

Date: **September 1, 2022**

Project No.: **20985**

To: **Orleans Wastewater Management Advisory Committee (WMAC)**

From: **Mike Giggey**

Subject: **Orleans Wastewater Management Planning  
Evaluation of Sewer Extension Options**

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We understand that the WMAC must provide recommendations to the Select Board related to the potential sewer extensions that are under consideration. At the August 25 meeting of the WMAC, it was agreed that Wright-Pierce will suggest some evaluative factors that can be used to move toward recommendations on those extensions and make some preliminary recommendations. This memo identifies the factors that we believe should be considered and provides some preliminary guidance on setting priorities.

### **Identification of Potential Sewer Extensions**

Based on the nomenclature used in recent AECOM PowerPoint slides, these are the eight sewer extensions being considered:

1. Eldredge Parkway Area 1
2. Eldredge Parkway Area 2
3. Tonset Road Area 1
4. Tonset Road Area 2
5. Uncle Harvey's Pond Area
6. Crystal Lake Area
7. Pilgrim Lake Area
8. Rock Harbor Area

### **Evaluative Factors**

These sewer extension options differ in some important ways. We suggest that they be compared in light of several evaluative factors:

Costs. If there are limited funds, then the costs of these alternatives are very important.

Degree of nitrogen removal achieved. The expected nitrogen removal should be compared with the total town responsibility in the given watershed.

Degree of phosphorus removal achieved. Pond protection is a CWMP objective that can be addressed by some of the options but not by others.

Impact on treatment plant capacity. How do the flows from each option compare with the expected reserve capacity at the treatment plant?

Conformance with CWMP. Does the option fit within one of the sewer phases in the CWMP, or is the service area beyond the CWMP intent or part of a later phase?

Sequence of construction. Some of the options require completion of other options.

Intensity of development served. Where will the town gain the "most bang for the buck" in terms of flow or nitrogen load per dollar of expenditure?

Requirements of Watershed Permits. The Town has unfulfilled responsibilities under the Pleasant Bay watershed permit, and its responsibilities in the Rock Harbor and Nauset system are not yet well defined nor legally binding.

### **Preliminary Evaluation**

Applying the evaluative factors reveals these findings:

Costs. AECOM has estimated the construction costs of these options to range from \$0.6 million (Uncle Harvey's Pond Area) to \$20.5 million (Tonset Road Area 2), with a total cost of about \$85 million. These costs do not include treatment plant expansion costs if available reserve capacity is not adequate. The aggregate amount is a large fraction of what the town will have already spent on the treatment plant and for sewers in the downtown area and for Meetinghouse Pond. The town's ability to support additional debt service may limit these potential extensions.

Nitrogen removal. The four Eldredge Parkway and Tonset Road projects would remove nitrogen from the Nauset watershed and collectively would satisfy nearly all of the Orleans' remaining share of nitrogen removal responsibilities, at least based on very preliminary estimates. (It is conceivable that the combined nitrogen removal might exceed Orleans' share.) The projects serving the Uncle Harvey's Pond, Crystal Lake and Pilgrim Lake areas would remove nitrogen in the Pleasant Bay watershed and might be enough to satisfy Orleans' shortfall for the first 5-year period of that watershed permit. The Rock Harbor project would remove nitrogen in a watershed where Orleans's responsibilities may already have been achieved.

Phosphorus removal. The projects serving the Uncle Harvey's Pond, Crystal Lake and Pilgrim Lake areas would directly address the phosphorus removal needs documented in the CWMP. Phosphorus removal is an important goal of the CWMP that has not yet been significantly addressed anywhere in town.

Impact on treatment plant capacity. In the aggregate, the eight extensions would convey about 150,000 gallons per day (gpd) of wastewater to the treatment plant on an annual average basis. The current best estimate of reserve capacity (after completion of the downtown and Meetinghouse Pond sewers) is 72,000 gpd. Therefore, an expansion of the treatment plant would be necessary to receive wastewater from all of the possible extensions. The eight options would collect flows ranging from 1,600 gpd in the Uncle Harvey's Pond area to about 42,000 gpd in each of the Eldredge Parkway-2 and Tonset Road-2 areas. An important consideration is the fact that the best estimate of reserve capacity is still very approximate, given the fact that no sewer connections have yet been made and that water use records indicate significant year-to-year variability. A further important unknown is the degree to which increases in flow will occur in the downtown commercial establishments once they connect to the sewer.

Conformance with CWMP. Most of the potentially sewered areas fall in Phase 3 of the CWMP. The Rock Harbor project falls in Phase 6. Implementing that project would be out of sequence with the CWMP phasing plan.

Sequence of construction. As currently configured, the two Eldredge Park areas could be connected directly to the recently completed sewers leading to the treatment plant. The Tonset Road and Uncle Harvey's Pond areas would connect to the Meetinghouse Pond system, not yet under construction. The Crystal and Pilgrim Lake areas would connect to the Eldredge Parkway-2 area, so would not be implemented unless or until the Eldredge Parkway-2 project is completed.

Intensity of development served. Most of the projects have about the same sewer "density", about 130 to 180 gpd per parcel served and 80 to 100 feet of pipe per parcel served. The Eldredge Parkway-1 area is somewhat less "dense".

Requirements of watershed permits. The Pleasant Bay watershed permit requires that Orleans remove an additional 177 kg/yr of attenuated nitrogen load by the end of the fifth year of that permit, that is, by mid 2023. There are no firm data available on Orleans' share of nitrogen removal needs in the Rock Harbor and Nauset systems and watershed permits will not be in place there for several years.

### **Preliminary Recommendations**

It seems that there are two significant unknowns: the town's ability to fund the local share of over \$80 million in capital costs, and the reserve capacity available at the wastewater treatment plant.

The extension to eliminate septic systems upgradient of Uncle Harvey's Pond should be the highest priority, given its low cost and the water quality benefits to the pond.

The Rock Harbor project should be the lowest priority because the nitrogen removal needs in that watershed are the least understood (given uncertainties about Cedar Pond), and there has been no discussions with Eastham on potential shared solutions.

The extensions to serve the Crystal Lake and Pilgrim Lake areas deserve high priority, since those projects would address phosphorus concerns and also help the Town fulfill its needs for nitrogen removal in the Pleasant Bay watershed. With the current preliminary design, these two areas would require the completion of the Eldredge Parkway-2 project, which increases the cost considerably. We should explore ways to connect these two lake service areas without building all of the Eldredge Parkway-2 project.

Some nitrogen removal progress has been made in the Town Cove sub-watershed through the downtown sewer project. Significantly more nitrogen removal will be required in that sub-watershed and that need could be fulfilled by sewer extensions in the four Eldredge Parkway and Tonset Road projects. However, it may be prudent to defer further removals there until more is known about the overall nitrogen removal needs and options have been explored for joint projects with Eastham.

Given all of these considerations, we believe that the highest priorities should be:

- Uncle Harvey's Pond (\$0.6 million with phosphorus control benefits)
- Crystal Lake (\$3.2 million with both phosphorus and nitrogen removal benefits)
- Pilgrim Lake (\$10.4 million with both phosphorus and nitrogen removal benefits)
- The portions of the Eldredge Parkway-2 area needed to connect Crystal Lake and Pilgrim Lake areas (unknown cost)

Together these four projects would cost about \$15 million, plus the portion of the Eldredge Parkway-2 project needed to allow the connection. The added wastewater flow would be about 20,000 gpd, well within the apparent 72,000-gpd available treatment capacity and leaving room for growth in sewer flow in the downtown and Meetinghouse Pond service areas.

To refine these discussion, the following steps should be taken:

1. Conduct a sensitivity analysis to better understand the wastewater flows that could be expected from the downtown and Meetinghouse Pond areas, and thus have a better idea of reserve capacity.
2. Determine the feasibility of constructing only parts of Eldredge Parkway-2 project needed to convey Crystal Lake and Pilgrim Lake flows to the treatment plant.
3. Evaluate the natural attenuation that would impact nitrogen removals in the Crystal Lake and Pilgrim Lake areas, so that the removal of attenuated nitrogen loads can be compared with the 177 kg/yr remaining portion of the Town's obligation in the first 5 years of the Pleasant Bay watershed permit.
4. Coordinate with the Town's financial planning for future debt.

We expect that the WMAC will discuss these concepts and these early recommendations at its September 8 meeting, after which this memorandum can be updated.