An Evaluation of Fire Protection Alternatives
Stone Arch Tax Increment Finance District
Jaffrey, NH

February 2009

The Stone Bridge Tax Increment Finance District (SBTIFD) is an area of Jaffrey located north of Fitch Road along Peterborough Street (Route 202) and including a portion of Hadley Road, Nutting Road and Old Sharon Road. (Figure 2).

Fire protection and potable water service is available to the southern extent only. Potable and fire protection services the DD Bean Company. Potable water and sprinkler service is provided by the Jaffrey Water Department with additional supplemental water available through a dry hydrant at Cheshire Pond and connection to Contoocook River.

> "Automatic Sprinklers have been the most important single system for automatic control of hostile fires in buildings for more than a century…Among the benefits of automatic sprinklers is the fact that they operate directly over a fire. Smoke, toxic gases and reduced visibility do not affect their operation. In addition, much less water is used because only those sprinklers fused by the heat of the fire operate, especially if the building is compartmented."[1]

The purpose of this report is to outline alternatives to supplying fire protection to the other developed portion of the SBTIFD, specifically Hadley Road from Old Sharon Road southerly and Old Sharon Road from Hadley Road to Maria Drive. Additionally, fire protection would be extended across Peterborough Street to Nutting Road to provide protection to the Godine Publishing property, which is also located within the SBTIFD.

This area contains an aggregate of $8,839,824 in assessed building values which is over 76% of the total building and land assessed value for the entire SBTIFD.

The district contains many commercial and industrial activities that presently are not provided water of sufficient quantity and pressure to assist fire suppression at any property. Presently there exists a dry hydrant on Hadley Road to draft from the Contoocook River which is located approximately 1270 feet north of the Hadley Road / Old Sharon Road intersection. The Fire Department has also drafted from the river in the vicinity of Monadnock Printing at a time of a working fire.

This report recognizes that any water available for fire suppression must be available for a finite time due to supply and storage constraints. This duration is to be of sufficient length to provide water to sufficiently cool the fire; produce steam to deplete the fire of oxygen; and hold the fire in check until additional supply is established by the Fire Department through dry hydrants, water shuttle and the like. The goal is to provide water of sufficient quantity to provide for fire protection for "protection of the tax base from destruction by fire, preservation of jobs that would be lost in the event of a large fire" and "preservation of human life, and reduction of human suffering"[2]

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[1] Cote, A.E., and J.L. Linville, eds. 2003. *Fire Protection Handbook*. 19th ed. Quincy, MA: National Fire Protection Association.

[2] Manual of Water Supply practices – M31, Fourth Edition, 2008. *Distribution System Requirements for Fire Protection.* American Water Works Association. Page 2.

Calculation of Needed Fire Flow (NFF)

Needed fire flow is defined as the rate of flow considered necessary to control a major fire in a specific building for certain duration.[3] Needed fire flow is not intended to be a design criterion but it has been "demonstrated that the needed fire flow reasonably coincides with the actual flow required to suppress a fire in a real life situation."[4]

For the SBTIFD, building construction and contents were considered. The highest fire loads were assumed to be:

New England Wood Pellet
Dave Houston warehouse storage
Coll's Farm stand – Barn

Atlas Pyrotechnics has a significant potential, but the characteristics of the business and stock are such that conventional fire protection and suppression are not applicable. While each property in the district has its unique fire loads and building characteristics, it is assumed for the purpose of this report that the New England Wood Pellet facility contains the highest threat for possible fire, due to the nature of its manufacturing operations, and damages as the complex has the highest assessed value. In evaluation of the NFF for New England Wood Pellets, the following information and assumptions were made.

Main Building	28,145 sq. ft.	metal building & roof
Warehouse	16,000 sq. ft.	metal building & roof
	6,250 sq. ft.	metal building & roof
Co Gen Building	4,800 sq. ft.	metal building & roof

Assumptions: All buildings would not be involved at the same time. Exposure & communication not and issue due to building construction and distance between buildings.

$$NFF = C_i O_i \left[1+(x+p)_i\right]$$

C_i = construction factor = $18F(A_i)^{½}$

A_i= Main building footprint + 50% office area

A_i= 28955 square feet

F= Construction coefficient = 0.8 (metal building and roof)

$$C_i = 18F(A_i)^{½} = 18(0.8)(28955)^{½} \approx 2500 \text{ gallons per minute}$$

[3] IBID, page 3.
[4] IBID, page 4.

O_i = occupancy factor = 1.25 (Class 5)
Exposure & Communication = 0

$NFF = C_f O_i [1+(x+p)_i] = 2500\ (1.25)[1+0] = 3125$ gallons per minute

Actual building is partitioned off – assume 50% flow necessary to contain /control potential fire = 3125/2 = 1562 gpm say 1500 gallons per minute

NFF = 1500 gpm

This calculation is similar to the flow requirements at a similar sized New England Wood Pellet facility in New York State (1250 gpm).

The installation of sprinklers in a building as a fire suppression measure is "intended to control a fire, not completely extinguish it".[5] Hose streams from the fire department are also necessary. In the calculation of NFF above, a 50% reduction allowance was taken due to the construction and partitioning in the building. The NFF in a sprinklered building "can be significantly reduced from the calculated NFF."[6] The NFF is augmented by fire department hose streams. In this case, the NFF is "the sum of the sprinkler flow at the base of the riser plus a hose stream allowance".[7] For the sake of this report, 1000 gallons per minute will be used for duration of one hour which is the recommended NFPA hose stream allowance for an Extra High Hazard Group 2 hazard classification. This flow will be in addition to sprinklered fire suppression at the subject property.

The water storage needed is as follows:

Sprinklered building	1500 gpm * 60 minutes	90,000 gallons
Secondary hose supply (fire dept hose stream)	1000 gpm * 60 minutes	60,000 gallons
		150,000 gallons
Safety factor (2)		300,000 gallons

From the above calculation, 150,000 gallons of water is the minimum necessary to supply the minimum amount of water needed. Utilizing a factor of safety of 2, useful storage volume is then 300,000 gallons.

Although the volume 300,000 gallons may be reasonable, each business owner should be required to provide their estimated fire flow requirements and determine whether or not the buildings would be equipped with fire suppression systems. This information

[5] IBID, page 13
[6] IBID, page 15
[7] IBID , page 15

would be have to be verified by a fire protection engineer who can estimate the flow requirements using NFPA requirements and size the storage tank accordingly.

The topography of the SBTIFD is generally sloping upward from the Contoocook River with a high point on a knoll adjacent to the transfer station access roadway at an elevation of approximately 1014 feet. Other elevations of interest (approximate) are

New England Wood Pellet	1000
Monadnock Disposal	986
Coll's Farm Stand	990
Dave Houston's	940
Hadley Road Pump Station	933
Godine Publishing	960

There are several alternatives to provide adequate storage to supply the needed water. These include:

1. Use of the wastewater lagoons for storage.
2. Installation of a ground storage tank within a lagoon.
3. Installation of ground storage tank on Town of Jaffrey property adjacent to the Transfer Station roadway.
4. Installation of an elevated storage tank on Town of Jaffrey property adjacent to the Transfer Station roadway.
5. Installation of ground storage tank at elevation sufficient to supply static pressure
6. Connection to public water supply

Water Mains

Of all the alternatives listed above, **all** require the installation of distribution mains within Hadley Road, Old Sharon Road and a portion of Nutting Road (figure 1). The minimum pipe diameter would be 12 inches.

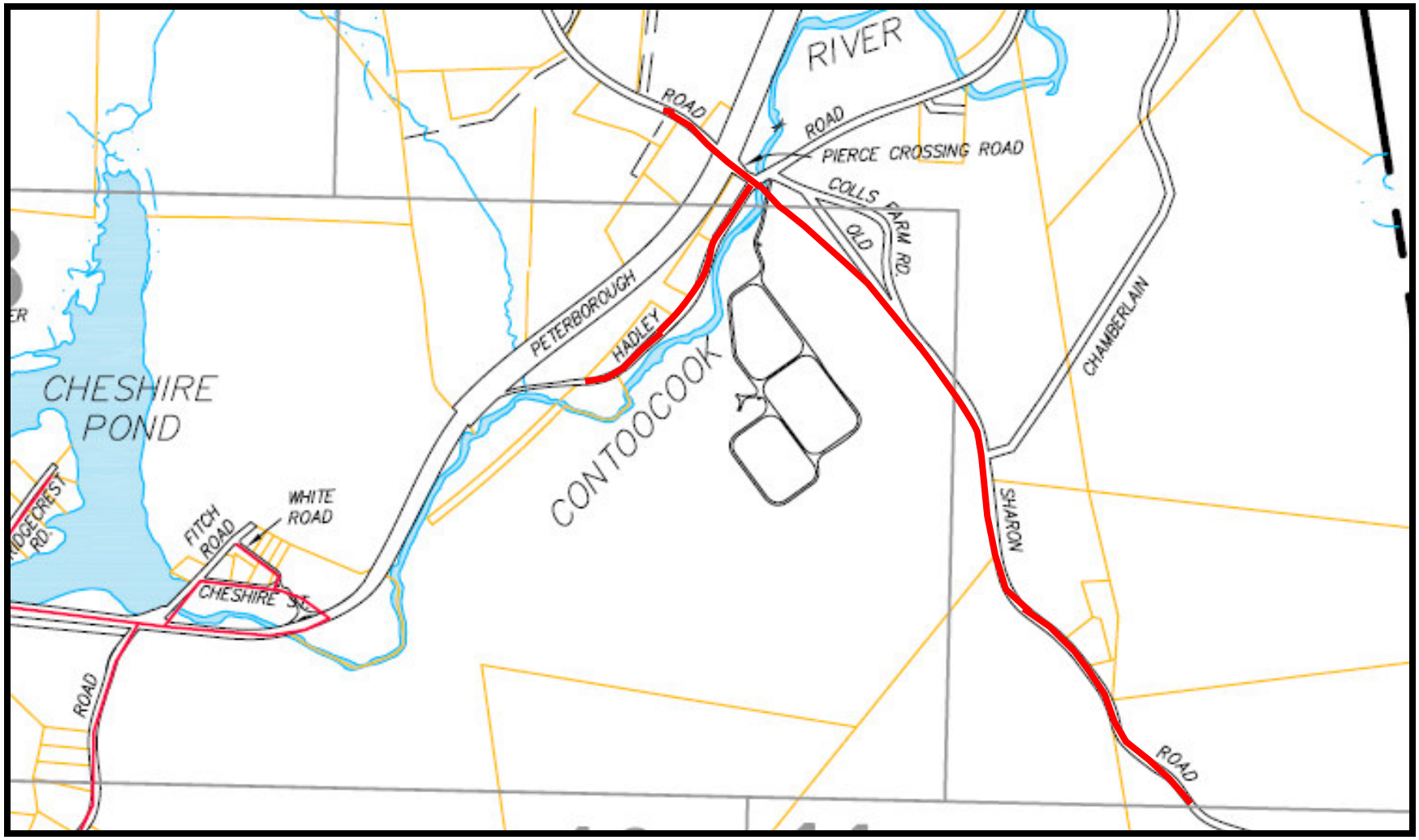
Hadley Rd (Pump Station to Old Sharon Rd)	1800	LF
Old Sharon Rd (Hadley Rd to Maria Drive)	4400	LF
River crossing (Pierce Crossing Bridge)on Old Sharon Rd	80	LF
Hadley Rd across Rte 202 up Nutting Rd to Godine Publishing Driveway including Route 202 crossing	450	LF

The estimate of probable construction cost for these mains is $1,262,000 which includes a 25 percent allowance for engineering and contingencies.

The supplying of water for the various alternatives will be discussed later in the report.

Water Main Common Capital Costs					
Location	From	To	Diameter (in)	Length	Estimate of Probable Construction Cost
Hadley Rd			12	1,800	$ 337,500
Old Sharon Rd	Hadley Rd	Maria Drive	12	4,400	$ 825,000
River Crossing on Old Sharon Rd			12	80	$ 15,000
Hadley Rd/Nutting Rd	Hadley Rd	Godine Publishing Driveway	12	450	$ 84,500
			Total:	6,730	$1,262,000

Based on installation cost of $150 per linear foot for 12 " diameter ductile iron water main
Includes 25% for engineering & contingencies



Water main installation required for all alternatives
Figure 1

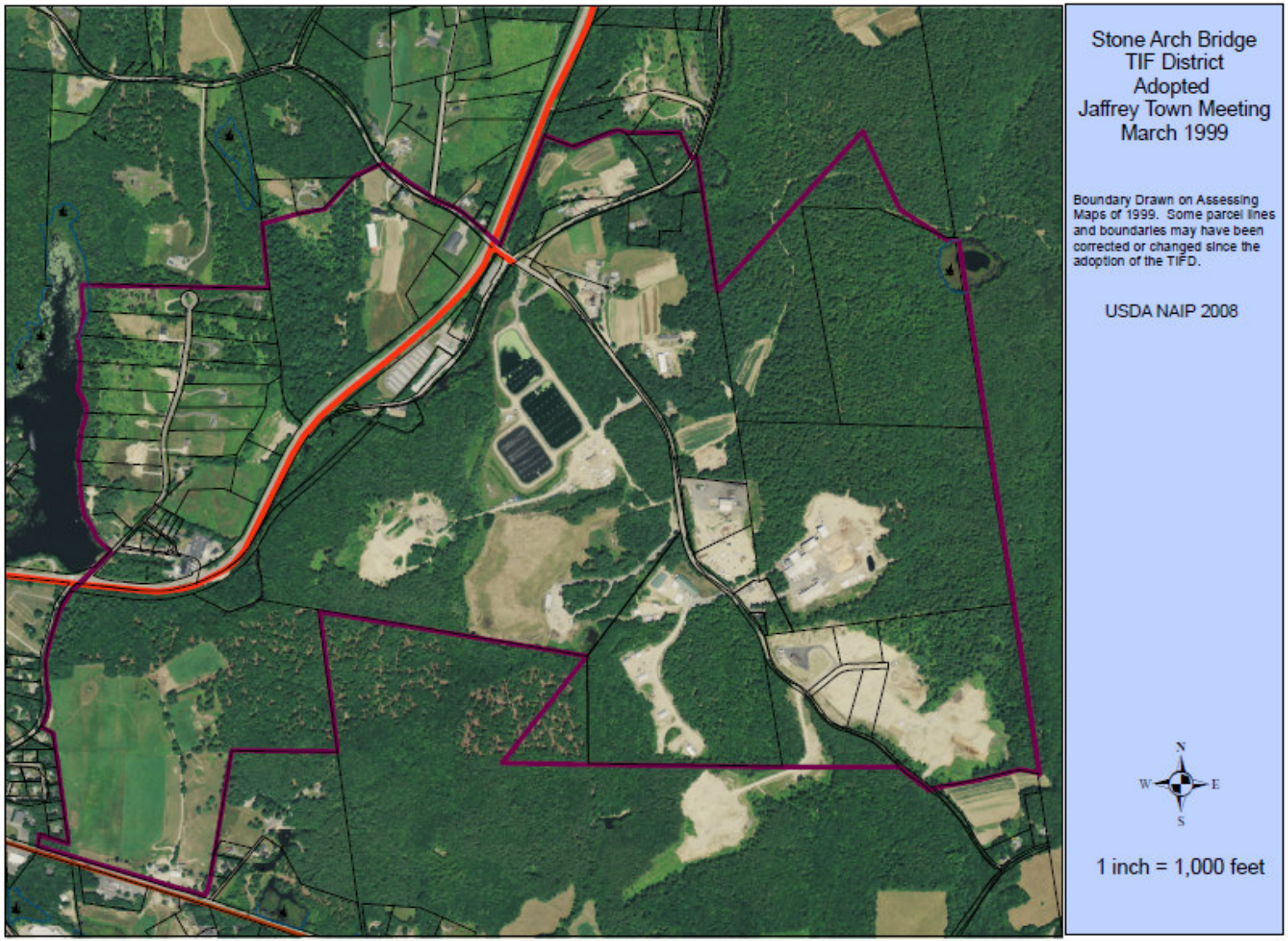

Stone Arch Bridge
TIF District
Adopted
Jaffrey Town Meeting
March 1999
Boundary Drawn on Assessing Maps of 1999. Some parcel lines and boundaries may have been corrected or changed since the adoption of the TIFD.
USDA NAIP 2008
N
W
E
S
1 inch = 1,000 feet

Figure 2

Alternative 1
Use of Wastewater Treatment Lagoon for water storage

There exist three (3) wastewater treatment lagoons that are scheduled to be placed off line and decommissioned as part of the wastewater treatment facility project. The capacity of each lagoon is as follows:

Lagoon 1	12.8 Million Gallons (2.2 Ac)
Lagoon 2	15.3 Million Gallons (2.8 Ac)
Lagoon 3	13.3 Million Gallons (2.2 Ac)

It is proposed that lagoon 3, once all accumulated sewerage sludge is removed can be refilled with non-sewerage water and stored for use as a non-potable, fire suppressing water supply. To prevent stagnation of the water in the lagoon, the aeration system must remain active and upgraded with additional diffusers installed in the lagoon. Fire pumps and emergency generator must be installed with emergency controls. The generator would have to supply adequate power for both aeration system and pumps. Because there will be no normal demand on the system, a hydropneumatic tank and jockey pump will be required to maintain a system static pressure. This would be assumed to be 50 psi. When a hydrant or sprinkler head is activated, a drop in pressure would signal the activation of fire pumps to supply the needed flow.

Pros:
- Town owns land infrastructure would be installed on
- Reutilization of existing town asset. The Town expended funds to construct, maintain, and upgrade the lagoon aeration system.
- Adequate supply of water storage
- Area fenced in and secured
- Centrally located

Cons:
- Former treatment system. Although the lagoons are to be removed of sludge, absolute removal of all septic material is unlikely. A chlorination or disinfection system will likely be necessary.
- Source of water unknown
- Utilization of aeration system. Continuous O&M required. The blowers are 20 years old and would need to be replaced concurrent with this alternative. Additional diffusers would need to be installed in the lagoon as well.
- Aeration is required to prevent stagnation and to minimize freezing, although the lagoon will freeze over in the winter.
- Lagoons are classified as dams by NHDES and will require maintenance and upkeep of emergency action plans in the event of breach. There exist permits with annual renewal costs. Additional costs exist with dam classification and inspection, which is required every six years. Permitting would be required to convert the wastewater lagoon into a water storage facility. The permitting level of effort required for this conversion is unknown. The NHDES may also have concerns with cross contamination of the water system.

- Mechanical redundancy needed for all components; There exists multiple blowers (3) that would be sufficient for redundancy. Redundant pumps would be required.
- Lagoons do freeze over in winter. Ice may limit available water
- Lack of flow through the line at the river crossing (Old Sharon Rd @ Hadley Rd) may be subject to freezing in the winter, even with insulation.
- Evaporation of water and use of the system would reduce water levels, requiring refilling of lagoon.
- O&M costs for fire pump system, chemical feed system and maintenance of the lagoon and jockey pumps.
- Chlorination would be required due to potential of fecal coliform from waterfowl and other animals, in addition to previous use activities (wastewater treatment).
- Maintenance of chlorination/disinfection system. How chlorination would occur at time of fire demand is challenge that would have to addressed further.
- O&M costs for this system presently covered under the sewer user structure. The costs associated for the reutilization for fire protection would be on the tax levy.
- Use of pumps would require reliance on electrical controls. Redundancy would be necessary.
- Growth of vegetation in the lagoons is a problem that could impact intake screen or structure.
- Significant investment would be required to install mains with it being unlikely that the mains could ever be interconnected with the Jaffrey water system in the future.

Alternative Number 1 Estimate of Capital Costs	
Item	Estimate of Probable Construction Cost
Emergency Generator	$40,000
Building (Hydropneumatic tank jockey pumps and fire pumps)	$250,000
Chlorination/disinfection system	$100,000
Replace Blowers	$80,000
Install Additional diffusers	$50,000
Instrumentation/Electrical Controls	$60,000
Subtotal	$580,000
Common Capital Costs	$1,262,000
Total Capital Costs	$1,842,000

Includes a 25% allowance for engineering and contingencies and does not include permitting for source of supply or lagoons.

DOES NOT include source water capital costs

Alternative Number 1 Estimate of Annual O&M Costs	
Item	Estimated Annual Probable Cost
Aeration System	$60,000
Jockey Pump System Operation	$25,000
Chlorination/disinfection system Operation	$500
Chlorination/disinfection system Chemicals	$5,000
Annual Operational & Maintenance Costs	$90,500

DOES NOT include source water annual O&M costs

Alternative 1
Use wastewater treatment lagoons for water storage

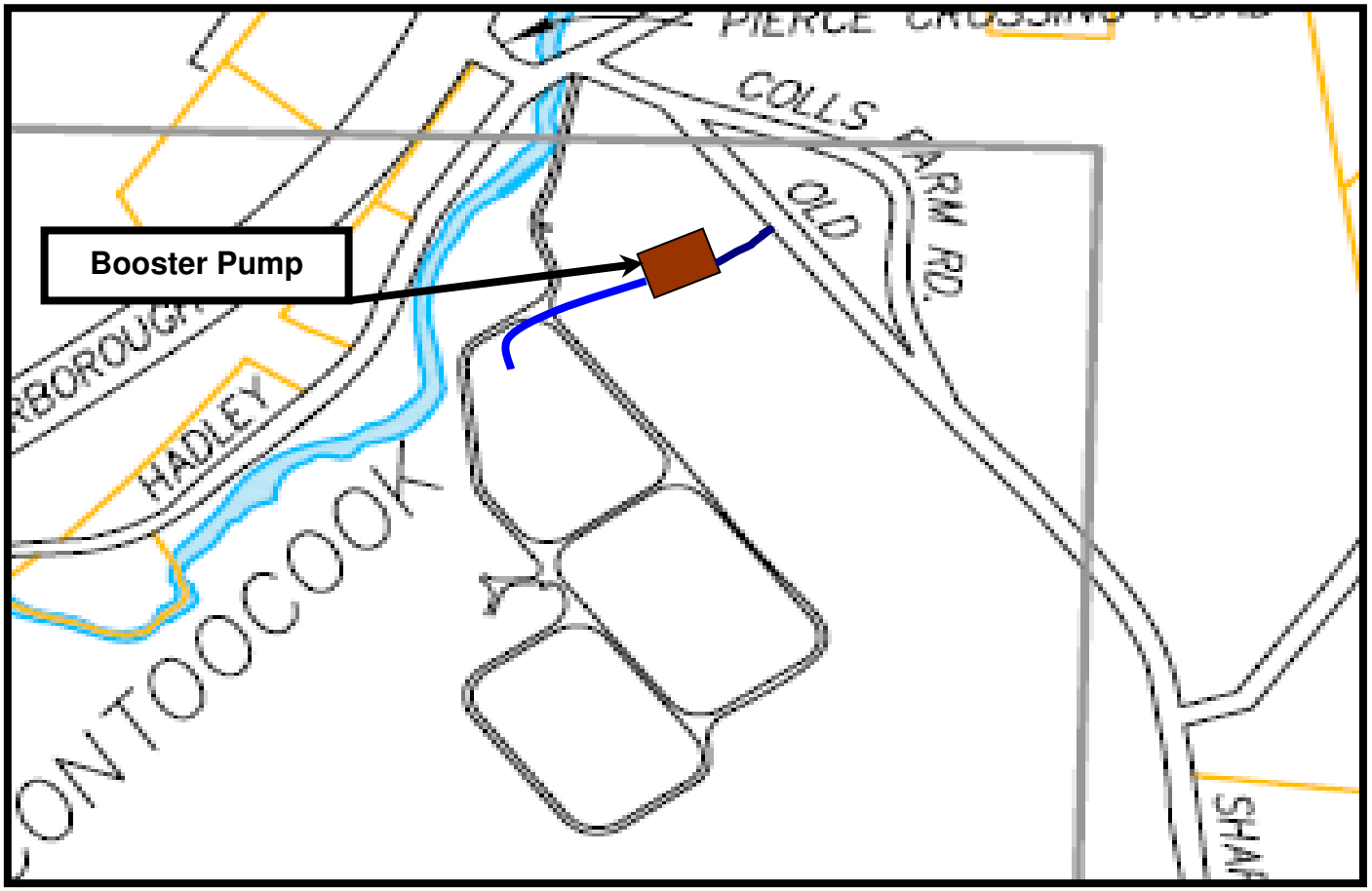


Figure 3

Alternative 2
Installation of a ground storage tank within the lagoons

A ground level water storage tank of 300,000 gallons would be installed within Lagoon 3. This installation would require fire pumps and emergency generator. A generator would have to supply adequate power for the system. Because there will be no normal demand on the system, a hydropneumatic tank and jockey pump will be required to maintain a system static pressure. This would be assumed to be 50 psi. When a hydrant or sprinkler head is activated, a drop in pressure would signal the activation of fire pumps to supply the needed flow.

Pros:
- Town owns land infrastructure would be installed on
- Adequate supply of water storage
- Area fenced in and secured.
- No O&M costs for aeration system, although some aeration may be necessary to prevent water stagnation at a significant reduced rate
- Centrally located in TIFD
- Unused lagoons could be decommissioned as planned, eliminating the concern that they are considered dams.

Pros:
- Mechanical redundancy needed for all components;
- Tank would be installed within former lagoon. Geotechnical analysis would be required to evaluate bearing capacity of the soils. Soils may impact construction costs of the tank if the existing material is determined unsuitable for the foundation design. This would require the installation of suitable materials for the tank foundation.
- Water in tank would be stagnant under most conditions and would be subject to freezing in the winter months. Although an internal mixing system in the tank would assist, it may not prevent the tank from freezing in the colder months.
- Lack of flow through the line at the river crossing (Old Sharon Rd @ Hadley Rd) may be subject to freezing in the winter, even with insulation.
- Use of pumps would require reliance on electronic controls. Redundancy would be necessary.
- O&M costs associated with operation of pumps and possible aeration on tax levy or SBTIFD.
- Challenge would be source of water to refill tank and the time required to fill tank.
- Inspection of tank every 5 years
- Significant investment would be required to install mains with it being unlikely that the mains could ever be interconnected with the Jaffrey water system in the future.
- Annual O&M including daily operational costs, replacement cost at end of useful life expectancy of the equipment and labor associated with daily monitoring and upkeep of station. These costs would need to be incorporated into the Town Budget and on the tax levy.

Alternative Number 2 Estimate of Capital Costs	
Item	Estimate of Probable Construction Cost
300,000 gallon capacity ground water storage tank	$550,000
Booster Pump Station	$250,000
Instrumentation/Electrical Controls	$60,000
Emergency Generator	$40,000
Subtotal	$900,000
Common Capital Costs	$1,262,000
Total Capital Costs	$2,162,000

Includes 25% allowance for engineering and contingencies and does not include permitting for source of water supply

DOES NOT include source water capital costs

Alternative Number 2 Estimate of Annual O&M Costs	
Item	Estimated Annual Probable Cost
Aeration System/mixer	$30,000
Booster Pump Station/Jockey Pump System Operation	$25,000
Annual Operational & Maintenance Costs	$55,000

DOES NOT include source water annual O&M costs

Alternative 2
Ground Storage Tank within Lagoon

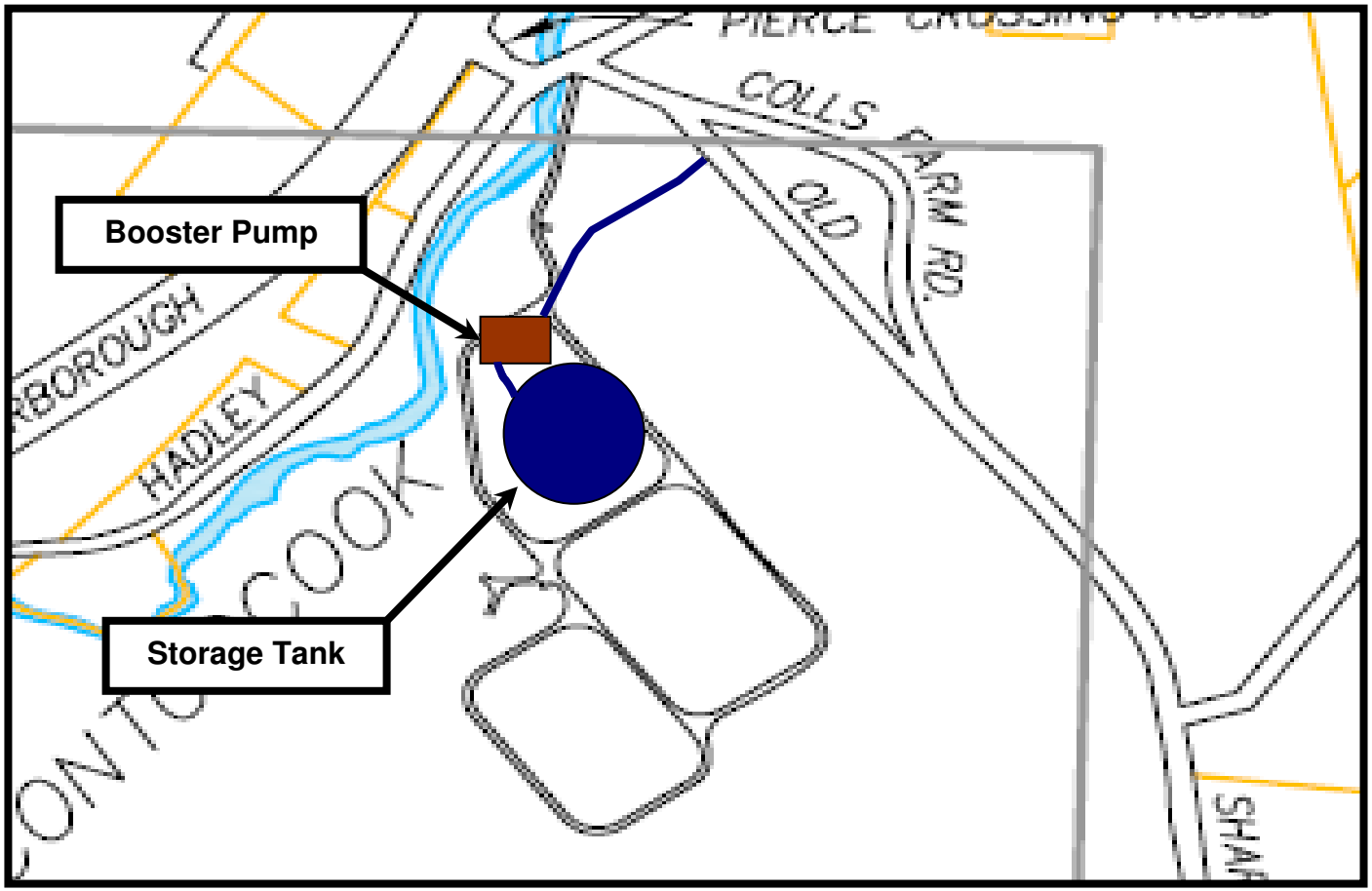


Figure 4

Alternative 3
Installation of ground storage tank on Town of Jaffrey property adjacent to the Transfer Station roadway

A ground level water storage tank of 300,000 gallons would be installed on Town of Jaffrey property adjacent to the transfer station roadway. The tank would be located on the slightly elevated knoll. This installation would require fire pumps and emergency generator. A generator would have to supply adequate power for the system. Because there will be no normal demand on the system, a hydropneumatic tank with jockey pump will be required to maintain a system static pressure. This would be assumed to be 50 psi. When a hydrant or sprinkler head is activated, a drop in pressure would signal the activation of fire pumps to supply the needed flow.

Pros:

- Town owns land infrastructure would be installed upon
- Adequate supply of water storage
- Area fenced in and secured.
- No O&M costs for aeration system at lagoon, although some aeration may be necessary to prevent water stagnation in tank and possible mixer.
- Centrally located

Cons:

- Mechanical redundancy needed for all components
- Geotechnical analysis would be required to evaluate bearing capacity of the soils. Soils may impact construction costs of the tank if the existing material is determined unsuitable for the foundation design. This would require installation of suitable materials for the tank foundation.
- Lack of flow through the line at the river crossing (Old Sharon Rd @ Hadley Rd) may be subject to freezing in the winter, even with insulation.
- Use of pumps would require reliance on electronic controls. Redundancy would be necessary.
- O&M costs associated with operation of pumps and possible aeration, mixer and generator. O&M costs on tax levy or SBTIFD.
- Challenge would be source of water to refill tank and the time required to fill tank. Source of water unknown.
- Inspection of tank required every 5 years
- Water in tank would become stagnant. Aeration may be required. Mixer may also be required to prevent freezing. Although a mixing system in the tank would assist, it may not prevent the tank from freezing in the colder months.
- Significant investment would be required to install mains with it being unlikely that the mains could ever be interconnected with the Jaffrey water system in the future.

Alternative Number 3 Estimate of Capital Costs	
Item	Estimate of Probable Construction Cost
300,000 gallon capacity ground water storage tank	$550,000
Building (Hydropneumatic Tank and fire and jockey pumps)	$250,000
Emergency Generator	$40,000
Instrumentation/Electrical Controls	$60,000
Subtotal	$900,000
Common Capital Costs	$1,262,000
Total Capital Costs	$2,162,000

Includes 25% allowance for engineering and contingencies and does not include permitting for source of water supply

DOES NOT include source water capital costs

Alternative Number 3 Estimate of Annual O&M Costs	
Item	Estimated Annual Probable Cost
Aeration System/mixer	$30,000
Booster Pump Station/Jockey Pump System Operation	$25,000
Annual Operational & Maintenance Costs	$55,000

DOES NOT include source water annual O&M costs

Alternative 3

Ground Storage Tank on Town of Jaffrey property adjacent to Transfer Station Roadway

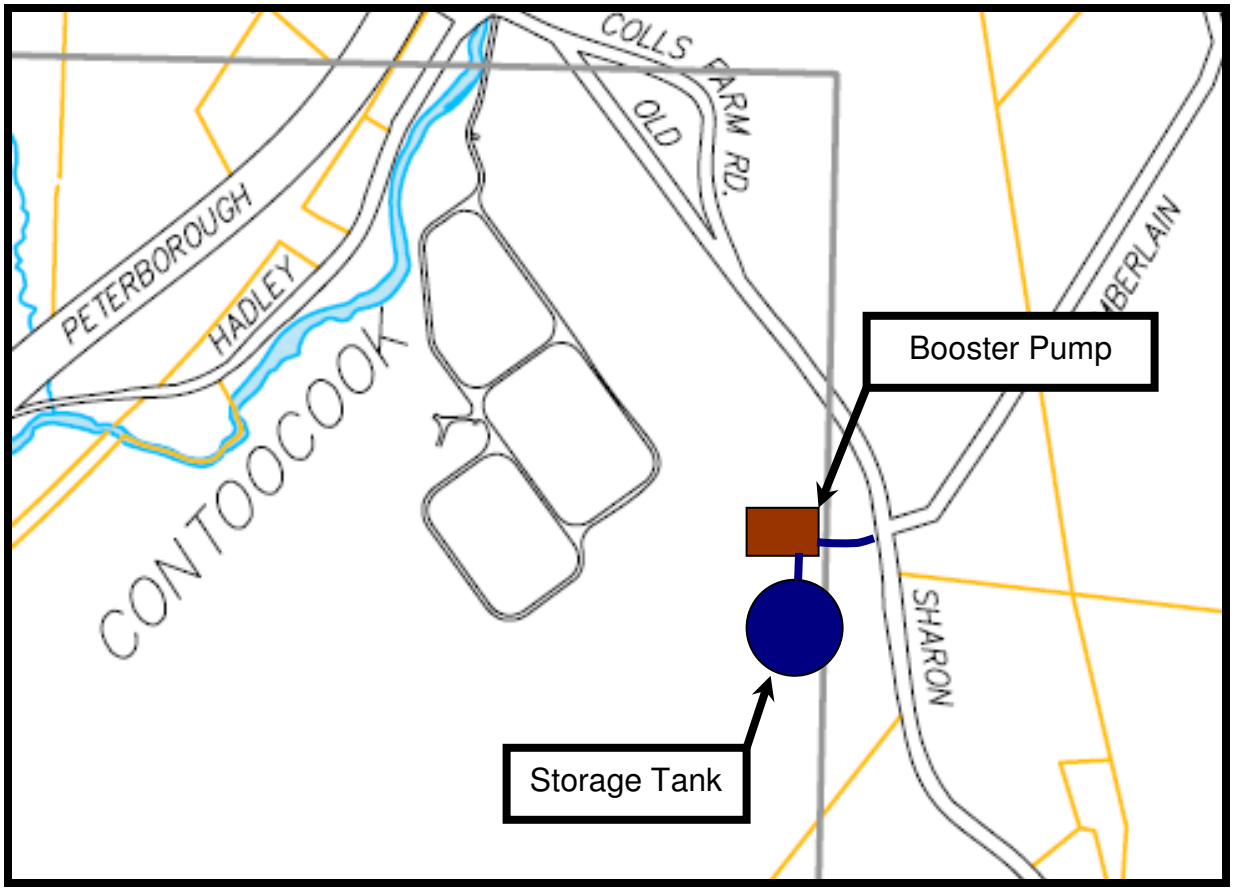


Figure 5

Alternative 4
Installation of an elevated storage tank on Town of Jaffrey property adjacent to the Transfer Station roadway

An elevated storage tank of 300,000 gallons would be installed on Town of Jaffrey property adjacent to the transfer station roadway. The tank would be located on the slightly elevated knoll. The tank would be elevated where the lower usable water level would be at approximate elevation of 1050. This would permit a minimum static pressure of 20 psi at the subject property. The tank would be a water spheroid or elevated Toro type tank, or similar. For a capacity of 300,000 gallons the diameter of the tank would be 46.5 feet for a spheroid or 43 feet for a Toro. Examples of each tank are shown on Figure 6. The top of the tank would be at approximately 1080 for the each tank. The total height from ground surface would be 66 feet. This installation would not require fire pumps and emergency generator as the head necessary to supply the region with fire protection is generated by the elevation.

Pros:

- Town owns land infrastructure would be installed upon
- Adequate supply of water storage
- Area fenced in and secured.
- Centrally located
- No fire pumps & electronic control system needed to activate pumps.
- No O&M costs for booster fire pumps. O&M for source water would be impacted due to the height of the tank.

Cons:

- Geotechnical analysis would be required to evaluate bearing capacity of the soil. The soils may impact construction costs of the tank if the existing material is determined unsuitable for foundation design. This would require installation of suitable materials for the tank foundation.
- Lack of flow through the line at the river crossing (Old Sharon Rd @ Hadley Rd) may be subject to freezing in the winter, even with insulation.
- The tank would be entirely exposed to winter weather. The steel tank, regardless of type, would be subject to the water freezing, especially since the water would be static. Although an internal mixing system would assist, it may not prevent the tank from freezing in colder months.
- Challenge would be source of water to refill tank and the time required to fill tank. Source water O&M costs would be impacted due to height of tank.
- Height of tank 66 feet in height may post permitting challenges. Tank is higher than what is allowed under land use plan – 45 feet (Section IV(4.6)).
- Tank inspection every 5 years with painting rehab every 10 years
- Tank would be 66 feet tall which could potentially affect activities at the Silver Ranch Airpark. Federal FAA signoff of the placement would be required.

- Significant investment would be required to install mains with it being unlikely that the mains could ever be interconnected with the Jaffrey water system in the future.

Alternative Number 4 Estimate of Capital Costs	
Item	Estimate of Probable Construction Cost
300,000 gallon capacity ground water storage tank	$780,000
Subtotal	$780,000
Common Capital Costs	$1,262,000
Total Capital Costs	$2,042,000

Includes 25% allowance for engineering and contingencies and does not include permitting for source of supply

DOES NOT include source water capital costs

Alternative Number 4 Estimate of Annual O&M Costs	
Item	Estimated Annual Probable Cost
Aeration System/mixer	$30,000
Annual Operational & Maintenance Costs	$30,000

DOES NOT include source water annual O&M costs

Alternative 4

Elevated Storage Tank on Town of Jaffrey property adjacent to Transfer Station Roadway

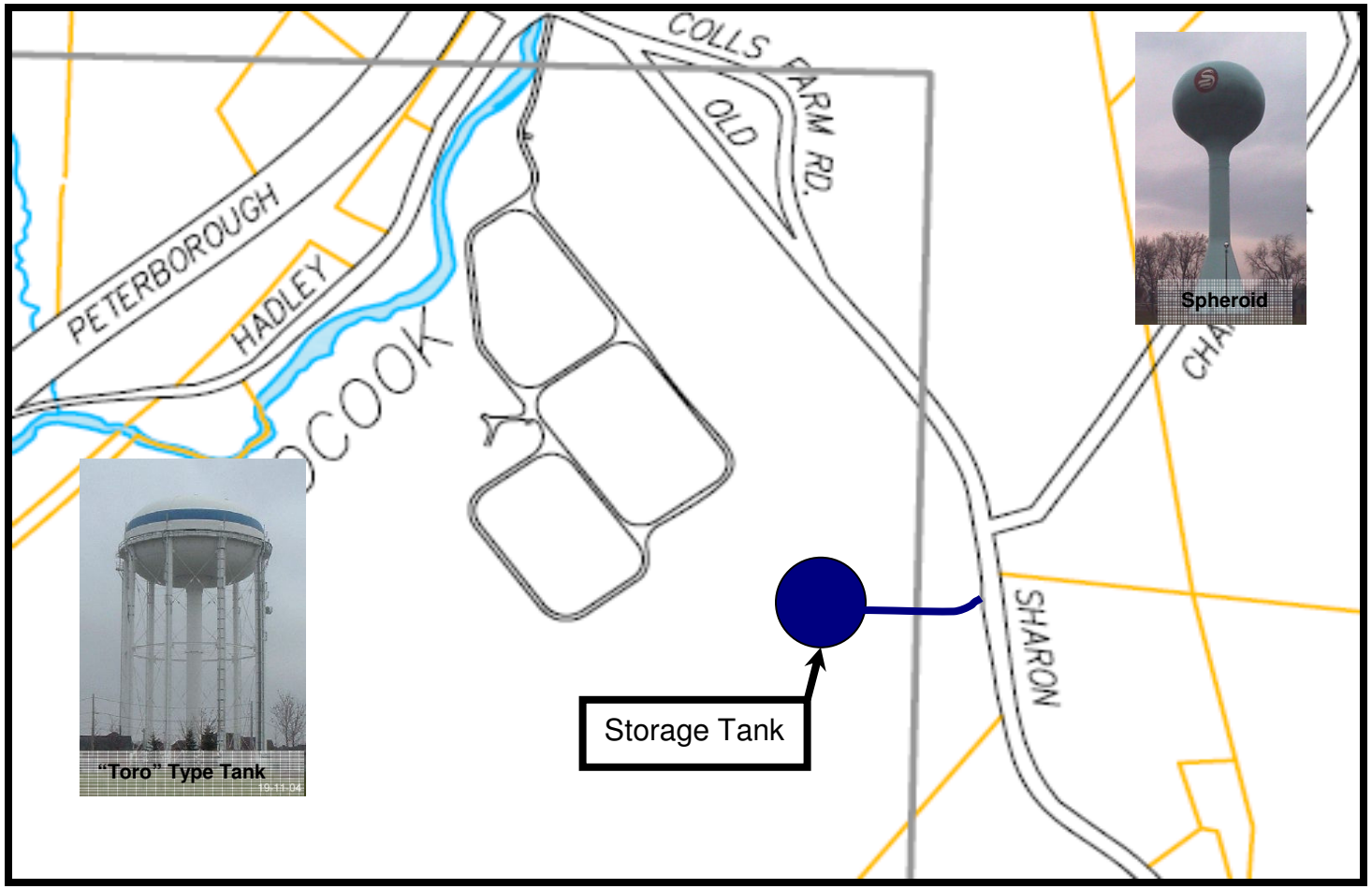


Figure 6

Alternative 5
Installation of ground storage tank at elevation sufficient to supply static pressure

A ground storage tank would be installed with a hydraulic grade line above the elevation necessary to provide adequate static pressure at the subject location. The minimum elevation would be 1050. An area adjacent to the SBTIFD located on Overlook Lane would provide adequate elevation for this purpose, with the top of the hill being approximately 1100 feet. The roadway, or portions thereof are undergoing development into residential lots, with several houses constructed or under construction.

Pros:

- Adequate supply of water storage
- No fire pumps & electronic control system needed to activate pumps.
- No O&M costs for booster fire pumps. O&M for source water would be impacted due to the height of the tank.

Cons:

- Location of the tank would be outside of the SBTIFD. Tank could be located on Overlook Lane. It is not clear if TIFD funds could be used for infrastructure outside of the district.
- Town does not own land infrastructure would be installed upon. Land purchase required
- Geotechnical analysis would be required to evaluate bearing capacity of the soils. The soils may impact construction costs of the tank if the existing material is unsuitable for the foundation design which would require installation of suitable materials for the tank foundation.
- Lack of flow through the line at the river crossing (Old Sharon Rd @ Hadley Rd) may be subject to freezing in the winter, even with insulation.
- Challenge would be source of water to refill tank and the time required to fill tank. Source water O&M costs would be impacted due to elevation of tank.
- Water in tank would become stagnant. Aeration may be required. Mixer may also be required to prevent freezing. Although a mixing system in the tank would assist, it may not prevent the tank from freezing in the colder months.
- Tank inspection every 5 years
- Additional water main would be required
    - Nutting Rd – Godine Publishing Driveway to Overview Dr - 820 LF
    - Overview Drive – Nutting Rd to proposed tank – 1000 LF
- Significant investment would be required to install mains with it being unlikely that the mains could ever be interconnected with the Jaffrey water system in the future.

Alternative Number 5 Estimate of Capital Costs	
Item	Estimate of Probable Construction Cost
300,000 gallon capacity ground water storage tank	$550,000
Nutting Road Water Main (820 feet from Godine Publishing to Overview Drive)	$125,000
Overview Drive Water Main (1,000 ft from Nutting Rd to tank site)	$150,000
Land Acquisition (2 Acres)	$120,000
Subtotal	$945,000
Common Capital Costs	$1,262,000
Total Capital Costs	$2,207,000

Includes 25% allowance for engineering and contingencies and does not include permitting for source of supply.

DOES NOT include source water capital costs

Alternative Number 5 Estimate of Annual O&M Costs	
Item	Estimated Annual Probable Cost
Aeration System/mixer	$30,000
Annual Operational & Maintenance Costs	$30,000

DOES NOT include source water annual O&M costs

Alternative 5

Installation of ground storage tank at elevation sufficient to supply static pressure

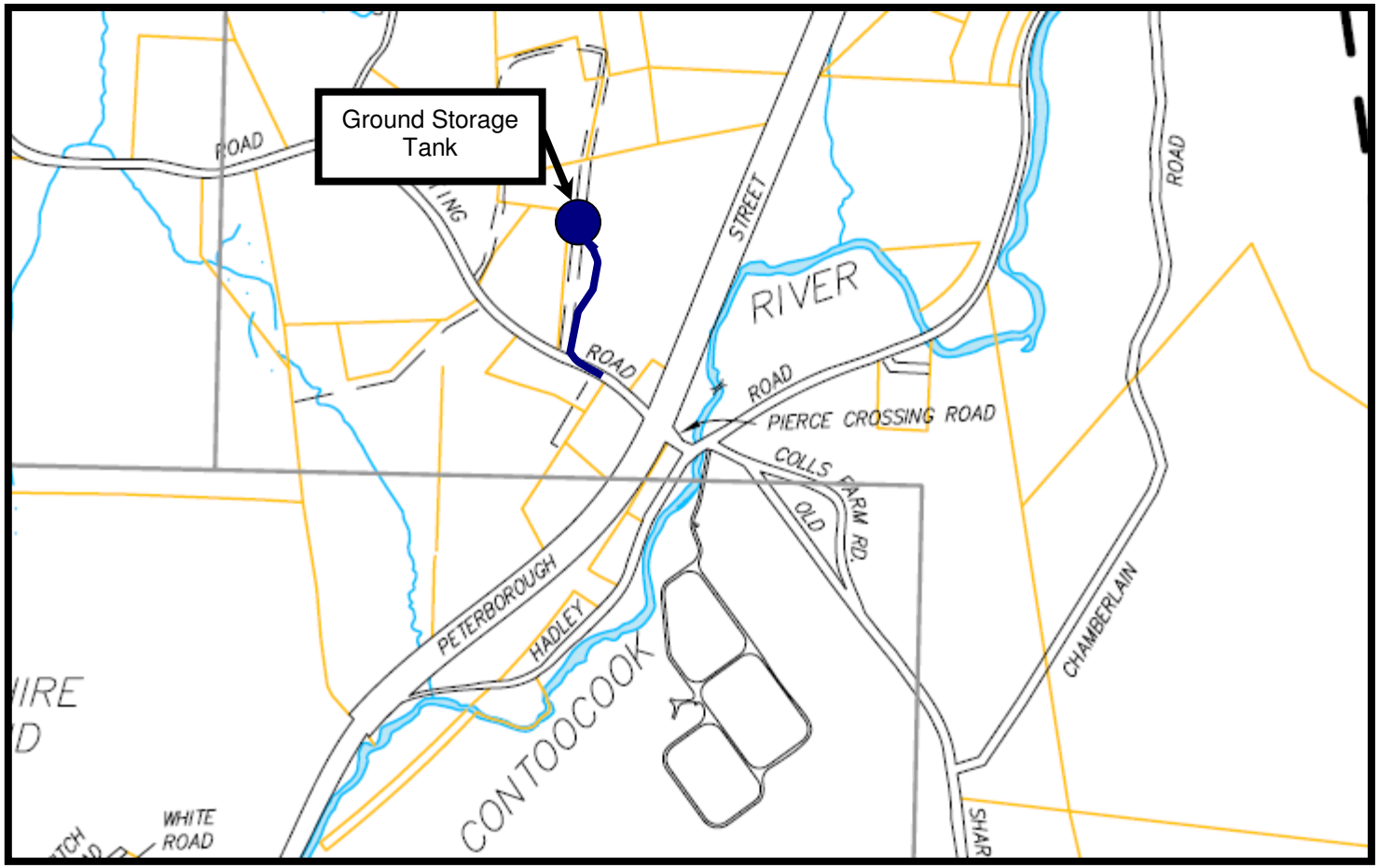


Figure 7

Alternative 6
Connection to public water supply

Pro:.

- Provides potable water to the district, addressing contaminated groundwater wells that exist eliminating public health threat
- Water Main extension only. No tank required.
- Adequate supply of water storage for duration needed
- Computer analysis of existing distribution system indicates that 2300 gpm can be supplied to the district. This nearly meets the needs of the highest user. If this alternative is determined to be the best alternative, the businesses in the district will have to determine their own needs and construct on-site storage to meet this deficiency.
- No reliance on fire pumps & electronic control system needed to activate pumps.
- The providing of potable water opens additional economic development opportunities in the SBTIFD.
- Directional drill under Route 202 to limit pavement disruption and work within state ROW.
- Potential for drinking water State Revolving Fund funding with principal forgiveness. The project would only be eligible if extension of potable water to address groundwater contamination issue with private wells. Funding is not guaranteed, though, as projects statewide are competitively judged and ranked.

Cons:

- Cathedral Road water main replacement necessary.
- Lack of flow through the line at the river crossing (Old Sharon Rd @ Hadley Rd) may be subject to freezing in the winter, even with insulation. Domestic potable use of water within the district would lessen the chance of freezing.
- Minor incremental O&M costs associated with water production at existing wells.

Water Main Lengths for connection to existing distribution system

Peterborough Street (Limit of existing water to Hadley Rd)	1850 LF
Hadley Rd (Peterborough Street to Pump Station)	400 LF

Additional costs
Route 202 crossing
River crossing at DD Bean outlet

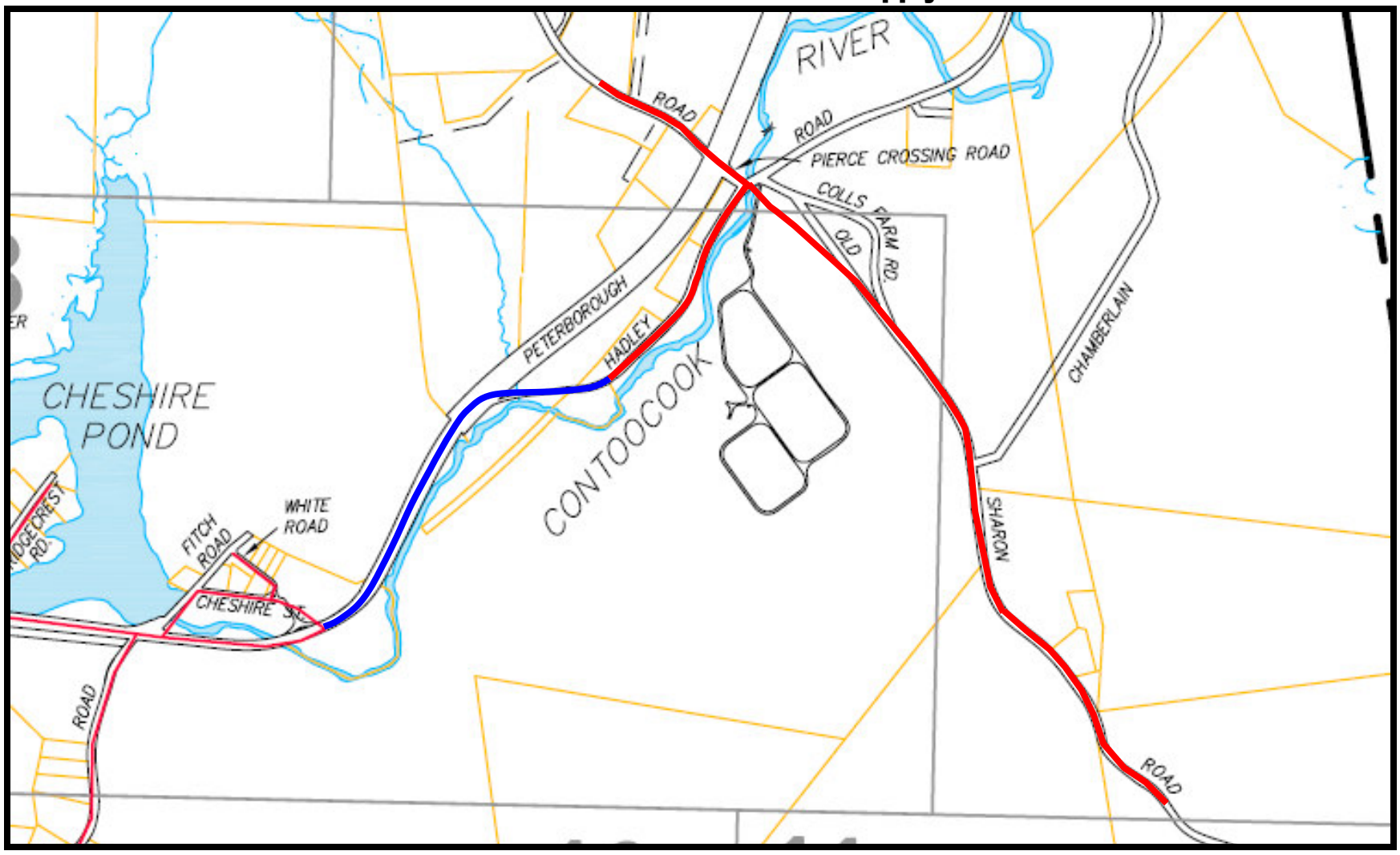
Alternative Number 6 Estimate of Capital Costs	
Item	Estimate of Probable Construction Cost
Peterborough Street Water Main (1850 LF from existing to Hadley Rd)	$280,000
Hadley Rd Water Main (400 feet from Peterborough St to Pump Station)	$60,000
Route 202 crossing	$30,000
River Crossing at DD Bean outlet	$30,000
Subtotal	$400,000
Common Capital Costs	$1,262,000
Total Capital Costs	$1,662,000

Includes 25% allowance for engineering and contingencies.

Alternative Number 6 Estimate of Annual O&M Costs	
Item	Estimated Annual Probable Cost
Bi-Annual Flushing and hydrant maintenance	$1,500
Annual Operational & Maintenance Costs	$1,500
Source Water Additional Cost (existing wells)	$1,000

Alternative 6

Connection to Public Water Supply



Water Supply to local storage Alternatives (Numbers 1 – 5)

For alternatives one through five delineated above, a source of water must be found in the SBTIFD adequate to fill the tank with water. There are three possible options.

a. Utilize treated wastewater effluent from the new Wastewater Treatment Facility. This effluent, although treated and disinfected would require additional chlorination for each of the options. A challenge would be the potential permitting for reuse of this effluent. The time to refill the tank after a fire event using the capacity of the tank (300,000 gallons) would be approximately 12-24 hours depending upon flows at the Wastewater Treatment Facility. Additional infrastructure alterations at the new facility would be required to divert the treated effluent to any of the options. This could involve pumps, construction of onsite clearwell, and electronic controls. Through conversation with NHDES, it is believed that this would be the first of its kind reuse of wastewater effluent. Additional treatment requirements of the wastewater effluent may be required such as maintaining a disinfectant residual.

   Any water taken from this source would be a potential cross-connection hazard, if it is stored or passed through Jaffrey Fire Department equipment and a subsequent connection to the Jaffrey water system is made to the same equipment.

   The costs and time required associated with permitting this type of reuse of wastewater effluent is unknown at this time. Additional meetings with the regulatory authorities would be required. It may be difficult and costly to permit this supply alternative.

   Utilization of wastewater effluent precludes any future possible reuse of the installed infrastructure in connecting to the public water supply.

   The annual O&M costs for this alternative cannot be determined at this time due to the uncertainty of permitting and any treatment requirements that may accompany regulatory approval.

   Also, if an elevated tank were to be installed, additional pumping costs would be incurred to pump water to a higher elevation.

b. Installation of a new well to fill tank. During construction of the new wastewater treatment facility, a new bedrock well was drilled at the edge of the groundwater management zone of the landfill. At the time the well was placed, it was believed to be the best possible location for a well. The well was intended to be used for both plant and potable use at the new facility. The new well is rated for approximately 5 gallons per minute (300 gph). At

this rate, it would take 1000 hours to refill the tank (42 days of constant pumping). It would be assumed that a well of similar yield could be developed near any tank. A hydrogeological study would have to be undertaken to find a well of higher yield in the district. Depending upon the capacity of the well, permitting of the well could take up to two years to complete. The cost for a hydrogeological study and well development could exceed $100,000.

Of particular concern with a well located within the groundwater management zone is the potential of contamination from the closed landfill. The new well installed for the new wastewater treatment facility exhibits contaminant levels which exceed drinking water and ambient water quality standards. For use at the WWTF, treatment is required. It is not clear if treatment would be required by the permitting authorities for fire protection use.

In the event a new source is identified and pursued, the new source approval process can take 6-12 months to complete. The estimated probable cost for the program may range from $100,000 to $150,000 depending upon the level of effort required to find a new source. These costs do not include legal costs, land acquisition or treatment. If treatment is required for fire protection, the type of treatment required would need to be determined upon review of preliminary water quality data and identification of the parameters that exceed water quality standards. This treatment would likely be a requirement in any water withdrawal permit.

Any water taken from this source would be a potential cross-connection hazard, if it is stored or passed through Jaffrey Fire Department equipment and a subsequent connection to the Jaffrey water system is made to the same equipment.

The annual O&M costs for this option cannot be determined at this time due to the lack of available information. For instance, it is not known where the source would be located, size of pump(s) needed to fill tank and what treatment would be required as part of the withdrawal permit.

Also, if an elevated tank were to be installed, additional pumping costs would be incurred to pump water to a higher elevation.

A generator would be needed to operate well during times of power failure.

c. Connection to Barking Dog Water Company private well(s). This is an approved wellsite consisting of three wells, two are community water supplies and one a bottled water supply. In September 2007, a Large Groundwater Withdrawal Permit (LGWP-2007-0004) was issued by the NHDES for a total withdrawal of all three wells of 576,000 gallons per day, with no single well exceeding 288,000 gallons per day. Several years ago, the owner offered to

sell water to the town, but was met with resistance at Town Meeting. In addition, approximately 3000 LF of 12" water main would have to be installed from Old Sharon Road along Chamberlain Rd (Class VI) to the well site. The estimated cost for this water main is $562,500 which includes a 25% allowance for engineering and contingencies. Additional costs may include land improvement or easement costs associated the upgrading of Chamberlain Road due to the installation of the infrastructure. Any improvement to this Class VI roadway may require acceptance of this roadway as a Class V roadway to legally expend town funds on the private roadway.

The annual costs for this option have not been determined as no contact has been made with the owner of the well to pursue this option. If this is chosen, negotiations would have to take place.

Acknowledgements:

The Department of Public Works acknowledges the assistance provided by the engineering firm of Tata & Howard who performed a peer review of this report and provided the cost estimates. Tata & Howard did make a recommendation on the options presented, which has not been included in the report. Following is one comment provided.

"2.) Operations - The construction of infrastructure that may be damaged or in-operable due frozen conditions is not in the best interest of the community or the business district. The expenditure of more than 1.67 M for a new fire protection system which may not function as designed in specific situations is counter productive. The structural integrity of both the tank and the water mains could be compromised as a result of frozen conditions.
3.) Liability - The community needs to assess if there is any pending liability in constructing a fire protection with known potential deficiencies. In addition, the potential introduction of wastewater parameters with the fire department equipment should be noted under certain alternatives.
4.) Service and Growth- The primary reason a community to install infrastructure is to provided a necessary service to the tax payer and promote future growth. The introduction of wastewater parameters and the potential for freezing new mains limits both the the [sic] future uses of the mains, as well as, limits the potential future growth within the business district."
Paul Sirois, Vice President, Tata & Howard

The Departments also acknowledges the assistance of Jo Anne Carr with review and figures.

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6
	Utilize Existing Lagoon for water storage	Ground water Storage Tank within lagoon	Ground water storage tank adjacent to Transfer Station Driveway	Elevated Storage Tank adjacent to Transfer Station Roadway	Ground Storage Tank at elevated location	Connect to Public Water Supply
Capital Costs	$ 1,842,000	$ 2,162,000	$ 2,162,000	$ 2,042,000	$ 2,207,000	$ 1,662,000
Annual O&M	$ 90,500	$ 55,000	$ 55,000	$ 30,000	$ 30,000	$ 1,500
Source Water Capital Costs	Unknown	Unknown	Unknown	Unknown	Unknown	Not Applicable
Source Water Annual O&M Costs	Unknown	Unknown	Unknown	Unknown	Unknown	$ 1,000