

PRELIMINARY ENGINEERING REPORT (PER) GUIDE

QUALITY SCHOOLS GRANT PROGRAM

I. **Executive Summary**

- a. Brief description of the basic needs or deficiencies of the system,
- b. Brief description of the alternatives considered,
- c. Brief description of the preferred alternative,
- d. Estimated total cost to construct the preferred alternative, and
- e. Other pertinent conclusions.

II. **Problem Definition and Evaluation of Existing Facilities**

Using narrative and drawings, describe the area under consideration, concerns and deficiencies, compliance issues and relevant regulations. The description should include the following information:

a. **Location Map and Schematic Layout**

Map should indicate legal and natural boundaries, latitude and longitude, major obstacles, elevations, etc., using maps, photographs, and sketches of the planning area. Provide a schematic layout for the existing system. The layout should provide basic information on the location and size of the components in the system.

b. **History**

Provide a brief history of the facilities, including when the system was constructed, major improvements and any past problems.

c. **Physical Characteristics of the Area**

Describe the physical character of the project area including geology, topography, soil types, groundwater, surface water, vegetation, etc. that may have an impact on the project costs, performance, simplicity of design and/or operation, etc. or allow for a more complete understanding of the problem. Provide a copy of the USGS topographic quadrangle, FEMA floodplain map, wetlands inventory map, and USGS soil identification map in instances where maps have been published.

d. **Environmental Resources Present**

Provide information on the location and significance of important land resources, historic sites, endangered species/critical habitats, etc., using maps, photographs, studies and narrative. Generally discuss any potential environmental impacts that the project may have on the broad geographical area where the project is to be constructed. Attach any other exhibits, maps, or correspondence that may be applicable to help identify environmental resources present. The information collected through the Environmental Assessment is the basis for identifying the environmental resources in the area that may be affected. The completed assessment must be signed by a **professional engineer** and included as an attachment to the PER.

At a minimum, state whether any of the following issues will or will not be potentially affected:

- i. Land use/formally classified lands (farmland, range land, forestland)
- ii. Biological resource
- iii. Water resource Issues (quality and quantity)
- iv. Surface water
- v. Ground water
- vi. 100/500 year floodplains

- vii. Wetlands, including stream crossings
- viii. Cultural resources
- ix. Socio-economic/Environmental justice issues

e. System O&M

Describe O&M concerns with emphasis on those with the greatest impact. Discuss operational, administrative and management capacity. Describe the duration of the problem, and the operation and management steps that have been taken to remedy the situation. If steps have been recommended as part of a regulatory agency review and the recommended actions have not been instituted, provide discussion as to why the actions have not been instituted.

f. Growth

Describe the system capacity that is necessary to meet needs during the planning period. Discuss any consideration given to designing for phased construction. Provide number of new users to be served by this project.

g. Unresolved Problems

Describe any of the problems identified above that are not to be addressed and the reasons for not addressing them. Discuss phasing if applicable. Analyze the system to determine its present condition and ability to meet current and future standards (Safe Drinking Water Act, Clean Water Act, and other federal, state, local or tribal requirements). Justify statements by summarizing available field studies, flow monitoring, TV inspection, operating records, water quality data, special studies, and citing the source of information. Include pictures if appropriate. Flow and load demands should be based on detailed inventories of system uses, flow monitoring as appropriate, pump station records, water quality sampling, existing records, and reports, and any other means available that document current and future flows and loads. Flow metering field data, if available, should be summarized with a map showing the location of all sampling points. If available for wastewater projects, provide a copy of the latest MPDES compliance inspection report or DEQ O & M inspection report, along with a copy of the MPDES Discharge Permit. For water projects, provide a copy of the latest sanitary survey. Attach copies of water quality test results. Attach correspondence to/from Federal, and state regulatory agencies. Attach documentation such as violation of discharge permits, notice of violations, administrative orders, or boil orders.

For drinking water systems analyze:

Water demand

- **Adequacy of supply.** Address volume and quality, reliability and susceptibility to drought, and capacity for growth.
- **Source water protection.** Has it been addressed?
- **Treatment.** Address waste streams and sludge disposal.
- **Storage.** Address ability to provide adequate storage for domestic and fire demands, condition of storage facilities.
- **Pumping facilities and other infrastructure.** Address condition, capacity for future growth.
- **Distribution system.** Address size & condition, ability to provide domestic & fire flows, capacity for growth.
- **Operational and management practices and capabilities.** Address problems that have been encountered in the operation and maintenance of the system.

For wastewater systems analyze:

Existing flows

- **Hydraulic and organic loading.** Compare the wastewater system loading with current water usage where high hydraulic loading is noted.
- **Treatment standards.** Address water quality standards and non-degradation. Are discharge standards met? Address sludge testing and removal.
- **Lift stations/pumping facilities,** if applicable.
- **Collection system.** Address capacity and slopes.
- **Impact of infiltration or inflow on system performance.**
- **Operational and management practices and capabilities.** Address problems that have been encountered in the operation and maintenance of the system.

III. General Design Requirements for Improvements

Describe the general design requirements that will need to be met in discussing the potential alternatives to remedying the system's problems.

For drinking water projects address:

Applicable DEQ Circulars

For school water systems these are typically DEQ 3, Standards for Small Water Systems and applicable sections of DEQ 1, Standards for Water Works.

- Regulatory requirements and permits
- Source(s) of water supply (quantity/quality/reliability/water rights).
- Source water protection
- Water use/demand data (average flows, peak flows, fire flows)
- Treatment
- Pumping
- Transmission/distribution
- Storage
- Water system wastes (treatment/handling/disposal/re-use)

For wastewater projects address:

Applicable DEQ Circulars

For school wastewater systems these will typically be Circular DEQ 2, Design Standards for Wastewater Facilities and DEQ 4 Standards for Subsurface Wastewater Treatment Systems.

- Existing and design flows
- Hydraulic and organic loading
- Regulatory requirements and permits
- Treatment
- Collection
- Pump stations
- Sludge

- IV. **Alternative Screening Process and Analysis**
Describe all available alternatives to remedy the problems to be solved, including the no action alternative. Please note why an alternative is obviously not suitable for further consideration. A sound justification is required for eliminating an alternative. This section documents that an option was not overlooked, but rather was considered and ruled out as a viable option during the early stages of the planning process. If a system is required to remedy a problem, such as having an administrative order, the “no action” alternative can be briefly discussed and eliminated in this section. All alternatives that are not eliminated in the screening process should be analyzed.
Address items A through I for each alternative being analyzed.
- a. **Description**
Describe the alternative technology that could be used to remedy a problem.
- b. **Schematic Layout**
Provide a schematic layout for the alternative. For wastewater collection systems provide general elevations. For water systems provide elevations of source, pressure zones and water tank (if applicable) operating levels.
- V. **Operational Requirements**
Discuss the operational skill involved or new operational duties resulting from a given alternative. Discuss manpower requirements.
- VI. **Energy Requirements**
Discuss energy consumption.
- VII. **Regulatory Compliance and Permits**
Describe how each alternative will bring the system into compliance with appropriate regulations such as Safe Drinking Water Act, Clean Water Act, and other federal, state, local or tribal requirements. Include a discussion on future, anticipated permit conditions (such as nutrient limitations, effect of TMDLs, or disinfection requirements). Describe and list any permits that will be required to implement each alternative.
- VIII. **Land Requirements**
Identify sites, rights-of-way and easements required. Specify whether these properties are currently owned, or are to be acquired or leased, and whether options have been obtained contingent upon receipt of funding. For any site not currently being used for the intended alternative, identify adjacent land uses and any potential conflicts.
- XIV. **Environmental Considerations**
Discuss any specific impacts that a particular alternative may have beyond those already discussed. Define in greater detail the environmental impacts of the selected alternative and how those impacts will be mitigated will be addressed in the Environmental Review.
- XV. **Construction Problems**
Discuss unique concerns such as geological constraints, high water table, limited access, underground storage tanks, contaminated soil, or other conditions that may affect cost of construction or operation of facility. If applicable, discuss any special considerations to keep existing facilities operable during construction. Provide an estimated dollar amount to mitigate such problems.

XVI. **Cost Estimates**

a. **Project Costs**

Provide unit costs and basis of estimated costs (i.e., administrative, financial, engineering and construction costs).

b. **Annual O&M Costs**

Provide a discussion of the increase or decrease in operation and maintenance requirements associated with the alternative being analyzed. Include increased energy costs in the O&M costs. Provide a line item breakout and basis of O&M costs.

c. **Present Worth Analysis**

Based on a consistent discount rate, evaluate cost-effectiveness considering, at a minimum, capital and O&M costs for an appropriate planning period.

For drinking water projects address:

Supply or source alternatives

Describe new supply alternatives, rehabilitating existing supply or source, water rights, etc. Discuss the proximity to, and feasibility of connection to municipal public water supply system, or other central water system, if appropriate.

- **Storage alternatives** (tank or reservoir types and locations)
- **Fire protection alternatives** (main size & routing, building sprinkler systems)
- **Pump stations & other infrastructure alternatives** (options to increase capacity, pump types, etc.)
- **Treatment alternatives:** Describe the various treatment alternatives being proposed including ability to meet regulations, treatment efficiency and O&M requirements. Address waste streams and sludge disposal.
- **Project site alternatives**

For wastewater projects address:

- **Collection system alternatives** (main size & routing alternatives, material alternatives)
- **Lift stations & other infrastructure alternatives** (options to increase capacity, pump types, etc.)
- **Treatment alternatives:** Describe the various treatment alternatives being proposed including ability to meet regulations, treatment efficiency, discharge, and O&M requirements. Address sludge testing and removal.
- **Project site alternatives:** Discuss the proximity to, and feasibility of connection to municipal public wastewater treatment and disposal system, or other central wastewater system, if appropriate.

XVII. **Selection of a Preferred Alternative**

Provide a comparative analysis of all of the alternatives discussed above. Clearly define the criteria utilized for the comparison of each alternative and consistently apply the criteria to each alternative. At a minimum, the evaluation should take into account technical feasibility, environmental impacts, financial feasibility, public health and safety, operational and maintenance considerations, and public comments. Briefly describe each alternative's ability to: meet the owner's needs within its financial and operational resources, comply with regulatory requirements, be compatible with existing comprehensive area-wide development plans, and satisfy public and environmental concerns. A matrix or spreadsheet

should be used to summarize the logic of the selection process.

XVIII. Detailed Description of the Preferred Alternative

Clearly describe and define the preferred alternative. Submit the following for the Preferred Alternative **only if it has not been previously addressed in Section IV. Alternative Screening Process and Analysis, above.**

a. Site location and characteristics

Discuss the site location of any facilities, and the characteristics of the site(s). Provide any drawings or schematics if not previously provided.

b. Operational requirements

Discuss the expertise required to operate the facility and any unique requirements of the system.

c. Impact on existing facilities

Discuss the impact that the project would have on other system's facilities. For example, impacts that a water system improvement may have on the wastewater system.

d. Design criteria

Describe in greater detail the design criteria for the selected alternative. Discuss how the selected alternative will meet existing, and anticipated, regulatory and permit requirements.

For drinking water projects address the following:

- **Water Supply:** Include requirements for quality and quantity. Describe recommended source, including site.
- **Treatment:** Describe process in detail and identify location of plant and site of any process discharges.
- **Storage:** Identify size, type and site location.
- **Pumping Stations:** Identify size, type, site location and any special power requirements.
- **Hydraulic Calculations:** Provide sufficient information to determine compliance with DEQ design requirements if applicable.

For wastewater projects address the following:

- **Treatment:** Describe process in detail and identify location and site of any discharges. Discuss sludge treatment/disposal.
- **Pumping Stations:** Identify size, type, site location and any special power requirements.
- **Hydraulic Calculations:** Provide sufficient information to determine compliance with DEQ design requirements if applicable.

e. Environmental Impacts and Mitigation

Discuss significant findings of the Environmental Review and Environmental Checklist, providing detail on environmental impacts that the selected alternative may have on environmental resources, and any appropriate short and long-term measures necessary to minimize each potentially adverse impact.

f. Cost Summary for the Preferred Alternative

i. Project Cost Estimate

Provide an itemized estimate of the project administration and construction costs based on the anticipated period of construction. Include administrative line items such as personnel, office costs, training, legal services, interim interest, bond services, audit costs and other costs associated with the proposed project. Include construction line items for preliminary engineering, engineering design services, construction management, construction costs, land purchase costs, and contingency.

ii. Annual O&M Costs

Project costs realistically. In the absence of other reliable data, base projections on actual costs of other existing facilities of similar size and complexity. Include facts to substantiate O&M cost estimates. Include salaries, wages, taxes, accounting and auditing fees, legal fees, interest, utilities, gasoline, oil and fuel, insurance, repairs and maintenance, supplies, chemicals, office supplies and printing, and miscellaneous.

XIX. Recommendations and Implementation

Provide any other conclusions and recommendations and any additional findings that should be considered in the evaluation of the proposed project and the selected alternative. Describe how the project will be implemented and any special concerns regarding implementation. Discuss any recommendations for special studies such as pilot studies, highlighting the need for special coordination, or recommending a plan of action to expedite project development, etc. Provide a project schedule. Include as part of the schedule the time line for obtaining all project funding. Identify any items that have the potential to delay or prevent the project from going forward.