

The Lonnie’s Pond target is the load removal needed after accounting for the benefits of the shellfish harvesting project. It is important to note that the credits estimated in Table 1 are based on water consumption in 2014 to 2015. Some of that water use may be in homes that did not exist when the 2006 MEP report was prepared (the water use basis was 2004 for Orleans). As an interim estimate, we have reduced those estimated credits by 5% to account for that growth. The credit discounts for Lonnie’s Pond and Arey’s Pond would be 9 and 5 kg/yr and are included in Table 1.

Possible Expansion of Phase 3 Service Area

We next considered an expansion of the current Phase 3 layout to see how many more homes would need to be sewered to accomplish the full nitrogen removal needs for Lonnie’s Pond and Arey’s Pond. This evaluation is based on an average sewer credit of 4 kg/yr/home, determined from the current water use across the full Phase 3 service area. The results are summarized here:

	Lonnie’s Pond	Arey’s Pond	Total
Properties in current Phase 3 service area	104	25	129
Added homes to address Orleans’ shortfall	2	6	8
Added homes to address unsewered growth elsewhere in watershed	17	7	24
Subtotal	123	38	161
Added Orleans homes to address Brewster’s responsibilities	5	10	15
Total	128	48	176

If the current Phase 3 service area were slightly expanded (by 2 homes in the Lonnie’s Pond tributary area and by 6 homes in the Arey’s pond sub-watershed) then Orleans could meet its full obligation under the Pleasant Bay watershed permit.

Please note that the numerical load removals in the Pleasant Bay permit relate only to “current” nitrogen loads. Implicit in that permit is the need for the towns to remove 100% of “future” nitrogen loads. To account for this provision, we considered a 10% growth in nitrogen load in the portions of the subject sub-watersheds that would remain unsewered. While this percentage must be vetted, the table above shows the number of homes that would need to be sewered to accomplish that place-holder growth

assumption. Between the two sub-watersheds, an additional 24 homes would need to be sewered to plan ahead for that level of growth.

By increasing the number of sewered properties from 104 to 123 in the Lonnie's Pond tributary areas, and from 25 to 38 in the Arey's pond sub-watershed, Orleans would address its current obligations there with an allowance for some growth.

Table 1 shows the target nitrogen removals both for Orleans and for the entire sub-watersheds. The difference between these two numbers is the load removal obligation of Brewster. Since Brewster's obligation is a small portion of the total, we estimated the number of homes that could be sewered in Orleans to accomplish the Brewster obligation. As shown above, that would require only 5 additional sewered homes in the Lonnie's Pond tributary area, and 10 additional homes in the Arey's Pond sub-watershed. Providing that nitrogen removal near the impaired ponds would allow the impact to be felt decades earlier than similar removals far upgradient in Brewster.

These projections should be compared with the proposed sewer layouts to see if these additional homes can be readily sewered.

This evaluation is instructive. It illustrates some of the fundamental aspects of nitrogen management planning. The WMAC review of this memo should allow productive discussions about the information available to plan nitrogen management projects, the role of natural attenuation, and the issues related to growth in watershed nitrogen loading.

Conclusions

This evaluation shows that:

1. The current Phase 3 sewer layout should accomplish a large part of the Orleans nitrogen removal obligations in the Lonnie's Pond (95%) and Arey's Pond (77%) sub-watersheds.
2. By adding 8 homes to the service areas, the entire Orleans obligation could be satisfied.
3. By adding another 24 homes, Orleans could provide nitrogen removal to accommodate 10% growth in unsewered areas of these sub-watersheds.
4. By adding a further 15 sewer connections in Orleans, Brewster's obligations could be addressed in these two sub-watersheds.

ORLEANS WASTEWATER MANAGEMENT PLANNING

Nitrogen Removal Credits for Potential Phase 3 Properties

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Table 1

Sub-Watershed	Developed Properties Served	Water Use, gpd	Nitrogen Loads, kg/yr		
			Approx Credit	Removal Targets	
				Orleans	Total
Crystal Lake	26	2,920	7		
Pilgrim Lake	43	6,033	33		
Lonnie's Pond	35	4,487	139		
Lonnie's System	104	13,440	179	188	202
Meetinghouse Pond	13	1,320	43	1,876	1,876
Town Cove	7	5,084	166	TBD	TBD
Upper River	5	651	21	375	378
Arey's Pond	25	2,814	87	113	142
Total	154	23,309	496		

Lonnie's Pond N removal target is 284/298 kg/yr, of which 96 kg/yr has been accomplished via shellfish harvesting

Crystal Lake and Pigrim Lake credits in Upper/Lower River are not shown