

TOWN OF RICHMOND
PRELIMINARY ENGINEERING REPORT UPDATES
FOR WATER STORAGE IMPROVEMENTS
DECEMBER, 2013



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*“INNOVATIVE ENGINEERING SOLUTIONS WITH A COMMON SENSE APPROACH,
DELIVERED TO OUR CLIENTS IN A PROFESSIONAL,
COST-EFFECTIVE AND PERSONAL MANNER”*

**TOWN OF RICHMOND, VERMONT
 INFRASTRUCTURE REHABILITATION
 PRELIMINARY ENGINEERING REPORT UPDATES
 FOR WATER STORAGE IMPROVEMENTS
 DECEMBER, 2013**

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SECTION I

CONCLUSIONS AND RECOMMENDATIONS

SECTION I

CONCLUSIONS AND RECOMMENDATIONS

The purpose of this Preliminary Engineering Report Update is to further evaluate alternatives for a new reservoir capable of providing the ISO (Insurance Services Office, Inc.) recommended water storage volume and residual system pressures required by Richmond's dual-purpose (domestic and fire protection) water system. Based on the findings of the distribution system Preliminary Engineering Report by Green Mountain Engineering, dated September 2010 and the Supplemental Tank Preliminary Engineering Report dated December, 2012. This update includes specific investigations regarding required fire flows throughout the entire water distribution network, required tank volumes and elevations, and maximum system pressure such that the resulting static and dynamic pressures within the network do not necessitate pressure-reducing valves.

In addition, supplemental fire suppression issues and options at the elementary and middle schools are outlined in Section II of this report. Independent supplemental fire suppression systems (such as sprinkler systems) may be advised at these locations.

This Preliminary Engineering Report Update outlines future water system considerations and has been conducted in accordance with our Professional Engineering Services Agreement dated August 19, 2013. This report includes opinions of probable costs, comparisons of long term costs (Present Worth Analysis in Appendix C) and project financing for the recommended option.

A. CONCLUSIONS

1. The current combined storage volume of roughly 250,000 gallons and top of water elevation of 498 feet do not provide the ISO-recommended volume of water and residual system pressures required by Richmond's dual-purpose system to provide full ISO fire flows.
2. Estimates indicate 750,000 gallons of storage is required with a top of water elevation of 537 feet. The 750,000 gallons is derived from a 630,000 gallon ISO fire flow volume requirement and a 120,000 gallon per day estimate of Average Daily Demand @ the end of the 30 year proposed financing period
3. Either of the existing storage tank sites could be used if standpipe-style (taller/narrower) tanks are constructed.
4. Since the acceptance of the Supplemental Report of December 2012, the Town of Richmond and GME have identified an offsite alternative location. The proposed location has allowed for a partially buried concrete tank to be considered, as long as the land can be purchased.

5. Utilization of the existing sites for a standpipe style tank system will require a variance from the Richmond Development Review Board since the necessary tank heights would exceed the 45' maximum structure height allowed in the zoning regulations.
6. Two cells or two tanks should be constructed in order to replicate the current ability to take one tank off line while utilizing the other during cleaning, repairs or to respond to a potential emergency situation.

B. RECOMMENDATIONS

1. If the identified off site location can be obtained at a reasonable cost, we recommend a single, two-cell, cast-in-place concrete tank be constructed at an offsite location, separate from the existing reservoir sites (Alternative # 3B).
2. If the offsite land is ultimately deemed unavailable, the preferred onsite alternative would be two (2) 34-foot diameter by 68-foot high Glass Fused to Steel tanks on the Lower Jericho Road site (the present steel reservoir site) (Alternative #1A).
3. Should the Town concur with our recommendations, an anticipated project schedule is presented in Section V of this report

C. PROJECT COSTS AND FINANCING

1. The opinion of probable total project costs for the recommended project (offsite) is approximately \$1,185,000. The opinion of probable total project costs for the recommended onsite alternative is \$1,193,000. The construction and total project costs for each of the 6 alternatives are presented in Appendix B.
2. The thirty year present worth analysis is presented in Appendix C and outlines a present worth value for the recommended offsite project of approximately \$1,218,000 and the onsite alternative at approximately \$1,299,000.
3. The Project financing options were calculated based on the best available information at the time of this Report and are subject to revision.
4. The utilization of State and Federal funding for this Project is dependent on the availability of funds, the Project's position on the State priority list, the readiness of the Project to proceed, and the Median Household Income of service area users as determined by an official income survey. Presently this project is ranked #3 on the DWSRF 2013 Priority List and is in the "fundable range".
5. Anticipated Project financing would result in an annual user fee increase of approximately \$125.00 per year, per ERU (Equivalent Residential Unit), assuming only water users pay for the improvements with a financing rate of 0% for 30 years.

SECTION II

WATER STORAGE TANK ALTERNATIVES

SECTION II

WATER STORAGE TANK ALTERNATIVES

A. DESIGN CRITERIA AND IDENTIFICATION OF ALTERNATIVES

There are several water storage tank options that can be utilized to satisfy the requirements of the Town of Richmond. Underground or partially buried tanks may be constructed of precast concrete, precast-prestressed concrete, traditional cast-in-place concrete, coated steel, fiberglass or polyethylene. Above ground tanks may be constructed of precast-prestressed concrete, bolted painted steel, bolted glass fused to steel or welded painted steel.

Alternatives have been developed based on the desired total tank capacity (750,000 gallons), the required top of water elevation, the land available at the existing reservoir sites, as well as the desire of the Town to consider a partially buried concrete, offsite alternative. Although the existing two-tank system does not provide full redundancy, it is an important feature of the existing system, and we recommend that it be maintained.

Two (2) possible areas exist at the existing reservoir sites on Jericho Road. Either the site of the existing 200,000 gallon steel tank (Alternatives 1A and 1B – Lower Jericho Road Site) or a combination of the lower site and existing 50,000 gallon buried concrete tank site (Alternative 2A and 2B – Lower and Upper Jericho Road Sites) would be adequate to accommodate either two side by side tanks or one tank on each site. For purposes of this report, we have also assumed an off-site location adequate in size (Alternatives 3A and 3B – Offsite) will be purchased by the Town within 350 feet of the existing reservoir site at an elevation adequate to provide for the appropriate top of water elevation of a buried concrete tank.

Precast concrete, fiberglass and polyethylene tanks will not be considered in this analysis as they are generally not practical or cost competitive in this tank size. A painted welded steel tank has also not been considered based experience with the existing tank and the desires of the Town of Richmond. The remaining tank materials will be considered at each site, if feasible.

An approximate top of water elevation of 537 feet is used for comparison and sizing of the proceeding tank alternatives.

B. DESCRIPTION OF ALTERNATIVES

1. ALTERNATIVE 1 – LOWER JERICHO ROAD SITE

In order to achieve the top of water elevation and provide the design volume, two possible tank types are considered at this site:

Alternative 1A - Two (2) 34 foot diameter by 68 foot high bolted, glass fused to steel storage tanks with a capacity of 374,000 gallons each.

Alternative 1B – Two (2) 36 foot diameter by 62 foot high precast, pre-stressed concrete tanks with a capacity of 426,000 gallons each.

A traditional cast in place concrete tank is not considered for this site due to structural limitations of the wall heights necessary to attain the proper top of water elevation.

2. ALTERNATIVE 2 – LOWER AND UPPER JERICHO ROAD SITE

In order to achieve the top of water elevation and provide the design volume, two possible tank types are considered at these sites:

Alternative 2A - A 36 foot diameter by 65 foot high bolted, glass fused to steel storage tank with a nominal total capacity of 428,000 gallons and a 36 foot diameter by 51 foot high bolted, glass fused to steel storage tank with a capacity of 319,000 gallons.

Alternative 2B - A 36 foot diameter by 65 foot high prestressed concrete storage tank with a nominal total capacity of 475,000 gallons and a 36 foot diameter by 51 foot high prestressed concrete storage tank with a capacity of 300,000 gallons.

A traditional cast in place concrete tank is not considered for this site due to structural limitations of the wall heights necessary to attain the proper top of water elevation.

3. ALTERNATIVE 3 – OFF-SITE LOCATION

We have considered two possible tank types two possible tank types to achieve the necessary design parameters at this site:

Alternative 3A – One (1) 68 foot diameter by 38 foot high precast, pre-stressed concrete concentric tank with an interior wall producing 2 cells and a capacity of 815,000 gallons.

Alternative 3B – One (1) two-cell cast-in-place concrete tank approximately 70 feet square by 24 feet deep and a capacity of 750,000 gallons.

The objective for including this site in the analysis was to design a tank that would be partially buried and not subject to weathering. For this reason, a glass-fused-to-steel tank was not considered.

C. ALTERNATIVES' ANALYSIS

Both economic and non-economic issues should be examined when comparing alternatives. Non-monetary issues such as vulnerability, method of construction and service life of each alternative should be considered. These factors may be considered subjective, but are presented for discussion purposes.

Although each of the tanks chosen to be considered have proven track records in Vermont with many examples nearby, it is generally accepted that a partially buried concrete tank will be less vulnerable to vandalism or terrorist activity and is best suited to survive a natural disaster, such as an earthquake (though the Glass Fused to Steel tanks are designed for the proper seismic zone).

A slight advantage may be given to factory-built or factory designed and coordinated tanks constructed by workmen that build dozens of tanks per year, versus traditional cast-in-place concrete tanks built onsite.

Finally, service life is proven for each of these tank alternatives, but an advantage should be given to concrete tanks, especially when buried and only partially exposed to the elements.

Specific advantages and disadvantages of each site are as follows.

1. ALTERNATIVE 1 – LOWER JERICHO ROAD SITE

Advantages

- A. There is no need to purchase additional land.
- B. The tank construction could be phased and the tanks could be built years apart to ultimately equal the recommended 750,000 gallons.

Disadvantages

- A. The Richmond water system would only have 50,000 gallons of storage during construction (the upper existing reservoir).
- B. Glass Fused to Steel tanks are expected to last 100 years or more with proper maintenance but no actual tanks are available to prove this claim. The life is expected to be well over the 30 year loan term anticipated for this project.
- C. The 30 year present worth is higher than that of the cast-in-place alternative proposed for the offsite location.
- D. Vandalism of above ground tanks may include graffiti, trespassers climbing on the structure and in the case of Glass Fused to Steel tanks, damage to the skin due to gunfire.
- E. A zoning variance is required to install tanks over 45' tall.

2. ALTERNATIVE 2 – LOWER AND UPPER JERICHO ROAD SITE

Advantages

- A. There is no need to purchase additional land.
- B. The tank construction could be phased and the tanks could be built years apart to ultimately equal the recommended 750,000 gallons.

Disadvantages

- A. Glass Fused to Steel tanks are expected to last 100 years or more with proper maintenance but no actual tanks are available to prove this claim. The life is expected to be well over the 30 year loan term anticipated for this project.
- B. The initial construction cost is slightly higher than the 2 tank alternatives on the lower site.
- C. Since both existing sites would be utilized, the construction would most likely encompass two construction seasons.
- D. Vandalism of above ground tanks include graffiti, trespassers climbing on structure and in the case of Glass Fused to Steel tanks, damage to the skin due to rifle shots.
- E. A zoning variance is required to install tanks over 45' tall.

3. ALTERNATIVE 3 – OFF-SITE LOCATION

Advantages

- A. The cast in place concrete option 3B is a lower cost option both in initial construction cost as well as the 30 year present worth cost.
- B. The buried concrete tank option is a common construction method which is proven to last more than 100 years with proper maintenance.

Disadvantages

- A. Land purchase is required to make this option viable.
- B. Site work is more complicated than that of Alternatives 1 and 2.

D. FIRE FLOW ISSUES

The addition of a new reservoir to the system with adequate capacity to provide ISO (Insurance Services Office, Inc.) fire flow volume would be achieved with any of the options presented herein. The fire flow rates, however, would not be achieved in all areas due to elevation, pipe size and pipe condition issues until the entire multi-phased construction of all of the upgrades outlined in the September 2010 report are completed.

Additionally, the available fire flows at the Middle and Elementary school area, although significantly increased over the existing condition by installing any of the recommended reservoir options, will not meet full ISO recommendation for flow from an individual hydrant or provide the required residual pressure at the school site under fire flow conditions. Due to the limited elevation difference between the schools and the reservoir (as outlined in the 2010 report), the available fire flow is approximately 2/3 of that recommended by ISO (2020gpm vs. 3000gpm as outlined in Appendix C of the 2010 report) @ a 20 psi residual pressure at the school site. The recommended 3000 gpm for 3 hours could be achieved in this area, if two pumper trucks are utilized at two different locations at the school complex, each pumping at 1500 gpm for 3 hours. Under this flow condition the residual pressure would be 14.5 psi at the school site. Raising the reservoir elevation higher than that outlined in this report to obtain the minimum 20 psi, would increase system pressures in lower locations above the 100 psi maximum requested by the town and would require a main pressure reducing valve or scores of individual pressure reducing valves to be installed in the system. The ultimate risk to the school structures and occupants could, however, be further mitigated through installation of fire suppression systems in the buildings.

SECTION III
PROJECT COSTS

SECTION III

PROJECT COSTS

A. CONSTRUCTION COSTS

Opinions of Probable Construction Cost are included in Appendix B.

B. TOTAL PROJECT COSTS

Opinions of Probable Total Project Cost are also presented in Appendix B. Total project costs include construction costs plus other project-related costs such as technical services, legal and fiscal concerns, administrative costs, construction engineering, project contingency, land acquisition, and interest on short-term loans. The Opinions of Total Project Cost for the recommended project will be used in Section IV to estimate anticipated user costs.

C. OPERATION AND MAINTENANCE COSTS

General Operation and Maintenance costs are not expected to increase as the Town is currently required to maintain the existing storage tank. Operation and Maintenance costs are shown in the present worth analysis table to use for comparison of the tank types and locations.

D. PRESENT WORTH ANALYSIS

A table outlining the present worth of the two recommended alternatives is presented in Appendix C. This table represents the actual cost, in present dollar value, that the Town would have to spend in order to cover the anticipated tank construction and maintenance costs for the subsequent 30 years (the anticipated loan term).

SECTION IV
PROJECT FINANCING

SECTION IV

PROJECT FINANCING

A. STATE FUNDING

The Town of Richmond is eligible to receive financial assistance from the State of Vermont for the proposed upgrade of the water storage tank. This assistance would be from the Drinking Water State Revolving Loan Fund (DWSRF) in the form of a low interest loan. Grants are not available under the current program though favorable interest rates (including negative interest) are available to make the project more affordable.

The Town completed a Priority List Application for this project for the 2013 DWSRF Program, and the project is currently ranked #3 and is in the range of fundable projects. It is anticipated that a loan would be available from this fund, with a 30-year term and 0% interest rate.

State funds have some limitations associated with them. Some of those limitations are:

1. The level of funding for the program is not guaranteed. The program can be dropped or reduced in the future.
2. Priorities for the projects are established in order to allocate the available Federal and State funds.
3. Annual operation and maintenance costs are not eligible for Federal or State funds.

For the current 320 equivalent users and based on an Opinion of Total Project Cost of approximately \$1,185,000 for the recommended project, and funding through the State of Vermont DWSRF program, the project would result in an annual user fee increase of \$125.00 per year, per Equivalent Residential Unit.

SECTION V

PROJECT SCHEDULE

SECTION V

PROJECT SCHEDULE

The following schedule is a proposed chronological listing of the activities that should follow the review of and concurrence with this Report Update by the Richmond Selectboard, Water Resources Department and Water and Sewer Commission.

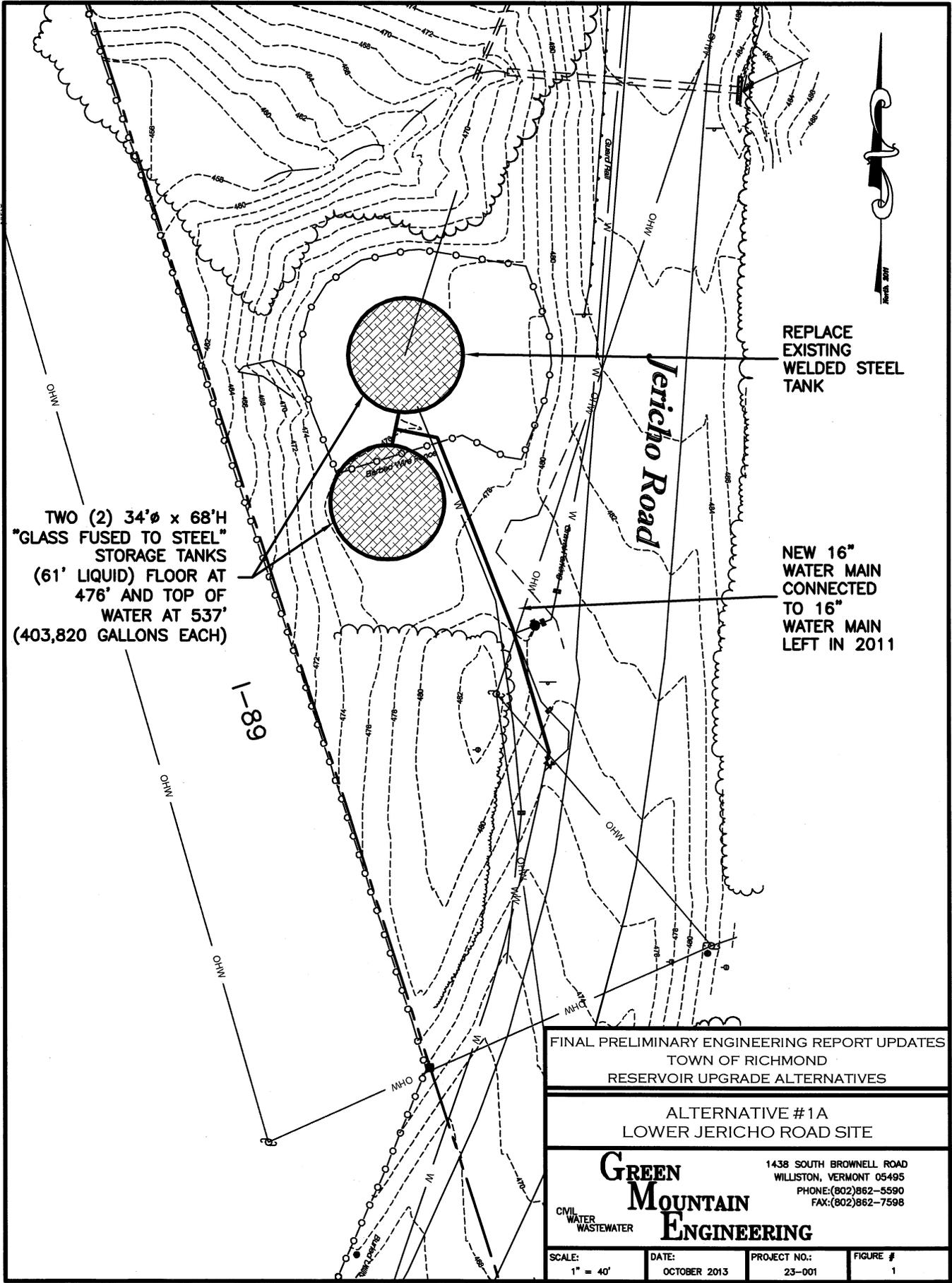
Based on the current ranking of this project on the DWSRF Priority List, the project could receive funding from the 2013 (current) program.

Each year, new applications are received for the funds, and the projects are re-prioritized. Projects that are ready to advance, with planning complete and positive bond votes, will receive funding sooner as lingering projects are bypassed for not being ready to proceed. Therefore, the Town is encouraged to continue with planning for this necessary project as follows:

<u>Milestone</u>	<u>Date</u>
Review and approve Supplemental P.E.R. Update	November 2013
Submit Final Supplemental P.E.R. to Funding Agencies	December 2013
Authorize Final Design of Project	December 2013
Conduct Bond Vote	March 2014
Advertise for Bids	January 2015
Begin Construction	June 2015
Complete Construction	November 2015

APPENDIX A

FIGURES



TWO (2) 34'Ø x 68'H
 "GLASS FUSED TO STEEL"
 STORAGE TANKS
 (61' LIQUID) FLOOR AT
 476' AND TOP OF
 WATER AT 537'
 (403,820 GALLONS EACH)

REPLACE
 EXISTING
 WELDED STEEL
 TANK

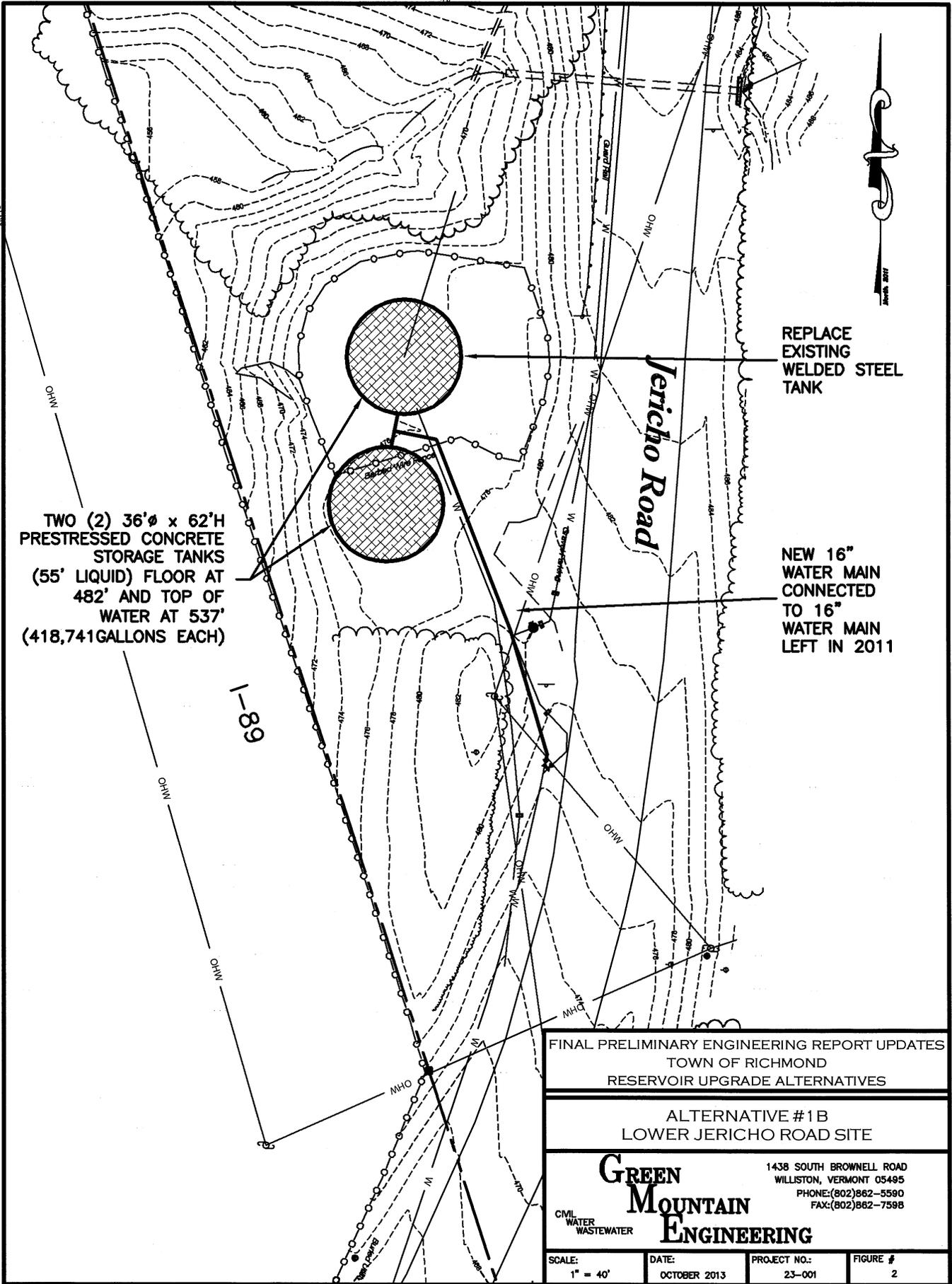
NEW 16"
 WATER MAIN
 CONNECTED
 TO 16"
 WATER MAIN
 LEFT IN 2011

FINAL PRELIMINARY ENGINEERING REPORT UPDATES
 TOWN OF RICHMOND
 RESERVOIR UPGRADE ALTERNATIVES

ALTERNATIVE #1A
 LOWER JERICHO ROAD SITE

GREEN MOUNTAIN <small>CIVIL WATER WASTEWATER</small> ENGINEERING	1438 SOUTH BROWNELL ROAD WILLISTON, VERMONT 05495 PHONE: (802)862-5590 FAX: (802)862-7598
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SCALE: 1" = 40'	DATE: OCTOBER 2013	PROJECT NO.: 23-001	FIGURE # 1
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TWO (2) 36'Ø x 62'H
 PRESTRESSED CONCRETE
 STORAGE TANKS
 (55' LIQUID) FLOOR AT
 482' AND TOP OF
 WATER AT 537'
 (418,741 GALLONS EACH)

REPLACE
 EXISTING
 WELDED STEEL
 TANK

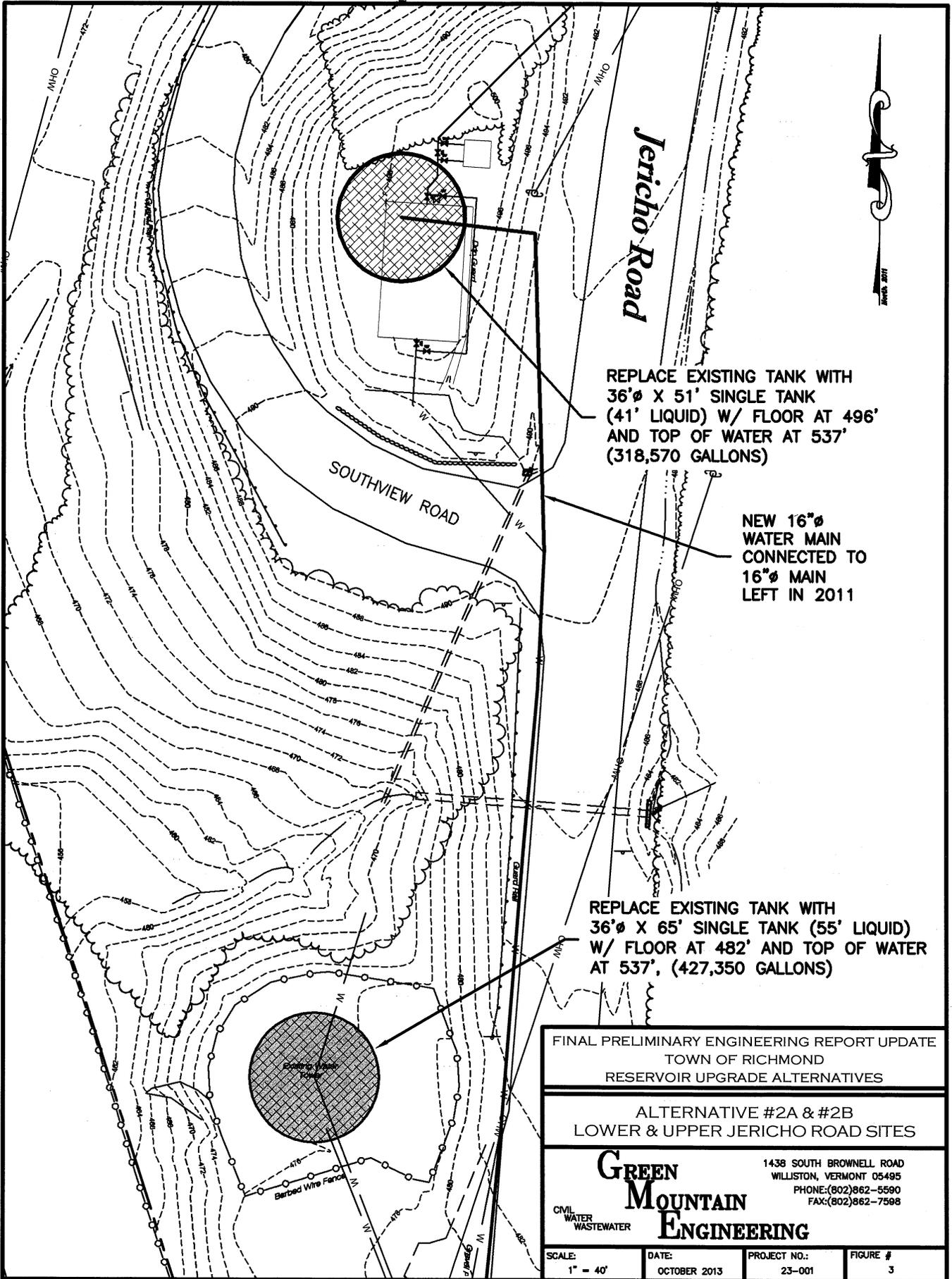
NEW 16"
 WATER MAIN
 CONNECTED
 TO 16"
 WATER MAIN
 LEFT IN 2011

FINAL PRELIMINARY ENGINEERING REPORT UPDATES
 TOWN OF RICHMOND
 RESERVOIR UPGRADE ALTERNATIVES

ALTERNATIVE #1B
 LOWER JERICHO ROAD SITE

CIVIL WATER WASTEWATER GREEN MOUNTAIN ENGINEERING	1438 SOUTH BROWNELL ROAD WILLISTON, VERMONT 05495 PHONE: (802) 862-5580 FAX: (802) 862-7588

SCALE: 1" = 40'	DATE: OCTOBER 2013	PROJECT NO.: 23-001	FIGURE # 2
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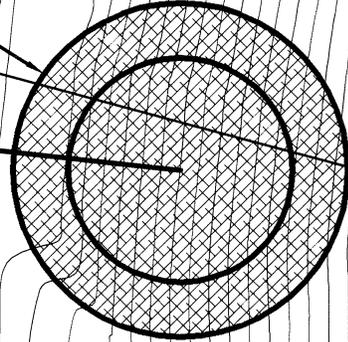
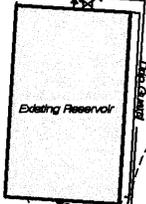
REPLACE EXISTING TANK WITH
 36'Ø X 51' SINGLE TANK
 (41' LIQUID) W/ FLOOR AT 496'
 AND TOP OF WATER AT 537'
 (318,570 GALLONS)

NEW 16"Ø
 WATER MAIN
 CONNECTED TO
 16"Ø MAIN
 LEFT IN 2011

REPLACE EXISTING TANK WITH
 36'Ø X 65' SINGLE TANK (55' LIQUID)
 W/ FLOOR AT 482' AND TOP OF WATER
 AT 537', (427,350 GALLONS)

FINAL PRELIMINARY ENGINEERING REPORT UPDATE			
TOWN OF RICHMOND			
RESERVOIR UPGRADE ALTERNATIVES			
ALTERNATIVE #2A & #2B			
LOWER & UPPER JERICHO ROAD SITES			
GREEN MOUNTAIN CIVIL WATER WASTEWATER ENGINEERING	1438 SOUTH BROWNELL ROAD WILLISTON, VERMONT 05495 PHONE: (802) 862-5590 FAX: (802) 862-7588		
	SCALE:	DATE:	PROJECT NO.:
1" = 40'	OCTOBER 2013	23-001	FIGURE #
			3

ONE (1) 70'Ø x 38'H
PRESTRESSED CONCRETE
DUAL CELL STORAGE TANK
TOP OF WATER AT 537'
(815,000 GALLONS)



NEW 16"Ø WATER MAIN
CONNECTED TO 16"Ø MAIN
LEFT IN 2011

SOUTHVIEW ROAD

JERICO ROAD

EXISTING TANKS TO BE ABANDONED



FINAL PRELIMINARY ENGINEERING REPORT UPDATE
TOWN OF RICHMOND
RESERVOIR UPGRADE ALTERNATIVES

ALTERNATIVE #3A
NEW RESERVOIR SITE

GREEN MOUNTAIN ENGINEERING
CIVIL WATER WASTEWATER

1438 SOUTH BROWNELL ROAD
WILLISTON, VERMONT 05495
PHONE:(802)862-5580
FAX:(802)862-7588

SCALE: 1" = 40'	DATE: OCTOBER 2013	PROJECT NO.: 23-001	FIGURE # 4
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ONE (1) 70'x70'x25' HIGH
 CAST IN PLACE CONCRETE
 DUAL CELL STORAGE TANK
 TOP OF WATER AT 537'
 (750,000 GALLONS)

Existing Reservoir

SOUTHVIEW ROAD

JERICO ROAD

NEW 16"Ø WATER MAIN
 CONNECTED TO 16"Ø MAIN
 LEFT IN 2011

EXISTING TANKS TO BE ABANDONED

FINAL PRELIMINARY ENGINEERING REPORT UPDATE
 TOWN OF RICHMOND
 RESERVOIR UPGRADE ALTERNATIVES

ALTERNATIVE #3B
 NEW RESERVOIR SITE

GREEN MOUNTAIN ENGINEERING
 CIVIL WATER WASTEWATER
 1438 SOUTH BROWNELL ROAD
 WILLISTON, VERMONT 05495
 PHONE: (802)862-5590
 FAX: (802)862-7598

SCALE: 1" = 40'	DATE: OCTOBER 2013	PROJECT NO.: 23-001	FIGURE # 5
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APPENDIX B

COST OPINION TABLES

TABLE 1				
TOWN OF RICHMOND				
RESERVOIR REPLACEMENT PROJECT - ALTERNATIVE #1A				
TWO GLASS-FUSED-TO-STEEL RESERVOIRS				
OPINION OF PROBABLE CONSTRUCTION COST				
Description	Quantity	Units	Unit Price	Total Cost
<u>STORAGE AND CONTROLS UPGRADE</u>				
2 New Reservoirs (374,000 gallons each):				
Clearing and Grubbing	0.5	Acre	\$6,000	\$3,000
Erosion Control	1	L.S.	\$5,000	\$5,000
Site Excavation	1	L.S.	\$15,000	\$15,000
Yard Piping	1	L.S.	\$15,000	\$15,000
Foundation, Overflow and Drain - Headwall	1	L.S.	\$5,500	\$5,500
Reservoir Base Prep.	2	L.S.	\$8,000	\$16,000
Reservoir Construction	2	L.S.	\$395,000	\$790,000
Finish Grading, Topsoil & Seeding	0.5	Acre	\$15,000	\$7,500
Driveway, Culverts, etc.	1	L.S.	\$10,000	\$10,000
Bedrock Removal (Blasting and Disposal)	0	C.Y.	\$110	\$0
New 16" Transmission Main	100	L.F.	\$110	\$11,000
Mixing System	1	L.S.	\$15,000	\$15,000
Existing Reservoir Decommissioning	2	L.S.	\$5,000	\$10,000
Controls Upgrade	1	L.S.	\$15,000	\$15,000
			SUBTOTAL	\$918,000
<u>MISCELLANEOUS</u>				
Site Preparation / Miscellaneous Work	1	L.S.	\$20,000	\$20,000
Contractor's Bond	1	L.S.	\$14,070	\$14,070
			SUBTOTAL	\$34,070
Construction Costs			SUBTOTAL	\$952,070
Contingency (10% of Construction Costs)				\$95,207
TOTAL ESTIMATED CONSTRUCTION COSTS			TOTAL	\$1,047,277
NOTES:				
1. This Opinion of Probable Construction Cost is preliminary, pre-design only. Changes in design may significantly affect cost. More detailed costs, based on Final Design Quantities, to be provided upon completion of Final Design Phase engineering.				
2. Costs prepared by Green Mountain Engineering, Inc. and are dated October 2013 and reflect costs of construction work completed mid in 2015.				
3. Total estimated cost includes only project construction. Total does not include engineering, administrative, legal, fiscal and land acquisition costs.				

TABLE 2 TOWN OF RICHMOND RESERVOIR REPLACEMENT PROJECT - ALTERNATIVE #1B TWO PRE-CAST RESERVOIRS ON LOWER SITE OPINION OF PROBABLE CONSTRUCTION COST				
Description	Quantity	Units	Unit Price	Total Cost
<u>STORAGE AND CONTROLS UPGRADE</u>				
2 New Reservoirs (426,000 gallons each):				
Clearing and Grubbing	0.5	Acre	\$6,000	\$3,000
Erosion Control	1	L.S.	\$5,000	\$5,000
Site Excavation	1	L.S.	\$15,000	\$15,000
Yard Piping	1	L.S.	\$15,000	\$15,000
Foundation, Overflow and Drain - Headwall	1	L.S.	\$5,500	\$5,500
Reservoir Base Prep.	2	L.S.	\$8,000	\$16,000
Reservoir Construction	2	L.S.	\$620,000	\$1,240,000
Reservoir Backfill	2	L.S.	\$5,000	\$10,000
Finish Grading, Topsoil & Seeding	0.5	Acre	\$15,000	\$7,500
Driveway, Culverts, etc.	1	L.S.	\$10,000	\$10,000
Bedrock Removal (Blasting and Disposal)	0	C.Y.	\$110	\$0
New 16" Transmission Main	100	L.F.	\$110	\$11,000
Mixing System	1	L.S.	\$15,000	\$15,000
Existing Reservoir Decommissioning	2	L.S.	\$5,000	\$10,000
Controls Upgrade	1	L.S.	\$15,000	\$15,000
			SUBTOTAL	\$1,378,000
<u>MISCELLANEOUS</u>				
Site Preparation / Miscellaneous Work	1	L.S.	\$20,000	\$20,000
Contractor's Bond	1	L.S.	\$20,970	\$20,970
			SUBTOTAL	\$40,970
Construction Costs			SUBTOTAL	\$1,418,970
Contingency (10% of Construction Costs)				\$141,897
TOTAL ESTIMATED CONSTRUCTION COSTS			TOTAL	\$1,560,867
NOTES:				
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2. Costs prepared by Green Mountain Engineering, Inc. and are dated October 2013 and reflect costs of construction work completed mid in 2015.				
3. Total estimated cost includes only project construction. Total does not include engineering, administrative, legal, fiscal and land acquisition costs.				

TABLE 3

TOWN OF RICHMOND

RESERVOIR REPLACEMENT PROJECT - ALTERNATIVE #2A TWO GLASS FUSED TO STEEL TANKS, ONE ON EACH SITE OPINION OF PROBABLE CONSTRUCTION COST

Description	Quantity	Units	Unit Price	Total Cost
<u>STORAGE AND CONTROLS UPGRADE</u>				
2 New Reservoirs (428K & 319K gallons):				
Clearing and Grubbing	0.5	Acre	\$6,000	\$3,000
Erosion Control	1	L.S.	\$7,500	\$7,500
Site Excavation	1	L.S.	\$20,000	\$20,000
Yard Piping	1	L.S.	\$20,000	\$20,000
Foundation, Overflow and Drain - Headwall	2	L.S.	\$5,500	\$11,000
Reservoir Base Prep.	2	L.S.	\$8,000	\$16,000
Reservoir Construction 428K Gallons	1	L.S.	\$342,000	\$342,000
Reservoir Construction 319K Gallons	1	L.S.	\$434,000	\$434,000
Finish Grading, Topsoil & Seeding	0.5	Acre	\$15,000	\$7,500
Driveway, Culverts, etc.	1	L.S.	\$10,000	\$10,000
Bedrock Removal (Blasting and Disposal)	0	C.Y.	\$110	\$0
New 16" Transmission Main	350	L.F.	\$110	\$38,500
Mixing System	1	L.S.	\$15,000	\$15,000
Existing Reservoir Decommissioning	2	L.S.	\$5,000	\$10,000
Controls Upgrade	1	L.S.	\$15,000	\$15,000
			SUBTOTAL	\$949,500
<u>MISCELLANEOUS</u>				
Site Preparation / Miscellaneous Work	1	L.S.	\$20,000	\$20,000
Contractor's Bond	1	L.S.	\$14,543	\$14,543
			SUBTOTAL	\$34,543
Construction Costs			SUBTOTAL	\$984,043
Contingency (10% of Construction Costs)				\$98,404
TOTAL ESTIMATED CONSTRUCTION COSTS			TOTAL	\$1,082,447

NOTES:

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3. Total estimated cost includes only project construction. Total does not include engineering, administrative, legal, fiscal and land acquisition costs.

TABLE 4

TOWN OF RICHMOND RESERVOIR REPLACEMENT PROJECT - ALTERNATIVE #2B TWO PRECAST RESERVOIRS, ONE ON EACH SITE OPINION OF PROBABLE CONSTRUCTION COST

Description	Quantity	Units	Unit Price	Total Cost
<u>STORAGE AND CONTROLS UPGRADE</u>				
2 New Reservoirs (475K & 300K gallons):				
Clearing and Grubbing	0.5	Acre	\$6,000	\$3,000
Erosion Control	1	L.S.	\$7,500	\$7,500
Site Excavation	1	L.S.	\$20,000	\$20,000
Yard Piping	1	L.S.	\$20,000	\$20,000
Foundation, Overflow and Drain - Headwall	2	L.S.	\$5,500	\$11,000
Reservoir Base Prep.	2	L.S.	\$8,000	\$16,000
Reservoir Construction 475K Gallons	1	L.S.	\$620,000	\$620,000
Reservoir Construction 300K Gallons	1	L.S.	\$470,000	\$470,000
Finish Grading, Topsoil & Seeding	0.5	Acre	\$15,000	\$7,500
Driveway, Culverts, etc.	1	L.S.	\$10,000	\$10,000
Bedrock Removal (Blasting and Disposal)	0	C.Y.	\$110	\$0
New 16" Transmission Main	350	L.F.	\$110	\$38,500
Mixing System	1	L.S.	\$15,000	\$15,000
Existing Reservoir Decommissioning	2	L.S.	\$5,000	\$10,000
				\$0
Controls Upgrade	1	L.S.	\$15,000	\$15,000
			SUBTOTAL	\$1,263,500
<u>MISCELLANEOUS</u>				
Site Preparation / Miscellaneous Work	1	L.S.	\$20,000	\$20,000
Contractor's Bond	1	L.S.	\$19,253	\$19,253
			SUBTOTAL	\$39,253
Construction Costs			SUBTOTAL	\$1,302,753
Contingency (10% of Construction Costs)				\$130,275
TOTAL ESTIMATED CONSTRUCTION COSTS			TOTAL	\$1,433,028

NOTES:

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TABLE 5

TOWN OF RICHMOND RESERVOIR REPLACEMENT PROJECT - ALTERNATIVE #3A PRE-CAST TANK WITH INTERIOR TANK - OFF SITE LOCATION OPINION OF PROBABLE CONSTRUCTION COST

Description	Quantity	Units	Unit Price	Total Cost
<u>STORAGE AND CONTROLS UPGRADE</u>				
New Reservoir (815,000 gallon):				
Clearing and Grubbing	1	Acre	\$10,000	\$10,000
Erosion Control	1	L.S.	\$5,000	\$5,000
Site Excavation	1	L.S.	\$60,000	\$60,000
Yard Piping	1	L.S.	\$30,000	\$30,000
Foundation, Overflow and Drain - Headwall	1	L.S.	\$5,500	\$5,500
Reservoir Base Prep.	1	L.S.	\$12,500	\$12,500
Reservoir Concrete Construction	1	L.S.	\$955,000	\$955,000
Finish Grading, Topsoil & Seeding	1	Acre	\$20,000	\$20,000
Driveway, Culverts, etc.	1	L.S.	\$15,000	\$15,000
Bedrock Removal (Blasting and Disposal)	400	C.Y.	\$110	\$44,000
New 16" Transmission Main	350	L.F.	\$110	\$38,500
Mixing System	1	L.S.	\$15,000	\$15,000
Existing Reservoir Decommissioning	2	L.S.	\$5,000	\$10,000
Controls Upgrade	1	L.S.	\$15,000	\$15,000
			SUBTOTAL	\$1,235,500
<u>MISCELLANEOUS</u>				
Site Preparation / Miscellaneous Work	1	L.S.	\$20,000	\$20,000
Contractor's Bond	1	L.S.	\$18,833	\$18,833
			SUBTOTAL	\$38,833
Construction Costs			SUBTOTAL	\$1,274,333
Contingency (10% of Construction Costs)				\$127,433
TOTAL ESTIMATED CONSTRUCTION COSTS			TOTAL	\$1,401,766

NOTES:

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3. Total estimated cost includes only project construction. Total does not include engineering, administrative, legal, fiscal and land acquisition costs.

TABLE 6
TOWN OF RICHMOND
RESERVOIR REPLACEMENT PROJECT - ALTERNATIVE #3B
CAST IN PLACE TWO CELL CONCRETE RESERVOIR - OFF SITE LOCATION
OPINION OF PROBABLE CONSTRUCTION COST

Description	Quantity	Units	Unit Price	Total Cost
<u>STORAGE AND CONTROLS UPGRADE</u>				
New Reservoir (750,000 gallon):				
Clearing and Grubbing	0.8	Acre	\$8,000	\$6,400
Erosion Control	1	L.S.	\$5,000	\$5,000
Site Excavation	1	L.S.	\$60,000	\$60,000
Yard Piping	1	L.S.	\$40,000	\$40,000
Foundation, Overflow and Drain - Headwall	1	L.S.	\$5,500	\$5,500
Reservoir Base Prep.	1	L.S.	\$12,500	\$12,500
Reservoir Concrete Construction	1	L.S.	\$510,000	\$510,000
Finish Grading, Topsoil & Seeding	0.8	Acre	\$20,000	\$16,000
Retaining walls	1	L.S.	\$15,000	\$15,000
Driveway, Culverts, etc.	1	L.S.	\$15,000	\$15,000
Bedrock Removal (Blasting and Disposal)	400	C.Y.	\$110	\$44,000
New 16" Transmission Main	350	L.F.	\$110	\$38,500
Mixing System	1	L.S.	\$15,000	\$15,000
Existing Reservoir Decommissioning	2	L.S.	\$5,000	\$10,000
Controls Upgrade	1	L.S.	\$15,000	\$15,000
			SUBTOTAL	\$807,900
<u>MISCELLANEOUS</u>				
Site Preparation / Miscellaneous Work	1	L.S.	\$20,000	\$20,000
Contractor's Bond	1	L.S.	\$12,419	\$12,419
			SUBTOTAL	\$32,419
Construction Costs			SUBTOTAL	\$840,319
Contingency (10% of Construction Costs)				\$84,032
TOTAL ESTIMATED CONSTRUCTION COSTS			TOTAL	\$924,350

NOTES:

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2. Costs prepared by Green Mountain Engineering, Inc. and are dated October 2013 and reflect costs of construction work completed mid in 2015.
3. Total estimated cost includes only project construction. Total does not include engineering, administrative, legal, fiscal and land acquisition costs.

APPENDIX C

PRESENT WORTH ANALYSIS

Richmond Storage Tank Alternatives

30 YEAR PRESENT WORTH ANALYSIS

Preliminary Engineering Report Updates - October 2013

Item	Two Cell Cast-in-place Buried Concrete Tank- Off Site Alternative 3B			Two Glass-Fused-to-Steel Tanks*** Lower Jericho Road Site Alternative 1A		
	Cost	Type	Present Worth	Cost	Type	Present Worth
CONSTRUCTION(with 10% Contingency)	\$924,350	P	\$924,350	\$1,047,277	P	\$1,047,277
P.E.R., FD & CONS. ENGINEERING*	\$200,000	P	\$200,000	\$180,000	P	\$180,000
LEGAL / FISCAL / ADMIN. COSTS	\$10,000	P	\$10,000	\$4,000	P	\$4,000
PROPOSED LAND PURCHASE (Estimate)****	\$50,000	P	\$50,000	\$0	P	\$0
OPERATION & MAINTENANCE**	\$2,000	A	\$34,065	\$4,000	A	\$68,130
TOTAL PRESENT WORTH			\$1,218,415			\$1,299,407

Alternatives 1A and 3B are the recommended alternatives, depending on availability of Off-Site location (Alt. 3B) and the ability to obtain zoning variance for the tall (over 45') tanks (Alt. 1A)

* Engineering Fees Based on Estimate for Preliminary, Final Design and Construction Engineering

** Assumes that the first-year O&M cost estimate will remain constant throughout the design life including additional pipeline maintenance for Alternative 3B

*** Interest/Discount Rate for comparison = 4.125%

** Design Life for comparison = 30 years

*** Assumes Zoning Variance for Tank Height over 45'

**** Purchase price is subject to Fair Market Value limit as determined by appraisal, within guidelines for funding established by the State of VT DWSRF Program

P= Present Cost, A = Annualized Present Cost

APPENDIX D

**2012 VT ANR
DWSRF PRIORITY LIST**

9. Projects Priority Lists and Anticipated Loan Recipients - Construction Loans

9.1. Comprehensive List – New Funding Commitments 2013 Drinking Water State Revolving Fund Capitalization Grant Comprehensive Project Priority List, August 26, 2013 Total Available Funding: \$12,320,686

Priority Points	Funding Type	Funding Status	WSID	WS Name	Pop	Project Description	Loan Amount	Rate	Term	Cumulative Total
133	C	F	VT0005212	CASTLETON FIRE DISTRICT 1	1940	Replacement of existing tuberculated 10-inch cast iron transmission main with 12-inch ductile iron main on Main St. (RT 4A) from Seminary St. to Ellis Orchard Drive (urban section) and then up Ellis Orchard Dr. (rural section)	\$350,000	-3.00%	30	\$350,000
73	C	F	VT0005132	SWANTON VILLAGE WATER	2986	New 16' transmission line extending east along the Rail Trail, southeast on Waugh Farm Rd., and includes a new river crossing under the Missisquoi River by directional bore	\$1,922,025	3.00%	21	\$2,272,025
63	C	F	VT0005084	RICHMOND WATER DEPT	1000	Construction of new cast-in-place reservoir to provide domestic use and fire protection	\$1,190,157	3.00%	20	\$3,462,182
140	N	F	VT0005115	EAST BERKSHIRE WATER COOP	184	Water system upgrades to address significant deficiencies in the system, including filtration for groundwater under the direct influence of surface water	\$418,254	3.00%	20	\$3,880,436
120	N	F	VT0005048	SUTTON WATER SYSTEM	190	Engineering assistance, source exploration to resolve nitrate issues, and disinfection treatment improvements	\$100,000	3.00%	20	\$3,980,436
117	N	F	VT0005027	ROYAL PINE VILLA	100	Construction of a new consolidated water storage tank and treatment facility	\$125,000	3.00%	20	\$4,105,436
117	N	F	VT0006707	HARWOOD UNION HIGH SCHOOL	900	Connection of a new well or wells to provide an adequate supply of water to meet the school's water demand	\$117,250	3.00%	20	\$4,222,686
110	N	F	VT0005076	HUNTINGTON FIRE DISTRICT 1	120	Replacement of the well supply line, control wiring, the distribution main to Roberts Park, and the backup line in the wake of a catastrophic flooding and landslide event	\$35,000	3.00%	20	\$4,257,686
92	N	F	VT0005261	CABOT TOWN WATER SYSTEM	250	Install 4,600' of water main and appurtenances to connect residents in Lower Cabot to the Town of Cabot Water System to eliminate private water supplies that have been contaminated by an active hazardous waste site	\$555,000	3.00%	20	\$4,812,686
80	N	F	VT0005045	ST. JOHNSBURY WATER SYSTEM	5000	Waterline, valve, hydrant, and service replacement in conjunction with a larger water, wastewater, and stormwater project	\$400,000	-3.00%	30	\$5,212,686

73	N	F	VT0020568	DERBY LINE VILLAGE WATER DISTRICT	1630	Distribution line improvements to improve flow and pressure to the west end of Elm Street	\$1,200,000	-3.00%	30	\$6,412,686
70	N	F	VT0005275	NORTHFIELD WATER DEPT	5145	Installation of approximately 2,500 linear feet of new 12-inch and 4,250 linear feet of 8-inch diameter ductile iron water main to replace the 100-year-old cast iron pipe on Central Street, Washington Street, Jarvis Lane, and King Street. This project will reduce excessive leakage in the 100-year-old distribution system. The project would also replace the 16 fire hydrants that have been "locked out" of service due to insufficient water line sizes and fire flows.	\$2,240,000	3.00%	20	\$8,652,686
70	N	F	VT0005130	ST ALBANS WATER DEPT	9956	Construction of a second 1.0 mg storage tank at the same hydraulic grade line as the Aldis Hill Tank to provide adequate volume for domestic and fire flow conditions	\$1,200,000	3.00%	20	\$9,852,686
70	N	F	VT0005045	ST JOHNSBURY WATER SYSTEM	5000	Replacement of three 1.0 mgd clarifier filter units	\$1,925,000	-3.00%	30	\$11,777,686
68	N	F	VT0005084	RICHMOND WATER DEPT	1000	Install new 12" water main below the river via directional boring or on the Bridge St. Bridge	\$193,000	3.00%	20	\$11,970,686
68	N	F	VT0005136	ALBURGH VILLAGE WATER SYSTEM	576	Painting and refurbishment of existing water storage tank	\$350,000	-3.00%	30	\$12,320,686
68	N	NF	VT0005070	HINESBURG WATER DEPT	2800	Connection of the Lyman Meadows Water System to the Hinesburg Water System	\$300,000	3.00%	20	\$12,620,686
65	N	NF	VT0005277	PLAINFIELD WATER SYSTEM	985	Waterline replacement behind the old Plainfield Town Hall in an easterly direction to connect to a previously upgraded waterline segment	\$1,100,000	3.00%	20	\$13,720,686
65	N	NF	VT0005556	GEORGIA STATION	120	Storage reservoir rehabilitation, storage reservoir cleaning, control replacement, pump station roof structure reinforcement, additional blow-off valve installation, and customer meter upgrade/replacement to include back flow prevention, install and replace security at pump stations and sources	\$55,000	3.00%	20	\$13,775,686
63	N	NF	VT0005084	RICHMOND WATER DEPT	1000	Construction of water system upgrades and appurtenances on East Main St.	\$755,000	3.00%	20	\$14,530,686
63	N	NF	VT0005084	RICHMOND WATER DEPT	1000	Construction of water system upgrades and appurtenances on Bridge St., Depot St. and Pleasant St.	\$908,000	3.00%	20	\$15,438,686
62	N	NF	VT0005289	WORCESTER FIRE DISTRICT 1	350	Installation of a new telemetry system for the pump and tank controls; project also includes replacement of existing filter media and chemical feed equipment	\$33,000	3.00%	20	\$15,471,686
58	N	NF	VT0005070	HINESBURG WATER DEPT	2800	New well source to provide additional capacity and redundancy; connecting a new source may also result in less manganese	\$750,000	3.00%	20	\$16,221,686

57	N	NF	VT0005114	BAKERSFIELD FIRE DISTRICT 1	446	Addition of second gravel pack well within the vicinity of existing well to provide redundancy	\$350,000	3.00%	20	\$16,571,686
55	N	NF	VT0005320	QUECHEE CENTRAL	2262	Addition of a new 200,000-gallon water storage tank to supplement the existing 40,000-gallon tank on Quechee Hartland Rd. and provide adequate storage and redundancy on the south side of the Ottaquehee River; also includes approximately 3,200 lf of new transmission main	\$1,500,000	3.00%	20	\$18,071,686
55	N	NF	VT0005637	TUCKERVILLE MHP	60	Construction of a new pump house, flushing hydrants, and water meters	\$250,000	3.00%	20	\$18,321,686
53	N	NF	VT0005170	BRADFORD VILLAGE WATER SYSTEM	1512	Abandonment of the existing Well #2 Building and installation of a new submersible-based pump station	\$75,000	3.00%	20	\$18,396,686
50	N	NF	VT0020820	GREEN LANTERN MHP	144	Reconstruction of distribution manifold and installation of blow-off devices and sampling bib	\$50,000	3.00%	20	\$18,446,686
45	N	NF	VT0020801	WHITE BIRCHES MHP	125	Installation of master meters for the three lines coming into the park from the Town of Bennington Water System and installation of flushing valves at distribution dead-ends	\$40,000	3.00%	20	\$18,486,686
45	N	NF	VT0005040	LYNDONVILLE WATER SYSTEM	4500	Water distribution improvements (Phase VI, Contract 2)	\$500,000	3.00%	20	\$18,986,686
40	N	NF	VT0005098	WILLISTON WATER DEPT	7690	Relocation of waterline on Route 2 and Industrial Avenue	\$400,000	3.00%	20	\$19,386,686
40	N	NF	VT0005298	BELLOWS FALLS WATER DEPT	3700	12-inch diameter ductile iron water main to replace approximately 8,940 lf of 10-inch diameter asbestos cement main and 325 lf of 8-inch diameter ductile iron main on Route 5	\$2,500,000	-3.00%	30	\$21,886,686
35	N	NF	VT0005298	BELLOWS FALLS WATER DEPT	3700	Replacement of 6-inch main on Mill St. with 8-inch ductile iron piping	\$476,000	-3.00%	30	\$22,362,686
25	N	NF	VT0005318	CHESTER WATER DEPT	1490	Replacement of deteriorated 6-inch cast iron main with 600 lf of new 8-inch water main and an additional 900 lf of 8-inch to complete a distribution system loop	\$400,000	3.00%	20	\$22,762,686
13	N	NF	VT0005315	BETHEL WATER DEPT	915	Installation of water meters for a currently unmetred system	\$300,000	3.00%	20	\$23,062,686

Notes:

- 1) Total available funding is based on Federal Capitalization Grant, State Match, interest earnings, and other fund income.
- 2) Funding Type: E = Emergency Project, C = Continuing Project, N = New
- 3) Funding Status: F = Fundable Project, NF = Non Fundable Project.
- 4) Final eligibility determinations will be made at time of the loan application review.
- 5) Interest rates and loan terms are preliminary estimates only.
- 6) Interest rates and loan terms for new water systems is initially set to 3%, 20 years and is subject to change as further information becomes available.
- 7) For multi-year projects that anticipate subsequent years of DWSRF funding, interest rates may change as the loan value increases.
- 8) Point totals are subject to change as further documentation may be required to substantiate the priority points awarded.