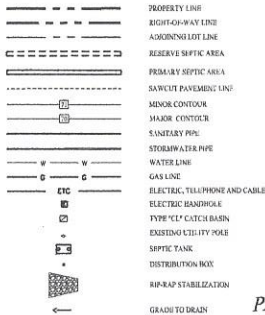


# LEGEND



## SEPTIC TANK BUOYANCY CALCULATIONS

**BUOYANT FORCE (LBS) = (VOLUME) (DENSITY) (GRAVITY)**  
**SEPTIC TANK BUOYANT FORCE (UPWARD DIRECTION) = (VOLUME OF TANK) (SPECIFIC WEIGHT OF WATER)**  
 VOLUME OF TANK =  $11.7 \text{ ft} \times 7.0 \text{ ft} \times 4.5 \text{ ft} = 47.0 \text{ CF}$   
 SPECIFIC WEIGHT OF WATER = 62.4 LB/CF  
 BUOYANT FORCE =  $47.0 \text{ CF} \times 62.4 \text{ LB/CF} = 2,932.8 \text{ LBS}$   
**WEIGHT OF SEPTIC TANK (DOWNWARD DIRECTION) = 21,500 LBS (FROM MANUFACTURER)**  
**NET BUOYANT FORCE (UPWARD DIRECTION) = 2,932.8 LBS - 21,500 LBS = -18,567.2 LBS**  
**SOIL FORCE APPLIED TO TANK (DOWNWARD DIRECTION) = (SOIL VOLUME) (SPECIFIC WEIGHT OF SOIL)**  
 DEPTH OF SOIL ABOVE TANK = 4.5 FT  
 AREA OF SOIL =  $11.7 \text{ ft} \times 7.0 \text{ ft} = 81.9 \text{ SF}$   
 VOLUME OF SOIL =  $81.9 \text{ SF} \times 4.5 \text{ ft} = 368.55 \text{ CF}$   
 SPECIFIC WEIGHT OF SOIL = 120 LB/CF  
 SOIL FORCE APPLIED TO TANK =  $368.55 \text{ CF} \times 120 \text{ LB/CF} = 44,226 \text{ LBS}$   
**SCM OF FORCES IN THE Y DIRECTION = 2,932.8 LBS - 21,500 LBS + 44,226 LBS = 25,658.8 LBS**  
 THEREFORE, SEPTIC TANK WILL OVERCOME BUOYANT FORCE IN WORST CASE SCENARIO

## PUMP CHAMBER BUOYANCY CALCULATIONS

**BUOYANT FORCE (LBS) = (VOLUME) (DENSITY) (GRAVITY)**  
**PUMP CHAMBER BUOYANT FORCE (UPWARD DIRECTION) = (VOLUME OF CHAMBER) (SPECIFIC WEIGHT OF WATER)**  
 VOLUME OF CHAMBER =  $10.0 \text{ ft} \times 7.0 \text{ ft} \times 4.5 \text{ ft} = 31.5 \text{ CF}$   
 SPECIFIC WEIGHT OF WATER = 62.4 LB/CF  
 BUOYANT FORCE =  $31.5 \text{ CF} \times 62.4 \text{ LB/CF} = 1,965.6 \text{ LBS}$   
**WEIGHT OF PUMP CHAMBER (DOWNWARD DIRECTION) = (VOLUME OF CONCRETE) (SPECIFIC WEIGHT OF CONCRETE)**  
 VOLUME OF CONCRETE =  $10.0 \text{ ft} \times 7.0 \text{ ft} \times 4.5 \text{ ft} = 31.5 \text{ CF}$   
 SPECIFIC WEIGHT OF CONCRETE = 150 LB/CF  
 WEIGHT OF PUMP CHAMBER =  $31.5 \text{ CF} \times 150 \text{ LB/CF} = 4,725 \text{ LBS}$   
**NET BUOYANT FORCE = 1,965.6 LBS - 4,725 LBS = -2,759.4 LBS (DOWNWARD DIRECTION)**  
**SOIL FORCE ABOVE TANK/DRAINAGE DIRECTION = 0 SINCE TOP OF PUMP CHAMBER IS AT GRADE**  
**SCM OF FORCES IN THE Y DIRECTION = 1,965.6 LBS - 4,725 LBS + 0 LBS = -2,759.4 LBS**  
 THEREFORE, PUMP CHAMBER TANK WILL OVERCOME BUOYANT FORCE IN WORST CASE SCENARIO

## DESIGN NOTES

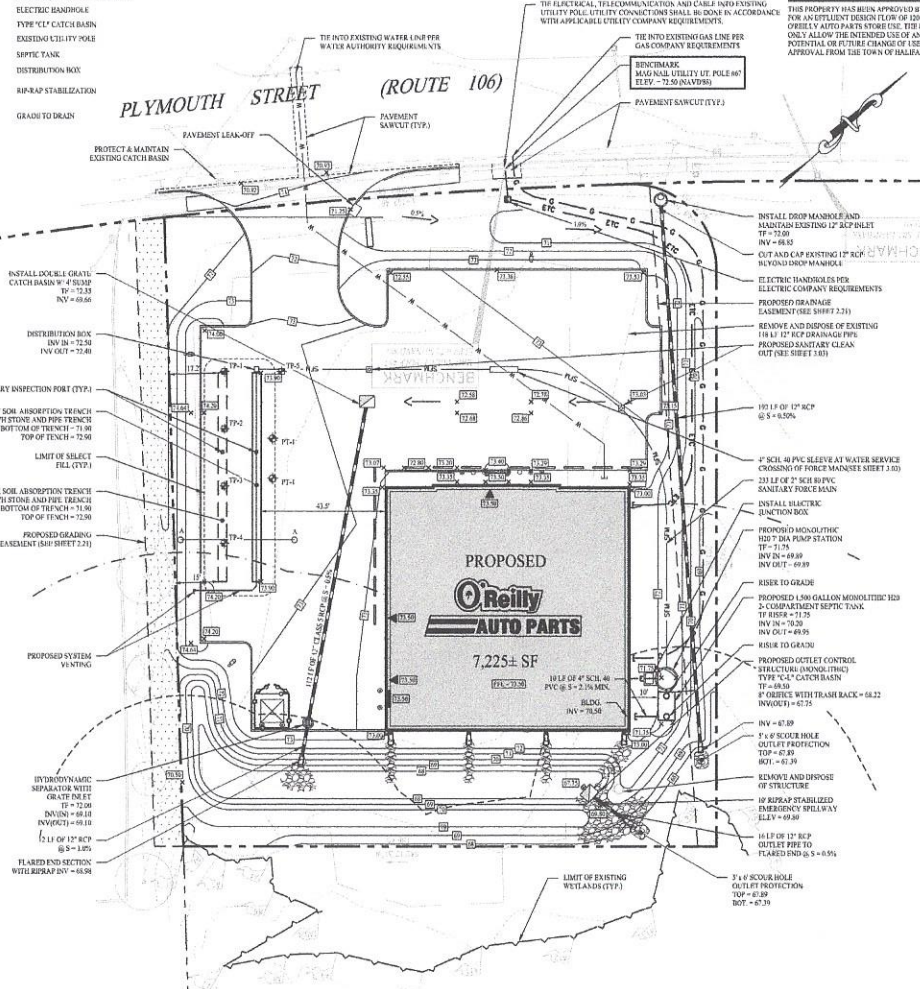
**MATERIAL SCHEDULE:**  
 PIPES FROM BUILDING TO SEPTIC TANK OR GREASE TRAP - 4" PVC SCHEDULE 40 ASTM D1576  
 GREASE TRAPS AND SEPTIC TANKS - PRECAST CONCRETE MONOLITHIC STRUCTURES IN COMPLIANCE WITH SECTION 12.22 OF THE 2013 CMAS  
 PIPE BETWEEN TANKS AND PUMP CHAMBER - 4" PVC SCHEDULE 40, ASTM D1576  
 PIPES WITHIN PUMP CHAMBER - 2" PVC SCHEDULE 40, ASTM D1576  
 FORCE MAIN - 16" POLYETHYLENE ASPH/2023 OR ASTM D2733, EITHER WITH COMPRESSION FITTINGS  
 DISTRIBUTION BOX - PER DETAIL  
 DISTRIBUTION PIPING - PER 315 PVC  
**DESIGN CALCULATIONS:**  
 AVERAGE DAILY USE PER CALCULATIONS IS 40 GALLONS PER DAY (SEE METER READINGS HEREIN)  
 APPLY A PEAKING FACTOR OF 2.0, PER 315 CMAS 15, THE DESIGN FLOW IS 120 GALLONS PER DAY  
**PUMP CHAMBER:**  
 DUMP PUMP CHAMBER (8" SHUT OFF), LEAD-A-CONTROL, WITH ALARM AND CONTROLS LOCATED WITHIN BUILDING, SEE DETAIL FOR PARTS AND MATERIALS. PEAK (SHUT OFF) DRAINAGE NOT MORE THAN 10' ABOVE PUMP CHAMBER. APPROXIMATELY 945 FEET. PUMP DISCHARGES 40 GALLONS PER CYCLE (120' @ 3 CYCLES PER DAY)  
**DESIGN CALCULATIONS:**  
 DESIGN FLOW RATE: 30.00 GPM  
 RETAIL: 7.25 SF GFA

## GRADING & UTILITY NOTES

- THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY CONSTRUCTION PERMITS REQUIRED BY THE STATE AND LOCAL AGENCIES BEFORE THE START OF THE PROJECT. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY CONSTRUCTION PERMITS REQUIRED BY THE STATE AND LOCAL AGENCIES BEFORE THE START OF THE PROJECT.
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## BOARD OF HEALTH APPROVAL NOTES

THIS PROPERTY HAS BEEN APPROVED BY THE TOWN OF HALIFAX BOARD OF HEALTH FOR AN EFFLUENT DESIGN FLOW OF 120 GPD, WHICH SATISFIES THE PROPOSED OREILLY AUTO PARTS STORE INC. THE PROPERTY WILL BE USED RESTRICTED TO ONLY ALLOW THE INTENDED USE OF AN OREILLY AUTO PARTS STORE. ANY POTENTIAL OR FUTURE CHANGE OF USE FOR THIS PROPERTY WILL REQUIRE APPROVAL FROM THE TOWN OF HALIFAX BOARD OF HEALTH.



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## DESIGN CALCULATIONS

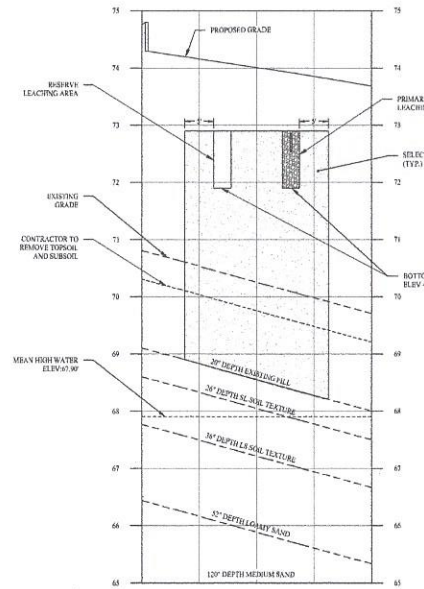
DESIGN FLOW RATE: 30.00 GPM  
 RETAIL: 7.25 SF GFA  
**PRIMARY SOIL ABSORPTION SYSTEM**  
 FLOW DESIGN: 120 GPD  
 EFFLUENT LOADING RATE CLASS 150: 0.37 GPD/SF  
 120 GPD = 0.37 GPD/SF (CLASS 150) = 364 SF AREA  
 12" DEEP TRENCH: 364 SF  
 364 SF = 2.00 SLOPE = 72.8' LF (8 ROW OF 13 LF PROVIDED)  
**RESERVE SOIL ABSORPTION SYSTEM**  
 FLOW DESIGN: 120 GPD  
 EFFLUENT LOADING RATE CLASS 150: 0.37 GPD/SF  
 120 GPD = 0.37 GPD/SF (CLASS 150) = 364 SF AREA  
 12" DEEP TRENCH: 364 SF  
 364 SF = 2.00 SLOPE = 72.8' LF (8 ROW OF 13 LF PROVIDED)  
**HALIFAX SUPPLEMENTAL REGULATIONS FOR DE-WATERED PERC TESTS REQUIRE THAT 1.5A OF 0.33 BE USED.**

## REQUESTED VARIANCES

OVER THE STATE ENVIRONMENTAL CODE, TITLE 5, SECTION 15.20(1) ACTUAL WATER AFTER DATA SHALL NOT BE SUBMITTED FOR THE DESIGN FLOW CRITERIA FOR THE ACTIVITIES LISTED IN 15.00 CMAS (SECTION 15.00). RETAIL STORE IS LISTED AS AN ACTIVITY IN THE DESIGN SECTIONS. THE DESIGN USES ACTUAL WATER METER DATA. PER THE STATE ENVIRONMENTAL CODE, TITLE 5, SECTION 15.20(2), THE MINIMUM ALLOWABLE GPD FOR SYSTEM DESIGN FOR A RETAIL STORE IS 200, 200 GPD. THE DESIGN USES 120 GPD, A VARIANCE FROM BOTH THESE STANDARDS IS REQUESTED.

## DESIGN FLOW CALCULATIONS

| METER READINGS FOR OREILLY AUTO PARTS STORE |                                 |         |          |                 |
|---------------------------------------------|---------------------------------|---------|----------|-----------------|
| BILLING DATE                                | SERVICE PERIOD (MONTHS)         | CURRENT | PREVIOUS | USAGE (GALLONS) |
| 1/28/2016                                   | 28                              | 132     | 122      | 1,000           |
| 2/25/2016                                   | 29                              | 170     | 132      | 3,800           |
| 3/26/2016                                   | 29                              | 135     | 170      | 2,300           |
| 4/28/2016                                   | 34                              | 135     | 135      | 0               |
| 5/27/2016                                   | 29                              | 140     | 135      | 500             |
| 6/29/2016                                   | 31                              | 141     | 140      | 100             |
| 7/28/2016                                   | 29                              | 140     | 141      | 100             |
| 8/30/2016                                   | 32                              | 140     | 140      | 0               |
| 9/29/2016                                   | 35                              | 140     | 140      | 0               |
| 10/27/2016                                  | 24                              | 140     | 140      | 0               |
| 11/30/2016                                  | 32                              | 131     | 140      | 900             |
| 12/29/2016                                  | 31                              | 131     | 131      | 0               |
| 1/27/2017                                   | 32                              | 135     | 131      | 400             |
| 2/24/2017                                   | 29                              | 137     | 135      | 200             |
| 3/23/2017                                   | 32                              | 136     | 137      | 100             |
| 4/21/2017                                   | 29                              | 136     | 136      | 0               |
| 5/11/2017                                   | 30                              | 162     | 136      | 2,600           |
| 6/27/2017                                   | 29                              | 162     | 162      | 0               |
| 7/25/2017                                   | 29                              | 163     | 162      | 100             |
| 8/30/2017                                   | 32                              | 167     | 163      | 400             |
| 9/28/2017                                   | 33                              | 169     | 167      | 200             |
| 10/27/2017                                  | 29                              | 170     | 169      | 100             |
| 11/29/2017                                  | 30                              | 172     | 170      | 200             |
| 12/28/2017                                  | 29                              | 172     | 172      | 0               |
| AVERAGE GALLONS PER DAY                     | USE 120 GPD FOR DESIGN PURPOSES |         |          | 60              |



|              |                     |
|--------------|---------------------|
| Drawn By:    | CJP                 |
| Checked By:  | CM                  |
| Approved By: | KMS                 |
| Project #:   | 180201              |
| Plan Date:   | 10/1/18             |
| Scale:       | AS SHOWN            |
| Project:     | O'Reilly AUTO PARTS |

330 PLYMOUTH STREET  
 HALIFAX, MASSACHUSETTS

2.21