FIRE SUPPRESSION
AND
POTABLE WATER SUPPLY STUDY

for the

PUBLIC WORKS COMMISSION

STRATHAM, NEW HAMPSHIRE

MAY 2010

WRIGHT-PIERCE

Engineering a Better Environment

FIRE SUPPRESSION
AND
POTABLE WATER SUPPLY STUDY

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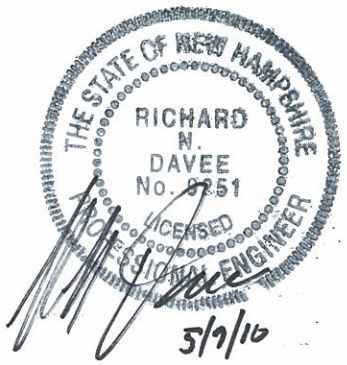

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FIRE SUPPRESSION DISTRICT MASTER PLAN

FOR THE

TOWN OF STRATHAM, NEW HAMPSHIRE

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SECTION 1

INTRODUCTION

1.1 BACKGROUND

The Town of Stratham is characterized by largely rural, residential area, a historic New England town feel and an agriculturally based culture. This is contrasted with the Commercial District along Route 108. The Commercial District lies within 800 feet on either side of Route 108 (Portsmouth Avenue) north of Route 101 to Bunker Hill Avenue. In 2005, the Town commissioned SFC Engineering to assess the potential for such a system utilizing existing private infrastructure. The SFC report depicted a system of water main paralleling the east and the west side of Route 108 from Route 101 to the Town Center located at the intersections of Route 33, and Winnicutt Road. It is desirable that a fire suppression system be capable of future expansion to the Stratham "Town Center" located at the intersection of Route 33 and Winnicutt Road. The system would be supported by a fire pumping station and fire pond located behind King's Highway Plaza. The extent of this system is currently limited to the area of King's Highway Plaza, the Honda Barn, and TD Banknorth. The SFC report identified that such a system was feasible. The Town attempted to bring together the affected (those that would benefit from the system) property owners such that the district could be formed and private infrastructure could transfer to municipal ownership and operation. This process is ongoing.

Since the SFC report in 2005, the west side of Route 108 has seen considerable development. The Town, working with private entities, has seen the installation of a considerable amount of fire suppression pipeline. This pipeline is served by a fire pond and fire pumping station behind Shaw's. Pipeline extends from Shaw's to the new CVS to the south and north to its shared property line with Market Basket. The Market Basket property has added dry pipe from this shared property line to a point directly across from the King's Highway system. The Town and private parties attempted to connect the Shaw's and Market Basket systems to the King's Highway Plaza system in 2007. Legal and technical issues prevented the completion

of this effort. The Town would like to have the three systems connected such that two pump stations and two fire ponds would be available to offer redundancy. The feasibility of connecting the two systems required further evaluation.

The Town has also recently modified the Commercial District zoning to that of a "Form Based" code within a newly created Gateway Commercial Business District (GCBD). The modification allows for greater density and utilization within the GCBD by encouraging a system of streets east and west of Route 108 that create a "village" environment that allows for closely spaced multi-story structures having a mix of retail, office, restaurant, and residential uses. The GCBD would add value to the tax base and encourage economic development where the Town desires it to occur. To accomplish this goal, additional municipal services will be necessary. Water, wastewater, and storm water utilities will be required in addition to fire protection. It is the Town's intent that the fire suppression system be designed for conversion to a potable water system in the future that is capable of fire protection as well.

1.2 STUDY GOALS AND OBJECTIVES

The purpose of this study is to conduct an assessment of the infrastructure, affirm the hydraulic strengths and limitations of the existing fire suppression infrastructure under existing conditions and develop a system expansion program that will meet the fire needs of Stratham. This study also identifies required improvements to the infrastructure to convert the fire suppression system into a potable water system and develop a capital improvement plan, which incorporates recommendations generated during the course of the study. The objectives of the study are as follows.

- Evaluate the condition and capacity of the existing fire suppression pump stations and storage facilities
- Detail the hydraulic strengths and limitations of the existing distribution system under existing and projected conditions
- Provide a new hydraulic distribution model
- Recommend needed improvements which will insure reliable service and will comply with current and anticipated regulatory requirements through the next 20-years

- Prepare a report summarizing the activities, findings, conclusions and recommendations.

1.3 REVIEW OF PRIOR STUDIES, REPORTS AND DOCUMENTATION

The above-mentioned report by SFC Engineering Partnership, Inc. entitled "Stratham Fire Suppression District, NH Route 108", dated November 21, 2005, does a good job of laying out the general requirements of a fire suppression system for the Commercial District in Stratham. The report provides estimates of required fire flows for sprinklered buildings of various types and configurations that are present within the current Commercial District.

Another report delineating essential project related information is the "Stratham New Hampshire Gateway Commercial Business District Master Plan" prepared by the Gateway Commercial Business District Master Plan Committee, dated January 18, 2008. In this report, descriptions of allowable use and acceptable development practices that will foster an increase in density and mixed use development are presented.

The Town voted in March 2010 to accept the Gateway Commercial Business District Zoning Ordinance incorporating "form based" zoning, which will allow for additional density through this area. The warrant article encompassing the zoning amendment is included in **Appendix A.**

1.4 SCOPE OF WORK

In general, the scope of work was proposed in a set of four detailed tasks as delineated below. The primary focus areas of the study are described as follows.

Task 1 - Existing Systems Evaluation

- Estimate the required fire flow based on ISO standards for the existing Commercial District and the Gateway Commercial Business District .
- Conduct field investigation with the assistance of the Town to gain access to identify and confirm the condition and capabilities of the Shaw's and the King's Highway Plaza pumping stations.

- Identify the necessary improvements to each station that would achieve the ISO flow requirements and allow the two stations to operate in a lead-lag redundant/backup mode.
- Identify additional weaknesses/deficiencies in the system that may lead to substandard performance or failure and the recommended improvements and costs to minimize them. Provide detailed recommendations and planning level cost estimates for each recommended improvement.
- Inventory and map existing piping and appurtenances based on original design drawings, existing as-built information, and field verification (by visual inspection).
- With the assistance of the Town, confirm or identify any gaps in the pipeline.
- Produce a map (GIS/AutoCAD based) that combines information from existing sources and field verification into a single source/database.
- Identify and map the necessary improvements and requirements thereof (pipe, materials, valves, hydrants, and special construction) that are required to connect the Shaw's and the King's Highway Fire suppression systems into a single system.
- Specifically identify the work required to connect the Shaw's, Market Basket, and the King's Highway systems across Route 108.
- Provide detailed recommendations and planning level cost estimates for each recommended improvement.

Task 2 - System Expansion Analysis

- Complete the necessary hydraulic calculations and assessment for expansion of the existing pipe network such that all properties and facilities have the ability to have internal sprinkler systems and adequate access to hydrant facilities.
- Identify, to the extent possible, the degree to which the current systems, once interconnected, could service the current commercial district without a major infrastructure improvement (e.g. water storage, booster pumps, etc.).
- Identify and map the necessary improvements and requirements thereof (pipe, materials, valves, hydrants, and special construction).
- Provide recommendations and planning level cost estimates for each recommended improvement/addition.

Task 3 - Potable Water System Conversion Analysis

Part 1: Demand Estimates

- Estimate current and future average day, maximum day, peak hour, and fire flow water demands based on current zoning and for future form based zoning in the GCBD.

Part 2: Potential Sources

- Based on the demand estimates above, identify the required source capacity for alternative water sources including:
    - Municipal wells within the Town and owned by the Town
    - Interconnection and purchase of water from a nearby public water system
- Assess the feasibility and cost to develop either of the sources listed above.

Part 3: Distribution Improvements

- Evaluate and identify additions and improvements to the fire suppression system that foster domestic water delivery in terms of flow, pressure and water quality
- Identify the requirements/need for additional pipe loops, valves and hydrants to facilitate system operation, maintenance and repair
- Prepare a conceptual sewer utility plan for the project area.
- Prepare a set of standard specifications for use by the Town that covers pipelines, hydrants, valves, fittings, water services (both domestic and fire), meters and in accordance with NHDES rules and standard water system practices.

Part 4: Storage Requirements

- Determine the necessary storage volume required to achieve domestic and fire flow demands in consideration of each potential source of water identified in Task 3, Part 2, above.
- Determine the type(s) of storage tank and potential locations within the service area.

Task 4 - Infrastructure Recommendation, Costs and Reports

Part 1: Preliminary Report

Wright-Pierce shall provide the Town with three (3) copies of the Preliminary Report for review by Town officials. The Preliminary Report will contain a description of the work completed to date, the data used during the evaluation, assumptions that were necessary to complete the work, recommendations, costs, and other considerations for the Town to consider during the development of the fire suppression system or conversion of it to a potable water system.

Part 2: Final Report

Wright-Pierce shall provide the Town with six (6) hard copies and one electronic copy of the Final Report for use by the Town. The Final Report shall incorporate comments and recommendations provided by the Town, where appropriate.

Part 3: Progress Meetings

Wright-Pierce shall attend up to three (3) formal meetings to present the findings of this effort. These meetings may include a progress meeting prior to the issuance of the Preliminary Report, a meeting to discuss the Town's review of the Preliminary Report, and a public meeting to present the Final Report.

Section 2

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SECTION 2

EXISTING SYSTEMS EVALUATION

2.1 GENERAL

The purpose of this section is to provide a general overview of the existing fire suppression infrastructure. This includes an overview of the storage, distribution and pumping capabilities.

2.2 FIRE SUPPRESSION SYSTEM

Service Areas

The systems are currently segregated into four separate systems; the Shaw's system, the King's Highway system, the Staples' system and the Market Basket system. None of these systems are currently interconnected through existing infrastructure.

TABLE 1
SERVICE AREA SUMMARY

Service Area	Fire Storage	Distribution Method	Material	Approximate Total Length of Pipe(ft)	Diameter (in)
Shaw's	Yes	Pump Station	Ductile Iron	4600	6, 8, 10
King's Highway Plaza	Yes	Pump Station	Cast Iron and Ductile Iron	1250	6, 8,10
Market Basket	No	Dry Hydrant	Ductile Iron	1225	6, 10, 12
Staples Plaza	Yes	Pump Station	Ductile Iron	900	6, 8

Piping Infrastructure

The existing privately owned fire suppression systems are currently comprised of ~6000 feet of water mains that range in size from 6-inch to 12-inch. Both cast iron and ductile iron water main are present in the pipe network. The infrastructure in the King's Highway system

is shown as cast iron and the Shaw's, Market Basket and Staples systems are all described as ductile iron pipe. A plan of the existing fire suppression infrastructure is shown in **Figure 1.** Information relating to the piping infrastructure was taken from plans and information supplied by the Town of Stratham including the following:

- Stratham GIS geodatabase, October 2009
- "Stratham Fire Suppression District Water Line", Emmanuel Engineering, dated 5/30/08
- "Former Shaw's Plaza Existing Conditions Plan", Appledore Engineering, dated 12/16/04
- "Plan of Land, Pantlin & Chananie Development Corp," John Durgin, Civil Engineer, dated February 1974
- "Stratham Crossing Commercial Development," Jones and Beach Engineers, dated 10/24/03
- NHDOT Project # 10421D Drainage plans (utility sleeve locations)

2.3 STORAGE FACILITIES

Total estimated storage capacity within all systems is 2.4 MG which includes the estimated volume of all fire storage ponds. There are currently no storage tanks available within the water distribution system. A summary of storage facilities is presented in **Table 2-2**. These storage capacity estimates assume depths of ponds and intake location at the base of the pond for full usable capacity.

TABLE 2

WATER STORAGE FACILITIES

Name	Approx. Normal WSE (feet)	Type	Approx. Capacity (MG)	Water Source
Shaw's	43	Open Pond	0.25	Domestic Well
King's Highway Plaza	50	Open Pond	2.1	Natural Spring*, Precipitation
Staples Plaza	56	Enclosed	0.1	Domestic Well

* Anecdotal. There are no known inlets to this reservoir.

Source:

Utility data developed by Wright-Pierce.
Imagery obtained from GRANIT.
Parcel data provided by the Town of Stratham, NH.

Legend

- Pumping Station
- Hydrant
- Gate Valve

Fire Line

Diameter(in)

- Unknown
- 6"
- 8"
- 10"
- 12"
- 36"

NH 101 WB
NH 101 EB
011 D
011 A
011 B
011 C
RIVER RD
108
STRATHAM HGHTS RD
FRYING PAN LN
UNK
PS

0 300 600 Feet

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Town of Stratham, NH

Fire Suppression System

PROJ NO:	DATE:	FIGURE:
11607A	May 2010	1

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2.3.1 Shaw's Storage Reservoir

The Shaw's Fire Storage Pond is part of the Shaw's fire suppression system. It is a 0.25 MG man-made pond designated for fire suppression storage. A 36-inch RCP pipe connects this pond to the fire pump station. This pond was not inspected, as access to the premises was not granted by the owner. The water source for this pond is the well for domestic water associated with Shaw's property.

2.3.2 Staples Plaza Fire Storage Reservoir

The Staple's Fire Storage Reservoir is part of the Staple's fire suppression system. It is an approximate 60-foot by 60-foot man-made reservoir designed for fire suppression storage. An 8-inch water main connects this reservoir to the fire pump station. This reservoir was not inspected and is not expected to be part of the infrastructure acquired by the Town.

2.2.3 King's Highway Plaza Storage Reservoir

The King's Highway Plaza Fire Storage Reservoir is part of the King's Highway Plaza Fire suppression system. It is an approximate 245-foot by 175-foot rectangular man-made reservoir designated for fire suppression storage with a usable volume of 2.1 MG. A 36-inch concrete intake pipe for the pumping system extends ~100 feet from the sub-grade cistern under the pump house to an intake structure in the reservoir. The intake structure is a 4' x 4' x ~11' deep concrete structure with metal trash rack to protect the fire pump from debris during operation. A removable steel plate has been installed on top of the structure to provide for access behind the trash rack when required. This reservoir has been characterized previously as "spring fed". During our inspection the pond was at full capacity and excess water was discharging from the 12-inch CMP overflow pipe. The estimate of the usable storage of this reservoir assumes volume from the overflow elevation to 8 feet below overflow. It is not known if seasonal or drought conditions affect the level of this reservoir as recharge rates of this reservoir were not evaluated as part of this study.

2.4 PUMP STATIONS

2.4.1 Shaw's Fire Pump Station

The Shaw's Fire Pump Station is part of the Shaw's fire suppression system. This pump station was not inspected as access to the premises was not granted by the owner. The pump station was installed in 2004; the general condition of the building should be good as this is very recent construction. Information contained in this description has been extracted from design plans available to the Town.

General Pump Station Infrastructure

The Shaw's pump station contains pumping facilities for fire suppression and domestic water service. The structure is precast concrete, has a flat EPDM rubber roof system and hollow metal doors. A block partition wall divides the building into two separate spaces for fire protection and domestic water service. The one story building foundation contains a 20,000 gallon domestic water reservoir and a fire pump cistern. Heat is provided to the building through the use of four infrared heat fans. Mechanical louvers and exhaust fans provide ventilation through the building. A copy of the design drawings of the building is included in **Appendix B**.

Process Systems

The Shaw's Fire Pump Station includes a jockey pump which supplies static pressure to the fire suppression system and an engine driven fire pump with right angle drive rated for 1500 gpm at a pressure of 100 psi. Water is drawn from the fire storage pond via a 36-inch RCP pipe into a 6-foot diameter cistern located directly under the pump station. The cistern contains two vertical turbine pumps (jockey and fire pump) and a 2-inch diameter storage pond refill line from the domestic water storage tank instrumented to operate if the water level in the cistern decreases below a set elevation.

2.4.2 Staple's Plaza Fire Pump Station

The Staples Plaza Fire Pump Station is part of the Staples Plaza fire suppression system. Based on a review of the available existing construction documents, it is comprised of one duty pump and one diesel engine driven pump. The rated capacities of the pump station could not be determined based on the available plans. This pump station was not inspected and is not expected to be part of the infrastructure acquired by the Town.

2.4.3 King's Highway Fire Pump Station

The King's Highway fire pump station is part of the King's Highway fire suppression system. This pump station was inspected on January 27, 2010 with Kirk Dickison acting as the owner's representative during the site visit.

2.4.3.1 General Pump Station Infrastructure

The following describes the physical conditions of the building and systems located at the site. A schematic drawing of the building is included in **Appendix B**.

- The building is a small single width block building with a steel framed metal deck flat roof.
- The original tar and gravel roof has been “recovered”, roofed over with plywood and an EPDM membrane.
- A scuttle type roof hatch provides access for vertical turbine pump removal from the pump station.
- Single width block construction is very low cost and economical, but not very durable. There is evidence of water intrusion into the building.
- This type of construction is un-insulated, so the building would not meet the current energy codes.
- The walls, doors and many of the interior metals are not painted.
- The steel framing and metal roof deck have significant corrosion. At some point the roof deck will become so corroded that it will fail under load.

2.4.3.2 Mechanical Systems

- The fuel tank does not have the code required secondary containment.
- The controls for the fire system appear to be new, but this and all of the operable components of the fire protection system should be inspected by someone who specializes in fire protection systems.
- Ventilation is provided by an open grill with no damper for control. The grill was currently covered over with Plexiglas presumably to reduce heat loss during the winter. This is very inefficient and may not meet combustion air requirements for the motor, resulting in an unsafe building.
- The station is equipped with a two head sprinkler system.

2.4.3.3 Electrical Systems

The electrical system in the King's Highway Plaza pump station is in adequate condition. There is slight surface corrosion on the electrical boxes.

2.4.3.4 Process Systems

The King's Highway Plaza Fire Pump Station includes a jockey pump which supplies static pressure to the fire suppression system and an engine driven fire pump with right angle drive rated for delivery of 1500 gpm at a pressure of 108 psi. Water is drawn from the fire storage pond via a 36-inch RCP pipe into a 6-foot diameter cistern located directly under the pump station. The cistern contains two vertical turbine pumps and a suction pipe for fire department use. There was 11 feet of water in the cistern with the reservoir full at the time of inspection. Depth to the pump bowls could not be determined during inspection. Discharge piping to the distribution system exits the building through the floor near the front of the building. On the west face of the building there is a six fire hose connection and a 5¼-inch water supply connection. On the south face of the building there is a 5¼-inch hydrant connection to the sub-grade cistern. All process components, except one gate valve and one pressure relief valve, have the Factory Mutual "FM" stamp indicating they are rated for fire protection service.

2.4.3.5 Pump Station Control Description

In general, the fire pump station operates in the following fashion. The jockey pump runs to maintain pressure to the fire suppression system at ~145 psi. In a fire flow situation, where the jockey pump cannot provide adequate flow for the demand and the pressure at the station drops below 100 psi, the engine driven pump is activated. This pump will run until the pressure at the station rises above 130 psi for a minimum of 20 minutes and then shuts down and the jockey pump continues to maintain pressure in the distribution system. The station is also equipped with a relief valve, to allow discharging water into the cistern to protect the pump from not overheating before shutting down. While onsite conducting flow tests, we observed two cycles of this control loop. If an alarm condition is generated at the pump station, an audible alarm sounds at the pump station. An alarm signal is generated in the Kings Highway Plaza Building at one of the sprinkler riser pipes and sent to Central Alarm in Manchester, NH.

Flow tests conducted indicate that this pump will provide the rated 1500 gpm at 108 psi. A copy of this flow test report and the most recent flow test conducted by the King's Highway fire protection consultant is located in **Appendix C**.

TABLE 3
KING'S HIGHWAY FIRE PUMP STATION COMPONENTS

Description	Jockey Pump	Fire Pump
Power source	Electric 1 phase 240V	Engine Cummings 240 HP Model N-855-F
Pump Manufacturer	Peerless	Peerless
Pump Model	411-10 STG	MMCF
Rated Capacity	N/A	1500 gpm @ 108 psi
Motor Manufacturer[1]	General Electric	Amarillo
Motor Model	5K226XH24A	SL200A
Motor Size	5 HP	200 HP

[1] Motor for fire pump is listed as a right angle drive mechanism since this is an engine driven pump.

Section 3

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SECTION 3

FIRE SUPPRESSION SYSTEM EXPANSION ANALYSIS

3.1 GENERAL

The current fire suppression system is segmented, privately held and mainly located on the south end of Town. As part of an effort to expand fire protection and create a public fire suppression district, improvements to existing infrastructure and expansion of the current systems will be required. These improvements can be constructed in a phased approach to reduce financial impact to the Town and system rate payers (**Figure 2**). This report assumes that all buildings connecting to the fire suppression system will be sprinklered.

All new water main, valves, hydrants and other water related appurtenances installed in the new system should be standardized to decrease the need for a variety of spare parts and familiarly with operations. **Appendix D** is the recommended standard for installation of water main. This includes material and installation specification, as well as construction details related to hydrant and water service connections. Additionally, there is standard language provided regarding easement related to providing and maintaining service connections to property owners.

3.2 SYSTEM EXPANSION WITHIN THE COMMERCIAL ZONE

PHASE 1 - KING'S HIGHWAY & MARKET BASKET INTERCONNECTION

To expand the current infrastructure in the most economically viable fashion, interconnecting the Market Basket property and the King's Highway property makes the most sense as most of the infrastructure is currently in place and the fire storage capacity at Kings Highway has more capacity than the Shaw's fire pond. There is currently 12-inch piping in the ground on the Market Basket property installed for the purpose of interconnecting with the Kings Highway Plaza fire suppression system. This 12-inch water main should be extended across Route 108 and out to the pump station behind the Kings Highway Plaza. There is currently an 8" extension for the Honda Barn that is much closer to the road, but connection to this stub will reduce the

Source:

Utility data developed by Wright-Pierce.
Imagery obtained from GRANIT.
Parcel data provided by the Town of Stratham, NH.

RIVER RD
UNK
UNK
READER DR
MEADOW VIEW LN
DOE RUN LN
BUTTERFIELD LN
OAK COURT
EVERGREEN WAY
PATRIOT'S RD
UNK
N.H. COLLEGE RD
108
LOOP RD?
N.H. COLLEGE RD
NH 101 EB
011 D
UNK
011 B
NH 101 WB
011 C
108
UNK
EMERY LN
STRATHAM TRAF CIR
UNK
UNK
33
TRISHA'S WAY
STEPHEN DR
STRATHAM HGHTS RD
WILLIAMS CIR
PINEWOOD DR
UNK
BUNKER HILL AV
BROWN AV
TALL PINES DR
FRYING PAN LN
UNK
UNK
SPRING GREEN
AUTUMN LN
UNK
UNK
UNK

Legend

- Phase 1
- Phase 2
- Phase 3
- Phase 4
- Water Tank
- Fire Line
- PS Pumping Station
- Existing Gas Line

0 1,000 2,000 Feet

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Town of Stratham, NH

Fire Suppression / Water Supply Phasing Plan

PROJ NO: 11607A | DATE: Feb 2010 | FIGURE: 2

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available flow from the pump station at the Market Basket Property. This interconnection would allow for a wet fire suppression system on the Market Basket site with estimated available fire flow rate of 2000 gpm at 80 psi. The King's Highway Plaza is currently sprinklered, reducing the required fire flow for this property from standard ISO requirements. The expected needed fire flow requirement for a building the size and type of the Market Basket building will be dependent on the sprinkler system design. To effectively supply appropriate fire protection to the Market Basket building, the installation of a sprinkler system must be designed to NFPA 13 standards for available flow and pressure. The current pump station could be used to supply fire protection, but will require some improvements delineated below:

Interconnection of the Market Basket and King's Highway Infrastructure

Recommendations

- The King's Highway Fire Pump Station building will require some repairs and improvements to meet code and ensure the life expectancy of the building:
    - Insulation and siding could be added to the exterior walls to provide thermal efficiency, weather protection and extend the life of the building
    - Repair/replace or repaint the front door.
    - Replace the metal roof deck and roofing. This may involve asbestos abatement if the original roof, which is still in place, contains asbestos
    - Conduct an asbestos survey. The original roof or roof flashings are the only building components that are likely to contain asbestos
    - Provide a new fuel tank with secondary containment
    - Paint the interior metal that will be/is effected by corrosion
    - Plug the existing floor drain and finish flush
    - Install a new hatch cover for cistern access
    - Calculate the proper amount of ventilation required both for fresh air and combustion air, and install properly sized louvers with motor operated dampers to control heat loss
- The electrical systems should be inspected by a licensed electrician.
- Have the fire protection system and controls inspected by a fire protection specialist.
- The engine should be inspected by a certified technician.

- The Town should request a copy of all annual maintenance and inspections reports. These are required on all fire protection systems. The individual or company that did this work will be able to provide information on the condition of the existing system.

Interconnection of the Shaw's and Market Basket Infrastructure

Recommendations

- Conduct an inspection of the Shaw's fire pump station and verify pump capacity with a hydrant flow test.
- The electrical systems should be inspected by a licensed electrician.
- Have the fire protection system and controls inspected by a fire protection specialist.
- The engine should be inspected by a certified technician.
- The Town should request a copy of all annual maintenance and inspections reports. These are required on all fire protection systems. The individual or company that did this work will be able to provide information on the condition of the existing system.
- Design communication and instrumentation such that the Shaw's pump station can provide adequate redundancy for the King's Highway pump station.
- Connect the water main piping at the Shaw's/Market Basket property line.
- Maintain separate operations of the Shaw's and King's Highway Pressure Zones.
    - The actual required operating pressures in the Shaw's and King's Highway pressure zones are slightly different and the elevations to which they serve are also slightly different. In this initial stage, it will be most cost-effective to maintain both pressure zones "as is" since the design of any fire suppression system on the Market Basket site will be new and based on the available pressure and flow from King's Highway Plaza.
    - Redundancy and backup capacity are attained in the event of a fire flow reducing reservoir levels, water can be transferred from one reservoir to another if needed.

Connection of Staples into Shaw's and King's Highway Infrastructure

(not shown or included in cost estimate).

- Connect the King's Highway Plaza 8-inch piping at the back of the building to the 8-inch piping on the Staple's Property.

Construction Considerations within the NHDOT Route 108 Right-of-Way

All water main installation within the Route 108 right-of-way will require an excavation permit. Excavation permits will be reviewed and approved though the NHDOT District 6 office. Water main crossing Route 108 will require a sleeve. Additionally, the NHDOT requires directional drilling or pipe jacking of the sleeve if the soils are appropriate for the technology (i.e. not ledge). Water main shall be installed a minimum of 10 feet away from the edge of pavement.

PHASE 2 - EXPANSION WITHIN THE GATEWAY DISTRICT

Phase 2 includes extension of water main within the Gateway Commercial District. A 16-inch water main should be extended south from the Phase 1 interconnection within the Route 108 Right-of-Way. This allows for connection to additional users for the fire suppression district and a potential interconnection with the Exeter water distribution system as an additional source of water. If interconnection with Exeter or service to the three parcels in Stratham on the South side of Route 101 is desirable, extension of water main to this area would utilize the 24-inch RCP sleeves previously installed as part of the most recent NHDOT upgrade of the Route 101 / Route 108 interchange.

Construction considerations within the NHDOT Route 101 Right-of-Way

Utility installation in the Route 101 right-of-way will require an encroachment permit as this road is maintained by the NHDOT Bureau of Turnpikes. This permit will be reviewed and approved through the NHDOT Bureau of Turnpikes office. Details of the typical encroachment permit application requirements are included **Appendix E.**

3.3 PHASE 3 - EXPANSION TO BUNKER HILL AVENUE

Phase 3 of the fire suppression system includes extending the service area further north into GCBD along Route 108 to Bunker Hill Avenue. Ground elevation increases through this area

with Bunker Hill Avenue being the high point of the proposed fire suppression system (ground elevation of approximately 130 feet). Since the existing fire suppression infrastructure is located in the lower elevations (50 to 60 feet elevation) of the system, the existing facility would have to be modified and a booster station would likely be required for effective operations.

Alternatively, the Town owns property on Bunker Hill Avenue and this would be an ideal location for an elevated fire storage tank (ground elevation of approximately 130 feet). Storage and pressure for the system could be supplied through the use of a 0.5 million gallon, elevated storage tank at this location. The elevated storage tank would require a combination of mixing, heating and insulation, as required by NFPA 20, since there is no significant turnover in a fire suppression storage tank to keep the stored water in it from freezing. Distribution water main sizing would need to be 16-inch diameter so that areas near the Exeter/Stratham town line would see appropriate fire flows and pressures.

Just to East of the Town Hall property on Bunker Hill Avenue, the ground elevation increases significantly. This additional 40'+ of elevation would make ground level storage in a traditional standpipe feasible. The advantage to this type of tank arrangement is that the unit cost of the storage tank ($/gallon stored) can be much less than the cost of elevated storage. The cost to acquire the land for the tank site, additional pipe installation and any difficult soils or ledge encountered on the tank site will increase the total cost of the tank.

3.4 EXPANSION TO TOWN CENTER

Phase 4 of the fire suppression system includes extending the service area beyond Bunker Hill Avenue to the "Town Center" area terminating on Winnicutt Road near the Fire Station. Ground elevation gradually decreases from Bunker Hill to the Town Center, so all of this phase could be served by the storage tank referenced in Phase 3. Distribution water main sizing would need to be 16-inch diameter so that customers at the end of the line near Winnicutt Road would see appropriate fire flows and pressures.

Section 4

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SECTION 4

POTABLE WATER SYSTEM CONVERSION EVALUATION

4.1 GENERAL

When creating the fire suppression system, exploring the alternative of providing a potable water system to the community is a valuable tool in determining the most viable approach to serving the communities needs.

4.2 DEMAND ESTIMATES

4.2.1 Potable Water Demand Estimate

Stratham has no current public water supply. Therefore, there is no publicly available data on current usage. To aid in the development of a demand estimate for the project area, we developed several maps. First, the limits of the water system has been set by the Town of Stratham as 800 feet either side of the centerline of Route 108 from the Exeter/Stratham Town line to Winnicutt Road (**Figure 3**). Properties that straddled the project limits were included as eligible if greater than 50% of the parcel is within the project area. Exceptions to this are parcels that are zoned for commercial/light industrial or special commercial use. These exceptions are located on the south end of Town. Information on building size, building type, current use, zoning, number of bedrooms, and parcel size on each parcel was gathered from the Town Assessors office to estimate current and future demands.

Three different demand estimates were developed to analyze the potential water use demands in the Project area:

1. Current development in the project area not including residential usage
2. Build out within the project area based on the pre GCBD zoning regulations
3. Build out within the project area based on the new GCBD zoning regulations.

In developing the water demand estimates were evaluated using the following assumptions:

- 90 gallons per day per bedroom for residential demands
- 7.5 gallons per square foot of building space for commercial/industrial demands

Source:

Project area data developed by Wright-Pierce.
Imagery obtained from GRANIT.
Parcel and zoning data provided by the Town of Stratham, NH.

Legend

- Project Boundary
- Conservation Easement
- Utility Right of Way
- Potential Users - Town Center
- Potential Users - Gateway
- Conservation Parcel

0 1,000 2,000 Feet

Town of Stratham, NH

Fire Suppression / Water Supply
Potential Customers
and Related Zoning

PROJ NO:	DATE:	FIGURE:
11607A	May 2010	3

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Taking into account the pre GCBD zoning regulations, setbacks, undevelopable areas (wetlands, rivers, steep slopes…) an estimate of future build out using the pre GCBD zoning regulations was conducted as a base line for the new GCBD zoning. Since the GCBD form based code is less structured, there are many more ways this land could be developed and potentially used in a mixed use commercial/residential capacity. As one potential buildout scenario we assumed the following conditions related to the GCBD buildout:

- Maximum commercial density will be approximately the same as existing zoning.
- Residential buildout will proliferate in the form of multi-family apartment style dwellings intermixed with the commercial space within the GCBD.
- Assumed one floor of two bedroom 1500 sf apartments over commercial space in 50 percent of the commercial development.

TABLE 4

Potable Water Demand Estimates

Zoning Scenario	Phase 1 & 2 - Commercial District	Phase 3 - Expansion to Bunker Hill	Phase 4 - Expansion to Town Center	**Total (GPD)**	**System Demand Total (GPD)**
Current Residential	2,070	8,820	29,250	**40,140**	**Current**
Current Commercial	31,050	12,080	13,830	**56,960**	**97,100**
Build out Residential	7,110	11,160	47,700	**65,970**	**Build out**
Build out Commercial	286,960	102,640	21,830	**411,430**	**477,400**
Gateway Residential	231,390	86,220	48,240	**365,850**	**Gateway**
Gateway Commercial	286,960	102,640	21,830	**411,430**	**777,280**

TABLE 5

Customer Count Estimates

Zoning Scenario	Phase 1&2 - Commercial District	Phase 3 - Expansion to Bunker Hill	Phase 4 - Expansion to Town Center	Total	Total Potential Customers
Current Residential	9	29	95	**133**	**Current**
Current Commercial	15	19	24	**58**	**191**
Build out Residential	26	29	161	**226**	**Build out**
Build out Commercial	89	83	30	**202**	**428**
Gateway Residential	1,297	455	161	**1,913**	**Gateway**
Gateway Commercial	89	83	30	**202**	**2,117**

4.2.2 Maximum-Day and Peak Hour Demands

Maximum day and peak hour flow rates for the water system are developed using industry standard multipliers since no historical data is available. The Maximum Day demand multiplier is 1.8 times the average day demand and the peak hour demand multiplier is 1.5 times the maximum day. These values are useful in determining appropriate water main sizing and water storage.

TABLE 6
Estimated Demand Variation

Demand Scenario	Average Day (gpm)	Maximum Day[1] (gpm)	Peak Hour[2] (gpm)
Estimated Current Demand	67	120	180
Estimated Current Zoning Build out Demand	327	590	885
Estimated Gateway Zoning Build out Demand	540	972	1485

[1] Maximum Day = Average Day * 1.8
[2] Peak Hour = Maximum Day * 1.5

Reviewing Tables 4, 5 and 6 it is evident that the Gateway zoning scenario promotes significantly more development in the GCBD than the pre GCBD zoning regulations. The Gateway scenario developed is also an ideal scenario. Realizing that development within the GCBD will not be ideal, as the GCBD will likely develop in a piecemeal fashion, buildout demands will likely be more than the current zoning scenario of 471,500 gpd and less than estimated in the Gateway scenario of 777,280 gpd. In developing realistic costs and expected storage requirements we will use an estimated future buildout demand of 600,000 gpd (417 gpm).

4.3 WATER SOURCE ANALYSIS

4.3.1 Town Owned Municipal Wells

A desktop study of existing hydrogeologic data was completed to identify preliminary locations for groundwater development within the Town of Stratham, NH. The desktop hydrogeologic evaluation was based on mapping data obtained from the US Geological Survey (USGS), NHGRANIT and the Town of Stratham.

A series of GIS maps depicting the soil classification (**Figure 4**), surficial geology (**Figure 5**), aquifers (**Figure 6**) and topography (**Figure 7**) of Stratham were overlayed with parcel and conservation land data provided by the Town.

N

Newfields

Greenland

Stratham

Exeter

North Hampton

Hampton

0 1,000 2,000 Feet

SOURCE: NHGRANIT and Town of Stratham

Legend

- Town Boundary
- Parcel
- Town of Stratham Owned Property
- Conservation Easement
- Wetlands
- Surface Water
- River/Stream
- Pipelines and Transmission Lines

Soils

- 26, WINDSOR LOAMY SAND
- 30, UNADILLA VERY FINE SANDY LOAM
- 298, PITS, SAND AND GRAVEL
- 313, DEERFIELD FINE SANDY LOAM
- 510, HOOSIC GRAVELLY FINE SANDY LOAM
- 546, WALPOLE VERY FINE SANDY LOAM
- 547, WALPOLE VERY FINE SANDY LOAM, VERY STONY

Coarse Grained Soils Map

Water Supply System Feasibility Study

Stratham, NH

PROJ NO: 11607A | DATE: Jan 2010 | FIGURE: 4

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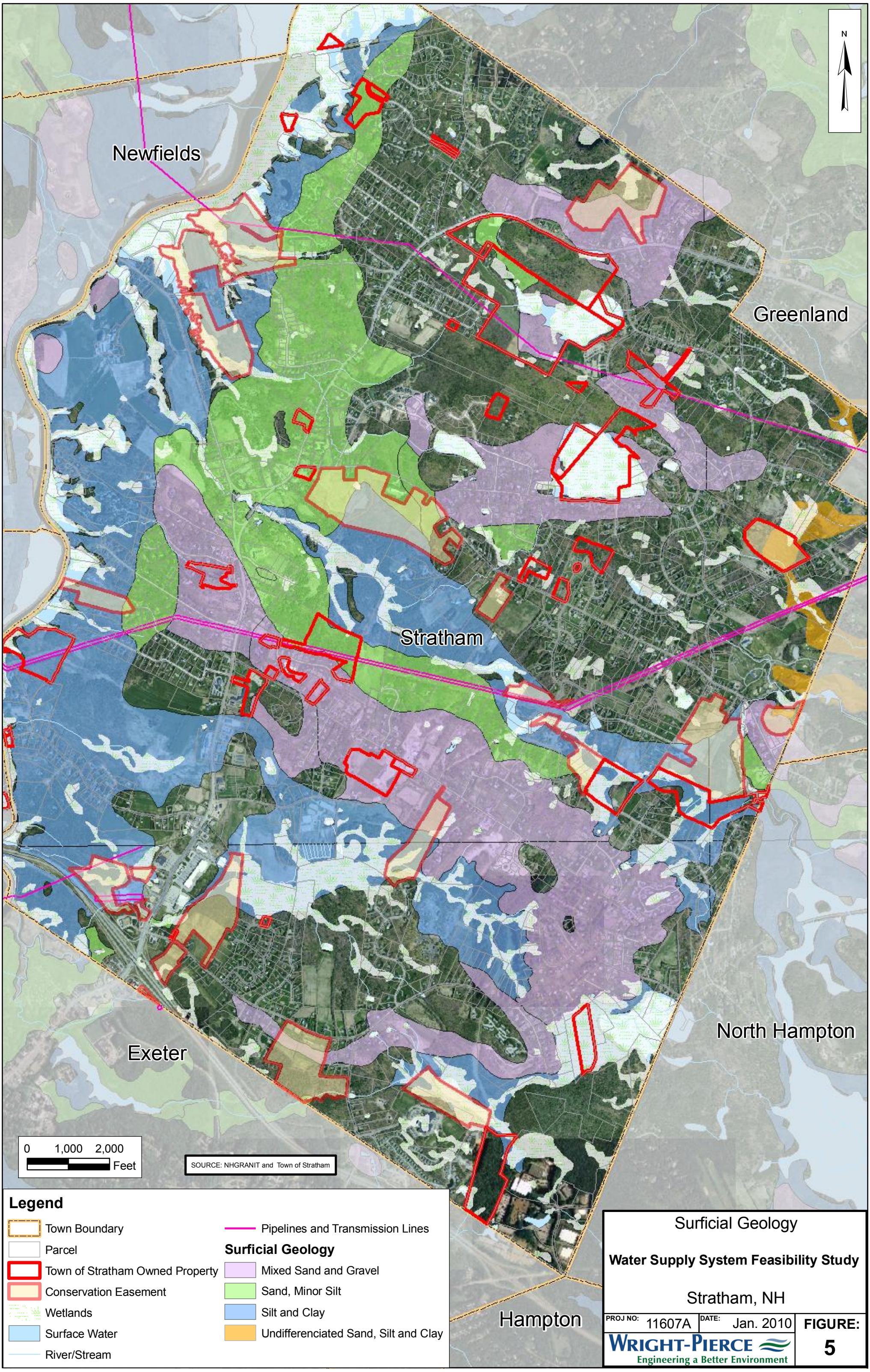
N
Newfields
Greenland
Stratham
Exeter
North Hampton
Hampton
0 1,000 2,000
Feet
SOURCE: NHGRANIT and Town of Stratham
Legend
Town Boundary
Parcel
Town of Stratham Owned Property
Conservation Easement
Wetlands
Surface Water
River/Stream
Pipelines and Transmission Lines
Surficial Geology
Mixed Sand and Gravel
Sand, Minor Silt
Silt and Clay
Undifferenciated Sand, Silt and Clay
Surficial Geology
Water Supply System Feasibility Study
Stratham, NH
PROJ NO: 11607A
DATE: Jan. 2010
FIGURE: 5
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N

Newfields

Greenland

Stratham

6" Bedrock Well
Scamman Property
Potential Safe Yield of
20 to 25 gpm

Exeter

North Hampton

Hampton

0 2,000 Feet

SOURCE: NHGRANIT and Town of Stratham

Legend

Potential Gravel Well Site

Parcel
Town of Stratham Owned Property
Conservation Easement
Town Boundary
Scamman Property
Surface Water
Wetlands

100 Year Flood Zone
Stratham Landfill
Pipelines and Transmission Lines
River/Stream

Aquifers

Transmissivity (ft/day)

< 500
0 - 1000
1000 - 2000
2000 - 4000

Potential and Exisiting Threats to Groundwater
Aboveground Storage Tank
Underground Storage Tank
Junk Yard
Local Inventory
Non Point Source
RCRA Generator
Public Supply Well
Registered Water User

Sand & Gravel Aquifer Map

Water Supply System Feasibility Study

Stratham, NH

PROJ NO:	DATE:	FIGURE:
11607A	Jan 2010	6

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N

SOURCE: USGS OFR 97-762 and USGS OFR 96-489

LEGEND

- Town Boundary
- Lineament observed by the use of low-altitude aerial photography (Scale 1:20,000)
- Lineament observed by the use of high-altitude aerial photography (Scale 1:80,000)
- Lineament observed by the use of side looking airborne radar mosaic (Scale 1:250,000)
- Lineament observed by the use of Landstat imagery (Scale 1:100,000)

0 1,000 2,000 Feet

Lineament Map

Water Supply System Feasibility Study

Stratham, NH

PROJ NO:	DATE:	FIGURE:
11607A	Jan 2010	7

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USGS Topographic Map

Water Supply System Feasibility Study

Stratham, NH

PROJ NO:	DATE:	FIGURE:
11607A	Jan 2010	8

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Sand and Gravel Well Potential

Potential sites for sand and gravel well development were then selected from parcels (or a pair of abutting parcels) that can encompass the 400-foot sanitary protective radius and that overly mapped sand and gravel aquifers (**Figure 4**). Other information such as hydrogeologic data (wetlands, streams, ponds, etc.), public supply wells, and known and potential contamination sources were also mapped. Many of these sites are located well away from the project area but were included as potential sites for reference. The sites having the most potential related to this project are the ones closest to Bunker Hill Avenue.

Bedrock Well Development

A bedrock lineament map (**Figure 7**) was prepared to aid in the preliminary siting of bedrock wells; however, a photolineament analysis should be performed to accurately site a potential bedrock well source.

The recent pumping test on an existing 6-inch diameter bedrock well located on the Scamman Property resulted in a potential safe yield of 20 to 25 gpm. The location of this well is shown on **Figure 6**. Water quality data from this test well was very good. The laboratory data sheet for this well pump is included in **Appendix F.** Although this well will not provide adequate capacity for the Town, hopefully it is an indication of the water quality of potential wells in the surrounding area.

The Town has elected to conduct additional investigations for groundwater on both the Scamman and Goodrich Properties which are currently held in conservation. These two properties are located adjacent to the GCBD making access to any wells located on these properties very close to the center of the proposed distribution system.

4.3.2 Interconnection with Newmarket/Newfields

The closest point of the Newmarket water distribution system is located along Route 108 near the Newmarket/Newfields town line. Newmarket is currently investigating expanding their available water supply in both the groundwater and surface water areas. An interconnection with

the Newmarket water system would require ~ 14,000 ft of pipe along NH Route 108 to the NH rout 108/33 intersection, one river crossing and one railroad crossing. Project costs associated with this interconnection are estimated to approximately $2.8 million. The Newfields water distribution system is located between the Newmarket distribution system and Stratham. It's most eastern extent is within 2000 feet of Route 108 along the stretch of road that the interconnection would run along. Newfields currently does not have enough excess capacity for Stratham to warrant interconnection relying on their existing facilities alone for a source of water. Costs for interconnecting to Newfields if a viable source was available would be similar to the Newmarket interconnection. Cost sharing of a portion of this section of the interconnection could reduce the total cost of the interconnection to Stratham. Further discussions with the managers of the Newmarket/Newfields water system would be required to discuss system hydraulics, operations responsibilities, purchasing arrangements, etc.

4.3.3 Interconnection with Hampton

The closest point of the Hampton water distribution system is located along Winnicutt Road near the Stratham/Hampton/Greenland town line intersection. An interconnection with the Hampton water system served by the Aquarion Water Company of New Hampshire would require an extension of a minimum of ~15,000 ft of piping along Winnicutt Road to the Winnicutt Rd/NH Route 33 intersection and one river crossing. Project costs associated with this interconnection are estimated to be approximately $3 million. Additionally, since Aquarion is in the business of operating water systems they may be amenable to handling operations and maintenance of the proposed system if Stratham does not want to handle operations of the distribution system. Further discussions with the managers of the water system would be required to discuss system hydraulics, operations responsibilities, purchasing arrangements, etc.

4.3.4 Interconnection with Epping

An interconnection with the Epping water system would require a minimum water main extension of ~43,000 ft through Epping and Exeter with multiple bridge/culvert crossing, this water main would also likely be located within the Route 101 right-of-way for a portion of the route. There are privately held wells located behind the Walmart that have been estimated to yield upwards of 0.5 MGD. The Town of Epping is looking to acquire these wells for future use.

Project costs associated with an interconnection in Epping are estimated to be approximately $9 million. Further discussions with the managers of the water system would be required to discuss system hydraulics, operations responsibilities, purchasing arrangements, etc.

4.3.5 Interconnection with Exeter

Another option for supplying a source of water for fire protection would be to connect to the Exeter potable water system. The connecting water main would be installed using the existing 24-inch RCP sleeves crossing under all road crossings in the Route 101 corridor on the East side of Route 108. Using the Exeter water distribution system hydraulic model we estimate that there is approximately 2000 gpm at 50 psi available for fire protection at the interconnection point of the Exeter distribution system. The hydraulic grade line of Exeter is approximately the same as the proposed Stratham system. If interconnection with Exeter is desireable, a more detailed review of the interconnection system hydraulics should be performed. Installation of the storage tank at Bunker Hill Avenue would be beneficial to both the Town of Stratham and Exeter as the hydraulic grade lines are similar. The Town of Stratham would benefit from interconnection with Exeter as the development of a separate source of supply could be eliminated or the required yield of a new source significantly reduced and the Exeter system would augment fire flows throughout the Gateway Commercial Business District. The Town of Exeter would benefit from this by gaining additional storage capacity and fire protection at Bunker Hill for the Route 108 section of their distribution system. Further discussions with the managers of the water system would be required to discuss operational responsibilities, purchasing arrangements, etc.

4.4 POTABLE WATER SYSTEM DISTRIBUTION SYSTEM IMPROVEMENTS

4.4.1 Water System Pressure

A water system should be designed to accommodate a range of pressures within minimum and maximum guidelines. Low system pressures result in customer complaints, may affect the accuracy of meters, and will restrict available fire flows. Higher pressures can contribute to increased water loss from leakage, can increase maintenance on equipment, lead to high energy costs, and tend to increase consumption.

Variations in customer demand, changes in elevation and proximity to pumping facilities and sources of supply will cause water pressure to vary throughout the service area. In general, when customer demands increase, pressure will decrease. Areas with higher elevations typically have lower pressures.

Standard water works practice and State Code requires that municipal water systems be designed with minimum and maximum operating pressure range of approximately 35 to 80 psi at all locations in the distribution system under normal operating conditions. Pressures throughout the system during fire flow events should be maintained above 20 psi at all locations. Services in areas where pressures exceed 80 psi should be considered for installation of pressure reducing valves. **Figure 9** presents locations that are outside of this 35-80 psi range.

Source:

Project area data developed by Wright-Pierce.
Imagery obtained from GRANIT.
Elevation data obtained from USGS.
Parcel data provided by the Town of Stratham, NH.

Overflow Elevation = 230'

Legend

Water Tank

Pressure

35-100 psi

0-35 psi Low Pressure

Project Boundary

0 1,000 2,000 Feet

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Town of Stratham, NH

Fire Suppression / Water Supply
Water Pressure Adequacy Plan

PROJ NO:	DATE:	FIGURE:
11607A	May 2010	9

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4.4.2 Pipe Velocities and Head Loss

Water velocities in pipelines can have either a positive or negative impact on operations and water quality throughout the system. Pipes which have velocities which exceed 5 feet per second (fps), contribute to increased headloss which, in turn, requires pumps to work harder and energy costs to increase. Higher velocities can also scour the interior of the pipe, which reduces its useful life. High velocities are common in smaller diameter piping. On the other hand, pipes having velocities below 2 fps present a risk of depositing sediment which could contribute to poor water quality and poor hydraulics.

4.4.3 Dead-End Mains and Pipe Looping

Dead-end mains in a water system present a number of operational issues. First, because water cannot pass through a dead-ended pipe, velocities in these pipes tend to be very low. This condition can cause sediment build-up and contribute to poor water quality. In winter months, pipes having low velocities can be prone to freezing. Generally, the only way to improve this condition is to regularly flush the ends of these pipes, add bleeders or loop the pipe into another location in the distribution system.

Flushing can be labor intensive and if not done on a regular basis, will have little effect in improving conditions. Bleeders, can be effective in improving water quality and help prevent freezing. But this method increases the unaccounted-for water component and electrical pumping costs. Looping requires capital investment in additional piping and, in Stratham's case, it may not be practical to loop pipes. Automated flushing stations at the extents of the system may be a solution if water quality becomes a concern. These have been successfully installed in other distribution systems to effectively address water quality issues on dead end mains.

The proposed Stratham distribution system will not be well looped by the nature of its delineation (800 feet either side of Route 108). Location of the water storage tank in the vicinity of Town Hall will be valuable as it will be centrally located in the fully developed system.

4.4.4 Fire Flow

When fire protection is to be provided, system design should be such that fire flows and facilities are in accordance with the requirements of the state Insurance Services Office. ISO is a service organization funded by insurance companies to conduct fire protection surveys in communities throughout the United States. To be as objective as possible, they develop a Fire Suppression Rating Schedule (FSRS) that is used to rate a community's ability to minimize fire damage to a property once a fire occurs. The FSRS will classify a community on a scale of 1 to 10 by analyzing three areas of the community's overall public fire protection system. The three areas are: Fire Alarm - deals with communications and the ability to report a fire, dispatching, etc.; Fire Department - considers all apparatus, equipment, manpower, and training of the fire department; and Water System - which includes the supply works, main capacity to deliver fire flows, distribution of hydrants, hydrant size, type and installation, and hydrant inspection and condition.

The Fire Alarm and Fire Department portions account for 10% and 50%, respectively, of a community's FSRS classification. The Water System accounts for the remaining 40% of the classification. The emphasis of the Water System portion is on the actual flows available for fire suppression at representative locations throughout the community. ISO will visit communities and establish Needed Fire Flows (NFF) at various locations. The AWWA has defined NFF as "the rate of flow considered necessary to control a major fire (fully involved) in a specific building".[1] When determining a specific NFF, consideration is given to such factors as the construction of the building, occupancy, and exposure to other surrounding structures.

Once the Needed Fire Flows are established, the water system must be evaluated to determine its ability to meet the required flows. First, the system must be capable of providing enough capacity of water to meet the system's expected maximum day demands occurring coincident with a fire flow demand of a given duration. ISO determined that the maximum flow rate a water system should be expected to supply is 3,500 gpm for a three hour duration. This capacity

[1] American Water Works Association, Manual M31 - Distribution System Requirements for Fire Protection.

would allow the water system to receive maximum credit towards supplying the NFF under the FSRS guidelines. However, some individual structures may require higher flow volumes over 3,500 gpm. In these high demand cases, the structures would be evaluated on an individual basis. Any additional, available flow over 3,500 gpm would not improve the water system's rating, but it would help reduce the fire rating of the individual structure.

The ability to provide fire protection is a valuable asset for a community. Guidelines for fire flow requirements are provided by the Insurance Services Office (ISO). ISO is an insurance organization responsible for evaluating and classifying communities for insurance rating purposes. Periodically, the ISO will visit a community, perform fire flow tests on potable water systems and develop a fire insurance rate for that community. The rate assigned ranges from 1 to 10 with 1 being the best rating. The rating is based on the total fire fighting capability of the community including such factors as water supply, fire department structure and available communication systems. **Table 4-4** presents typical fire flow requirements for various building types and uses. **Appendix G** is a list of needed fire flow requirements for commercial buildings in Town as identified by ISO.

TABLE 7
TYPICAL FIRE FLOW REQUIREMENTS

Land-Use or Building Type	Range of Required Fire Flows and Flow Duration
Single and Two Family Dwellings	
Over 100 feet Building Separation	500 gpm for 2 hours
31 to 100 feet Building Separation	700 gpm for 2 hours
11 to 30 feet Building Separation	1,000 gpm for 2 hours
10 feet or less Building Separation	1,500 gpm for 2 hours
Multiple Family Residential Complexes	2,000 to 3,000 gpm for 2-3 hours
AVERAGE DENSITY COMMERCIAL	1,500 to 2,500 gpm for 2-3 hours
HIGH VALUE COMMERCIAL	2,500 to 3,500 gpm for 2-3 hours
LIGHT INDUSTRIAL	2,000 to 3,500 gpm for 2-3 hours
HEAVY INDUSTRIAL	2,500 to 3,500 gpm for 2-3 hours

Municipal fire insurance ratings are partially based on a water utility's ability to provide needed fire flows up to a maximum flow of 3,500 gpm. The ISO requirement of 3,500 gpm is the criteria used for all non-residential land uses. This is the largest fire flow that the ISO recognizes as necessary for a system to provide even if a specific building within the community requires a greater fire flow. Only two buildings in the commercial district in Stratham have fire flow requirements of greater than 3,500 gpm.

4.4.5 Conceptual Sewer Utility Plan

In developing a potable water system, accounting for sewer collection is also a factor in system design. NHDES requires a 10 foot horizontal separation between sewer and water utilities to avoid any potential cross contamination issues. The NHDOT will not allow utilities running parallel to Route 108 to be located under the roadway pavement. This being the case, the most effective location for sewer main would be on the opposite side of the road from the water main. **Figure 10** delineates the expected location of any gravity or pressurized sewer mains in the project area. Further evaluation of a location for sewer treatment, disposal, type of collection system (pressure or gravity) is required.

Improvements to, or development of stormwater utilities should be handled on a case by case basis. It is very likely that any drainage improvements in the project area would be designed by or in conjunction with the NHDOT. The development of a water and /or sewer system should not have a significant impact on the drainage system in place in the project area.

4.5 DISTRIBUTION STORAGE

Distribution storage is used for and provides a number of important functions to a water system. This includes establishing and sustaining adequate pressure throughout the system, fire fighting capabilities, and short-term emergency purposes. Storage also provides a "cushion" to equalize peak fluctuations, improves service reliability, provides operational flexibility, and allows intermittent operation of pumping equipment.

Source:

Utility data developed by Wright-Pierce.
Imagery obtained from GRANIT.
Parcel data provided by the Town of Stratham, NH.

HOLLAND WAY
LOOP RD 2
011 A
011 B
011 C
011 D
NH 101 WB
NH 101 EB
UNK
STRATHAM HEIGHTS RD
RIVER RD
108
FRYING PAN LN
UNK
READER DR
DOE RUN LN
MEADOW VIEW LN
BUNKER HILL AV
UNK

0 600 1,200 Feet

UNK
READER DR
DOE RUN LN
BUTTERFIELD LN
PATRIOTS RD
UNK
UNK
108
EMERY LN
UNK
E STRAT TRAF C
33
UNK
BUNKER HILL AV
UNK
STEPHEN DR
UNK
UNK
WINICUT

Legend

- Project Boundary
- Proposed Sewer Main
- Proposed Water Main

0 600 1,200 Feet

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Town of Stratham, NH

Conceptual Utilities Plan

PROJ NO:	DATE:	FIGURE:
11607A	Feb 2010	10

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4.5.1 Storage Analysis

In general, system storage is necessary to satisfy the following conditions:

- Storage should be provided to satisfy all demands which exceed the maximum day average flow rate. The volume of storage which is depleted during the daytime, (peak flow periods) is refilled during the lower demand, early morning hours.
- Storage should be provided for fire protection. If a fire occurred during the maximum day demand, all the water used to fight the fire would be drawn from storage volume.
- Storage can be provided to meet emergency conditions such as power failures, transmission main breaks, etc.
- Storage is used for cycling pumps during normal daily operation.

The primary criteria used to evaluate storage requirements include; average and peak water usage, water supply capabilities, as well as fire protection and reserve or emergency needs. Each of these criteria is used to establish three components of storage; equalizing volume, emergency volume and fire volume. The total of these three components is referred to as the active or available storage volume. All storage components described should be available while still providing at least 20 psi of pressure in the each pressure zone. This pressure is equivalent to the volume of water stored 46 feet above the highest service. This storage volume is referred to as the available or active storage. Storage tanks need to be dispersed appropriately throughout the distribution system to deliver flows from multiple locations to reduce pipe velocities and provide flows to a fire location.

Equalizing storage is the volume of water required during peak demand periods above the maximum available pumping capacity. This volume should be provided independent of the required fire volume in order to assure sufficient reserve volume in the event of a fire during the peak demand period. In the case of Stratham, the equalizing storage volume was estimated to be 25 percent of the maximum-day demand, depending on the size of the zone and the amount of industrial/commercial land-use zoning.

Emergency storage is desirable and recommended for purposes above and beyond that which is required for equalizing and fire volumes. This may include storage desired as a factor of safety

for emergencies or where demands are unpredictable and fluctuate widely. It may also include storage when a utility desires to take advantage of off-peak electrical charges for pumping. Determining emergency storage is somewhat arbitrary and generally depends on the level of safety a utility desires. Emergency storage is often simply calculated as the volume necessary to supply the system during repair or maintenance work, or in the event that the pumping facilities do not have emergency back-up power equipment. In most cases, this is calculated as a specified number of hours of the average-day demands. For the purposes of this study, an assumption was made that a maximum of 8-hours would be required to respond to and repair an emergency generator unit. Therefore, the emergency volume recommended is equal to 8-hours of the average-day demand. Caution is urged that if emergency units are not installed as planned, revisions to these estimates are recommended.

Fire storage is that component set aside solely for the purpose of fire fighting. Properly sized storage will include a sufficient volume of water for fire protection on days of maximum demands. In most cases, the fire volume is the largest component of storage. This is particularly true for smaller systems which must provide high fire flows to adequately serve commercial and industrial users.

Storage requirements have been evaluated on a system-wide basis. Three primary criteria were used to develop a relationship between the supply capacity and optimum storage volumes for Stratham. These include:

1. The reliable supply capacity should equal or exceed the projected maximum-day pumping requirements.
2. Total storage should be capable of providing fire protection needs throughout the system.
3. The reliable supply capacity *plus* the available storage volume should equal or exceed fire flow requirements *plus* the maximum-day volume requirements. This is typically the worst case scenario.

To determine the adequacy of the proposed storage volume, an analysis of each of the storage components described was made using projected estimated buildout demands (417 gpm). Three different scenarios were tested:

- Scenario #1 - A fire would occur on the maximum-day during summer months. Under this condition, the fire flow and hourly fluctuation volume required should be available simultaneously.
- Scenario# 2 - Storage for one average-day during the seasonal months.
- Scenario #3 - Storage for the maximum fire flow condition (3500 gpm) with a 3-hour reserve for maximum-day demands

TABLE 8

ESTIMATED STORAGE VOLUME REQUIREMENTS

Storage Scenario	Fire Storage (gallons)	Equalization/Emergency Storage	Total Storage
Scenario 1	630,000	67,500	697,500
Scenario 2	--	600,500	600,500
Scenario 3	630,000	135,000	**765,000**

Using the largest required volume from these three scenarios yields the minimum storage volume required. Proposed storage volume for the Town's potable water system for the build out condition would be approximately 1,000,000 gallons. This sizing promotes operational flexibility as the required water volume in the tank may be modulated slightly based on required demand. If the system is interconnected with another system there is potential to allocate a portion of the fire suppression storage to another tank and reduce the size of the tank. This should be revisited as the distribution system is developed.

Section 5

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SECTION 5

CAPITAL IMPROVEMENT PLAN (CIP)

5.1 GENERAL

The capital improvement plan for the Stratham fire suppression and potable water system study outlines the costs associated with each phase of the system development. Costs presented for each phase include upgrades as described below and in Sections 3 and 4. Tables 9 through 14 list individual phased improvement costs and Tables 15 through 17 describe total project costs dependent on water source and services provided.

TABLE 9

PHASE 1 - KINGS HIGHWAY PLAZA & MARKET BASKET INTERCONNECTION

Phase 1 - Existing Infrastructure Interconnection	Cost
Pump Station Upgrades	$130,000
Water Main	$240,000
Contingency	$50,000
Professional Services (Survey, Design, Permitting, Construction Oversight)	$60,000
Total	**$480,000**

Includes project costs for connecting the Kings Highway and Market Basket fire suppression systems with 12-inch water main and appurtenances, a 24-inch sleeve for Route 108 crossing, and upgrades to the existing pump station.

TABLE 10

PHASE 2- EXPANSION WITHIN THE GATEWAY DISTRICT/INTERCONNECTION WITH EXETER

Phase 2 – Expansion in the Gateway District	Cost
Exeter interconnection across Route 101	$400,000
Water Main on Route 108	$1,000,000
Contingency	$200,000
Professional Services (Survey, Design, Permitting, Construction Oversight)	$200,000
Total	**$1,800,000**

This table includes project costs for expanding the fire suppression system along Route 108 with 16-inch water main and appurtenances, and a meter/backflow protection vault at the interconnection point.

TABLE 11

PHASE 2A - NEW WELL INSTALLATION

Phase 2A - Well Development	Cost
Well Development and Pump Station	$300,000
Iron and Manganese Treatment Facility	$1,800,000
Water Main	$760,000
Contingency	$420,000
Professional Services (Survey, Design, Permitting, Construction Oversight)	$720,000
Total	**$4,000,000**

This table includes project costs for hydrogeologic investigation, permitting, and installation of a new bedrock well pumping facility, iron and manganese treatment facility, 8-inch water main, a 14-inch sleeve and 8-inch water main for Route 108 crossings and appurtenances.

TABLE 12

PHASE 3 - EXPANSION FROM FRYING PAN LANE TO BUNKER HILL AVENUE (Fire Suppression Only)

Phase 3 - Expansion to Bunker Hill	Cost
Water Main	$1,500,000
Fire Pump Station Upgrades	$250,000
0.5 MG Elevated Water Storage For Fire Suppression	$1,500,000
Contingency	$440,000
Professional Services (Survey, Design, Permitting, Construction Oversight)	$460,000
Total	**$4,150,000**

Includes project costs for expanding the fire suppression systems from Phase 1 along Route 108 with 16-inch water main and appurtenances, 24-inch sleeve and 12-inch water main for Route 108 crossings and a 0.5 million gallon heated, mixed and insulated fire suppression tank located at Bunker Hill.

TABLE 13

PHASE 3A - EXPANSION FROM FRYING PAN LANE TO BUNKER HILL AVENUE (Potable water supply)

Phase 3A – Expansion to Bunker Hill (Fire then conversion to potable well supply)	Cost
Water Main	$1,500,000
1.0 MG Elevated Water Storage For Potable Water	$2,000,000
Contingency	$590,000
Professional Services (Survey, Design, Permitting, Construction Oversight)	$610,000
Total	**$4,700,000**

Includes project costs for the potable water system from Phase 1 along Route 108 with 16-inch water main and appurtenances, 24-inch sleeve and 12-inch water main for Route 108 crossings

and a 1.0 million gallon potable water storage tank located at Bunker Hill. This 1.0 MG storage capacity will be needed to supply fire and potable water storage for the estimated demand at the future build out condition.

TABLE 14

PHASE 4 - EXPANSION TO TOWN CENTER

Phase 4 – Bunker Hill to Town Center	Cost
Water Main	$1,350,000
Contingency	$200,000
Professional Services (Survey, Design, Permitting, Construction Oversight)	$200,000
Total	**$1,750,000**

This table includes project costs for expanding the fire suppression systems from Bunker Hill Avenue along Route 108 with 16-inch water main and appurtenances, and 24-inch sleeve and 12-inch water main for Route 108 crossings.

TABLE 15

PROJECT COST SUMMARY - POTABLE WATER WITH STRATHAM GROUNDWATER SUPPLY

Description	Cost
Phase 1 – Existing Infrastructure Interconnection	$480,000
Phase 2 – Expansion within the Gateway District	$1,400,000
Phase 2A - Water Source Development	$4,000,000
Phase 3A- Bunker Hill Extension	$4,700,000
Phase 4 – Town Center Extension	$1,750,000
Total	**$12,330,000**

TABLE 16

PROJECT COST SUMMARY - EXETER INTERCONNECT

Description	Cost
Phase 1 – Existing Infrastructure Interconnection	$480,000
Phase 2 – Expansion within the Gateway District	$1,800,000
Phase 3A - Bunker Hill Extension	$4,700,000
Phase 4 – Town Center Extension	$1,750,000
Total	**$8,730,000**

TABLE 17

PROJECT COST SUMMARY - FIRE SUPPRESSION ONLY

Description	Cost
Phase 1 – Existing Infrastructure Interconnection	$480,000
Phase 2 – Expansion within the Gateway District	$1,800,000
Phase 3 - Bunker Hill Extension	$4,150,000
Phase 4 – Town Center Extension	$1,750,000
Total	**$8,180,000**

Reviewing the project costs summaries, the costs to develop the fire suppression system alone on has the lowest capital costs between the three alternatives proposed but this provides the least benefit as the system will provide fire protection only and not potable water. Interconnecting the system into Exeter and providing potable water is more capital intensive than the fire protection only option but will benefit more people in Stratham and provide an additional source of revenue to fund the project. Creating a potable water system with a groundwater source located in Stratham is the most capital intensive project alternative but provides more operational and financial flexibility while the system is operating.

5.2 PRO FORMA - WATER RATES

A Pro Forma has been developed to estimate the user rates of both the fire suppression and the potable water system. Fire suppression rates will be based on assessed building valuations. For the purpose of this analysis, potable water rates are fixed at $5/1000 gallons used with a $30 quarterly service fee. This water rate is comparable with Exeter's existing water rate structure. Water usage has been set to 50 percent of the expected buildout condition so revenue related to water sales are not overestimated and required fire protection rates are artificially depressed. To aid in the review of water and fire rates to customers we reviewed six different rate scenarios:

1. Fire suppression only for the project area, current construction, no buildout
2. Stratham groundwater supply, current construction, no buildout
3. Exeter interconnection supply, current construction, no buildout
4. Fire suppression only for the project area, modified existing zoning buildout
5. Stratham groundwater supply, proposed Gateway zoning buildout
6. Exeter interconnection supply, proposed Gateway zoning buildout

All scenarios assumed Phase 1 including fire suppression only for the affected businesses with existing infrastructure. Appendix H includes the pro forma used to develop these fire protection rates.

TABLE 18

FIRE PROTECTION RATES

Scenario	Fire Protection Rate[1]			
	Phase 1	Phase 2	Phase 3	Phase 4
1	$2.75	$4.50	$10.50	$8.50
2	$2.75	$13.00	$16.00	$11.00
3	$2.75	$5.00	$11.00	$8.50
4	$2.75	$2.00	$3.25	$3.50
5	$2.75	$0.00	$0.15	$0.00
6	$2.75	$0.25	$0.75	$1.00

[1]Fire suppression charge unit cost is $/$1000 of building valuation

TABLE 19

TYPICAL ANNUAL COST OF FIRE PROTECTION RATES

Scenario	Fire Protection Cost[1]			
	Phase 1	Phase 2	Phase 3	Phase 4
1	$2,750	$4,500	$10,500	$8,500
2	$2,750	$13,000	$16,000	$11,000
3	$2,750	$5,000	$11,000	$8,500
4	$2,750	$2,000	$3,250	$3,250
5	$2,750	$0	$150	$0
6	$2,750	$250	$750	$1,000

[1]Fire protection charges based on a $1,000,000 building valuation

Table 18 and 19 indicate the required fire protection rates and typical annual costs for fire protection in each project phase for the Town to cover all expenses. It is evident that the required cost of service in scenarios 1, 2 and 3 are much higher than the rates in Scenarios 4, 5 and 6. This highlights the importance of gaining additional users and developing the GCBD into a productive and densely developed area to provide an adequate number of distribution system users. Scenario 4 is really a paper exercise, given that the water and/or sewer services are really needed to allow the development expected in the GCBD. Comparing Scenarios 2 and 5 and Scenarios 3 and 6 there is a "tipping point" during the GCBD development where the cost to purchase water (initially more cost effective) becomes less economically advantageous than developing an in town water source. In either of these comparisons, the cost to provide fire protection is shown to decrease as population density increases when a potable water system is available.

5.3 CAPITAL COST FUNDING SOURCES

There are several state and federal agencies from which the Town of Stratham may be able to obtain financial assistance in the form of grants and/or low-interest loans. These programs are discussed in the following paragraphs.

5.3.1 New Hampshire Department of Environmental Services

The New Hampshire Department of Environmental Services (NHDES) has several programs available to municipalities for the planning, design, and construction of water infrastructure projects - the State Revolving Loan Fund (SRF) program. There is a regional grant program that provides 25% grant funds to interconnect two or more public water systems.

The SRF loan program, which is federally funded, provides low-interest loans for the planning, design, and construction of municipal water projects. Loan interest rates vary depending on the repayment period (i.e. 5 year loans at 0.9225% interest and 20-year loans at 2.9520% interest).

5.3.2 U.S. Department of Agriculture

The U.S. Department of Agriculture also has a grant and loan program, administered by Rural Development, that is available for the planning, design, and construction of municipal water and wasterwater infrastructure projects. Grant amounts and loan interest rates vary depending on the availability of funds, the median household income of the municipality, and the projected user rates resulting from the project. The main eligibility criterion is median household income (MHI). Specifically, if the municipality's MHI is below the State average, then it qualifies for up to 45% grant funding; however, if the municipality's MHI is below 80% of the State average, then it qualifies for up to 75% grant funding. The State average MHI based on the 2000 Census was $49,467.

Based on the 2000 Census results, the Town of Stratham's overall MHI was $76,726. Accordingly, it is anticipated that the Town could not qualify for grant funding but a 30-year loan at an interest rate of 3.625%.

5.3.3 Possible Federal Stimulus Money

In addition to the additional funding provided to Rural Development for drinking water project noted in the preceding paragraph, the State is currently administering the American Recovery and Reinvestment Act (ARRA) "stimulus bill funding" through the existing Drinking Water SRF

program. The program provides 50% principal and interest forgiveness for certain eligible projects. The construction award deadline for these projects has passed and the likelihood of a second round of funds collected from states that did not spend their share of the first round of stimulus money is not anticipated.

There is potential for additional infrastructure funding through the "Jobs for Main Street" bill now moving through the federal legislature that would assist in the funding of additional water infrastructure projects.

5.3.4 New Hampshire Community Development Finance Authority

The New Hampshire Community Development Finance Authority (formerly the Office of State Planning) administers the Community Development Block Grant (CDBG) program with funds allocated by the U.S. Department of Housing and Urban Development. Grants are available in several different categories, including public facilities implementation grants for water and wastewater projects. Grant funds of up to $500,000 are available for eligible projects. It is recommended that the Town meet with the Community Development Finance Authority to discuss potential project financing. CDBG applications are due in late January and late July on an annual basis.

5.3.5 U.S. Economic Development Administration

The U.S. Economic Development Administration (EDA) also has a grant program for municipal infrastructure construction necessary to attract or increase commercial and/or industrial development. Grants of 50% of project cost, up to a maximum of $1,000,000, are available. One of the primary eligibility criteria is that the project must create or maintain employment opportunities in an economically disadvantaged area. It is unlikely that the recommended project can be shown to be economically disadvantaged; therefore, no EDA funding has been assumed in this analysis.

Appendix A
Gateway Commercial Business District Zoning Amendment

STATE OF NEW HAMPSHIRE

THE POLLS WILL BE OPEN FROM 8 AM TO 8 PM

To the inhabitants of the Town of Stratham in the County of Rockingham in said State, qualified to vote in Town Affairs:

You are hereby notified to meet at the Stratham Municipal Center on Tuesday, on the ninth day of March 2010, next at eight of the clock in the forenoon, to act upon the following subjects:

ARTICLE 1: – To choose all necessary Town Officers for the year ensuing.

ARTICLE 2: – Are you in favor of adopting the following amendment to the Town of Stratham Zoning Ordinance as proposed by the Planning Board?

Amend Section 3.1 Establishment of Districts and add Section 3.4.15 Gateway Commercial Business District and Section 3.8 Gateway Commercial Business District with the following:

Amend Section 3.1 by adding the underlined language to read as follows:

3.1 ESTABLISHMENT OF DISTRICTS:

For the purpose of this Ordinance, the Town of Stratham is hereby divided into the following districts:

District Name:	**Abbreviation:**
Residential/Agricultural ……	R/A
Manufactured Housing/Mobile Home……	MAH
Professional/Residential……	PRE
Town Center……..	TC
General Commercial…….	GCM
Special Commercial…….. **(Adopted 3/09)**	SC
Commercial/Light Industrial/Office……. **(Rev. 3/98)**	CLIO
Industrial……	IND
Wetlands Conservation (overlay)……..	WTC
Shoreland Protection (overlay)……..	SHP
Floodplain Management District (overlay)…….. **(Rev. 3/91)**	FM

Aquifer Protection District (overlay)…….APD
(Rev. 3/92)

Retirement Planned Community…… RPC
(Adopted 3/99)

Flexible\Mixed Use Development District ……. MUD
(Adopted 3/07)

Gateway Commercial Business District (overlay)…… GCBD

And in connection therewith, adding new section, Subsection 3.4.15 Gateway Commercial Business District by adding the underlined language to read as follows:

3.4.15 Gateway Commercial Business District
The intent of this district is to promote economic vitality, business diversity, accessibility, and visual appeal of the Route 108/Portsmouth Avenue corridor in a manner that is consistent with the landscape and architecture of the Town's agricultural tradition. Further, the ordinance fosters the development of a vibrant mixed use zoning district with a cohesive street layout and architectural character that includes commercial, residential, and civic uses and the integration of open spaces, transit, bicycle, and pedestrian accommodations. The Gateway Commercial Business District would be implemented on a voluntary basis at the request of an applicant and/or property owner.

And in connection therewith, adding new section, Subsection 3.8 Gateway Commercial Business District by adding the underlined language to read as follows:

3.8.1 GATEWAY COMMERCIAL BUSINESS DISTRICT

3.8.1.1 AUTHORITY

1. The action of the Town of Stratham, New Hampshire in the adoption of this Ordinance is authorized under RSA 674:21.II Innovative Land Use Controls and RSA 674:16 Grant of Power.

2. This Ordinance was adopted to promote the health, safety, and general welfare of the Town of Stratham and its citizens, including protection of the environment, conservation of land, energy and natural resources, reduction in vehicular traffic congestion, more efficient use of public funds, health benefits of a pedestrian environment, preservation of community character, education and recreation, reduction in sprawl development, and improvement of the built environment.

3. This Section was adopted as one of the instruments of implementation of the public purposes and objectives of the Town's Master Plan. This Ordinance is declared to be in accord with the Master Plan, as required by RSA 674:2.

3.8.1.2 APPLICABILITY

1. This Ordinance shall establish the Gateway Commercial Business District (the "District" or "GCBD"). The boundaries of the District shall correspond with the Commercial Business District and as shown on the plan entitled "Gateway Commercial Business District, Town of Stratham, New Hampshire" and dated December 22, 2009 (as amended).

2. Provisions of this Ordinance are activated by "shall" when required, "should" when recommended, and "may" when optional.

3. The provisions of the GCBD shall be implemented on a voluntary basis upon request from a developer or property owner for development projects within the Gateway Commercial Business District. Development projects submitted for approval under this zoning district shall be subject to applicable requirements of the Subdivision and Site Plan Review Regulations of Stratham.

4. When implemented voluntarily, the provisions of the GCBD, when in conflict, shall take precedence over those of other ordinances, regulations, and standards except the Local Health and Safety Ordinances and Building Codes.

5. Section 3.8.6 Definitions of Terms contains regulatory language that is integral to the GCBD. Those terms not defined in Section 3.8.6 or in Section II of the Zoning Ordinance shall be accorded their commonly accepted meanings. In the event of conflicts between definitions in the Zoning Ordinance and the GCBD, those of the GCBD shall take precedence.

6. The requirements of Section 3.8.4 Development Standards and Tables are an integral part of the GCBD and are legally binding. Unless otherwise noted, other diagrams and illustrations that accompany this ordinance are provided for guidance purposes and as recommended examples.

7. If in conflict, numerical requirements shall take precedence over graphic illustrations.

3.8.1.3 PURPOSE AND INTENT

1. The purpose of the Gateway Commercial Business District is to enhance the economic vitality, business diversity, accessibility, and visual appeal of Stratham's Gateway Commercial Business District, in a manner that is consistent with the landscape and architecture of the Town's agricultural tradition.

2. The intent of the GCBD is to foster development of a vibrant mixed-use district with a cohesive street layout and architectural character that includes commercial, residential, and civic uses and integration of open spaces, transit, bicycle, and pedestrian accommodations. The requirements of the GCBD are based primarily on building form, placement and function, site design, and the overall built environment including streetscapes, landscaping, and outdoor spaces and facilities.

3. Development in the Gateway Commercial Business District shall incorporate the following:
   a. Wherever possible, natural infrastructure and visual character derived from topography, woodlands, farmlands, riparian corridors, and other environmental features shall be retained;
   b. Infill development and redevelopment shall be encouraged;
   c. Development contiguous to adjacent zoning districts shall be organized to complement and be compatible with the existing pattern of development and the natural landscape;
   d. Network of existing and proposed streets shall be designed for access to Portsmouth Avenue and local connector roads, disperse traffic to and from the District, and reduce traffic volumes;
   e. Transportation corridors shall be planned and reserved in coordination with proposed land uses;
   f. Greenways shall be used to define and connect developed areas and provide public spaces and enhance viewsheds to adjacent conservation lands;
   g. Development shall integrate a framework of transit, pedestrian, and bicycle systems that provide accessible alternatives to the automobile;
   h. Use of on-street parking shall be emphasized;
   i. Architectural and landscape design suited to a traditional New England appearance shall be applied; and
   j. Public gathering and public use spaces shall be established and connections made throughout the District in a manner and location that will encourage use and promote safety and security.

3.8.1.4 THE REGULATING PLAN

1. The purpose of this Ordinance is to enable, encourage, and implement the following plans and general requirements.

2. For the purposes of the delineation, the Gateway Commercial Business District and the location and boundaries of Special Districts are hereby established as shown on a map entitled "Regulating Plan for the Gateway Commercial Business District of the Town of Stratham, New Hampshire" (the "Regulating Plan") dated December 22, 2009 and hereby incorporated as part of this ordinance.

3. The Regulating Plan for the GCBD shall identify the extent of Zones within the District where specific provisions shall apply. Following are general descriptions of these zones (refer to Section 3.8.4 for detailed requirements for each zone):
   a. Central Zone – for the purpose of providing non-residential uses, mixed uses and multi-family uses in a primarily dense development pattern with wide streets in a grid-like network, and dedicated public spaces;
   b. Outer Zone – for the purpose of providing non-residential uses and residential uses in a moderate density and residential development pattern with narrower local streets and dedicated public and open spaces; and
   c. Open Space Zone – for the purpose of providing, scenic beauty and viewsheds, natural resource protection, land conservation, and passive recreational opportunities.

3.8.1.5 DISTRICT CHARACTER

1. Development in the Gateway Commercial Business District should incorporate the following concepts to preserve and complement elements of the agricultural and historic tradition of Stratham and local and regional village character:
   a. Comprised of compact, pedestrian-oriented development;
   b. Mixed use pattern of development where development specializing in a single use should be the exception;
   c. Where ordinary activities of daily living should be located within walking distance of residential areas, allowing independence to those who do not drive;
   d. Within mixed use and residential neighborhoods, a range of housing types and price levels shall be provided to accommodate diverse ages and incomes; Workforce housing is encouraged within the District to promote a variety of housing choices;
   e. A range of Open Space including parks, squares, and playgrounds shall be distributed within neighborhoods and throughout the District;
   f. Expansion and provision of public transportation facilities that promote use and access is encouraged;
   g. Provide improved visibility and access to and use of conservation lands, where appropriate; and
   h. Provide opportunities for agrarian activities such as farmers markets and community gardens.

3.8.2 REVIEW AND PERMITTING PROCESS

3.8.2.1 REVIEW PROCESS

1. The Board of Selectmen will hereby create a GCBD Review Committee ("GRC") comprised of the Town Planner and four (4) members and two (2) alternates appointed by the Board of Selectmen and recommended by the Planning Board. The GRC shall process applications for development within the District for the purpose of determining compliance with the provisions of the Ordinance. The GRC may consult with other committees, commissions, and professionals for review and comment on applications within the District. Any cost associated with professional review shall be the responsibility of the applicant.

2. Projects that do not require a Conditional Use Permit shall be evaluated for compliance with this ordinance by the GRC, administratively approved by the Town Planner, and processed by the Planning Board when required under the Subdivision or Site Plan Review Regulations of Stratham.

3. An administrative decision by the Town Planner relating to compliance with the requirements of this ordinance (approval or denial of an application) may be appealed to the Zoning Board of Adjustment.

4. Should any construction, site work, or development be commenced without an approved Conditional Use Permit, Subdivision, Site Plan approval or administrative approval, or any should a violation of an approved Development Plan or Conditional Use Permit occur, the Planning Board or the Town Planner has the right to require the property owner to stop, remove, and/or mitigate the violation, or seek the appropriate appeal process to gain compliance.

3.8.2.2 CONDITIONAL USE PERMIT

1. Applications for development within the District may include a request for a Conditional Use Permit to deviate from the requirements of this ordinance. All such requests shall be accompanied by a narrative description of the deviation and a site plan showing the deviation from any requirement within this ordinance. Deviation from the requirements of this Ordinance shall be permitted by grant of a Conditional Use Permit issued by the Planning Board.

2. A Conditional Use Permit is a decision that would permit deviation from or reduction in a specific provision(s) of this Ordinance but that is otherwise generally consistent with the provisions of Section 3.8.1.3 Purpose and Intent. The Planning Board shall have the authority to grant or deny a request for a Conditional Use Permit pursuant to the provisions of RSA 674:16 and RSA 674:21.

3. The granting or denial of a Conditional Use Permit by the Planning Board may be appealed to the Superior Court, as provided for in RSA 677:15. [A Planning Board decision on the issuance of a Conditional Use Permit cannot be appealed to the Zoning Board of Adjustment (RSA 676:5 III).]

4. A Conditional Use Permit, for relief from the requirements of this Ordinance, may be granted by the Planning Board after proper public notice and public hearing provided the Planning Board finds that an application complies with standards 4.a and 4.b below.
   a. Consistent with the Gateway Business District Master Plan, including but not limited to:
      i. Both public and private buildings and landscaping shall contribute to the physical definition of streetscapes and public spaces; and
      ii. Development shall adequately accommodate automobiles and emergency vehicles, while respecting the pedestrian and the spatial form of public spaces; and
      iii. Design of streets and buildings shall reinforce safe environments, but not at the expense of accessibility and efficient traffic flow; and
      iv. Architecture and landscape design shall complement climate, topography, community character, and building practice; and
      v. Open space and public gathering places shall be provided as locations that reinforce the identity and activity of the District and the community; and
      vi. New development and redevelopment shall be otherwise consistent with the intent and purpose of this ordinance; and
      vii. Does not impact adjacent properties and uses in the District.

   b. Improves public safety within the District and/or in adjacent zoning districts; or provides environmental and natural resource protection; or provides a measureable public benefit (such as increased public space, open space or public amenities).

3.8.3 BUILDING AND SITE DESIGN STANDARDS

3.8.3.1 PURPOSE

In order to provide for harmonious and aesthetically pleasing development in the built environment [RSA 674:44,II(b)], the Gateway Review Committee (refer to Section 3.8.2) and the Planning Board will apply the following Building and Site Design Standards in its review of all applications in the District.

3.8.3.2 INTENT

Maintaining the quality and character of the community is dependent upon the quality and character of the architecture and development that is allowed to occur. Poorly planned and executed development detracts from the character and function of the built environment, while well-planned development enhances community character, quality of life, and value of the surrounding properties and the community overall.

Design standards are a tool to help guide development and redevelopment assuring that community priorities are an integral part of the design process. Design Standards, implemented as part of the application review and approval process, are a set of design principles that offer a positive direction for building and site level design. The guidelines and interpretations are based upon maintaining and enhancing the character of the community. They are not intended to specify any particular architecture or style.

Design Standards address a wide range of design issues including such elements as: pedestrian and traffic circulation, building mass and scale, architectural details, signs, landscaping, lighting, open space, and natural features. When integrated, these elements will create a project that is functional, attractive, and an asset to the community.

3.8.3.3 BUILDING AND SITE DESIGN EVALUATION

The evaluation of the following factors will inform the GCBD Review Committee and the Planning Board's decisions on whether proposed site and building designs achieve the purpose and intent of these Design Standards and of this Ordinance. The Planning Board shall develop a GCBD guidance document to further illustrate and provide details of the design standards stated below. This document shall be utilized by applicants when designing projects within the District.

1. Within a development project, site design elements should be compatible with small New England Village character and the town's agricultural history.

2. Building architecture should demonstrate the cohesive planning of the development and present a clearly identifiable, attractive design feature and appearance throughout. It is not intended that buildings be totally uniform in appearance or that designers and

developers be restricted in their creativity. Rather, cohesion, and identity can be demonstrated in harmonious building style, scale or mass; consistent use of facade materials; similar ground level detailing, color or signage; consistency in functional systems such as roadway or pedestrian way surfaces, signage, or landscaping; public amenities; the framing of outdoor open space and linkages, or a clear conveyance in the importance of various buildings and features on the site.

3. Building architecture should be designed to provide an attractive appearance. Franchise or corporate style architecture and/or highly contrasting color schemes are strongly discouraged. If proposed, such building styles should be substantially modified to create a project that complements the small New England Village character. All architectural details should be related to an overall architectural design approach or theme.

4. Diversity of architectural design is encouraged. Buildings that are characteristic of a historic period are encouraged, particularly if a building style or the site is historically appropriate for the community or necessary for architectural harmony.

5. Multiple buildings on the same site should be designed to create a cohesive visual relationship, as well as efficient circulation and access for pedestrians and vehicles. Accessory buildings should be designed to complement the primary building and/or use on the site in design and material expression.

6. Building placement should take best advantage of solar orientation, climatic and other environmental conditions, should encourage safety and use of adjacent public spaces and public open spaces, and should minimize the impact of activity and light upon and from the project.

7. Buildings adjacent to public open space should generally be oriented to that space, with access to the building opening onto the public open space.

8. Implementation of Low Impact Development techniques is strongly encouraged, including but not limited to, stormwater management practices, alternative surfacing materials, building and site design elements, and landscaping features.

9. The practice of creating structures and using processes that are environmentally responsible and resource-efficient throughout a building's life-cycle from siting to design, construction, operation, maintenance, renovation, and deconstruction are strongly encouraged.

10. All electrical utilities shall be located underground.

3.8.3.4 STREET AND STREETSCAPE STANDARDS

1. Thoroughfare intersections and on-street parking shall be setback a minimum of 100 feet from Portsmouth Avenue.

2. In the Central Zone, thoroughfares shall be laid out in a grid-like pattern and may be composed of angular, rectangular, or square configurations that define blocks.

3. Thoroughfares shall provide the following streetscape elements: sidewalks, pedestrian crossings, planting strips, street trees, and lighting. Bike lanes shall be provided on Boulevards, Avenues, and Streets shown on the Regulating Plan and as detailed in Section 3.8.4.2 and Section 3.8.4.3 for additional standards for required and recommended streetscape elements.

4. Thoroughfares that incorporate commons and squares are encouraged to provide public parks and spaces and add visual form and interest to the development. Roundabouts may also be incorporated when necessary to enhance traffic flow and safety.

5. Other new thoroughfares shall be aligned as closely as possible at right angles to the roadway network shown on the Regulating Plan and spaced according to the needs of the development serviced, traffic demand and safety.

3.8.3.5 LANDSCAPING STANDARDS

The following landscaping standards shall apply to all development:

1. Following are requirements for implementation of buffers:
   a. A minimum 30-foot vegetated buffer shall be provided between proposed development and adjacent residential zoning districts outside the GCBD;
   b. Street trees and other plantings shall be placed within the building setback on the lot or right of way of Portsmouth Avenue;
   c. A 30-foot vegetated buffer where a residential use abuts a non-residential use or a mixed-use development in the Outer Zone.

2. Buffers shall be established or maintained at a density that attenuates year round the impact of activity and light on adjacent properties.

3. Use of native species of trees, shrubs, groundcover, and decorative plants in all landscaping is strongly encouraged.

4. A landscaping plan, including a maintenance plan and agreement, shall be approved as part of the review and approval process as stated in the Site Plan Review (Section V.5.2) and Subdivision Regulations.

3.8.3.6 SIGNAGE STANDARDS

Except as otherwise stated in this ordinance, signage for development in the Central Zone and Outer Zone of the District shall comply with the signage standards in Section VII of the Zoning Ordinance; however, free-standing signs may be placed with minimal setbacks from lot lines.

3.8.3.7 LIGHTING STANDARDS

1. Street, building and site lighting shall not adversely impact surrounding uses and residential projects, and be designed with no light spilling or reflecting into adjacent properties and with protection of the night sky. Such lighting shall not blink, flash, oscillate, or be of unusually high intensity of brightness, except for purposes of providing emergency services or to protect public safety.

2. Energy efficient exterior lighting and streetlights shall be provided.

3. Lighting of the site shall be adequate at ground level for the protection and safety of the public in regard to pedestrian access and vehicular circulation. This shall include, but not be limited to sidewalks, crossings, parking areas, and other public spaces.

4. Refer to additional lighting requirements in Section 3.8.4, Tables 4.2-E and 4.3-F.

5. Unless otherwise stated, lighting shall comply with the standards of the Site Plan Review Regulations, Section V.5.8.

3.8.3.8 PARKING STANDARDS

1. On-street parking shall provide short-term parking for patrons of shops and businesses. On street parking to service residential areas is recommended.

2. Parking for mixed use developments shall provide long term and shared parking by multiple uses and users.

3. Delivery and other service related areas for mixed use and non-residential uses can be

located at the front, rear, or sides of buildings, or within designated portions of parking areas. Loading docks and service areas shall not face a public frontage. Delivery and service vehicles are encouraged to utilize rear alleys for building access.

4. Parking structures shall comply with the dimensional requirements and design standards of principal buildings. Below ground and multi-story parking structures are encouraged.

5. Refer to additional parking requirements in Section 3.8.4, Tables 4.2_F and 4.3-G.

6. Parking in the District shall comply with the requirements of Section V-H of the Site Plan Regulations.

3.8.4. DEVELOPMENT STANDARDS AND TABLES

TABLE 4.1 PERMITTED USES BY ZONE

Type of Use	*Central Zone*	*Outer Zone*	*Open Space Zone*
Agriculture and Forestry	By Conditional Use Permit Agriculture (crop productions), forestry, community gardening	Permitted Includes farming (dairying, livestock, raising of animals and poultry, crop production); customary accessory uses; forestry (tree farming, commercial timbering, non-commercial harvesting of forest products); community gardening	See *Footnote*
Civic/ Institutional	By Conditional Use Permit Includes private schools, nursery through college schools; day care facilities; senior citizen centers; outpatient clinics and treatment facilities; non-profit lodges and fraternal organizations; place of worship including customary ancillary facilities; public utilities; and municipal buildings	Permitted Includes private schools, nursery through college schools; day care facilities; senior citizen centers; outpatient clinics and treatment facilities; non-profit lodges and fraternal organizations; place of worship including customary ancillary facilities; public utilities; and municipal buildings	By Conditional Use Permit; see *Footnote*
Commercial	Permitted Includes retail sales and service, business and professional services, banking and lending institutions, food service/bar/entertainment, special promotional sales and displays, conference centers, movie and performance theatres, indoor entertainment complex, By Conditional Use Permit Includes self storage facilities, light manufacturing facilities[3], and veterinary hospitals	Permitted Includes retail sales and service, business and professional services, banking and lending institutions, food service/bar/entertainment, special promotional sales and displays, conference centers, movie and performance theatres, indoor entertainment complex, By Conditional Use Permit Includes self storage facilities, light manufacturing facilities[3], and veterinary hospitals	Not Permitted
Drive-through Service	Not Permitted	Not Permitted	Not Permitted
Food Service/Bar/ Entertainment[1]	Permitted	By Conditional Use Permit	Not Permitted
Mixed Use[2]	Permitted	Permitted	Not Permitted
Open Space/Conservation	See #4	See #4	Permitted
Residential – single-family, two-family	Not Permitted	Permitted Includes single-family (1 unit), two-family (2 units), workforce housing, manufactured housing, home occupations, accessory apartments	Not Permitted
Residential – multi-family and other residential uses	By Conditional Use Permit Includes multi-family (3-8 units), workforce housing, manufactured housing, home occupations, accessory apartments, bed and breakfast inns, hotels, motels, and hostels	Permitted Includes multi-family (3-8 units), workforce housing, manufactured housing, home occupations, accessory apartments, bed and breakfast inns, hotels, motels, hostels, and open space cluster developments	Not Permitted
Recreational	By Conditional Use Permit Includes public parks and playgrounds; passive, non-motorized recreation; natural resource management and research	Permitted Includes forestry, wildlife, timber preserves, reservoirs; public parks and playgrounds; commercial riding stables and riding trails; recreational camping parks, recreational areas, and residential tent camping; passive, non-motorized recreation; natural resource management and research	Permitted
Other Uses not listed	By Conditional Use Permit	By Conditional Use Permit	By Conditional Use Permit; ***See #4***

[1]**Food Service/Bar/Entertainment** includes all food service and entertainment related uses such as restaurants, dinner theatres, bars, pubs, cafes, and coffee shop/diners.

[2]**Mixed Use** includes Residential and Commercial and/or Professional Business uses in combination in one or several structures; non-residential use shall comprise >50% of the gross floor area.

[3]**Light Manufacturing Facility*** includes facilities that produce and sell artisanal products derived from materials such as paper, wood, metal and ceramic, food products, and fine art.

[4] Uses may be permitted according to the terms and restrictions of any open space designated on a specific property.

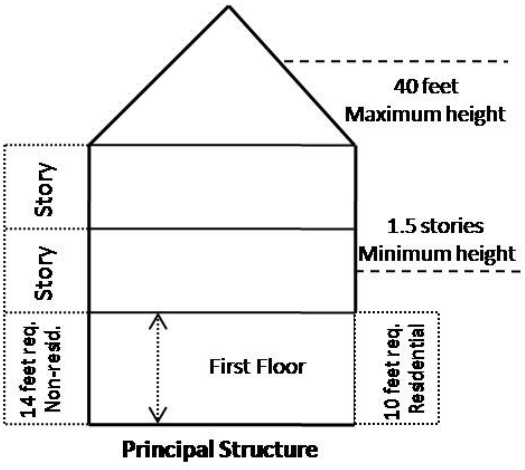
3.8.4.2 CENTRAL ZONE DESIGN STANDARDS AND ROADWAYS

TABLE 4.2-A

Dimensional Requirements		
Elements	***Standard***	***Description***
Block	8,000 sq.ft. minimum 30,000 sq.ft. maximum	Block with thoroughfare frontage on no less than two sides; Minimum area dependent on Soil-Based Lot Sizing*
Building Footprint (non-residential and mixed use)	15,000 sq.ft. maximum	Minimum area dependent on Soil-Based Lot Sizing*
Multi-Family (3-8 units)	8,000 sq.ft. maximum building footprint	Minimum area dependent on Soil-Based Lot Sizing*
Frontage Buildout	60% min / 80% maximum	
* Unless innovative sewage treatment facilities are proposed or public water and wastewater services are available, all developments shall meet the standards set forth in the Stratham Subdivision Regulations Section 4.3 Soil-Based Lot Size Determination (as amended).		

TABLE 4.2-B

Building Height		***Setbacks – Principal Structures***	
Principal Structure[1] (maximum)	3 stories 40 feet maximum height	Frontage (from street or lot line)	0 minimum 15 maximum
Principal Structure[1] (minimum)	1.5 stories	Side or Secondary Frontage (from street or lot line)	10 minimum 0 feet if secondary frontage
[1] Principal Structures include: (1) uses served by single and multiple structures and (2) parking structures			
First Floor Height	14 feet minimum required for non-residential; 10 feet minimum required for residential	Rear (from street or lot line)	10 feet minimum 0 feet if secondary frontage
		Note: Individual buildings on a lot or block may be connected, with no separation between or setback from one another.	



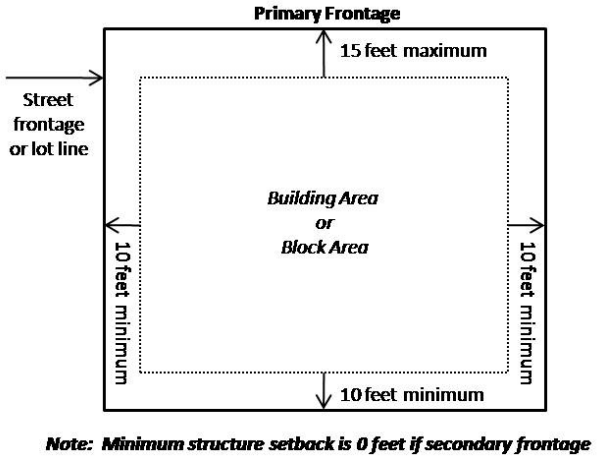


Table 4.2-C

Accessory structures shall be limited to the following:	
Type of Use	***Dimensional Requirements***
Commercial, Businesses and Other Non-Residential Uses	1.5 stories maximum height 8 feet minimum first story height 400 sq.ft. maximum footprint
Civic, Recreational, Public Facilities or Transportation Uses	No restrictions on dimensional requirements.

Table 4.2-D

Streetscape Standards		
Roadway Type	***Right of Way Width***	***Description***
Boulevard	72 feet minimum 94 feet maximum	Two-way traffic flow is required.
Avenue	72 feet minimum 76 feet maximum	One-way traffic flow is permitted.
Street (per Regulating Plan)	51 feet minimum 55 feet maximum	Two-way traffic flow is required.
Street (proposed local)	51 feet minimum 55 feet maximum	One-way traffic flow is permitted; sidewalks required on one side of street.
Alley	12 feet maximum	One-way traffic flow is required.

Table 4.2-E

Streetscape Elements		
Element	***Standards***	***Description***
Planting Strip	5-foot minimum width (as shown on roadway cross-sections)	Refer to Site Plan Review Regulations Section V.5.2. for landscaping requirements.
Setback	Combined 13 feet minimum/20 feet maximum	Composed of sidewalk and planting or street buffer strip with granite curbing.
Crossings	6 feet minimum width, 10 feet maximum width Required at street intersections and permitted at mid-block	Within an individual block or development, shall be composed consistently of similar materials and may include brick, pavers, stamped concrete, porous pavement; all sidewalks shall have granite curbing against a thoroughfare. Differentiate with use of non-asphalt materials, striping and accent paving or materials.
Street Trees	1 per 25 linear feet of right of way	Located within the Planting Strip or Street Buffer Strip.
Lighting	1 per 25 linear feet of right of way	Along all sidewalks, New England traditional fixtures with downcast illumination; lighting placement shall alternate with street tree placement.
Seating	Encouraged	In public spaces (such as pocket parks and gardens) and at street intersections.
Shelters (transit, school bus stops)	Optional	Painted or coated metal frame or natural materials.
Trash Receptacles	Required	Secured and covered at street intersections or mid-block.
Bicycle Racks	Required	At transit stops/shelters, public spaces, parking areas.

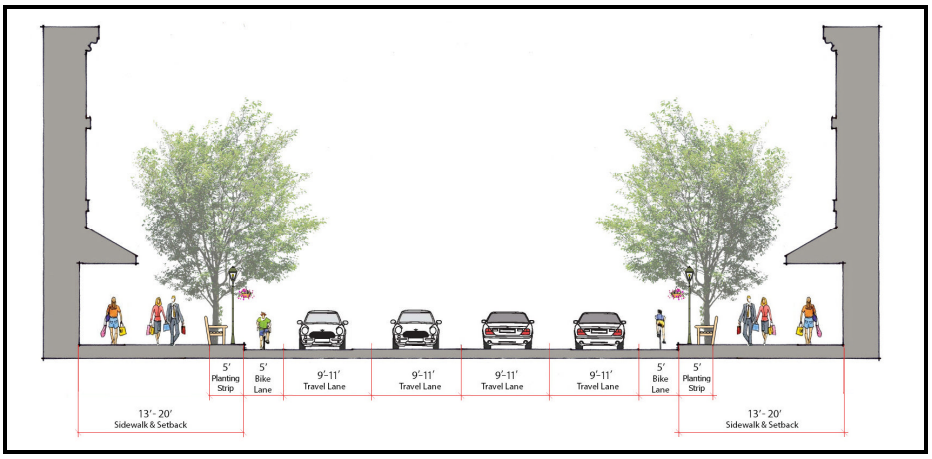
TABLE 4.2-F

Parking Area Design Standards		
Element	***Standards***	***Description***
Medians	Located between opposing parking isles and at periphery.	Shall incorporate for use as a stormwater management best management practice, wherever feasible; vegetation shall be appropriate for wet/dry conditions and salt tolerant.
Islands	Located at end of parking isles and at entrance/exit.	Used primarily as screening and landscaping areas comprised mostly of trees, shrubs, and groundcovers that are drought and salt tolerant.
Placement	Located at rear or side of buildings, and interior of blocks.	

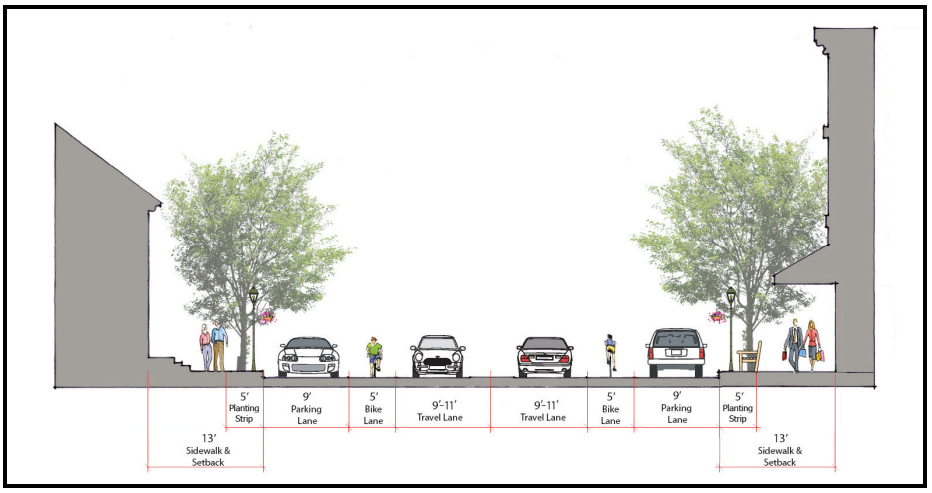
TABLE 4.2-G

Public Space and Open Space Standards	
Public Space	Developments shall include a minimum of 15 percent of the total area dedicated to public spaces. Public space calculations shall not include lands within required thoroughfare cross-sections and other proposed streets. Public space shall include facilities and landscapes that promote outdoor activities and enjoyment.
Open Space	Developments of 1 acre or greater shall include a minimum of 15 percent of the total area dedicated to open space. Open space shall not include lands within required thoroughfare cross-sections and other proposed streets. Open space shall be no less than 1 acre of contiguous area or the entire 15 percent area requirement whichever is less; open space requirement can be transferred elsewhere within the Central Zone by designating the minimum open space requirement on another property. Open Space may include septic reserve areas, well protection areas, and LID stormwater management features (i.e. natural areas such as bioretention areas, vegetated buffers and rain gardens). Open space shall consist of natural areas, or created natural areas such as gardens, landscaped areas and parks, where the public may gather, recreate and enjoy scenic views.

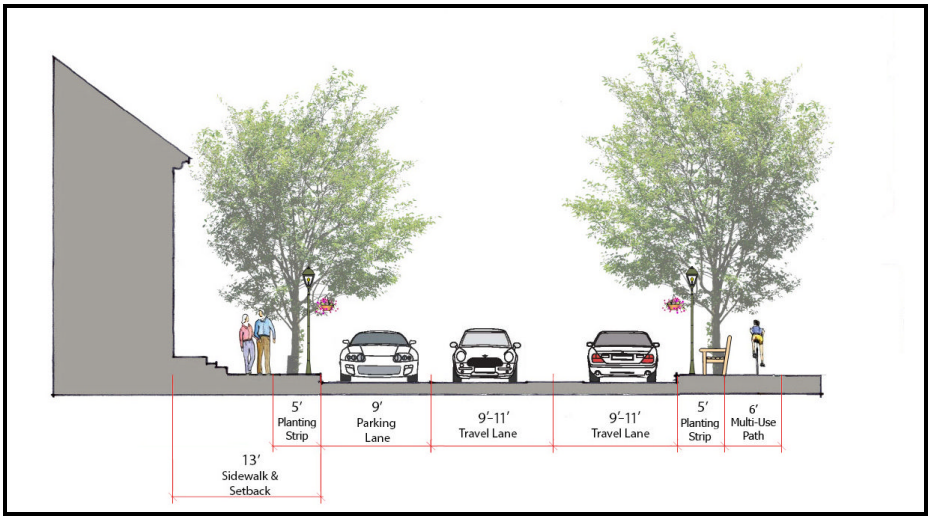
Figure 4.2-H Central Zone Roadway Cross-Section Types



Boulevard (minimum width 72 feet; maximum width 94 feet)



Avenue (minimum width 72 feet; maximum width 76 feet)



Street (required per Regulating Plan; Minimum width 51 feet; maximum width 55 feet)

8.4.4.3 OUTER ZONE DESIGN STANDARDS AND ROADWAYS

TABLE 4.3-A

Dimensional Requirements		
Footprint, Block or Lot	***Area***	***Description***
Multi-Family (3-8 units)	8,000 sq.ft. maximum building footprint 40,000 sq.ft. maximum block	Block with frontage on no less than two sides; Minimum area dependent on Soil-Based Lot Sizing*
Single Family (1 unit)	6,000 sq.ft. minimum lot	Minimum area dependent on Soil-Based Lot Sizing*
Two-Family (2 units)	15,000 sq.ft. minimum lot	Minimum area dependent on Soil-Based Lot Sizing*
Building Footprint (non-residential and mixed use)	10,000 sq.ft. maximum footprint	Minimum area dependent on Soil-Based Lot Sizing*
* Unless innovative sewage treatment facilities are proposed or public water and wastewater services are available, all developments shall meet the standards set forth in the Stratham Subdivision Regulations Section 4.3 Soil-Based Lot Size Determination (as amended).		
Frontage Buildout	70% maximum	Includes Principal and Accessory Structures

TABLE 4.3-B

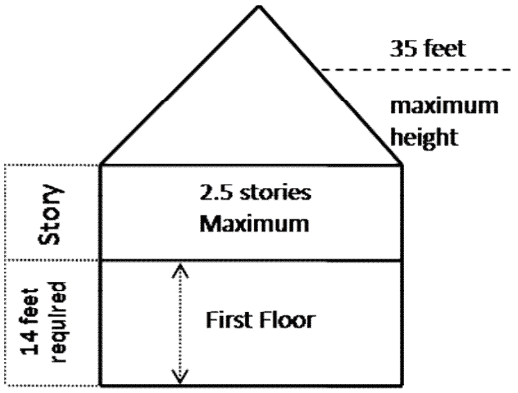
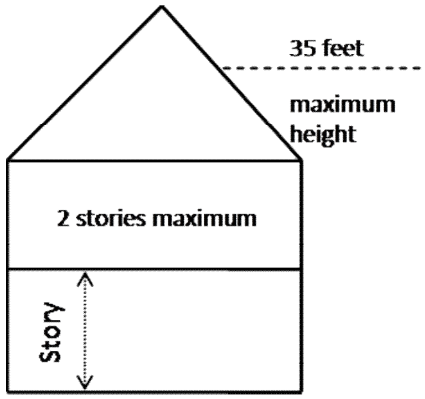
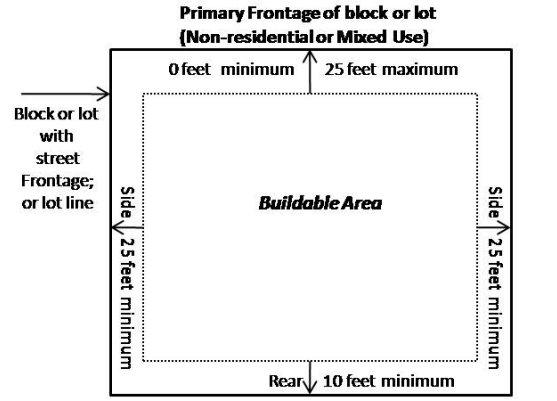
Building Height			
Principal Structure (non-residential, mixed use, and multi-family)	2.5 stories maximum 35 feet maximum height 14 feet minimum required for non-residential	**Principal Structure (single-family and two-family)**	2.0 stories maximum;
 **Principal Structure (non-residential and mixed use)**		 **Principal Structure (Residential)**	

TABLE 4.3-C

Setbacks – Principal Structures			
Principal Structure (non-residential, mixed use)		**Principal Structure (single-family, two-family, multi-family)**	
Frontage	0 feet minimum/25 feet maximum	Frontage	8 feet minimum/25 feet maximum
Side	25 feet minimum 0 feet if secondary frontage	Side	10 feet minimum
Rear	10 feet minimum 0 feet if secondary frontage	Rear	10 feet minimum
		Note: individual buildings on a lot or block may be connected, with no separation between or setback from one another.	



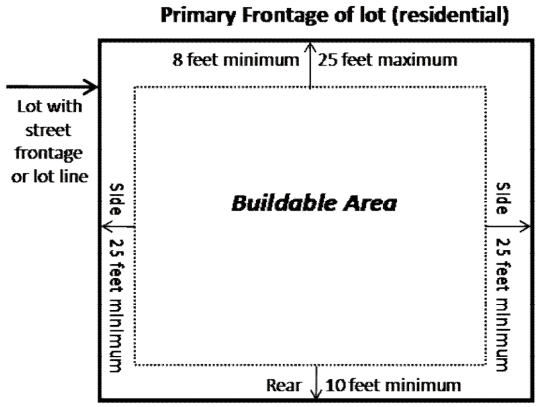


TABLE 4.3-D

Setbacks – Accessory Structures	
Type of Use	***Dimensional Requirements***
Commercial, Businesses and Other Non-Residential Uses	1.5 stories maximum height 8 feet minimum first story height 400 sq.ft. maximum footprint
Residential Uses	1.5 stories maximum height 8 feet minimum first story height 400 sq.ft. maximum footprint Shall be setback behind the front building wall of principal structure (see diagram below.
Civic, Recreational, Public Facilities or Transportation Uses	No restrictions on dimensional requirements.
Description	

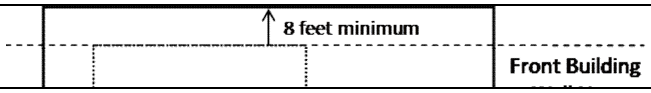


TABLE 4.3-E

Outer Zone Streetscape Standards		
Roadway Type	***Right of Way Width***	***Description***
Street (per Regulating Plan)	51 feet minimum 55 feet maximum	Two-way traffic flow is required.
Street (proposed local)	51 feet minimum 55 feet maximum	Two-way traffic flow is required; sidewalks required on one side of street.
Alley	12 feet maximum	One-way traffic flow is required.

TABLE 4.3-F

Element	***Standards***	***Description***
Planting Strip	5-foot minimum width (as shown on roadway cross-sections)	Refer to Site Plan Review Regulations Section V.5.2.) for landscaping requirements.
Setback	Combined 14 foot min, 20 foot max	Composed of sidewalk and planting strip or street buffer strip with granite curbing.
Crossings	6 foot minimum width, 10 foot maximum width Required a t street intersections and permitted at mid-block	Within an individual block or development, shall be composed consistently of similar materials and may include brick, pavers, stamped concrete, porous pavement; all sidewalks shall have granite curbing against a thoroughfare; sidewalks recommended on both sides of street (except when serving only residential development). Differentiate with use of non-asphalt materials, striping and accent paving or materials.
Street Trees	1 per 25 linear feet	Refer to Site Plan Review Regulations Section V.5.2.; street tree placement shall alternate with lighting placement.
Lighting	1 per 25 linear feet of right of way	Along all sidewalks, New England traditional fixtures with downcast illumination; lighting placement shall alternate with street tree placement
Seating	Encouraged	At public spaces (such as pocket parks and gardens) and at street intersections.
Lighting	1,000 linear feet of right of way	Painted or coated metal frame or natural materials.
Trash Receptacles	Optional	Secured and covered at street intersections or mid-block.
Bicycle Racks	Required	At transit stops/shelters, public spaces, public parking areas.

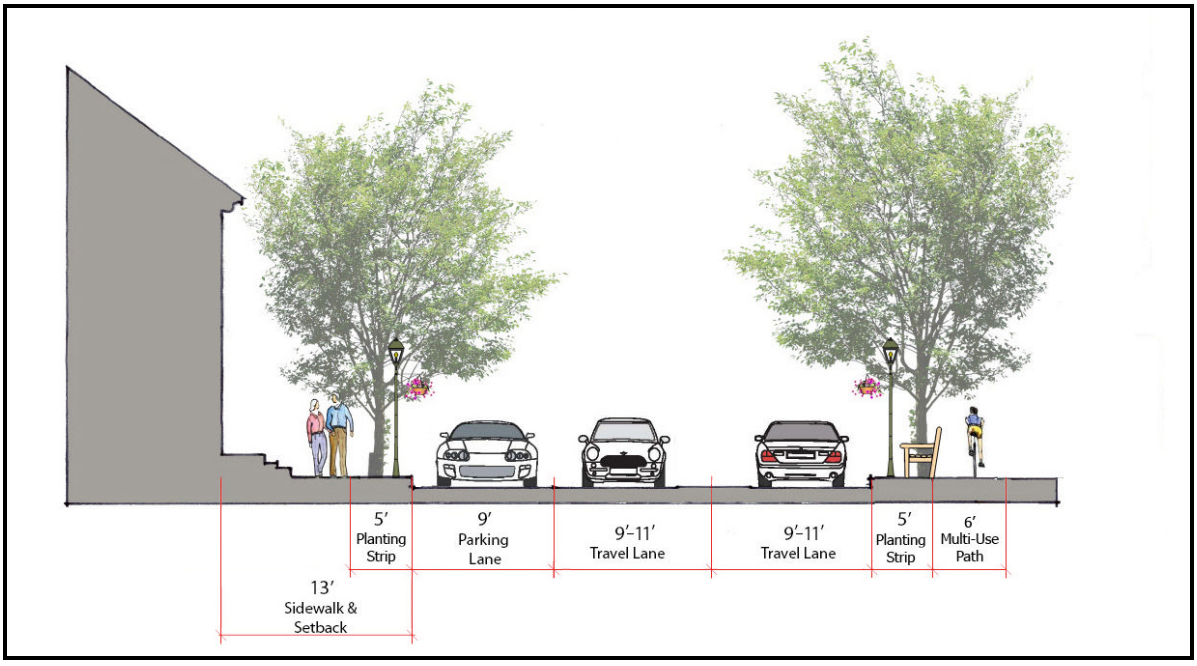
TABLE 4.3-G

Parking Area Design Standards		
Element	***Standards***	***Description***
Medians	Located between opposing parking isles and at periphery	Shall incorporate for use as a stormwater management best management practice, wherever feasible; vegetation shall be appropriate for wet/dry conditions and salt tolerant.
Islands	Located at end of parking isles and at entrance/exit	Used primarily as screening and landscaping areas comprised mostly of trees, shrubs and groundcovers that are drought and salt tolerant.
Placement	Located at rear or side of buildings, and interior of blocks	

TABLE 4.3-H

Public and Open Space Standards	
Public Space	Developments shall include a minimum of 15 percent of the total area dedicated to public spaces. Public space calculations shall not include lands within required thoroughfare cross-sections and other proposed streets. Public space shall include facilities and landscapes that promote outdoor activities and enjoyment.
Open Space	Developments of 1 acre or greater shall include a minimum of 15 percent of the total area dedicated to open space. Open space shall not include lands within required thoroughfare cross-sections and other proposed streets. Open space shall be no less than 1 acre of contiguous area or the entire 15 percent area requirement whichever is less. Open Space may include septic reserve areas, well protection areas, and LID stormwater management features (i.e. natural areas such as bioretention areas, vegetated buffers and rain gardens). Open space shall consist of natural areas, or created natural areas such as gardens, landscaped areas and parks, where the public may gather, recreate and enjoy scenic views.
Greenway Trail (optional)	Developments may provide a Greenway Trail through the property with connections provided to trails on adjacent properties or open space areas. Greenway Trails shall be a minimum of 8 feet in width and surfaced to provide universal access.

FIGURE 4.3-I Outer Zone Roadway Cross-Section Type



Street (required per Regulating Plan; Minimum width 51 feet; maximum width 55 feet)

Note: Multi-Use Paths may abut the street frontage or meander through a property providing the path enters and exits the property via the street frontage *OR* connects to a multi-use path on an adjacent property.

3.8.4.4 OPEN SPACE ZONE

TABLE 4.4

Standard	*Description*
District Boundary	Comprises all conservation lands and open space lands designated as part of development within the District (as amended) including both publicly accessible and privately owned lands.
Permitted Uses	Uses may be permitted according to the terms and restrictions of any open space designated by any easement implemented on a specific property; where permitted uses may include passive, non-motorized recreation; natural resource management and research; and commercial agriculture and forestry.
Access	All development shall provide public access to designated open space within the District.
Location and Connectivity	Lands designated as open space shall be connected preferably by being contiguous from one lot to another lot or within a development, or secondarily by walking paths, designated public spaces or sidewalks. The goal of locating open space is to create a contiguous greenway that provides pedestrians and bicyclists opportunity to move throughout the District. The open space greenway will provide an alternative to vehicle travel for both residents and visitors.
Character and Features	Existing natural areas may be preserved and maintained as open space. Open space may also be newly established through the creation of parks, gardens, ponds and other natural areas and/or features. Open space shall be maintained or established to provide opportunity for the public – both residents and visitors - to gather, recreate outdoors, and enjoy scenic views and landscapes.

3.8.5 ARCHITECTURAL AND SITE DESIGN STANDARDS

3.8.5.1 BUILDING EXTERIOR FEATURES

1. Building facades shall be compatible in scale, mass, and form with adjacent structures and the development pattern of the surrounding area (assuming the adjacent structures are generally in compliance with these design standards).

2. Exterior building design and detail on all elevations shall be coordinated with regard to color, types of materials, number of materials, architectural form, and detailing to achieve harmony and continuity of design.

3. Paint colors, excluding signage and awnings, shall be limited to a reasonable number and range of palette to achieve consistency of style and character with adjacent development.

4. Where appropriate, architectural details and richly detailed designs are encouraged to provide variation and creative designs. All features and details should be of a style consistent with the overall design scheme and in proportion with the building and adjacent structures.

5. Rear and side building walls, if visible from public streets and spaces or neighboring properties, shall be designed with similar detailing and materials and be compatible with the principal façade(s) of the building. All elevations and cross-sections of a building shall be shown on a site plan.

6. To avoid long unbroken or unadorned wall planes, building facades and walls should not extend beyond 50 – 75 feet without including changes of wall plane that provide strong shadow or visual interest.

7. Exterior materials shall be durable and of high quality. Excessively vibrant colors, sharply contrasting colors, and highly reflective materials are not compatible with the traditional New England character. Architectural elements visible to the public but not detailed on the plans shall be finished in a material compatible with other exterior colors and materials.

8. Pedestrian level storefronts shall employ non-reflective glass or light gray tinted glass to enhance the visibility of the displayed merchandise from the outside.

9. Window and door openings on the front façade shall occupy a total of no less than 20% and no more than 70% of the gross square footage of that façade. The size and placement of windows should be commensurate with architectural style of the buildings and landscape elements in the development.

10. All windows and doorways shall be encased with wood or simulated wood trim; decorative trim is preferred. Aluminum windows shall be finished to match the proposed trim color of the building.

11. True divided light windows and shutters are encouraged. Shutters shall be sized such that when closed they cover the window.

12. All vents, gutters, downspouts, flashing, electrical conduits, etc., shall be painted to match the color of the adjacent building surface, unless being used expressly as a trim or accent element.

13. Material or color changes generally should occur at a change of plane. Piecemeal embellishment and frequent changes in color or material should be avoided.

14. The visibility of rooftop equipment shall be minimized by grouping all plumbing vents, ducts, and rooftop mechanical equipment away and screened from public view at ground level. Wall or ground mounted equipment shall be screened fully from public view with walls, fences or vegetation. No air conditioning, ventilating, or other mechanical or electrical equipment, except for lighting fixtures, may project more than four (4) inches beyond the face of a wall facing a public street or space.

15. Awning covers designed for shade and for entryways shall be made of fabric or simulated fabric-like material that match or complement paint colors used on the building. Brightly illuminated and franchise type awnings are not acceptable.

16. Franchise or corporate style architecture and/or highly contrasting color schemes are strongly discouraged. If used, such buildings shall be designed to create a project that is consistent with traditional New England village character.

17. Fences in the traditional historic New England style and materials (i.e. picket, split rail, wrought iron, brick, stone) shall be used. Chain link security fences may be allowed only where necessary for safety or security, but their use is generally discouraged.

18. The following building materials shall be used and combined to create a consistent, attractive, and cohesive building design:
    a. Natural Brick (painted brick is not recommended, as it tends to require frequent maintenance);
    b. Natural Stone (such as, but not limited to, fieldstone, granite, limestone and marble);
    c. Terra cotta and/or cast stone which simulate natural stone);
    d. Split-face Block/Concrete Masonry Unit (CMU) and painted concrete block or panels as appropriate for side and rear elevations;
    e. Natural wood and/or cement-based artificial wood siding;
    f. Glass; and
    g. Non-decorative cinder block (limited to walls not visible from a public street).

3.8.5.2 ROOF LINES, STYLES AND MATERIALS

1. Sloped roofs are highly preferred. Gabled and hipped roofs should have a slope of greater than 4/12 (18º), but less than 14/12 (49º).

2. Gambrel and Mansard roofs are acceptable for appropriately sized structures.

3. Standing seam, copper roofing, asphalt, and slate shingles are preferred. Photovoltaic (PV) panel roof materials, which "simulate" traditional roofing materials, are acceptable. Metal roofs that face the street are discouraged, unless architecturally blended with the facade.

4. Flat roofs are strongly discouraged unless to allow the creation of a "green roof" as a Low Impact Development (LID) technique. Where used, they should have a parapet wall at the façade with cornice elements and facing all thoroughfares.

3.8.5.3 SITE DESIGN

1. Traditional New England Village planning principles ("Traditional Neighborhood Design") are used to create a village center consisting of dense mixed use and commercial areas organized around public spaces and bordering residential neighborhoods.

2. All roadways shall provide a pedestrian and bicycle friendly layout and incorporate landscaping and lighting elements.

3.8.5.4 LAND USE AND HOUSING

1. Mixed Uses in the Central Zone and Outer Zone shall provide commercial retail stores and shops, food service/bar/entertainment establishments, and professional offices and businesses on the first floor of buildings, with professional office and businesses, light commercial (such as artisanal manufacturing) and residential uses optionally on the upper floors.

2. Residential neighborhoods should include a mix of housing types, sizes and styles, and provide public gathering and/or recreational spaces or areas for use by residents, businesses, visitors and the community.

3. Developments shall provide a viable mix of residential and non-residential uses to promote living and employment opportunities in the style of a Traditional New England Village.

3.8.5.5 LANDSCAPING

1. Landscaping shall be an integral component of site design to provide visual interest, scenic and aesthetic beauty, maintain natural vegetation and landscape features, and maintain or create greenways throughout the District.

2. Traditional New England Village landscaping shall include street trees, large shade trees, groups of plantings, box planters along streets, and pocket gardens and parks. Low shrubs and flowering plants soften lines of buildings and help screen parking lots and utilities.

3. Landscaping shall be integrated with LID practices, general stormwater management, and parking lot and roadway designs.

4. Landscaping should consider use of native species of trees, shrubs, ground cover and flowering plants.

5. For all development within the Central and Outer Zones of the District, a Landscaping Plan shall be prepared and submitted following the requirements of this ordinance and Section V-5.2.N of the Site Plan Regulations.

3.8.5.6 TRANSPORTATION NETWORK AND ACCESS

1. The Central Zone shall incorporate a grid-pattern of Boulevards, Avenues, and Streets as well as squares or loop roads around central open spaces or public spaces.

2. The Outer Zone shall incorporate grids of local and neighborhood streets, loop roads, access roads and alleys.

3. New roads and streets shall connect to the existing transportation network within the District and adjacent zoning districts to provide efficient traffic patterns and site access, and provide for public safety. Development shall provide potential future connections to adjacent properties and not prevent or preclude these connections.

3.8.5.7 OPEN SPACE AND RECREATION

1. All development in the District is required to provide a percentage of open space. These open spaces shall be located to provide connections between existing open spaces (both within the outside the District), visual interest, scenic vistas and viewsheds, diversity in the developed landscape, preserve natural resources and features, provide gathering spaces for community uses, civic uses and outdoor activities.

2. Existing conservation lands within the District and beyond its periphery provide natural areas for passive recreation by residents, visitors and the public, and provide extensions of the required open space areas within the District.

3.8.6 DEFINITIONS OF TERMS

This Subsection provides definitions for terms in this Ordinance that are technical in nature or that otherwise may not reflect a common usage of the term.

Accessory Structure: An Outbuilding or with an Accessory Use to the Principal Structure.

Bicycle Lane: A dedicated lane for cycling within a moderate-speed vehicular Thoroughfare, demarcated by striping.

Block: The aggregate of private Lots, Passages, Rear Alleys and Rear Lanes, circumscribed by Thoroughfares or Streets.

Boulevard: A Thoroughfare designed for high vehicular capacity and moderate speed, traversing an urbanized area.

Civic: The term defining not-for-profit organizations dedicated to arts, culture, education, recreation, government, transit, and municipal parking.

Civic Building: A building operated by not-for-profit organizations dedicated to arts, culture, education, recreation, government, transit, and municipal parking, or for use approved by the legislative body.

Civic Space: An outdoor area dedicated for public use. Civic Space types are defined by the combination of certain physical constants including the relationships among their intended use, their size, their landscaping and adjacent buildings.

Curb: The edge of the vehicular pavement or edge of a sidewalk or setback that may be raised or flush, and often incorporates a drainage system.

Density: The number of dwelling units within a standard measure of land area.

Disposition: The placement of a building on its Lot.

Driveway: A vehicular lane within a Lot for the purpose of providing access from a thoroughfare.

Elevation: An exterior wall of a building not along a Frontage Line. See: **Facade.**

Facade: The exterior wall of a building that is set along a Frontage Line. *See* **Elevation.**

Frontage: The area between a building Facade and the vehicular lanes, inclusive of its built and planted components. Frontage is divided into **Private Frontage** and **Public Frontage.**

Frontage Line: A lot line bordering a Public Frontage.

Greenway: An Open Space Corridor in largely natural conditions or re-established vegetated and/or forested conditions, which may include trails for bicycles and pedestrians.

Infill: *Noun* - New development on land that had been previously developed, including most Greyfield and Brownfield sites and cleared land within Urbanized areas. *verb*- to develop such areas.

Lot Width: The length of the Principal Frontage Line of a Lot.

Low Impact Development: Low Impact Development (LID) incorporates sustainable land development approaches that begin with a site planning process that first identifies critical natural drainage systems and other landscape hydrologic functions. LID techniques include: maintaining natural drainage flow paths, minimizing land clearance, clustering buildings, and reducing impervious surfaces. A series of small stormwater best management practices (BMPs) that preserve the natural features and hydrology of the land are used instead of the conventional methods of collecting, conveying, and discharging runoff off the site.

Mixed Use: Multiple functions within the same building or in multiple buildings on a lot.

Office: Premises available for the transaction of general business but excluding Retail, artisanal and Manufacturing uses.

Open Space: Land intended to remain undeveloped.

Park: A Civic Space type that is a natural preserve available for unstructured recreation.

Parking Structure: A building containing one or more Stories of parking above grade.

Path: A pedestrian way traversing a Park or rural area, with landscape matching the contiguous Open Space, ideally connecting directly with the Sidewalk network.

Principal Building: The main building on a Lot, usually located toward the Frontage.

Principal Entrance: The main point of access for pedestrians into a building.

Principal Frontage: The Frontage designated to bear the address and Principal Entrance to the building, and the measure of minimum Lot width. *See* **Frontage.**
Private Frontage: The privately held Layer between the Frontage Line and the Principal Building Facade.

Public Frontage: The area between the Curb of the vehicular lanes and the Frontage Line.

Public Space: Lands that are dedicated for public use but that are privately owned and maintained which may include squares, plazas, greens, civic spaces, paths, trails, allée, park,

Rear Alley: A vehicular way located to the rear of Lots or Blocks providing access to service areas, parking, and Outbuildings and that may contain utility easements. Rear Alleys should be paved from building face to building face, with drainage by inverted crown at the center or with roll Curbs at the edges.

Rear Lane: A vehicular way located to the rear of Lots providing access to service areas, parking, and Outbuildings and containing utility easements. Rear Lanes may be paved lightly to Driveway standards. The streetscape consists of gravel or landscaped edges, has no raised Curb, and is drained by percolation.

Regulating Plan: A Zoning Map that shows the boundaries of the Gateway Commercial Business District and Zones within it, and other areas subject to or potentially subject to regulation.

Secondary Frontage: On corner Lots, the Private Frontage that is not the Principal Frontage.

Sidewalk: The section of the Public Frontage dedicated exclusively to pedestrian activity.

Square: A Civic Space type designed for unstructured recreation and Civic purposes, spatially defined by building Frontages and consisting of Paths, lawns and trees, formally disposed.

Story: A habitable level within a building, excluding an attic or raised basement.

Street: A local urban Thoroughfare of low speed and capacity.

Thoroughfare: A way for use by vehicular and pedestrian traffic and to provide access to Lots and Open Spaces, consisting of Vehicular Lanes and the Public Frontage.

Traditional New England Village: Development patterns that are civic-oriented, pedestrian-friendly, economically vibrant and diverse, environmentally sustainable, and evoke a unique sense of place that emulates the agricultural tradition of Stratham.

The Planning Board recommends this article by unanimous vote.

ARTICLE 3: – Are you in favor of adopting the following amendment to the Town of Stratham Zoning Ordinance as proposed by the Zoning Board of Adjustment?

Amend Section II. Definitions, Subsection 2.1.27 Home Occupation and insert new section, Section V: Supplementary Regulations, Subsection 5.13 Home Occupations to further clarify the definition of a Home Occupation, types of allowed Home Occupations, and requirements for granting a Special Exception to allow a Home Occupation with the following:

Delete Section 2.1.27 Home Occupation as it now reads:

~~2.1.27 Home Occupation: Any individual business or profession conducted entirely within a dwelling or accessory building which is incidental to the dwelling and which does not change either its character or that of the neighborhood in which it is established and which is conducted by the resident owner of the dwelling, employs not more than two persons outside the immediate family and utilizes an area less than twenty-five percent (25%) of the total floor area of finished floor space of the dwelling including the basement.~~

By replacing the current language to read as follows:

2.1.27 Home Occupation: An individual business or profession conducted within a dwelling or an accessory building or property which is clearly incidental and secondary to the use of the dwelling for dwelling purposes and does not adversely affect or undermine the residential character of the neighborhood thereof, and in connection with which there is no outside display, no outside storage (unless permitted under Section 5.13.2.f.) , nor emission of dust, noise, fumes, vibration or smoke beyond the lot line. Refer to Section 5.13.4 for exemptions.

And in connection therewith, adding the new Section 5, Subsection 5.13 to read as follows:

5.13 HOME OCCUPATION

5.13.1 Business uses clearly secondary to the home/residence may be permitted, by special exception from the Zoning Board of Adjustment in accordance with Section 3.6, in the Residential/Agricultural Zone, Manufactured Housing/Mobile Home Zone, and Professional/Residential Zone to allow a place of work.

5.13.2 Conditions.

A special exception for a home occupation shall be allowed subject to Section 17.8.2 and the following conditions and standards set forth below:

a. The home occupation shall utilize an area less than twenty five percent (25%) of the total floor area of finished floor space of the dwelling including the basement and does not change the residential character of the premises thereof.

b. The home occupation and the conduct thereof shall not impair the residential character of the premises and/or reasonable use, enjoyment and value of other residential property in the neighborhood. Further, such business shall not be injurious, noxious, or offensive to the neighborhood by reason of emission of odor, fumes, dust, smoke, vibration, and noise.

c. Home occupation shall be allowed only for a single-family residence and shall be carried on strictly by the owner of the principal building, who shall reside in said building or tenant (with owner's written permission) residing in the principal building. The residential use is established prior to the business use.

d. The granting of a special exception use shall be deemed to authorize the identified or particular use. The special exception shall expire if the authorized use ceases for more than twelve (12) months for any reason. The approval of a new application shall be required for reinstatement of the special exception use.

e. There shall be no more than two (2) persons outside the immediate family employed or otherwise engaged in the conduct of the business therein;

f. Storage in an accessory building or exterior storage may be permitted as a condition of the special exception granted by the Zoning Board of Adjustment. Exterior storage must be screened from neighboring views by either a solid fence, evergreens of an adequate height and bulk at the time of planting or by an existing combination of natural foliage and longer distances, to be determined sufficient by the Code Enforcement Officer.

g. Accessory finished goods may be provided for sale in conjunction with the home occupation, sold and stored in allowed home occupation space only.

h. The home occupation shall not be such that it requires regular or frequent service by heavy commercial trucks greater than 26,000-pound gross vehicle weight since this would adversely impact the character of the neighborhood.

i. Sufficient off-street parking for the employee and clients is to be provided. Any required deliveries can only be made by vehicles consistent with normal residential activities between the hours of 7:00 a.m. and 7:00 p.m. The outside parking of not more than two business vehicles on the lot are permitted in all residential zoned districts provided the vehicles:

    i. Do not exceed 26,000 pounds gross vehicle weight.

    ii. Are used as a means of transportation to and from the resident's place of business and location of business activity.

iii. Are not loaded with flammable, noxious, or dangerous materials.

iv. Vehicle must be registered with the Town.

j. The business shall not be contrary to any covenants of conditions contained on the deed to the property.

k. Not more that one sign or other advertising device is to be displayed on the property and it shall not exceed a size of four (4) square feet. Signs will not be lighted from within or by exterior spot lighting

5.13.3 Application for Special Exception & Home Occupation Permit; Inspections.

a. Special exceptions granted under this section are intended to allow for a specific business use. To apply for a home occupation special exception, a completed application form must be submitted to the Building Department. The applicant is required to provide:

i. A brief narrative describing the nature of the home occupation and providing details of the business and its scope of operation.

ii. A sketch and/or drawing of the floor plan of the residence, clearly showing the dimensions of the living area and the area to be used for the business and a plot plan of the property showing provisions for off-street parking and proposed outside storage area.

iii. A copy of the deed must be submitted as part of the application to the Board when applying for the Special exception.

iv. An accurate list of abutters and mailing addresses on labels.

b. Before special exception is granted, mandatory building inspections shall be made by the Code Enforcement Officer if the public is to be served at the proposed location or if hazardous materials are to be stored there. In addition, a formal site plan review by the Planning Board may be required if deemed necessary by the Zoning Board of Adjustment and/or Code Enforcement Officer.

c. Upon the granting of the special exception, an application for a home occupation permit shall be made to the Building Department on a form provided by the Building Department. All home occupation permits shall be issued for a period of three (3) years and may be renewed provided there is no violation of the provisions of Section 5.13. Requests for renewals shall be submitted to the Building Department accompanied by the renewal fee as approved by the Board of Selectmen.

d. Periodic inspections of the home occupation premises may be required subsequent to the issuance of a home occupation permit in order to confirm compliance with the conditions of the original special exception granted. If, in the opinion of the Code Enforcement Officer and/or the Zoning Board of Adjustment, the conditions of the

special exception have been violated, the Code Enforcement Officer may revoke the home occupation permit that was issued. Permit holders may make application to the Zoning Board of Adjustment for a new home occupation permit based on changed circumstances of the home occupation.

5.13.4. Exemptions from Special Exception Application Requirements

a. Home occupations in which neither customers nor vehicles come to the location where the business activity takes place and at which no sign is displayed and no outside person is to be employed and there is no outward appearance of business activity.

b. Agricultural activity, including farming and forestry, in which products are grown on the premises and sold on or off the premises.

The Planning Board recommends this article by unanimous vote.

ARTICLE 4: – Are you in favor of adopting the following amendment to the Town of Stratham Zoning Ordinance as proposed by the Planning Board?

Amend Section 3.6 Table of Uses, by deleting the current Section 3.6.A.4 and add a new section 3.6.A.3 Multi-Family Dwelling in accordance with Section 5.8 of this ordinance and a new Section 3.6.A.6 Workforce and Elderly Affordable Housing in accordance with Section 5.8 of this ordinance and renumber accordingly; delete and replace Section 5.8 Multi-Family, Workforce Housing, and Elderly Affordable Housing; and further amend Section VIII Residential Open Space Cluster Development Section 8.1.9 Density Bonus and Section 8.4 General Requirements in conformance with the revised New Hampshire Statutes Annotated 674:58-61, and related text changes for clarification and consistency with said Statutes with the following:

Amend Section 3.6 by adding the underlined language and renumbering accordingly to read as follows:

Section 3.6 Table of Uses

USES:		R/A	MAH	PRE	TC	GCM	SC	CLIO	IND
A.	**RESIDENTIAL USES:**								
1.	Single-Family Dwelling.	P	P	P	P	X	X	X	X
2.	Two-Family Dwelling.	P	P	P	P	S	S	X	X
3.	Multi-Family Dwelling in accordance with Section 5.8 of this ordinance.	X	X	C	C	C	C	C	X
4~~3~~.	Cluster Developments *by conditional use permit in accordance with Section VIII of this Ordinance*. **(Rev. 3/99)** Also Senior Housing as set forth in Section 5.7 **(3/05)**	C	X	C	C	C	C	X	X
5~~4~~.	~~Multi-Family Housing in accordance with Section 5.8 Elderly/Workforce Affordable~~ **(3/05)** Workforce and Elderly Affordable Housing in accordance with Section 5.8 of this ordinance.	~~X~~ C	X	C	C	C	C	C	X
6~~5~~.	Manufactured Housing;	P	P	X	X	X	X	X	X
	Mobile Homes; in accordance with Section IX of this Ordinance.	X	P	X	X	X	X	X	X
7~~6~~.	Home Occupations in accordance with Section 2.1.27. **(Rev. 3/91)**	S	S	S	X	X	X	X	X
8~~7~~.	Accessory Apartments in accordance with Section 5.4. **(Rev. 3/90 & 3/05)**	S	S	S	S	X	X	X	X

Section 5.8 MULTI-FAMILY, WORKFORCE HOUSING, AND ELDERLY AFFORDABLE HOUSING

5.8.1 Purpose

The purpose of this section is to provide reasonable and realistic opportunities for the development of multi-family and workforce housing within Stratham. It is intended to promote the continued availability of a diverse supply of home ownership and rental

opportunities. This Section was established in order to meet the goals related to workforce housing provisions set forth in the Stratham Master Plan and to meet the State of New Hampshire requirement that all communities provide realistic opportunities for the development of needed workforce housing. At the same time, the Town enacts this Section to assure that any such housing meets reasonable standards and conditions for approval related to environmental protection, water supply, sanitary disposal, traffic safety, and fire and life safety protection.

5.8.2 Authority

This Section is created in accordance with the provisions of RSA 674:58-674:61. In addition, this innovative land use Ordinance is adopted under the authority of NH RSA 674:21 and is intended as an "Inclusionary Zoning" provision, as defined in NH RSA 674:21 (I)(k) and 674:21 (IV)(a).

5.8.3 Definitions

a. "Affordable" - Housing with combined rental and utility costs or combined mortgage loan debt services, property taxes, and required insurance that do not exceed thirty (30%) percent of a household's gross annual income.

b. "Multi-Family Housing" - Any structure containing three (3) or more residential units, each designed for occupancy by an individual household;

c. "Workforce Multi-Family Housing" - For the purpose of workforce housing developments, means a building or structure containing five (5) or more dwelling units, each designed for occupancy by an individual household.

d. "Elderly Affordable Housing":

   i. Housing which is intended for sale and which is affordable to households whose head or spouse or sole member is 62 years or older with an income no more than ninety (90%) percent of the median income, applicable to Stratham, as published annually by the United States Department of Housing and Urban Development (HUD);

   ii. Rental Housing which is affordable to households whose head or spouse or sole member is 62 or older with an income no more than fifty (50%) percent of the median income, applicable to Stratham, as published annually by the HUD.

e. "Workforce Housing": Workforce housing developments may consist of:

   i. Housing which is intended for sale and which is affordable to a household with an income of no more than one hundred (100%) percent of the median income for a 4-person household for counties and metropolitan areas of the State of New Hampshire, applicable to Stratham, as published annually by the HUD;

ii. Rental housing which is affordable to a household with an income of no more than sixty (60%) percent of the median income for a 3-person household for counties and metropolitan areas of the State of New Hampshire, applicable to Stratham, as published annually by the HUD. Housing developments that exclude minor children from more than twenty (20%) percent of the units, or in which more than fifty (50%) percent of the dwelling units have fewer than two (2) bedrooms, shall not constitute workforce housing for the purposes of this section.

f. The terms "workforce housing" and "affordable housing" are used interchangeably throughout this Ordinance.

5.8.4 Applicability:

Developments under this Section shall be permitted within the Residential/Agricultural (refer to Section 8. Residential Open Space Cluster Development), Professional Residential, Town Center, General Commercial, Commercial/Light Industrial/Office, and the Gateway Commercial Business District zoning districts by Conditional Use Permit issued by the Planning Board.

The Planning Board may grant a Conditional Use Permit for an accessory development of multi-family housing to any approved site plan for an office or commercial development and shall adhere to all provisions of the Stratham Zoning Ordinance unless preempted by the provisions within this Section.

5.8.5 Procedural Requirements:

Any applicant who applies to the Planning Board for approval of a development that is intended to qualify as a workforce housing under this section shall follow the Town's application procedures for a site plan and/or subdivision approval as defined in the Town's Site Plan and/or Subdivision Regulations. The applicant shall also provide with the initial application(s), a statement of intent for the development to qualify as workforce housing per R.S.A. 674:60. Failure to file such a statement of intent at the time of submission of the initial application to the Planning Board shall constitute a waiver of the applicant's appeal rights under N.H. R.S.A. 674:61, but shall not preclude an appeal under other applicable laws.

5.8.6 Development Standards:

Unless otherwise stated herein, housing developments pursuant to Section 5.8 shall meet the requirements of the Town of Stratham Zoning Ordinance, Subdivision Regulations, and Site Plan Regulations, as applicable.

a. Density

i. The maximum allowed density shall not exceed that which may be allowed under NH Department of Environmental Services Septic System Design Rules and shall be applicable on the date of site plan and/or subdivision application to the

Planning Board and as may be determined under Section XX (Sanitary Protection & Septic Ordinance) of these regulations;

ii. In a mixed income development where there are both market-rate and workforce and/or elderly affordable housing units, a minimum of 25% of the dwellings must qualify as workforce housing and/or elderly affordable housing. The housing units should be interspersed throughout the overall development;

iii. The maximum number of units per building in a housing development pursuant to this section shall be eight (8) units.

iv. Density Bonus:

a. A site plan or subdivision plan which guarantees thirty percent (30%) of units proposed with the development (including all units allowed by density bonuses) reserved as workforce housing, may be approved with an increase of fifteen percent (15%) in the density of the site. The Planning Board may allow a reduction of the minimum lot size of the district to accommodate the increased site density.

b. A site plan or subdivision which guarantees thirty percent (30%) of units proposed with the development reserved as workforce serviced by municipal sewer and water can accumulate a maximum bonus equal to thirty percent (20%).

b. Dwelling Units:

i. Single-family, duplexes, and multi-family can qualify as workforce and/or elderly affordable housing;

ii. Dwelling units qualifying as workforce housing and elderly affordable housing shall be compatible in architectural style and exterior appearance with the market rate dwellings of similar type in the proposed development and shall not impact the abutting properties. Said housing units should be interspersed throughout the overall development. The structures must also include energy efficient construction that will ensure affordable annual operation long-term;

iii. Housing shall be so designed as to provide minimal impact to a site, complement and/or be accessory to any other existing or proposed uses on the site;

iv. Any housing shall be sufficiently screened and buffered in such a way as to mitigate any impact on abutting single-family residential uses;

v. Housing may be developed on the same lot as an approved commercial or office use as a stand-alone structure or structures;

vi. Housing developed as upper story units over an allowed commercial or office use is encouraged;

vii. The total square footage of the residential units shall not exceed 75% of the total square footage of the existing or proposed commercial or office use;

viii. In a mixed income development where there are both market-rate and workforce housing units, the dwellings qualifying as Workforce Housing shall be made available for occupancy on approximately the same schedule as a project's market-rate units. A schedule setting forth the phasing of the total number of units shall be established prior to final approval by the Planning Board. Said schedule shall be filed at the Registry of Deeds, and be properly updated with the Town and Registry as a condition of release of building permits.

c. Frontage, Setbacks, and Yard Regulations:

Structures may be located in any manner on the site that meet this Ordinance's requirements and objectives, and provided that the following dimensional standards are met:

i. Proposed dwelling units that have their frontage on existing public roads shall have frontages and front yard setbacks as required in the underlying zoning district or applicable overlay district.

ii. Proposed dwelling units shall have the required building setbacks for the underlying zoning district or applicable overlay district along the abutting property lines.

5.8.7 Administration of Units – Sales or Rentals:

a. In the event of a unit sale or transfer of an owner-occupied unit, the buyer will be certified for income eligibility under this section by an agency with expertise acceptable to the Town, prior to the sale or transfer. A copy of said certification will be provided to the seller.

b. In the event of a rental or renewal of an affordable rental unit, the renter will be certified for income eligibility under this section by an agency with expertise acceptable to the Town, prior to the rental or renewal. A copy of said certification shall be provided to the landlord. Rental units cannot be sub-let to a third party by the current renter of record.

c. In the event rental units are sold, the requirements set forth in Section 5.8.8(a), pertaining to deed restrictions and recorded housing agreements, will apply.

d. A certification fee will be charged for each sale, transfer, or rental term for a unit. The fee will be paid by the purchaser or renter of the unit, as designated by the Town.

e. A third party non-profit or for-profit organization or property management entity shall be responsible for income verification and ongoing affordability compliance. The designated organization or company shall provide appropriate reports to the Planning Board on these two issues when necessary. The Planning Board may adopt

regulations to aid in the implementation and administration of Section 5.8 pertaining to workforce housing developments.

5.8.8 Affordability:

a. Units will be sold with deed restrictions and a recorded housing agreement, in a form satisfactory to the Planning Board, that limits, for a period of thirty (30) years renewable upon sale or transfer, the resale value of the unit to not more than the purchase price multiplied by a factor of 1, plus the percentage increase in median income from the year of initial occupancy until the year in which the unit is resold, plus the cost of property improvements, other than normal maintenance, made by the owner.

b. Units will be rented with deed restrictions and a recorded housing agreement, in a form satisfactory to the Planning Board, that limits, for a period of thirty (30) years, renewable upon each rental, the rental price for each unit to an affordable price as determined by the formula set forth above in Section 5.8.3(d)(ii) updated to the year in which the subsequent tenant assumes occupancy, unless no such tenant is found after a sixty (60) day good faith effort. Total gross rent to be charged to subsequent tenants shall not exceed the gross rent at the time of initial occupancy times a factor equal to 1 plus the percentage increase in the median area income, updated to the year in which the subsequent tenant occupies the unit.

5.8.10 Annual Report

A third party non-profit or for-profit organization or property management entity shall prepare an annual report certifying that the gross rents of affordable units and the household incomes of tenants of affordable units have been maintained in accordance with the income restrictions set forth in this Section. Such reports shall be submitted to the Planning Board or its designee, and shall list the contract rent and occupant household incomes of all affordable units for the calendar year and the dates of initial occupancy for each household. Failure to file a complete report with sworn certification by the owner shall be considered a violation of the Stratham Zoning Ordinance.

Amend Section VIII Residential Open Space Cluster Development Sections 8.1.9 by deleting the existing language and replacing it with the following language and further amending Section 8.4 by adding the underlined language shown:

e. To encourage the development of diverse and affordable housing, the following bonuses for elderly housing, may be granted as follows:

1. If the project is developed as an Elderly Housing Development and no less than 20% of the units are provided as elderly affordable, a density bonus of 10% shall be awarded. If 50% or more of the units are offered as affordable, a 25% density bonus shall be granted.

i. Any elderly housing developed under this section must be established and maintained in compliance with the Fair Housing Act, as amended, 42 U.S.C. Sec.

3601 et esq. and NH Human Rights Commission Regulations Hum 302.02 62 or Over Housing, 302.03 55 or Over Housing as may be amended.

ii. Any applicant seeking approval of a development that is intended to qualify as elderly affordable housing under this section shall adhere to requirements stated in Section 5.8.

iii. Housing for adults aged 55 and older shall at a minimum shall provide that at least 80% of the units shall be occupied by at least one person 55 years of age or older per unit.

iv. Multi-family units, as defined under section 8.4.1, may be permitted to be increased up to a unit count of 6 per building or structure.

f. To encourage the development of diverse workforce housing opportunities, the Planning Board may allow a density bonus and/or reduction to the minimum required acreage if certain conditions are met.

1. For developments consisting of twenty (20) acres are greater, the Planning Board shall grant a density bonus of 15% if the project designate at least 20% of the units as workforce affordable.

2. The Planning Board may allow a reduction of the minimum open-space cluster development acreage to ten (10) acres for a plan which guarantees a designated percentage of units reserved for workforce housing as set forth below:

Percentage of Workforce Units in the Development	Density Bonus Units
40%	30%
25%	25%
20%	15%

3. Within an open space cluster development, workforce multi-family units as defined under section 8.4.1, may be permitted to be increased up to a unit count of 6 per building or structure.

4. Any applicant seeking approval of a development that is intended to qualify as workforce housing under this section shall adhere to the requirements, standards, and administration of workforce housing as stated in Section 5.8. Where conflict arises in other sections of the Ordinance, Section VIII. shall supersede.

g. Every development seeking such bonuses shall provide the Planning Board with easements, covenants, or deed restrictions, which shall provide for the perpetual continuation of the performance standards, which are used in the granting of any bonus.

Said easements, covenants, or deed restrictions shall be reviewed by qualified legal counsel on behalf of the town (at the developer's expense) and approved by the planning board prior to the issuance of any final approval.

h. Where a final number is greater than .5, the density number may be rounded up to the next whole number.

i. In no event shall the total density bonus awarded exceed the soil-based carrying capacity for the entire parcel. The Planning Board may adopt additional regulations that provide for density bonuses in accordance with this section.

j. Multi-family units, as defined under section 8.4.1, may be permitted to be increased up to a unit count of 6 per building or structure.

Section 8.4.1.b General Requirements:

Multi-family Units: Shall be permitted up to a unit count of 4 per building or structure. <u>For the purpose of workforce housing developments, multi-family means a building or structure containing five (5) or more dwelling units, each designed for occupancy by an individual household.</u> These are units that are structural joined and share walls with no yard between units.

The Planning Board recommends this article by unanimous vote.

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THE FOLLOWING ARTICLES WILL BE VOTED ON FRIDAY, MARCH 12, 2010 AT **7:00 P.M.** AT THE **STRATHAM MEMORIAL SCHOOL, 39 GIFFORD FARM ROAD**, STRATHAM, NEW HAMPSHIRE.

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<u>ARTICLE 5:</u> – To see if the Town will raise and appropriate Five Million Eighty Four Thousand Two Hundred Sixty Four Dollars and no cents ($5,084,264.00) to defray general town charges for the ensuing year.

The Board of Selectmen recommends this Article by a unanimous vote.

<u>ARTICLE 6:</u> – To see if the Town will vote to raise and appropriate the sum of One Million One Hundred Forty Six Thousand Dollars and no cents ($1,146,000.00) to implement the Capital Improvements Program for 2010 as presented in the Town Report and approved by the Planning Board. This is a special warrant article which will be non-lapsing until the specific items are completed or obtained but shall in no case be later than five (5) years from this appropriation per NH RSA 32:7 (VI).

The Board of Selectmen recommends this Article by a unanimous vote.

ARTICLE 7: – To see if the Town will vote to raise and appropriate the sum of Thirty Eight Thousand Dollars and no cents ($38,000.00) for the purpose of purchasing two (2) defibrillators/ cardiac monitors for the use of the Stratham Volunteer Fire Department, and to further authorize the withdrawal of Thirty Eight Thousand Dollars and no cents ($38,000.00) from the Stratham Fire Department EMS Special Revenue Fund created for these purposes during the March 17, 2000 Annual Town Meeting and as amended during the March 11, 2005 Town Meeting. This is a special warrant article, which will be non-lapsing until this purpose is accomplished but shall in no case be later than five (5) years from this appropriation per NH RSA 32:7 (VI). No additional funds from general taxation are to be used.

The Board of Selectmen recommends this Article by a unanimous vote.

ARTICLE 8: – To see if the Town will vote to raise and appropriate the sum of Eight Thousand Five Hundred Dollars and no cents ($8,500.00) for the purpose of providing EMS training for the members of the Stratham Volunteer Fire Department for the ensuing year, and to further authorize the withdrawal of Eight Thousand Five Hundred Dollars and no cents ($8,500.00) from the Stratham Fire Department EMS Special Revenue Fund created for these purposes during the March 17, 2000 Annual Town Meeting and as amended during the March 11, 2005 Town Meeting. No additional funds from general taxation are to be used.

The Board of Selectmen recommends this Article by a unanimous vote.

ARTICLE 9: – To see if the Town will vote to authorize the Board of Selectmen to prescribe the powers and duties of the Board of Public Works Commissioners established under the authority of RSA 38-C and Article 19 of the 2005 Town Warrant (incorporating and ratifying Article 14 of the 1996 Town Warrant) and also authorize the Board of Selectmen to adopt ordinances and bylaws with respect to a municipal water system, a municipal sewer system, and/ or a municipal stormwater system.

The Board of Selectmen recommends this Article by a unanimous vote. The Public Works Commission also supports this Article.

ARTICLE 10: – To see if the Town will vote to raise and appropriate the sum of Forty Thousand Dollars and no cents ($40,000.00) for the purpose of conducting further studies of the water resources, waste water, and stormwater needs and related utilities to enhance the current General Commercial District. This is a special warrant article, which will be non-lapsing until this purpose is accomplished but shall in no case be later than five (5) years from this appropriation per NH RSA 32:7 (VI).

The Board of Selectmen recommends this Article by a unanimous vote. The Public Works Commission also supports this Article.

ARTICLE 11: – To see if the Town will ratify the long term lease agreement between the Town and Unitil Corporation, its successors and assigns for the construction and operation of a solar array and associated generation equipment on Town property located at 4 Winnicutt Road (Tax Map 11 Lot 36.) Unitil Corporation and the Board of Selectmen have agreed to a lease the rooftop of the Stratham Fire Department Building to site at least a 40 Kw solar array for a term of Twenty (20) years, which includes easements reasonably required to implement the proposed use such as easements to provide access and utilities to the site. The lease includes other terms the Board of Selectmen deems in the best interests of the Town.

The Board of Selectmen recommends this Article by a unanimous vote.

ARTICLE 12: – To see if the Town will vote to create a committee of Five (5) members and up to Five (5) alternates, all of whom to be appointed by the Board of Selectmen, to study, investigate, organize, and prepare for the Town of Stratham's 300th Anniversary to occur in the year 2016.

The Board of Selectmen recommends this Article by a unanimous vote.

ARTICLE 13: – To see if the Town will vote to raise and appropriate the sum of Twenty Thousand Dollars and no cents ($20,000.00) to be deposited into the Accrued Benefits Liability Expendable Trust Fund as created by the March 16, 2007 Town Meeting to meet the currently unfunded obligations of the Town. This is a special warrant article which will be non-lapsing until the specific items are completed or obtained but shall in no case be later than five (5) years from this appropriation per NH RSA 32:7 (VI).

The Board of Selectmen recommends this Article by a unanimous vote.

ARTICLE 14: – To see if the Town will vote to authorize the Conservation Commission to use the Land Conservation Fund to purchase, acquire, maintain, improve, and protect natural resources within the Town of Stratham pursuant to RSA 36-A.

The Board of Selectmen recommends this Article by a unanimous vote. The Conservation Commission also supports this Article.

ARTICLE 15: – To see if the Town will vote to name the Town Forest created by Article 18 of the March 11, 1994 Town Meeting as the "Gordon Barker Town Forest" in the memory of Gordon Barker who was instrumental in many ways of bettering the community, not the least of which was the acquisition of the Gifford Property, so called, which is the site of the Town Forest. This Article is intended to honor Gordon Barker's memory in recognition of his many years of service to the Town of Stratham.

The Board of Selectmen recommends this Article by a unanimous vote. The Conservation Commission also supports this Article.

ARTICLE 16: – By petition of John Polzella and 26 other registered voters of the Town of Stratham, to see if the Town will vote to approve the following resolution to be forwarded to our State Representative(s), our State Senator, the Speaker of the House, and the Senate President:

> Resolved: The citizens of New Hampshire should be allowed to vote on an amendment to the New Hampshire Constitution that defines "marriage."

ARTICLE 17: – To transact any other business that may legally come before this meeting.

Given under our hands and seal, this twenty-second day of February in the year of our Lord two thousand ten.

Selectmen of Stratham, NH

_____
David Canada

_____
Bruno Federico

_____
Timothy Copeland

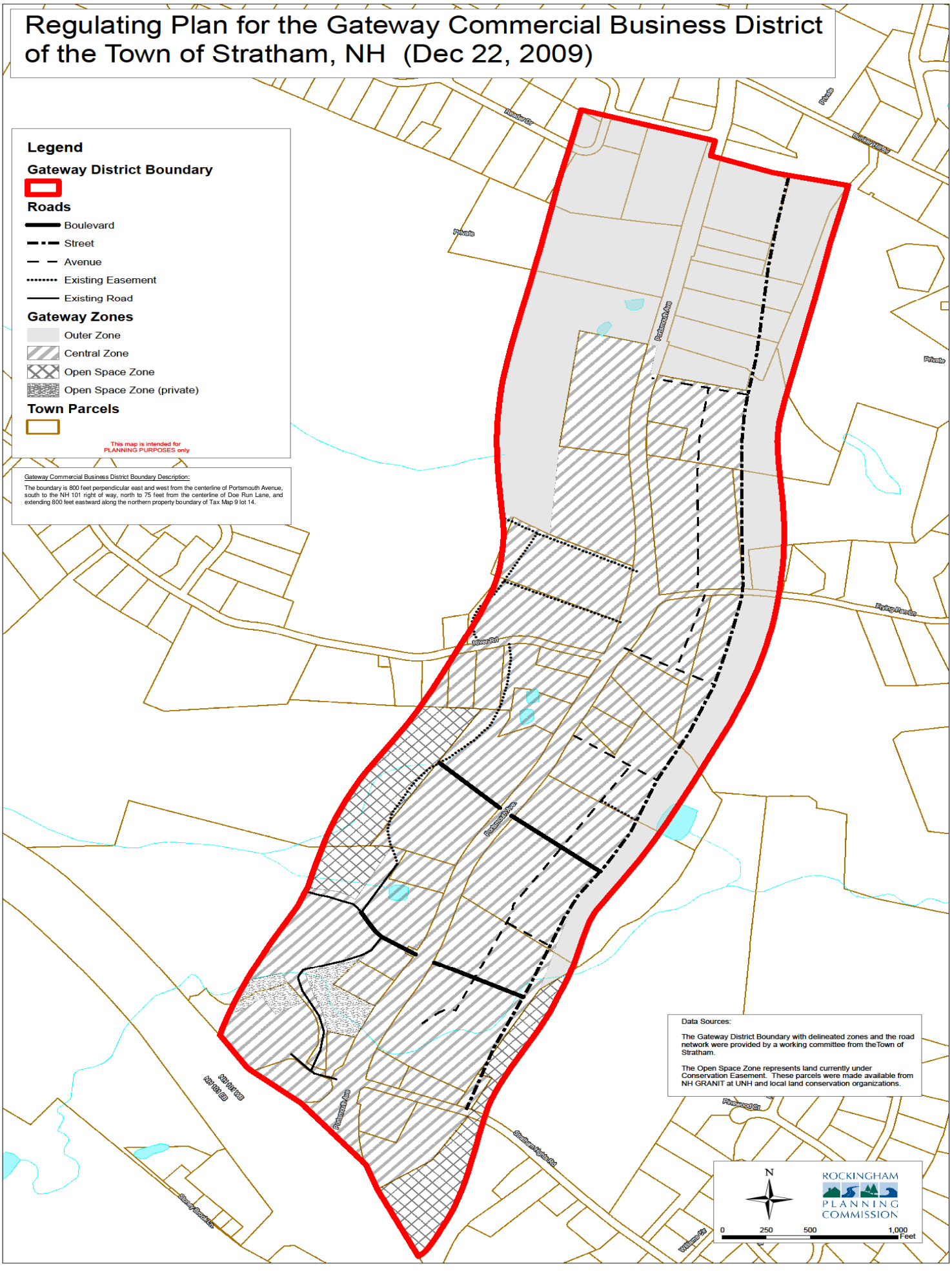
A true copy of Warrant—Attest:

_____
David Canada

_____
Bruno Federico

_____
Timothy Copeland

Regulating Plan for the Gateway Commercial Business District of the Town of Stratham, NH (Dec 22, 2009)



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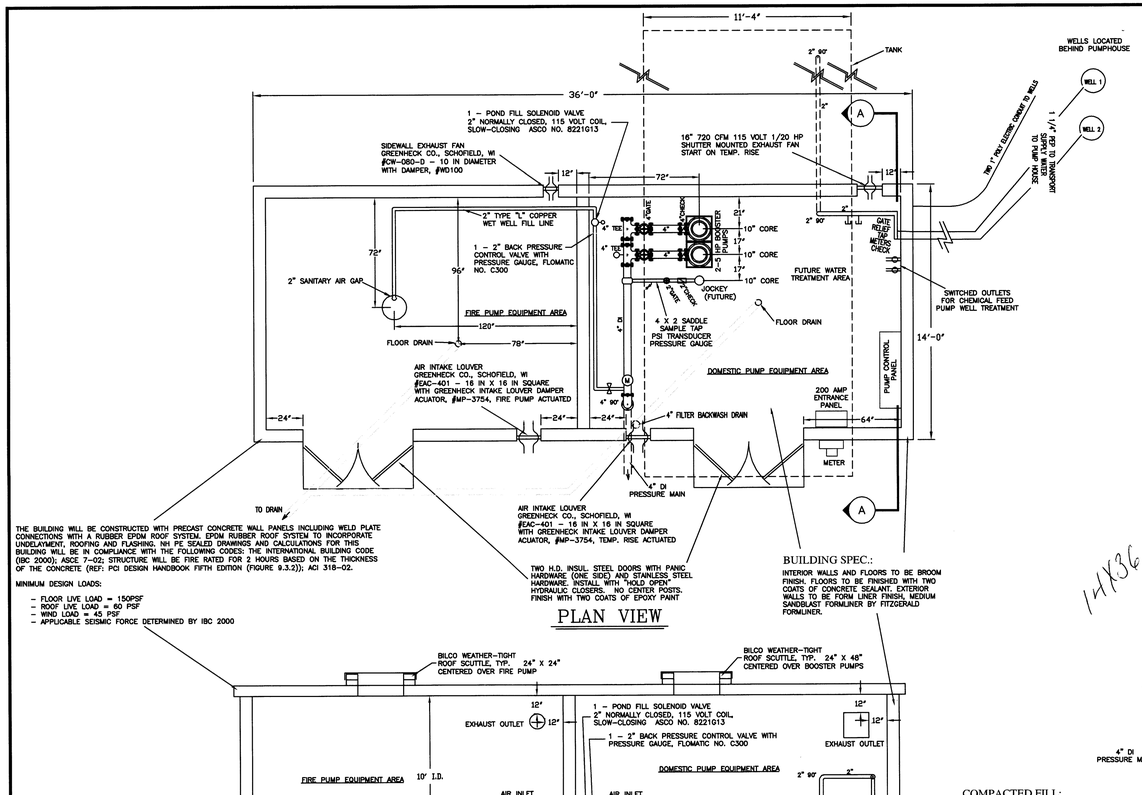
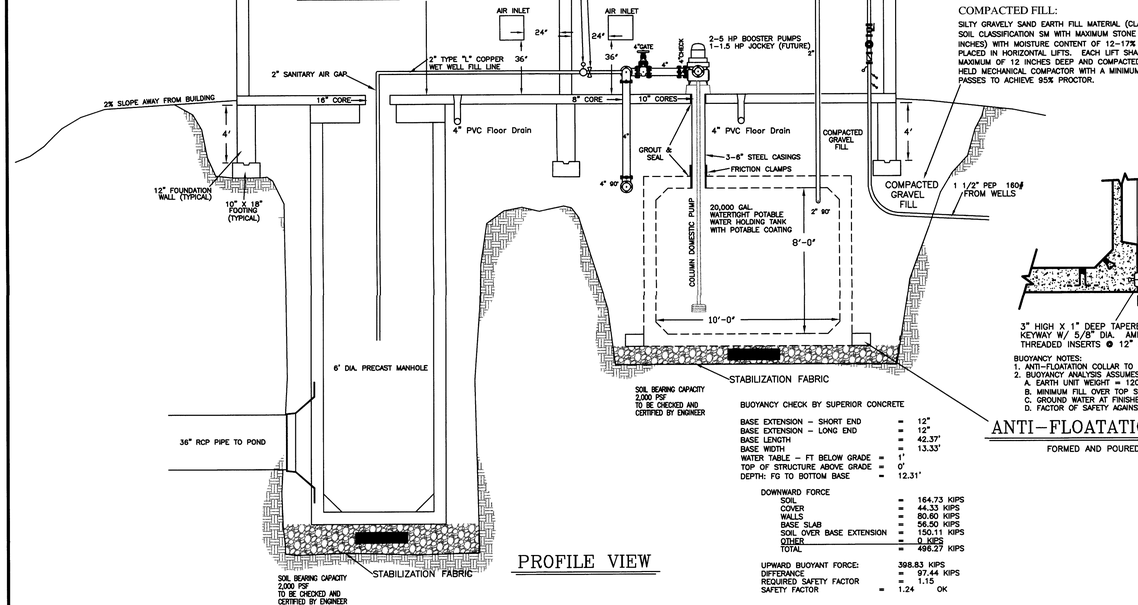
Appendix B
General Schematic of the Kings Highway Plaza Fire Pump Station

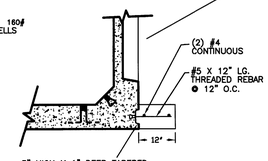


PLAN VIEW



PROFILE VIEW

COMPACTED FILL:
SILTY GRAVELY SAND EARTH FILL MATERIAL (CLASS I UNIFIED SOIL CLASSIFICATION SM WITH MAXIMUM STONE SIZE OF 6 INCHES) WITH MOISTURE CONTENT OF 12–17% SHALL BE PLACED IN HORIZONTAL LIFTS. EACH LIFT SHALL BE A MAXIMUM OF 12 INCHES DEEP AND COMPACTED BY HAND HELD MECHANICAL COMPACTOR WITH A MINIMUM OF 4 PASSES TO ACHIEVE 95% PROCTOR.



ANTI–FLOATATION COLLAR
FORMED AND POURED ON SITE

BUOYANCY NOTES:
1. ANTI–FLOATATION COLLAR TO BE CAST–IN FIELD BY OTHERS.
2. BUOYANCY ANALYSIS ASSUMES:
A. EARTH UNIT WEIGHT = 120 PCF
B. MINIMUM FILL OVER TOP SLAB = 3'–0"
C. GROUND WATER AT FINISHED GRADE.
D. FACTOR OF SAFETY AGAINST BUOYANCY = 1.05

BUOYANCY CHECK BY SUPERIOR CONCRETE

BASE EXTENSION – SHORT END	=	12"
BASE EXTENSION – LONG END	=	12"
BASE LENGTH	=	42.37'
BASE WIDTH	=	13.33'
WATER TABLE – FT BELOW GRADE	=	1'
TOP OF STRUCTURE ABOVE GRADE	=	0'
DEPTH: FG TO BOTTOM BASE	=	12.31'
DOWNWARD FORCE		
SOIL	=	164.73 KIPS
COVER	=	44.33 KIPS
WALLS	=	80.60 KIPS
BASE SLAB	=	56.50 KIPS
SOIL OVER BASE EXTENSION	=	150.11 KIPS
OTHER	=	0 KIPS
TOTAL	=	496.27 KIPS
UPWARD BUOYANT FORCE:		398.83 KIPS
DIFFERANCE	=	97.44 KIPS
REQUIRED SAFETY FACTOR	=	1.15
SAFETY FACTOR	=	1.24 OK

LIGHT WEIGHT WATER TIGHT TANK STANDARD SPECIFICATION

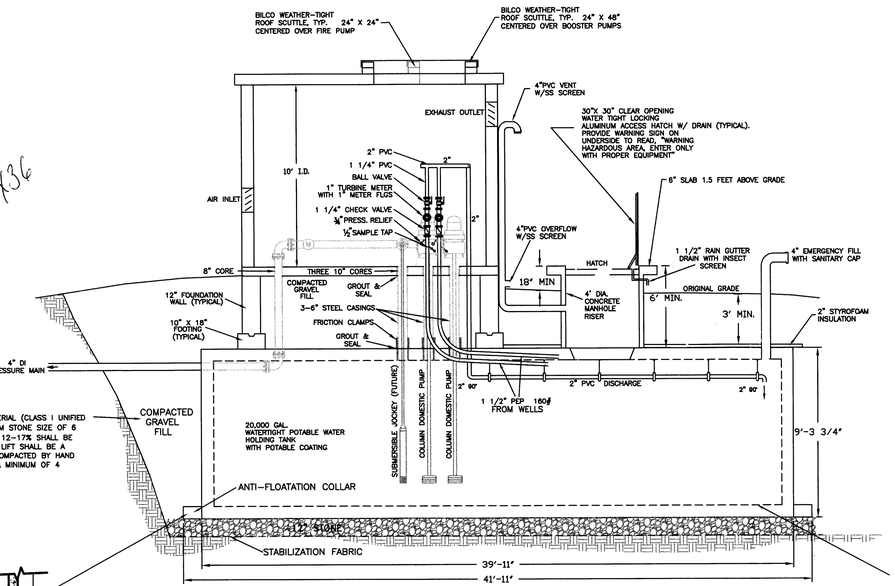
PART 1 GENERAL

1.1 DESCRIPTION
A. WORK INCLUDED:
1. FURNISH AND DELIVER A COMPLETE FACTORY BUILT LIGHTWEIGHT WATER TIGHT TANK AND ALL APPURTENANCES NECESSARY TO MAKE A COMPLETE SYSTEM AS DETAILED IN THESE SPECIFICATIONS AND DRAWINGS.
2. THE WATERTIGHT TANK SHALL BE MANUFACTURED BY SUPERIOR CONCRETE CO., A DIVISION OF OLDCASTLE PRECAST OR APPROVED EQUAL, AND TO BE DELIVERED TO THE JOBSITE. THE CONTRACTOR SHALL PROVIDE THE EXCAVATION, BEDDING AND BACKFILL FOR THE TANK AND SHALL PLACE THE TANK IN THE EXCAVATION.
3. THE WATERTIGHT TANK MANUFACTURER SHALL PROVIDE FACTORY TRAINED PERSONNEL TO ADVISE IN THE ASSEMBLY OF THE TANK SECTIONS IN THE FIELD, WHILE THE SECTIONS ARE BEING SET IN PLACE BY THE CONTRACTOR.
4. SCOPE OF WORK TO INCLUDE: PRECAST REINFORCED CONCRETE SECTIONS INCLUDING JOINT GASKET MATERIAL AND INBEDDED ITEMS AND PIPE SLEEVES WHERE POSSIBLE.

PART 2 – PRODUCTS

2.1 PRECAST CONCRETE TANK STRUCTURE – DESIGN
A. THE WATERTIGHT TANK SHALL BE CONSTRUCTED TO THE DIMENSIONS AS SHOWN ON THE CONTRACT DRAWINGS. EACH SECTION SHALL BE DESIGNED THE ADEQUATELY AND SAFELY SUPPORT ALL LIVE AND DEAD LOADS TO WHICH THE STRUCTURE WILL BE SUBJECTED, AND TO WITHSTAND ALL CONDITIONS WHICH MAY BE ENCOUNTERED. STRUCTURAL DRAWINGS AND CALCULATIONS SHALL BE INCLUDED WITH THE SUBMITTAL BY THE TANK MANUFACTURED. THE SIDES AND BOTTOM OF THE TANK SECTIONS TO HAVE VOIDED WAFFLE AREAS TO MAKE SECTIONS LIGHT WEIGHT. THESE WAFFLED AREAS SHALL NOT EFFECT THE STRUCTURAL INTEGRITY OF THE SECTION.
B. DESIGN CALCULATIONS SHALL VERIFY THAT THE STRUCTURES HAVE BEEN DESIGNED TO WITHSTAND THE BURIAL, SUBMERGENCE AND DUE TO THE DEAD AND LIVE LOADS ANTICIPATED FOR THE TANK. THE TANK SECTIONS SHALL HAVE ADEQUATE WALL, FLOOR AND ROOF THICKNESS AND STEEL REINFORCEMENT SUFFICIENT FOR THE DEPTH OF BURIAL SHOWN ON THE DRAWINGS.
C. DESIGN COMPUTATIONS FOR UPLIFT FORCES SHALL CONTAIN A MINIMUM FACTOR OF SAFETY OF 1.15. WHEN REQUIRED FOR COUNTER–FLOTATION, AS DETERMINED BY THE BUOYANCY CALCULATIONS, THE STRUCTURES SHALL BE DESIGNED TO SATISFACTORILY WITHSTAND UPLIFT PRESSURES EXERTED ON THE CHAMBERS. THE MANUFACTURER TO HAVE AS AN OPTION A KEYWAY WITH INSERTS FOR THE CONTRACTOR TO CAST IN PLACE AN ANTIFLOATATION COLLAR.
D. ALL WALL PENETRATIONS SHALL BE FORMED UTILIZING RESILIENT RUBBER PIPE CONNECTORS BY LOCKJOINT OR PRESS–SEAL GASKET CORP.

2.2 PRECAST CONCRETE TANK JOINT – DESIGN
A. THE JOINT DESIGN SHALL CONSIST OF A SHIPLAP TYPE JOINT. THE TANK SECTION JOINTS WILL BE FORMED BY A MACHINED STEEL. THE JOINT TO BE DESIGNED TO BE FLEXIBLE AND WATERTIGHT.
B. ALL SURFACES OF THE JOINT UPON OR AGAINST WHICH THE GASKET MAY BEAR SHALL BE SMOOTH, FREE OF SPALLS, CRACKS OR FRACTURES, AND IMPERFECTIONS THAT WOULD ADVERSELY EFFECT THE PERFORMANCE OF THE JOINT.
C. THE JOINTS OF THE TANK SHALL BE DESIGN SUCH THAT THEY WILL WITHSTAND THE FORCES CAUSED BY THE COMPRESSION OF THE GASKET WHEN JOINED, WITHOUT CRACKING OR FRACTURING.
D. EACH PRECAST SECTION SHALL BE PROVIDED WITH FORMED MALE AND FEMALE JOINTS IN INSURE ACCURATE JOINT SURFACES AND TOLERANCE FOR A WATERTIGHT SEAL. ALL JOINTS BETWEEN ADJOINING PRECAST MODULES SHALL BE PRIMED AT THE FACTORY AND SEALED BY THE TANK MANUFACTURER'S PERSONNEL WHEN MODULES ARE SET IN THE FIELD UTILIZING A CONTINUOUS DIAMETER POLYISOPRENE "O" RING GASKET. THE GASKET IS ONE PIECE, NO SPLICES WILL BE ALLOWED.



SECTION VIEW AA

OLDCASTLE PRECAST
WATERTIGHT HOLDING TANK

DESIGN NOTES
CONCRETE MINIMUM STRENGTH – 5000 PSI @ 28 DAYS
STEEL REINFORCEMENT – ASTM A–615, GRADE 60
COVER TO STEEL – 1" MIN. OR AS SHOWN
DESIGN LOADING – AASHTO HS20–44
CONSTRUCTION JOINT – SEALED W/1" DIA. BUTYL RUBBER
DESIGN SPECIFICATION – ACI 318 & AASHTO LOAD FACTOR DESIGN METHOD

REFER TO DESIGN SPECIFICATIONS FOR ADDITIONAL PRODUCT INFORMATION.

SUPERIOR CONCRETE CO.
PO BOX 223
AUBURN, ME 04212
(207) 784–9144

SYSTEM OPERATION:
THERE ARE 2 NEW WELLS NUMBERED AS 1 AND 2. WELL VOLUME FROM WELLS 1 AND 2 WILL BE DISCHARGED INTO 20,000 GALLONS OF ATMOSPHERIC STORAGE. WATER FROM ATMOSPHERIC STORAGE IS THEN PUMPED BY A HIGH CAPACITY WATER PRESSURE SYSTEM CONSISTING OF A VFD DUPLEX BOOSTER PUMP SYSTEM WITH BLADDER TANK. THE SYSTEM SHALL BE CONTROLLED BY A 4–PUMP CONTROL PANEL FOR AUTOMATIC OPERATION OF FILLING ATMOSPHERIC TANK WITH THE WELL PUMPS AND MAINTAINING PRESSURE AND FLOW WITH THE BOOSTER PUMPS.

PANEL OPTIONS:
INTEGRATE LOW FIRE POND ALARM AND FIRE PUMP RUN SIGNAL TO ACTIVATE 2" POND FILL SOLENOID. CONTROL PANEL SHALL HAVE 2–PAIR LABELED INPUT TERMINAL CONNECTIONS FOR SIGNAL WIRES TO BE CONNECTED ON SITE.

WELL PUMPS:
2 – 1.5 HP A.Y. MCDONALD 18 GPM CLASS SET ON 300 FT. 1/1/4 X 160 LB. POLY PIPE 208 VOLT 3–PHASE

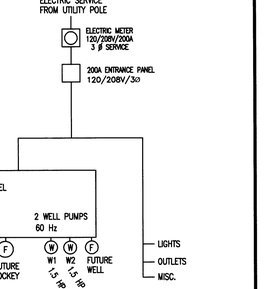
BOOSTER PUMPS:
2 – 5 HP GRISWOLD 60 GPM AT 200 FT EACH VERTICAL TURBINE MODEL G6LXE 206 VOLT 3–PHASE

INPUTS:
4 – 20 MA PRESSURE TRANSDUCER, WATER TANK LEVEL
4 – 20 MA PRESSURE TRANSDUCER, WATER MAIN PRESSURE
4 – 20 MA FLOW TRANSMITTER, 0 – 200 GPM

SCALE: ¼" = 1'

4 0 4 8

ONE LINE SCHEMATIC ELECTRIC DIAGRAM C



1. SEE FLOOR PLAN LIGHTING, POWER & SYSTEMS DRAWING EP101 & EP201 BY HARRIMAN ASSOCIATES
2. SEE FLOOR PLAN HVAC & PLUMBING DRAWING MP101 BY HARRIMAN ASSOCIATES
3. ALL WIRING TO MEET OR EXCEED ALL PROVISIONS OF NH BUILDING CODE AND NATIONAL ELECTRIC CODE.

WIRING & CONTROL

1. All wiring for water system controls and equipment shall be in accordance with the requirements of the International Building Code (Publication date of April 2001 with an ISBN # 1–892395–22–3).
2. All electrical devices shall be grounded by a separate and dedicated ground wire.
3. Convenience outlets shall be of the ground fault interrupting type.
4. All junction boxes, relays, and contactors shall be in enclosures.
5. Conduits shall be run 2 feet above the floor. Panels shall be mounted at least 3.5 feet above the floor.
6. All equipment disconnects shall be capable of being locked out during service.
7. Motorized equipment shall have a functional overload protection above and beyond the protection offered by fuses or circuit breakers. Excluded from this requirement shall be items such as fans, chemical feed pumps, mixers, treatment sequence timers, and dehumidifiers.
8. All relays and starters not part of an integrated panel shall be labeled.
9. A detail schematic of the electrical system shall be posted in the enclosure or in an obvious place in the pump station, and shall be part of the operation manual.
10. The pump controls shall have a manual "off/on/auto" switch to control pump operations where water is pumped into the vented tank. Where water is pumped into the pressure system, a pressure relief valve or spring locked "on" switch shall be provided.
11. Mercury type float switched shall not be used.

PUMP HOUSE DESIGN

STRATHAM CROSSING
STRATHAM, NH

DESIGN BY: R.E. PRESCOTT CO., INC.
10 RAILROAD AVE.
EXETER, NH 03833
Tel (603) 772–4321

Des by: RUSSELL E. PRESCOTT, PE

Date: 2/05/04
REV. 6/18/04
REV. 7/13/04
REV. 7/30/04
REV. 8/5/04
REV. 8/10/04

CCMI #04015

14436

Signed/Rose

8/18/04

GENERAL NOTES:

1. THE INTENT OF THIS PLAN IS TO SHOW THE PROPOSED FIRE PUMP HOUSE AND WET PIT INSTALLATION.
2. CONTRACTOR SHALL NOTIFY ENGINEER PRIOR TO STARTING CONSTRUCTION IF FIELD CONDITIONS ARE FOUND DIFFERENT THAN INFORMATION SHOWN ON THE PLANS.
3. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL BUILDING, ELECTRICAL, PLUMBING AND MECHANICAL PERMITS.
4. LOCATION OF FIRE PUMP HOUSE AND YARD PIPING SHALL BE IN ACCORDANCE WITH APPLEDORE ENGINEERING INC.

WETLANDS CONSTRUCTION:

1. THE POND HAS BEEN DESIGNED AS THE FIRE PROTECTION WATER SUPPLY NEEDING A MINIMUM CAPACITY OF 66,000 USABLE GALLONS. AT AN ELEVATION OF 33.5 FEET, THE POND IS CAPABLE OF SUPPLYING 78,000 USABLE GALLONS.
2. TEMPORARY SILT BOOM SHALL BE INSTALLED PRIOR TO START OF ANY CONSTRUCTION AND SHALL REMAIN IN PLACE UNTIL CONSTRUCTION IS COMPLETE.

PIPING INSTALLATION:

1. INSTALLATION SHALL COMPLY WITH NFPA 24 STANDARD FOR THE INSTALLATION OF PRIVATE FIRE SERVICE MAINS AND THEIR APPURTENANCES.
2. ALL YARD PIPING SHALL BE 10" CLASS 52 DUCTILE IRON.
3. REFER TO APPLEDORE ENGINEERING INC. FOR TYPICAL PIPE TRENCH DETAIL.

WET PIT INSTALLATION:

1. A 6' DIAMETER PRE-CAST MANHOLE SHALL BE USED FOR THE FIRE PUMP WET PIT.
2. MANHOLE SHALL BE PLACED ON A BEDDING CONSISTING OF A MINIMUM OF 12" OF 1 1/2" DIAMETER CRUSHED AND WASHED STONE. THE STONE SHALL BE COMPACTED. NO FILL MATERIAL SHALL BE PLACED UNDER THE STONE UNLESS APPROVED BY THE ENGINEER.
3. MANHOLE SHALL BE BACKFILLED WITH SCREENED GRAVEL WITH STONE NO LARGER THAN 1 1/2". THE BACKFILL SHALL BE COMPACTED TO 95% OF ASTM 1557, METHOD D.
4. WET PIT SHALL BE EQUIPPED WITH A LOW LEVEL SENSOR AND ALARM SET AT 33.5 FT.
5. PROVIDE DOMESTIC FILL LINE INTO WET PIT FOR WATER LEVELS BELOW 33.5 FT.

FIRE PUMP HOUSE:

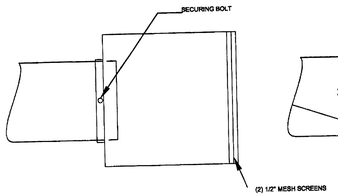
1. FIRE PUMP SHALL BE RATED AT 1500 GPM AT 100 PSI.
2. FIRE PUMP HOUSE TO BE DESIGNED BY R.E. PRESCOTT.
3. FIRE PUMP SHALL BE A DIESEL POWERED VERTICAL TURBINE BY PEERLESS PUMP OR APPROVED EQUAL.
4. A SELF CONTAINED HEATER UNIT SHALL BE INSTALLED IN THE FIRE PUMP HOUSE.
5. FIRE PUMP HOUSE SHALL HAVE AN ELECTRIC SERVICE INSTALLED.
6. A DC OPERATED VENT LOUVER SHALL BE INSTALLED WITH SOLENOID TO OPERATE SYSTEM WHEN DIESEL ENGINE RUNS.
7. A 24"x24" ROOF HATCH SHALL BE INSTALLED DIRECTLY OVER PUMP SHAFT.

PUMP HOUSE SPECIFICATIONS

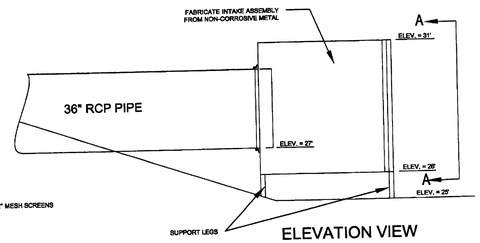
1. FIRE PUMP BUILDINGS OR ROOMS ENCLOSING DIESEL ENGINE PUMP DRIVERS AND DAY TANKS SHALL BE PROTECTED WITH AN AUTOMATIC SPRINKLER SYSTEM INSTALLED IN ACCORDANCE WITH NFPA 13, STANDARD FOR THE INSTALLATION OF SPRINKLER SYSTEMS.
2. AN APPROVED OR LISTED SOURCE OF HEAT SHALL BE PROVIDED FOR MAINTAINING THE TEMPERATURE OF THE PUMP HOUSE, ABOVE 40°F.
3. ARTIFICIAL LIGHT SHALL BE PROVIDED IN A PUMP ROOM OR PUMP HOUSE.
4. EMERGENCY LIGHTING SHALL BE PROVIDED BY FIXED OR PORTABLE BATTERY-OPERATED LIGHTS.
EMERGENCY LIGHTS SHALL NOT BE CONNECTED TO AN ENGINE-STARTING BATTERY.
5. PROVISION SHALL BE MADE FOR VENTILATION OF PUMP HOUSE.
EXHAUST FAN SHALL CONSIST OF SHUTTER, FAN ASSEMBLY, WALL SLEEVE, AND REAR GUARD. FAN SHALL HAVE A 115-VOLT, 1/6 HP DIRECT TOTALLY ENCLOSED MOTOR FOR CONTINUOUS DUTY WITH THERMAL OVERLOAD PROTECTION BUILT IN. REAR GUARD SHALL CONFORM TO OSHA SPECIFICATIONS.
PROVIDE GREENHECK MODEL CW-090-D DIRECT DRIVE CENTRIFUGAL SIDEWALL FAN OR APPROVED EQUAL.
6. FLOORS SHALL BE PITCHED FOR ADEQUATE DRAINAGE OF ESCAPING WATER AWAY FROM CRITICAL EQUIPMENT SUCH AS THE PUMP, DRIVER, CONTROLLER, AND SO FORTH. THE PUMP HOUSE SHALL BE PROVIDED WITH A FLOOR DRAIN THAT WILL DISCHARGE TO A FROST-FREE LOCATION.
7. GUARDS SHALL BE PROVIDED FOR FLEXIBLE COUPLINGS AND FLEXIBLE CONNECTING SHAFTS TO PREVENT ROTATING ELEMENTS FROM CAUSING INJURY TO PERSONNEL.
8. A/C MOTOR OPERATOR LOUVER
PROVIDE GREENHECK MODAL EAC-401 COMBINATION LOUVER DAMPER OR APPROVED EQUAL.
9. PROVISION SHALL BE MADE FOR A ROOF ACCESS HATCH HAVING A MINIMUM CLEAR OPENING OF 24 INCHES SQUARE TO BE USED FOR REMOVING AND REPLACING PUMP. ROOF ACCESS HATCH TO BE CENTERED DIRECTLY OVER PUMP.

INTAKE NOTES

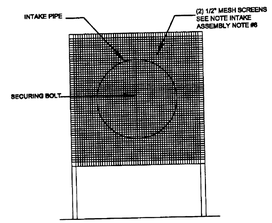
1. 36" RCP PIPE SHALL EXTEND INTO THE POND FAR ENOUGH TO ALLOW A 5'X5'X5' ASSEMBLY TO BE INSTALLED AT THE END OF IT WITH THE ATTACHED BOX'S INVERT AT AN ELEVATION OF 1' ABOVE POND BOTTOM.
2. AS SHOWN IN DRAWING, THE SIDE OF ASSEMBLY OPPOSITE INCOMING PIPE SHALL BE EQUIPPED WITH (2) INDEPENDENT 1/2" MESH SCREENS. THE SCREENS SHALL BE METAL FRAMED AND BE SLID INTO GROOVES PRESENT IN THE BOX. SCREENS MUST BE INDEPENDENT TO ALLOW FOR REMOVAL OF ONE SCREEN FOR CLEANING WHILE STILL MAINTAINING A BARRIER TO PROTECT THE INTAKE.
3. ASSEMBLY SHALL BE SECURED TO THE INTAKE PIPE TO ENSURE NO DEBRIS WILL ENTER THE INTAKE PIPE.
4. ASSEMBLY SHALL BE SUPPORTED BY (4) LEGS EXTENDING TO THE BOTTOM OF THE POND.
5. SCREEN MATERIALS AND INSTALLATIONS SHALL BE IN ACCORDANCE WITH NFPA 20.
6. MESH SCREENS SHALL BE BRASS, COPPER, MONEL, STAINLESS STEEL, OR OTHER EQUIVALENT CORROSION-RESISTANT METALLIC MATERIAL WIRE SCREEN OF 12.7 MM (0.50 IN.) MAXIMUM MESH AND NO. 10 B&S GAUGE.



PLAN VIEW

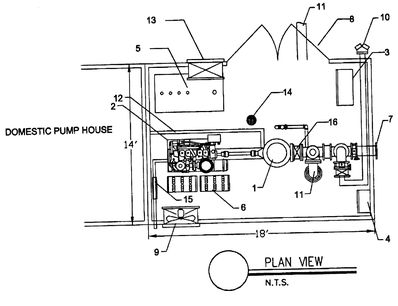


ELEVATION VIEW



SECTION A-A

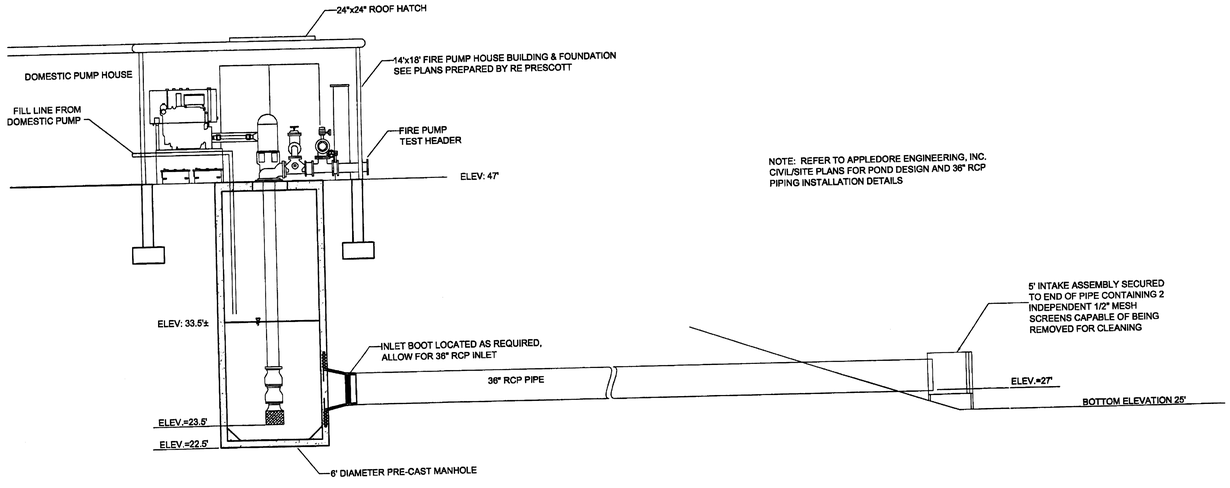
INTAKE ASSEMBLY
3/8" = 1'



PLAN VIEW
N.T.S.

EQUIPMENT LEGEND

1. FIRE PUMP
2. DIESEL ENGINE
3. CONTROL PANEL (FIRE PUMP)
4. CONTROL PANEL (JOCKEY PUMP)
5. FUEL TANK
6. DUAL LEAD ACID BATTERIES ON RACKS
7. TEST HEADER
8. DOUBLE WALK DOOR
9. EXHAUST FAN
10. FIRE DEPARTMENT CONNECTION
11. 10" DUCTILE IRON PIPE TO BUILDINGS
12. DOMESTIC FILL LINE
13. BAROMETRIC INTAKE LOUVER
14. BUILDING DRAIN
15. MUFFLER
16. CHECK VALVE



ELEVATION VIEW
N.T.S.

NOTE: REFER TO APPLEDORE ENGINEERING, INC. CIVIL/SITE PLANS FOR POND DESIGN AND 36" RCP PIPING INSTALLATION DETAILS

Contractor Fee
17,056 Per Day
118 Per Man

No.	Date	Revision	By
1	7/26/04	ADD GENERAL NOTE #3 AND UPDATE BUILDING LOUVER	JMM
2	7/12/04	WATER SUPPLY REVISIONS PER DUFRESNE-HENRY	JMM
3	6/14/04	PUMP HOUSE REVISIONS	JMM

STATE OF NEW HAMPSHIRE
SEAN P. TOOMEY
No. 10951
LICENSED PROFESSIONAL ENGINEER
7/27/04

SFC ENGINEERING PARTNERSHIP INC
25 SUNDIAL AVENUE SUITE 205W
MANCHESTER, NH 03103-7230
TEL. 603-647-8700
FAX. 603-647-8711
www.sfceng.com

Stratham Crossing
NH Route 108
Stratham, NH
Fire Pump House Plan

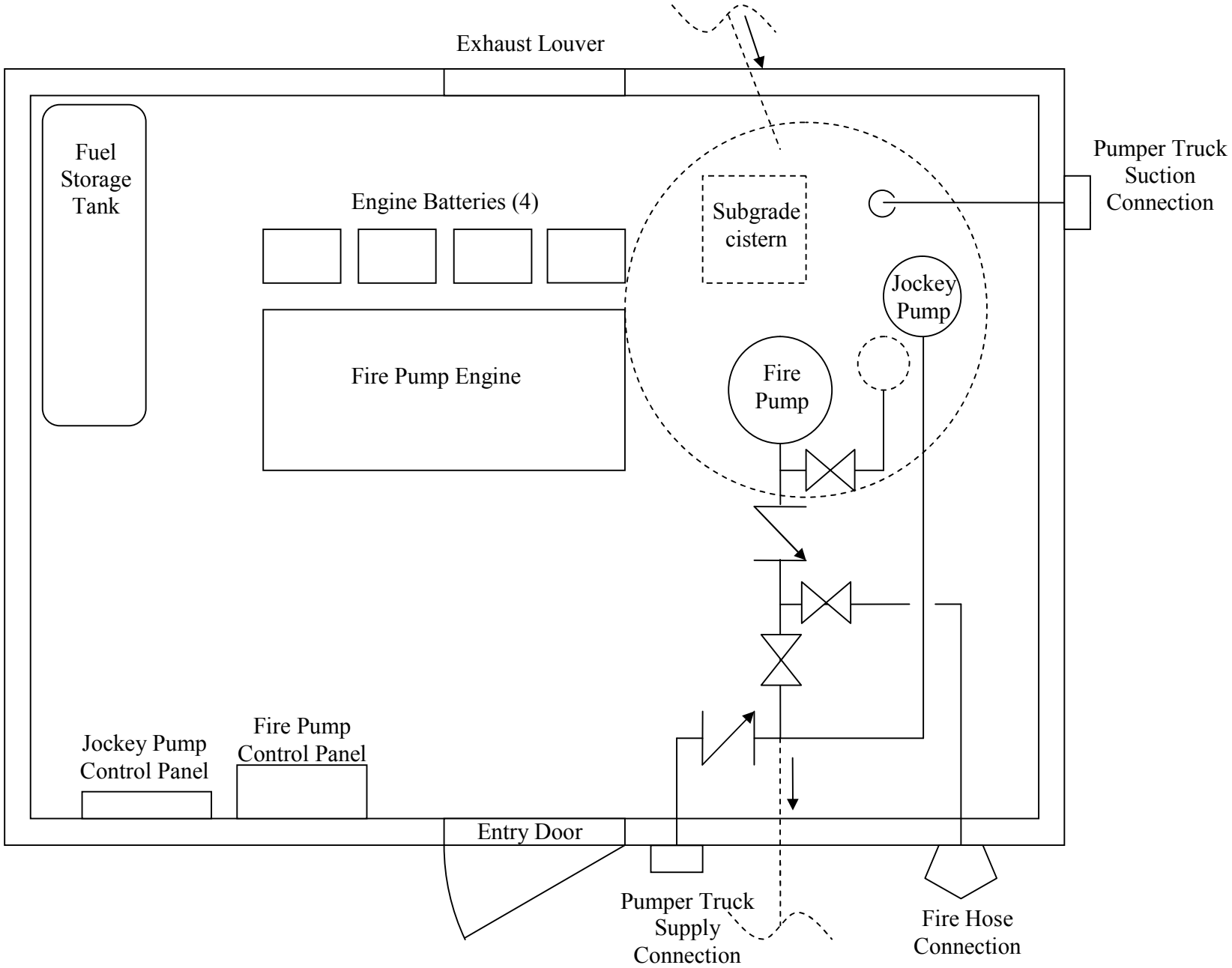
Project No. 374302
Date: 05/24/2004
Designed by: JMM
Drawn by: JMM
Checked by: SFT
Scale: As Shown

Prepared for:
Appledore Engineering Inc
15 Rye Street Suite 305
Portsmouth, NH 03801

DWG NO.
FP1

033004PumpHouse.dwg

Drawing name: M:\Fire Protection\374301 Jones Beach Stratham Tim\033004 Pump House.dwg


Exhaust Louver
Fuel Storage Tank
Engine Batteries (4)
Subgrade cistern
Pumper Truck Suction Connection
Jockey Pump
Fire Pump Engine
Fire Pump
Jockey Pump Control Panel
Fire Pump Control Panel
Entry Door
Pumper Truck Supply Connection
Fire Hose Connection

Appendix C
Flow Test Results for Kings Highway Plaza Fire Suppression System

WRIGHT-PIERCE
Engineering a Better Environment

HYDRANT FLOW TEST LOG

JOB NAME:	Kings Highway Plaza	TEST NO.:	1
JOB NO.:	11607A	TIME:	8:00 AM
PERFORMED BY:	CDB	DATE:	1/27/2010

FLOW TEST DATA

HYDRANT NO.	STATIC PRESSURE (PSI)	RESIDUAL* PRESSURE (PSI)	PITOT PRESSURE (PSI)	FLOW OPENING (IN.)	DISCHARGE COEF.	FLOW Qa (GPM)	REMARKS
FPH	145	145					
1			85	1.75	0.9	757	

*Note: The pressure drop between the static and residual should be greater than 20 psi. If necessary, additional hydrants should be opened.

Flow - Qa

$$Q_a = 29.8 D^2 C \sqrt{P_p}$$

Qa=Test Flow, gpm
D=Flow Opening Diam. ,in.
Pp=Pitot Pressure, psi
C=Hydraulic Coef.
0.9 - Rounded
0.8 - Sharp
0.7 - Intruding

CALCULATED FLOWS

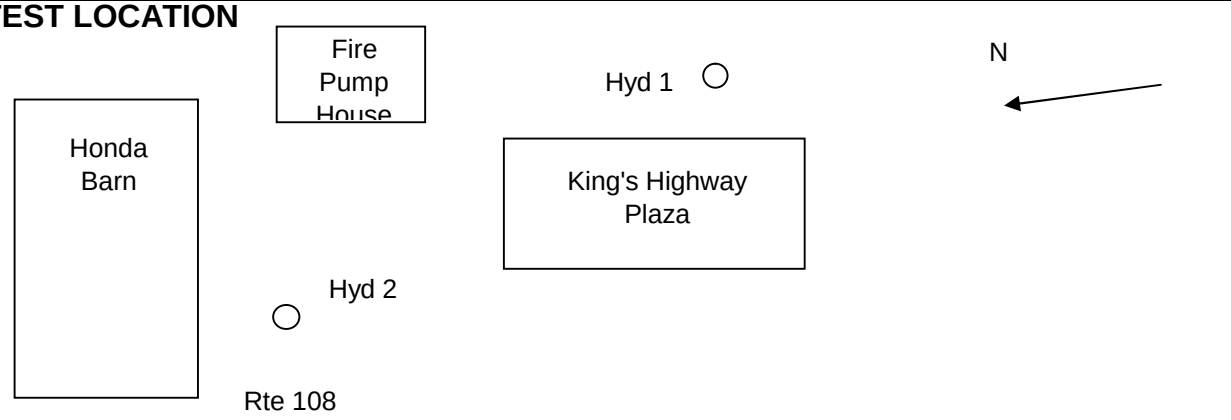
ASSUMED RESIDUAL (PSI)	STATIC PRESSURE (PSI)	FLOW Qc (GPM)
	Total Calc. Flow	

Flow - Qc

$$Q_c = Q_a \left(\frac{P_s - P_f}{P_s - P_t} \right)^{0.54}$$

Qc=Flow@Pf,gpm
Qa=Test Flow,gpm
Ps=Static Pressure, psi
Pf= Assumed Residual Press., psi
Pt=Residual Pressure, psi

SKETCH OF TEST LOCATION



WRIGHT-PIERCE
Engineering a Better Environment

HYDRANT FLOW TEST LOG

JOB NAME:	Kings Highway Plaza	TEST NO.:	2
JOB NO.:	11607A	TIME:	8:30 AM
PERFORMED BY:	CDB	DATE:	1/27/2010

FLOW TEST DATA

HYDRANT NO.	STATIC PRESSURE (PSI)	RESIDUAL* PRESSURE (PSI)	PITOT PRESSURE (PSI)	FLOW OPENING (IN.)	DISCHARGE COEF.	FLOW Qa (GPM)	REMARKS
FPH	145	75					
2			20	4.5	0.9	2,429	

*Note: The pressure drop between the static and residual should be greater than 20 psi. If necessary, additional hydrants should be opened.

Flow - Qa

$$Q_a = 29.8 D^2 C \sqrt{P_p}$$

Qa=Test Flow, gpm
D=Flow Opening Diam. ,in.
Pp=Pitot Pressure, psi
C=Hydraulic Coef.
0.9 - Rounded
0.8 - Sharp
0.7 - Intruding

CALCULATED FLOWS

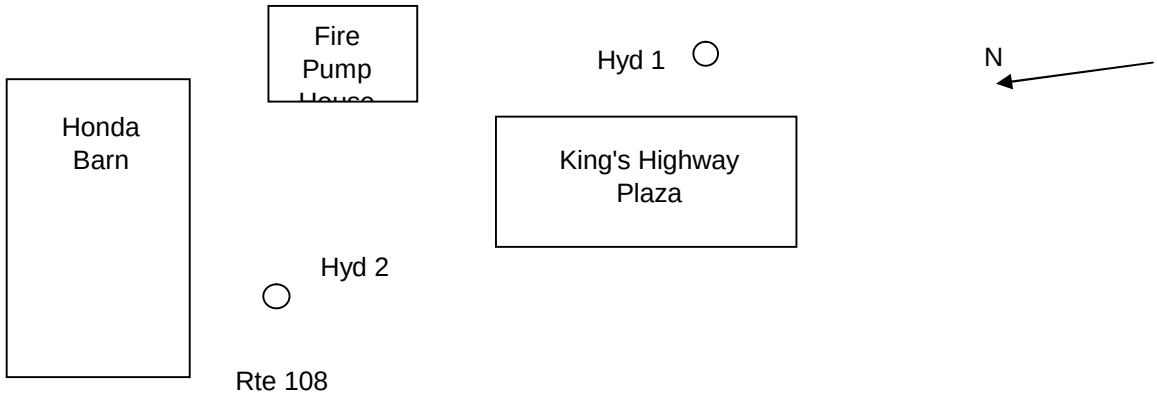
ASSUMED RESIDUAL (PSI)	STATIC PRESSURE (PSI)	FLOW Qc (GPM)
	Total Calc. Flow	

Flow - Qc

$$Q_c = Q_a \left(\frac{P_s - P_f}{P_s - P_t} \right)^{0.54}$$

Qc=Flow@Pf,gpm
Qa=Test Flow,gpm
Ps=Static Pressure, psi
Pf= Assumed Residual Press., psi
Pt=Residual Pressure, psi

SKETCH OF TEST LOCATION



Superior Fire Protection, Inc. 230 Londonderry Turnpike Hooksett, NH 03106 Ph: (603) 644-4788 Fax: (603) 644-4788

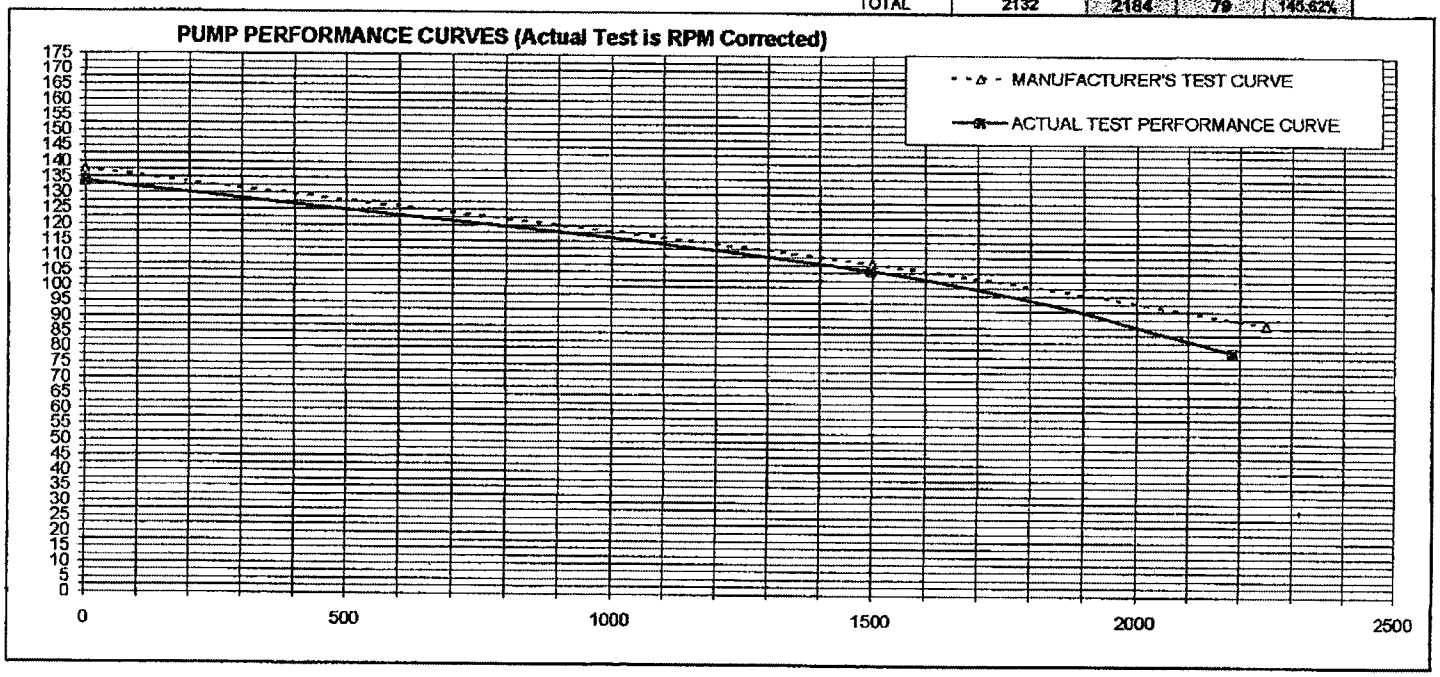
Pump Performance Test Report (0 to 5000 gpm)

Client:	STRATHAM KING'S PLAZA	Location:	29 Portsmouth Ave. Stratham, NH
Date:	6-Oct-09	Tested by:	Paul & Brad

Pump Identification:	Peerless Pump Model: 14MCCF			S/N : 653373	
Rated GPM	1500	Rated PSIG:	108	Rated PSIG @ 0% :	138
Rated GPM @ 150% :	2250	PSIG @ 150% :	68.4	Rated Pump RPM:	1750

* * * Distance from the pumping water level to the center of the discharge gauge in FEET - Vertical Turbine Pumps: 0.00 Feet

Rated Pump RPM	As Tested Pump RPM	Test Discharge Pressure	Test Suction Pressure (+ or -) * * *	Test Net Head (PSIG)	Nozzle Diameters	Nozzle "K"	Test Nozzle Pitot Pressure	Calculated Test Flow (GPM)	ACTUAL FLOW (GPM) (rpm corrected)	ACTUAL NET HEAD (PSIG) (rpm corrected)	Actual % of Rated Flow
1760	1733	133	3.26	129.75	1.75	0.97	0	0	0	134	0
"A-B" Leg Amperage			Voltage								
"B-C" Leg Amperage			Voltage								
"A-C" Leg Amperage			Voltage								
1760	1716	104	3.26	100.74	1.75	0.97	17	365	374		
"A-B" Leg Amperage			Voltage		1.75	0.97	17	365	374		
"B-C" Leg Amperage			Voltage		1.75	0.97	17	365	374		
"A-C" Leg Amperage			Voltage		1.75	0.97	17	365	374		
							TOTAL	1461	1497	106	99.81%
1760	1719	79	3.26	75.74	1.75	0.97	38	546	560		
"A-B" Leg Amperage			Voltage		1.75	0.97	38	546	560		
"B-C" Leg Amperage			Voltage		1.75	0.97	38	546	560		
"A-C" Leg Amperage			Voltage		1.75	0.97	31	493	505		
					1.75	0.97	0	0	0		
							TOTAL	2132	2184	79	145.62%
1760	1719	79	3.26	75.74	1.75	0.97	38	546	560		
"A-B" Leg Amperage			Voltage		1.75	0.97	38	546	560		
"B-C" Leg Amperage			Voltage		1.75	0.97	38	546	560		
"A-C" Leg Amperage			Voltage		1.75	0.97	31	493	505		
					1.75	0.97	0	0	0		
					1.75	0.97	0	0	0		
							TOTAL	2132	2184	79	145.62%
1760	1719	79	3.26	75.74	1.75	0.97	38	546	560		
"A-B" Leg Amperage			Voltage		1.75	0.97	38	546	560		
"B-C" Leg Amperage			Voltage		1.75	0.97	38	546	560		
"A-C" Leg Amperage			Voltage		1.75	0.97	31	493	505		
					1.75	0.97	0	0	0		
					1.75	0.97	0	0	0		
					1.75	0.97	0	0	0		
							TOTAL	2132	2184	79	145.62%



Appendix D
Requirements for New Water Main

REQUIREMENTS FOR NEW WATER MAIN INSTALLATION

REQUIREMENTS FOR NEW WATER MAIN INSTALLATIONS

Table of Contents

REQUIREMENTS FOR NEW WATER MAIN INSTALLATIONS

I. GENERAL

Developers of a Subdivision or extension of mains in the Town of Stratham desiring water service shall apply to the Town of Stratham. At the same time, the developer must submit plans and specifications indicating the installations proposed by the developer for review.

The developer shall assume all costs for engineering and installation of water main, hydrants and associated equipment. In addition, materials, pipe size, hydrant spacing, and installation shall be in accordance with the specifications herein. Criteria on Fire Flow requirements as determined by Insurance Services Offices (ISO) most recent Public Protection Classification (PPC) survey, used in determination of pipe sizes and hydrant spacing. Gate valves shall be installed to permit isolation of sections of water mains, where practicable, to facilitate future repairs on mains.

II. DESIGN CRITERIA

A) Plans and Specifications

All plans for water main extensions or improvements shall be drafted with the following specifications:

1. Plans shall be drafted on 24" x 34" (Max.) plan and profile sheets with a horizontal scale of 1" = 20' or 1" = 40'. Detail sheets need not be on plan - profile sheets.

2. Specifications shall be type written on standard 8½" x 11" sheets.

3. Town construction, material, installation and testing standards shall be incorporated into the plans and/or the specifications.

B) General Requirements

1. Service Pressure - Water system improvements shall be designed to provide a normal working pressure of not less than approximately 30 psi or more than 130 psi.

2. Main Size - The minimum size of all new water mains for providing fire protection and serving fire hydrants shall be 8 inch diameter. Larger size mains will be required if necessary to allow the withdrawal of the required fire flow or peak demand while maintaining a minimum residual pressure of 20 psi. The minimum size of all hydrant branch mains shall be 6 inch diameter.

3. Bury Depth - Pipe shall be laid at a minimum of five (5) feet (60") and at a depth of six (6) feet (72") wherever possible.

Hydrants - Unless otherwise required by the fire department the maximum spacing for fire hydrants intended to supply a fire flow requirement of 500 gallons per minute or less shall be 1000 feet and for fire flow requirements in excess of 500 gpm the maximum spacing shall be 500 feet. Closer spacing may be required in order to locate hydrant at street intersections or other points convenient to the fire department, or as required by the Town. In the case of main extensions by others, hydrants shall be paid for by the Owner and must meet the specifications of the Town. Upon acceptance of the main extension, the maintenance, repair or replacement of such hydrants shall become the responsibility of the Town.

4. Gate Valves - Gate valves shall be required at all main intersections and along the water main at intervals of 1000 feet. Gate valves are required on each hydrant branch and on all service mains adjacent to the hydrant branch. The Town shall decide on the final number and location of all valves.

5. Dead Ends - Dead ends shall be minimized by looping all new mains whenever practical as determined by the Town.

6. Air Relief Valves - Air relief valves shall be installed at all high points of the new main as determined by the Town. The size and design of the valve and piping shall be determined by the Town.

7. Blowoffs - Blowoffs or hydrants shall be installed at the ends of all dead end lines and at low points in mains as determined by the Town. The size and design of the blowoff valve and piping shall be determined by the Town.

8. Separation of Water Mains and Sewers:

A. PARALLEL INSTALLATION

1) NORMAL CONDITIONS- Water mains shall be laid at least 10 feet horizontally from any sanitary sewer, storm sewer or sewer manhole, whenever possible; the distance shall be measured edge to edge.

2) UNUSUAL CONDITIONS - When local conditions (such as ledge, bridges, etc.) prevent a horizontal separation of 10 feet, a water main may be laid closer to a storm or sanitary sewer provided that:

a. The bottom of the water main is at least 18 inches above the top of the sewer and a minimum of 5 feet edge to edge horizontally is provided.

b. Where this vertical separation cannot be obtained, the sewer shall be constructed of materials and with joints that are equivalent to water main standards of construction and shall be pressure tested to assure watertightness prior to backfilling.

c. The NHDES agrees that local conditions warrant less than 10 feet horizontal separation and approves the plans and specifications of the work.

B. CROSSINGS

1) NORMAL CONDITIONS - Water mains crossing over house sewers, storm sewers or sanitary sewers shall be laid to provide a separation of at least 18 inches between the bottom of the water main and the top of the sewer, whenever possible.

2) UNUSUAL CONDITIONS - When local conditions prevent a vertical separation as described in 8.A.2.a. the following construction shall be used:

a. Sewers passing over or under water mains should be constructed of the materials described with joints that are equivalent to the water main standards of construction and shall be pressure tested to assure watertightness prior to backfilling.

b. Water mains passing under sewers shall, in addition, be protected by providing a vertical separation of at least 18 inches between the bottom of the sewer and the top of the water main; adequate structural support for the sewers to prevent excessive deflection of joints and settling on and breaking the water mains; and that one full length of water pipe be centered at the point of crossing so that the joints will be equidistant and as far as possible from the sewer.

c. Services: No more than one customer shall be served from a service pipe under the control of a single curb stop or shut off. A separate meter shall be provided for each customer. Where the length of the service pipe is greater than 200 feet between the Town's main and the premises to be serviced, the water meter shall be placed in a meter pit at the edge of the right-of-way. The Town shall establish the size and type of construction of the meter pit. The Town shall determine the size of the service pipe based upon the information provided by the customer. No water services shall be installed in a common trench with other underground utilities; separation from sewers shall be as outlined in paragraph 1, above. Curb stops shall not be located in driveways or under pavement.

d. Backflow Devices: All water services shall be equipped with an approved backflow device in accordance with the Town's cross connection program. The backflow device shall be installed at the meter location unless otherwise approved by the Town.

e. Fire Services: A separate service shall be provided to serve a building sprinkler system and/or private fire protection system unless otherwise approved by the Town.

C. Review Process

Besides reviews by other state and local regulatory agencies ALL water line extensions shall go through the review process in the following order:

1) An approved site plan and an approved subdivision plan shall be submitted with the plans in the review process.

2) Plans shall be submitted to the Town for review, comment and approval. If approved, then:

3) Plans shall be submitted, by the Owner or his engineer, to the NH Dept. of Environmental Services, Drinking Water & Groundwater Bureau, P.O. Box 95, 6 Haven Drive, Concord, NH 03301, Tel.: 603-271-2513, for their review, comment and approval. If approved, then:

4) Copies of all approved plans and specifications shall be submitted to the Town.

5) The Contractor shall obtain trench permits from the Town of Stratham and/or State of NH DOT.

6) The Dig Safe Telephone Number: 888/344-7233

7) The Contractor is required to pay for the services of a Clerk of the works. The Town will hire the Clerk to ensure compliance with these regulations.

8) Upon completion of the installation, the Town will be provided with a "Mylar" print showing the as-built installation, plus two blueprints. As-built drawings shall include "**ties**" to all curb stops and valves. Also, a Deed or Certificate of Title shall be furnished to the Town before water services is turned on (see Attachments No. 1 & No. 2).

NOTE: The property owners shall personally be notified of the requirement in C.8 by the Town during the review process.

III. MATERIALS

A. Ductile Iron Pipe

Pipe shall be eight inch minimum in diameter and shall be ductile iron double cement lined, with a protective coating on the exterior of the pipe, conforming to the requirements of ANSI Standard A21 51/AWWA C151:LR for "Ductile Iron Pipe, Centrifugally Cast in Metal Molds or Sand Lined Molds for Water and Other Liquids". All ductile iron shall be made in North America. The minimum pipe thickness shall be Class 52, unless previously agreed to in writing by the Water Department. **All water works iron shall be made in North America**.

Ductile iron pipe shall have push-on joints, with rubber gaskets, except where pipe is to be joined with special fittings or valves in which case pipe shall be furnished with mechanical joints.

The nominal laying length of each pipe shall be shown in Tables 51.3 and 51.4 ANSI Standard A21.51-LR, except that a maximum of 20% of the total number of each pipe size specified in the order, may be furnished as much as 24 inches shorter than the nominal laying length.

Ductile iron pipe shall be designed in strict accordance with ANSI Standard A21-50-LR (AWWA C150-LR) for "Thickness design of Ductile-iron Pipe".

1. MARKING PIPE – Each ductile iron pipe shall have conspicuously painted on the exterior the pressure, class, and weight of the pipe.

2. LININGS & COATINGS – The outside surface of all pipe shall be factory coated with bituminous coating of either coal tar or asphalt base approximately 1 mil thick. The inside surface of all pipe shall receive a double cement mortar lining and bituminous seal coat in strict accordance with ANSI Standard A2.4/AWWA C104-LR for "Cement-Mortar Lining for Cast-iron Pipe with Fittings for Water".

3. MANUFACTURER'S AFFIDAVIT OF FACTORY INSPECTION AND TESTING – Upon request, the Developer shall provide a sworn affidavit of compliance that all Hydrostatic and Physical Properties Tests have been made and that the results of the same comply with the American Standard's Association (ASA) requirements.

4. DEVELOPERS RESPONSIBILITY FOR MATERIAL - The Developer is responsible for all material from procurement, handling, storage, and installation.

Pipe shall be handled in such a manner as to avoid damage to the coating and lining. Detrimental abrasions to coatings, as determined by the Clerk of the Works or the Town's Superintendent, shall be repaired by the Contractor or be cause for pipe replacement. The interior of the pipe shall be kept free of dirt and other foreign matter at all times. Material shall not be dropped or bumped.

5. DUCTILE IRON FITTINGS – Fittings for ductile iron water pipe shall be ductile or cast iron and shall meet the requirements of AWWA C110. Outside surface of all fittings shall be coated by hot coal tar dip method before lining. Inside cement lining shall be in accordance with AWWA C104. The minimum pressure rating for all fittings shall be 250 psi unless a higher pressure class is required for the specific installation. Unless otherwise required for joint restraint, joints on fittings shall be mechanical joints in accordance to AWWA C111.

B. THRUST RESTRAINT – Thrust restraint shall be appropriate for the soil type, size, and length of pipe and shall consist of thrust blocks and one of a variety of type restrained joints (e.g., Grip Ring™, Megalug®, etc.). Thrust blocks shall be cast in place concrete with a minimum compressive strength of 3000 psi at 28 days.

C. VALVES -

1. GATE VALVES: Gate valves should be iron body bronze mounted, resilient seat, mechanical joint, with stainless steel nuts and bolts for underground use, wrench operated, non-rising stem, and "O-ring" seal in accordance to AWWA C509. All valves shall open LEFT, and shall have the makers' initials, pressure rating, and the year of manufacturer cast on the body. The valves shall be Mueller A2370-20 or equal. Valves twelve (12") inches and smaller shall be designed for a water working pressure of two hundred (200) pounds per square inch and valves larger than twelve (12") inches shall have a working pressure of one hundred and fifty (150) pounds per square inch. Gate valves shall have a two inch (2") square nut for wrench operation and the operating nut shall have an arrow cast in metal indicating the direction of opening. Valves shall "OPEN LEFT". Valves shall have the makers' initials, pressure rating, and the year of manufacture cast on the body.

D. VALVE BOXES: Valve boxes shall be heavy pattern cast or ductile iron, cast in two or three telescoping sections of sliding construction and of such lengths as will provide, without full extension, the required cover. The lower section shall be five and one quarter (5¼") inch minimum inside diameter and shall be valved or domed at the bottom to fit over the valve nut. The upper section shall fit over the lower section. Covers shall be at least six (6") inches in diameter, shall fit flush with the top, shall be slotted for easy removal, and shall have the words "Water" and "Open" and a direction arrow plainly cast in relief on the top surface. Valve boxes shall be free from all defects in material and workmanship, and shall be coated with coal tar pitch enamel or other approved coating. Valve boxes shall be manufactured in North America.

E. HYDRANTS: Post Fire Hydrants shall have minimum 5½" opening, 6" hub inlet and two 2 ½ " hose and one 4½" pumper nozzles with National Standard threads. Operating nut shall open by turning to the LEFT and be five sided, 1½ point to flat. Hydrant shall conform to the latest revision of AWWA Standard for Fire Hydrants for Ordinary Water Works Service, serial designation (C502-LR). Hydrants shall be Smith H-205, Kennedy Guardian K-81A, or Mueller Super Centurion 200. Hydrants shall be fitted with stainless steel nuts and bolts.

In areas of installation where ground water table is higher than that of dry barrel hydrant drains, the drains shall be plugged (per Town discretion). A special note

of this application shall be made and immediately sent to the Fire Department and Water Department, noting exact location and/or number of Hydrant(s).

See Figure 1 (attached) for Hydrant Connection Details.

F. CORPORATE STOPS: Corporation stops shall be 1" (unless otherwise required) ball type compression. INLET: AWWA taper CC thread; OUTLET: Conductive compression connection for C.T.S. O.D. corporation stops shall be equal to Mueller CAT #B-25008 or Ford CAT #FB1000.

G. COPPER WATER TUBE: Copper tube shall be 1" (unless otherwise required) Soft temper, type "K" conforming to ASTM B-88. No splices will be allowed from the corporation stop to the curb box stop. Service lines shall be installed through a 4" PVC pipe when crossing under the roadway.

H. CURB STOPS AND BOXES: Curb stops shall be 1" (unless otherwise required) ball type compression conductive compression connections for C.T.S. O.D. both ends. Curb stops shall be equal to Mueller Cat. #B-25209 or Ford Cat. #B44-444G.

Curb boxes shall conform to the specifications for Valve Boxes except that for curb boxes for curb stops 2 inches and smaller shall have a one-piece cast or ductile iron arch base, a steel pipe extension upper section, cast iron lid and thread bronze plug with pentagon nut (rope thread). A stationary 5/8 inch minimum diameter by 24-30 inches minimum stainless steel long rod shall be installed in each curb box.

Curb boxes shall be set plumb and flush with finish grade. In addition, no obstruction shall be placed to obstruct use of shut-off valve wrench within a 6 foot circumference from center of curb box. Curb boxes shall be manufactured in North America.

I. BACKFILL

1) Common Fill Mineral soil substantially free from organic materials, loam, wood, trash, and other objectionable materials which may be compressible or which cannot be properly compacted. Common fill shall contain no stones larger than 6 inches in diameter. Common fill shall have properties such that it can be readily spread and compacted. Snow, ice and frozen material shall not be permitted.

2) Screened Gravel shall be well graded in size from 1/4 inch to 3/4 inch and shall consist of clean, hard, and durable particles or fragments. It shall be free from dirt, vegetable, or other objectionable matter, and excess of soft, thin elongated, laminated or disintegrated pieces. The grading shall

Square Opening	1"	¾"	3/8"	No. 4	No. 8
% Passing by Weight	100	96-100	20-55	0-10	0-5

conform to the following requirements:

Sieve Designation % Passing by Weight

3) Granular fill shall consist of hard, durable stone and coarse sand, free from frost, frozen lumps, loam and clay, well graded, and containing no stone having any dimension greater than 1 inch. The grading of sizes and material shall be such that the gravel may be thoroughly consolidated. The grading shall conform to the following requirements:

Sieve Designation % Passing Weight

Square Opening	¾"	No. 4	No. 40	No. 200
% Passing by Weight	95-100	50-95	5-50	0-10

J. PAVEMENT

Provide all materials in accordance with the applicable sections of the latest edition of the Standard Specification for Highways and Bridges of the New Hampshire Department of Transportation (D.O.T.).

1) AGGREGATE SUBBASE AND BASE - Division 700 - Material Details, Section 703 - Aggregates, Subsection 703.06 - type A and Type B for Aggregate Base.
2) BITUMINOUS TACK COAT - Provide AE90 Asphalt Emulsion Material, Division 700 Material Details, Section 702 Bituminous Material, Subsection 702.04 Emulsified Asphalts.
3) BITUMINOUS CONCRETE BINDER AND SURFACE COURSES - Division 700 Materials Details, Section 702 Bituminous Material and Section 703 Aggregates Subsection 703.09, Grading B and Grading C for roadways; Grading C and D for sidewalks, islands and drives.
4) SIDEWALKS (When Applicable): Division 700 Material Details and (When Applicable) Section 608 Sidewalks.

IV. CONSTRUCTION METHODS

A) General

In unloading, storing, stacking and handling of pipe, fittings, valves or appurtenances, the contractor shall take special care to insure that his methods are consistent with methods employed by the manufacturer in the manufacture and shipping of the product. Insofar as possible, all heavy materials shall be carefully handled by the use of hoists or skidways to avoid shock or damage. Pipe handled on skidways shall not be skidded or rolled against pipe already on the ground. It shall be the contractor's responsibility to inspect all shipments, and to replace or repair at his own expense any materials which have been damaged through his own negligence. Whenever possible, pipe shall be strung along the routes with the bell ends facing in the direction in which the work is to proceed.

B) Trench Evacuation

The contractor shall be responsible to excavate trench/trenches in a manner consistent with all safety requirements prescribed by OSHA and/or State regulations for the soil type(s) involved. However, The Town does reserve the right to request trench adjustment (for safety reasons) prior to Town Personnel performing in-trench inspections or tapping. Special care shall be taken to protect existing underground utilities and support the sides of the trench to prevent movement, to include the use of sheeting, shoring and bracing. The contractor shall also be required to do all dewatering of the trench which may be necessary to insure that the trench bottom is firm and dry. If, in the opinion of the Town, unsatisfactory soil conditions exist at the required trench grade, the contractor may be required to excavate below normal trench grade until suitable foundation material is encountered. The excavation shall then be backfilled with screened gravel in six inch layers. Each layer shall be properly tamped and compacted until normal trench grade is obtained. The contractor shall make such additional excavations as may be necessary to provide for proper placement of concrete thrust blocks, valves, hydrants, services and other appurtenances as shown on the plans or as required by the Water Department.

C) Cover

All water main trenches shall be such that a minimum cover of 5 feet to 6 feet where possible, is provided over the pipe, except at gate valves where a minimum of 3 feet of cover shall be provided at the top of the valve bonnet. The maximum depth of cover shall be 7 feet unless approved otherwise by the Town.

D) Bedding the Pipe and Fittings

All pipe and fittings shall be placed on a layer of bedding material consisting of compacted screened gravel or granular fill. The depth of the bedding shall be 6 inches minimum or equal to one half the diameter of the pipe whichever is greater. Any voids under the pipe shall be filled and thoroughly tamped.

E) Laying the Pipe and Fittings

The pipe shall be placed in the trench in accordance with the manufacturer's recommendations or by an approved method in such a manner as to insure that the pipe is not damaged. All pipe shall be thoroughly sound, dry and clean, before laying and the utmost of care shall be taken to insure that its condition is not altered when it is placed on the bed. A water tight plug shall be installed once the pipe is in place to keep out ground water and dirt. All work associated with laying the pipe shall conform to A.W.W.A. Standard Specification C600 wherever applicable and not in conflict with the provisions contained in these specifications. When the pipe is in place, screened gravel or granular fill, whichever is applicable, shall be placed in the trench and thoroughly compacted in six inch lifts to 12 inches above the top of the pipe.

1. VALVES*:* The contractor shall install all valves and tapping sleeves and valves together with valve boxes, at the locations shown on the plans or as directed by the Town. In general, valves shall be installed as close as possible to plumb and in accordance with the applicable subsections 4(c) and 4(d) of this article, and in accordance with the manufacturer's recommendations. Valve boxes shall be installed at every valve location and shall be adjusted to the proper finish grade

and set plumb and centered over the operating nut of the valve. The contractor shall exercise special care that the valve box is free of dirt and other obstructions and that the base does not rest on the valve bonnet. An earth cushion shall be provided between the bonnet and the base. After installation is completed, all valves shall be operated and then left in the closed position.

2. TAPPING SLEEVES AND VALVES: Shall be installed with the outlet flange set vertically and the sleeve squarely centered on the main. Concrete or granite blocking shall be placed beneath the sleeve and valve to provide support. Concrete thrust blocking shall be placed behind and under the sleeve and valve after the tap is completed. The valve shall be flushed after completing the taps to ensure the valve seat is clean. Bituminous coating shall be applied to the bolts and nuts holding the sleeve together.

3. HYDRANTS: The hydrant shall be set plumb and at the proper elevation with respect to final finished grade. The break away flange shall be set two inches above finish grade. The hydrant base shall be set on fine material. The hydrant branch valve and hydrant tee shall be adequately anchored together by mechanical means (anchor tee) and by concrete thrust blocks. Hydrant locations shall be such that no part of the hydrant is within one foot of the curb line and no less than twenty feet from an intersecting street. The final location of the hydrant shall be approved by the Town. Prior to any hydrant being tested under pressure, all hydrant laterals and mains shall be flushed to remove dirt, rocks, and foreign matter. Each nozzle and pumper outlet shall be at least eighteen (18") inches above grade on the installed hydrant. Steamer connection shall face the traveled way. Each hydrant shall be provided with an approved gate valve at an easily accessible location, located off the traveled way. Hydrants shall be painted to meet Town requirements for color.

F) Thrust Restraint: Concrete thrust blocks and joint restraint shall be installed at all bends, fittings, dead ends and hydrants as shown on the plans or as directed by the Town. The bearing area of the thrust blocks shall be determined for each installation based on soil type and system design pressure. The thrust block shall be formed in such a way that as much of the undisturbed earth on the trench wall and bottom will be incorporated into the forming as is possible. In making both the forms and the pour, special care shall be taken to insure that concrete is not poured in and around the joints of the pipes and fittings. Fittings and joints shall be wrapped in plastic prior to pouring concrete. In the event that other utilities or local conditions prohibit the use of thrust blocks, the contractor shall furnish and install additional mechanical thrust resisting devices, upon the approval of such devices by the Town.

G) Service Connections: Services shall be constructed in accordance with the most recent revision of the BOCA, CABO, and International Plumbing Codes.

1. CORPORATION STOPS: The contractor shall furnish and install all corporation stops at the locations as shown on the plans or as directed by the Town. A tapping machine shall be used which will permit tapping of water mains under pressure. The tapping machine shall be rigidly fastened to the pipe and the tap shall be made in the upper one-half of the pipe. The length of travel of the tap shall be so established that when

the stop is inserted and tightened with a fourteen inch wrench, not more than one to three threads will be exposed on the outside. When the wet tap is made, the corporation shall be inserted with the machine still in place.

2. COPPER TUBING: The contractor shall furnish and install copper tubing at the locations as shown on the plans or as directed by the Town. Excavation for services shall be to a minimum depth of 5 feet and the contractor shall exercise special care to insure that the bottom is free from sharp rocks or ledge outcroppings. In placing the service in the trench, the contractor shall be careful that the copper tubing has no kinks or sharp bends and that the screened gravel (or granular fill) placed to a depth of six inches over and around the service is free from large or sharp stones which may come in contact with the service.

3. CURB STOPS AND BOXES: Curb stops and boxes shall be furnished and installed by the contractor where noted on the plans or as directed by the Town. The contractor shall place compacted gravel around and below the curb stop. The curb box shall be set flush with the finish grade and at or near the property line.

H) Pressure and Leakage Testing - The Contractor shall furnish the necessary equipment and labor for carrying out a pressure test and leakage test, as specified in AWWA C600, on the completed pipes. The pressure and leakage test shall be conducted concurrently. Prior to leakage and chlorination, the mains shall be flushed to remove dirt and other foreign substances.

1. LEAKAGE TEST: (Refer to ANSI/AWWA C600-LR) All air in the pipeline to be tested shall be expelled.

The newly laid pipe shall be tested in valved or plugged sections as determined in the field. Water shall be slowly introduced by means of an approved power-driven pump. The pressure shall be raised to 150 PSI measured at the lowest point (if practical) of the section being tested as determined by Town Superintendent; when reached, the time of test shall begin.

The duration of each leakage test shall be two hours, and during the test water will be introduced into the main by pumps. Leakage shall be defined as the quantity of water that must be supplied into the newly laid pipe to maintain pressure within 5 PSI of the test pressure.

Approved pressure gauge and flow meters shall be installed to indicate pressure in line and amount of water being introduced into the pipe line. Gauges must show that they have been calibrated within one year of testing.

No pipe installation will be accepted if the leakage is greater than that determined by the following formula (refer to ANSI/AWWA C600-LR Section 4):

$$L = \frac{SD\sqrt{P}}{133{,}200}$$

Where: L = allowable leakage, in gallons per hour
S = length of pipe tested, in feet
D = nominal diameter of pipe, in inches
P = average test pressure during the leakage test, in pounds per square inch (gauge).

At the end of the test period if the amount of water added to the main is less than the allowable leakage, and if no visible leaks or other failures, the portion of the main tested will be approved by the Town' representative. If any test of pipe laid discloses leakage greater than that specified, the contractor shall, at his own expense, locate and repair the defective material until the leakage is within the specified allowance.

2. DISINFECTION: Following satisfactory pressure and leakage test, a newly installed main shall be disinfected by the contractor and under the direction of the Town representative. A modified "slug" method (ANSI/AWWA C651-LR) shall be used. The form of chlorine used for disinfection shall be liquid sodium hypochlorite. Common household bleach containing approximately 5% sodium hypochlorite (vol. %) or industrial bleach containing 15% sodium hypochlorite (vol. %) may be used. A concentration of approximately 50 mg/l free chlorine shall be achieved throughout the main, at which time the main shall be sealed off for a period of 24 hours. At the end of the retention period, sufficient residual chlorine (approximately 10 mg/l) as determined by the Town representative shall be present.

NOTE: The modification of the "slug" method (lower concentration hypochlorite, longer retention time) assures proper disinfection while reducing the amount of free chlorine discharge to the environment.

3. FLUSHING: Following disinfection the chlorinated water shall be flushed until the replacement water throughout the system is equal to the quality of the Twon water as determined by the Town representative. This flushing shall be done as soon as possible (within 24 hours of satisfactory disinfection) since prolonged exposure to highly chlorinated water might damage the asphalt seal coating of the pipe.

Additionally, the environment into which the heavily chlorinated water is to be discharged shall be inspected to assure discharge shall cause no damage to the environment.

4. SANITARY SAMPLING: After satisfactory flushing, samples of the new main shall be taken by the Town representative and submitted to a qualified laboratory for coliform testing. Two consecutive samples shall be taken at least 24 hours apart from each 1200 feet of new main. The new water main shall not be put in service until satisfactory samples are achieved, and as-built drawings and deed or certificate of title have been received by the Town.

V. ELECTRIC POWER AND TELEPHONE LINES

Underground Electric and Telephone line installation shall NOT be installed in the same trench as the water main.

Wherever possible, the electric and telephone lines shall be installed on the opposite side of the street from the water main. However, if it is necessary to install underground power and telephone lines on the same side of the street as the water main, the approval of the Town shall be required.

Wherever the electric or telephone lines must cross either mains or service branches, the installation shall be in conduit encased in concrete. The concrete shall extend laterally for a minimum distance of five feet each side of the water installation.

If the lines are laid parallel to mains or service branches, including those between street shut-off and house, there must be a lateral separation of a minimum of six feet.

There shall be NO installation of any electric or telephone line within ten feet of a hydrant or house service street shut-off.

A) Warning Tape - All water, electric, cable, and telephone lines must be marked with underground warning tape located a minimum of 1'-6" above the utility or as required by local utility.

B) Private Fire Protection - There shall be a separate pipe, gated on Municipal property, for private fire protection. In no case shall the fire service pipe be used for anything other than fire protection.

VI. ADDITIONAL REQUIREMENTS

Subdivision Developer Will Be Responsible For The Water Line And Materials For Two (2) Years After Being Deeded To The Town of Stratham.

TOWN OF STRATHAM

_____

_____

KNOW ALL MEN BY THESE PRESENTS

That I, _____ of _____, Rockingham County and said State of New Hampshire, hereinafter called the "Grantor", for and in consideration of the sum of One Dollar ($1.00) to it in hand before the delivery hereof well and truly paid by the Town of Stratham, in the county of Rockingham and State of New Hampshire, hereinafter called the "Town", does hereby sell and convey unto said Town, its successors and assigns, the perpetual and exclusive right and easement to enter upon and to repair, replace, maintain, operate, inspect and patrol and at its pleasure, remove a water pipeline already laid over, in and across _____, situate in said Town, said land being more particularly described as follows:

It is agreed that said water pipeline shall be and remain the property of the Town, its successor and assigns.

TO HAVE AND TO HOLD the same to said Town, its successors and assigns, forever and the Grantor covenants and agrees that he has full right, title and authority to convey the foregoing rights and privileges and will defend the same against the claims or demands of all persons whomsoever.

IN WITNESS WHEREOF, I have hereunto set my hand and seal this _____ day of _____, 20____.

Singed, sealed and delivered
in the presence of

_____ _____

STATE OF NEW HAMPSHIRE
Rockingham, ss.

Personally appeared the above named _____ and acknowledged the foregoing to be his voluntary act and deed, before me.

.

_____
Justice of the Peace/Notary Public

Attachment 1

TITLE CERTIFICATE

This will certify that I, as attorney for the developer hereinafter mentioned, have made a careful examination of the records in Rockingham County Registry of Deeds and Registry of Probate insofar as they relate to the property of _____ as set forth in the Warranty Deed from _____ dated _____, 20____ and recorded in _____ County Registry of Deeds on _____, 20____ at _____ a.m./p.m. in Book _____ Page _____, and I further certify that the water system laid over and in said real estate is presently owned by the grantee/developer and that said grantee/developer is able, upon request of the Town, to deliver a good and sufficient deed to same to said Town.

_____
Attorney for the above developer

Date: _____

SIGN-OUT FORM

TOWN OF STRATHAM

REQUIREMENTS FOR NEW WATER MAIN INSTALLATIONS

I, _____, representing, _____, have received a copy of the Town of Stratham Requirements for new water main installations dated _____.

Signature: _____

Date: _____

Attachment #3

REVISION HISTORY SHEET

Revision Number	Revision Date	Change(s)	Prepared by (Signature/Date)	Approved by: (Signature/date - Superintendent & Commission)

Attachment 4

Appendix E
NHDOT Encroachment Permit Requirements

Encroachment Permit Application Requirements

The following information is required for an encroachment permit for anyone encroaching on the New Hampshire Department of Transportation (NHDOT) Bureau of Turnpikes Limited Access Right of Way (LAROW):

- The name and address of the owner and contact information.
- The name and address of the owner's representative responsible for signing the permit and contact information.
- The name and address of the contractor performing the work including the contractor's contact person and contact information.
- Location and limits of the work (shown on a NHDOT plan depicting the LAROW which can be obtained from NHDOT Records Department located at the John O. Morton Building on Hazen Drive in Concord, NH) and a locus map showing general location of work.
- An explanation of why the work needs to encroach on the LAROW and what alternatives were evaluated and why the alternatives are not feasible.
- Description of the work being performed including all areas in the LAROW that will be disturbed, and any applicable engineering drawings that detail the work sufficiently. A Traffic Control Plan (TCP) will need to be submitted for any work that could potentially impact the flow of traffic, the TCP shall be prepared, signed, and stamped by a Licensed Professional Engineer licensed in the state of New Hampshire. All plans will be submitted for documentation and should be submitted in sets of three (3).
- Contractor to furnish a Certificate of Insurance for General Liability for a minimum of one million dollars ($1,000,000), Aggregate and Worker's Compensation and Employer's Liability for a minimum of five hundred thousand dollars ($500,000.00)
- Contractor to furnish a continuing Surety Bond naming the State as an additional insured for 100% of the cost of work (or an amount otherwise accepted by The Bureau of Turnpikes) guaranteeing the fulfillment of the scope of work during performance of the work and satisfactory maintenance of the disturbed areas for a period of two years following the acceptance of the project by the Owners.
- Dates for work to begin and work to end.
- A $30.00 processing fee.

Appendix F
Water Quality Report on Existing Well at the Scamman Property

NELSON ANALYTICAL LAB

150 Kaye Street
Manchester, NH 03103
www.testNH.com

New Hampshire Environmental Lab Accreditation Program
NELAC Accreditation #NH1005

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(603) 666-0055 fax
info@nelsonanalytical.com

REPORT OF ANALYSIS

Smith Pump Company
48 Londonderry Turnpike
P.O. Box 16358
Hooksett, NH 03106
Steve Smith / Jack Porter

Date Collected: 12/23/09
Collected By: SMITH PUMP
Date Received 12/23/09
Date Reported 1/13/10
Laboratory ID: 2912-00952

Sample Description: WELL WATER - TOWN OF STRATHAM, SCAMMAN FARM, STRATHAM, NH
Temp. rec'd: 9 oC

PARAMETERS	RESULTS	ACCEPTABLE LEVELS	UNITS	DATE ANALYZED	TEST METHOD	TEST TYPE	TEST REMARKS
Total Coliform	ABSENT	ABSENT	/100ml	12/23/09	9223B	PRIMARY	ACCEPTABLE
E. coli	ABSENT	ABSENT	/100ml	12/23/09	9223B	PRIMARY	ACCEPTABLE
Nitrate Nitrogen	<1.0	10	mg/l	12/28/09	4500NO3D	PRIMARY	ACCEPTABLE
Iron	0.07	0.3	mg/l	12/28/09	200.7	SECONDARY	ACCEPTABLE
Manganese	0.01	0.05	mg/l	12/28/09	200.7	SECONDARY	ACCEPTABLE
Chloride	<6	250	mg/l	12/28/09	4500CLD	SECONDARY	ACCEPTABLE
Sodium	29	250	mg/l	12/28/09	200.7	SECONDARY	ACCEPTABLE
Hardness	79	150	mg/l	12/28/09	2340B	SECONDARY	ACCEPTABLE
pH	7.67	6.5-8.5	S.U.	12/23/09	4500HB	SECONDARY	ACCEPTABLE
Arsenic	0.003	0.010	mg/l	12/28/09	3113B	PRIMARY	ACCEPTABLE
Turbidity	0.25	5.0	NTU	12/23/09	2130B	SECONDARY	ACCEPTABLE
Apparent Color	<5	15	Pt-Co	12/23/09	8025	SECONDARY	ACCEPTABLE
Alkalinity	130	na	mg/l	12/28/09	2320B	SECONDARY	ACCEPTABLE
Total Suspended Solids	<10		mg/l	12/29/09	2540D		
Total Organic Carbon	<0.5		mg/l	1/07/10	5310B		
Uranium (sub)	1.2	30	ug/l	1/06/10	D5174	PRIMARY	ACCEPTABLE
Gross Alpha (sub)	2.4+-1.9	SEE NOTE	pCi/l	1/11/10	900.0	SEE NOTE	SEE NOTE
Compliance Alpha	1.6+-1.9	15	pCi/l	1/11/10	CALC.	PRIMARY	ACCEPTABLE
Sulfate	12	250	mg/l	12/24/09	8051	SECONDARY	ACCEPTABLE
Radon	2460	SEE NOTE	pCi/l	12/24/09	7500RN	SEE NOTE	SEE NOTE
VOLATILE ORGANICS (SUB)				12/31/09	524.2		
Bromodichloromethane	<0.5	na	ug/l	12/31/09	524.2	PRIMARY	ACCEPTABLE
Bromoform	<0.5	na	ug/l	12/31/09	524.2	PRIMARY	ACCEPTABLE
Chloroform	<0.5	na	ug/l	12/31/09	524.2	PRIMARY	ACCEPTABLE
Chlorodibromomethane	<0.5	na	ug/l	12/31/09	524.2	PRIMARY	ACCEPTABLE
Total Trihalomethanes	<2.0	100	ug/l	12/31/09	524.2	PRIMARY	ACCEPTABLE
Benzene	<0.5	5.0	ug/l	12/31/09	524.2	PRIMARY	ACCEPTABLE
Bromobenzene	<0.5	na	ug/l	12/31/09	524.2	PRIMARY	ACCEPTABLE
Bromochloromethane	<0.5	na	ug/l	12/31/09	524.2	PRIMARY	ACCEPTABLE
Bromomethane	<0.5	na	ug/l	12/31/09	524.2	PRIMARY	ACCEPTABLE
n-Butylbenzene	<0.5	na	ug/l	12/31/09	524.2	PRIMARY	ACCEPTABLE
sec-Butylbenzene	<0.5	na	ug/l	12/31/09	524.2	PRIMARY	ACCEPTABLE
tert-Butylbenzene	<0.5	na	ug/l	12/31/09	524.2	PRIMARY	ACCEPTABLE
Carbon Tetrachloride	<0.5	5.0	ug/l	12/31/09	524.2	PRIMARY	ACCEPTABLE
Chloroethane	<0.5	na	ug/l	12/31/09	524.2	PRIMARY	ACCEPTABLE
Chloromethane	<0.5	na	ug/l	12/31/09	524.2	PRIMARY	ACCEPTABLE
o-Chlorotoluene	<0.5	na	ug/l	12/31/09	524.2	PRIMARY	ACCEPTABLE
p-Chlorotoluene	<0.5	na	ug/l	12/31/09	524.2	PRIMARY	ACCEPTABLE

(Report Continued on Next Page)

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REPORT OF ANALYSIS

Smith Pump Company
48 Londonderry Turnpike
P.O. Box 16358
Hooksett, NH 03106
Steve Smith / Jack Porter

Date Collected: 12/23/09
Collected By: SMITH PUMP
Date Received 12/23/09
Date Reported 1/13/10
Laboratory ID: 2912-00952

Sample Description: WELL WATER - TOWN OF STRATHAM, SCAMMAN FARM, STRATHAM, NH

Temp. rec'd: 9 oC

PARAMETERS	RESULTS	ACCEPTABLE LEVELS	UNITS	DATE ANALYZED	TEST METHOD	TEST TYPE	TEST REMARKS
Dibromomethane	<0.5	na	ug/l	12/31/09	524.2	PRIMARY	ACCEPTABLE
1,2-Dichlorobenzene	<0.5	600	ug/l	12/31/09	524.2	PRIMARY	ACCEPTABLE
1,3-Dichlorobenzene	<0.5	na	ug/l	12/31/09	524.2	PRIMARY	ACCEPTABLE
1,4-Dichlorobenzene	<0.5	5.0	ug/l	12/31/09	524.2	PRIMARY	ACCEPTABLE
Dichlorodifluoromethane	<0.5	na	ug/l	12/31/09	524.2	PRIMARY	ACCEPTABLE
1,1-Dichloroethane	<0.5	na	ug/l	12/31/09	524.2	PRIMARY	ACCEPTABLE
1,2-Dichloroethane	<0.5	5.0	ug/l	12/31/09	524.2	PRIMARY	ACCEPTABLE
1,1-Dichloroethene	<0.5	7.0	ug/l	12/31/09	524.2	PRIMARY	ACCEPTABLE
cis-1,2-Dichloroethene	<0.5	70.0	ug/l	12/31/09	524.2	PRIMARY	ACCEPTABLE
trans-1,2-Dichloroethene	<0.5	100	ug/l	12/31/09	524.2	PRIMARY	ACCEPTABLE
Dichloromethane	<0.5	5.0	ug/l	12/31/09	524.2	PRIMARY	ACCEPTABLE
1,2-Dichloropropane	<0.5	5.0	ug/l	12/31/09	524.2	PRIMARY	ACCEPTABLE
1,3-Dichloropropane	<0.5	na	ug/l	12/31/09	524.2	PRIMARY	ACCEPTABLE
2,2-Dichloropropane	<0.5	na	ug/l	12/31/09	524.2	PRIMARY	ACCEPTABLE
1,1-Dichloropropene	<0.5	na	ug/l	12/31/09	524.2	PRIMARY	ACCEPTABLE
cis-1,3-Dichloropropene	<0.5	na	ug/l	12/31/09	524.2	PRIMARY	ACCEPTABLE
trans-1,3-Dichloropropene	<0.5	na	ug/l	12/31/09	524.2	PRIMARY	ACCEPTABLE
Ethylbenzene	<0.5	700	ug/l	12/31/09	524.2	PRIMARY	ACCEPTABLE
Hexachlorobutadiene	<0.5	na	ug/l	12/31/09	524.2	PRIMARY	ACCEPTABLE
Isopropylbenzene	<0.5	na	ug/l	12/31/09	524.2	PRIMARY	ACCEPTABLE
p-Isopropyltoluene	<0.5	na	ug/l	12/31/09	524.2	PRIMARY	ACCEPTABLE
Monochlorobenzene	<0.5	100	ug/l	12/31/09	524.2	PRIMARY	ACCEPTABLE
Naphthalene	<0.5	na	ug/l	12/31/09	524.2	PRIMARY	ACCEPTABLE
n-Propylbenzene	<0.5	na	ug/l	12/31/09	524.2	PRIMARY	ACCEPTABLE
Styrene	<0.5	100	ug/l	12/31/09	524.2	PRIMARY	ACCEPTABLE
1,1,1,2-Tetrachloroethane	<0.5	na	ug/l	12/31/09	524.2	PRIMARY	ACCEPTABLE
1,1,2,2-Tetrachloroethane	<0.5	na	ug/l	12/31/09	524.2	PRIMARY	ACCEPTABLE
Tetrachloroethene	<0.5	5.0	ug/l	12/31/09	524.2	PRIMARY	ACCEPTABLE
Tetrahydrofuran (THF)	<5	na	ug/l	12/31/09	524.2	PRIMARY	ACCEPTABLE
Toluene	1.0	1000	ug/l	12/31/09	524.2	PRIMARY	ACCEPTABLE
1,2,3-Trichlorobenzene	<0.5	na	ug/l	12/31/09	524.2	PRIMARY	ACCEPTABLE
1,2,4-Trichlorobenzene	<0.5	70.0	ug/l	12/31/09	524.2	PRIMARY	ACCEPTABLE
1,1,1-Trichloroethane	<0.5	200	ug/l	12/31/09	524.2	PRIMARY	ACCEPTABLE
1,1,2-Trichloroethane	<0.5	5.0	ug/l	12/31/09	524.2	PRIMARY	ACCEPTABLE
Trichloroethene	<0.5	5.0	ug/l	12/31/09	524.2	PRIMARY	ACCEPTABLE
Trichlorofluoromethane	<0.5	na	ug/l	12/31/09	524.2	PRIMARY	ACCEPTABLE
1,2,3-Trichloropropane	<1.0	na	ug/l	12/31/09	524.2	PRIMARY	ACCEPTABLE
1,2,4-Trimethylbenzene	<0.5	na	ug/l	12/31/09	524.2	PRIMARY	ACCEPTABLE
1,3,5-Trimethylbenzene	<0.5	na	ug/l	12/31/09	524.2	PRIMARY	ACCEPTABLE

(Report Continued on Next Page)

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Sample Description: WELL WATER - TOWN OF STRATHAM, SCAMMAN FARM, STRATHAM, NH

Temp. rec'd: 9 oC

PARAMETERS	RESULTS	ACCEPTABLE LEVELS	UNITS	DATE ANALYZED	TEST METHOD	TEST TYPE	TEST REMARKS
Vinyl Chloride	<0.5	2.0	ug/l	12/31/09	524.2	PRIMARY	ACCEPTABLE
Total Xylenes	<2.5	10000	ug/l	12/31/09	524.2	PRIMARY	ACCEPTABLE
2-Butanone (MEK)	<10	na	ug/l	12/31/09	524.2	PRIMARY	ACCEPTABLE
4-Methyl-2-Pentanone(MIBK	<10	na	ug/l	12/31/09	524.2	PRIMARY	ACCEPTABLE
MtBE	<0.5	13.0	ug/l	12/31/09	524.2	PRIMARY	ACCEPTABLE
Ethyl-t-butyl Ether(ETBE)	<0.5	na	ug/l	12/31/09	524.2	PRIMARY	ACCEPTABLE
Diisopropyl Ether (DIPE)	<10	na	ug/l	12/31/09	524.2	PRIMARY	ACCEPTABLE
t-amyl methyl ether(TAME)	<0.5	na	ug/l	12/31/09	524.2	PRIMARY	ACCEPTABLE
t-Butyl Alcohol (TBA)	<50	na	ug/l	12/31/09	524.2	PRIMARY	ACCEPTABLE

RADON NOTE: Both the EPA and the State of New Hampshire have yet to adopt a formal regulatory limit for Radon in drinking water. The EPA has proposed a limit of 4000 pCi/l. In 1991 New Hampshire recommended a limit of 2000 pCi/l. Massachusetts has a recommended limit of 10,000, Vermont 4,000, and Maine 4,000 pCi/l.
For more information, contact the NH DES Radon Office at 603-271-6845 or consult the EPA website www.epa.gov/radon

TEST TYPES: PRIMARY: EPA regulated as a health related parameter
SECONDARY: Aesthetic parameter - non-health related

Respectfully Submitted

Andrew O. Nelson, Laboratory Director

NELSON ANALYTICAL LAB - TEST DESCRIPTIONS

Total Coliform & E.coli Bacteria (Limit = "ABSENT" per 100ml)

The organisms in the total coliform group are called indicator organisms. That is, if present, they indicate that there is a **possibility, but not a certainty**, that disease organisms may **also** be present in the water. When absent there is a very low probability of disease organisms being present in the water. The ability of the total coliform test to reliably predict the bacterial safety of water relative to the hundreds of possible diseases that might be present is critical since it is impossible, in a practical sense, to check separately for every disease organism directly on a monthly or quarterly basis. The presence of only **Total Coliform** generally does not imply an imminent health risk but does require an analysis of all water systems facilities and their operation to determine how these organisms entered the water system. **Escherichia Coli (e-coli).** This is a specific species (subgroup) within the coliform family. They originate only in the intestines of animals and humans. They have a relatively short life span compared to more general Total Coliform. Their presence indicates a strong likelihood that human or animal wastes are entering the water system, and have a much higher likelihood of causing illness.

Iron & Manganese (Limits = 0.3 & 0.05 mg/l respectively)

These occur naturally in New Hampshire's geology. They dissolve into groundwater as acidic rainfall percolates through the soil and rock. In higher concentrations, they can cause the following problems:

1. Staining on laundry and water fixtures.
2. Taste - a metallic or vinyl type taste in the water.
3. Appearance – occasionally will give an oily appearing, "crusty" sheen to the water's surface.
4. Clogging. - supports the growth of Iron bacteria. These non-health related bacteria can clog strainers, pumps, and valves.

EPA, at present, has not set health standards for either iron or manganese in drinking water. They are both considered aesthetic concerns only.

Hardness (Limit = 150 mg/l)

The presence or absence of conventional hardness in drinking water is not known to pose a health risk to users. Hardness is normally considered an aesthetic water quality factor. The presence of some dissolved mineral material in drinking water is typically what gives the water its characteristic and pleasant "taste". At higher concentrations however, hardness creates the following consumer problems:

1. Produces white mineral deposits on tubs, showers, and dishes
2. Reduces the efficiency of devices that heat water. As hardness deposits build in thickness, they act like insulation, reducing heat transfer.
3. Can reduce the ability of soaps to create suds, thus reducing the efficiency of cleaning ability. Can cause problems with laundry.

Nitrate & Nitrite Nitrogen (Limits = 10.0 & 1.0 mg/l respectively)

Nitrate is a component in fertilizer, and both nitrate/nitrite are found in sewage and sanitary wastes from humans and animals. Nitrate/nitrite concentrations are not normally high in New Hampshire wells or surface waters. When elevated, the surrounding area is often heavily developed, used for agricultural purposes, or subject to heavy fertilization. Excessive levels of these nitrogen compounds in drinking water have caused serious illness and sometimes death in infants under six months of age. Symptoms include shortness of breath and blueness of the skin (methemoglobinemia).

Sodium & Chloride (Limits = 250 mg/l for each)

The compound known as "salt" consists of the elements sodium and chloride. Substantially higher levels of Sodium and Chloride tend to imply contamination by activities of man including road salt storage, use of road salts, and discharges from water softeners. Typical background levels of Sodium and Chloride for pristine locations in New Hampshire are generally less than 15 mg/L and 30 mg/L respectively.

pH (Acceptable Range = 6.5 – 8.5)

The pH of water is a measure of its acidity or alkalinity. A low pH indicates acidic water, which is therefore likely to be corrosive to household plumbing such as copper pipes. In older homes (prior to mid to late 1980's) the plumbing may also contain Lead in the soldered joints. Corrosive water will dissolve these metals from the plumbing into the water. Dissolved Copper & Lead in drinking water can be a health concern, and can also be a maintenance concern as the water corrodes the plumbing in the home eventually causing water leaks.

Lead & Copper (Limits = 0.015 & 1.3 mg/l respectively)

Found in water with corrosive tendencies (see pH). There is an extremely low occurrence of naturally occurring lead & copper in water. It is nearly always from plumbing systems with copper lines and/or lead solder. Levels are highest after water has been stagnant in the pipes. The recommended method for testing of Lead & Copper when plumbing is a concern is to sample water after it has been sitting in the pipes for 6 – 10 hours, without running the water at all prior to filling the bottle. This is called a "first draw" and simulates a worst case test.

Radioactivity (Limit = 15 pCi/L for Gross Alpha)

New Hampshire's bedrock contains naturally occurring radioactivity. A few examples **include Radon, Radium 226, Radium 228 and Uranium**. Radon is a gas (see separate description); the others are minerals. The basic test to determine the total radioactivity from all these sources is **Gross Alpha**.

Alkalinity: A measure of water's acid neutralizing capacity. A low alkalinity in combination with low hardness may increase corrosive tendencies, especially in water that already has a pH below or at the low end of the acceptable range.

Arsenic (Limit = 0.010 mg/l)

Arsenic occurs naturally in New Hampshire and other areas of New England. In fact, arsenic was mined commercially in New Hampshire during the 1800s. Arsenic also occurs as a result of human activities. Activities that could have left arsenic residuals include apple orchard spraying and coal ash disposal. Generally is not possible to predict if a well will have elevated arsenic. Arsenic has no smell, taste or coloration when dissolved in water, even at high concentrations. Only water quality testing can determine its presence and concentration in well water. Arsenic has been classified by the U.S. Environmental Protection Agency (EPA) as a human carcinogen (cancer causing agent.) Long term exposure to arsenic has been linked to cancer, cardiovascular disease, immunological disorders, diabetes and other medical issues. On February 22, 2002 a new EPA rule for arsenic in drinking water became effective. This new Limit is 0.010 mg/l, the old limit was 0.050 mg/l. This new rule is final, and became fully enforced on all public water systems in January of 2006. New Hampshire DES recommends that at least two tests be processed before concluding the well's arsenic concentration, as well water quality can change due to many factors.

Radon (No regulated limit)

Radon gas is normally found in all well water. Bedrock wells typically have much higher levels then dug or point wells. The most significant concern is the inhalation of Radon from the air. Radon typically enters air via two common pathways:

1. Migration (up from the soil) into the house air through cracks and/or other openings in the foundation.
2. Release of dissolved radon gas into the air from water usage in the home.

In New Hampshire, the migration of radon up from the soil contributes the largest percent of radon found in the average home. Radon from a groundwater type water supply source, particularly a bedrock (artesian, drilled) well, contributes the next largest percentage of radon in the home. The US EPA has set an advisory "action level" of **4 pCi/L for radon gas in indoor air**. While not a mandated health standard, this level is a guideline for people to use in assessing the seriousness of their exposure to airborne radon. Studies show that high levels of radon gas in the air increase the risk of developing lung cancer. **At present there is no federal or state regulated standard for radon in drinking water.** In 1991, the New Hampshire Department of Environmental Services (DES) and the New Hampshire Department of Health and Human Services (DHHS) jointly recommended a maximum level for radon gas in PUBLIC drinking water at 2,000 pCi/L. Although this recommendation was never acted upon by any regulatory agency, it is commonly referred to in New Hampshire. The EPA is currently proposing a limit of 4000 pCi/L. Massachusetts recommends 10,000, Vermont 5000, and Maine 4,000 pCi/L. A useful equation developed by the EPA to determine the seriousness of Radon in water is that 1 pCi/L of Radon will develop in the air for every 10,000 pCi/L in the water. This is especially useful for adding the total radon found in both air & water.

IMPORTANT NOTE: Radon levels may test significantly different when collected from a well that is not in a normal pattern of use, compared to Radon levels from the same well when in normal daily use.

Fluoride (limit = 2.0/4.0 mg/l primary/secondary)

Fluoride occurs naturally in New Hampshire's bedrock. Fluoride has no taste, color or odor and **thus the only way** to determine its concentration is by laboratory analysis. The Centers for Disease Control (CDC) have recommended 1.0 to 1.2 milligrams per liter (mg/L) as the optimum beneficial concentration of fluoride in drinking water for dental protection in state of New Hampshire. Below 0.5 mg/L there is little tooth decay protection. Above 1.5 mg/L, there is little additional benefit. In the range of 2.0-4.0 mg/L of fluoride, staining of tooth enamel is possible. At concentrations above 4.0 mg/L, studies have shown the possibility of skeletal fluorosis as well as the staining of teeth. In its most severe form, skeletal fluorosis is characterized by irregular bone deposits that may cause arthritis and crippling when occurring at joints.

MtBE / Volatile Organic Compounds (VOC's)

MtBE is the abbreviation for the compound "methyl tertiary butyl ether". This compound is a colorless liquid added to gasoline. Thus its presence in well water would indicate that gasoline contamination exists in the well. MtBE degrades very slowly, is highly soluble in water, and has very low taste and odor thresholds. The EPA has not set a formal health based drinking water standard for MtBE. However, the NH.Department of Health and Human Services has recently developed a health-based drinking water standard for MtBE of 13 micrograms per liter (ug/L). Studies with animals suggest drinking water with high levels of MtBE may cause stomach irritation, liver and kidney damage, and nervous system effects. An increased amount of liver and kidney cancer was found in rats and mice breathing high levels of MtBE. Because of the animal studies on MtBE, New Hampshire considers MtBE a possible human carcinogen. MtBE is tested in a group of approx. 60 compounds associated with petroleum or organic chemical contamination called Volatile Organic Compounds (VOC's). Many of these compounds are also known carcinogens.

Sulfide (Rotten Egg Odor) Sulfide can be formed naturally as a by-product of the decomposition of organic material possibly aided by the presence of sulfur reducing bacteria. These bacteria are not hazardous to human health. It can also be produced by chemical reactions of soil and bedrock minerals containing sulfur. At the concentrations typically found in drinking water, it is not hazardous to health. It is important to note that the odor threshold for sulfide is considerably lower than the point at which our laboratory test detects it. So you smell it before we can find it.

Conductivity: A very basic test measuring the total dissolved mineral content of water. Includes all individual minerals separately listed on this page.

Appendix G

Existing ISO Needed Fire Flow Requirements for Commercial Businesses in the Project Area.

Risk ID	County	Terr	Community	Alt Cmty (FPD)	FPA	Low	High	Dir	Street	Type	Building Description	Surv Type	Surv Date	File Number	Latitude	Longitude	LatLong Match	LatLong Source	NFF gpm	R	C	P	Surv Status	Eff Area	Div Wall	C- x	Sty	CSP	Total Area
282812031384	ROCKINGHAM	080	STRATHAM		STRATHAM	146			HIGH	ST	CORNER STONE SCH 3S	A	07/2004	NH54918	43.022245	-70.861664	PL	6	3,000	1	1	9	Z	20,019		2	3	1052	27,380
282812031350	ROCKINGHAM	080	STRATHAM		STRATHAM	25			KIRRIEMUIR	RD	KIRRIEMUIR CONDOS	A	10/1986		43.001675	-70.896966	SL	6	1,750	1	1	8	Z	4,020		3	2	0321	8,040
28NH99004937	ROCKINGHAM	080	STRATHAM		STRATHAM	3			PORTSMOUTH	AVE	AUTOMOBILE SUPER STORE 2S	A	12/2007	NH57754	42.99225	-70.928175	GP	2	2,500	1	1	9	Z	11,550		2	2	0933	13,300
28NH99001669	ROCKINGHAM	080	STRATHAM		STRATHAM	20			PORTSMOUTH	AVE	SHAWS PLAZA- 3 1S	A	09/2000	NH54220C	42.996034	-70.923275	PL	6	500	1	4	9	Z	680		2	1	1070	680
28NH99001670	ROCKINGHAM	080	STRATHAM		STRATHAM	20			PORTSMOUTH	AVE	SHAWS PLAZA 4 1S	A	09/2000	NH54220D	42.996034	-70.923275	PL	6	500	1	4	9	Z	720		2	1	0532	720
28NH99001671	ROCKINGHAM	080	STRATHAM		STRATHAM	20			PORTSMOUTH	AVE	SHAWS PLAZA 5 1S	A	09/2000	NH54220E	42.996034	-70.923275	PL	6	500	1	4	9	Z	572		2	1	1070	572
28NH99001672	ROCKINGHAM	080	STRATHAM		STRATHAM	20			PORTSMOUTH	AVE	SHAW S PLAZA 2 2S	A	09/2000	NH54220A	42.996034	-70.923275	PL	6	1,750	1	4	9	Z	16,182		3	2	0433	21,576
28NH99001673	ROCKINGHAM	080	STRATHAM		STRATHAM	20			PORTSMOUTH	AVE	SHAW S PLAZA 3 1S	A	09/2000	NH54220C	42.996034	-70.923275	PL	6	500	1	4	9	Z	680		2	1	1070	680
28NH99001674	ROCKINGHAM	080	STRATHAM		STRATHAM	20			PORTSMOUTH	AVE	SHAW S PLAZA 4 1S	A	09/2000	NH54220D	42.996034	-70.923275	PL	6	500	1	4	9	Z	720		2	1	0532	720
28NH99001675	ROCKINGHAM	080	STRATHAM		STRATHAM	20			PORTSMOUTH	AVE	SHAW S PLAZA 5 1S	A	09/2000	NH54220E	42.996034	-70.923275	PL	6	500	1	4	9	Z	572		2	1	1070	572
28NH99001668	ROCKINGHAM	080	STRATHAM		STRATHAM	20			PORTSMOUTH	AVE	SHAWS PLAZA 1 2S	A	09/2000	NH54220A	42.996034	-70.923275	PL	6	1,750	1	4	9	Z	16,182		3	2	0433	21,576
282812031266	ROCKINGHAM	080	STRATHAM		STRATHAM	20			PORTSMOUTH	AVE	SHAWS PLAZA2 2 1S	A	09/2000	NH54220B	42.996034	-70.923275	PL	6	3,500	1	4	9	Z	52,640		3	1	0433	52,640
282812031005	ROCKINGHAM	080	STRATHAM		STRATHAM	23			PORTSMOUTH	AVE	JAMES AND CO 2S	A	06/1984		42.998285	-70.924124	PL	6	1,750	1	1	9	Z	3,075		4	3	3959	4,400
28NH99001375	ROCKINGHAM	080	STRATHAM		STRATHAM	28			PORTSMOUTH	AVE	MAINE CHANCE CORP 1S	A	10/1999		42.998135	-70.920938	PL	6	1,250	1	1	8	Z	2,358		3	1	0542	2,358
282812031264	ROCKINGHAM	080	STRATHAM		STRATHAM	28			PORTSMOUTH	AVE	KINGS HIGHWAY PLAZA 1S	A	12/1999	NH54013	42.998135	-70.920938	PL	6		4	4	8	Z	0		3	1	0433	120,072
28NH99003871	ROCKINGHAM	080	STRATHAM		STRATHAM	34			PORTSMOUTH	AVE	HONDA BARN 1S	A	01/2006	NH57454	42.999949	-70.921707	SL	6	1,750	1	3	9	Z	20,900		2	1	0933	23,700
28NH99004243	ROCKINGHAM	080	STRATHAM		STRATHAM	37			PORTSMOUTH	AVE	EXETER SUBARU 1S	A	08/2006		43.001705	-70.921623	PL	6	1,000	1	4	9	Z	8,400		2	1	0933	8,400
28NH66002477	ROCKINGHAM	080	STRATHAM		STRATHAM	38			PORTSMOUTH	AVE	KANE OFFICE BUILDING 2S	A	11/2009		43.001163	-70.920138	FS	2	1,750	1	1	9	Y	5,193		2	2	0702	6,894
28NH66002478	ROCKINGHAM	080	STRATHAM		STRATHAM	38			PORTSMOUTH	AVE	CITIZENS BANK 1S	A	11/2009		43.000676	-70.920288	FS	2	750	1	1	9	Y	1,516		2	1	0702	1,516
28NH99003872	ROCKINGHAM	080	STRATHAM		STRATHAM	50			PORTSMOUTH	AVE	GILS JEEP 1S	A	01/2006		43.004145	-70.919476	SL	6	1,250	1	3	9	Z	12,090		2	1	0933	12,090
28NH99003779	ROCKINGHAM	080	STRATHAM		STRATHAM	58			PORTSMOUTH	AVE	HURLBERT TOYOTA 1S	A	11/2005		43.006387	-70.917324	PL	6	1,500	2	3	9	X	14,280		2	1	0933	14,280
28NH99003780	ROCKINGHAM	080	STRATHAM		STRATHAM	60			PORTSMOUTH	AVE	HURLBERT TOYOTA 2S	A	11/2005		43.007364	-70.918188	PL	6	1,500	2	2	9	M	7,350		3	2	0932	8,700
28NH99003357	ROCKINGHAM	080	STRATHAM		STRATHAM	70			PORTSMOUTH	AVE	GOVE GROUP REAL ESTATE 3S	A	10/2004		43.010228	-70.918265	SL	6	2,000	2	1	9	M	6,686		2	3	0702	13,312
282812031387	ROCKINGHAM	080	STRATHAM		STRATHAM	72			PORTSMOUTH	AVE	STRATHAM PLAZA 2S	A	04/2001		43.010404	-70.917284	PL	6	5,000	1	1	9	Z	30,581		3	2	0433	32,106
28NH50000098	ROCKINGHAM		STRATHAM		STRATHAM	91			PORTSMOUTH	AVE	PHOTO	D			43.015231	-70.916951	SL	6					0	0					0
282812031388	ROCKINGHAM	080	STRATHAM		STRATHAM	95			PORTSMOUTH	AVE	JUST THE WRIGHT PLACE 2S	A	05/2005		43.015189	-70.917388	PL	6	1,000	2	1	9	M	1,656		3	2	0532	1,944
28NH99003193	ROCKINGHAM	080	STRATHAM		STRATHAM	100	104		PORTSMOUTH	AVE	NH SPCA TRAINING CENTER 2S	A	05/2004	NH57231	43.017853	-70.916615	SL	6	0	4	1	9	Z	0		3	2	0921	12,384
28NH99003194	ROCKINGHAM	080	STRATHAM		STRATHAM	100	104		PORTSMOUTH	AVE	NH SPCA RECEPTION BLDG 2	A	05/2004		43.017853	-70.916615	SL	6	2,000	2	2	9	M	11,796		3	1	0921	12,396
28NH99003195	ROCKINGHAM	080	STRATHAM		STRATHAM	100	104		PORTSMOUTH	AVE	NH SPCA BARN BLDG 3 3S	A	05/2004		43.017853	-70.916615	SL	6	1,250	2	1	9	M	2,166		3	2	0921	2,888
28NH99003196	ROCKINGHAM	080	STRATHAM		STRATHAM	100	104		PORTSMOUTH	AVE	NH SPCA VACANT BLDG 4 2S	A	05/2004		43.017853	-70.916615	SL	6	1,250	2	1	9	M	1,950		3	2	1180	2,600
282812031180	ROCKINGHAM	080	STRATHAM		STRATHAM	120			PORTSMOUTH	AVE	WENTWORTH LUMBER 4S	A	10/1981		43.021091	-70.916722	SL	6	3,000	2	1	9	X	9,720		4	4	0431	15,552
28NH99001149	ROCKINGHAM	080	STRATHAM		STRATHAM	145			PORTSMOUTH	AVE	F AND T PARTNERSHIP 2S	A	06/2005	NH56722A	43.027458	-70.910655	SL	6	500	1	1	9	Z	0		4	2	0433	26,775
28NH99003600	ROCKINGHAM	080	STRATHAM		STRATHAM	145			PORTSMOUTH	AVE	F AND T PARTNERSHIP - PUMPHO	A	06/2005	NH56722B	43.027458	-70.910655	SL	6	0	4	2	9	Z	0		2	1	1070	144
28NH66001096	ROCKINGHAM	080	STRATHAM		STRATHAM	152			PORTSMOUTH	AVE	GLEASON ARCHITECTS 1S	A	10/2008		43.023996	-70.912799	FS	2	1,000	1	1	9	Y	2,232		2	1	0702	4,058
28NH66001095	ROCKINGHAM	080	STRATHAM		STRATHAM	154			PORTSMOUTH	AVE	WINFIELD FOOTE ANTIQUES 2S	A	10/2008		43.024486	-70.91207	FS	2	1,500	1	1	9	Y	3,078		3	2	0564	4,368
282812031383	ROCKINGHAM	080	STRATHAM		STRATHAM	157			PORTSMOUTH	AVE	MARCOS RESTAURANT 1S	A	05/2005		43.03017	-70.909017	SL	6	750	1	1	9	Z	1,000		3	1	0542	1,000
28NH66001094	ROCKINGHAM	080	STRATHAM		STRATHAM	158			PORTSMOUTH	AVE	STRATHAM HISTORICAL SOCIETY	A	10/2008		43.025176	-70.911394	FS	2	750	1	2	9	Y	1,520		2	1	1051	2,992
28NH66001093	ROCKINGHAM	080	STRATHAM		STRATHAM	160			PORTSMOUTH	AVE	OCEAN BANK 1S	A	10/2008		43.025682	-70.911013	FS	2	1,250	1	1	9	Y	3,576		2	1	0702	6,360
28NH99002243	ROCKINGHAM	080	STRATHAM		STRATHAM	166			PORTSMOUTH	AVE	TAYLOR RIVER JEWELRY 1S	A	05/2005		43.031813	-70.907566	SL	6	750	1	1	9	Z	728		2	1	6900	728
282812031389	ROCKINGHAM	080	STRATHAM		STRATHAM	309			PORTSMOUTH	AVE	RONS WELDING 1S	A	05/2005		43.039931	-70.886234	SL	6	750	1	1	9	Z	810		2	1	6850	810
28NH66001091	ROCKINGHAM	080	STRATHAM		STRATHAM	313			PORTSMOUTH	AVE	LARCHMONT IRRIGATION 1S	A	10/2008		43.040096	-70.881069	FS	2	750	1	3	9	Y	4,000		2	1	0434	4,000
28NH66001092	ROCKINGHAM	080	STRATHAM		STRATHAM	313			PORTSMOUTH	AVE	BIRSE LANDSCAPING 1S	A	10/2008		43.040335	-70.881777	FS	2	1,500	1	1	9	Y	3,600		3	1	0567	3,600
28NH66002052	ROCKINGHAM	080	STRATHAM		STRATHAM	2			WINNICUTT	RD	STRATHAM FIRE DEPARTMENT 1	A	07/2009		43.025168	-70.910868	FS	2	3,000	1	1	8	Y	20,356		2	1	1070	24,216
282812031355	ROCKINGHAM	080	STRATHAM		STRATHAM	36			WINNICUTT	RD	WAREHOUSE 1S	A	10/1988		43.02438	-70.901994	SL	6	3,500	2	1	8	X	15,060		4	1	1213	15,060
28NH99003640	ROCKINGHAM	080	STRATHAM		STRATHAM	136			WINNICUTT	RD	ACORN SCHOOL 2S	A	07/2005	NH57395	43.012662	-70.879943	PL	6	1,250	1	1	9	Z	2,663		2	2	1052	3,386
28NH99003277	ROCKINGHAM	080	STRATHAM		STRATHAM	167			WINNICUTT	RD	GOLF CLUB OF NEW ENGLAND 1	A	08/2004	NH57255A	43.009341	-70.871062	SL	6	0	4	1	9	Z	0		3	2	0755	30,529
28NH99003282	ROCKINGHAM	080	STRATHAM		STRATHAM	167			WINNICUTT	RD	GOLF CLUB OF NEW ENGLAND 2	A	08/2004	NH57255B	43.009341	-70.871062	SL	6	1,500	1	3	9	Z	11,000		3	1	0755	11,000

Appendix H
Fire Protection and Potable Water Rates

STRATHAM WATER AND RATE STUDY
WATER REVENUES AND EXPENSES

Existing Construction in Project Area
Scenario 1

Fire Suppression System
Present and Projected Revenues and Expenses

3/10/2010		Phase 1 **2011**	Phase 2 **2016**	Phase 3 **2021**	Phase 4 **2026**
Revenue					
Fire Precinct tax		$59,837	$150,937	$406,710	$485,512
Water Sales		--	--	--	--
Hydrant rental	$ 3,000 /hydrant	--			
Connection fees	$ 1,000 /connection	--	--	--	--
Total Revenue		$59,837	$150,937	$406,710	$485,512
Number of Hydrants		18	24	34	40
Expenses					
Treatment O&M		$0	$0	$0	$0
Water Purchase		--	--	--	--
Distribution O&M		$ 15,000	$ 15,000	$ 40,000	$ 40,000
Annual pump station Inspection		$ 5,000	$ 5,000	$ 5,000	$ 5,000
Principal and Interest (1)		$ 21,601	$ 102,603	$ 289,357	$ 368,110
Capital reserve		10,000	10,000	20,000	20,000
Total Expenses		$51,601	$132,603	$354,357	$433,110
Net Revenue		$8,236	$18,334	$52,352	$52,402
% of Expenses		16.0	13.8	14.8	12.1
Project Costs		$ 480,000	$ 1,800,000	$ 4,150,000	$ 1,750,000
Precinct Tax per $1000 building valuation		**$2.75**	**$6.00**	**$11.50**	**$9.00**
Protected Building Area (2)		365,682	418,952	590,459	868,350
Valuation of Protected Buildings (2)		$ 21,758,800	$ 25,156,100	$ 35,366,060	$ 53,945,760
Average Valuation / sf of Building		$ 59.50	$ 60.05	$ 59.90	$ 62.12
Water Rate Structure					
Service Fee		--	--	--	--
Usage Fee	cost/1000 gal	--	--	--	--
Estimated Customers		--	--	--	--
Estimated Annual Usage		--	--	--	--
Estimated Annual Fire Protection Charge					
Building Valuation	$ 250,000	$688	$1,500	$2,875	$2,250
Building Valuation	$ 1,000,000	$2,750	$6,000	$11,500	$9,000

(1) assumes a 20 yr bond at 4.5% interest from the NH Municipal Bond Bank.
(2) Assumes existing development areas in all phases

STRATHAM WATER AND SEWER RATE STUDY
WATER REVENUES AND EXPENSES

Existing Construction in Project Area
Scenario 2

Potable Water System (groundwater source)
Present and Projected Revenues and Expenses

3/10/2010

	Phase 1 (1) **2011**	Phase 2+ 2A **2016**	Phase 3A **2021**	Phase 4 **2026**
Revenue				
Fire Precinct tax	$59,837	$402,498	$636,589	$701,295
Water Sales	--	$7,580	$35,177	$86,570
Hydrant rental $ 3,000 /hydrant	--	--	--	--
Connection fees $ 1,000 /connection	--	--	--	--
Total Revenue	$59,837	$410,077	$671,766	$787,865
Number of Hydrants	18	24	34	40
Expenses				
Treatment O&M	$0	$75,000	$75,000	$75,000
Water Purchase (2)	--	--	--	--
Distribution O&M	$ 15,000	$ 15,000	$ 30,000	$ 30,000
Annual pump station Inspection	$ 5,000	$ 5,000	$ 5,000	$ 5,000
Principal and Interest (3)	$ 21,601	$ 264,607	$ 476,112	$ 554,864
Capital reserve	10,000	10,000	20,000	20,000
Total Expenses	$51,601	$369,607	$606,112	$684,864
Net Revenue	$8,236	$40,470	$65,654	$103,001
% of Expenses	16.0	10.9	10.8	15.0
Project Costs	$ 480,000	$ 5,400,000	$ 4,700,000	$ 1,750,000
Precinct Tax per $1000 building valuation	**$2.75**	**$16.00**	**$18.00**	**$13.00**
Protected Building Area (4)	365,682	418,952	590,459	868,350
Valuation of Protected Buildings (4)	$ 21,758,800	$ 25,156,100	$ 35,366,060	$ 53,945,760
Average Valuation / sf of Building	$ 59.50	$ 60.05	$ 59.90	$ 62.12
Water Rate Structure				
Service Fee	--	$ 120	$ 120	$ 120
Usage Fee cost/1000 gal	--	$ 5.00	$ 5.00	$ 5.00
Estimated Customers (4)	--	22	71	191
Estimated Annual Usage (4)	--	987,900	5,331,400	12,730,000
Estimated Annual Fire Protection Charge				
Building Valuation $ 250,000	$688	$4,000	$4,500	$3,250
Building Valuation $ 1,000,000	$2,750	$16,000	$18,000	$13,000

(1) Assumes conversion to a potable water system during phase 2
(2) assumes water from the wells can be collected and treated at a central location
(3) assumes a 20 yr bond at 4.5% interest from the NH Municipal Bond Bank.
(4) Assumes existing development areas in all phases

STRATHAM WATER AND SEWER RATE STUDY
WATER REVENUES AND EXPENSES

Existing Construction in Project Area
Scenario 3

Potable Water System (Exeter interconnection)
Present and Projected Revenues and Expenses

3/10/2010

		Phase 1 (1) **2011**	Phase 2 **2016**	Phase 3A **2021**	Phase 4 **2026**
Revenue					
Fire Precinct tax		$59,837	$150,937	$424,393	$458,539
Water Sales		--	$7,580	$35,177	$86,570
Hydrant rental	$ 3,000 /hydrant	--	--	--	--
Connection fees	$ 1,000 /connection	--	--	--	--
Total Revenue		$59,837	$158,516	$459,570	$545,109
Number of Hydrants		18	24	34	40
Expenses					
Treatment O&M		$0	$0	$0	$0
Water Purchase (2)		--	$4,940	$26,657	$63,650
Distribution O&M		$ 15,000	$ 20,000	$ 35,000	$ 35,000
Annual pump station Inspection		$ 5,000	$ 5,000	$ 5,000	$ 5,000
Principal and Interest (3)		$ 21,601	$ 102,603	$ 314,108	$ 392,860
Capital reserve		10,000	10,000	20,000	20,000
Total Expenses		$51,601	$142,542	$400,765	$516,510
Net Revenue		$8,236	$15,974	$58,805	$28,599
% of Expenses		16.0	11.2	14.7	5.5
Project Costs		$ 480,000	$ 1,800,000	$ 4,700,000	$ 1,750,000
Precinct Tax per $1000 building valuation		**$2.75**	**$6.00**	**$12.00**	**$8.50**
Protected Building Area (4)		365,682	418,952	590,459	868,350
Valuation of Protected Buildings (4)		$ 21,758,800	$ 25,156,100	$ 35,366,060	$ 53,945,760
Average Valuation / sf of Building		$ 59.50	$ 60.05	$ 59.90	$ 62.12
Water Rate Structure					
Service Fee		--	$ 120	$ 120	$ 120
Usage Fee	cost/1000 gal	--	$ 5.00	$ 5.00	$ 5.00
Estimated Customers (4)		--	22	71	191
Estimated Annual Usage (4)		--	987,900	5,331,400	12,730,000
Estimated Annual Fire Protection Charge					
Building Valuation	$ 250,000	$688	$1,500	$3,000	$2,125
Building Valuation	$ 1,000,000	$2,750	$6,000	$12,000	$8,500

(1) Assumes conversion to a potable water system during phase 2
(2) Water will be purchased from Exeter at the existing customer rate of $5/1000 gallons
(3) assumes a 20 yr bond at 4.5% interest from the NH Municipal Bond Bank.

STRATHAM WATER AND RATE STUDY
WATER REVENUES AND EXPENSES

Current Zoning in Project Area
Scenario 4
3/10/2010

Fire Suppression System
Present and Projected Revenues and Expenses

				Phase 1	Phase 2	Phase 3	Phase 4
				2011	**2016**	**2021**	**2026**
Revenue							
Fire Precinct tax				$59,837	$150,205	$401,073	$515,594
Water Sales				--	--	--	--
Hydrant rental	$	3,000	/hydrant	--	--	--	--
Connection fees	$	1,000	/connection	--	--	--	--
Total Revenue				$59,837	$150,205	$401,073	$515,594
Number of Hydrants				18	24	34	40
Expenses							
Treatment O&M				$0	$0	$0	$0
Water Purchase				--	--	--	--
Distribution O&M				$ 15,000	$ 15,000	$ 40,000	$ 40,000
Annual pump station Inspection				$ 5,000	$ 5,000	$ 5,000	$ 5,000
Principal and Interest (1)				$ 21,601	$ 102,603	$ 289,357	$ 368,110
Capital reserve				10,000	10,000	20,000	20,000
Total Expenses				$51,601	$132,603	$354,357	$433,110
Net Revenue				$8,236	$17,602	$46,715	$82,485
% of Expenses				16.0	13.3	13.2	19.0
Project Costs				$ 480,000	$ 1,800,000	$ 4,150,000	$ 1,750,000
Precinct Tax per $1000 building valuation				**$2.75**	**$2.50**	**$3.50**	**$4.00**
Protected Building Area (2)				365,682	1,001,366	1,909,871	2,048,816
Valuation of Protected Buildings (2)				$ 21,758,800	$ 60,081,960	$ 114,592,247	$ 128,898,616
Average Valuation / sf of Building				$ 59.50	$ 60.00	$ 60.00	$ 62.91
Water Rate Structure							
Service Fee				--	--	--	--
Usage Fee	Cost/1000 gal			--	--	--	--
Estimated Customers (2)				--	--	--	--
Estimated Annual Usage (2)				--	--	--	--
Estimated Annual Fire Protection Charge							
Building Valuation	$	250,000		$688	$625	$875	$1,000
Building Valuation	$	1,000,000		$2,750	$2,500	$3,500	$4,000

(1) assumes a 20 yr bond at 4.5% interest from the NH Municipal Bond Bank.
(2) Existing building values used for Phase 1 and 1/2 of the Current Zoning Buildout estimates used for Phase 2-4

STRATHAM WATER AND SEWER RATE STUDY
WATER REVENUES AND EXPENSES

GCBD Buildout in Project Area
Scenario 5

Potable Water System (groundwater source)
Present and Projected Revenues and Expenses

3/10/2010

		Phase 1 (1)	Phase 2+2A	Phase 3A	Phase 4
		2011	**2016**	**2021**	**2026**
Revenue					
Fire Precinct tax		$59,837	$0	$174,118	$181,271
Water Sales		--	$492,026	$675,329	$747,743
Hydrant rental	$ 3,000 /hydrant	--	--	--	--
Connection fees	$ 1,000 /connection	--	--	--	--
Total Revenue		$59,837	$492,026	$849,447	$929,014
Number of Hydrants		18	24	34	40
Expenses					
Treatment O&M		$0	$100,000	$180,000	$180,000
Water Purchase (2)		--	--	--	--
Distribution O&M		$ 15,000	$ 15,000	$ 30,000	$ 30,000
Annual pump station Inspection		$ 5,000	$ 5,000	$ 5,000	$ 5,000
Principal and Interest (3)		$ 21,601	$ 264,607	$ 476,112	$ 554,864
Capital reserve		10,000	10,000	20,000	20,000
Total Expenses		$51,601	$394,607	$711,112	$789,864
Net Revenue		$8,236	$97,420	$138,334	$139,150
% of Expenses		16.0	24.7	19.5	17.6
Project Costs		$ 480,000	$ 5,400,000	$ 4,700,000	$ 1,750,000
Precinct Tax per $1000 building valuation		**$2.75**	**$0.00**	**$0.50**	**$0.50**
Protected Building Area (4)		365,682	3,922,181	5,208,036	5,422,012
Valuation of Protected Buildings (4)		$ 21,758,800	$ 272,186,961	$ 348,235,402	$ 362,541,771
Average Valuation / sf of Building		$ 59.50	$ 69.40	$ 66.87	$ 66.86
Water Rate Structure					
Service Fee		--	120	120	120
Usage Fee	Cost/1000 gal	--	$ 5.00	$ 5.00	$ 5.00
Estimated Customers (4)		--	1067	1482	1675
Estimated Annual Usage (4)		--	72,792,000	99,491,800	109,342,600
Estimated Annual Fire Protection Charge					
Building Valuation	$ 250,000	$688	$0	$125	$125
Building Valuation	$ 1,000,000	$2,750	$0	$500	$500

(1) Assumes conversion to a potable water system during phase 2
(2) assumes water from the wells can be collected and treated at a central location
(3) assumes a 20 yr bond at 4.5% interest from the NH Municipal Bond Bank.
(4) Existing building values used for Phase 1 and GCBD Buildout estimates used for Phase 2-4

STRATHAM WATER AND SEWER RATE STUDY
WATER REVENUES AND EXPENSES

GCBD Buildout in Project Area
Scenario 6

Potable Water System (Exeter interconnection)
Present and Projected Revenues and Expenses

3/10/2010	Phase 1 (1) **2011**	Phase 2 **2016**	Phase 3A **2021**	Phase 4 **2026**
Revenue				
Fire Precinct tax	$59,837	$68,047	$348,235	$362,542
Water Sales	--	$492,026	$675,329	$747,743
Hydrant rental $ 3,000 /hydrant	--	--	--	--
Connection fees $ 1,000 /connection	--	--	--	--
Total Revenue	$59,837	$560,073	$1,023,564	$1,110,285
Number of Hydrants	18	24	34	40
Expenses				
Treatment O&M	$0	$0	$0	$0
Water Purchase (2)	--	$363,960	$497,459	$546,713
Distribution O&M	$ 15,000	$ 20,000	$ 35,000	$ 35,000
Annual pump station Inspection	$ 5,000	$ 5,000	$ 5,000	$ 5,000
Principal and Interest (3)	$ 21,601	$ 102,603	$ 314,108	$ 392,860
Capital reserve	10,000	10,000	20,000	20,000
Total Expenses	$51,601	$501,563	$871,567	$999,573
Net Revenue	$8,236	$58,510	$151,997	$110,712
% of Expenses	16.0	11.7	17.4	11.1
Project Costs	$ 480,000	$ 1,800,000	$ 4,700,000	$ 1,750,000
Precinct Tax per $1000 building valuation	**$2.75**	**$0.25**	**$1.00**	**$1.00**
Protected Building Area (4)	365,682	3,922,181	5,208,036	5,422,012
Valuation of Protected Buildings (4)	$ 21,758,800	$ 272,186,961	$ 348,235,402	$ 362,541,771
Average Valuation / sf of Building	$ 59.50	$ 69.40	$ 66.87	$ 66.86
Water Rate Structure				
Service Fee	--	120	120	120
Usage Fee Cost/1000 gal	--	$ 5.00	$ 5.00	$ 5.00
Estimated Customers (4)	--	1067	1482	1675
Estimated Annual Usage (4)	--	72,792,000	99,491,800	109,342,600
Estimated Annual Fire Protection Charge				
Building Valuation $ 250,000	$688	$63	$250	$250
Building Valuation $ 1,000,000	$2,750	$250	$1,000	$1,000

(1) Assumes conversion to a potable water system during phase 2
(2) Water will be purchased from Exeter at the existing customer rate of $5/1000 gallons
(3) assumes a 20 yr bond at 4.5% interest from the NH Municipal Bond Bank.
(4) Existing building values used for Phase 1 and GCBD Buildout estimates used for Phase 2-4

WRIGHT-PIERCE

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