the southwest side of the landfill, have shown some similar water quality changes to those at MW03-802B and MW03-803A. Recent water quality at MW03-802B, MW03-803A, MW03-803B, and MW03-804A share some characteristics that may also suggest influence from the abated leachate seeps from the landfill cover defects. MW03-802B, MW03-803A, and MW03-803B all had substantial increases in dissolved oxygen concentrations starting in 2015. For example, dissolved oxygen concentrations at MW03-802B were typically around 1 milligram per liter (mg/L) or less from the start of landfill closure in 2008 to 2014, but they increased to values as high as 5.4 mg/L in October 2017. The dissolved oxygen at MW03-804A, which is located at a greater distance from the repaired landfill cover defects, also began to increase in 2017. Iron concentration increases from the increased dissolved oxygen concentrations have been observed at MW03-802B, MW03-803A, and MW03-803B.

A potential source of the higher dissolved oxygen concentrations may be from the conditions near the well associated with the removal of the impacted soil from the leachate seeps cleaned up in 2016. In 2020, the dissolved oxygen concentrations at MW03-802B, MW03-803A, MW03-803B, and MW03-804A have returned to or have started to return to concentrations similar to those prior to the noted increases.

With more than four years of monitoring data since the corrective actions completed in 2016, there are many parameters at MW03-802B and MW03-803A that have remained below peak values detected in 2016 or early 2017. These observations are summarized in Table 3-5.

TABLE 3-5

SUMMARY OF RECENT WATER QUALITY AT MW03-802B and MW03-803A

Monitoring Location	Parameters	Recent Peak Concentration and Date	October 2020 Value
MW03-802B	Specific Conductance (µmhos/cm)	**1,587 (Oct-2016)**	1,023 [1]
	Total Dissolved Solids (mg/L)	**877 (Oct-2016)**	733
	Arsenic (mg/L)	**0.146 (Apr-2016)**	0.050
	Calcium (mg/L)	140 (Apr-2017)	110
	Magnesium (mg/L)	**57 (Apr-2017)**	43
	Manganese (mg/L)	22.3 (Apr-2016)	5.7
	Bicarbonate (mg/L)	575 (Oct-2016)	530
	Nickel (mg/L)	0.029 (Oct-2016)	0.006
	Organic Carbon (mg/L)	8.7 (Oct-2016)	**110** [2]
	Potassium (mg/L)	13.1 (Oct-2016)	9.4
	Chloride (mg/L)	140 (Apr-2017)	93
	Sodium (mg/L)	**71.3 (Oct-2016)**	50
MW03-803A	Specific Conductance (µmhos/cm)	**1,867 (Apr-2018)**	1,682 [1]
	Total Dissolved Solids (mg/L)	**1,178 (Apr-2017)**	1,007
	Arsenic (mg/L)	**0.048 (Jul-2016)**	0.005
	Calcium (mg/L)	222 (Oct-2016)	190
	Magnesium (mg/L)	**75 (Apr-2017)**	59
	Manganese (mg/L)	3.13 (Jul-2016)	3.4
	Bicarbonate (mg/L)	491 (Jul-2016)	610
	Nickel (mg/L)	**0.020 (Apr-2017)**	0.010
	Organic Carbon (mg/L)	2 U (Apr-2016)	**94** [2]
	Potassium (mg/L)	3.3 (Apr-2017)	2.6
	Chloride (mg/L)	**450 (Apr-2017)**	1 U
	Sodium (mg/L)	**42 (Apr-2017)**	26

Notes:
1 Mean value from April 2020 and October 2020.
2 Due to an identified laboratory instrumentation malfunction, this analytical result is likely elevated. The 110 mg/L organic carbon at MW03-802B is anomalously greater than the previous historical maximum value of 8.7 mg/L. The 94 mg/L organic carbon at MW03-803A is anomalously greater than the previous historical maximum value of 5.8 mg/L.
U – Not detected above indicated laboratory reporting limit.

Bold text indicates historical maximum value.

Since 2020 was the fifth year of supplemental monitoring at MW03-802B and MW03-803A, these locations now become eligible for five-year Mann-Kendall trend analyses for the supplemental monitoring parameters. The results of the five-year Mann Kendall trend analyses show positive signs that the groundwater quality at these monitoring locations has stabilized. There are no parameters at MW03-802B with five-year statistically significant increasing trends (95 percent confidence level). Visual review of the specific conductance data at MW03-802B shows a clear decreasing trend since October 2016. Specific conductance is the only parameter at MW03-803A with a five-year statistically significant increasing trend (95 percent confidence level). Visual review of the specific conductance data at MW03-803A shows stable values since October 2018 with a slight decrease from the historical maximum value measured in April 2018. The improvements to groundwater quality with respect to specific conductance values are likely to have been observed sooner at MW03-802B than MW03-803A because MW03-802B is located further from the landfill cover defects observed on the southwest corner of the landfill.

Based on these noted groundwater quality trends and the water quality data summarized in Table 3-5, water quality at these wells shows some signs of overall improvement following abatement of the cover defects. Continued monitoring in 2021 will be useful to determine if these tendencies continue. We recommend that supplemental sampling at these two locations be continued in 2021 as they were done in 2020.

VOCs: Samples for laboratory analysis of VOCs were obtained and analyzed during the October 2020 monitoring event at south monitoring locations MW02-801A, MW03-802A, MW03-802B, MW03-803A, and MW03-803B. There were no VOCs (excluding dissolved methane) detected above their respective laboratory reporting limits during 2020 at monitoring location MW03-802A. The VOCs detected above laboratory reporting limits at the south on-site monitoring locations are included in the historical water quality data summary reports in Appendix B. Only one VOC detected above laboratory reporting limits, vinyl chloride, was at a concentration above an MCL and/or MEG. Vinyl chloride was detected at MW03-802B at a concentration of 1.2 µg/L in October 2020, which is below its MCL of 2 µg/L and above its MEG of 0.2 µg/L. This is consistent with previous vinyl chloride MEG exceedances at MW03-802B. Vinyl chloride was detected at MW03-803B at a concentration of 1.6 µg/L in October 2020, which is below its MCL of 2 µg/L and above its MEG of 0.2 µg/L. This is consistent with previous vinyl chloride MEG exceedances at MW03-803B. Water quality parameters less than applicable groundwater MCLs and MEGs at on-site monitoring wells is not a post-closure threshold criterion given in the Department Closure Order.

VOC detections during 2020 at the south monitoring locations are consistent with historical VOC detections at these monitoring locations. With the exception of the new historical maximum diethyl ether concentration detected at MW03-803A in October 2020, all 2020 VOC detection concentrations at the south monitoring locations remained below their respective historical maximum values. Diethyl ether was added to the VOC monitoring program in 2016.

Arsenic

At the south on-site monitoring locations, arsenic concentrations were measured during both 2020 sampling events at monitoring locations MW-906B, 200, 641, MW02-801A, MW03-802A, and MW03-803B; and once in October 2020 at MW03-802B and MW03-803A. Arsenic concentrations detected at these monitoring locations have been considerably lower than the annual maximum arsenic concentrations detected in 2016. A summary of 2020 arsenic concentrations at south on-site monitoring locations is provided in Table 3-6. These monitoring results are consistent with the generally site-wide lower arsenic values observed since October 2016, as discussed earlier in Section 3.0.

TABLE 3-6

ARSENIC CONCENTRATIONS AT SOUTH ON-SITE MONITORING LOCATIONS

Monitoring Well	Concentration (mg/L)		
	April 2020	October 2020	2016 Annual Maximum
MW-906B	0.005 U	0.005 U	0.026
200	0.029	0.033	0.057
641	0.027	0.009	0.067
MW02-801A	0.026	0.078	0.256
MW03-802A	0.005 U	0.005 U	0.034
MW03-802B	NS	0.050	0.146
MW03-803A	NS	0.005	0.048
MW03-803B	0.015	0.008	0.181

Notes:
U = not detected above indicated laboratory reporting limit
NS = not sampled

3.1.3 North On-Site Monitoring Location

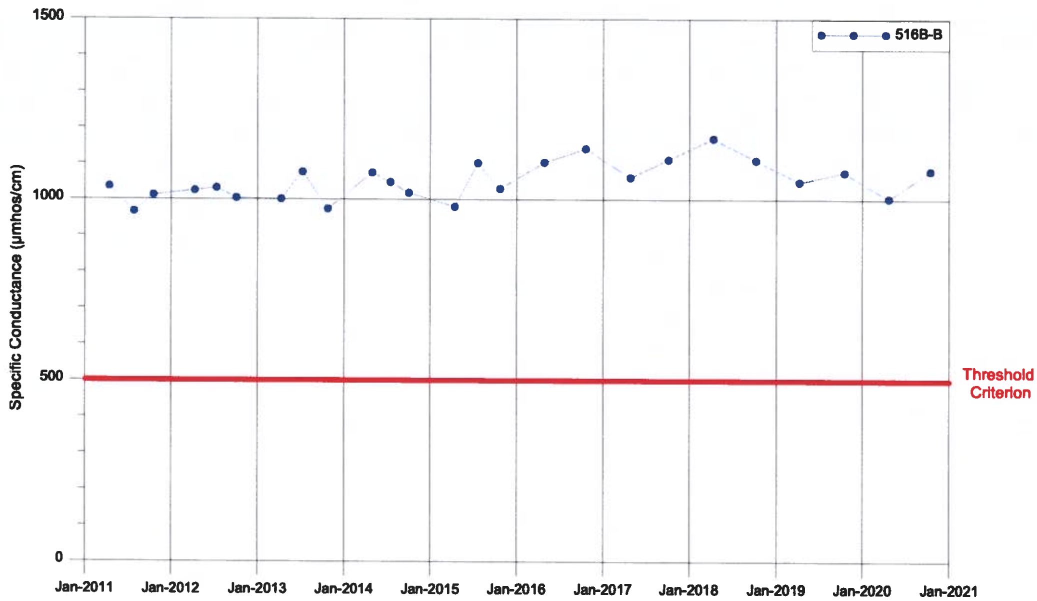
Monitoring well 516B-B monitors groundwater quality in the bedrock at the north corner of the PTL site. This well is hydraulically upgradient of the Conventional Landfill and Secure Landfills. Similar to water quality at 509B (as discussed in Section 3.1.1), the close proximity of 516B-B to the site facilities may indicate landfill influences; however, the presence of Interstate 95 and other upgradient site activity in close proximity to this well needs to be considered when reviewing the water quality data.

Specific Conductance

North on-site specific conductance results are summarized in Table 3-1 for 2020 and show that monitoring well 516B-B is above the on-site closure threshold value of 500 μmhos/cm. Specific conductance values at 516B-B have been rather steady during post-closure monitoring at the PTL, which is illustrated on Figure 3-8. The 2020 annual mean specific conductance value at 516B-B has increased by 4 percent compared to the annual mean specific conductance value at the start of post-closure monitoring in 2011. The average of annual specific conductance values at 516B-B have generally decreased (9 percent decrease) since 2018.

FIGURE 3-8

SPECIFIC CONDUCTANCE
NORTH ON-SITE MONITORING LOCATION



Trend Analysis

A summary of the results of the statistically significant increasing and decreasing trends (95 percent confidence level) identified by the Mann-Kendall analyses are presented in Table 3-7 for monitoring location 515B-B. The full results of the Mann-Kendall analyses are included in Appendix C.

TABLE 3-7

SUMMARY OF MANN-KENDALL ANALYSES AT NORTH MONITORING WELL

Monitoring Location	Decreasing Trends							Increasing Trends					
	3-Year			5-Year				3-Year			5-Year		
	Multiple Parameters with Trend [1]	Specific Conductance	Dissolved Methane	Multiple Parameters with Trend [1]	Specific Conductance	Dissolved Methane		Multiple Parameters with Trend [1]	Specific Conductance	Dissolved Methane	Multiple Parameters with Trend [1]	Specific Conductance	Dissolved Methane
516B-B	No	No	NS	No	No	NS		No	No	NS	No	No	NS

Notes:
1 Number of parameters with trend shown in parenthesis for analyses with three or more trends (95 percent confidence level). Locations monitored for field parameters only are not assessed for multiple (three or more) parameters.

NS – parameter not analyzed for a specific location
I – insufficient sample data points for analyses

There are not statistically significant increasing or decreasing trends (95 percent confidence level) for multiple parameters (i.e., three or more) at monitoring location 516B-B over the past three years and five years.

There are no statistically significant trends (95 percent confidence level) for specific conductance at 516B-B for the past three years or five years.

Detection Monitoring Parameters

Monitoring location 516B-B is monitored for a broad list of detection monitoring parameters. The results of 2020 detection monitoring at 516B-B are summarized in Appendix B and are discussed further below.

All parameters monitored at 516B-B in 2020 were within their respective historical ranges. With few exceptions, detection monitoring during post-closure monitoring at 516B-B has shown stable parameter values. Arsenic, manganese, and iron all increased in concentration at 516B-B during early post-closure monitoring, but have since begun to decrease. These trends are coupled with generally decreasing Eh values during early post-closure monitoring.

Arsenic

The 2020 annual maximum arsenic concentration at monitoring location 516B-B was 0.011 mg/L in October 2020, which is substantially lower than the historical maximum arsenic concentration of 0.062 mg/L detected at 516B-B in April 2016. This is consistent with generally site-wide lower arsenic concentrations since October 2016.

3.1.4 East On-Site Monitoring Locations

Shallow and deep bedrock groundwater quality east of the landfill are monitored by MW-916 and MW-917, respectively. Monitoring wells MW-916 and MW-917 were installed and constructed as landfill monitoring wells and their locations are in close proximity to the PTL site boundaries. Over their monitoring history, groundwater in these wells previously had high concentrations of bicarbonate and dissolved methane and low concentrations of leachate-related parameters. This indicates a primary historical influence from Conventional Landfill gas (i.e., carbon dioxide and methane). The groundwater quality in both wells is similar in concentrations and trends over time.

Corrective Activities

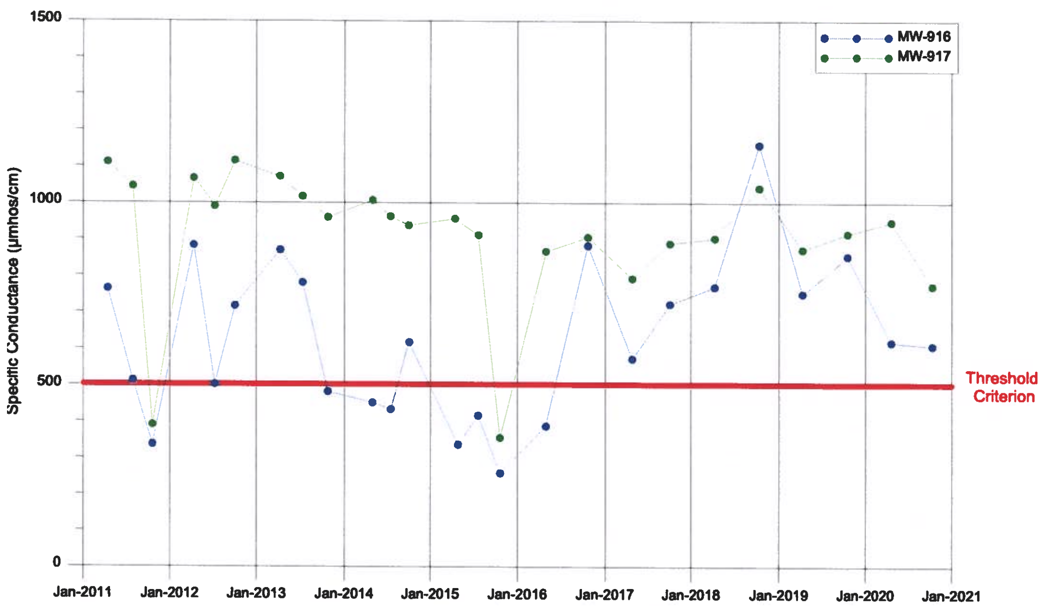
Substantial reductions in the concentrations of dissolved methane and bicarbonate at MW-916 and MW-917 since 2009 are attributed to the implemented corrective action plan; namely, the nearby perimeter landfill gas extraction wells located outside of the east perimeter of the Conventional Landfill that began operation in May 2009. About 126 tons of methane gas were removed during 2020 from PTGW-08-1, which is located east of the landfill. The annual mean bicarbonate concentration at MW-916 in 2020 (300 mg/L) has decreased by approximately 73 percent from a historical maximum value of 1,120 mg/L in October 2007 and the dissolved methane concentration at MW-916 in 2020 (not detected above the laboratory reporting limit of 20 µg/L) has decreased by more than 99 percent from a historical maximum value of 13,200 mg/L in October 2006. The mean bicarbonate concentration at MW-917 in 2020 (440 mg/L) has decreased by approximately 60 percent from a historical maximum value of 1,098 mg/L in March 2002 and the dissolved methane concentration at MW-917 in 2020 (53 µg/L) has decreased by more than 99 percent from a historical maximum value of 10,000 mg/L in April and June 2006.

Specific Conductance

The specific conductance values at MW-916 and MW-917 were above the post-closure threshold criterion of 500 µmhos/cm during 2020. Monitoring results at the east monitoring locations for specific conductance are summarized in Table 3-1 for 2020. Post-closure specific conductance values at monitoring locations east of the PTL (i.e., at MW-916 and MW-917) are shown on Figure 3-9.

FIGURE 3-9

SPECIFIC CONDUCTANCE
EAST ON-SITE MONITORING LOCATIONS



Specific conductance values at MW-916 and MW-917 generally decreased during the first five years of post-closure monitoring (i.e., 2011 through 2015). This was followed by generally increasing specific conductance values through 2018. The mean 2020 specific conductance values at MW-916 and MW-917 were 612 µmhos/cm and 860 µmhos/cm, respectively. Both values are lower than the mean 2018 specific conductance values at MW-916 (965 µmhos/cm) and MW-917 (973 µmhos/cm).

The 2020 annual mean specific conductance values at MW-916 and MW-917 have increased by approximately 14 percent and 1 percent, respectively, compared to the annual mean specific conductance values at the start of post-closure monitoring in 2011. As shown on Figure 3-9, specific conductance values have generally been decreasing at MW-916 and MW-917 for the past two years.

Trend Analysis

A summary of the results of the statistically significant increasing and decreasing trends (95 percent confidence level) identified by the Mann-Kendall analyses are presented in Table 3-8 for the east monitoring locations. The full results of the Mann-Kendall analyses are included in Appendix C.

TABLE 3-8

SUMMARY OF MANN-KENDALL ANALYSES AT EAST MONITORING WELLS

Monitoring Location	Decreasing Trends							Increasing Trends					
	3-Year			5-Year				3-Year			5-Year		
	Multiple Parameters with Trend [1]	Specific Conductance	Dissolved Methane	Multiple Parameters with Trend [1]	Specific Conductance	Dissolved Methane		Multiple Parameters with Trend [1]	Specific Conductance	Dissolved Methane	Multiple Parameters with Trend [1]	Specific Conductance	Dissolved Methane
MW-916	No	No	I	No	No	No		No	No	I	No	No	No
MW-917	No	No	I	No	No	No		No	No	I	No	No	No

Notes:

[1] Number of parameters with trend shown in parenthesis for analyses with three or more trends (95 percent confidence level). Locations monitored for field parameters only are not assessed for multiple (three or more) parameters.

NS – parameter not analyzed for a specific location
I – insufficient sample data points for analyses

There are not statistically significant increasing or decreasing trends (95 percent confidence level) for multiple parameters (i.e., three or more) at MW-916 and MW-917 over the past three years and five years.

There are no statistically significant trends (95 percent confidence level) for specific conductance at MW-916 and MW-917 for the past three years or five years.

There is a statistically significant decreasing trend (95 percent confidence level) for arsenic at MW-917 for the past five years.

Detection Monitoring Parameters

Monitoring locations MW-916 and MW-917 are monitored for a broad list of detection monitoring parameters. The results of 2020 detection monitoring at MW-916 and MW-917 are summarized in Appendix B. All parameters monitored at MW-916 and MW-917 in 2020 were within their respective historical ranges.

Multiple detection monitoring parameters at MW-916 have generally decreased in concentration since the start of post-closure monitoring in 2011: arsenic, calcium, magnesium, manganese, total dissolved solids, and bicarbonate.

At MW-917, arsenic, calcium, iron, magnesium, potassium, sodium, total dissolved solids, and bicarbonate have generally decreased in values since the start of post-closure monitoring in 2011.

The chloride concentrations at MW-916 and MW-917 remain very low with 2020 annual maximum concentrations of 8.2 mg/L (October 2020) and 4.7 mg/L (April 2020), respectively. The low chloride concentrations at MW-916 and MW-917 are an indication that the recent specific conductance increases are not associated with influence from PTL leachate.

A VOC sample was collected and analyzed during the October 2020 monitoring event at MW-916. There were no VOCs (excluding dissolved methane) detected above laboratory reporting limits at MW-916 in October 2020.

Arsenic

A summary of 2020 arsenic concentrations at east on-site monitoring locations is provided in Table 3-9. At the east on-site monitoring locations, arsenic concentrations were measured two times during 2020 at monitoring locations MW-916 and MW-917. The April and October 2020 arsenic concentration of 0.007 mg/L at MW-916 is well below the arsenic concentration at this location at the start of landfill closure monitoring in July 2008 (0.072 mg/L). Since October 2016, the arsenic concentrations detected at MW-917 have been considerably lower than the arsenic concentration detected in and prior to April 2016. These monitoring results from MW-917 are consistent with the generally site-wide lower arsenic values observed since October 2016, as discussed earlier in Section 3.0. There is a five-year statistically significant decreasing trend (95 percent confidence level) for arsenic at MW-917.

TABLE 3-9

ARSENIC CONCENTRATIONS AT EAST ON-SITE MONITORING LOCATIONS

Monitoring Well	Concentration (mg/L)		
	April 2020	October 2020	2016 Annual Maximum
MW-916	0.007	0.007	0.008
MW-917	0.091	0.088	0.185

Off-site Threshold Criteria

Although MW-916 and MW-917 are located slightly beyond the site property boundaries, they have historically been considered on-site wells due to their location relative to the landfill. Since they are located beyond the site property boundaries, the 2020 groundwater quality at MW-916 and MW-917 are also discussed here as they relate to the post-closure threshold criteria for off-site groundwater quality. These criteria include: (1) parameter concentrations below MCLs and MEGs; (2) a specific conductance upper 95 percent confidence limit of less than 400 µmhos/cm; and (3) a dissolved methane concentration of less than 700 µg/L. Comparison of 2020 water quality to these criteria is discussed below:

- MW-916, shallow groundwater:
    - The off-site groundwater quality threshold criterion for parameters with concentrations below MCLs and MEGs was satisfied at MW-916 during 2020;
    - The upper limit of the 95 percent confidence interval for specific conductance data at MW-916 for the past five years of the post-closure monitoring period (i.e., since 2016) is 862 µmhos/cm, which does not satisfy the off-site groundwater quality threshold criterion of 400 µmhos/cm; and
    - As discussed above, dissolved methane at MW-916 was not detected above the laboratory reporting limit of 20 µg/L in October 2020. Dissolve methane was detected at a concentration of 53 µg/L at MW-917 in October 2020. These concentrations satisfy the off-site groundwater quality threshold criterion of 700 µg/L for dissolved methane.
- MW-917, deep groundwater:
    - The arsenic concentrations at MW-917 exceeded the MCL and MEG of 0.01 mg/L in April 2020 (0.091 mg/L) and October 2020 (0.088 mg/L). The iron concentrations at MW-917 exceeded the MEG of 5 mg/L in April 2020 (6.8 mg/L) and October 2020 (6.5 mg/L). The manganese concentration at MW-917 exceeded the MEG of 0.3 mg/L in October 2020 (0.61 mg/L). These parameters have previously exceeded their respective standards at MW-917; and
    - The upper limit of the 95 percent confidence interval for specific conductance data at MW-917 for the past five years of the post-closure monitoring period (i.e., since 2016) is 938 µmhos/cm, which does not satisfy the off-site groundwater quality threshold criterion of 400 µmhos/cm.

3.1.5 West On-Site Monitoring Locations

Monitoring locations P-914A and P-914B are located over 800 feet to the west of the Conventional Landfill and are used to monitor bedrock groundwater quality. P-914B is monitored only for field parameters under the post-closure EMP. P-914A is monitored for field parameters as well as the detection monitoring parameters.

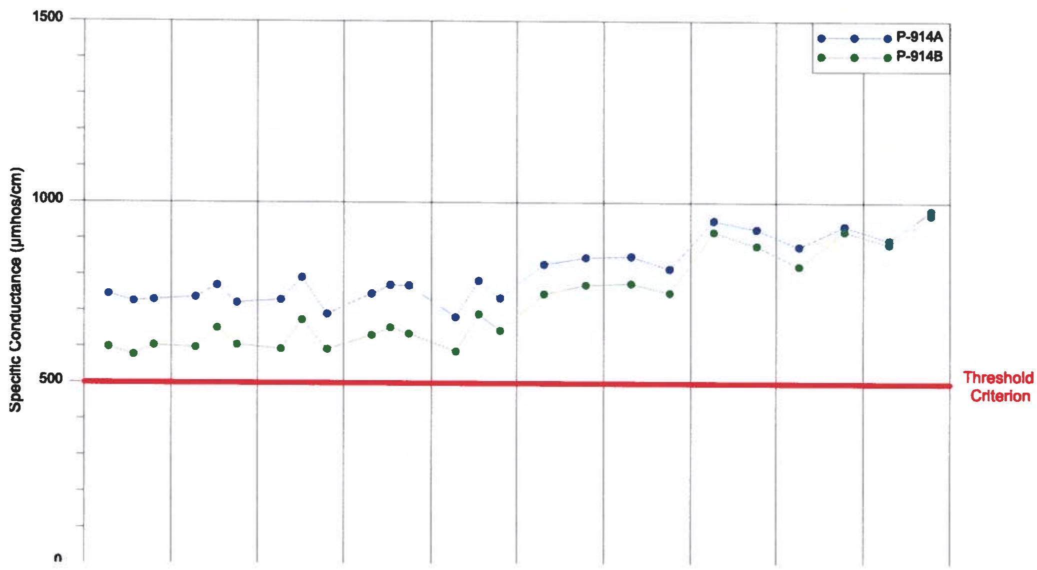
With respect to groundwater flow, this group of wells is cross-gradient to the Conventional Landfill and the Secure I, Secure II, and Secure III Landfills and downgradient from Interstate 95 and the PTL entrance road and scale. Historical water quality for multiple parameters at P-914A is generally similar to that at well 516B-B although with higher parameter values at 516-B, which is located much closer to Interstate 95. The effects of road salt and other upgradient site activities should be considered when reviewing water quality at both west on-site monitoring locations.

Specific Conductance

The specific conductance values at P-914A and P-914B were above the post-closure threshold criterion of 500 µmhos/cm during 2020. Monitoring results at the west monitoring locations for specific conductance are summarized in Table 3-1 for 2020. Post-closure specific conductance values at monitoring locations west of the PTL (i.e., at P-914A and P-914B) are shown on Figure 3-10.

FIGURE 3-10

SPECIFIC CONDUCTANCE
WEST ON-SITE MONITORING LOCATIONS



The mean 2020 specific conductance values at P-914A and P-914B were 936 µmhos/cm and 924 µmhos/cm, respectively. The 2020 specific conductance values at P-914A and P-914B were within their respective historical ranges.

Specific conductance values at P-914A and P-914B were rather stable during the first five years of post-closure monitoring (i.e., from 2011 through 2015) but have since generally increased through 2020. The 2020 annual mean specific conductance values at P-914A and P-914B have increased by approximately 28 percent and 55 percent, respectively, compared to the annual mean specific conductance values at the start of post-closure monitoring in 2011.

Trend Analysis

A summary of the results of the statistically significant increasing and decreasing trends (95 percent confidence level) identified by the Mann-Kendall analyses are presented in Table 3-10 for the west monitoring locations. The full results of the Mann-Kendall analyses are included in Appendix C.

TABLE 3-10

SUMMARY OF MANN-KENDALL ANALYSES AT WEST MONITORING WELLS

Monitoring Location	Decreasing Trends						Increasing Trends					
	3-Year			5-Year			3-Year			5-Year		
	Multiple Parameters with Trend [1]	Specific Conductance	Dissolved Methane	Multiple Parameters with Trend [1]	Specific Conductance	Dissolved Methane	Multiple Parameters with Trend [1]	Specific Conductance	Dissolved Methane	Multiple Parameters with Trend [1]	Specific Conductance	Dissolved Methane
P-914A	No	No	NS	No	No	NS	No	No	NS	Yes (4) specific conductance, total dissolved solids, calcium, chloride	Yes	NS
P-914B	-	No	NS	-	No	NS	-	No	NS	-	Yes	NS

Notes:
[1] Number of parameters with trend shown in parenthesis for analyses with three or more trends (95 percent confidence level). Locations monitored for field parameters only are not assessed for multiple (three or more) parameters.

NS – parameter not analyzed for a specific location
I – insufficient sample data points for analyses

Currently, there is a five-year statistically significant increasing trend (95 percent confidence level) for specific conductance at both P-914A and P-914B.

Detection Monitoring Parameters

P-914A is monitored for a broad list of detection monitoring parameters. P-914B is monitored for field parameters only. The results of 2020 detection monitoring at P-914A are summarized in Appendix B and are discussed below.

At P-914A, specific conductance, Eh, calcium, magnesium, manganese, sodium, total dissolved solids, sulfate, chloride, and turbidity have generally increased in value since the start of post-closure monitoring in 2011.

Arsenic

At the west on-site monitoring locations, arsenic concentrations were measured two times during 2020 at monitoring location P-914A. Arsenic was not detected above the laboratory reporting limit of 0.005 mg/L in April 2020 and October 2020 at P-914A. This reported concentration is lower than the 2016 annual maximum arsenic concentration for this location of 0.050 mg/L in April 2016. This is consistent with generally site-wide lower arsenic concentrations since October 2016.

3.2 Residential Wells

Off-site groundwater quality data are obtained from one residential water supply well (i.e., DW-103) and one open borehole bedrock monitoring well (non-water supply) located at a residential location near the PTL (i.e., DW04-109). DW04-109 is considered a residential well due to its location and construction; however, DW04-109 is not used as a water supply well.

DW-103 and DW04-109 are located east from the landfill. As outlined in the post-closure EMP: (1) field parameters and dissolved methane samples were obtained at DW04-109 and DW-103 during the April 2020 sampling event; and (2) field parameters, dissolved methane samples, and samples for the indicator parameter and expanded parameter lists were obtained at DW04-109 and DW-103 during the October 2020 sampling event. The post-closure threshold criteria for off-site groundwater quality include: (1) parameter concentrations below MCLs and MEGs; (2) a specific conductance upper 95 percent confidence limit of less than 400 µmhos/cm; and (3) a dissolved methane concentration of less than 700 µg/L. For the second consecutive year, DW04-109 has meet all three of its post-threshold criteria. Comparison of 2020 water quality to these criteria are discussed below.

Off-site MCL and MEG Exceedances

The off-site applicable MCL and MEG criteria for DW-103 and DW04-109 (based on parameters analyzed at those locations) are summarized in Table 3-11.

TABLE 3-11

SUMMARY OF OFF-SITE RESIDENTIAL WELL
MCL AND/OR MEG EXCEEDANCES

Parameter Exceeding Standard	DW-103	DW04-109
Arsenic (0.01 mg/L MCL/MEG)	Not Exceeded [1]	Not Exceeded
Sodium (20 mg/L MEG)	36	Not Exceeded
Nickel (0.02 mg/L MEG)	Not Exceeded	Not Exceeded
Manganese (0.5 mg/L MEG)	Not Exceeded	Not Exceeded
Lead (0.01 mg/L MEG, 0.015 mg/L MCL)	Not Exceeded	Not Exceeded
Iron (5 mg/L MEG)	Not Exceeded	Not Exceeded
Cobalt (0.01 mg/L MEG)	Not Exceeded	Not Exceeded

Note:
[1] Arsenic was detected below the MCL and MEG at a concentration of 0.008 mg/L at DW-103 in October 2020. The duplicate sample for DW-103 in October 2020 had an arsenic concentration (0.011 mg/L) slightly above the MCL and MEG.
Samples obtained for all of these parameters in October 2020.

There were no MCL or MEG exceedances for parameters analyzed at DW04-109 in October 2020. The off-site groundwater quality threshold criterion for parameters with concentrations below MCLs and MEGs has now been satisfied for two consecutive years at DW04-109.

The sodium concentration exceeded its MEG at DW-103 in October 2020; however, its value is consistent with historical data and there is not a statistically significant increasing trend (95 percent confidence level) for sodium at DW-103 over the past five years.

Off-site Specific Conductance Threshold Criterion

SME calculated the 95 percent upper confidence limit for specific conductance values measured for the past five years of the post-closure monitoring period (i.e., since 2016) at the off-site residential wells for comparison to the post-closure threshold criterion of 400 µmhos/cm. The 2020 specific conductance values at DW-103 and DW04-109 are shown in Table 3-12.

TABLE 3-12

2020 OFF-SITE SPECIFIC CONDUCTANCE EVALUATION

Monitoring Location	Specific Conductance (µmhos/cm)		
	April 2020	October 2020	Upper Limit of the 95 percent confidence interval for the past 5 years
DW-103	405	477	481
DW04-109	225	238	247

The upper limit of the 95 percent confidence interval for specific conductance data for the past five years of the post-closure monitoring period (i.e., since 2016) exceeds the threshold criterion of 400 µmhos/cm at DW-103. The upper limit of the 95 percent confidence interval for specific conductance data at DW-103 for five-year intervals has been slowly increasing since 2015 when it was 422 mg/L.

The upper limit of the 95 percent confidence interval for specific conductance data for the past five years of the post-closure monitoring period (i.e., since 2016) is below the threshold criterion of 400 µmhos/cm at DW04-109. This is the second consecutive year that the specific conductance threshold criterion was met over a five-year period at DW04-109.

Off-site Dissolved Methane Threshold Criterion

The threshold criterion for dissolved methane of 700 µg/L was met at DW04-109 and DW-103 in 2020. The 2020 dissolved methane concentrations at these locations are shown in Table 3-13.

TABLE 3-13

2020 RESIDENTIAL DISSOLVED METHANE CONCENTRATIONS

Monitoring Location	Dissolved Methane (µg/L)	
	April 2020	October 2020
DW-103	40	47
DW04-109	20 U	20 U

Notes:
U = not detected above indicated laboratory reporting limit

Dissolved methane concentrations at DW04-109 in 2020 have decreased substantially from 2008 values that ranged from 5,580 µg/L to 7,320 µg/L. Historical dissolved methane data has never exceeded 700 µg/L at DW-103. The decrease in dissolved methane concentrations at DW04-109 indicates that the external landfill gas extraction system (which was installed in 2009) has shown effectiveness on groundwater quality farther east of the landfill.

Trend Analysis

There are not multiple parameters (i.e., three or more) with statistically significant increasing or decreasing trends (95 percent confidence level) over the past three years or five years at DW-103 and DW04-109.

3.3 Surface Water Quality

Under the current post-closure EMP, surface water quality is monitored two times annually at two locations along Souadabscook Stream and at two locations on a tributary to Cold Brook Stream. Monitoring locations along both water courses include locations upstream and downstream with respect to the landfill. Notable observations at these locations during 2020 include:

Souadabscook Stream

During 2020, chemical parameter concentrations in Souadabscook Stream upstream of the landfill (SW-A) remained very similar to the location downstream of the landfill (SW-C) (see Water Quality Summary reports in Appendix B). At upgradient monitoring location SW-A and downgradient monitoring location SW-C all but one of the monitored parameters were within their respective historical ranges. Chloride was detected upstream of the site at SW-A at a new historical maximum concentration of 25 mg/L in October 2020, which is slightly greater than the previous historical maximum value of 22.7 mg/L at this location in October 2016.

There were no MFCCC surface water quality standards exceeded at SW-A or SW-C in Souadabscook Stream during 2020 monitoring for the parameters analyzed. Annual maximum specific conductance values were low at both SW-A (107 µmhos/cm in October 2020) and SW-C (139 µmhos/cm in October 2020). Chloride concentrations were low at both SW-A (12 mg/L) and SW-C (12 mg/L) in April 2020. The chloride concentrations were somewhat greater at both SW-A and SW-C (i.e., both upstream and downstream from the landfill) in October 2020 (25 mg/L at SW-A and 26 mg/L at SW-C). Water quality at downgradient surface water sampling location SW-C is not indicative of impact from landfill leachate.

<u>Cold Brook Stream</u>

Surface water sampling stations along the tributary to Cold Brook Stream (SW-D and SW-E) have generally higher constituent concentrations than along Souadabscook Stream (SW-A and SW-C) (see Water Quality Summary reports in Appendix B). This is consistent with historical water quality data when comparing these two water bodies. The higher concentrations occur both upstream and downstream from the PTL and are likely due to the close proximity of the Cold Brook Stream tributary to major roadways, commercial development in the watershed of the stream, landfill site operations, and the higher suspended sediment loads caused by the silt-clay substrate over which the stream runs. Monitoring location SW-D is located hydraulically upgradient from the PTL and on the north and upstream side of Interstate 95 (the PTL is on the south side of Interstate 95). Monitoring location SW-E is located downgradient from the PTL and Interstate 95, just upstream from Cold Brook Road.

At upgradient monitoring location SW-D and downgradient monitoring location SW-E, all of the 2020 parameters had values within their respective historical ranges.

The 2020 specific conductance values at upgradient monitoring location SW-D (644 µmhos/cm in April 2020 and 325 µmhos/cm in October 2020) were somewhat less than those at downgradient monitoring location SW-E (740 µmhos/cm in April 2020 and 439 µmhos/cm in October 2020). The 2020 chloride concentrations at upgradient monitoring location SW-D (110 mg/L in April 2020 and 84 mg/L in October 2020) were equal to or slightly less than those at downgradient monitoring location SW-E (110 mg/L in April 2020 and 98 mg/L in October 2020). The parameters with higher concentrations at the downgradient sampling location of the tributary to Cold Brook Stream (SW-E) are likely in part attributed to SW-D being upstream of both Interstate 95 and landfill operations. There were no MFCCC surface water quality exceedances at SW-D or SW-E during 2020, which is consistent with recent historical data.

Visual review of the water quality data from SW-D and SW-E shows that many of the monitored parameters generally increased during the first several years of post-closure monitoring, typically up until about 2017. These values have begun to decrease in most instances. Parameters with recent visually apparent decreases at both SW-D and SW-E include specific conductance, arsenic, calcium, sodium, total dissolved solids, magnesium, manganese, bicarbonate, and chloride. Dissolved oxygen also began increasing at these locations starting in 2015.

Arsenic was not detected above the laboratory limit of 0.005 mg/L in April 2020 and October 2020 at SW-A, SW-C, SW-D, and SW-E.

The Mann-Kendall trend analyses have identified that there are not statistically significant increasing or decreasing trends (95 percent confidence level) for multiple parameters (i.e., three or more) for the past three years or five years at SW-A, SW-C, and SW-D. There are three parameters (bicarbonate, calcium, and magnesium) with statistically significant decreasing trends (95 percent confidence level) at SW-E over the past five years.

3.4 Leachate

Leachate from the Secure Landfills is captured by leachate collection systems and is stored in an on-site, aboveground, 980,000-gallon leachate storage tank. Currently, groundwater impacted by the residual leachate from the Conventional Landfill is captured by a groundwater interceptor drain (i.e., perimeter drain) and six groundwater extraction wells. This groundwater is also conveyed to and stored in the on-site aboveground leachate storage tank. The leachate and extracted groundwater from the storage tank is either recirculated in the landfill or sent to the Bangor wastewater treatment plant. In 2020, a total of 169,316 gallons of this leachate were recirculated into the Secure III facility and 8,723,714 gallons sent to the Bangor wastewater treatment plant.

Under the current post-closure EMP, the PDPS and leachate monitoring location LCS-3C are monitored annually for: (1) field parameters and the indicator list of parameters during the spring (i.e., April) monitoring event; and (2) field parameters, the indicator list of parameters, the expanded list of parameters, dissolved methane, and VOCs during the fall (i.e., October) monitoring event. Conventional Landfill leachate parameter concentrations are monitored at a manhole on the perimeter drain at the southeast toe of the Conventional Landfill (PDPS). LCS-3C is the leachate sampling location at the Phase VIII-C pump station and has been monitored since 2011.

For each year during the 2016 through 2020 post-closure monitoring period, leachate was sampled from one of the other site leachate monitoring locations (i.e., LCS-SI, LCS-SII, LCS-SIII, LCS-6, and LCS-7) during the fall sampling event. Leachate monitoring at location LCS-7 was conducted in October 2020 for field parameters, the indicator list of parameters, the expanded list of parameters, dissolved methane, and VOCs.

The results from the 2020 monitoring from PDPS, LCS-3, and LCS-7 samples are summarized below, including comparison to historical results.

Key Indicator Parameters

A summary of the key indicator parameter values at the PDPS and leachate monitoring locations sampled in 2020 is shown in Table 3-14.

TABLE 3-14

SUMMARY OF 2020 ANNUAL MAXIMUM LEACHATE KEY INDICATOR VALUES

Parameter	PDPS	LCS-3C [1]	LCS-7
Specific Conductance (µmhos/cm)	3,941 (6,670) [2]	27,500 (36,400)	43,458 (35,500)
Chloride (mg/L)	570 (1,610)	11,000 (19,200)	15,000 (11,200)
Dissolved Methane (µg/L)	440 (4,200)	730 (4,010)	960 (NS) [3]
Arsenic (mg/L)	0.280 (0.171)	0.440 (0.239)	0.730 (0.435)

Notes:
1 LCS-3C is the leachate sampling location at the Phase VIII-C pump station.
2 2011 maximum annual parameter values (i.e., the first year of post-closure) are included in parentheses for comparison to 2020 parameter values.
3 NS = not sampled

Specific conductance values and chloride concentrations at PDPS and LCS-3C during 2020 are considerably lower than during the first year of post-closure monitoring in 2011. The specific conductance values at PDPS during 2020 were within their respective historical ranges. The October 2020 specific conductance value of 14,396 at leachate monitoring location LCS-3C was a new historical minimum value. The specific conductance value and chloride concentration at LCS-7 in October 2020 were greater than those in October 2011. The October 2020 specific conductance value at LCS-7 was a new historical maximum value, but was only slightly greater than the 43,300 µmhos/cm specific conductance measured at LCS-7 in September 2014.

Dissolved methane concentrations from the PDPS and LCS-3C in October 2020 are considerably lower than dissolved methane concentrations detected since the PTL post-closure monitoring began in 2011. Dissolved methane had not been monitored at LCS-7 prior to 2020.

The lower dissolved methane concentrations detected from the perimeter drain and leachate sample LCS-3C in 2020 is concurrent with the substantial decrease in dissolved methane concentrations during the post-closure monitoring period at south and east monitoring locations 641, MW02-801A, MW03-802A, MW03-802B, MW03-803A, MW03-803B, MW-916, and MW-917 (see Table 3-1); this suggests that the Conventional Landfill is not producing as much methane as has been generated in the past.

Annual maximum arsenic concentrations from the perimeter drain and leachate samples from the PDPS, LCS-3C, and LCS-7 were higher during 2020 than during the first year of post-closure monitoring in 2011. These increases are likely attributed to a number of redox driven reactions that occur in leachate after covering the landfill and cutting off recharge to the waste mass. Therefore, the arsenic concentration increases at these locations are not unexpected following the closure (which occurred from 2008 through 2010).

VOC Analyses

Samples for VOC analyses were obtained during the October 2020 monitoring event at the PDPS, LCS-3C, and LCS-7. The following VOCs (excluding dissolved methane) were detected above laboratory reporting limits at these monitoring locations during 2020:

- Acetone at PDPS (29 µg/L) and LCS-3C (23 µg/L);
- Tetrahydrofuran at PDPS (40 µg/L), LCS-3C (92 µg/L), and LCS-7 (200 µg/L);
- 1,4-dichlorobenzene at PDPS (3.2 µg/L);
- Diethyl ether at PDPS (15 µg/L) and LCS-3C (2.6 µg/L);
- Methyl ethyl ketone at LCS-3C (11 µg/L);
- Benzene at PDPS (1.0 µg/L) and LCS-7 (2.4 µg/L);
- Toluene at LCS-3C (4.0 µg/L) and LCS-7 (4.6 µg/L);
- Ethylbenzene at LCS-3C (1.5 µg/L) and LCS-7 (3.8 µg/L);
- m,p-xylene at PDPS (1.0 µg/L), LCS-3C (2.1 µg/L), and LCS-7 (2.9 µg/L); and
- o-xylene at LCS-3C (1.1 µg/L) and LCS-7 (1.9 µg/L).

Trend Analysis

The Mann-Kendall trend analyses for the PDPS indicate that there are not multiple parameters (i.e., three or more) with statistically significant increasing or decreasing trends (95 percent confidence level) over the past five-year and three-year periods. There is a statistically significant decreasing trend (95 percent confidence level) for arsenic at the PDPS over the past five years.

The Mann-Kendall trend analyses for LCS-3C indicate that calcium, magnesium, potassium, total dissolved solids, and sodium have statistically significant decreasing trends (95 percent confidence level) over the past five years. There are not multiple (i.e., three or more) parameters at LCS-3C with statistically significant (95 percent confidence level) increasing or decreasing trends over the past three years, or increasing trends for the past five years. Due to the limited sampling frequency from LCS-7, there is insufficient data for three-year and five-year Mann-Kendall trend analyses.

Annual flows from the leachate collection pump stations at Secure I, Secure II, Secure III, Perimeter Drain, Phase VI, Phase VII, and Phase VIII-C have shown a decreasing trend since post-closure monitoring began in 2011. Though the flows at the perimeter drain pump station display an overall decreasing trend, the flow in 2019 is higher than the flow recorded in 2011. As noted in Section 2.2, this is consistent with the higher than normal precipitation that occurred in 2019. The leachate collection pump stations will continue to be monitored in 2021. The annual data for the leachate collection pump stations is provided on the graphs in Appendix F.