Clean Water Services
East Basin 2019 Master Plan Project

Technical Memorandum 1
PROJECT GOALS AND PLANNING CRITERIA

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PROJECT GOALS AND PLANNING CRITERIA

1.1 Background

This technical memorandum presents the public values, project goals and evaluation criteria to be used for the integrated planning of the wastewater systems in the East Basin, which include:

- Durham Advanced Wastewater Treatment Facility (AWWTF).
- East Basin Gravity Conveyance Pipelines and Pump Stations.

1.2 Introduction

The project goals, objectives, and criteria were developed in the Project Kick-Off and Chartering Workshop conducted on January 29,2020.

Economic evaluation factors, including provisions for non-construction costs, contingencies, and for cost indexing are defined herein. Non-economic criteria for alternative selection are also identified. Process design and reliability criteria will be developed in the Capacity Assessment Memoranda.

The planning horizon for the project is year 2040. The economic alternatives evaluation will be based on equivalent uniform annual cost (EUAC). The EUAC cost of the alternatives will include:

- Capital costs and salvage value.
- Operation and maintenance costs including labor, materials, and power.
- Asset reinvestment?

Alternatives will also be compared on a non-economic basis. The implementation schedule will also be considered when choosing an appropriate alternative.

1.3 Planning Goals

The planning goals provide focus around having a plan that is flexible and useable for numerous years under changing conditions. The following general planning goals were agreed upon as a group for this planning effort:

1. Be consistent with and advance strategies to improve overall watershed health (i.e. Water Supply Project, Watershed based Permit).
2. Be flexible and provide a framework for successful long-term implementation decisions.
3. Meet all applicable regulatory requirements.
4. Be a vision for the future.
5. Be accepted by internal and external stakeholders, elected officials, and the public.
6. Be cost-effective.
7. Be resilient with respect to climate change and seismic risks.

In addition to the general planning goals, the following goals were agreed upon by the group for each of the systems included in this planning process:

- Durham AWWTF:
  - Selection of tertiary treatment technology relative to regulation.
  - Updates to timing of secondary and tertiary treatment expansions.
  - Identify preferred option to increase stabilization capacity.
  - Optimize balance of expansion, operation and maintenance (O&M) costs, and revenues (fats oils and grease [FOG], gas utilization, etc.).
  - Minimize sidestream effects.
- East Basin Gravity Conveyance Pipelines and Pump Stations:
  - Update to planning assumptions based on current Clean Water Services (District) documents.
  - Update to hydraulic model based on recent capital projects.
  - Identify cost-effective solutions for capacity limitations in Fanno Creek Interceptor.
  - Capital improvement phasing/timing strategy for projects throughout the Durham Basin.
  - Develop accurate costs for selected capital improvement program.

1.4 Evaluation Criteria

The evaluation criteria were developed while considering the project goals. The criteria measures of quantitative and qualitative values used to screen and evaluate alternatives are presented herein.

1.4.1 Factors for Conducting Economic Evaluation

The economic evaluation of alternatives is based on EUAC analysis which includes initial capital cost, and operation and maintenance costs over the planning period and the expected life of the facilities.

1.4.1.1 Capital Costs

All cost estimates prepared as part of the East Basin planning effort are order-of-magnitude estimates as defined by the American Association of Cost Engineers (AACE). An order of magnitude estimate is one that is made without detailed engineering data and uses techniques such as cost curves and scaling factors applied to similar projects. The overall expected level of accuracy of the cost estimates presented is –30 percent to +50 percent. This means that bids can be expected to fall within a range of 30 percent under to 50 percent over the estimate for each project. This is consistent with the guidelines established by the AACE for planning level studies.

The costs estimates for this project are based on the perception of current conditions in the Washington County area. Costs will be prepared based on a 20 Cities *Engineering News-Record* (ENR) Construction Cost Index average of 11455 (August 2020) and a location factor of 0.995. The estimates reflect a professional opinion of costs at this time and are subject to change as the design of each project component develops. The consultant team has no control over variances in the cost of labor, materials, and equipment; services provided by others; contractor's methods of determining process; competitive bidding or market conditions; or bidding practices or strategies; and therefore does not warrant or guarantee that proposals, bids or actual construction costs will not vary from costs presented in this report.

Preliminary cost estimates are presented for various wastewater conveyance and treatment facilities. Construction costs are costs without contingency. Estimated construction costs include the work items described for each, plus the following indirect costs:

- Contingencies - 30 percent.
- Contractor general conditions – 10 percent (e.g., mobilization, demobilization, permits).
- Contractor overhead and profit – 15 percent.
- Annual escalation to mid-point of construction – 2 percent.

The preliminary construction cost estimates do not include the following:

- Potential cost increases due to unknown historical or cultural impacts to construction.
- Potential costs associated with identification and mitigation of hazardous waste.
- Easement or land acquisition costs.
- Engineering, legal and administration (ELA) costs.

Total project costs for East Basin alternatives will be calculated by multiplying the sum of the estimated construction costs (with general conditions and overhead and profit) by a factor to account for engineering, legal and administration costs as follows:

- Engineering, legal and administration - 25 percent.

The engineering, legal and administrative cost factor will be applied to the construction cost following the application of the contingencies factor.

1.4.1.2 Operation and Maintenance Costs

O&M costs will be based on annual average flow and load conditions. Unit costs for labor, materials, and power were developed based on current District costs and will be used to develop O&M costs for alternative analysis. The O&M unit costs are summarized in Table 1.1.

Table 1.1 Operations and Maintenance Unit Costs

Item	Unit Cost	Source
O&M Labor (including benefits)	$59/hour	District (Erin L.)
O&M Pipelines	$0.25/(in diameter-ft-year)	Industry standard
O&M Pump Station	$50,000/pump station-year	District
Pump Station Run Time	2,200 hours/year	District
Power	$0.06/kWh	District
Natural Gas	$0.85/Therm	District
Chemicals		
Alum	$355.98/dry ton	District
Polymer	$2.12/lb (43% active) $0.91/lb (neat)	District
Solids Disposal		
Local	$14.03/wet ton (July – October)	District
Long Distance	$17.60/wet ton (November – June)	District
Revenue Sources		
HSW Tipping Fee	$0.07/gallon	District
RIN	$0.45 /77000 BTU	EPA website

Note:
Abbreviations: ft - feet; lb - pound; BTU - British thermal unit; RIN - Renewable Identification Number; EPA - Environmental Protection Agency.

1.4.1.3 Land Acquisition Costs

Land prices will be determined on a case-by-case basis. Where possible, costs will be estimated from county tax assessor appraisal records.

1.4.1.4 EUAC

The economic evaluation of treatment and conveyance alternatives utilizes the EUAC methodology. The EUAC methodology calculates the annualized present value of constructing, operating, and maintaining each component of the system. The EUAC includes the initial and replacement cost of capital, annual O&M costs, and annual energy costs. The approach considers a varied design life for infrastructure component replacement as follows:

- Conveyance Pipelines – 80-years.
- Treatment or Pumping Structures – 50-years.
- Treatment or Pumping Mechanical and Electrical – 20-years.

The net discount rate for the EUAC methodology is used for both present worth and annualized replacement cost calculations. The net discount rate assumes the following:

- Annual Inflation Rate = 2-percent.
- Discount Rate (interest rate used to determine the present value of future cash) = 4-percent.
- Net Discount Rate = Discount Rate – Annual Inflation = 2-percent.

The following formulation is used for the EUAC cost methodology when comparing alternatives:

- **Annualized Capital and Replacement Percentage** = (Net Discount Rate)/(Net Discount Rate + 1)/[1 - (1 + Net Discount Rate)^(-Component Design Life)]; *where design life is specific to component type.*
- **Component Annual Capital Cost (present worth $/year) =** [Capital Cost/((1+ Net Discount Rate)^t)] x Annualized Capital and Replacement Percentage; *where t is time of implementation in years.*
- **Component Annual O&M Cost (present worth $/year)** = [Annual O&M Cost/((1+ Net Discount Rate for O&M)^t)]; *where t is time of implementation in years.*
- **Component Annual Energy Cost (present worth $/year)** = [Annual Energy Cost/((1+ Net Discount Rate)^t)]; *where t is time of implementation in years.*
- **Component EUAC (present worth $/year)** = Component Annual Capital Cost + Component Annual O&M Cost + Component Annual Energy Cost.
- **Alternative EUAC (present worth $/year)** = sum of all component EUACs within an improvement alternative.

An EUAC can further be applied and summed for each component part of a system over the number of years in the planning horizon for which the component part is implemented. This totalized cost is an estimate of the total present worth for the capital program.

1.4.2 Factors for Conducting Non-Economic Evaluation

The non-economic evaluation of treatment and conveyance alternatives utilizes a scoring system based on five factors: (1) construction risk; (2) environmental, cultural impacts and permitting; (3) easements and property acquisition; (4) flexibility; and (5) O&M. Each of these

five criteria are summarized in more detail below. The evaluation includes a weighting of the above criterion and a 1 to 5 score for each alternative and each criterion as listed below:

- Score 1 = Considerably Below Average.
- Score 2 = Moderately Below Average.
- Score 3 = Average Performance.
- Score 4 = Moderately Above Average.
- Score 5 = Considerably Above Average.

Where: Composite Score = Σ_i (Criteria Weight$_i$) x (Criteria Score$_i$).

1.4.2.1 Construction Risk

Alternatives consider feasibility and risk of construction including ground and soils conditions (erosion and landslide potential) and challenges associated with construction access (proximity to creeks, wetlands, utilities, etc.). Preferred alternatives limit risk to construction schedule, minimize change orders, and maximize infrastructure design life based on site conditions or construction techniques.

1.4.2.2 Environmental, Cultural Impacts, and Permitting

Alternatives consider permitting and mitigation for environmentally and culturally sensitive areas including vulnerable habitats, endangered species, artifacts, protected cultural sites, and fossils. Preferred alternatives minimize requirements for environmental and land use permitting associated with regulated lands, water bodies, urban growth boundaries, and land use/zoning. Additional consideration is given to public and business disruption during construction.

1.4.2.3 Easements and Property Acquisition

Alternatives consider land owners, number of parties, and existing assets or easements owned by the District. Preferred alternatives minimize complexity of negotiating and purchasing additional property or easements.

1.4.2.4 Flexibility

Alternatives consider phasing of infrastructure to accommodate timing of development without excessive over-building of capacity. Preferred alternatives favor flexibility in system operations and timing of capital projects to maximize use of the existing system while meeting future regulation. Additional consideration is given to a balance of improvement types (such as capacity upgrades, infiltration and inflow (I/I) reduction, and system storage) to provide both flexibility and redundancy.

1.4.2.5 Operations and Maintenance

Alternatives consider ease of access for maintenance, frequency of operation, odor control, corrosion, and design life. Preferred alternatives promote reliable infrastructure and safety guidelines while minimizing resources for day-to-day operations.