

New Jersey Department of Environmental Protection Water Resource Management Division of Water Quality and Division of Water Supply and Geoscience

Application Requirements

for

Managed Aquifer Recharge (MAR) Program



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Introduction

This document provides guidance for Managed Aquifer Recharge (MAR) proposal(s), technical review(s), permitting and the requirements associated with performing these tasks. The guidelines set forth herein serve to provide a way to oversee and promote the use of the MAR program. There are three phases to the MAR approval process:

- involvement with the early stages of conceptual proposal(s) through preapplication meeting(s);
- 2.) construction and test cycle(s) to support theoretical models; and
- 3.) permitting phase with data supporting the feasibility of a MAR proposal.

The Division of Water Supply and Geoscience (DWSG) and the Division of Water Quality (DWQ) within the New Jersey Department of Environmental Protection (the Department) oversee the MAR Program. The MAR Program requires coordination between the following Bureaus within those Divisions:

Division of Water Supply and Geoscience (DWSG)	Division of Water Quality (DWQ)
Bureau of Water Allocation & Well Permitting (BWAWP) - New Jersey Geological and Water Survey (NJGWS)	Bureau of Ground Water, Residuals and Permit Administration (BGRPA)
Bureau of Water System Engineering (BWSE)	Bureau of Surface Water and Pretreatment Permitting (BSWPP)
Bureau of Water Resources and Geoscience (BWRG) - New Jersey Geological and Water Survey (NJGWS)	

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What is MAR?

MAR is the injection of potable water into aquifers, typically for future recovery. MAR is a technique for improving groundwater recharge and maintaining aquifer levels to support water storage for drinking water systems or other water needs. MAR can be an effective buffer against future fluctuations in water demand and drought. In the United States, MAR system use has increased for several reasons including water shortages, greater need for reliable seasonal water sources, and favorable costs.

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Categories of MAR

There are four categories of MAR proposals:

- 1. <u>Aquifer Recharge (AR)</u>: injection of water into an aquifer without recovery.
- 2. <u>Aquifer Storage and Recovery (ASR)</u>: injection of water into an aquifer via an injection well for storage in the aquifer for later recovery of injected water from the same injection well.

- 3. <u>Aquifer Storage, Transfer and Recovery (ASTR)</u>: injection of water into an aquifer via an injection well for storage in the aquifer and recovery of injected water from a neighboring well or wells.
- 4. <u>Hybrid Aquifer Storage, Transfer and Recovery (HASTR)</u>: injection of water into an aquifer via an injection well for storage in the aquifer and recovery of injected water from both the same injection well as well as neighboring wells.

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MAR Approval Process

This section outlines the three phases associated with developing an MAR project(s) from the proposal stage to the final approval stage. A summary of the project phases is outlined below.

Summary of Phase 1: Pre-Construction/Pre-Application Meeting

Phase 1 includes a pre-construction and pre-application meeting with the Department. The purpose of the meeting is to review details of an MAR proposal, including submission requirements, prior to significant capital expenditure. The meeting allows for an open technical discussion with the representatives of the water system, consultants, and the Department regarding the MAR proposal. [page 5 for details]

Summary of Phase 2: Construction

Phase 2 is where the applicant applies for permits and approvals to construct and test a proposed system, including but not limited to:

- <u>Well Permit</u>: Applicant applies for a Well Permit from BWAWP.
- <u>Permit to construct MAR well</u>: Applicant applies for a Permit to Construct from the BWSE. If installing a test well only, a permit from BWSE is not needed.
- <u>MAR Proposal Report</u>: Applicant submits the MAR Proposal Report for a test cycle(s) to BWAWP and BGRPA for approval prior to initiating the testing cycle(s).
 [page 7 for details]

Summary of Phase 3: Final Permitting

To receive Department approval for an MAR project, an applicant needs to apply to the following Department Bureaus for the listed permits:

- BWAWP Water Allocation Permit or Water Use Registration
- BWSE Safe Drinking Water Construction and/or Operation Permit
- BGRPA New Jersey Pollutant Discharge Elimination System (NJPDES)-Discharge to Ground Water Permit (DGW)

[page 9 for details]

PHASE 1– PRE-CONSTRUCTION/PRE-APPLICATION MEETING

Phase 1 includes a pre-application and pre-construction meeting with the Department. In addition to providing guidance on submission requirements, the meeting provides for an open discussion with the representatives of the water system, consultants, and the Department regarding the details of the MAR request.

Pre-Construction/Pre-Application Meeting

This meeting is conducted with representatives of the following Department Bureaus:

- Bureau of Ground Water, Residuals and Permit Administration (BGRPA);
- Bureau of Water Allocation and Well Permitting (BWAWP);
- Bureau of Water System Engineering (BWSE);
- Bureau of Water Resources and Geoscience (BWRG); and
- Bureau of Surface Water and Pretreatment Permitting (BSWPP).

The primary point of contact for the MAR Program is the BGRPA. In order to schedule a preapplication meeting, the applicant can contact the BGRPA at: (609) 984-4428 and ask to speak with someone from the MAR program, or email: dwq_groundwater@dep.nj.gov.

Prior to or at the meeting, the applicant or consultant(s) proposing the MAR project shall provide the following preconstruction materials:

- Identification of injectate source water and the aquifer to be recharged (e.g., injectate source from surface water (Delaware River) to be injected into the ground water (Upper PRM Aquifer));
- 2. Map with location of recharge well(s) and recovery well(s);
- 3. Proposed MAR test cycle recommendations;
- 4. Reason for the project (e.g., saltwater intrusion, location within a Critical Area, seasonal peak demands with no alternative source of water supply, etc.);
- 5. Identification of discharge location of the recovered test cycle water;
 - Identify the proposed discharge method for recovered test cycle water (e.g., discharge to surface water, discharge to groundwater, discharge to the head of a treatment plant).
- 6. A Water Conservation Plan, unless such a plan has been submitted within the past 2 years. The applicable Water Conservation Plan forms can be found at <u>WCP-WS (state.nj.us)</u>; and
- 7. American Water Works Association (AWWA) Water Audit results.

More information on the AWWA Water Audit can be obtained at <u>https://www.awwa.org/Resources-</u> <u>Tools/Resource-Topics/Water-Loss-Control</u>. [back to top]

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Department Review of the Pre-Construction Materials

Subsequent to the meeting, BWAWP and BGRPA will review the preconstruction materials.

If the information received is sufficient, the applicant will be notified via letter and the applicant may proceed to Phase 2- Application and Construction [page 7 for details] for the 1st Test Cycle with any applicable approval conditions.

The notification letter will specify the items required to be submitted in the MAR Proposal Report for the 1st Test Cycle. If additional information is required, the Department will notify the applicant and outline the additional information required. All required information must be received and approved prior to moving onto Phase 2 – Application and Construction.

PHASE 2 - CONSTRUCTION

Phase 2 incorporates the associated tasks with any request to construct a new MAR public supply source well or modify an existing public supply source well for MAR purposes. This Phase also includes the request to conduct a test cycle(s) to support the use of a proposed MAR well.

Permit Applications

The applicant shall apply for the following:

- A Well Drilling Permit from BWAWP for construction of any new wells, modification of the construction of any existing wells, and/or to change the class of existing wells that will be used for any MAR Test Cycle(s).
- A Permit to Construct from BWSE. If installing a test well only, a permit from BWSE is not needed. A permit to construct and operate will be required at a later date, when the well designation is changed from Test to Public Supply.

The applicant must obtain these permits prior to conducting test cycle(s). [back to top]

MAR Proposal Report Submission

To ensure that test cycle(s) will not adversely impact ground water sources, the applicant shall submit an MAR Proposal Report for the first and reoccurring Test Cycle(s) to BWAWP and BGRPA for review and approval. Written Department approval is required prior to initiating each testing cycle. The MAR Proposal Report shall include the following:

- 1. Construction plans for well(s) and infrastructure;
- 2. Description of the proposed test cycle(s):
 - Proposed number of test cycles;
 - Injection and recovery wells to be utilized for each test cycle;
 - Approximate proposed date of test cycle(s);
 - Proposed volume of water to be injected and recovered during each test cycle; and
 - Time range necessary to conduct each test cycle injection and recovery phases.
- 3. Projected result(s) of the test cycle(s);
- 4. Detailed list of all well(s) proposed to be utilized for the MAR test cycle(s), including location of well(s), depth of well(s), aquifer in which well is located, and well permit number(s), if available;
- 5. For Level 1 and 2 Injectate (see Appendix 2 for definitions);
 - Baseline treated injectate scan (see Appendix 3 for list of parameters)
 - Baseline aquifer scan (see Appendix 3 for list of parameters)
- 6. For Level 3 Injectate (see Appendix 2 for definitions);
 - Aquifer Geochemistry Scan and PFNA, PFOA, PFOS (See Appendix 5 for geochemistry parameters)
- 7. Inventory Information to satisfy N.J.A.C. 7:14A-8.5(c):
 - The well drilling permit number, where applicable;
 - The facility name and location;
 - The name and address of the legal contact;

- The ownership of the facility;
- The nature and type of injection well(s);
- The operating status of injection well(s); and
- The type, quantity, and quality of discharge.
- 8. Discharge location of recovered test cycle water:
 - Identify the proposed discharge method for recovered test cycle water.

Notes:

¹ If there is a well permit to construct and operate from BWSE and Drinking Water standards are met, the applicant can propose to put the test cycle recovered water into the public water supply. ² If there is no well permit to operate from BWSE, the recovered water cannot be discharged into the public water supply. Note: A test well will still require a permit to operate, but this permit will be obtained at a later date when the designation of the well is changed from Test to Public Supply. ³ NJPDES DGW permit application requirements pursuant to N.J.A.C. 7:14A-4.7.

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MAR Proposal Report Review

Once the Department receives the MAR Proposal Report from the applicant, BWAWP, NJGWS and BGRPA will review the Report for Test Cycle #1 and all subsequent Test Cycle reports.

BWAWP and BGRPA issue a joint letter approving or denying the request to move forward with Test Cycle #1.

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MAR Test Cycle Results

Upon conclusion of the test cycle, the applicant shall update and submit the MAR Proposal Report to BWAWP and BGRPA. The updated Report shall include the following information:

- 1. Detailed results and conclusions from Test Cycle #1;
- 2. Recovered Water Geochemistry Scan results from Test Cycle #1; and
- 3. Materials required if an additional test cycle is proposed.
 - The MAR Proposal Report Submission requirements are provided on <u>Page 7</u> and the scans required for additional test cycles are listed in <u>Appendix 3</u>.

The updated MAR Proposal Report and any request to conduct an additional test cycle will be reviewed.

Upon conclusion of the review of the updated MAR Report, BWAWP and BGRPA will issue one of the following, depending on the stage of the project and the Applicant's request:

- 1. If an additional test cycle is proposed, a joint letter approving or denying the request to move forward with the additional test cycle will be issued.
- 2. If the applicant does not propose to run an additional test cycle, the Department may issue a letter advising the applicant that an additional test cycle(s) is required to determine feasibility; or,
- 3. Once the facility successfully runs a test cycle with the maximum volume they are seeking (or can demonstrate that based on test cycles, the total injection volume is theoretically achievable), a letter advising the applicant that they must apply for NJPDES Discharge to Ground Water Permit, BWAWP Water Allocation Permit and Well Permit

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and BWSE Permit to Construct and/or Operate if they want to seek permanent operation will be issued.

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PHASE 3 – PERMITTING

To receive Department approval for an ongoing MAR project, an applicant shall apply for the following permits:

- BGRPA NJPDES DGW Permit
- BWAWP Water Allocation Permit and Well Permit
- BWSE Construction and/or Operation Permit

Application requirements are described below.

BGRPA – NJPDES DGW Permit

STEP 1: Applicant applies for a NJPDES-DGW Permit for Permanent Operation

Applicant shall submit a NJPDES-DGW permit application to BGRPA. The application consists of the following documents:

- 1. NJPDES-1 Form;
- 2. Topographical Map;
- 3. Site Plan; and
- 4. MAR Technical Report.
 - a. The MAR Technical Report consists of the following items listed below:
 - i. Hydraulic modeling of the injection and recovery process (Bubble Analysis);
 - ii. Classification Exemption Area (if applicable);
 - iii. Aquifer Test Cycle results;
 - iv. Aquifer Water Quality (Baseline Scan); [page 14 for details]
 - v. Treated Injectate Water Quality (Baseline Scan); and
 - vi. Recovered water quality (Geochemistry Scan);

Notes:

¹ Many of the items required in the MAR Technical Report may be contained in the most updated version of the MAR Proposal Report and should be resubmitted to ensure a complete permit application.

²An approved NJPDES-DGW permit will require compliance with the Ground Water Quality Standards (GWQS), N.J.A.C. 7:9C, upon injection.

³NJPDES DGW permit application requirements pursuant to N.J.A.C. 7:14A-4.7.

STEP 2: Department conducts review of the NJPDES-DGW application and supporting data

Analysis of all data from Phase 2 is conducted by BGRPA and BWRG.

1. BWRG will review the hydrogeological aspects of the Bubble Analysis.

STEP 3: BGRPA drafts and issues the NJPDES-DGW Permit Determination

BWAWP – Water Allocation Permit or Water Use Registration

STEP 1: Applicant applies for a Water Allocation Permit or a Water Use Registration

Applicant shall submit for a minor/new/major modification of their Water Allocation Permit to BWAWP

- 1. For Minor Permit Modification, the permit application shall include:
 - Completed Form <u>BWA-001D</u>; and
 - Results from the MAR Test Cycles
- 2. For New or Major Permit Modification the permit application shall include:
 - Completed Form <u>BWA-001A</u>;
 - Technical Report in accordance with N.J.A.C. 7:19-2.2; and
 - Results from the MAR Test Cycles
- 3. For Water Use Registration, submit form DWR-188

STEP 2: BWAWP Issues a Water Allocation Permit Determination

BWSE – Construction/Operation Permit

STEP 1: Applicant Applies for a BWSE Permit

Applicant shall submit a construction and/or operation permit application to BWSE.

- 1. If application is for a new well or an increase in pump capacity, a construction and operation permit will be required.
- 2. If a construction permit was previously issued, the applicant shall apply for an operation permit only.

STEP 2: BWSE Issues a Construction and/or Operation Permit Determination

Note: More information on Construction Permits can be obtained at <u>https://www.state.nj.us/dep/watersupply/dws_const.html</u> [back to top]

DIVISION / BUREAU	PERMIT TYPE	ΑCTIVITY
Division of Water Supply and Geoscience Bureau of Water Allocation and Wall Parmitting	Water Supply Allocation Permit	Minor modification if proposing to add MAR activities to an existing approved production well or a new well with no diversion privileges. Major modification or new permit if proposing a new MAR well with diversion privileges.
und wen rennitting	Water Use Registration	For wells that do not have approved diversion privileges in excess of 100,000 gallons per day and do not meet the criteria to be included in an existing water allocation permit.
	Well Drilling Permit	Construction/Redesignation of wells.
Division of Water Supply and Geoscience	Permit to Construct	Construction of well/treatment for public supply use.
Bureau of Water System and Engineering	Permit to Operate	Required prior to utilizing water in distribution system for public consumption – includes well and treatment.
Division of Water Quality	NJPDES Permit	For permanent operation.
Bureau of Ground Water, Residuals and Permit Administration		

Appendix 1 – Permits Required for MAR Projects

Appendix 2 – Types of Injectates

For the purposes of this guidance, types of injectate shall be categorized as follows:

	TYPES OF INJECTATE	
Level 1 • Surface Water • Mixture of Surface Water and Ground Water (Confined or Unconfined A • Ground Water (Unconfined Aquifer to Confined Aquifer) Level 2 • Ground Water (Confined Aquifer to Different Confined Aquifer)		
		Level 3
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Appendix 3 – Water Quality Requirements

	Wa	ater Quality Requirements	
Stage of Project ↓	Level 1	Level 2	
Water Source and Injection Aquifer→	SW, SW/GW, and GW from Unconfined Aquifer to Confined Aquifer ³	Confined Aquifer to Different Confined Aquifer ³	Aquife
Fest Cycle 1 Report Only	 PRIOR TO INJECTION Treated Injectate <u>Baseline Scan</u> Aquifer <u>Baseline Scan</u> (Location of Injection)¹ DURING RECOVERY Geochemistry <u>Scan</u> 	 PRIOR TO INJECTION Treated Injectate <u>Baseline Scan</u> Aquifer <u>Baseline Scan</u> (Location of Injection)¹ DURING RECOVERY Geochemistry <u>Scan</u> 	PRIOR TO • Treated • Aquifer Injection) DURING R • <u>Geocher</u>
Additional Test Cycles Report Only	 PRIOR TO INJECTION Treated Injectate <u>Baseline Scan</u> DURING RECOVERY Geochemistry <u>Scan</u> 	 PRIOR TO INJECTION Treated Injectate <u>Baseline Scan²</u> DURING RECOVERY Geochemistry <u>Scan</u> 	PRIOR TO • Treated DURING R • <u>Geoche</u>
NJPDES Permit njection - Limitations (1/month unless otherwise noted) Recovery - Report Only (1/month unless otherwise noted) Periphery Wells - Report Only (quarterly)	 PRIOR TO INJECTION and DURING RECOVERY MAR <u>Specific Scan</u> Standard Parameters (quarterly) Parameters based on Baseline Scan Results PFNA PFOA, and PFOS (quarterly) Geochemistry Scan Parameters of Potential Concern Scan (Quarterly -Report Only) BUBBLE ANALYSIS Periphery Wells Scan 	 PRIOR TO INJECTION and DURING RECOVERY MAR <u>Specific Scan</u> Standard Parameters (quarterly) Parameters based on Baseline Scan Results PFNA PFOA, and PFOS (quarterly) Geochemistry Scan Parameters of Potential Concern Scan (1x/permit cycle) BUBBLE ANALYSIS Periphery Wells Scan 	PRIOR TO • <u>Geoche</u> • PFNA P BUBBLE A • <u>Periphe</u>

FOOTNOTES:

¹The Aquifer Baseline Scan is only required to be completed one time for aquifer pollutant characterization. If additional parameters without standards are added, a baseline analysis for those particular parameters will be required. ²Treated Injectate Scan ONLY Applies if any of the following criteria are met:

- Injectate altered;

- Timeframe between Test Cycles Warrants (~18 months maximum); or

- Data from recovery warrants additional testing."

³Injection for the purpose of Saltwater Intrusion will be assessed on a case-by-case basis.

NOTE: A Treated Injectate Baseline Scan will be required to be conducted as a part of the application renewal process (1x/5 yrs)

⁴Each stage of an MAR project will include the requirement to monitor for scans which include specific parameters. During the test cycle phase(s) of the project, data from the Baseline Scan(s) and Geochemistry Scan(s) will be used to determine project feasibility. During the NJPDES permitting phase of the project, data from the MAR Specific Scan, Geochemistry Scan, Parameter of Potential Concern Scan and Periphery Well Scan will be used to ensure ground water protection and the ongoing functioning of the MAR.

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Level 3

ifer to Same Aquifer or Confined Aquifer to Unconfined Aquifer³

O INJECTION

ed Injectate <u>Geochemistry Scan</u> + PFNA, PFOA, and PFOS Fer <u>Geochemistry Scan</u> + PFNA, PFOA and PFOS (Location of

6 RECOVERY hemistry Scan

O INJECTION

ed Injectate <u>Geochemistry Scan² + PFNA</u>, PFOA, and PFOS

i RECOVERY hemistry Scan

O INJECTION and DURING RECOVERY <u>hemistry Scan</u> PFOA, and PFOS (quarterly)

ANALYSIS hery Wells Scan

Appendix 4 - Baseline Scan Parameter List

Baseline scan data will be utilized to evaluate data against GWQS as set forth in N.J.A.C. 7:90
Results for each parameter should be reported in the ug/L unless otherwise noted

No.	Parameter Name	CASRN
1	(beta) (beta-HCH)	319-85-7
2	1,1,1,2-Tetrachloroethane	630-20-6
3	1,1,1-Trichloroethane (TCA)	71-55-6
4	1,1,1-Trifluoroethane	420-46-2
5	1,1,2,2-Tetrachloroethane	79-34-5
6	1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)	76-13-1
7	1,1,2-Trichloroethane	79-00-5
8	1,1-Dichloro-1-fluoroethane	1717-00-6
9	1,1-Dichloroethane (1,1-DCA)	75-34-3
10	1,1-Dichloroethylene (1,1-DCE)	75-35-4
11	1,2,3-Trichloropropane	96-18-4
12	1,2,4-Trichlorobenzene	120-82-1
13	1,2,4-Trimethylbenzene	95-63-6
14	1,2-Dibromo-3-chloropropane (DBCP)	96-12-8
15	1,2-Dichlorobenzene (ortho)	95-50-1
16	1,2-Dichloroethane	107-06-2
17	1,2-Dichloroethylene (cis)	156-59-2
18	1,2-Dichloroethylene (trans)	156-60-5
19	1,2-Dichloropropane	78-87-5
20	1,2-Diphenylhydrazine	122-66-7
21	1,3-Dichlorobenzene (meta)	541-73-1
22	1,3-Dichloropropene(cis and trans)	542-75-6
23	1,4-Dichlorobenzene (para)	106-46-7
24	1,4-Dioxane	123-91-1
25	1-Chloro-1,1-difluoroethane	75-68-3
26	1-Methylnaphthalene	90-12-0
27	2-(2,4,5-trichlorophenoxy)propionic acid (Silvex)	93-72-1
28	2-(2-Methyl-4-chlorophenoxy) propionic acid (MCPP)	93-65-2
29	2,3,4,6-Tetrachlorophenol	58-90-2
30	2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	1746-01-6
31	2,4,5-Trichlorophenol	95-95-4
32	2,4,6-Trichlorophenol	88-06-2
33	2,4,6-Trinitrotoluene (TNT)	118-96-7
34	2,4-Dichlorophenol	120-83-2
35	2,4-Dichlorophenoxyacetic acid (2,4-D)	94-75-7
36	2,4-Dimethyl phenol	105-67-9
37	2,4-Dinitrophenol	51-28-5
38	2,4-Dinitrotoluene/2,6-Dinitrotoluene Mix	25321-14-6
39	2-Butanone (Methyl Ethyl Ketone)	78-93-3
40	2-Chloronaphthalene	91-58-7
41	2-Chlorophenol	95-57-8

42	2-Ethyl-1-Hexanol	104-76-7
43	2-Hexanone	591-78-6
44	2-Methylnaphthalene	91-57-6
45	2-Methylphenol (o-cresol)	95-48-7
46	3,3'-Dichlorobenzidine	91-94-1
47	3-Methylphenol (m-cresol)	108-39-4
48	4,4'-DDD (p,p'-TDE)	72-54-8
49	4,4'-DDE	72-55-9
50	4,4'-DDT	50-29-3
51	4,6-Dinitro-O-Cresol (2 -Methyl-4,6-Dinitrophenol)	534-52-1
52	4-Chloro-3-methylphenol (3-methyl-4-chlorophenol)	59-50-7
53	4-Chloroaniline (p-Chloroaniline)	106-47-8
54	4-Methylphenol (p-cresol)	106-44-5
55	Acenaphthene	83-32-9
56	Acenaphthylene	208-96-8
57	Acetone	67-64-1
58	Acetonitrile	75-05-8
59	Acetophenone	98-86-2
60	Acrolein	107-02-8
61	Acrylamide	79-06-1
62	Acrylonitrile	107-13-1
63	Adipates (Di(ethylhexyl)adipate) (DEHA)	103-23-1
64	Alachlor	15972-60-8
65	Aldicarb sulfone	1646-88-4
66	Aldrin	309-00-2
67	Aluminum	7429-90-5
68	Ammonia (Total)	7664-41-7
69	Aniline	62-53-3
70	Anthracene	120-12-7
71	Antimony (Total)	7440-36-0
72	Arsenic (Total)	7440-38-2
73	Asbestos - f/L>10uma	1332-21-4
74	Atrazine	1912-24-9
75	Barium	7440-39-3
76	Benzene	71-43-2
77	Benzidine	92-87-5
78	Benzo(a)anthracene	56-55-3
79	Benzo(a)pyrene(BaP)	50-32-8
80	Benzo(b)fluoranthene (3,4-Benzofluoranthene)	205-99-2
81	Benzo(ghi)perylene	191-24-2
82	Benzo(k)fluoranthene	207-08-9
83	Benzoic Acid	65-85-0
84	Benzyl Alcohol	100-51-6
85	Beryllium	7440-41-7
86	BHC (alpha-HCH) (benzenehydrochloride)	319-84-6

87	BHC (gamma-HCH/Lindane)	58-89-9
88	Biphenyl (Diphenyl) (1,1 Biphenyl)	92-52-4
89	Bis(2-chloroethyl) ether (Dichloroethyl ether)	111-44-4
90	Bis(2-chloroisopropyl)ether	108-60-1
91	Bis(2-ethylhexyl) phthalate (DEHP)	117-81-7
92	Bromodichloromethane(Dichlorobromomethane)	75-27-4
93	Bromoform	75-25-2
94	Bromomethane (Methyl bromide)	74-83-9
95	Butylbenzyl phthalate	85-68-7
96	Cadmium	7440-43-9
97	Camphor	76-22-2
98	Caprolactam	105-60-2
99	Carbofuran	1563-66-2
100	Carbon Disulfide	75-15-0
101	Carbon Tetrachloride	56-23-5
102	Chlordane	57-74-9
103	Chloride	16887-00-6
104	Chlorobenzene	108-90-7
105	Chloroethane	75-00-3
106	Chloroform	67-66-3
107	Chlorpyrifos	2921-88-2
108	Chromium (Total)	7440-47-3
109	Chrysene	218-01-9
110	Cobalt	7440-48-4
111	Copper	7440-50-8
112	Cumene (isopropyl benzene)	98-82-8
113	Cyanide (free cyanide)	57-12-5
114	Dalapon (2,2-Dichloropropionic acid)	75-99-0
115	Demeton	8065-48-3
116	Dibenz(a,h)anthracene	53-70-3
117	Dibromochloromethane (Chlorodibromomethane)	124-48-1
118	Dichlormid	37764-25-3
119	Dieldrin	60-57-1
120	Diethyl phthalate	84-66-2
121	Diisodecyl phthalate (DIDP)	26761-40-0
122	Diisopropyl ether (DIPE)	108-20-3
123	Dimethyl phthalate	131-11-3
124	Di-n-butyl phthalate	84-74-2
125	Di-n-octyl phthalate	117-84-0
126	Dinoseb	88-85-7
127	Diphenyl oxide (ether)	101-84-8
128	Diphenylamine	122-39-4
129	Diquat	85-00-7
130	Endosulfan (alpha and beta)	115-29-7
131	Endosulfan (Endosulfan I)	959-98-8

132	Endosulfan (Endosulfan II)	33213-65-9
133	Endosulfan Sulfate	1031-07-8
134	Endothall	145-73-3
135	Endrin	72-20-8
136	Epichlorohydrin	106-89-8
137	Ethion	563-12-2
138	Ethyl acetate	141-78-6
139	Ethyl ether	60-29-7
140	Ethylbenzene	100-41-4
141	Ethylene dibromide (EDB) (1,2-dibromoethane)	106-93-4
142	Ethylene glycol	107-21-1
143	Ethylene glycol monomethyl ether	109-86-4
144	Fecal Coliform	Fecal
145	Fluoranthene	206-44-0
146	Fluorene	86-73-7
147	Fluoride	16984-48-8
148	Formaldehyde	50-00-0
149	Freon 11 (Trichlorofluoromethane)	75-69-4
150	Freon 12 (Dichlorodifluoromethane)	75-71-8
151	Glyphosate	1071-83-6
152	Hardness (as CaCO3)	Hardness
153	Heptachlor	76-44-8
154	Heptachlor Epoxide	1024-57-3
155	Hexachlorobenzene	118-74-1
156	Hexachlorobutadiene	87-68-3
157	Hexachlorocyclopentadiene	77-47-4
158	Hexachloroethane	67-72-1
159	Hexahydro-1,3,5-Trinitro-1,3,5-Triazine (RDX)	121-82-4
160	Indeno (1,2,3-cd)pyrene	193-39-5
161	Iron	7439-89-6
162	Isophorone	78-59-1
163	Lead (Total)	7439-92-1
164	Malathion	121-75-5
165	Manganese	7439-96-5
166	Mercury (Total)	7439-97-6
167	Methanol	67-56-1
168	Methoxychlor	72-43-5
169	Methyl acetate	79-20-9
170	Methyl Salicylate	119-36-8
171	Methyl tert. butyl ether (MTBE)	1634-04-4
172	Methylene chloride	75-09-2
173	Metolachlor	51218-45-2
174	Mirex	2385-85-5
175	Molybdenum	7439-98-7
176	Naphthalene	91-20-3

177	n-Butanol (n-butyl alcohol)	71-36-3
178	n-Heptane	142-82-5
179	n-Hexane	110-54-3
180	Nickel (Soluble salts)	7440-02-0
181	Nitrate	84145-82-4
182	Nitrite	14797-65-0
183	Nitrobenzene	98-95-3
184	N-Nitrosodimethylamine	62-75-9
185	N-Nitrosodi-n-propylamine (Di-n-propylnitrosamine)	621-64-7
186	N-Nitrosodiphenylamine	86-30-6
187	n-Propanol	71-23-8
188	Oxamyl	23135-22-0
189	Parathion	56-38-2
190	PBBs (Polybrominated biphenyls)	67774-32-7
191	PCBs (Polychlorinated biphenyls)	1336-36-3
192	Pentachlorophenol	87-86-5
193	Perchlorate	14797-73-0
194	Perfluorononanoic acid (PFNA) - ng/L	375-95-1
195	Perfluorooctane Sulfonate (PFOS) - ng/L	1763-23-1
196	Perfluorooctanoic Acid (PFOA) - ng/L	335-67-1
197	pH - SU	NA
198	Phenanthrene	85-01-8
199	Phenol	108-95-2
200	Picloram	2-1-1918
201	Pyrene	129-00-0
202	Radionuclides – Gross Alpha Particles - PCI/L	_
203	Radionuclides – Combined Radium 226/228 - PCI/L	7440-14-4/ 15262-20-1
204	Radionuclides - Uranium	7440-61-1
205	Salicylic acid	69-72-7
206	Selenium (Total)	7782-49-2
207	Silver	7440-22-4
208	Simazine	122-34-9
209	Sodium	7440-23-5
210	Strontium	7440-24-6
211	Styrene	100-42-5
212	Sulfate	14808-79-8
213	TDS (Total Dissolved Solids)	TDS
214	Tertiary-Butyl alcohol (TBA)	75-65-0
215	Tetrachloroethylene (PCE)	127-18-4
216	Tetrahydrofuran	109-99-9
217	Thallium	7440-28-0
218	Toluene	108-88-3
219	Toxaphene	8001-35-2
220	Trichloroethene (TCE) (Trichloroethylene)	79-01-6
221	Tricresyl phosphate	1330-78-5

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222	Tri-m-cresyl phosphate	563-04-2
223	Tri-o-cresyl phosphate	78-30-8
224	Tri-p-cresyl phosphate	78-32-0
225	Vanadium Pentoxide	1314-62-1
226	Vinyl Acetate	108-05-4
227	Vinyl Chloride	75-01-4
228	Xylenes (Total)	1330-20-7
229	Zinc	7440-66-6
No.	Parameter Name – Extended PFAS List - ng/L	CASRN
230	C4 – Perfluorobutanoic Acid (PFBA) - ng/L	375-22-4
231	C5 – Perfluoropentanoic Acid (PFPeA) - ng/L	2706-90-3
232	C6 – Perfluorohexanoic acid (PFHxA) - ng/L	307-24-4
233	C7 – Perfluoroheptanoic acid (PFHpA) - ng/L	375-85-9
234	C10 – Perfluorodecanoic acid (PFDA)- ng/L	335-76-2
235	C11 – Perfluoroundecanoic acid (PFUnA) - ng/L	2058-94-8
236	C12 – Perfluorododecanoic acid (PFDoA)- ng/L	307-55-1
237	C13 – Perfluorotridecanoic acid (PFTriA) - ng/L	72629-94-8
238	C14 – Perfluorotetradecanoic acid (PFTeA) - ng/L	376-06-7
239	C4-S – Perfluorobutanesulfonic acid (PFBS) - ng/L	375-73-5
240	C6-S – Perfluorohexanesulfonic acid (PFHxS)	355-46-4
241	HFPO-DA-hexafluoropropylene oxide dimer acid (GenX) - ng/L	13252-13-6

Note: Please provide a list of compounds for which a certified lab could not be obtained and/or sufficiently sensitive methods of analysis were not available with your data submission. The Department will investigate these parameters with our Office of Quality Assurance and notify your facility if additional information is required.

Appendix 5 – Geochemistry Scan Parameters

These 14 geochemistry parameters were selected based on their ability to demonstrate aquifer geochemistry. This includes parameters used to identify the rate a mineral may or may not precipitate out based on their ability to oxidize at a rapid pace. This precipitation is usually associated with certain pH levels and may cause hydraulic problems if not properly addressed.

Geochemistry Scan Parameters			
1	Iron	8	TDS
2	Manganese	9	Zinc
3	рН	10	Dissolved Oxygen (DO)
4	Chloride	11	Cobalt
5	Copper	12	Nickel
6	Silver	13	Arsenic
7	Sulfate	14	Trihalomethanes