# *FACILITY PLAN OR PRELIMINARY ENGINEERING REPORT GUIDE*

FOR WASTEWATER OR DRINKING WATER FACILITIES

GENERAL OUTLINE OF A FACILITY PLAN OR PRELIMINARY ENGINEERING REPORT

WWAC applicants considering Clean Water State Revolving Funds (wastewater treatment works projects) should include in their engineering report a certification using the following language that the engineer prepares on behalf of the applicant.

*(A) has studied and evaluated the cost and effectiveness of the processes, materials, techniques, and technologies for carrying out the proposed project or activity for which assistance is sought under this title; and*

*(B) has selected, to the maximum extent practicable, a project or activity that maximizes the potential for efficient water use, reuse, recapture, and conservation, and energy conservation, considering—*

*(i) the cost of constructing the project or activity,*
*(ii) the cost of operating and maintaining the project or activity over the life of the project or activity, and*
*(iii) the cost of replacing the project or activity.*

## 1) PROJECT PLANNING

a) Location
b) Environmental Resources Present
c) Population Trends
d) Community Engagement

## 2) EXISTING FACILITIES

a) Location Map
b) History
c) Condition of Existing Facilities
d) Financial Status of any Existing Facilities
e) Water/Energy/Waste Audits

## 3) NEED FOR PROJECT

a) Health, Sanitation, and Security
b) Aging Infrastructure
c) Reasonable Growth

## 4) ALTERNATIVES CONSIDERED

a) Description
b) Design Criteria
c) Map
d) Environmental Impacts
e) Land Requirements
f) Potential Construction Problems
g) Sustainability Considerations
    i) Water and Energy Efficiency
    ii) Green Infrastructure
    iii) Other
h) Cost Estimates

## 5) SELECTION OF AN ALTERNATIVE

a) Life Cycle Cost Analysis
b) Non-Monetary Factors

## 6) PROPOSED PROJECT (RECOMMENDED ALTERNATIVE)

a) Preliminary Project Design
b) Project Schedule
c) Permit Requirements
d) Sustainability Considerations
    i) Water and Energy Efficiency
    ii) Green Infrastructure
    iii) Other
e) Total Project Cost Estimate (Engineer's Opinion of Probable Cost)
f) Annual Operating Budget
    i) Income
    ii) Annual O&M Costs
    iii) Debt Repayments
    iv) Reserves

## 7) CONCLUSIONS AND RECOMMENDATIONS

## ABBREVIATIONS

CDBG – Community Development Block Grant

CFR – Code of Federal Regulations

EDU – Equivalent Dwelling Unit

EPA – Environmental Protection Agency

GAO – Government Accountability Office

GPCD – Gallons per Capita per Day

HUD – Department of Housing and Urban Development

NEPA – National Environmental Policy Act

NPV – Net Present Value

O&M – Operations and Maintenance

OMB – Office of Management and Budget

PER – Preliminary Engineering Report

RD – Rural Development

RUS – Rural Utilities Service

SPPW – Single Payment Present Worth

SRF – State Revolving Fund

USDA – United States Department of Agriculture

USPW – Uniform Series Present Worth

WEP – Water and Environmental Programs

WWD – Water and Waste Disposal

# DETAILED OUTLINE of a PRELIMINARY ENGINEERING REPORT

## 1) PROJECT PLANNING

Describe the area under consideration. Service may be provided by a combination of central, cluster, and/or centrally managed individual facilities. The description should include information on the following:

a) Location. Provide scale maps and photographs of the project planning area and any existing service areas. Include legal and natural boundaries and a topographical map of the service area.

b) Environmental Resources Present. Provide maps, photographs, and/or a narrative description of environmental resources present in the project planning area that affect design of the project. Environmental review information that has already been developed to meet requirements of NEPA or a state equivalent review process can be used here.

c) Population Trends. Provide U.S. Census or other population data (including references) for the service area for at least the past two decades if available. Population projections for the project planning area and concentrated growth areas should be provided for the project design period. Base projections on historical records with justification from recognized sources.

d) Community Engagement. Describe the utility's approach (or proposed to use) to engage the community in the project planning process. The project planning process should help the community develop an understanding of the need for the project, the operational service levels required, funding and revenue strategies to meet these requirements.

## 2) EXISTING FACILITIES

Describe each part of the existing facility and include the following information:

a) Location Map. Provide a map, photographs and a schematic process layout of all existing facilities. Identify facilities that are no longer in use or abandoned.

b) History. Indicate when major system components were constructed, renovated, expanded, or removed from service. Discuss any component failures and the cause for the failure. Provide a history of any applicable violations of regulatory requirements.

c) Condition of Existing Facilities. Describe present condition; suitability for continued use; adequacy of current facilities; and their conveyance, treatment, storage, and disposal capabilities. Describe the existing capacity of each component. Describe and reference compliance with applicable federal, state, and local laws. Include a brief analysis of overall current energy consumption. Reference an asset management plan if applicable.

d) Financial Status of any Existing Facilities. Provide information regarding current rate schedules, annual O&M cost (with a breakout of current energy costs), other capital improvement programs, and tabulation of users by monthly usage categories for the most recent typical fiscal year. Report existing debts and required reserve accounts.

e) Water/Energy/Waste Audits. If applicable to the project, discuss any water, energy, and/or waste audits which have been conducted and the main outcomes.

## 3) NEED FOR PROJECT

Describe the needs in the following order of priority:

a) Health, Sanitation, and Security. Describe concerns and include relevant regulations and correspondence from/to federal and state regulatory agencies. Include copies of such correspondence as an attachment to the Report.

b) Aging Infrastructure. Describe the concerns and indicate those with the greatest impact. Describe water loss, inflow and infiltration, treatment or storage needs, management adequacy, inefficient designs, and other problems. Describe any safety concerns.

c) Reasonable Growth. Describe the reasonable growth capacity that is necessary to meet needs during the planning period. Facilities proposed to be constructed to meet future growth needs should generally be supported by additional revenues. Consideration should be given to designing for phased capacity increases. Provide number of new customers committed to this project.

## 4) ALTERNATIVES CONSIDERED

This section should contain a description of the alternatives that were considered in planning a solution to meet the identified needs. Documentation of alternatives considered is often a report weakness.

Alternative approaches to ownership and management, system design (including resource efficient or green alternatives), and sharing of services, including various forms of partnerships, should be considered.

In addition, the following alternatives should be considered, if practicable: building new centralized facilities, optimizing the current facilities (no construction), developing centrally managed decentralized systems, including small cluster or individual systems, and developing an optimum combination of centralized and decentralized systems.

Alternatives should be consistent with those considered in the NEPA, or state equivalent, environmental review.

Technically infeasible alternatives that were considered should be mentioned briefly along with an explanation of why they are infeasible, but do not require full analysis.

For each technically feasible alternative, the description should include:

a) Description. Describe the facilities associated with every technically feasible alternative. Describe source, conveyance, treatment, storage and distribution facilities for each alternative. Basic hydraulic calculations shall be listed in tabular form. A feasible system may include a combo of centralized/ decentralized (on-site/ cluster) facilities.

b) Design Criteria. State the design parameters used for evaluation purposes. These parameters should comply with federal, state, and agency design policies and regulatory requirements.

c) Map. Provide a schematic layout map to scale and a process diagram if applicable. If applicable, include future expansion of the facility.

d) Environmental Impacts. Provide information about how the specific alternative may impact the environment. Describe only those unique direct and indirect impacts on floodplains, wetlands, other important land resources, endangered species, historical and archaeological properties, etc., as they relate to each specific alternative evaluated. Include generation and management of residuals and wastes.

e) Land Requirements. Identify sites and easements required. Further specify whether these properties are currently owned, to be acquired, leased, or easements.

f) Potential Construction Problems. Discuss concerns such as subsurface rock, high water table, limited access, existing resource or site impairment, or other conditions which may affect cost of construction or operation of facility.

g) Sustainability Considerations. Sustainable utility management practices include environmental, social, and economic benefits that aid in creating a resilient utility.

   i) Water and Energy Efficiency. Discuss water reuse, water efficiency, water conservation, energy efficient design (i.e. reduction in electrical demand), and/or renewable generation of energy, and/or minimization of carbon footprint, if applicable to the alternative. Alternatively, discuss the water and energy usage for this option as compared to other alternatives.

   ii) Green Infrastructure. If applicable, discuss aspects of project that preserve or mimic natural processes to manage stormwater. Address management of runoff volume and peak flows through infiltration, evapotranspiration, and/or harvest and use.

   iii) Other. Discuss any other aspects of sustainability (such as resiliency or operational simplicity) that are incorporated into the alternative, if applicable.

h) Cost Estimates. Provide cost estimates for each alternative, including a breakdown of the following costs associated with the project: construction, non- construction and annual O&M costs. A construction contingency should be included as a non-construction cost.

   Cost estimates should be included with the descriptions of each technically feasible alternative. O&M costs should include a rough breakdown by O&M category (see example below) and not just a value for each alternative.

   Information from other sources, such as the recipient's accountant or other known technical service providers, can be incorporated to assist in the development of this section.

   The cost derived will be used in the life cycle cost analysis described in Section 5 a.

| **Example O&M Cost Estimate** | |
|---|---|
| Personnel (i.e. Salary, Benefits, Payroll Tax, Insurance, Training) | |
| Administrative Costs (e.g. office supplies, printing, etc.) | |
| Water Purchase or Waste Treatment Costs | |
| Insurance | |
| Energy Cost (Fuel and/or Electrical) | |
| Process Chemical | |
| Monitoring & Testing | |
| Short Lived Asset Maintenance/Replacement* | |
| Professional Services | |
| Residuals Disposal | |
| Miscellaneous | |
| Total | |

* See Table A for example list [page 18]

## 5) SELECTION OF AN ALTERNATIVE

Selection of an alternative is the process by which data from the previous section, "Alternatives Considered" is analyzed in a systematic manner to identify a recommended alternative.

The analysis should include consideration of both life cycle costs and non- monetary factors such as reliability, ease of use, and appropriate wastewater or water treatment technology for the Applicant's management capability shall be conducted. (I.e. triple bottom line analysis: financial, social, and environmental).

If water reuse or conservation, energy efficient design, and/or renewable generation of energy components are included in the proposal provide an explanation of their cost effectiveness in this section.

a) Life Cycle Cost Analysis. A life cycle present worth cost analysis (an engineering economics technique to evaluate present and future costs for comparison of alternatives) should be completed to compare the technically feasible alternatives. Do not leave out alternatives because of anticipated costs; let the life cycle cost analysis show whether an alternative may have an acceptable cost. This analysis should meet the following requirements and should be repeated for each technically feasible alternative. Several analyses may be required if the project has different aspects, such as one analysis for different types of collection systems and another for different types of treatment.

   i) The analysis should convert all costs to present day dollars;

   ii) The planning period to be used is recommended to be 20 years, but may be any period determined reasonable by the engineer and concurred on by the state or federal agency;

   iii) The discount rate to be used should be the "real" discount rate taken from Appendix C of OMB circular A-94 and found at www.whitehouse.gov/Appendix-C.pdf (0.30% in 2020).

   iv) The total capital cost (construction plus non-construction costs) should be included;

v) Annual O&M costs should be converted to present day dollars using a uniform series present worth (USPW) calculation;

vi) The salvage value (S) of the constructed project should be estimated using the anticipated life expectancy of the constructed items using straight line depreciation calculated at the end of the planning period and converted to present day dollars, i.e. remaining depreciation;

vii) The present worth of the salvage value is subtracted from the net present worth ;

viii) The net present value (NPV) is then calculated for each technically feasible alternative as the sum of the capital cost (C) plus the present worth of the uniform series of annual O&M (USPW (O&M)) costs minus the single payment present worth of the salvage value (SPPW(S)):

NPV = C + USPW (O&M) – SPPW(S)

ix) A table showing the capital cost, annual O&M cost, salvage value, present worth of each of these values, and the NPV should be developed for state or federal agency review. All factors (major and minor components), discount rates, and planning periods used should be shown within the table;

x) Short lived asset costs (See Table A for examples [page 18]) should also be included in the life cycle cost analysis if determined appropriate by the consulting engineer or agency. Life cycles of short-lived assets should be tailored to the facilities being constructed and be based on generally accepted design life. Different features in the system may have varied life cycles.

b) Non-Monetary Factors. Non-monetary factors, including social and environmental aspects (E.g. sustainability considerations, operator training requirements, permit issues, community objections, reduction of greenhouse gas emissions, wetland relocation) should also be considered in determining which alternative is recommended and may be factored into the calculations.

c) Wastewater Projects. If population is decreasing, the engineer preparing the PER/FP should contact NDEQ for options that can be applied to the project. For these towns, an option must be included as an alternative in the PER/FP.

**6) PROPOSED PROJECT (RECOMMENDED ALTERNATIVE)**

The engineer should include a recommendation for which alternative(s) should be implemented. This section should contain a fully developed description of the proposed project based on the preliminary description under the evaluation of alternatives. Include a schematic for any treatment processes, a layout of the system, and a location map of the proposed facilities.

At least the following information should be included as applicable to the specific project:

a) Preliminary Project Design.

i) Drinking Water:

Water Supply. Include requirements for quality and quantity. Describe recommended source, including site and allocation allowed. Details should be provided for determining average daily demand (residential, commercial & leakage). The

applicant's average gallons per capita per day (3 years data preferred) may be used OR the use of other published engineering design guidelines may be submitted for consideration in designing the proposed project. Peak period demands for daily and hourly should reflect the same conditions as described above.

Treatment. Describe process in detail (including whether adding, replacing, or rehabilitating a process) and identify location of plant and site of any process discharges. Identify capacity of treatment plant (i.e. Maximum Daily Demand). Identify any wastewater generation and treatment method. If discharged to sanitary sewer, evaluate collection system and wastewater treatment capability.

Storage. Identify size, type and location. Storage facilities should be sized using the Recommended Standards for Water Works guidelines (except for fire flows as stated above) OR the use of other published engineering design guidelines may be submitted for consideration in designing the proposed project.

Pumping Stations. Identify size, type, location and any special power requirements. For rehabilitation projects, include description of components upgraded.

Distribution Layout. Identify general location of new pipe, replacement, or rehabilitation: lengths, sizes and key components.

CDBG. Monies are to be expended for human consumption and/or for health-related issues. Upsizing wells, storage, and distribution to mainly meet fire flows or primarily serve residential & industrial future growth or agricultural irrigation & livestock purposes will not be considered as eligible under the program rules and those uses must be separated from the project and funded through other lenders.

Development of a new well field site. The following information will be provided:
1) Site approval by the Dept. of Health & Human Services Division of Public Health and
2) Data which supports the development of the well in this area such as geological surveys, water quality and production data (gallons per minute, specific capacity, etc.) on wells in adjoining areas, data from the Dept. of Natural Resources or Natural Resource District, or water quality and production results from a test hole(s).

ii) Wastewater/Reuse:

Collection System/Reclaimed Water System Layout. Identify general location of new pipe, replacement or rehabilitation: lengths, sizes, and key components. Flows in excess of 120 gpcd indicating infiltration or 275 gpcd during a storm event should require the completion of a Sanitary Sewer Evaluation Survey. This study analyzes which is more cost effective; to transport and treat the excess I&I, or if sewer rehabilitation would be cost effective in removing the excess I&I. Winter quarter potable water usage should be analyzed and compared to the wastewater flow data to check if exfiltration is occurring in the collection system. Unsewered areas within the planning jurisdiction should be identified. A cost-effectiveness analysis should be conducted on eliminating existing septic tank systems with sewer extensions.

Pumping Stations. Identify size, type, site location, and any special power requirements. For rehabilitation projects, include description of components upgraded.

Storage. Identify size, type, location and frequency of operation.

Treatment. Describe process in detail (including whether adding, replacing, or rehabilitating a process) and identify location of any treatment units and site of any discharges (end use for reclaimed water). Identify capacity of treatment plant (i.e. Average Daily Flow). Details should be provided for determining the average daily, peak hour and maximum daily wastewater flows to the POTW. Actual flow monitoring data should be gathered over a sufficient period to capture a wet weather event to analyze for infiltration and inflow from the sewer system. If commercial or industrial contributions are received by the POTW then flow proportioned composite sampling should be conducted measuring the daily pounds of Ammonia, CBOD, and TSS and their peak monthly values.

Receiving stream. Information along with the current or proposed NPDES discharge permit limitations determined and disinfection and any industrial pretreatment considerations analyzed.

Evaluation of the treatment alternatives should include conventional as well as any alternative or innovative technology including regionalization and sludge disposal alternatives for the 20-year design average and peak wastewater flows. Design criteria shall follow the current design standards as required by NDEQ. A cost effectiveness monetary analysis will be required on the principal alternatives as outlined in paragraph C above, along with an engineering evaluation of the following factors: a) reliability, b) energy use, c) revenue generating alternatives, d) process complexity, e) O&M considerations, and f) environmental impacts.

SRF. Monies are directed for municipally owned wastewater facility needs. Projects of a speculative nature or primarily for industrial capacity are not normally funded.

iii) Solid Waste:

Collection. Describe process in detail and identify quantities of material (in both volume and weight), length of transport, location and type of transfer facilities, and any special handling requirements.

Storage. If any, describe capacity, type, and site location.

Processing. If any, describe capacity, type, and site location.

Disposal. Describe process in detail and identify permit requirements, quantities of material, recycling processes, location of plant, and site of any process discharges.

iv) Stormwater:

Collection System Layout. Identify general location of new pipe, replacement or rehabilitation: lengths, sizes, and key components.

Pumping Stations. Identify size, type, location, and any special power requirements.

Treatment. Describe treatment process in detail. Identify location of treatment facilities and process discharges. Address capacity of treatment process.

Storage. Identify size, type, location and frequency of operation.

Disposal. Describe type of disposal facilities and location.

Green Infrastructure. Provide the following for green infrastructure alternatives:

(1) Control Measures Selected: Identify types of control measures selected (e.g., vegetated areas, planter boxes, permeable pavement, rainwater cisterns).
(2) Layout: Identify placement of green infrastructure control measures, flow paths, and drainage area for each control measure.
(3) Sizing: Identify surface area and water storage volume for each green infrastructure control measure. When applicable address soil infiltration rate, evapotranspiration rate, and use rate (for rainwater harvesting).
(4) Overflow: Describe overflow structures and locations for conveyance of larger precipitation events.

b) Permit Requirements. Identify any construction, discharge and capacity permits that will/may be required as a result of the project.

c) Sustainability Considerations (if applicable).

i) Water and Energy Efficiency. Describe aspects of the proposed project addressing water reuse, water efficiency, and water conservation, energy efficient design, and/or renewable generation of energy, if incorporated into the selected alternative.

ii) Green Infrastructure. Describe aspects of project that preserve or mimic natural processes to manage stormwater, if applicable to the selected alternative. Address management of runoff volume and peak flows through infiltration, evapotranspiration, and/or harvest and use, if applicable.

iii) Other. Describe other aspects of sustainability (such as resiliency or operational simplicity) that are incorporated into the selected alternative, if incorporated into the selected alternative.

d) Total Project Cost Estimate (Engineer's Opinion of Probable Cost). Provide an itemized estimate of the project cost based on the stated period of construction. Include construction, land and right-of-ways, legal, engineering, construction program management, funds administration, equipment, construction contingency, and other costs associated with the proposed project. The construction subtotal should be separated out from the non-construction costs. The non-construction subtotal should be included and added to the construction subtotal to establish the total project cost. An appropriate construction contingency should be added as part of the non- construction subtotal. For projects containing both water and waste disposal systems, provide a separate cost estimate for each system. The engineer may rely on the owner for estimates of cost for items other than construction, equipment, and engineering.

e) Annual Operating Budget. Provide itemized annual operating budget information. The owner has primary responsibility for the annual operating budget; however, there are other parties that may provide technical assistance. Provide a copy of the previous 3 years financial history on the operations of the water (or sewer) fund. Provide an amortization schedule on existing indebtedness held on the system. This information will be used to evaluate the financial capacity of the system. The engineer will incorporate information from the owner's accountant and other known technical service providers.

i) Income. Provide information about all sources of income for the system including a proposed rate schedule. Realistically project income for existing and proposed new users separately, based on existing user billings, water treatment contracts, and

other sources of income. In the absence of historic data or other reliable information, for budget purposes, base water use/ sewage of 100 gallons per capita per day. Water use per residential connection may then be calculated based on the most recent U.S. Census or other data for the state or county of the average household size. When large agricultural or commercial users are projected, the Report should identify those users and include facts to substantiate such projections and evaluate the impact of such users on the economic viability of the project.

ii) Annual O&M Costs. Provide an itemized list by expense category and project costs realistically. Provide projected costs for operating the system as improved. In the absence of other reliable data, base the estimate on actual costs of other facilities of similar size and complexity. Include facts to substantiate O&M cost estimates. Include personnel costs (note operator upgrades needed), administrative costs, water purchase or treatment costs, accounting and auditing fees, legal fees, interest, utilities, energy costs, insurance, annual repairs and maintenance, monitoring and testing, supplies, chemicals, residuals disposal, office supplies, printing, professional services, and miscellaneous as applicable. Any income from renewable energy generation which is sold back to the electric utility should also be included, if applicable.

iii) Short-Lived Asset Reserve – A table of short-lived assets (Assets with design life of 15 years or less) should be included for the system (See Table A for examples [page 18]). The table should include the asset, the expected year of replacement, the anticipated cost and a recommended annual reserve deposit to fund replacement. Short-lived assets include those items not covered under O&M.

iv) Debt Repayments. Describe existing and proposed financing with the estimated amount of annual debt repayments from all sources. All estimates of funding should be based on loans, not grants. All annual debt repayments should take into consideration reasonable population trends over the life of the loan.

v) Reserves. Describe the existing and proposed loan obligation reserve requirements.

f) Land. Provide evidence of land rights being procured such as easements, purchase options or other evidence for well sites or lagoon sites. When land application sites are part of the project they shall be purchased or leased. The lease or easement executed as an interest in real property, filled and indexed as such in the appropriate office of the registrar of deeds. The lease or easement shall be for the life of the loan.

## 7) CONCLUSIONS AND RECOMMENDATIONS

Provide any additional findings and recommendations that should be considered in development of the project. This includes recommendation of special studies, highlighting the need for special coordination, a recommended plan of action to expedite project development, and any other necessary considerations.

A timetable with the following milestones shall be included:

a) Securing land rights.
b) Completion of test hole drilling and testing.
c) Completion of environmental review process.
d) Submission of loan/grant application(s) to appropriate agency(ies).
e) Completion of final plans and specification.
f) Start and completion of construction.

| Table A: Example List of Short-Lived Asset Infrastructure | | | | |
|---|---|---|---|---|
| | | **Design Life** | **Present Value** | **Annualized Value** |
| **Drinking Water Utilities** | | | | |
| Treatment Related | | | | |
| | Process Equipment | 15 | | |
| | Granular filter media/ Membranes | 15 | | |
| | Air compressors & control units | 15 | | |
| | High Service Pumps & Pump Controls | 15 | | |
| | Water Level Sensors & Pressure Transducers | 15 | | |
| | Sludge Collection & Dewatering UV Lamps | 15 | | |
| | Chemical feed pumps/ Leak Detection Equipment | 15 | | |
| Source Related | | | | |
| | Well Pumps | 15 | | |
| Distribution System Related | | | | |
| | Storage reservoir painting/ gaskets | 15 | | |
| Systemwide Related | | | | |
| | Service Trucks (in some cases) | 15 | | |
| | Computer | 5 | | |
| **Wastewater Utilities** | | | | |
| Treatment Related | | | | |
| | Pump, Pump Controls Pump Motors | 15 | | |
| | Field & Process Instrumentation Equipment/ Flow meters, Pressure transducers, level sensors | 15 | | |
| | UV lamps | 5 | | |
| | Membrane Filters/Fibers | 15 | | |
| | Aeration blowers, diffusers and nozzles | 15 | | |
| | Chemical feed pumps/ Leak Detection Equipment | 15 | | |
| | Sludge Collecting and Dewatering Equipment/ Belt presses & driers | 15 | | |
| Collection System Related | | | | |
| | Lift Station Pumps | 10 | | |
| Systemwide Related | | | | |
| | Service Trucks (in some cases) | 15 | | |
| | Computer | 5 | | |
| **Both Utilities** | | | | |
| | Service Meters | 15 | $180 each | $12 each |