UNIFORM PRELIMINARY ENGINEERING REPORT FOR MONTANA PUBLIC FACILITY PROJECTS

Attached is the revised PER* outline. This outline replaces the previous W2ASACT PER outline. Applicants that have started or completed a PER using the outline contained in the Eighth Edition of the *Uniform Application for Montana Public Facilities Projects* may use that format for the upcoming funding cycle.

The outline provides information on what to include in a report. The level of detail required may vary according to the complexity of the specific project. In order to facilitate the review of the PER, adherence to the outline is strongly encouraged. The PER is submitted as part of an application to any of the federal and state agencies that fund public facilities in the State of Montana as listed in this publication. The PER must be prepared by a professional engineer licensed to practice in Montana.

Please note that the W2ASACT funding agencies in Montana require that an Executive Summary also be part of the PER. This is specifically noted because the new report outline did not include an Executive Summary. Additionally, most funding agencies require completion of the Uniform Environmental Checklist.

Environmental resources that may be impacted by the proposed project must be identified and evaluated. This is accomplished, in part, by completing the Uniform Environmental Checklist, analyzing the potential impacts of the project on the identified environmental resources in the PER, and requesting that several State and Federal agencies comment on the selected alternative in order to identify any specific concerns that they may have about the proposed project. This process is explained in more detail in the section entitled, *Environmental Related Requirements.* Please note that for RD funding, a stand-alone Environmental Report is required. Also, the TSEP and CDBG Programs must be contacted separately regarding the environmental documentation needed to apply for funding.

The various agencies funding these projects have different requirements related to the environmental review process, the selection of the preferred engineering alternative, and adoption of the PER. Public review and notifying the public in particular varies by funding agencies. Failure to follow a particular funding agency's requirements may result in additional engineering and environmental review activities, which may include subsequent review and additional notices. As a result, applicants should contact those agencies that they are considering applying to, in order to determine each of the agencies specific requirements.

Prior to the final adoption of the PER, at least one public meeting is required to receive comments from the public. The public meeting must be properly noticed and the public must be provided with an opportunity at the meeting to comment on the project. Minutes of the meeting should reflect what was discussed about the project, including all comments received from the public. Refer to individual program's application guidelines for any additional hearing requirements.

---

*The outline was developed by the following agencies in January of 2013:

- U.S. Department of Agriculture, Rural Development, Rural Utilities Service, Water and Environmental Programs;
- U.S. Environmental Protection Agency, Offices of Water, Ground Water and Drinking Water; and Waste Management;
- U.S. Department of Housing and Urban Development, Office of Community Planning and Development;
- U.S. Department of Health and Human Services, Indian Health Service; and
- The Small Communities Water Infrastructure Exchange.

GENERAL OUTLINE OF A PRELIMINARY ENGINEERING REPORT

0) EXECUTIVE SUMMARY
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
    f. Annual Operating Budget
        i. Income
        ii. Annual O&M Costs
        iii. Debt Repayment
        iv. Reserves
7) CONCLUSIONS and RECOMMENDATIONS

DETAILED OUTLINE OF A PRELIMINARY ENGINEERING REPORT

The following is a more detailed outline that provides guidance regarding the type and level of detail under each of the required headings. It should be noted that the outline is by no means all-inclusive. The engineer should use judgment in presenting sufficient information in the preparation of the PER, taking into account that different systems require varying levels of detail (facultative lagoons versus mechanical plants, groundwater sources versus surface water treatment, land filling versus transportation, etc.). The level of effort required to prepare the report and the depth of analysis within the report should be proportional to the size and complexity of the proposed project.

Section 2.c of this outline requires an evaluation of existing facilities associated with the entire system. The intent of this requirement is not to force the unnecessary expenditure of time or money conducting a detailed engineering study and evaluation of system components not being replaced or improved as part of this project. However, in order for funding agencies to properly evaluate an application and make meaningful funding decisions, it is necessary for them to know the condition of all of the components of the system, the improvements that have been made to the various components of the system in the past, and how the remaining improvements that will be needed will be phased. It is therefore required that the general condition of all components of the system be discussed in the PER in enough detail to provide an understanding of the overall condition of the entire system. Drawings, schematics, and the level of detail required to convey this information is left to the professional judgment of the engineer preparing the PER.

0) EXECUTIVE SUMMARY

Provide a summary of why the engineering study was undertaken, a brief description of the basic needs or deficiencies of the system being studied, a brief description of the alternatives considered, a brief description of the preferred alternative, the estimated total cost to construct the preferred alternative and the net cost per user based on the proposed funding plan. Note any other pertinent conclusions.

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 National Environmental Policy Act of 1969 (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 used (or proposed for 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 utility operational service levels required, funding and revenue strategies to meet these requirements, along with other considerations.

2) EXISTING FACILITIES

Describe each part (e.g. processing unit) of the existing facility and include the following information:

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

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. Note: Some agencies require the owner to submit the most recent audit or financial statement as part of the application package. 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. Give status of 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 the following information:

a) Description. Describe the facilities associated with every technically feasible alternative. Describe source, conveyance, treatment, storage and distribution facilities for each alternative. A feasible system may include a combination of centralized and decentralized (on-site or 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 have access agreements.

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

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 5a.

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 Appendix A for example list.*

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 (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 cost present worth 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 of the project has different aspects, such as one analysis for different types of collection systems and another for different types of treatment.

1. The analysis should convert all costs to present day dollars.

2. 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.

3. The discount rate to be used should be the "real" discount rate taken from Appendix C of OMB Circular A-94 and found at: https://www.whitehouse.gov/wp-content/uploads/2019/12/Appendix-C.pdf

4. The total capital cost (construction plus non-construction costs) should be included.

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

6. The salvage value 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.

7. The present worth of the salvage value should be subtracted from the present worth costs.

8. 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)

9. 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.

10. Short lived asset costs (see Appendix A for examples) 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, reliability, operability) should also be considered in determining which alternative is recommended and may be factored into the calculations.

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.

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).

Storage. Identify size, type and location.

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.

ii) Wastewater/Reuse (refer to Circular DEQ-2, Chapter10)

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

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).

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. Capacity of treatment process should also be addressed.

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

Disposal. Describe type of disposal facilities and location.

Green Infrastructure. Provide the following information for green infrastructure alternatives:

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

b) Project Schedule. Identify proposed dates for submittal and anticipated approval of all required documents, land and easement acquisition, permit applications, advertisement for bids, loan closing, contract award, initiation of construction, substantial completion, final completion, and initiation of operation.

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

d) 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.

e) 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, interest, equipment, construction contingency, refinancing, 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 as well as a grand total. If applicable, the cost estimate should be itemized to reflect cost sharing including apportionment between funding sources. The engineer may rely on the owner for estimates of cost for items other than construction, equipment, and engineering.

f) 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. 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. Project income realistically 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 on 100 gallons per capita per day. Water use per residential connection may then be calculated based on the most recent U.S. Census, American Community Survey, 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.

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, based on actual costs of other existing facilities of similar size and complexity. Include facts in the report to substantiate O&M cost estimates. Include personnel costs, 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. If applicable, note the operator grade needed.

ii) 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.

iii) Reserves. Describe the existing and proposed loan obligation reserve requirements for the following:

Debt Service Reserve – For specific debt service reserve requirements consult with individual funding sources. If General Obligation Bonds are proposed to be used as loan security, this section may be omitted, but this should be clearly stated if it is the case.

Short-Lived Asset Reserve – A table of short lived assets should be included for the system (See Appendix A for examples). The table should include the asset, the expected year of replacement, and the anticipated cost of each. Prepare a recommended annual reserve deposit to fund replacement of short-lived assets, such as pumps, paint, and small equipment. Short-lived assets include those items not covered under O&M, however, this does not include facilities such as a water tank or treatment facility replacement that are usually funded with long-term capital financing.

7) CONCLUSIONS and RECOMMENDATIONS

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

Appendix A: Example List of Short-Lived Asset Infrastructure

Estimated Repair, Rehab, Replacement Expenses by Item within up to 20 Years from Installation

Drinking Water Utilities

Source Related: Pumps; pump controls; pump motors; telemetry; intake/well screens; water level sensors; pressure transducers.

Treatment Related: Chemical feed pumps; altitude valves; valve actuators; field process instrumentation equipment; granular filter media; air compressors and control units; pumps; pump motors; pump controls; water level sensors; pressure transducers; sludge collection & dewatering; UV lamps; membranes; back-up power generators; chemical leak detection equipment; flow meters; SCADA systems.

Distribution System Related: Residential and small commercial meters; meter boxes; hydrants and blow offs; pressure reducing valves; cross connection control devices; altitude valves; alarms & telemetry; vaults, lids, and access hatches; security devices and fencing; storage reservoir painting/patching.

Wastewater Utilities

Treatment Related: Pump; pump controls; pump motors; chemical feed pumps; membrane filters fibers; field and process instrumentation equipment; UV lamps; centrifuges; aeration blowers; aeration diffusers and nozzles; trickling filters, RBCs, etc.; belt presses and driers; sludge collecting and dewatering equipment; level sensors; pressure transducers; pump controls; back-up power generator; chemical leak detection equipment; flow meters; SCADA systems.

Collection System Related: Pump; pump controls; pump motors; trash racks/bar screens; sewer line rodding equipment; air compressors; vaults, lids, and access hatches; security devices and fencing; alarms & telemetry; chemical leak detection equipment.