ENGINEERING DESIGN & OPERATIONAL SUMMARY
DOCKHAM SHORES WATER IMPROVEMENTS
PWS # 0882190
GILFORD, NEW HAMPSHIRE
April 2018

The Dockham Shores PWS #0882190 is located on the northeasterly side of Route 11B in Gilford, NH. Dockham Shores is owned by Lakes Region Water Company of Moultonborough. The existing water facilities are being upgraded to current standards through the addition of a new water storage / pump house facility that will be located proximate to the existing two bedrock wells that provide water to this system.

This document describes the engineering and operation of water improvements at this PWS. The new Pump House facilities include a reinforced concrete 15,000-gallon water storage tank, Pump House building, booster pumps, automatic controls and related equipment. There is provision for water treatment, and for a standby generator.

The design of the improvements will operate automatically, with Wells operation based on tank levels. Booster pumps will be VFD controlled. There are two pre-charged pressure tanks that allow boosters to shut off during low flow conditions. Water use, based on NHPUC records shows average use within this 63 home community to be 6,900+/- gallons per day. A peak day calculated at 2.0 times = 13,800 gallons. The reported well pumping capacity from 2 onsite wells is 50 gpm and 60 gpm respectively. Wells 1 & 2 are located proximate to the new Pump House. Atmospheric Tank level will be used to start and stop the respective well pumps. A submersible level transducer will provide water level readings.

New Pump House - The water improvement project will include the construction of a new water pump house building on the site. A pre-cast reinforced concrete water storage tank will act as the building's foundation. The building is 11'4" W x 27'4" L x 8'0" H ceiling height. This is an insulated wood framed structure that uses manufactured roof trusses (80 psf snow load and 20 psf ceiling load), a painted plywood interior, Zip exterior sheathing with vinyl siding, and an insulated metal

access door. A Zip Roofing System, 25-year fiberglass / asphalt shingles will also be used. A Bilco, or equal, roof access hatch will allow access to the line-shaft turbine booster pumps. The reinforced concrete water storage tank has 8' floor to ceiling height, with an outside screened vent / overflow, and two access hatches located inside the Pump House. The tank acts at the frost wall foundation and floor slab. A floor drain will be located inside the station. The floor drain will have a rodent screen. A flood alarm will be part of the station.

System Connection and Water Supplies - The pump house will be connected into the existing 3" diameter water distribution system.

The water supply wells will each have individual 1" meters, check valves, pressure relief valves, sampling taps, 2.5" - 100 psi liquid filled pressure gauges and flushing valves to daylight. Provision has been made for future water treatment, if needed. An existing UV unit may be transferred from the existing pump house to be used in the new pump house.

Master Water Meter and Controls - The Pump House uses a 2" Badger M2000 master water meter measuring in gallons, a submersible tank level pressure transducer to supply water level data to start and stop well pumps. Smart Drives will be used to operate the 5 h.p. VFD water booster pumps, using input from a 0-100 psi WIKA discharge pressure transducer and the 2" master water meter. There will be 4.5" liquid filled pressure gauge (0 – 100 psi), twin 119-gallon pre-charged pressure tanks, sampling taps, and provision for emergency chlorination. There is also a high-level alarm, a low water warning and an emergency low water shut off for the booster pumps that will be connected into the GS-400 automatic monitoring / alarm system.

Electrical Service, VFD Booster Pumps, Heat, Lights, Ventilation - The station will use a new single phase 200 A/240-120 VAC, 1- phase electrical service. The Smart Drives area VFD's that create 3 phase power for the Booster Pumps. Well pumps will remain across the line start. Heat is provided from 2 – 3 KW electric heaters. There are 3 – 48" long, water resistant fluorescent lights, an automatic

ventilation fan, with motor operated air inlet vent that operates based on temperature rise.

Additional details are found on the Plan Set, and Data Sheets are included within the balance of this document.

Pump House Automatic Operation - The standard operation will be as follows, starting from the atmospheric tank being full, and the Pump House at 70-psi full system discharge pressure, with booster pumps "off":

1. As water is used in the system, the first water is supplied from the pre-charged pressure tanks. As pressure drops to 55 psi, the "lead" VFD booster pump starts and runs. As demand is met and pressure is restored with flow below 3 gpm for more than 60 seconds, this pump shuts off. The "lag" booster pump will start and run as "lead" during the next cycle. If water flow from the lead pump exceeds 60 gpm, the lag booster will start and run. If flow exceeds 80 gpm for 1 minute, a high flow alarm is sent. If the discharge pressure with one booster running drops to 50 psi, the lag booster will start and run until pressure is restored. If pressure drops to 35 psi, or is above 75 psi, either condition will activate an alarm. Alarm and booster starting and stopping pressures are operator adjustable on the Smart Drive. The boosters will have 2 minute minimum run times programmed. Pump speed will vary to maintain the set discharge pressure which will be 65+/- psi, with a 5 psi bump-up just before shutting off. The booster pumps are line-shaft submersible turbine pumps mounted inside the pump house. A roof hatch allows easy removal for maintenance.

2. As water is used in the system and the atmospheric tank drops from Full at 92" to 86", a well pump will start and run until the Full level is reached. If the level goes to 94" a highwater alarm will be activated. If the water level continues to drop to 80" the lag well pump will start and run until the tank is refilled. If the tank drops to 55" there will be a low water warning alarm activated. If the water continues to drop to 40", there is a second alarm and the booster pumps

will be automatically shut down to prevent pump damage. Alarm levels, and well starting and stopping level, are operator adjustable.

3. A GS-400, cell phone based, automated monitoring and alarm system will be included in the station. This system may be accessed through a secure web portal and will send alarm and status signals to responsible party's smart phone.

Following construction, commissioning, and start- up with NH-DWGB approval, as-Built Drawings and an IOM manual will be provided.

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Capital Improvements - Actual Costs & Step Increase

Preliminary Calculation of Revenue Requirement

Plant Additions/Retirements:
Plant Additions

	Source / Pumping	
302	Franchises	$ 18,335
304.02	Structures & Improvements	173,677
307	Wells	4,905
310	Power Generation Equipment	26,170
311	Pumping Equipment	9,682
339	Miscellaneous Equipment	
	Transimission and Distribution	
330	Storage Tank	29,975
334	Meters	7,002
	Total Improvements	300,599

Plant Retirements			87,614
Net Additions/Retirements			$212,985
Add: Accum Depr on Retired Plant			87,614
Less: Accum Depr on New Plant			(6,728)
Net Plant			$293,871
Plus: Working Capital			0
Total Additional Rate Base			$293,871
Rate of Return			8.91%
Additional Net Operating Income Required			$26,188
Increase in Depreciation Expense			13,456
Increase in Taxes other than Income - State			1,801
Increase in Taxes other than Income - Town			4,370
Increase in Federal Income and State Business Taxes	293,871	2.75%	8,079
Total Increase in Operating Expenses			$ 27,705
Total Additional Revenue Required			$53,894
Revenue from Current Rates for the period 7/1/17 - 6/30/18			38,035
Total Revenue Required			$91,928
Percentage Increase Required			141.70%

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SPS 2

Capital Improvements - Actual Costs & Step Increase

Cost Rate for Step Adjustment on Dockham Shores improvements

Debt Holder	Amount		Interest Rate	Interest Expense	Amortization of Fin Costs	Total Interest	Cost Rate	Wght Avg Cost Rate
CoBank	$ 75,000	23.52%	5.45%	$ 4,088	$ 917	$ 5,004	6.67%	1.57%
LRWC	243,934	76.48%					9.60%	7.34%
Total Cost of Capital	$ 318,934	100.00%						8.91%

Income Tax on Equity Component:	(1) Weighted Cost		(2) Tax Multiplier		(3) Pre-Tax Cost	(4) Tax Gross-u ((3) - (1))
Debt	1.57%	x	1	=	1.57%	0.00%
Equity	7.34%	x	1.3744	=	10.09%	2.75%
Total	8.91%					2.75%

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Capital Improvements - Actual Costs & Step Increase

EFFECTIVE TAX FACTOR

Taxable Income		100.00%
Less: NH Business Profits Tax		-7.90%
Federal Taxable Income		92.10%
Federal Income Tax Rate	x	21.00%
Effective Federal Income Tax Rate		19.34%
Add: NH Business Profits Tax		7.90%
Effective Tax Rate		27.24%
Percent of Income Available if No Tax		100.00%
Less: Effective Tax Rate		27.24%
Percent Used as a Divisor in Determining Revenue Requirement		72.76%
Tax Multiplier (Effective Tax Rate ÷ Percent Used as a Divisor)		0.3744

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SPS 4

Capital Improvements - Actual Costs & Step Increase

Plant / Depreciation Expense / Accumulated Depreciation

PUC Acct. No.	Description	Cost	Depr. Rate	Annual Cost	Accum Depr.
	Source / Pumping				
302	Franchises	$ 18,335	5.00%	$ 917	$ 458
304.02	Structures & Improvements	173,677	2.50%	4,342	2,171
307	Wells	4,905	3.30%	162	81
310	Power Generation Equipment	26,170	10.00%	2,617	1,309
311	Pumping Equipment	30,853	10.00%	3,085	1,543
339	Miscellaneous Equipment	9,682	14.29%	1,383	692
	Transimission and Distribution				
330	Storage Tank	29,975	2.00%	600	300
334	Meters	7,002	5.00%	350	175
	Total Improvements	$ 300,599		$ 13,456	$ 6,728

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SPS-5

Capital Improvements - Actual Costs & Step Increase

Taxes

State Property Taxes on Wells and Pump Station Improvements	Total Projected Costs
Total Project Costs	$ 300,599
Accumulated Depreciation	(6,728)
Net Plant	$ 293,871
Percent of Assessed Value to Net Plant	92.87%
Net Plant subject to State utility property taxes	$ 272,931
Thousand Dollars of Assessed Value	$ 273
Property Tax Rate	6.60
State Property Taxes	$ 1,801

Town of Gilford Property Taxes	
Total Project Costs	$ 300,599
Accumulated Depreciation	(6,728)
Net Plant	$ 293,871
Net Plant subject to Town of Gilford property taxes	100.00%
Thousand Dollars of Assessed Value	$ 293,871
Thousand Dollars of Assessed Value	$ 294
Property Tax Rate	14.87
Local Property Taxes	$ 4,370

State Utility Property Taxes Percent	
12/31/16 Net Plant	$ 3,864,253
Assessed value as of April 1, 2017	3,588,900
Percent of Assessed Value to Net Plant	92.87%

Town of Gilford Property Taxes Percent	
12/31/17 Net Plant	$ 79,277
Assessed value as of ...	82,600
Percent of Assessed Value to Net Plant	104.19%

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Capital Improvements - Actual Costs & Step Increase

Total Costs of Projects	$ 318,934
Source of Funds:	
CoBank	$ 75,000
LRWC	243,934
Total Source of Funds	$ 318,934
Use of Funds:	
Franchises	$ 18,335
Financing/Step Adjustment	18,335
Pump Station & T&D Improvements	$ 282,264
Total Use of Funds	$ 318,934

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12/3/2018

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Capital Improvements - Actual Costs & Step Increase

Actual Franchise and Financing/Step Adjustment Costs

Belknap County Registry of Deeds	$	75
CoBank *		3,000
Stephen P. St. Cyr & Associates *		3,257
Upton & Hatfield *		30,338
Total Franshises and Financing/Step Adjustment Costs	$	36,670
Allocation of Franchises and Financing/Step Adjustment Costs:		
Franchises (50%)	$	18,335
Financing/Step Adjustment Costs		18,335
Total	$	36,670
Annual Amortization of Franchises	$	917
Annual Amortization of Financing/Step Increase		917
Total	$	1,834

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SPS-8

Capital Improvements - Actual Costs & Step Increase

Rates

Current Rates

	# of Customers	Base Rate	Revenue from Base Rate
Base Rates	61	$ 165.08	$ 10,070
	7/1/17 - 6/30/2018 Usage	Consumption Rate per 100 gallons	Revenue from Cons Rate
Consumption Rate	2,663,060	$ 1.0501	$ 27,965
Total Revenue for 7/1/17 - 6/30/18			$ 38,035

Proposed Rates

	# of Customers	Base Rate	Revenue from Base Rate
Base Rates	61	$ 399.00	$ 24,339
	7/1/17 - 6/30/2018 Usage	Consumption Rate per 100 gallons	Revenue from Cons Rate
Consumption Rate	2,663,060	$ 2.5380	$ 67,590
Total Revenue for 7/1/17 - 6/30/18			$ 91,928

Total Revenue Required	$ 91,928
Less Proposed Revenue from Base Rate	(24,339)
Proposed Revenue from Consumption Rate	$ 67,590
7/1/17 - 6/30/18 Usage	2,663,060
Proposed Consumption Rate per 100 galoons	$ 2.5380

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