Group B Design Workbook

Complete this workbook to satisfy the planning and design requirements needed to get approval for a new or expanding Group B water system.

Washington State Department of Health
Environmental Public Health
Office of Drinking Water

DOH 331-468
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INTRODUCTION

Completing this *Group B Design Workbook* (workbook) will satisfy the design and planning requirements for a new or expanding Group B water system (WAC 246-291-120 and WAC 246-291-140, respectively). The department's review of your water system design will not confer or guarantee any right to a specific quantity of water. Our review will be based on your representation of available water quantity. If the Washington Department of Ecology, a local planning agency, or other authority responsible for determining water rights and water system adequacy determines that you have use of less water than you represent, the number of approved connections may be reduced commensurate with the actual amount of water and your legal right to use it.

If you're a professional engineer and are not comfortable using this workbook format, you may submit your design in an alternate format of your choosing. However, you must submit all the information referenced in this workbook and required by chapter 246-291 WAC.

Before sending your completed workbook to the reviewing agency, make copies of all plans, design drawings, worksheets, equipment information, operations and maintenance manuals, legal documents, and forms. Keep this information with your other project documents to help you and others successfully manage and operate your new water system.

Regulations

We suggest you become familiar with Washington's Group B water system rule (chapter 246-291 WAC) before you start your design. The Group B Rule, effective January 1, 2014, is online doh.wa.gov/CommunityandEnvironment/DrinkingWater/RegulationandCompliance/Rules.

Group B Water System Design Guidelines

Use this workbook with the *Group B Water System Design Guidelines* (331-467). The guidelines are online at doh.wa.gov/portals/1/Documents/pubs/331-467.pdf.

Even if you are experienced designing small systems, we recommend you read the guidelines before starting your design. We created them to support your goal of preparing a complete submittal that reflects sound water system design practices and established principles of public health protection. They will answer questions such as:

- When can't I develop my own Group B water system?
- When don't I need to get approval before I construct my water system?
- When must a professional engineer design the new or expanding system?
- Which water quality tests must I submit?
- How long must I run the pump test on my well?
- How do Washington's water rights laws affect my design?
- How big an easement should I have for my pipelines?
- What information must I include on the title of customers' properties?

Certain one and two-connection water systems are not regulated. Before submitting your Group B design workbook, see Section 2.1 of the *Group B Water System Design Guidelines* (331-467) to be sure your project design requires department approval.

Fees Charged for Workbook Design Reviews

A completed workbook addresses the planning, design report, and construction documents required by WAC 246-291-120 and -140.

- **If the local health jurisdiction is the reviewing authority:**

  Ask your local health department about the fees it will charge to review your workbook.

- **If the state Department of Health is the reviewing authority:**

  The department will charge applicants each of the following fees for a **new** Group B water system.

  $138 for a Water System Plan Review (WAC 246-290-990 (1)(a))

  $205 for a Design Report Review (WAC 246-290-990 (1)(d))

  $281 for a Construction Document Review (WAC 246-290-990 (1)(f))

  Total fee = $624

  In addition to the fees above, the department will charge applicants for the following services.

  $205 for a Well Site Evaluation (WAC 246-290-990 (1)(i))

  Fee varies for a Secondary Treatment Design Review
  (For amounts, see WAC 246-290-990 (1)(d) and (1)(f)).

  Fee varies for evaluation of a potential groundwater under the direct influence of surface water source.

Online Group B Resources

We developed online Group B resources to help you from the pre-submittal stage of your water system design through operation and maintenance.

The *Online Group B Resources* include:

- All the forms you need to meet the submittal requirements for a new or expanding Group B water system, including the *Group B Project Approval Application Form* and *Water Facilities Inventory Form*.

- Guidance to help you operate and maintain your small system. After you receive written approval of your water system design, you may begin construction of the distribution system, well house, tanks, treatment equipment, and so forth. We urge you to review this information before you begin operating your new or expanded system.

You can view the Group B resources at doh.wa.gov/CommunityandEnvironment/DrinkingWater/WaterSystemAssistance/GroupB/Resources.

Department of Health Contacts

Before beginning your Group B workbook, we strongly recommend that you contact your local health jurisdiction to find out whether the local or state health department administers the Group B program in your county. In the Group B workbook and in the *Group B Water System Design Guidelines*, the term "department" refers to the agency responsible for reviewing and approving a Group B water system design in your particular county.

Designers or design engineers with questions or concerns should contact the department. Table 1 presents contact information for the state Department of Health. You can get contact information for your local health jurisdiction from your local phone book.

Table 1

Office of Drinking Water Regional Offices

If you have questions about this workbook, the *Group B Water System Design Guidelines*, the *Online Group B Resources*, or the State Board of Health Rules on Group B Public Water Systems, call our regional office or your local health jurisdiction.

Eastern Region	**Serving**
Drinking Water Eastern Regional Office 16201 E. Indiana Ave. Suite 1500 Spokane Valley, WA 99216 **Phone:** 509-329-2100 **Fax:** 509-329-2104 **TDD Relay:** 1-800-833-6388	Adams, Asotin, Benton, Chelan, Columbia, Douglas, Franklin, Ferry, Garfield, Grant, Kittitas, Klickitat, Lincoln, Okanogan, Pend Oreille, Spokane, Stevens, Walla Walla, Whitman, and Yakima counties.
Northwest Region	**Serving**
Drinking Water Northwest Regional Office 20425 - 72nd Avenue South Suite 310 Kent, WA 98032 **Phone:** 253-395-6750 **Fax:** 253-395-6760 **TDD Relay:** 1-800-833-6388	Island, King, Pierce, San Juan, Skagit, Snohomish, and Whatcom counties.
Southwest Region	**Serving**
Drinking Water Southwest Regional Office **Physical:** 243 Israel Road Tumwater, WA 98501 **Mailing:** P O Box 47823 Olympia, WA 98504-7823 **Phone:** 360-236-3030 **Fax:** 360-664-8058 **TDD Relay:** 1-800-833-6388	Clallam, Clark, Cowlitz, Grays Harbor, Jefferson, Kitsap, Lewis, Mason, Pacific, Skamania, Thurston, and Wahkiakum counties.

Group B Planning and Design Submittal Checklist

CHECKLIST FOR A NEW OR EXPANDING
GROUP B WATER SYSTEM

Check the appropriate box for each row and submit a completed checklist with workbook

Planning and Design Submittal Element	Group B Design Guidelines Section	Yes, Included	No, Not Applicable
Completed submittal checklist for a new or expanding Group B system			**Always Applicable**
Completed project approval application form	Section 2.2		
Property title notice	Section 2.6		
Service area map	Section 2.3		
Demonstrate compliance with SMA requirement **Applies to new systems only**.	Section 2.5		
Demonstrate compliance with PWS Coordination Act	Section 2.4		
Completed Water Facilities Inventory (WFI) Completing a WFI will expedite the review process.	Section 2.9		
Water users' agreement (**optional**)	Section 2.8		
Water right permit or other needed Dept. of Ecology approval	Section 3.0		
Well log	Section 4.1		
Well pump test report	Section 4.1		
Well water quality sampling results	Section 4.2		
Documentation of well site approval	Section 4.3		
Well sanitary control area protective covenants	Section 2.7 and 4.3		
Intertie agreement	Section 4.4		
Well and pump house detailed drawings and specifications	Section 5.2 and 5.3		
Distribution system detailed drawing and specifications	Section 6.10		**Always Applicable**
Storage tank sizing, detailed drawings, and specifications	Section 7.6		
Booster pump sizing, detailed drawings, and specifications	Section 8.1		
Secondary contaminant treatment design	Chapter 9		
Completed *Group B Design Report Workbook*			**Always Applicable**

1.0 Designer and Owner

Failure to complete all applicable sections of this workbook will result in denial of your application or delay in its approval. Please print all information.

1.1 Water System Designer

Workbook prepared by: _____

Mailing Address: _____

_____

Company Name: _____

Day Phone: _____

If prepared by a Professional Engineer, apply seal here.

1.2 Water System Owner

Owner's Name: _____

Owner's Mailing Address: _____

_____

Day Phone: _____

Owner's Representative Signature _____ Date _____

2.0 Basic Water System Information

2.1 Water system name and location.

System Name _____

Water System Location _____
(Town or City, County)

Public Water System ID# _____
(Applies only to existing systems seeking approval to expand.)

2.2 Basic information.

You **must** submit the following with this workbook.

- Completed Group B planning and design submittal checklist.
- Completed project approval application form.
  The form is online at
  doh.wa.gov/CommunityandEnvironment/DrinkingWater/WaterSystemAssistance/GroupB/Design.
- Property title notice (the notice you intend to record on the title for each property served, see *Group B Water System Design Guidelines* Section 2.6).
- Service area map.
- Demonstrated compliance with Satellite Management Agency requirement.
  See *Group B Water System Design Guidelines* Section 2.5.
- Demonstrated compliance with Public Water System Coordination Act.
  See *Group B Water System Design Guidelines* Section 2.4.

We recommend you include a completed Water Facilities Inventory Form. See *Group B Water System Design Guidelines* Appendix E.

2.3 Connections and Population

See the requirements for establishing the design service population for each dwelling unit in WAC 246-291-200 (2). See Section 2.0 of the *Group B Water System Design Guidelines* for expectations on counting accessory dwelling units as separate connections.

Connections		Service Population	
Dwelling units	**Nonresidential**	**Residential**	**Nonresidential**

Use the space below to describe the basis for estimating your residential and nonresidential service population.

3.0 Estimating Water Demands

3.1 Complete Worksheet 3-1

Summary of Peak Hourly Demand (PHD) and Maximum Daily Demand (MDD) Summary

Worksheet 3-1

Line	Group B Design Guidelines Section	Description	Value
A	3.1.1, and 3.3	Total residential MDD, gallons per day	
B	3.1.2, and 3.3	Total residential PHD, gallons per minute	
C	3.2.1, and 3.3	Total non-residential MDD, gallons per day	
D	3.2.2, and 3.3	Total non-residential PHD, gallons per minute	
F-1	3.4	Fire suppression flow required (if any), gpm	
F-2	3.4	Fire suppression flow duration, minutes	

Total area intended for irrigation: _____ square feet or acres

Total system MDD (Lines A+C): _____ gallons per day

Total system PHD (Lines B+D+F1): _____ gallons per minute

Is a **water right permit** or other written Department of Ecology water resource approval required? See Section 3.0 of the *Group B Water System Design Guidelines*.

_____Yes _____No

If "Yes," enclose a copy of the water right permit or other written approval from the Department of Ecology.

Use the space below to show your calculations of estimated MDD and PHD:

4.0 Source of Supply

4.1 Well information

If a well will supply water to your system, you must attach the following to your design submittal:

- Well log.
- Pump test report. (See Section 4.1 of the *Group B Water System Design Guidelines*.)
- Water quality sampling results. (See Section 4.2 of the *Group B Water System Design Guidelines* and WAC 246-291-125 (3)(g).)
- Well site inspection report prepared by DOH or the local health jurisdiction.
- Well sanitary control area protective covenants. (Attach a copy of the actual protective covenants filed with the County Auditor for each public drinking water well. See Sections 2.7 and 4.3 of the *Group B Water System Design Guidelines*.)
- Low yield well water supply contingency plan, if required. (See Section 4.1 of the *Group B Water System Design Guidelines*.)

4.2 Wellhead Protection Inventory

Please indicate whether any of the following are present within 600 feet of your well.

Potential Water Quality Threat	Yes	No	Unknown
Likely pesticide application			
Storm water injection wells			
Other injection wells			
Abandoned groundwater wells			
Landfills, dumps, disposal areas			
Known hazardous materials site			
Another water system with known water quality problems			
Residential development greater than one house per acre			
Residential septic tanks			
Underground storage tanks			
Sewer lines			
Storm water disposal areas			
Surface water – **If yes, specify distance from well site: _____ feet**			

Use this space to provide more detail of any water quality threat located within 600 feet of your well.

4.2 Intertie information

If an intertie will supply your system, you must attach a copy of your intertie agreement, and service capacity and hydraulic analyses of the wholesale system. For details about the minimum scope of an intertie agreement, see WAC 246-291-135.

5.0 Well Pump, Bladder Tanks, and Pump House

5.1 Piping Schematic

Draw a schematic of the piping system below. Begin with the well, continue to the pump house, and on to the distribution system. Include each branch line in the distribution system, and label each branch line junction. These junction points will be referenced in Worksheet 5-1.

(See Example 5-1 in Section 5.0 of the *Group B Water System Design Guidelines*.)

5.2 Complete Worksheet 5-1 (See Example 5-1 in Section 5.0 of the *Group B Water System Design Guidelines*.)

Total Dynamic Head Calculation												
Friction Head Calculation								Static Head Calculation, Assume top of well casing elevation is 0 ft.			Min. Pressure Head, ft	Min. Total Dynamic Head, ft
Pipe Segment	From	To	Pump or Flow Rate, gpm	Pipe Size, inches	Friction Loss per 100 ft	Pipeline Length, ft	Pipe Segment Friction Loss, ft	Top of well casing to water while pumping, ft	Ground Elev. at "to"	Elevation difference, ft		
1	Well pump	Top of well casing									69	
2	Top of well casing										69	
3											69	
4											69	
5											69	
6											69	
7											69	
8											69	
9											69	

1. With a simple system consisting of only a well pump and bladder tanks, the well pump is the only pump in the system. Without a storage tank, the well pump must generate enough flow and pressure to supply at least the PHD, and to provide at least 30 psi to each customer connected to the distribution system during PHD conditions.
2. For the segment that includes the well house, **add ten feet of friction loss** to account for losses related to fittings and valves. If you intend to use a cycle control valve, **add additional friction loss** per manufacturer's data (See Section 5.0 of the *Group B Water System Design Guidelines*).
3. Total the "pipe segment friction loss" for each pipe segment + "elevation difference" + "minimum pressure head" values. The highest Total Dynamic Head (TDH) is the minimum pressure, expressed in feet of head that the well pump must generate while pumping the peak hourly demand. You may wish to select a pump with a TDH greater than the required minimum.

5.3 Summary of Well Pump Selection

Cycle Control Valve (CCV) incorporated in design: _____Yes _____No

Variable frequency drive well pump(s) incorporated in design: _____Yes _____No

Pump Design Parameter	At well pump "on":	At well pump "off":	Comment
Pressure switch settings	_____ psi	_____ psi	If well pumps to bladder tanks
or			
Reservoir level control	_____ ft	_____ ft	If well pumps to atmospheric reservoir
Discharge rate	_____ gpm	_____ gpm	
Total Dynamic Head	_____ feet	feet	

Well pump setting (depth) below top of well casing: _____ feet.

Attach well pump catalog information with your design submittal:

- Pump curve (or table showing discharge head and corresponding discharge flow).
- Identify the pump "on" and pump "off" operating points on the pump curve.
- Pump manufacturer and pump model number.
- Pump horse power.

5.4 Bladder Tank Selection (for well pump or booster pump)

Follow the design guidance in Section 5.1 of the *Group B Water System Design Guidelines* for bladder tank selection. If the design includes a cycle control valve, see the design guidelines Appendix G.

Summarize the bladder tank selection.

Size of bladder tanks	_____ gallons
Number of tanks	_____ tanks
Pre-charged pressure	_____ psi

Use the space below to show your calculations (Equation 5-2) for selecting bladder tanks.

5.5 Well and pump house detailed drawings and specifications

Attach a copy of the well and pump house detailed drawings and specifications. The minimum scope of this information is in Sections 5.2 and 5.3 of the *Group B Water System Design Guidelines*.

6.0 Piping and Distribution System

6.1 Summary of pipe design

Distribution system pipe size and material specified.

(For example, *1½ to 3-inch ASTM D 1785 Schedule 40 PVC.*)

Minimum pipeline depth of bury specified.

(For example, No less than 48 inches from finished grade.)

Pipeline hydrostatic pressure testing specification.

(For example, APWA/WSDOT (2012) Section 7-11 … minimum 200 psi.)

Pipeline disinfection specification.

(For example, *APWA/WSDOT (2012) Section 7-11*.)

Private property easements required?

_____Required (design drawings must identify the location and dimension of these easements).

_____Not required.

6.1 Service meters

Service meters:

_____Provided at each connection.

_____Not provided at each connection.

6.3 Cross connection control

Are there any existing or proposed customer connections that pose a high health risk if a cross connection occurred between the drinking water system and a contaminant source originating from the consumer's property? (See Section 6.8 of the *Group B Water System Design Guidelines*).

_____Yes (if yes, attach a description of the cross connection and how the cross connection will be controlled or eliminated.)

_____No.

6.4 Distribution system detailed drawings and specifications

Attach a copy of the distribution system detail drawings and specifications (see Section 6.10 of the *Group B Water System Design Guidelines*).

7.0 Atmospheric Storage Tank

7.1 Determining need for an atmospheric storage tank

If any of the following conditions apply to the design of the new or expanding Group B water system, an atmospheric storage tank must be provided (check all that apply).

_____Yes The peak hourly demand is greater than the selected well pump can deliver at the pump "on" setting.

_____Yes The local fire authority requires the Group B water system to provide fire suppression capacity, and the source of supply cannot match the needed fire flow.

_____Yes The location of the Group B water system is subject to the Public Water System Coordination Act, it must provide a minimum fire flow, and the source of supply cannot match the needed fire flow.

_____Yes The designer wishes to provide standby storage or fire suppression capacity.

Use the space below (or a separate sheet of paper) to show your calculations for sizing the storage tank and establishing the elevation of the tank bottom and tank overflow. See Chapter 7 and Equation 7-4 in the *Group B Water System Design Guidelines*.

Operating storage.

Equalizing storage.

Standby storage.

Fire suppression storage.

Dead storage.

7.2 Storage tank detailed drawings and specifications

Attach a copy of the storage tank detail drawings and specifications. (See Section 7.6 of the *Group B Water System Design Guidelines*.)

8.0 Booster Pumps

8.1 Booster pump selection

Summarize the following booster pump design information.

Number of booster pumps: _____

Pump Cycle Control Valve (CCV) incorporated in design.

_____Yes _____No

Variable frequency booster pump drive pump(s) incorporated in design.

_____Yes _____No

Booster Pump 1

Pump Design Parameter	At well pump "on":	At well pump "off":
Pressure switch pressure setting	_____ psi	_____ psi
Discharge rate	_____ gpm	_____ gpm
Total Dynamic Head	_____ feet	_____ feet

Attach booster pump catalog information with your design submittal:

- Pump curve (or table showing discharge head and corresponding discharge flow).
- Identify the pump "on" and pump "off" operating points on the pump curve.
- Pump manufacturer and pump model number.
- Pump horse power.

Booster Pump 2 (if applicable)

Pump Design Parameter	At well pump "on":	At well pump "off":
Pressure switch pressure setting	_____ psi	_____ psi
Discharge rate	_____ gpm	_____ gpm
Total Dynamic Head	_____ feet	_____ feet

Attach booster pump catalog information with your design submittal:

- Pump curve (or table showing discharge head and corresponding discharge flow).
- Identify the pump "on" and pump "off" operating points on the pump curve.
- Pump manufacturer and pump model number.
- Pump horse power.

8.2 Booster pump station detailed drawings and specifications

Attach a copy of the booster pump station detailed drawings and specifications. (See Sections 5.2, 5.3, and 8.0 of the *Group B Water System Design Guidelines*.)

9.0 Secondary Contaminant Treatment Design

If treatment for a secondary contaminant (such as iron or manganese) is required, provide the following information.

Contaminant(s) to be treated: _____

Treatment device: _____

Manufacturer's name: _____

Model: _____

Capacity (gpm): _____

Capacity (gpd): _____

Removal efficiency: _____

Concentration in well: _____ mg/l

Expected concentration after treatment: _____ mg/l

Attach a copy of the following information:

- Treatment process and maximum daily treated water production capacity.
- Hydraulic considerations and headloss calculations.
- Manufacturer's catalog information showing the treatment system is appropriate for removing the contaminant, based on the untreated water sample information from the well.
- A complete set of water quality data necessary to assess and confirm the effectiveness of the proposed treatment, based on the unique water quality characteristics of the well to be treated.
- Residual disposal volume, disposal permit(s) (if required), and plan for residual disposal.
- Manufacturer's recommended operations and maintenance procedures.
- A list of all chemicals needed for normal operation and maintenance (if any).
- Materials safety data sheet information on all chemicals needed.
- Manufacturer's recommended field water quality testing (if any).

10.0 Financial Viability

10.1 Financial Viability Worksheet

The goal is to establish plans, policies, and procedures that give the system owner(s) the ability to obtain enough funds to cover the total cost of operating and maintaining a safe, reliable water system on a continuing basis. Rates and other revenue should be adequate to cover all anticipated expenses. See Chapter 10 of the *Group B Water System Design Guidelines*.

TOTAL EXPENSES	**1st Yr.**	**2nd Yr.**	**3rd Yr.**	**4th Yr.**
1. Wages & Benefits (Incl. SMA costs)	$	$	$	$
2. Electricity & other utilities	$	$	$	$
3. Chemical & Treatment	$	$	$	$
4. Monitoring Costs	$	$	$	$
5. Materials & Supplies	$	$	$	$
6. Repairs and Parts	$	$	$	$
7. Emergency Reserve Contribution	$	$	$	$
8. Asset Replacement Reserve Contribution	$	$	$	$
9. Principal & Interest Payments (For outstanding loans)	$	$	$	$
10. Taxes and Assessments	$	$	$	$
11. Insurance and Misc. Expenses	$	$	$	$
12. Total Expenses (Add lines 1 to 11)	$	$	$	$
TOTAL REVENUE FROM SOURCES OTHER THAN WATER RATES				
13. Hook Up and Other User Fees	$	$	$	$
14. Interest Earned	$	$	$	$
15. Other Revenue	$	$	$	$
16. Total Revenue (Add lines 13 to 15)	$	$	$	$
WATER RATE CALCULATIONS				
17. Remaining Revenue Required (Line 12 minus Line 16)	$	$	$	$
18. Number of Connections	$	$	$	$
19. Average Water Rate (Line 17 divided by Line 18)	$	$	$	$