



GAC Treatment Engineering Checklist for Public Water Systems

This checklist outlines required documentation and important considerations in designing and implementing effective Granular Activated Carbon (GAC) PFAS treatment that aligns with design standards and regulatory requirements outlined in the Vermont Water Supply Rule (Rule). The intent is to streamline and expedite the design and Permit to Construct review process for treatment installation at impacted public water systems. Any proposed variances to the Rule shall be accompanied by supporting documentation and a separate Variance Request (Section 3.7 of the Rule). If more space is needed for the responses, please attach additional pages or reference the section/page of the Engineering Report that covers this.

Water System Overview and Treatment Space

1. An overview of the water system and a brief description of the proposed construction is provided in the Engineer's Report and/or Basis of Design. Yes No

2. A description of the treatment system space is included in the Engineer's Report and/or Basis of Design. The description includes:
 - a. The operational and maintenance space, and any impacts the proposed treatment will have on the area. Yes No
 - b. Indication that the treatment space is heated and ventilated, not located in a confined space, and not located within a flood plain (determined as any area which is flooded with an average frequency of once or more in each 100 years as determined by the secretary). Yes No

3. A description of existing facilities that may impact the proposed treatment design is provided. (Consider existing wells, pump stations, treatment facilities, and storage facilities). Yes No

4. Proposed treatment equipment will be housed in enclosures that provide adequate room for routine operation and maintenance and will protect equipment from weather elements. Yes No



5. If new structures are needed to house treatment equipment, a description is provided.

Yes No Not Applicable

6. If standby power is currently available, is it adequate to run the proposed new infrastructure?

Yes No Not Applicable

7. Evaluate existing disinfection treatment infrastructure (if applicable). If improvements are necessary to ensure disinfection treatment meets requirements of Appendix A, Subpart 4.3 of the Rule and 40 CFR Part 141, a discussion is provided.

Yes No Not Applicable

8. A location map is provided?

Yes No

9. The following have been provided in the Engineer's Report and/or Basis of Design:

a. Design flow/ADD (gpd)	Yes	No
b. Design rate/MDD (gpm)	Yes	No
c. The water system's long term / safe yield	Yes	No
d. Flow rate through treatment (gpm)	Yes	No
e. Instantaneous peak demand (gpm)	Yes	No

10. A description of any existing infrastructure that will be removed or modified as a part of the proposed project is provided.

Yes No Not Applicable

11. A description of any other proposed improvements to the water system infrastructure (if applicable), such as new storage, new pumping facilities, etc. is provided.

Yes No Not Applicable

Water Quality Characteristics

1. A characterization of the contaminants and their concentrations that the proposed treatment is designed to remove is provided.

Yes No



2. A characterization of the following **REQUIRED** water quality constituents and their concentrations that may interfere with GAC treatment is provided: *(Refer to PFAS Treatment Engineering Document (Section 4.1.1) for more details on interfering water quality constituents).*

a. Nitrate (mg/L)	Yes	No
b. Iron (mg/L)	Yes	No
c. Manganese (mg/L)	Yes	No
d. Turbidity (NTU)	Yes	No
e. pH	Yes	No
f. Alkalinity (mg/L)	Yes	No
g. Hardness (mg/L)	Yes	No
h. Total Organic Carbon (mg/L)	Yes	No

3. A characterization of the following **SUGGESTED** water quality constituents and their concentrations that may interfere with GAC treatment is provided: *(Refer to PFAS Treatment Engineering Document (Section 4.1.1) for more details on interfering water quality constituents).*

a. Nitrite (mg/L)	Yes	No
b. Phosphate (mg/L)	Yes	No
c. Sulfate (mg/L)	Yes	No
d. Bicarbonate (mg/L)	Yes	No
e. Chloride (mg/L)	Yes	No

4. A description on how the water quality constituents can impact carbon media lifespan and whether pretreatment is needed is provided. *(Refer to the PFAS Treatment Engineering Document (Section 4.1.1) for specific water quality constituents.)*

Yes No

5. Water quality samples were collected and analyzed in accordance with requirements of Subchapter 21-6 and Appendix A. Part 4.11.1(a) of the Rule. Yes No

Unknown



6. A description of the water sampling locations and when water samples were located is provided. Yes No Not Applicable

GAC Treatment Design Recommendations

1. For TNC and Domestic Bottled Water Systems: At least one train of two GAC filters are plumbed in series? Yes No Not Applicable

2. For Public Community and NTNC Water Systems: At least two treatment trains are proposed, each train consisting of two GAC filters plumbed in series?

Yes No Not Applicable

- a. Where only two trains are proposed, each train is capable of meeting the Permitted Water System Demand Design Rate (MDD) at the proposed filtration rate. Yes No Not Applicable
- b. Where more than two treatment trains are proposed, the GAC filters are capable of meeting the Permitted Water System Demand Design Rate (MDD) at the approved filtration rate with one treatment train removed from service.

Yes No Not Applicable

3. All wetted components are NSF 61 certified. Yes No

4. All treatment chemicals are NSF 60 certified.

Yes No Not Applicable

5. All chemicals proposed in the design are described in the Engineer's Report and/or the Basis of Design? Yes No Not Applicable

6. A justification for the choice of the selected GAC media is provided and considers the water quality of the source water and those suggested by manufacturers.

Yes No

7. The GAC media manufacturer and type is provided. Yes No



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| 8. The expected useful life of the GAC media is provided. | Yes | No |
| 9. Filter media meets the AWWA B604, Standard for GAC. | Yes | No |
| 10. Equipment manufacturer's specifications for units, including minimum and maximum flow rates, pressures, operating temperatures and other applicable design parameters are provided. | Yes | No |
| 11. The carbon vessel make and model is provided. | Yes | No |
| 12. The carbon vessel (internal and external) diameter and height are included in inches. | Yes | No |
| 13. A description of the arrangement of piping and treatment trains, including lateral header and drainpipes installed within units is provided. | Yes | No |
| 14. A description of the underdrains, supporting gravel, and screens that will prevent carbon media loss is provided. | Yes | No |
| 15. Media depth is at least 30 inches for every filter: | Yes | No |
| 16. The volume of media in each unit (cubic ft.) is provided. | Yes | No |
| 17. The amount of headspace and underdrain required for backwashing is accounted for when determining total media volume. | Yes | No |
| 18. Calculations for the Empty Bed Contact Time (EBCT) for each GAC treatment train are provided, and meet or exceed the specifications in Appendix A. Subpart 4.11 of the Rule. EBCT is based on the actual volume of resin in the vessels, not the size of the vessels. | Yes | No |



19. EBCT meets the 10-minute minimum per train, as outlined in Appendix A. Subpart 4.11.2 of the Rule, assuming maximum flow rate through the primary (lead) vessel(s).

Yes No

20. The hydraulic loading rate calculations are provided in gallons per minute per square foot (gpm/ft²) of bed area of each unit, and does not exceed 7 gpm/ft².

Yes No

21. GAC filters have necessary piping and valves to facilitate ease of operational adjustments to modify the configuration of primary (lead) and secondary (lag) units, and to remove a unit from service while maintaining functionality of treatment process.

Yes No

If no, a justification is provided. Yes No Not Applicable

22. Pressure gauges are added so that pressure loss across treatment units can be monitored.

Yes No

23. A description of the range and precision of the pressure gauge including maximum operating pressure is provided. Yes No

24. Pressure gauges are appropriately sized to monitor the pressure loss across the units per manufacturer specification, which is provided. Yes No

25. The expected pressure loss across each GAC filter unit is provided.

Yes No



26. If individual water meters for each well need to be installed as a part of the project, they are shown on the Engineering Drawings and cut sheets for the proposed meters are submitted.

Yes

No

Not Applicable

27. If new well pumps are proposed, rationales for well pump selection, well pump cut sheets, and well pump operating curves are provided.

Yes

No

Not Applicable

23. If more than one source is used, details on well pump operations are provided. (e.g. Do well pumps operate at the same time, or are they alternating? What is the flow rate for each well?)

Yes

No

Not Applicable

28. Disinfection treatment meets requirements of Appendix A, Subpart 4.3 of the Rule and 40 CFR Part 141.

Yes

No

29. Disinfection treatment is provided prior to the entry point to the distribution system.

Yes

No

30. Appropriate details for the chlorine injection point and any other details associated with disinfection treatment are provided on the treatment plans and specifications?

Yes

No

31. If proposing post-GAC chlorination, chlorine contact time calculations are provided.

Yes

No

Not Applicable

32. Sample ports are provided for the inlet and outlet of each unit.

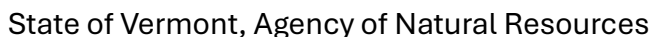
Yes

No

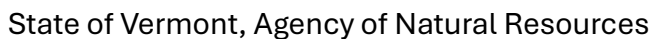
33. Design drawings demonstrate that all sampling ports and gauges are accessible and that the lead/lag changeout can be accomplished.

Yes

No



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| 1. Water quality constituents that will prevent successful performance of the proposed carbon treatment are present and pre-treatment is necessary. | Yes | No |
| 2. Pretreatment rationale and how it can impact water quality and PFAS treatment performance is provided and includes the treatment processes and sequence of treatment. | Yes | No |
| 3. Treated water below the Vermont PFAS MCL will be used for the backwashing of any pretreatment processes. | Yes | No |
| 4. If backwashing/regenerating pretreatment is proposed, a description of how the backwash/regenerated water will be supplied, and where the wastewater will go is provided. | Yes | No |
| 5. Backflow prevention on the pretreatment backwash line is provided. | Yes | No |



6. If backwashing/regenerating pretreatment is proposed, a description of how the backwash/regenerated water will be supplied, and where the wastewater will go is provided.

Yes	No	Not Applicable

7. The total volume of backwash water and the anticipated frequency of backwashing is described. Yes No

8. If backwashing/regeneration pretreatment is proposed, a description of any negative impacts or limitations to use/demand during backwash/regeneration of pretreatment is provided.

Yes	No	Not Applicable

9. Design includes provisions to add a chemical before the carbon treatment.

Yes	No	Not Applicable
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1. The Water System has the appropriate Operator Classification for the proposed treatment system. Yes No

2. A description of where treatment chemicals will be stored for all chemicals identified in proposed treatment design is provided.

Yes	No	Not Applicable
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3. A description of how initial rinse to waste of the carbon media will be completed upon installation and media change out is provided. Yes No



4. Applicable to CWS and NTNCs only: verify how the water system intends to operate PFAS treatment system:

- a. One train on stand-by at all times until breakthrough of the PFAS compounds listed in Section 6.12 at the entry point to the distribution system, followed by the valving-off of the expired train(s) and valving-on of the stand-by train and initiation of the changeout procedure. ☐
- b. Quarterly mid-point sampling and reporting to the Secretary until a mid-point sample result exceeds any of the PFAS compounds listed in Section 6.12, followed by the initiation of changeout procedure. ☐

For TNCs only: A description on how the water system will anticipate media change outs is provided. Yes No Not Applicable

5. The water system has a master meter installed to record and report to the Secretary a meter reading when it collects PFAS samples. Yes No

6. A description of how GAC filters will be changed out and how vessels will be swapped between lead/lag positions is provided and included the following:

- a. The size and potential weight of the vessels Yes No
- b. Provisions to precondition new GAC media in accordance with manufacturer recommendations Yes No
- c. Requirements for physically moving/removing/replacing treatment vessels and other large equipment, and appropriate details to address these requirements Yes No
- d. The anticipated lead time required for the vendor (i.e. How many days/weeks lead time are required for vendors to complete the changeout of the GAC media?) Yes No
- e. A demonstration that the GAC trains are not being bypassed Yes No
- f. The anticipated disposal process of the spent GAC media Yes No



7. The Operations and Maintenance Manual or Standard Operating Procedure states that Virgin NSF 61 certified media will be used for all carbon media changeouts. (i.e., reconditioned media cannot be used unless pre-approved by the Division).

Yes

No

8. The Operations and Maintenance Manual or Standard Operating Procedure will include GAC media start up procedures and should include arsenic performance testing.

Yes

No

9. The location where Raw Water samples will be collected is provided.

Yes

No

10. The location where Entry Point samples will be collected is provided.

Yes

No