

## Burlington Development Review Board

149 Church Street, City Hall  
Burlington, VT 05401

[www.burlingtonvt.gov/pz/DRB](http://www.burlingtonvt.gov/pz/DRB)

Telephone: (802) 865-7188

Fax (802) 865-7195

Austin Hart  
Brad Rabinowitz  
Israel Smith  
AJ LaRosa  
Geoff Hand  
Alexandra Zipparo  
Wayne Senville  
Jim Drummond, (Alternate)  
Robert Purvee, (Alternate)



### **BURLINGTON DEVELOPMENT REVIEW BOARD Tuesday March 21, 2017, 5:00 PM PUBLIC HEARING NOTICE**

The Burlington Development Review Board will hold a meeting on  
**Tuesday March 21, 2017 at 5:00pm in Contois Auditorium, City Hall.**

- 1. 17-0762CA/CU; 35 GROVE STREET (RL, Ward 1E) Russell B. Higgins and Gina S. Lambdin**  
Expand existing single family residence, add accessory dwelling unit, and change parking layout. (Project Manager, Mary O'Neil)
- 2. 17-0763CU; 311 NORTH AVENUE (RM-W, Ward 4N) VLTBTV Parkland LLC**  
Change of use from post-secondary school to community house.  
(Project Manager, Ryan Morrison)
- 3. 17-0776CU; 449 SOUTH PROSPECT STREET (RL, Ward 6S) Chris Khamnei**  
Change of use from single family to duplex and expand driveway.  
(Project Manager, Scott Gustin)

Plans may be viewed in the Planning and Zoning Office, (City Hall, 149 Church Street, Burlington), between the hours of 8:00 a.m. and 4:30 p.m.

Participation in the DRB proceeding is a prerequisite to the right to take any subsequent appeal. Please note that ANYTHING submitted to the Planning and Zoning office is considered public and cannot be kept confidential.

This may not be the final order in which items will be heard. Please view final Agenda, at [www.burlingtonvt.gov/pz/dr/ agendas](http://www.burlingtonvt.gov/pz/dr/ agendas) or the office notice board, one week before the hearing for the order in which items will be heard.

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### **BURLINGTON DEVELOPMENT REVIEW BOARD Tuesday March 21, 2017, 5:00 PM AMENDED PUBLIC HEARING NOTICE**

The Burlington Development Review Board will hold a meeting on  
**Tuesday March 21, 2017 at 5:00pm in Contois Auditorium, City Hall.**

**The following item has been added:**

- 1. 17-0755CA/CU; 235 PENNY LANE (DW-PT, Ward 3C) City of Burlington**  
Construct marina, parking lot, and related site improvements.  
(Project Manager, Scott Gustin)

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### BURLINGTON DEVELOPMENT REVIEW BOARD Tuesday, March 21, 2017, 5:00 PM Contois Auditorium, City Hall, 149 Church St, Burlington, VT AGENDA

- I. **Agenda**
- II. **Communications**
- III. **Minutes**
- IV. **Public Hearing**
  - 1. **17-0762CA/CU; 35 GROVE STREET (RL, Ward 1E) Gina S. Lambdin**  
Add accessory apartment and mudroom. Convert porch into year-round living space.  
Reconfigure parking area. (Project Manager, Mary O'Neil)
  - 2. **17-0763CU; 311 NORTH AVENUE (RM-W, Ward 4N) VLTBTV Parkland LLC**  
Allow for a conditional use of the stone house as a community house.  
(Project Manager, Ryan Morrison)
  - 3. **17-0776CU; 449 SOUTH PROSPECT STREET (RL, Ward 6S) Chris Khamnei**  
Establish duplex and widen driveway. (Project Manager, Scott Gustin)
  - 4. **17-0755CA/CU; 235 PENNY LANE (DW-PT, Ward 3C) City of Burlington**  
Construct marina, parking lot, and related site improvements.  
(Project Manager, Scott Gustin)
- V. **Other Business**
- VI. **Adjournment**

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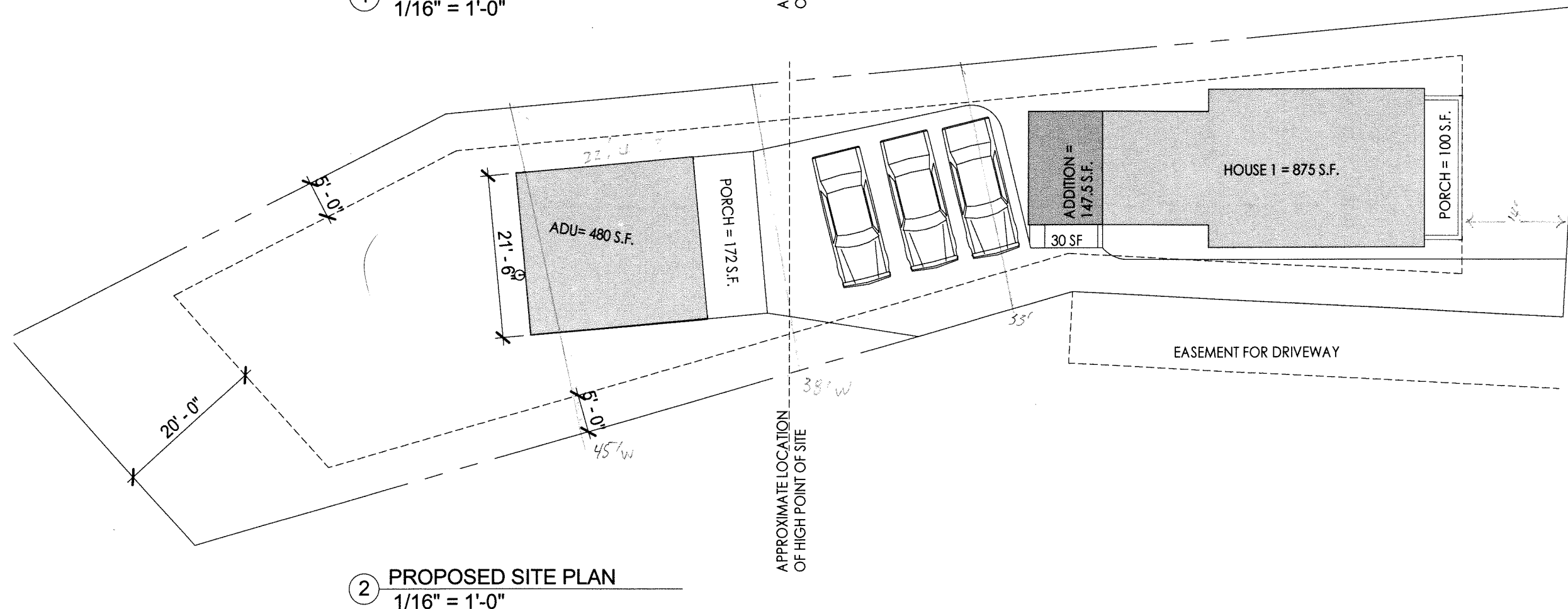
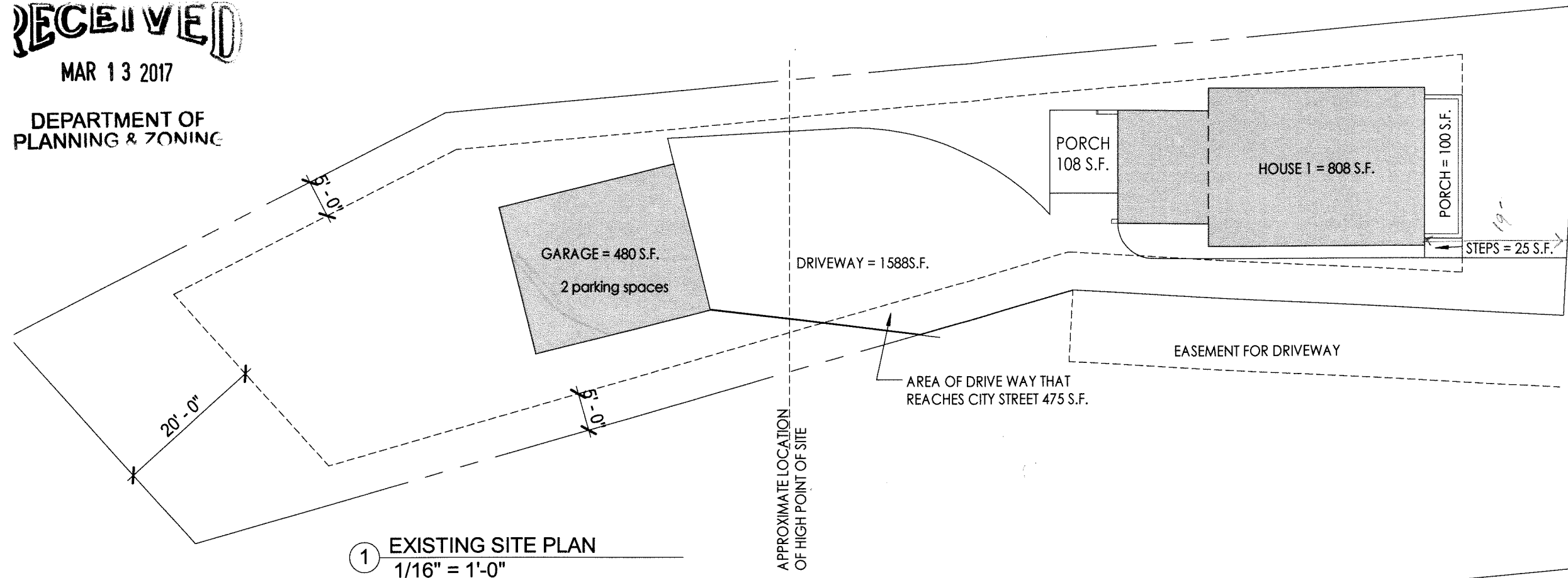
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DEPARTMENT OF  
PLANNING & ZONING



ZONING DISTRICT: RL

MAX. LOT COVERAGE = 35%  
+10 COVERAGE FOR PATIOS, DECKS PORCHES  
TERRACES.

FRONT: AVE. OF 2 ADJACENT LOTS ON BOTH  
SIDE +/- 5'-0"  
SIDE: 10% OF LOT WIDTH, BUT IN NO EVENT  
LESS THAN 5'-0"  
REAR: 25% OF LOT DEPTH, BUT IN NO EVENT  
LESS THAN 20'-0"

EXISTING LOT COVERAGE

EXISTING LOT SIZE: 8,134 S.F.

HOUSE : 808 S.F.  
GARAGE: 480 S.F.  
PORCHES: 208 S.F.

DRIVEWAY: 1,590 S.F.

EXISTING LOT COVERAGE = 3,086 S.F. = 38%

PROPOSED LOT COVERAGE

EXISTING LOT SIZE: 8,134 S.F.

HOUSE: 808 S.F.  
ADDITION TO HOUSE : 147.5 S.F.  
ADU & WORKSHOP: 508 S.F.

DRIVEWAY: 1,335 S.F.

PROPOSED LOT COVERAGE = 2,798.5 S.F. = 34.4%

PORCHES: 302 S.F.

10% ADD FOR PORCHES = 3,100.5 S.F. = 38.1%

DRAWING KEY

- EXISTING STRUCTURE
- NEW HOME
- PROPERTY LINE
- SETBACK LINE

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PLANNING & ZONING

GENERAL NOTES

1. ARCHITECTURAL DRAWINGS ARE FOR GENERAL INFORMATION ONLY. ARCHITECTURAL DRAWINGS DO NOT INCLUDE STRUCTURAL, MECHANICAL, OR ELECTRICAL CALCULATIONS, TECHNICAL INFORMATION OR COORDINATION. CONTRACTOR TO PROVIDE STRUCTURAL, MECHANICAL AND ELECTRICAL INFORMATION FOR PERMITTING AND CONSTRUCTION.
2. ALL CONSTRUCTION TO MEET OR EXCEED ALL LOCAL, STATE AND FEDERAL CODES.
3. ALL DIMENSIONS TO BE VERIFIED IN FIELD BY OTHERS.
4. ALL DIMENSIONS ARE TO FACE OF GYPSUM BOARD OR CONCRETE UNLESS OTHERWISE NOTED.
5. CONTRACTOR SHALL COORDINATE ALL WATER, SEWER AND ELECTRICAL CONNECTIONS WITH SUB-CONTRACTOR.

Sec. 5.4.5 Accessory Dwelling Units

(a) Accessory Units, General Standards/Permitted Uses:

2. The unit does not consist of more than 30 percent of the total habitable floor area of the building, inclusive of the accessory dwelling unit;

**Habitable:** A space in the building for living, sleeping, eating, or cooking. Bathrooms, toilet rooms, closets, halls, storage or utility spaces and similar areas are not considered habitable spaces.

SINGLE FAMILY DWELLING TOTAL  
HABITABLE FLOOR AREA:

1ST FLOOR (NON-HABITABLE IS  
ITALICIZED)

MUD ROOM = 118 S.F.  
WORKSHOP = 163 S.F.  
CLOSET = 16 S.F.  
PANTRY(S) = 12 S.F.  
KITCHEN = 181 S.F.  
BATHROOM = 31 S.F.  
PLAY ROOM = 73 S.F.  
DINING = 187 S.F.  
LIVING = 154 S.F.  
HALLWAY = 80 S.F.

2ND FLOOR (NON-HABITABLE IS  
ITALICIZED)

OFFICE = 129 S.F.  
BEDROOM = 167 S.F.  
BEDROOM = 123 S.F.  
CLOSET = 26 S.F.  
BATHROOM = 24 S.F.  
HALLWAY = 50 S.F.

TOTAL HABITABLE = 1,295 S.F.  
30% = 388.5 S.F.

ACCESSORY DWELLING  
TOTAL HABITABLE FLOOR  
AREA:

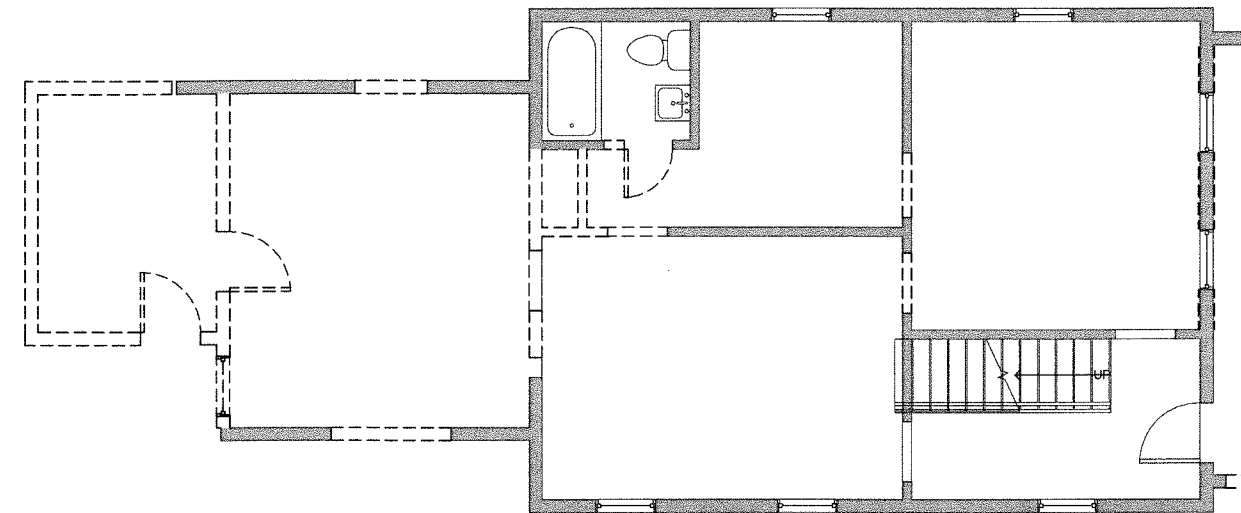
1ST FLOOR (NON-HABITABLE  
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KITCHEN = 156 S.F.  
BATHROOM = 52 S.F.  
CLOSET = 13 S.F.

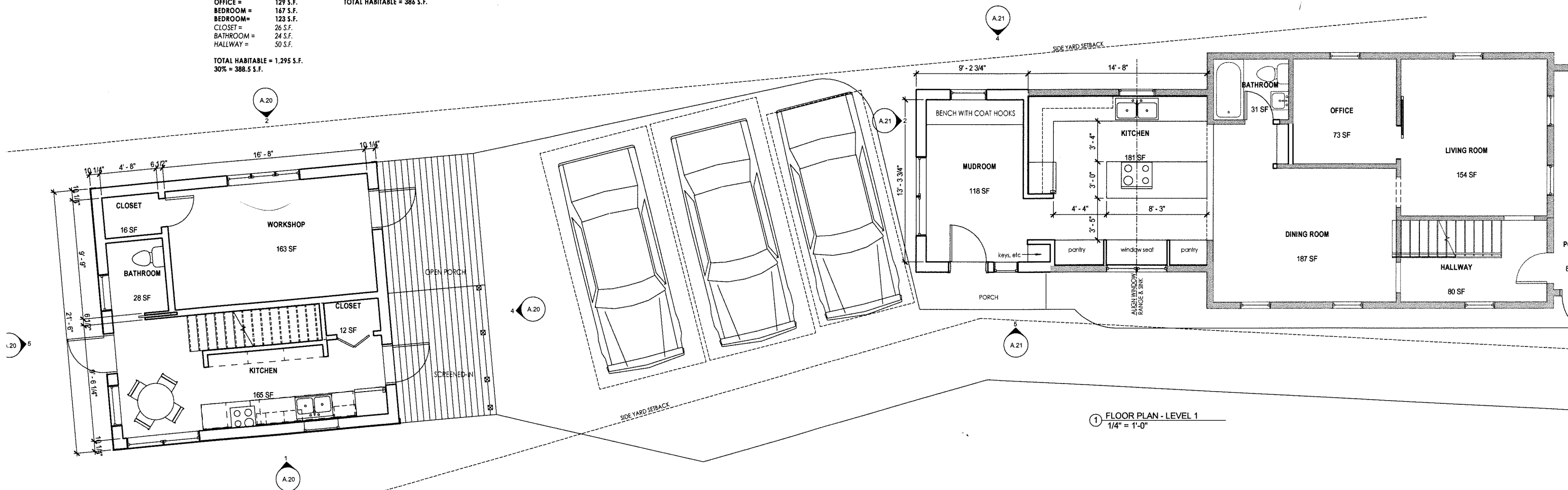
2ND FLOOR (NON-  
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BEDROOM = 160 S.F.  
HALLWAY = 46 S.F.  
OFFICE = 70 S.F.  
CLOSET = 39 S.F.  
BATHROOM = 70 S.F.

TOTAL HABITABLE = 386 S.F.



② DEMOLITION PLAN - LEVEL 1  
1/4" = 1'-0"



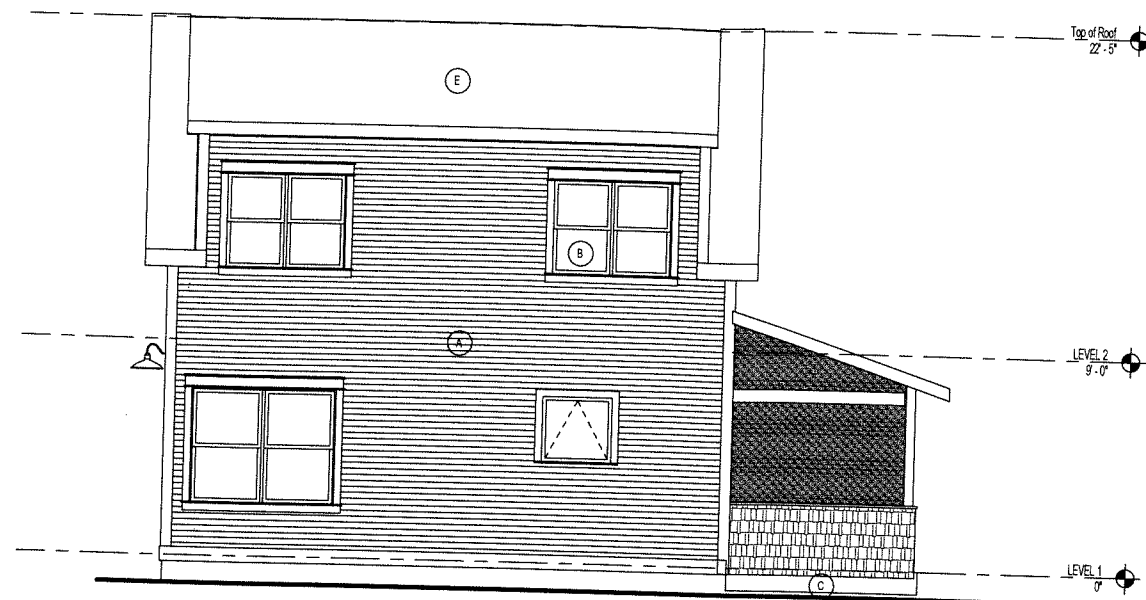
① FLOOR PLAN - LEVEL 1  
1/4" = 1'-0"

RECEIVED

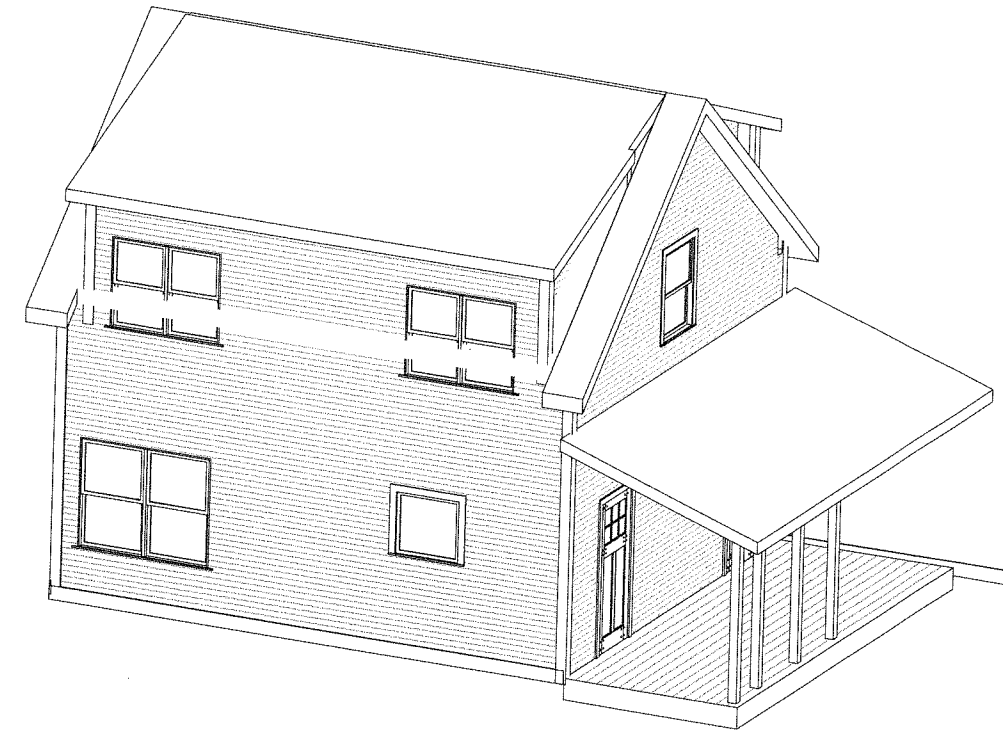
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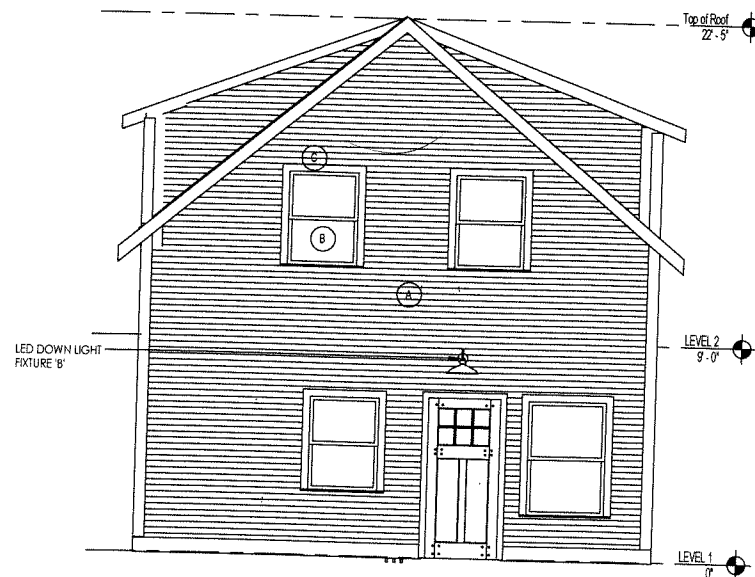
| MATERIAL KEY |                               |
|--------------|-------------------------------|
| Key Value    | Keynote Text                  |
| A            | 4" CLAPBOARD SIDING - PAINT   |
| B            | ALUMINUM CLAD WINDOW          |
| C            | WOOD TRIM                     |
| D            | WOOD SHINGLES - PAINT         |
| E            | ASPHALT SHINGLES              |
| F            | CABLE GUARDRAIL WITH WOOD CAP |



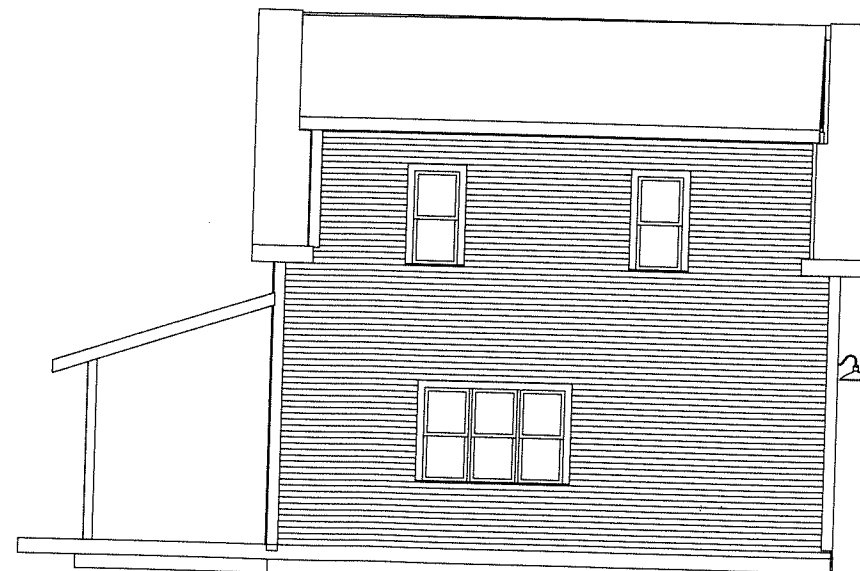
① ADU - SOUTH  
1/4" = 1'-0"



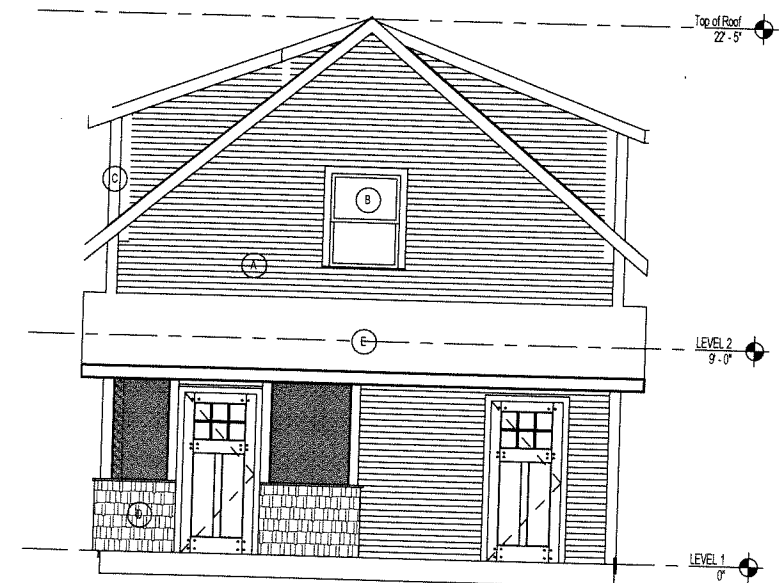
③ ADU MASSING



⑤ WEST ELEVATION  
1/4" = 1'-0"



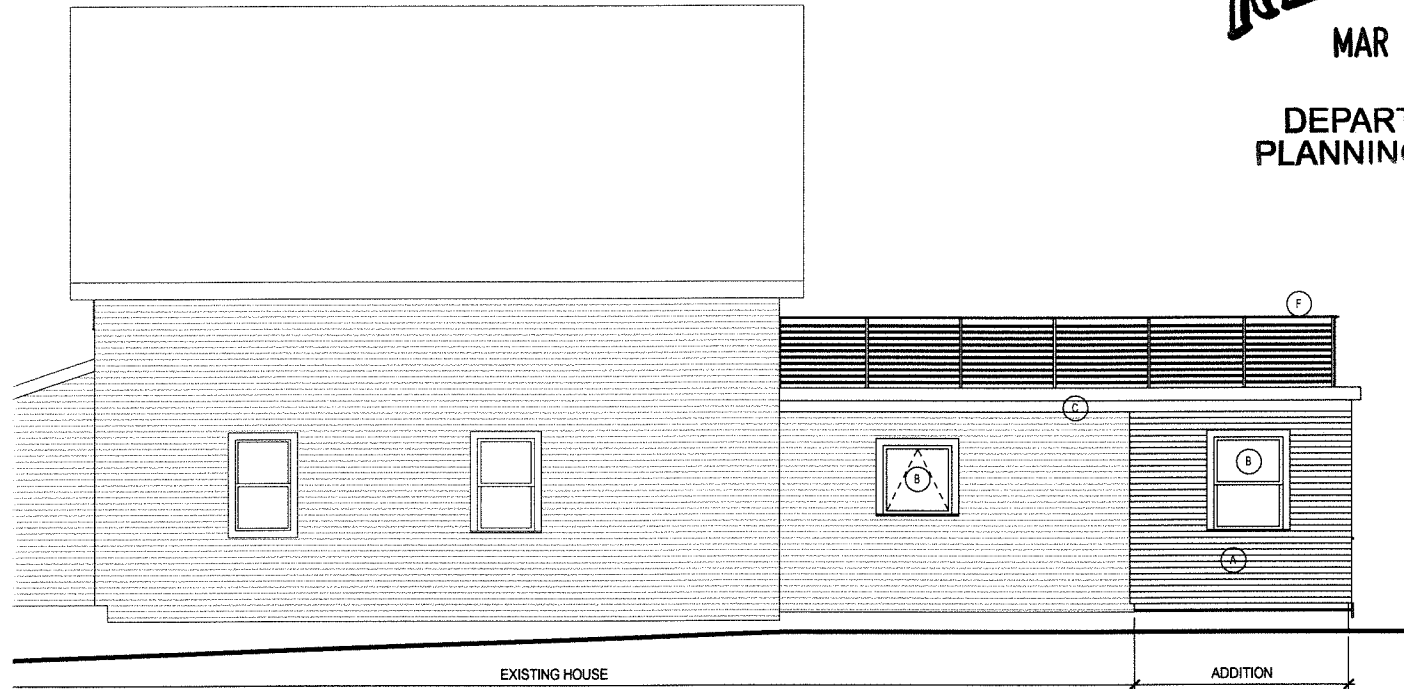
② ADU - NORTH  
1/4" = 1'-0"



④ ADU - EAST  
1/4" = 1'-0"

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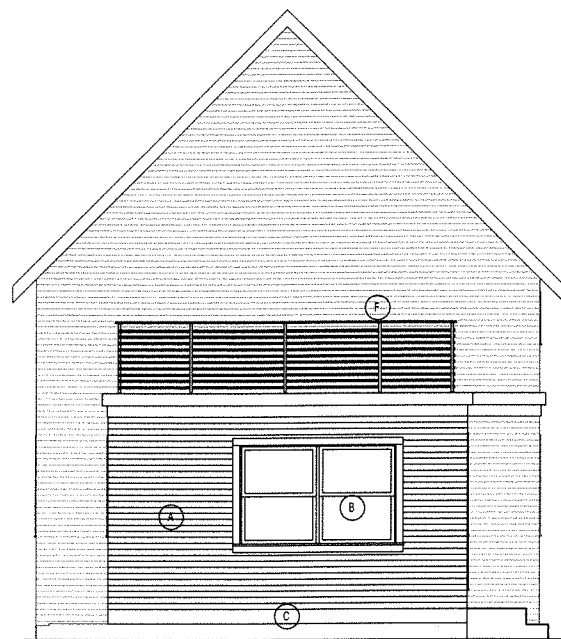
④ MAIN HOUSE - NORTH  
1/4" = 1'-0"



⑤ MAIN HOUSE - SOUTH  
1/4" = 1'-0"



① MAIN HOUSE - EAST  
1/4" = 1'-0"



② MAIN HOUSE - WEST  
1/4" = 1'-0"



③ VIEW FROM SOUTHEAST  
1/4" = 1'-0"

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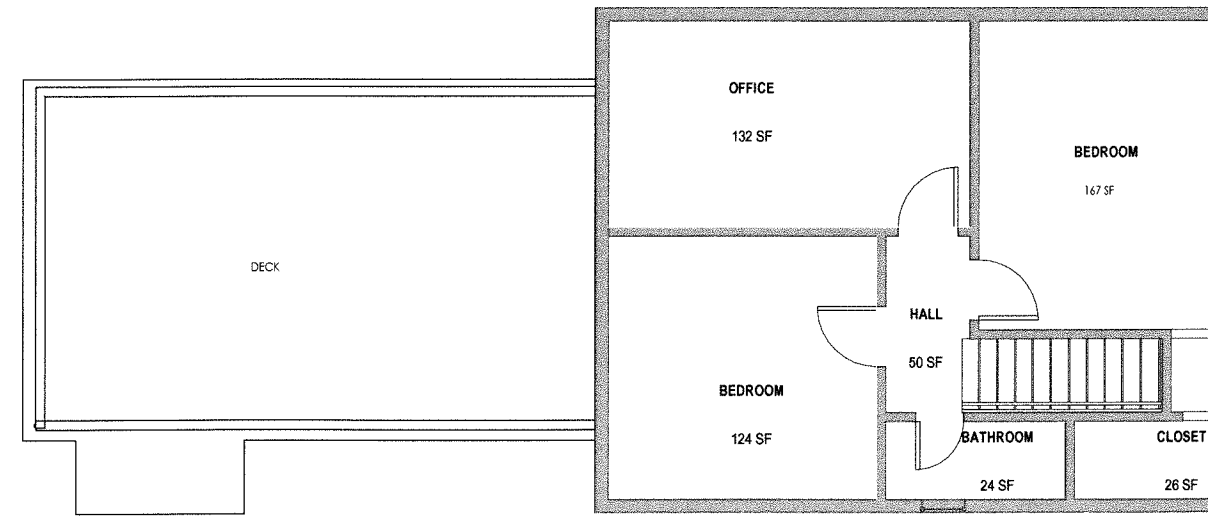
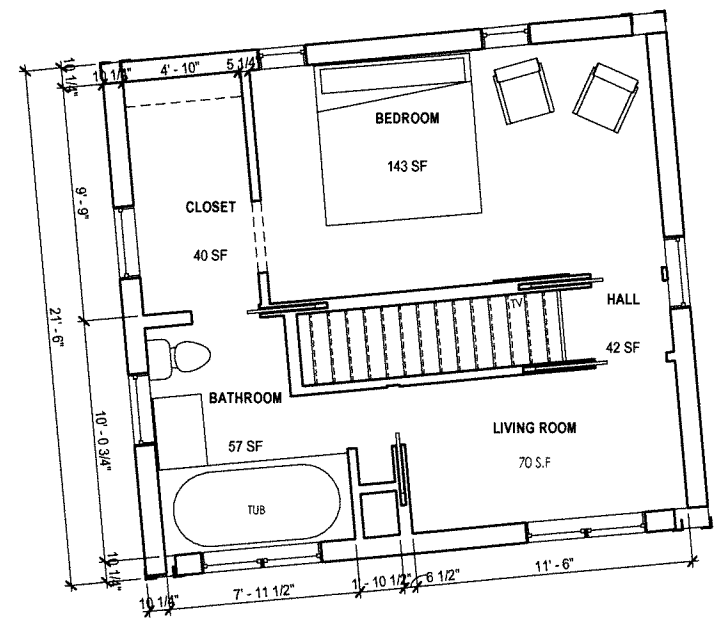
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① LEVEL 2  
1/4" = 1'-0"



Google Maps 35 Grove St



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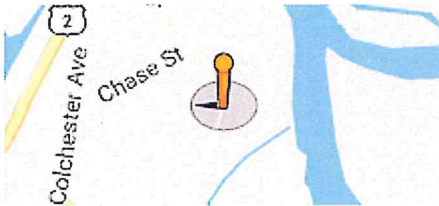
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Image capture: Oct 2014 © 2017 G

Burlington, Vermont

Street View - Oct 2014



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FIGURE B



1/25/17



Google Maps 37 Grove St

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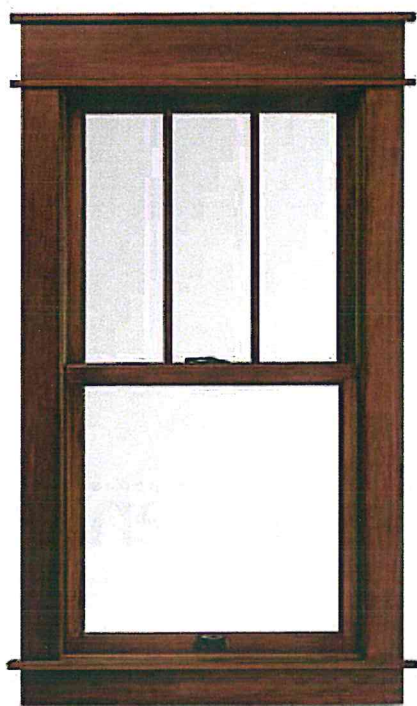
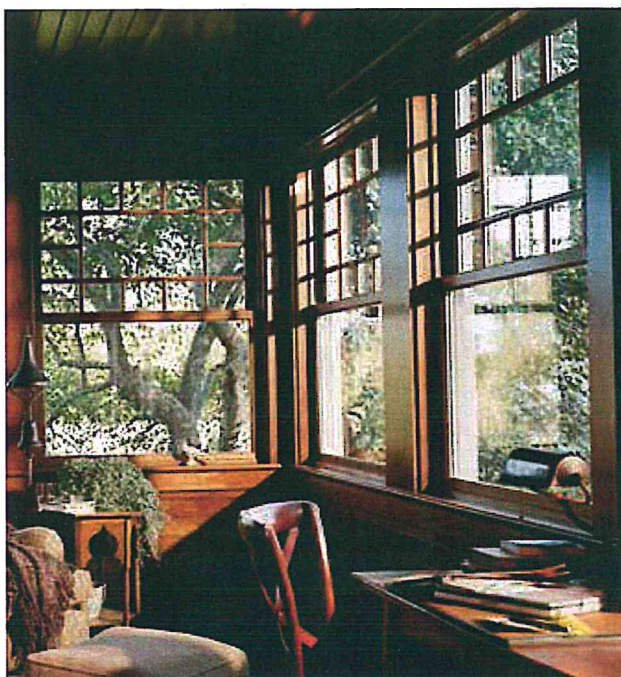
Image capture: Oct 2014 © 2017 G

Burlington, Vermont

Street View - Oct 2014







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## WOODWRIGHT® DOUBLE-HUNG WINDOWS

Andersen® 400 Series Woodwright® double-hung windows are designed with old-world character and modern performance. Exteriors use two different levels of protection. The frames are vinyl clad, the sash and the sills are made of Fibrex® material. On the inside you have a choice of natural pine, oak, maple or low-maintenance white finish. Both sash tilt in for ease of cleaning. For added style there are historically accurate grille patterns, hardware and glass options.

### DURABLE

- Virtually maintenance-free
- Perma-Shield® exteriors never need painting and won't peel, blister, flake or corrode\*
- Frame exterior is protected by a tough vinyl cover that resists dents and repels water and provides long-lasting protection
- Sash members have a tough Fibrex® material exterior
- The sill is made with a solid wood core and are protected from the elements with Fibrex® cladding

### ENERGY EFFICIENT

- Weather-resistant construction for greater comfort and energy efficiency
- Weatherstripping is designed to seal out drafts, wind and water
- A variety of Low-E4® glass options are available to control heating and cooling costs in any climate
- Many 400 Series Woodwright® double-hung windows have options that achieve ENERGY STAR® version 6.0 certifications in all 50 states\*\*



### BEAUTIFUL

- Seven exterior color options
- Natural pine, maple, oak or white interiors
- Extensive hardware selection
- Add style with grilles, exterior trim or patterned glass

### EXTERIOR COLORS



White

Canvas

Sandtone

Terratone

Forest Green

Dark Bronze

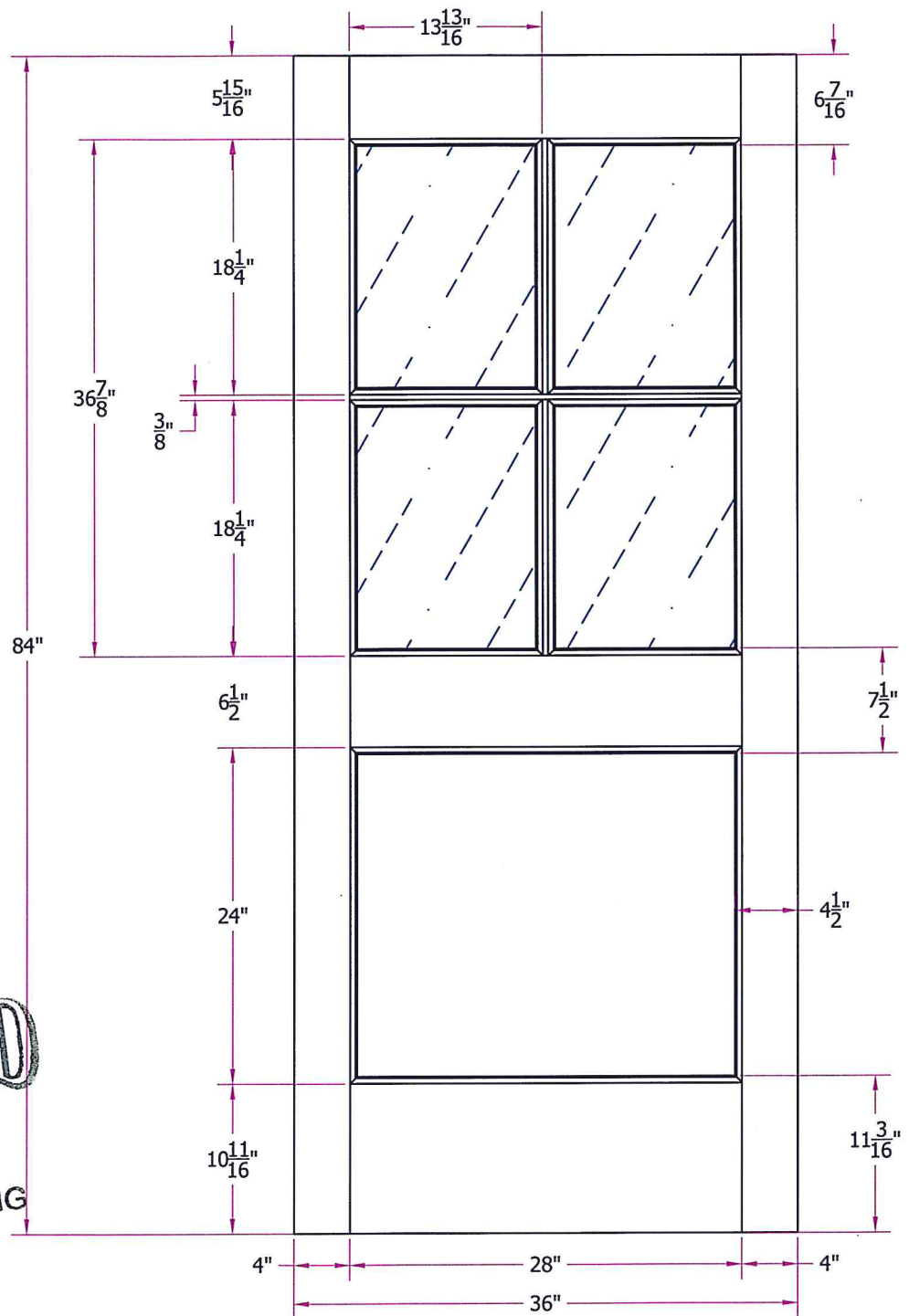
Black¹

\*\*Visit [andersenwindows.com/warranty](http://andersenwindows.com/warranty) for details.  
¹ See your Andersen dealer for availability. "ENERGY STAR" is a registered trademark of the U.S. Environmental Protection Agency.

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Revisions

| Rev. # | Description | Date | by Whom |
|--------|-------------|------|---------|
|        |             |      |         |
|        |             |      |         |
|        |             |      |         |
|        |             |      |         |

TITLE 7482 3/0 x 7/0  
Customer Layout

DRAWING NO. D-7482-300-700-0700

|                   |           |                 |
|-------------------|-----------|-----------------|
| LAYOUT 00         | SCALE NTS | PATTERN # 701   |
| DRAWN BY: V.KEECH |           | DATE 10/14/2011 |

**Simpson®**





## FEATURES & SPECIFICATIONS

**INTENDED USE** — Recessed housing rated IC or Non-IC. For new construction only.

Approved for all ceiling and wiring types.

Approved for direct burial in insulation.

**CONSTRUCTION** — Air-tight standard. Tested to meet current energy codes.

Aluminum foam-gasketed housing with galvanized steel pan.

Galvanized bar hangers span up to 24" o.c. and feature stepped shank nail and positioning guide with integral T-bar locks. Two locking screws hold fixture in position.

Galvanized steel junction box with four built-in Romex clamps. Four 1/2" and two 3/4" knockouts with slots for pryout. Rated for through branch wiring.

Maximum 4 (2 in, 2 out) No. 12 AWG conductors. Rated for 90°C.

Ground wire provided.

Removable J-box doors for easy access.

**ELECTRICAL** — Quick disconnect provided for power connection to the LED modules.

Paint overspray masked by disposable disconnect plug.

Housing and LED module combination is IC rated and thermally protected.

120 volt only.

**INSTALLATION** — Air-tight housing suitable for air-tight installations. Refer to energy codes for proper installations.

2x8 and 2x6 wood joist or T-bar installation.

Expandable bar hangers allow for off-center mounting in wood joist or T-bar ceilings. Length of 25-1/2" maximum 13-1/4" minimum or cut to fit 5-1/2" on center joist construction.

Vertical adjustment of housing allows for flush mounting with ceiling face.

Suitable for ceilings up to 1-1/2" thick.

**LISTINGS** — UL Listed to US and Canadian safety standards. Damp location listing (See trim selection for wet location listing).

**WARRANTY** — 1-year limited warranty. Complete warranty terms located at

[www.acuitybrands.com/CustomerResources/Terms\\_and\\_conditions.aspx](http://www.acuitybrands.com/CustomerResources/Terms_and_conditions.aspx)

Note: Actual performance may differ as a result of end-user environment and application.

Specifications subject to change without notice.

Catalog  
Number

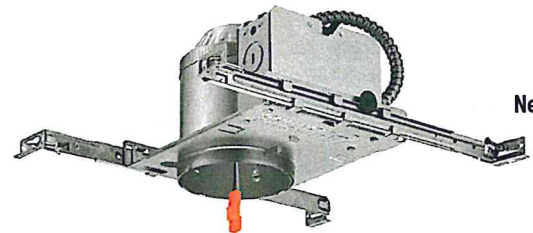
Notes

Type

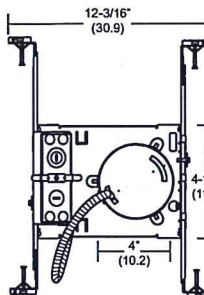
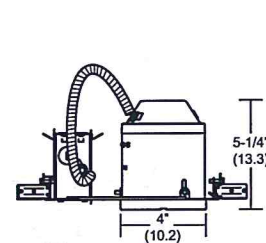
Fixture A

4" LED Ho

# L3LED T2



IC/N  
New Constr



### Specifications

Height: 5-1/4 (13.3)

Length: 13-1/4 (33.7)

Width: 12-3/16 (30.9)

Ceiling opening: 4 (10.2)

All dimensions are inches (centimeters) unless otherwise specified.

### ORDERING INFORMATION

For shortest lead times, configure product using **bolded options**.

Example: L3L

| L3LED T24 |                                                                     |                                               |
|-----------|---------------------------------------------------------------------|-----------------------------------------------|
| Series    | Options                                                             | Packaging                                     |
| L3LED T24 | <b>Shipped installed in fixture</b><br>PHC Poke-home wire connector | <b>R6</b> Resale pack of six<br><b>U</b> Unit |

Accessories: Order as separate catalog number.

ATK3 R6 Airtight trim kit

### Notes

See trim summary on reverse side for maximum wattage

## Department of Planning and Zoning

149 Church Street

Burlington, VT 05401

<http://www.burlingtonvt.gov/PZ/>

Telephone: (802) 865-7188

(802) 865-7195 (FAX)

David E. White, AICP, Director  
Meagan Tuttle, AICP, Comprehensive Planner  
Jay Appleton, Senior GIS/IT Programmer/Analyst  
Scott Gustin, AICP, CFM, Principal Planner  
Mary O'Neil, AICP, Principal Planner  
Ryan Morrison, CFM, Associate Planner  
Anita Wade, Zoning Clerk



### MEMORANDUM

To: Development Review Board  
From: Mary O'Neil, AICP, Principal Planner  
Date: March 21, 2017  
RE: ZP17-0762CA/CU; 35 Grove Street

**Note: These are staff comments only. Decisions on projects are made by the Development Review Board, which may approve, deny, table or modify any project. THE APPLICANT OR REPRESENTATIVE MUST ATTEND THE MEETING.**

**File:** ZP17-0762CA/CU

**Location:** 35 Grove Street

**Zone:** RL **Ward:** 1E

**Date application accepted:** February 3, 2017

**Revised plans received:** March 13, 2017

**Applicant/ Owner:** Gina Lambdin

**Request:** Addition to existing single family dwelling, demolish garage, construct detached accessory dwelling unit, reconfigure parking area.

#### **Background:**

There are no zoning permits on file for this property.



#### **Overview:**

The application seeks to demolish an existing garage and erect a detached structure to provide an accessory dwelling unit and workshop space for the owner; construct an addition to the existing single family home, enclose a front porch, and redefine the parking area adding a third parking space.

**Applicable regulations:** Article 3 (Applications Permits and Project Reviews), Article 4 (Zoning Maps and Districts), Article 5 (Citywide General Regulations), Article 6 (Development Review Standards), Article 8 (Parking) and Article 13 (Definitions.)

**Recommendation:** Denial, per the following findings and conditions:

#### **I. Findings**

##### **Article 3: Applications, Permit and Project Reviews**

##### **Part 5: Conditional Use**

##### **Section 3.5.6 Review Criteria**

##### **(a) Conditional Use Review Standards (as adopted by City Council 8.10.2015)**

*Approval shall be granted only if the DRB, after public notice and public hearing, determines that the proposed conditional use and associated development shall not result in an undue adverse effect on each of the following general standards:*

1. *Existing or planned public utilities, facilities, or services are capable of supporting the proposed use in addition to the existing uses in the area.*

An addition to an existing single family home in a residential zoning district will not result in an undue adverse effect on existing or planned public facilities. **Affirmative finding.**

2. *The character of the area affected as defined by the purpose or purposes of the zoning district(s) within which the project is located, and specifically stated policies and standards of the municipal development Plan;*

This is a residential zoning district; the proposed addition to an existing single family home to include an accessory dwelling unit is in concert with the district and the Municipal Development Plan:

- *Support the development of additional housing opportunities within the city...* [MDP, Housing Plan, Page IX-1.]
- *Encourage a wide range of housing options to meet different and changing needs of households with children, the elderly, people with disabilities and moderate and low income households.* [MDP, Housing Plan, Page IX-1.]
- *Conserve the existing elements and design of its established neighborhoods.* [MDP, Historic Preservation, Page IV-1.]
- *Support the creation of new rental and owner-occupied housing on every parcel of land in Burlington that is zoned for residential development at the number of units allowed by zoning.* [MDP, Housing Plan, Page IX-12.]

**Affirmative finding.**

3. *The proposed use will not have nuisance impacts from noise, odor, dust, heat, and vibrations greater than typically generated by other permitted uses in the same zoning district;*

An addition to an existing single family home and construction of a replacement accessory structure will have no discernable nuisance impacts greater than typically generated by other residences in the neighborhood. **Affirmative finding.**

4. *The transportation system is capable of supporting the proposed use in addition to the existing uses in the area. Evaluation factors include street designations and capacity; level of service and other performance measures; access to arterial roadways; connectivity; transit availability; **parking and access**; impacts on pedestrian, bicycle and transit circulation, safety for all modes; and adequate transportation demand management strategies;*

The required addition of a single parking space/car will have no measureable impact on transportation systems, street level of service or other performance measures. The reconfigured parking arrangement, however, intends to further encroach over a property boundary onto an abutting neighbor's parcel. As illustrated, car parking would be unattainable without further area to maneuver into parking spaces. Without an expanded



access easement area, the proposed parking/access configuration is flawed. **Adverse finding.**

*and*

5. *The utilization of renewable energy resources;*

No part of this application will prevent the use of wind, solar, water, geothermal or other renewable energy resource. **Affirmative finding.**

*and*

6. *Any standards or factors set forth in existing City bylaws and city and state ordinances.*

The applicant will be required to provide a letter from the Department of Public Works confirming adequate water and sewer capacity for the new accessory dwelling unit.

**Affirmative finding if conditioned.**

### **(c) Conditions of Approval**

*In addition to imposing conditions of approval necessary to satisfy the General Standards specified in (a) or (b) above, the DRB may also impose additional conditions of approval relative to any of the following:*

1. *Mitigation measures, including but not limited to screening, landscaping, where necessary to reduce noise and glare and to maintain the property in a character in keeping with the surrounding area;*

New utility installation may require screening; as well as landscaping to prevent headlight trespass from the parking arrangement.

**Affirmative finding if conditioned.**

2. *Time limits for construction.*

The permit will have a two-year life from the date of approval. Reference is made to Section 3.2.9 (d). **Affirmative finding as conditioned.**

3. *Hours of operation and/or construction to reduce the impact on surrounding properties.*

Residential use has no limitation on hours of operation.

Construction shall be limited Monday-Friday 7:30- 6:00 pm, with indoor work only on Saturdays. No construction shall occur on Sundays. **Affirmative finding as conditioned.**

4. *That any future enlargement or alteration of the use return for review to the DRB to permit the specifying of new conditions,*

Any enlargement will be reviewed under the zoning regulations in effect at that time.

**Affirmative finding.**

*and*

5. *Such additional reasonable performance standards, conditions and safeguards as it may deem necessary to implement the purposes of this chapter and the zoning regulations.*

Any other performance standards are at the discretion of the Development Review Board.

## **Article 4: Zoning Maps and Districts**

## Section 4.4.5 Residential Districts

**Table 4.4.5-1 Minimum Lot Size and Frontage: RL, RL-W, RM and RM-W**

35 Grove Street has a lot frontage of 41'; less than the 60' minimum for a single detached dwelling in the RL zoning district. The project will therefore require review under **Section 5.3.6, Non-conforming Lots.**

**Table 4.4.5-3 Residential District Dimensional Standards**

| Zoning District                 | Max. Lot Coverage <sup>1</sup>                                          | Setbacks <sup>1, 3, 4, 5, 6</sup>                                                                                                                                                                                                                                  |                                                                                                                                 |                                                                                                  |                                                                                                    |                                                                               |
|---------------------------------|-------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|
|                                 |                                                                         | Front <sup>2</sup>                                                                                                                                                                                                                                                 | Side <sup>3</sup>                                                                                                               | Rear                                                                                             | Waterfront                                                                                         | Max. Height <sup>1</sup>                                                      |
| <b>RL; WRL</b>                  | 35%                                                                     | <b>Min/Max:</b><br>Ave. of 2 adjacent lots on both sides +/- 5-feet                                                                                                                                                                                                | <b>Min:</b><br>10% of lot width Or<br>ave. of side yard setback of 2 adjacent lots on both sides<br><b>Max required:</b><br>20' | <b>Min:</b><br>25% of lot depth but in no event less than 20'<br><b>Max required:</b><br>75-feet | <b>Min:</b><br>75' feet from the ordinary high water mark of Lake Champlain and the Winooski River | 35-feet                                                                       |
| <b>35 Grove Street proposed</b> | 37.93% existing;<br>38.11% proposed (34.4 % excluding bonus components) | Proposed enclosure to front porch changes setback (measured to principal structure unless converted to habitable area. Only 2 principal structures to establish average setback. (25 Grove and 39 Grove.) No average setback number provided to assess compliance. | Lot width varies; meets minimum 10% lot width for new addition and detached structure. Parking area 5' from property line.      | Rear residential addition does not encroach into rear lot setback. 25% of 205' +/- = 51.25'.     | 430+ from Winooski River.                                                                          | New detached structure approx. 20' to mid-line of the rise of the gable roof. |

**No finding possible** without determination of front yard setback based on average of abutting properties; calculation of front yard setback with porch enclosure. (Setback must fall with +/-5' of average.)

#### **Section 4.4.5 (d) Encroachment for Residential Driveways**

*For purposes of allowing existing, developed, nonconforming lots containing single family homes to create a driveway and provide a maximum of two tandem parking spaces, driveways may encroach into a required sideyard setback up to the property line with DRB approval. Such approval shall be based on demonstrated necessity on the part of the property owner as well as unique physical circumstances of the lot, conditional use criteria and findings that there shall be no undue adverse impact on all of the following items of concern: drainage, safety, **protection of neighboring side yard**, light and air. In addition, the lot shall be found to have dimensions that are smaller than the existing standards for lot size or frontage. The maximum relief from the 5' minimum setback shall be the minimum necessary for the purposes of creating such a driveway and parking spaces and shall be allowed only after a finding that driveway and parking configuration cannot be otherwise located on the lot. With such approval by the DRB, the lot shall not be considered nonconforming due to the decreased setback for the creation of the driveway and parking spaces.*

The existing single family home on the non-conforming lot has a shared driveway, which encroaches into the side yard setback. The non-conformity is the property width; less than the required 60' for a single family home in the RL zoning district. This original site plan proposed to expand the non-conformity by extending the amount of driveway in the setback (further west) to accommodate the altered parking area. The revised site plan does not illustrate the expansion, but assumes it for purposes of vehicular maneuvering. The proposal also assumes expansion of the identified "easement area" for the shared driveway. Exercise of the expanded parking area would also increase the use of the neighboring property. No instrument has been provided that confirms neighbor acceptance of the expanded use of the shared driveway.

This section allows for minimal encroachment for the purposes of establishing 2 parking spaces for an existing single family home. While a single family home with an accessory dwelling unit remains identified as a single family home, the limitation to 2 parking spaces for consideration of this allowance is not consistent with this application. Two parking spaces already exist. A third parking space is being established for the ADU.

Approval of such expanded non-conformity is at the discretion of the DRB for the purpose of allowing access to the rear parking area. As the request exceeds the parameters of this allowance (access to 2 parking spaces – the application is for 3), **Adverse finding** for functional expansion of access driveway in a required setback and in excess of easement area.

#### **Article 5: Citywide General Regulations**

##### **Section 5.2.1 Existing Small Lots**

Not applicable.

##### **Section 5.2.2 Required Frontage or Access**

There is an existing shared driveway, which the application proposes to further expand into a required setback to accommodate a third parking space. See Section 4.4.5 (d) above.

##### **Section 5.2.3 Lot Coverage Requirements**

See Table 4.4.5-3, above.

##### **Section 5.2.4 Buildable Area Calculation**

This lot does not exceed 2 acres in size. Not applicable.

### Section 5.2.5 Setbacks

See Table 4.4.5-3, above.

### Section 5.2.6 Building Height Limits

See Table 4.4.5-3, above.

### Section 5.2.7 Density and Intensity of Development Calculations

The property will remain a single family home, but with an accessory dwelling unit. For purposes of density, the property remains a single family home. **Affirmative finding.**

### Section 5.3.6 Nonconforming Lots

#### (c) Changes to a Nonconforming Lot:

*No change shall be permitted to any nonconforming lot which would have the effect of increasing the density at which the property is being used, or increasing the structure located upon such lot, if the dimensional requirements and standards, including parking, of the underlying zoning district are not met as a result thereof. Any changes proposed on a non-conforming lot are subject to conditional use review.*

35 Grove Street is non-conforming as the property frontage is less than the required 60' for a single family home in the RL zoning district (it is 41'.)

See Table 4.4.5-3 for dimensional standards and Article 8 for Parking standards.

- It is undetermined if the front yard setback meets the minimum as averaged from abutting properties (the enclosure of the front porch expands the principle structure, diminishing the setback measurement. Open front porches are permitted to encroach into a required setback.)
- The proposed driveway access will functionally expand an encroachment into a required setback and expands the degree of non-conformity; and
- The required amount of backup space is not provided for any of the parking spaces without backing or pulling onto a neighboring property. See Article 8. **Adverse finding.**

### Section 5.4.5 Accessory Dwelling Units

#### (a) Accessory Units, General Standards/Permitted Uses:

*Where there is a primary structure on a lot which exists as an owner-occupied single family residence, one accessory dwelling unit, that is located within or appurtenant to such single family dwelling, shall be allowed as a permitted use if the provisions of this subsection are met. An accessory dwelling unit means an efficiency or one-bedroom apartment that is clearly subordinate to the primary dwelling, and has facilities and provisions for independent living, including sleeping, food preparation, and sanitation. No accessory unit shall be inhabited by more than 2 adult occupants. An accessory unit shall not be counted as a dwelling unit for the purposes of density calculation. Additionally, there must be compliance with all the following:*

- 1. The property has sufficient wastewater capacity as certified by the department of public works;*

The applicant will be required to provide written proof of capacity issued from the Department of Public Works. **Affirmative finding if conditioned.**



*2. The unit does not consist of more than 30 percent of the total habitable floor area of the building, inclusive of the accessory dwelling unit;*

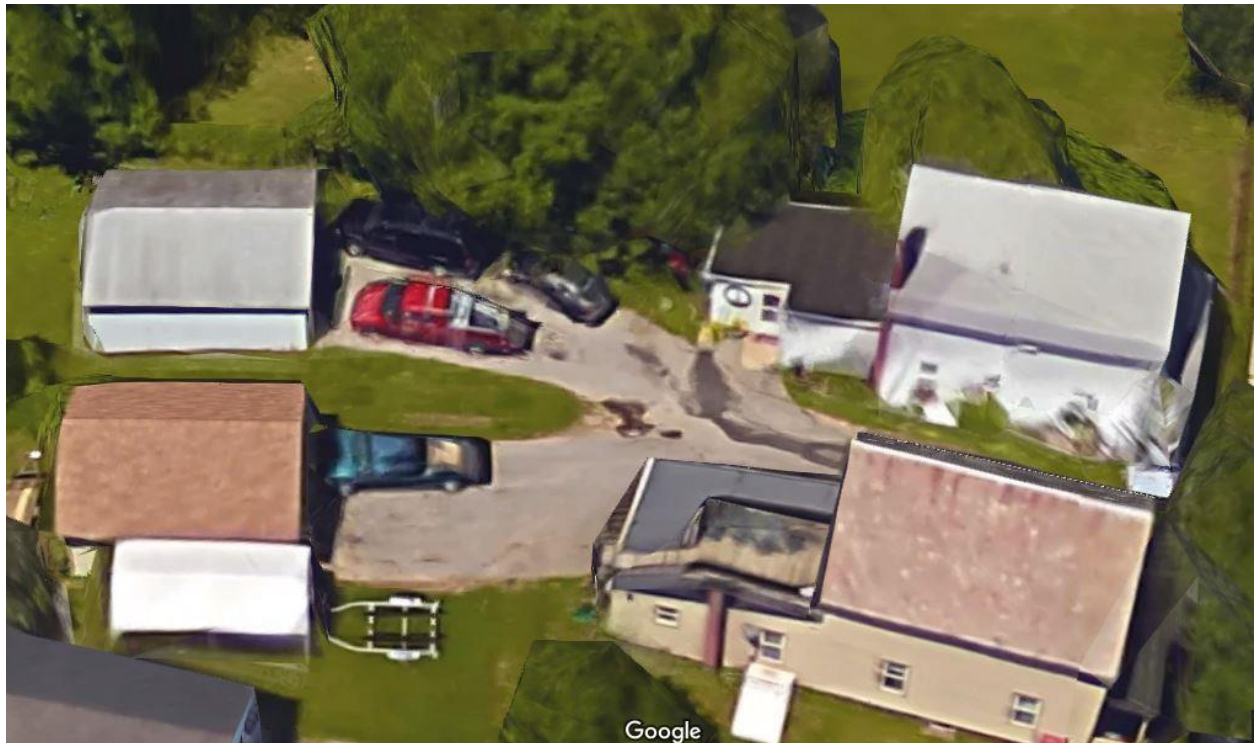
Utilizing the definition of habitable space from Article 13, the ADU does not exceed 30% of the total habitable floor area of the principle dwelling and the ADU combined. **Affirmative finding.**

*3. Applicable setback and coverage requirements are met;*

See Table 4.4.5-3, above. Functional expansion of access drive into a required setback is assumed by plan without an expanded easement with neighboring property. **Adverse finding.**

*4. One additional parking space which may be legally allocated to the accessory unit must be provided for the accessory unit;*

Three parking spaces are illustrated on revised Plan A.01, but it is inconceivable how vehicles could align in that manner given the access proposed. Any vehicular maneuvering will require expanded encroachment onto a neighboring property without a companion expansion of the existing easement. Additionally, parking does not provide the required back-up area as defined by Article 8. **Adverse finding.**



and,

*5. A deed or instrument for the property shall be entered into the land records by the owner containing a reference to the permit granting the accessory unit prior to the issuance of the certificate of occupancy for the unit. Such reference shall identify the permit number and note that the property is subject to the permit and its terms and conditions including owner occupancy. No certificate of occupancy shall be issued for the unit unless the owner has recorded such a notice.*

If approved, this will be a condition of approval. **Affirmative finding if conditioned.**

**(b) Conditional Use for Accessory Units:**

*If any of the following are also proposed, conditional use approval as well as development review provisions of Article 6 shall be required:*

1. *A new accessory structure;*
2. *An increase in the height or habitable floor area of the existing dwelling;*
3. *An Increase in the dimensions of any parking area.*

The application proposes a new accessory structure, so Conditional Use Review applies. See Section 3.5.6 (a), above.

**(c) Discontinuance of Accessory Units:**

*Approval of an accessory dwelling unit is contingent on owner occupancy of the single-family dwelling unit as a primary residence. For purposes of this section, owner occupancy means that, after the creation of the accessory unit all individuals listed on the deed for the property must reside in the primary unit or in the accessory unit. If either the primary unit or the accessory unit is no longer owner occupied as a primary residence, the approval for the accessory dwelling unit is void and the kitchen of the accessory dwelling unit must be removed within 90 days with the entirety of the property being occupied as a single unit. When an accessory unit that is the result of additional square footage and/or a new accessory structure is proposed to be removed, revised floor plans and a revised site plan shall be required to be submitted for review and approval. Furthermore, where additional square footage is added to a single family home for purposes of creating an accessory unit and the accessory unit is at any point discontinued, none of the additional square footage shall be eligible for the purposes of increasing the number of unrelated adults that may be allowed to inhabit the property.*

**Affirmative finding if conditioned.**

**Article 6: Development Review Standards**

**Part 1: Land Division Design Standards**

No land division is proposed. Not applicable.

**Part 2: Site Plan Design Standards**

**Sec. 6.2.2 Review Standards**

**(a) Protection of Important Natural Features:**

There are no identified important natural features on the site. Not applicable.

**(b) Topographical Alterations:**

The project submission does not detail any proposed changes to topography. **Affirmative finding.**

**(c) Protection of Important Public Views:**

There are no protected important public views from this parcel. Not applicable.

**(d) Protection of Important Cultural Resources:**

*Burlington's architectural and cultural heritage shall be protected through sensitive and respectful redevelopment, rehabilitation, and infill. Archeological sites likely to yield information important to the city's or the region's pre-history or history shall be evaluated, documented, and avoided whenever feasible. Where the proposed development involves sites listed or eligible for listing on a state or national register of historic places, the applicant shall meet the applicable development and design standards pursuant to Sec. 5.4.8(b).*

The property is not listed on the state or National Register of Historic Resources. Not applicable.

**(e) Supporting the Use of Renewable Energy Resources:**

No part of the application will prevent the utilization of wind, solar, water, geothermal or other renewable energy resource. **Affirmative finding.**

**(f) Brownfield Sites:**

The site is not listed on the VT ANR or DEC Brownfields list of identified sites. **Affirmative finding.**

**(g) Provide for nature's events:**

*Special attention shall be accorded to stormwater runoff so that neighboring properties and/or the public stormwater drainage system are not adversely affected. All development and site disturbance shall follow applicable city and state erosion and stormwater management guidelines in accordance with the requirements of Art 5, Sec 5.5.3.*

*Design features which address the effects of rain, snow, and ice at building entrances, and to provisions for snow and ice removal or storage from circulation areas shall also be incorporated.*

An Erosion Prevention and Sediment Control Plan has been submitted and given approval by the Stormwater program. The revised plan will require new review by that program.

The plan shows both a screened porch and open porch on the new detached structure; either would provide shelter from inclement weather.

The entrance into the mudroom is covered by a small roof extension, also a place of shelter. **Affirmative finding.**

**(h) Building Location and Orientation:**

The addition is proposed in a typical location for residential expansion; at the rear of a principal structure. The new ADU is proposed for a rear (detached) structure. As located, it is consistent with residential additions. **Affirmative finding.**

**(i) Vehicular Access:**

There is an existing driveway to a rear garage. The application proposes to expand that drive access area further west, expanding the encroachment into a required side yard setback and assuming greater area for a shared driveway. The annotated easement for the driveway does not extend that far, and assumes the neighbor approves functional expansion of the driveway access.

As expanding the existing non-conformity, the driveway expansion is not compliant with the ordinance. If the neighboring property owner offers an extended easement for the shared use drive, then the expansion may be considered. **Adverse finding** without written instrument of expanded easement area.

**(j) Pedestrian Access:**

The new plan omits a path to the house or to the ADU. Although pedestrians may access the ADU via the driveway pavement and the mudroom via the porch, there is no path/steps indicated to the front door of the existing dwelling (where the porch is proposed to be enclosed.) All new coverage must be included in the lot coverage calculation. **Affirmative finding if conditioned.**

**(k) Accessibility for the Handicapped:**

Accessibility is not a requirement for a single family residence, but it encouraged. Not applicable.

**(l) Parking and Circulation:**

Plan A.01 illustrates the required three parking spaces (2 for single family residence, one for the ADU) but it is not possible to get a car in that location without circulation onto an abutting property. The parking arrangement also lacks required backup space. (Minimum back-up length for 90° angled parking is 24'.) The parking layout is unworkable within the confines of this parcel. **Adverse finding.**

**(m) Landscaping and Fences:**

No landscaping plan has been submitted. The applicant is required to provide a plan for Board review. **No finding possible.**

**(n) Public Plazas and Open Space:**

There are no public plazas or dedicated open spaces. The rooftop deck proposed for the existing residence lacks an access point (stairs, or exterior door from the dwelling.) If this is intended as a rooftop deck, more information is necessary. **No finding possible.**

**(o) Outdoor Lighting:**

*Where exterior lighting is proposed the applicant shall meet the lighting performance standards as per Sec 5.5.2.*

A spec sheet for a soffit recessed can light has been provided; assumedly for a porch entrance. This needs definition. Plans define a LED Downlight at the rear entrance of the ADU. **Affirmative finding if conditioned.**

**(p) Integrate infrastructure into the design:**

*Exterior storage areas, machinery and equipment installations, service and loading areas, utility meters and structures, mailboxes, and similar accessory structures shall utilize setbacks, plantings, enclosures and other mitigation or screening methods to minimize their auditory and visual impact on the public street and neighboring properties to the extent practicable.*

*Utility and service enclosures and screening shall be coordinated with the design of the principal building, and should be grouped in a service court away from public view. On-site utilities shall*

*be place underground whenever practicable. Trash and recycling bins and dumpsters shall be located, within preferably, or behind buildings, enclosed on all four (4) sides to prevent blowing trash, and screened from public view.*

*Any development involving the installation of machinery or equipment which emits heat, vapor, fumes, vibration, or noise shall minimize, insofar as practicable, any adverse impact on neighboring properties and the environment pursuant to the requirements of Article 5, Part 4 Performance Standards.*

There is no identified location of utility connections, meter installation, mailbox locations, HVAC equipment, or intended waste/recycling storage areas. As the garage is proposed to be demolished, the location of trash etc. must be defined. **No finding possible.**

### **Part 3: Architectural Design Standards**

#### **Sec. 6.3.2 Review Standards**

##### **(a) Relate development to its environment:**

###### **1. Massing, Height and Scale:**

The addition duplicates the height and scale of the existing dwelling. Although large for a typical accessory unit, it includes a workshop for the owner and is located behind the primary structure. **Affirmative finding.**

###### **2. Roofs and Rooflines.**

The proposed gable roof again duplicates the existing roofline, albeit with a full shed dormer on both north and south elevations. The addition to the existing single family home is flat roofed and accommodates a roof deck. **Affirmative finding.**

###### **3. Building Openings**

There is a paired arrangement of double hung windows over a bathtub, curious given the assumed desire for privacy associated with the use. Further analysis of window and door openings is recommended. **Affirmative finding if conditioned.**

##### **(b) Protection of Important Architectural Resources:**

*Burlington's architectural and cultural heritage shall be protected through sensitive and respectful redevelopment, rehabilitation, and infill. Where the proposed development involves buildings listed or eligible for listing on a state or national register of historic places, the applicant shall meet the applicable development and design standards pursuant to Sec. 5.4.8. The introduction of new buildings to a historic district listed on a state or national register of historic places shall make every effort to be compatible with nearby historic buildings.*

35 Grove Street is not listed on the state or National Register of historic places. Not applicable.

##### **(d) Protection of Important Public Views:**

Not applicable.



**(d) Provide an active and inviting street edge:**

The plan includes enclosing the front porch for additional living space. As an enclosed space, this “deadens” the streetfront activation of the dwelling, and is less inviting than the existing open porch. The proposed enclosure also becomes problematic as it potentially encroaches into a required front yard setback. (Open front porches may encroach into a required setback.)

The entrance to the ADU is behind the existing structure, and therefore not easily visible from the streetfront.

**Adverse finding** providing an active and inviting street edge; **No finding possible** for setback noncompliance with enclosed front porch.

**(e) Quality of materials:**

*All development shall maximize the use of highly durable building materials that extend the life cycle of the building, and reduce maintenance, waste, and environmental impacts. Such materials are particularly important in certain highly trafficked locations such as along major streets, sidewalks, loading areas, and driveways. Efforts to incorporate the use of recycled content materials and building materials and products that are extracted and/or manufactured within the region are highly encouraged.*

Aluminum clad windows with wood trim, clapboard siding and asphalt shingles are proposed. All are considered of acceptable durability for new construction. **Affirmative finding.**

**(f) Reduce energy utilization:**

All new construction is required to meet the Guidelines for Energy Efficient construction pursuant to the requirements of Article VI, Energy Conservation, Section 8 of the City of Burlington Code of Ordinances. **Affirmative finding if conditioned.**

**(g) Make advertising features complementary to the site:**

Not applicable.

**(h) Integrate infrastructure into the building design:**

See Section 6.2.2. (p) above.

**(i) Make spaces secure and safe:**

All applicable building and life safety code as defined by the building inspector and/or fire marshal shall be applied. **Affirmative finding if conditioned.**

**Article 8: Parking**

The existing single family home requires 2 parking spaces in the Neighborhood Parking District, and the proposed ADU requires 1 additional space. See problems with access drive expansion under Section 4.4.5 (d) 1. A; Section 5.3.5 (Non-conformities), and Sections 6.2.2. (i) and (l).

**Adverse finding.**

**Article 13: Definitions**

**Habitable:** *A space in the building for living, sleeping, eating, or cooking. Bathrooms, toilet rooms, closets, halls, storage or utility spaces and similar areas are not considered habitable spaces.*

Using this guidance, the applicant has met the 30% limitation for habitable space for the accessory dwelling unit. See Section 5.4.5 (a), above.

**II. If considered for approval, Recommended Conditions of Approval**

1. **Prior to release of the zoning permit**, the applicant shall provide verification of easement area from the abutting (southerly) property owner sufficient to accommodate the proposed vehicular circulation and parking plan.
2. A deed or instrument for the property shall be entered into the land records by the owner containing a reference to the permit granting the accessory unit **prior to the issuance of the certificate of occupancy for the unit**. Such reference shall identify the permit number and note that the property is subject to the permit and its terms and conditions **including owner occupancy**. No certificate of occupancy shall be issued for the unit unless the owner has recorded such a notice.
3. **Approval of an accessory dwelling unit is contingent on owner occupancy of the single-family dwelling unit as a primary residence**. For purposes of this section, owner occupancy means that, after the creation of the accessory unit all individuals listed on the deed for the property must reside in the primary unit or in the accessory unit. If either the primary unit or the accessory unit is no longer owner occupied as a primary residence, the approval for the accessory dwelling unit is void and the kitchen of the accessory dwelling unit must be removed within 90 days with the entirety of the property being occupied as a single unit. When an accessory unit that is the result of additional square footage and/or a new accessory structure is proposed to be removed, revised floor plans and a revised site plan shall be required to be submitted for review and approval. Furthermore, where additional square footage is added to a single family home for purposes of creating an accessory unit and the accessory unit is at any point discontinued, none of the additional square footage shall be eligible for the purposes of increasing the number of unrelated adults that may be allowed to inhabit the property.
4. Functional Family provisions of the ordinance remain in effect. Not more than 4 unrelated adults may occupy the single family residence.
5. No more that 2 adults may occupy the Accessory Dwelling Unit.
6. The accessory dwelling unit is limited to 30% of the habitable area of the single family residence including the ADU. As proposed, the ADU may not expand into the proposed area defined as a workshop.
7. A letter assuring adequate wastewater and water capacity for the new unit from the Department of Public Works shall be required **prior to release of the zoning permit**.
8. A pedestrian walkway and steps to the principle entrance of the existing dwelling shall be incorporated into the plan.

9. The intended location of recessed lighting fixtures shall be provided to staff for review and approval **prior to release of the zoning permit.**
10. A landscaping plan shall be provided for review and approval **prior to release of the zoning permit.** This plan shall include appropriate screening for utility connections, mechanical equipment, or to prevent headlamp trespass as necessary.
11. Reconsideration of building openings is recommended to avoid large windows over tubs and toilets.
12. **Prior to release of the zoning permit,** the location of meters, utility connections, HVAC equipment, mailboxes, trash and recycling facilities shall be provided to staff for review and approval.
13. All new construction is required to meet the Guidelines for Energy Efficient construction pursuant to the requirements of Article VI, Energy Conservation, Section 8 of the City of Burlington Code of Ordinances.
14. Standard Permit Conditions 1-15.

**NOTE: These are staff comments only. The Development Review Board, who may approve, table, modify, or deny projects, makes decisions.**

## Department of Planning and Zoning

149 Church Street  
Burlington, VT 05401  
<http://www.burlingtonvt.gov/PZ/>  
Telephone: (802) 865-7188  
(802) 865-7195 (FAX)

*David E. White, AICP, Director*  
*Meagan Tuttle, Comprehensive Planner*  
*Jay Appleton, Senior GIS/IT Programmer/Analyst*  
*Scott Gustin, AICP, CFM, Principal Planner*  
*Mary O'Neil, AICP, Principal Planner*  
*Ryan Morrison, CFM, Associate Planner*  
*Anita Wade, Zoning Clerk*



### MEMORANDUM

To: Development Review Board  
From: Ryan Morrison, CFM, Associate Planner  
Date: March 21, 2017  
RE: ZP17-0763CU – 311 North Avenue

**Note: These are staff comments only. Decisions on projects are made by the Development Review Board, which may approve, deny, table or modify any project. THE APPLICANT OR REPRESENTATIVE MUST ATTEND THE MEETING.**

**File:** ZP17-0763CU  
**Location:** 311 North Avenue  
**Zone:** RM **Ward:** 4N  
**Date application accepted:** February 2, 2017  
**Applicant/ Owner:** Jesse Bridges, City DPW Parks Rec Dept  
**Request:** Allow for conditional use of the existing stone house as a community house.

#### **Background:**

- **Zoning Permit 11-0280CU;** Convert existing institutional office use and group home use to post-secondary school. No site or exterior building changes proposed. Approved November 3, 2010.
- **Zoning Permit 12-0627CA;** Replace five existing double windows to basement on side of building with new clad wood single casement windows with vertical mullion to simulate the look of a double window. Approved December 16, 2011.
- **Zoning Permit 12-0705SN;** Install new freestanding sign for Burlington College – Stone House Residence Hall. Approved February 16, 2012.
- **Zoning Permit 13-0037FC;** Install new wire fence around existing community garden. Approved July 12, 2012.
- **Zoning Permit 15-0548NA;** Replacement of damaged asphalt shingle roof with same. Approved October 29, 2014.
- **Zoning Permit 16-1077MP;** Tree maintenance plan for 311 and 329 North Avenue. Approved November 17, 2015.
- **Zoning Permit 16-0649LL;** Lot line adjustment with 329 North Avenue. Approved December 7, 2015.
- **Zoning Permit 16-0785LL;** Lot line adjustment with 329 North Avenue. Approved January 21, 2016.
- **Zoning Permit 16-1026CA;** Relocation of existing garden shed to site. Approved April 6, 2016.
- **Zoning Permit 16-1347CA;** Replace 3 garage doors, replace front half of garage roof (sheathing and shingles). Approved May 31, 2016.

- **Zoning Permit 17-0267SD**; Preliminary plat review of 11-lot subdivision. No development included. Approved October 19, 2016.
- **Zoning Permit 17-0581SP**; DAB sketch plan review of development proposed on 33.65 acre PUD, development limited to 329-375 North Avenue. Held November 22, 2016.
- **Zoning Permit 17-0694CA**; Replace windows. Wood core aluminum clad windows will be replaced in the original stone house and vinyl windows replaced in the addition. Approved January 20, 2017.

**Overview:** Burlington Parks, Recreation & Waterfront (owner) is looking into potential partnerships for the City owned Stone House at 311 North Avenue until the City has the funds to historically restore and repurpose the building for City use. The house will potentially be used to house a minimum of 13 homeless or at risk, unhoused individuals.

The City of Burlington took ownership of the property on February 18, 2016 with the closing of the former Burlington College land. Previously, the building had been a private home, a group home for the Howard Center with a license for up to 18 persons, and most recently, a dormitory for the former Burlington College.

The house has 15 rooms, 3 shared bathrooms, a common kitchen/dining area, and a living room. Any partner agency will have full time staff on site, as well as additional supervision from regular full time employees.

Additional uses include expanded community gardens, repurposing of the garage for conservation and bike path maintenance equipment storage, as well as BPD and BFD use of the property for training.

**Applicable Regulations:** Article 3 (Applications, Permits, and Project Reviews); Article 4 (Zoning Maps and Districts); Article 5 (Citywide General Regulations); Article 8 (Parking)

**Recommendation:** **Consent approval**, per the following findings and conditions:

## **I. Findings**

### **Article 3: Applications and Reviews**

#### **Part 5, Conditional Use & Major Impact Review:**

#### **Section 3.5.6 (a) Conditional Use Review Standards**

*Approval shall be granted only if the DRB, after public notice and public hearing, determines that the proposed conditional use and associated development shall not result in an undue adverse effect on each of the following general standards:*

1. *Existing or planned public utilities, facilities or services are capable of supporting the proposed use in addition to the existing uses in the area;*

An increase in demand on municipal utilities, facilities, and services is not anticipated with the re-use of the property as a community home for 13+ individuals. The building was previously used as a group home for up to 18 individuals, and most recently as dormitories for the former Burlington College. This section of North Avenue has supported an institutional use for over 40



years. Previous uses aside, the applicant will be responsible for securing verification of adequate wastewater capacity from the Department of Public Works. **Affirmative finding as conditioned.**

2. *The character of the area affected as defined by the purpose or purposes of the zoning district(s) within which the project is located, and specifically stated policies and standards of the municipal development plan;*

As noted above, the proposed use is not one that will result in a shift of impacts on the surrounding area. The RM zoning district is intended primarily for medium density residential development in the form of single-family detached dwellings and attached multi-family apartments. Given the property's zoning and lot size (9 acres), the property has the potential to support a density of well over a 100 dwelling units.

Cambrian Rise, a major development on two adjacent properties to the north, consisting of 11 buildings containing 735 residential units, approximately 45,000 sf of non-residential support/amenity space, approximately 40,000 sq. ft. of neighborhood commercial spaces, and 1,093 parking spaces, was recently approved by the Development Review Board. Additionally, a Champlain Farms convenient store/gas station exists across North Ave., which further mixes the uses within the immediate area. It is not anticipated that the building's conversion to a community home will have an undue adverse effect on the area. **Affirmative finding.**

3. *The proposed use will not have nuisance impacts from noise, odor, dust, heat, and vibrations greater than typically generated by other permitted uses in the same zoning district;*  
No nuisance impacts are expected as a result of the community home. **Affirmative finding.**

4. *The transportation system is capable of supporting the proposed use in addition to the existing uses in the area. Evaluation factors include street designations and capacity; level of service and other performance measures; access to arterial roadways; connectivity; transit availability; parking and access; impacts on pedestrian, bicycle and transit circulation; safety for all modes; and adequate transportation demand management strategies;*

Only the staff are expected to have vehicles, the residents are not. This should result in a reduction to traffic flow from the previous dormitory use. The property, which fronts on North Ave. (an arterial roadway), is on a CATMA bus route, and is within walkable downtown services. **Affirmative finding.**

5. *The utilization of renewable energy resources;*

No part of this request prohibits the use of wind, solar, water, geothermal or other renewable energy resources.

*and,*

6. *Any standards or factors set forth in existing City bylaws and city and state ordinances;*  
Compliance with building, fire, and energy efficiency codes will be required. A state wastewater permit may also be required. **Affirmative finding as conditioned.**

### **Section 3.5.6 (c) Conditions of Approval**

*In addition to imposing conditions of approval necessary to satisfy the General Standards specified in (a) or (b) above, the DRB may also impose additional conditions of approval relative to any of the following:*

*1. Mitigation measures, including but not limited to screening, landscaping, where necessary to reduce noise and glare and to maintain the property in a character in keeping with the surrounding area.*

The proposed development is not expected to generate offsite noise or glare substantial enough to require mitigation. **Affirmative finding.**

*2. Time limits for construction.*

The application suggests that there will be no construction occurring for this change of use. **Not applicable.**

*3. Hours of operation and/or construction to reduce the impacts on surrounding properties.*

As noted above, there are no construction plans to change the use of the structure into a community house. **Not applicable.**

*4. That any future enlargement or alteration of the use return for review to the DRB to permit the specifying of new conditions; and,*

Any future enlargement or alteration will be reviewed under the zoning regulations in effect at that time. **Affirmative finding as conditioned.**

*5. Such additional reasonable performance standards, conditions and safeguards, as it may deem necessary to implement the purposes of this chapter and the zoning regulations.*

To be addressed in conditions of approval.

#### **Article 4: Zoning Maps and Districts**

##### **Section 4.4.5 Residential Districts**

###### **(a) Purpose**

*3. The Residential Medium Density (RM) district is intended primarily for medium density residential development in the form of single-family detached dwellings and attached multi-family apartments.*

A community house is listed as a conditional use in Appendix A – Use Table – All Zoning Districts. **Affirmative finding.**

###### **(c) Permitted and Conditional Uses**

As noted above, a community house is a conditional use per Appendix. A – Use Table – All Zoning Districts. **Affirmative finding.**

#### **Article 5: Citywide General Regulations**

##### **Part 4: Special Use Regulations**

###### **Section 5.4.4 Community Houses**

*Community houses shall be considered a conditional use in any residential district and subject to all applicable provisions of Art. 3, Part 5, and the site and design review standards in Art. 6. In*

*addition to conditional use standards, proposals for new community houses shall also comply with the following requirements:*

- (a) *Density shall not exceed 1 person per two hundred (200) square feet of gross floor area:*  
The Assessor's records identify the gross floor area to be 6,228 sf, which would result in a maximum density of 31 individuals. **Affirmative finding as conditioned.**
- (b) *All dimensional standards for the underlying zoning per the requirements of Art. 4 shall be applicable; and*  
The community house will occupy within an existing building. No new construction is proposed. **Affirmative finding.**
- (c) *The minimum distance (lot line to lot line) between any two community houses shall not Exceed the following:*

| <i>Total Occupancy<br/>(beds)</i> | <i>Distance<br/>(feet)</i> |
|-----------------------------------|----------------------------|
| <i>6 or less</i>                  | <i>0</i>                   |
| <i>7 – 12</i>                     | <i>500</i>                 |
| <i>13 – 20</i>                    | <i>1,000</i>               |
| <i>21 or more</i>                 | <i>1,500</i>               |

There are no community houses within 1,500 feet of the subject property. **Affirmative finding.**

### **Section 5.5.1 Nuisance Regulations**

No part of this application suggests the introduction of impacts deemed to be in conflict with applicable nuisance regulations and performance standards pursuant to the requirements of the Burlington Code of Ordinances. **Affirmative finding.**

### **Article 8: Parking**

#### **Table 8.1.8-1, Minimum Off-Street Parking Requirements**

Community House requires 1 parking space per dwelling unit in the Neighborhood Parking District.

The Community House counts as 1 dwelling unit. The property currently contains 9 parking spaces, one of which is handicap accessible. **Affirmative finding.**

#### **Table 8.2.5-1 Bicycle Parking Requirements**

The community house has no minimum bike parking requirement. **Not applicable.**

## **II. Conditions of Approval**

1. **Prior to release of the zoning permit**, the applicant shall receive written verification of adequate wastewater capacity from the Department of Public Works.

2. Occupancy shall not exceed the limitation defined in Section 5.4.4 (a).
3. Any structural or programmatic expansion of the Conditional Use will require a return to the DRB for review.
4. A state wastewater permit may be required, and will be the responsibility of the applicant to secure if needed.
5. It is the applicant's responsibility to comply with all applicable building, life safety, and ADA requirements.
6. The applicant shall secure any associated trades permits for the interior work.
7. The applicant/property owner is responsible for obtaining all necessary Zoning Permits and Building Permits through the Department of Public Works as well as other permit(s) as may be required, and shall meet all energy efficiency codes of the city and state as required.
8. Vermont Residential Building Energy Standards apply to this project. Compliance with the standards is the Owner's responsibility. Prior to requesting a Certificate of Occupancy, a copy of a completed Vermont Residential Building Energy Standards Certificate shall be submitted with a Certificate of Occupancy (final or temporary) request, and filed in the Land Records located at the Clerk/Treasurers office in City Hall (149 Church Street). For more information, see [http://publicservice.vermont.gov/topics/energy\\_efficiency](http://publicservice.vermont.gov/topics/energy_efficiency).
9. Standard Permit Conditions 1-15 shall apply.



## Department of Planning and Zoning

149 Church Street, City Hall  
Burlington, VT 05401-8415

Phone: (802) 865-7188

Fax: (802) 865-7195

[www.burlingtonvt.gov/pz](http://www.burlingtonvt.gov/pz)

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DEPARTMENT OF  
PLANNING & ZONING

### Zoning Permit Application

Use this form for ALL zoning permit applications. See the relevant checklist for specific requirements.

|                                                                                                                                                                                                            |                                 |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|
| PROJECT LOCATION ADDRESS: <u>311 North Ave.</u>                                                                                                                                                            |                                 |
| PROPERTY OWNER*: <u>Burlington Parks</u><br><small>*If condominium unit, written approval from the Association is also required</small>                                                                    | APPLICANT: <u>Jesse Bridges</u> |
| POSTAL ADDRESS: <u>645 Pine St.</u>                                                                                                                                                                        | POSTAL ADDRESS: _____           |
| CITY, ST, ZIP: <u>Burlington, VT, 05401</u>                                                                                                                                                                | CITY, ST, ZIP: <u>Same</u>      |
| DAY PHONE: <u>802-865-7557</u>                                                                                                                                                                             | DAY PHONE: _____                |
| EMAIL: <u>jbridges@burlingtonvt.gov</u>                                                                                                                                                                    | EMAIL: _____                    |
| SIGNATURE: <u>Jesse Bridges</u><br><small>I am the owner. In addition, I duly authorize the applicant (if noted) to act on my behalf for all matters pertaining to this zoning permit application.</small> | SIGNATURE: <u>Jesse Bridges</u> |
| Description of Proposed Project: <u>Allow for conditional use of Stone House as Community House</u>                                                                                                        |                                 |

Existing Use of Property: ☐ Single Family ☐ Multi Family: #\_\_\_ Units ☒ Other: Education

Proposed Use of Property: ☐ Single Family ☐ Multi Family: #\_\_\_ Units ☒ Other: Community

- Does your project involve new construction, addition, alteration, renovation, or repair to a structure that is heated or cooled? Yes ☐ No ☐  
(If yes, the Vermont Residential Building Energy Standards (VRBES) apply. Visit the P&Z Office, Public Service Board or PSB website for details)
- Will 400 sq ft or more of land be disturbed, exposed and/or developed? Yes ☐ No ☒  
(If yes, you will need to submit the 'Erosion Prevention and Sediment Control Plan' questionnaire, with a site plan)
- For Single Family & Duplex, will total impervious area be 2500 sq ft or more? Yes ☐ No ☒  
(If yes, you will need to submit the 'Stormwater Management Plan' questionnaire, with a site plan)
- Are you proposing any work within or above the public right of way? Yes ☐ No ☒  
(If yes, you will need to receive prior approval from the Department of Public Works)

Estimated Construction Cost (value)\*: \$ 0

(\*Estimated cost a typical contractor would charge for all materials and labor, regardless of who physically completes the work)

Within 30 days of submission, the permit application will be reviewed for completeness, and, if complete, will be processed administratively or referred to a board for review. All permit approvals or denials are subject to an appeal period (15 days for administrative permit; 30 days for board permit). A building (and/or electrical, mechanical, plumbing, curb cut) permit will also be required. Contact the Department of Public Works at 802-863-9094 to inquire. Please ask for assistance if you have any questions about filling out this form. Call the Planning and Zoning at 802-865-7188, or visit the office in the lower level of City Hall, 149 Church Street.

Office Use Only: Zone: RM Eligible for Design Review? 4 Age of House 1923 Lot Size 3989/18  
Type: SN\_\_\_ AW\_\_\_ FC\_\_\_ BA\_\_\_ COA 1\_\_\_ COA 2\_\_\_ COA 3\_\_\_ CU ☒ MA\_\_\_ VR\_\_\_ HO\_\_\_ SP\_\_\_ DT\_\_\_ MP\_\_\_  
Check No. \_\_\_\_\_ Amount Paid \_\_\_\_\_ Zoning Permit # 17-076304

GENERAL FUND

April 20

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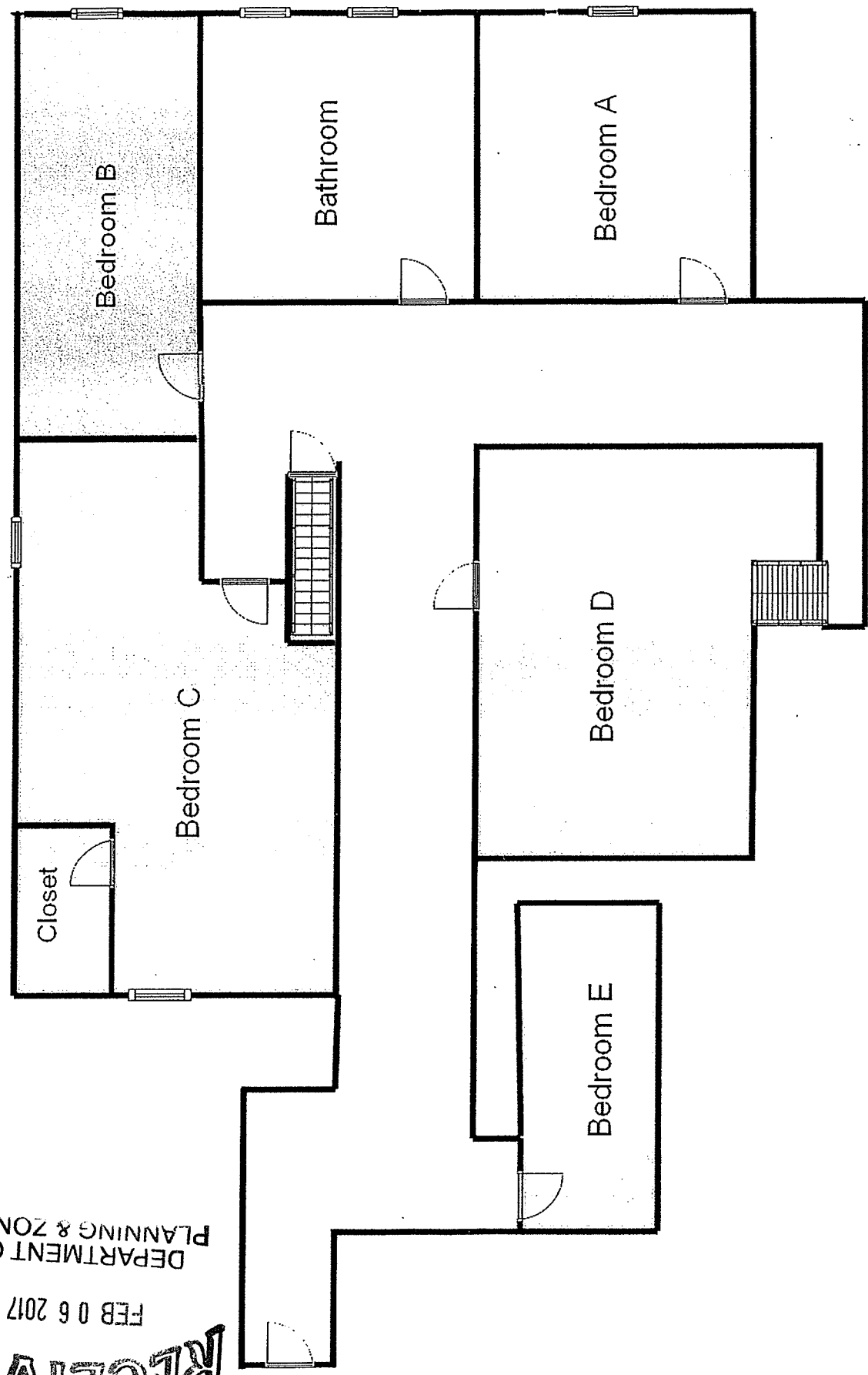
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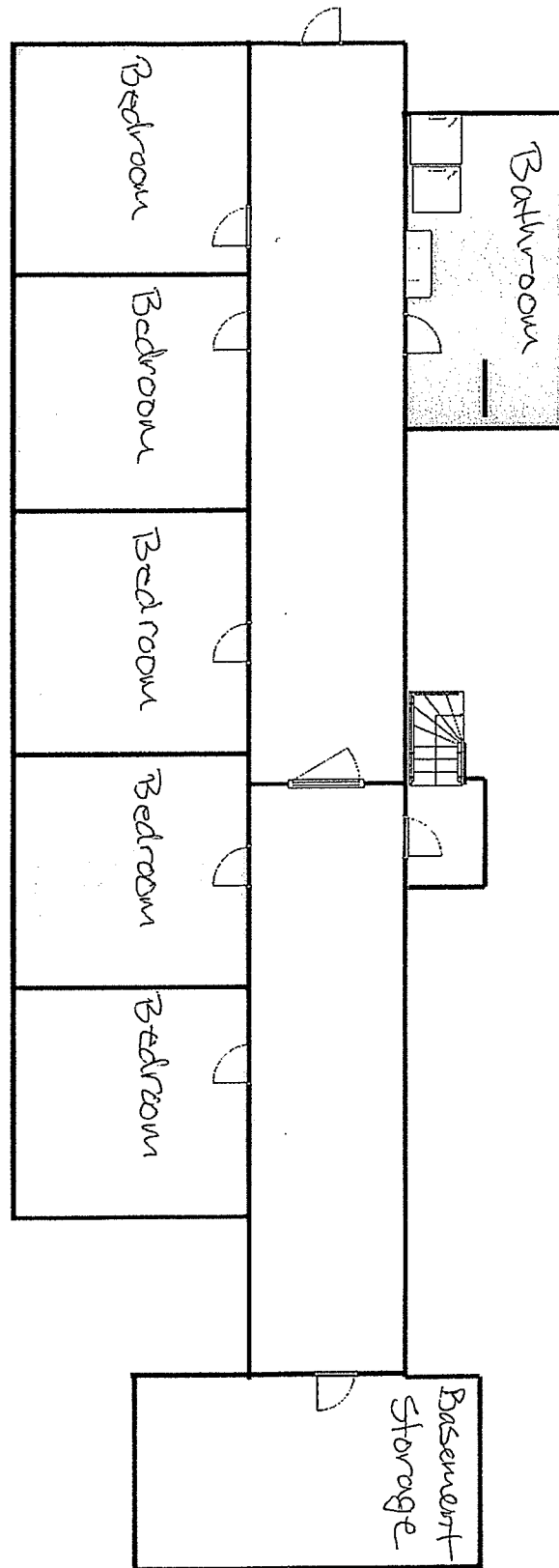
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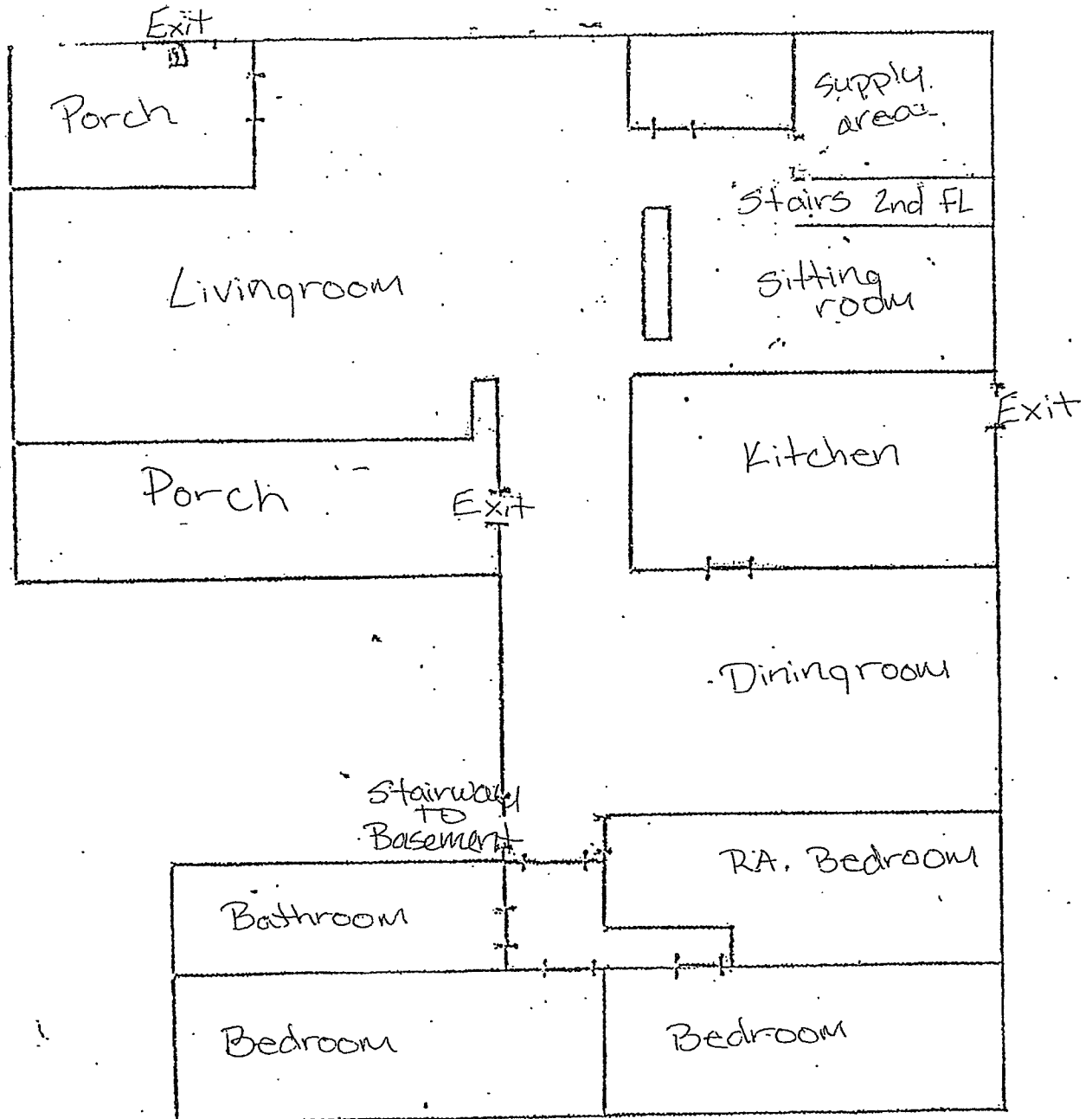
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**BURLINGTON  
PARKS  
RECREATION  
WATERFRONT**



**COMMUNITY & ECONOMIC DEVELOPMENT OFFICE**

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## MEMO

**DEPARTMENT OF  
PLANNING & ZONING**

**Date:** February 3, 2017  
**To:** DRB  
**From:** Jesse Bridges, Director  
Marcy Esbjerg, Assistant Director, Community, Housing and Opportunity Programs  
**RE:** Stone House Conditional Use Application  
**Cc:** Scott Gustin

The City is looking to enter into a zero-dollar two-year interim lease with Champlain Valley Office of Economic Opportunity (CVOEO) for the City of Burlington-owned Stone House at 311 North Avenue with an option to renew monthly until the City has the funds to historically restore and repurpose the building for City use. The house will be used to house a minimum of 13 homeless or at risk unhoused individuals.

To accommodate this program we are requesting a conditional use of a Community House for the 13 individuals. The house has 15 bedrooms, 3 shared bathrooms and a common kitchen/dining and living room. CVOEO will have full time staff on site as well as additional supervision from regular full time employees. There are eight parking spaces plus one accessible space formally located at the site.

**Background:** The City of Burlington took ownership of the property on February 18, 2016 with the closing on the former Burlington College land. Previously, the building had been a private home, a group home for the Howard Center and most recently, a dormitory for the former Burlington College. With the abrupt departure and closing of the College, the building was abandoned and subject to vandalism, break-ins and trespassing during the early summer of 2016. Bringing additional use to the property and fortification from our buildings maintenance team helped to cut down on the problems but costly interior and exterior damage had already been done. Additional uses include expanded Community Gardens, repurposing of the garage for Conservation and Bike Path maintenance equipment storage as well as BPD and the BFD use of the property for training

Meanwhile, although Chittenden County has experienced a significant drop in the number of chronic homeless, our shelters remain full; our waiting lists for housing long; our homeless counts still over 330 (Point in Time Count 2016). At a recent Warming Shelter Advisory Board meeting, it was announced that the shelter had guests who possessed housing vouchers but stayed in the shelter because they were unable to secure permanent supportive housing. This is a common story at a few emergency shelters. This creates a bottleneck at the shelters and prevents others from accessing the emergency shelter system.

CVOEO proposes to provide a two year 'sober' home for a minimum of 13 homeless or at risk unhoused individuals and assist the residents towards permanent housing. The budget includes a proposal to hire a full time resident manager (who is or was homeless) to assist with the operations for the house and success for the residents. The residents will be connected to the coordinated entry process for the Chittenden County Homeless Alliance and also the resources of CVOEO for housing financial capability training, employment training and case management services.

Proposed financial partners include UVM Medical Center's Community Investment Committee, United Way of NW Vermont, Vermont Community Foundation and Vermont's Agency of Human Services.



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The City of Burlington would play a key partnership role in providing the housing rent free for the two-year period. In a comparable single room occupancy setting, the fair market rent would be approximately \$8307 per year per person, bringing the potential cumulative donation of the City to be almost \$108,000/year based on the most recent dollar figures. Additional City support comes in the form of rehabilitation from the vandalism amounting to approximately \$25,000-\$30,000.

The proposal to use the Stone House to temporarily house those in need provides critical additional housing for those in need in our area. An additional benefit is that it provides a level of use and security for the building, thereby mitigating additional clean up and repair due to vandalism.

Outcomes for this project:

- Provision of a two year home for 13 homeless or at risk unhoused individuals
- Movement toward permanent housing for 13 individuals
- Support for individual sustainability

Elements of the project

- Monthly program fee to support daily operations for the house
  - If a resident were to participant in Financial Capability training ½ of their program fee would be deposited in a bank account for future use toward permanent housing (Security Deposit/rent)
- Support to make this a sober house
- Full time resident manager to assist with accountability, operations for the house and success for the residents
- Connection to the resources of CVOEO for housing, financial capability training, employment training, case management services
- Connection to other resources as needed

Advantages for the project

- Incorporation into the Chittenden Homeless Alliances Coordinated Entry System
- On the bus line and within walkable distance to downtown services



## TRAFFIC IMPACT STUDY

# WATERFRONT NORTH MARINA

9.14.2016



**PREPARED FOR:**  
BURLINGTON HARBOR MARINA, LLC

**SUBMITTED BY:**  
RSG

180 Battery Street, Suite 350  
Burlington, VT 05401  
802.383.0118  
[www.rsginc.com](http://www.rsginc.com)







## WATERFRONT NORTH MARINA

PREPARED FOR:  
BURLINGTON HARBOR MARINA, LLC

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## 1.0 SUMMARY OF KEY FINDINGS

---

Burlington Harbor Marina, LLC has retained RSG to conduct a traffic impact study to understand and assess the effects of its proposed Burlington Harbor Marina in the Waterfront North area of Burlington, Vermont.

The proposed project would construct a 160 boat slip marina with 96 slips reserved for seasonal rentals and 64 slips for transient users arriving by boat. The Marina will be open May through October.

Key project findings, presented in greater detail below, include:

- Based on the expected vehicle demand for the 96 seasonal berth rentals the Marina is expected to generate 20 trips during the weekday PM peak hour and 26 trips during the Saturday peak hour.
- During the weekday PM peak hour, we project the addition of site generated traffic to the adjacent road network will increase delays on local roadways by less than 1 second or less in both 2018 and 2023.
- Acceptable overall and movement delays for the study intersections are expected with or without the addition of project generated traffic during both the weekday and Saturday peak hours.
- Acceptable queues are expected for all study intersection movements, although an increase of three car lengths is anticipated in 2023 during the Saturday peak hour at the southbound approach to College Street – Lake Street.

We conclude the proposed project will not cause undue adverse traffic congestion or safety conditions and will not unnecessarily or unreasonably endanger the public investment in roads, highways, and related infrastructure.

## 2.0 INTRODUCTION

---

Burlington Harbor Marina, LLC has retained RSG to conduct a traffic impact study to understand and assess the effects of its proposed Burlington Harbor Marina in the Waterfront North area of Burlington, Vermont. Waterfront North currently consists of a variety of land uses, several of which will be affected by the development of the Marina, which is expected to open in time for the 2018 boating season. This report is a summary of findings pertaining to the direct and indirect traffic impacts of the proposed Marina.

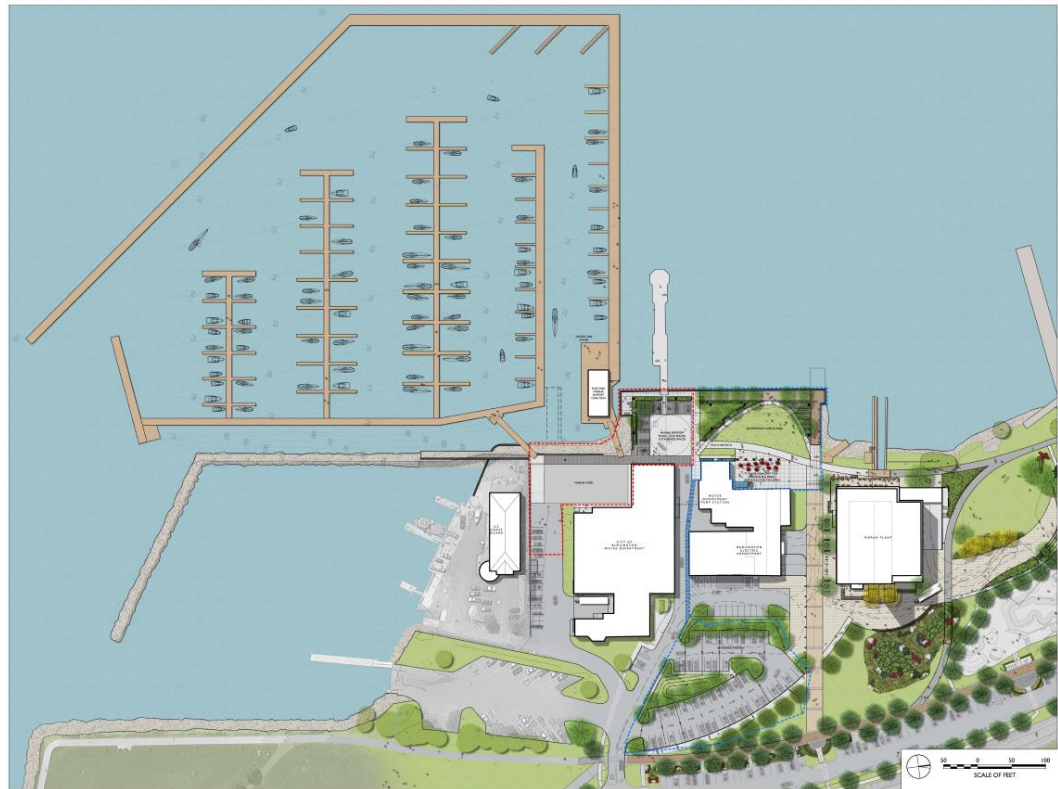
### 2.1 | PROJECT DESCRIPTION

The proposed Burlington Harbor Marina and associated developments will include:

- 160 boat slips
  - 96 slips for seasonal boaters (rented on a seasonable basis)
  - 64 slips for transient boaters
- Short-term / Drop-off parking area
- Public park/plaza adjacent to fishing pier
- Marina parking for employees
- Marina parking for boaters
- Floating Marina facility
  - Offices
  - Public restrooms
  - Bathing/laundry for guests
  - Store & chandlery
- Other Marina support and services, including fuel pumpout facilities, dockmaster facility, and boat launching
- Wave attenuation system

An illustrated site plan is shown in **Figure 1**.

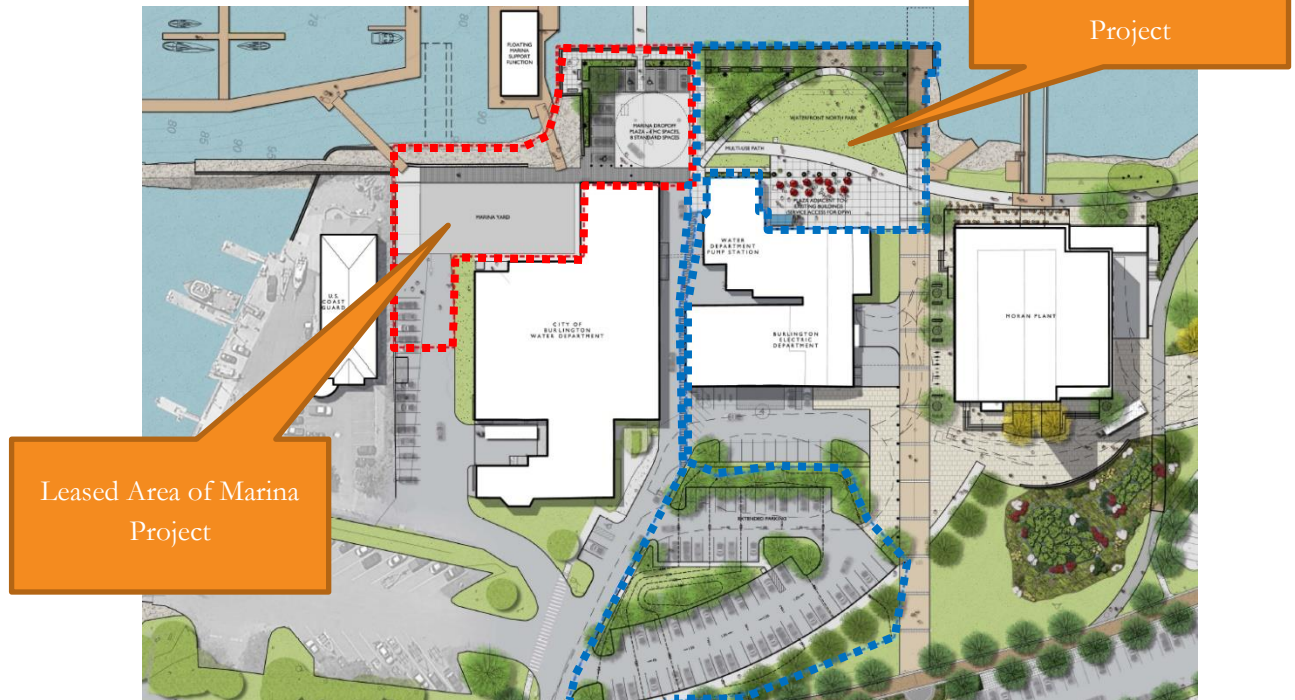
**FIGURE 1: BURLINGTON HARBOR MARINA SITE PLAN**



Burlington Harbor Marina, LLC will lease land from the City for the Marina yard, employee parking spaces, and the drop-off area, outlined in red in the zoomed-in plan shown in **Figure 2**. The remaining area, outlined in blue, is outside of the area controlled by the lease but will be constructed by the Marina project. These areas include Marina visitor parking, the public park/plaza, and a pedestrian connection between the two areas.

All existing buildings, the Coast Guard grounds, and the public boat launch lot will remain where they are.

FIGURE 2: ZOOMED-IN PLAN OF BURLINGTON HARBOR MARINA



## 2.2 | PROJECT CONTEXT

The City of Burlington, Vermont, borders Lake Champlain, a lake situated primarily between New York and Vermont. To the west of the lake are the Adirondack Mountains, and to the east are the Green Mountains, giving those on the shore and on the water cherished views. Recreation on the water includes fishing, swimming, and boating - for canoes, kayaks, paddle boards, sailboats, and motorboats alike.





*View of Lake Champlain from Burlington*

Outside of Burlington's downtown core and dense residential areas, a number of public beaches and parks line much of the shoreline. In addition, an eight-mile bike path runs parallel to the lake for the entire length of the City. Within the urban part of Burlington, there are a number of waterfront attractions, including restaurants, boating docks, fishing spots, picnic and playground areas, and other amenities that allow people to access the water itself and have views of the water and its backdrop.

The northern portion of the Burlington waterfront - called Waterfront North - is in the midst of revitalization improvements led by the City of Burlington, collectively called Waterfront Access North (WAN). This area, which is owned by the City, includes the area north of Waterfront Park and west of the railroad. The WAN site plan, created before financing was approved for the Marina, is shown in **Figure 3**.

**FIGURE 3: WATERFRONT ACCESS NORTH SITE PLAN, 2014**



Within this Waterfront North area, Burlington Harbor Marina, LLC intends to lease land from the City to build a 160-slip Marina, to be open for business in the summer of 2018. Currently, there are two small on-water boating storage locations in the City - at the Community Boathouse (College Street) and Perkins Pier (Maple Street). The proposed Burlington Harbor Marina would have larger capacity than the existing Marinas and will involve redevelopment of Waterfront North to include additional surface car parking, as well as a formalized park immediately adjacent to the water.

## 3.0 EXISTING CONDITIONS

### 3.1 | LAND USE

Waterfront North is the site of a variety of uses that attract a variety of users. It is zoned as Mixed Use: Downtown Waterfront - Public Trust, a district “intended to enhance and diversify commercial and residential development in the downtown waterfront area, and to increase access, utilization, and enjoyment of the lakeshore by the community.”

Existing uses and layout of Waterfront North are shown in **Figure 4**.

**FIGURE 4: WATERFRONT NORTH EXISTING LAYOUT**



### DESCRIPTIONS OF USES

- The **US Coast Guard** has had a unit at this location, Station Burlington, since 1948. The 25 enlisted staff members at Station Burlington provide Lake Champlain with Search and Rescue (including ice rescue), Enforcement of Laws and Treaties, and

aid to navigation. The existing three-floor building was commissioned in 1993. A locked gate prevents the public from entering the grounds.

- The **City of Burlington Water Department** has offices and a pump station here. The pump station shares a building with the Electric Department, and its garage is used by the Community Sailing Center.
- The **City of Burlington Electric Department** houses the backup generators for the city and includes bulk fuel storage. These result in modest operational and transportation demands.
- The **Community Sailing Center** (CSC) is a non-profit organization that offers lessons, programs, and rentals for sailing, paddleboarding, kayaking, and canoeing. It has been operating at its current location for over 20 years, but it is expected to relocate soon; the CSC currently has a permit to build a new and larger (22,180-square foot) facility north of the skatepark.
- The **Moran Plant** was built in 1953 and was an active coal-fired power plant from 1954 to 1986. A number of new uses have been considered since the plant closed, but the building remains vacant except for a small area used by the CSC. Given the current development plan status, the Moran Plant will not be considered in this traffic study.
- The **Andy A\_Dog Williams Skatepark** was built in November 2015, replacing a run-down skatepark built 14 years prior. The new skatepark is a significant draw to Waterfront North.

### 3.2 | SITE ACCESS

With more attractions in the project area, it is likely that motor vehicle, pedestrian, and bicycle traffic to the project area will increase. Access for each of these modes is described below.

Within the project area itself, there will be a painted walkway between the two City utility buildings to designate a safe route for pedestrians and bicyclists through the project area. It is anticipated that this walkway will be the way in which the majority of users will travel from their access points to the waterfront.

#### MOTOR VEHICLES

Waterfront North is primarily only accessible to motor vehicles via **Lake Street**, which extends south to College Street.

**Depot Street**, which connects the area to North Avenue, is used for local traffic, event egress, and emergency vehicle access to the waterfront.

The majority of vehicles associated with the project will use the parking designated for the Marina, with a small fraction of them using the short-term parking option at the water edge as a loading/unloading zone.

## BICYCLES

Bicycles can access Waterfront North via:

- **Lake Street** (On-road; no bicycle facilities)
- **Depot Street** (Generally no motor vehicles allowed)
- **Island Line Trail / Burlington Bike Path** (Non-motorized transportation only)

The Burlington Bike Path runs parallel to the lake between Oakledge Park at the southern end of the City and the Winooski River at the northern end of the City. Despite the name, it is open to forms of non-motorized transportation other than bicyclists, including walkers, runners, and roller skaters. The bike path is extremely popular among locals and tourists alike, especially in the summer. This path not only connects the parks, beaches, residential areas, and other attractions along the waterfront, but it is part of the longer Island Line Trail, which extends through Colchester and up to the island of South Hero.

## PEDESTRIANS

Pedestrians can access Waterfront North via:

- **Lake Street** (sidewalk on the east side)
- **Depot Street**
- **Island Line Trail / Burlington Bike Path**
- A concrete **walking path** that connects to the **boardwalk** north of College Street

## TRANSIT

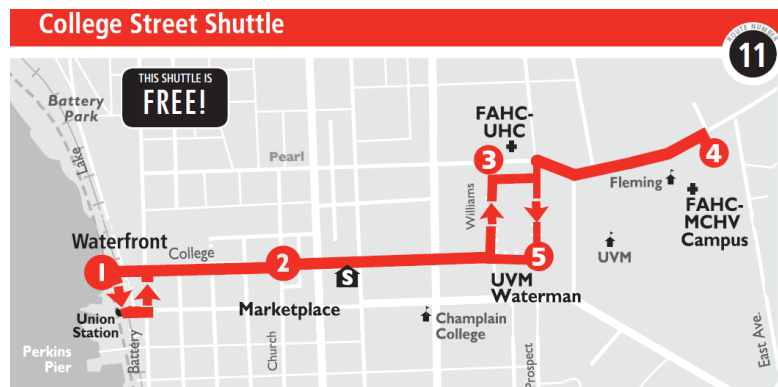
There are two bus lines that make stops near Waterfront North:

The **City Loop** bus (Route number 8) stops at the intersection of Battery Street and College Street, approximately 0.35 miles from Penny Lane. It generally runs once every half hour.





The free **College Street Shuttle** (Route Number 11) stops at the intersection of College Street and Lake Street, approximately 0.3 miles from Penny Lane. It generally runs once every 15 minutes.



### 3.3 | EXISTING PARKING

Within Waterfront North, there is a mix of designated parking, managed parking, and free, unlimited public parking. There are a number of parking lots, as well as on-street parking on the newly constructed segment of Lake Street north of Penny Lane.

**A NOTE ABOUT LAKE STREET:** Prior to construction of the new segment of Lake Street, Lake Street terminated at the intersection of Penny Lane and Depot Street. While the Penny Lane street sign remains at the Depot Street intersection, for the purposes of

this report, Penny Lane now begins to the west of the new segment of Lake Street; in other words, the old and new segments of Lake Street are not interrupted by Penny Lane.

The new segment of **Lake Street**, which dead-ends just past the skatepark, has 96 parking spaces. These spaces are used primarily by people accessing the waterfront for recreational purposes, as opposed to the utility department buildings.

Employees and customers of the **Water Department** and **Electric Department** are assigned to specific lots and spaces, which are all open to the public outside of normal business hours. These lots have signs stating their allowed uses.

The **Coast Guard** has its own private lot, which is closed to the public.

The **boat launch** lot is intended only for cars who have launched a boats. Launching costs \$10.

The **Community Sailing Center** does not have signage restricting parking spaces for its users, so it effectively shares parking spaces with visitors accessing the fishing pier and the green space along the water. There are 35 spaces in the lot between the sailing center and the lake, which are primarily used by sailing center visitors, in addition to visitors to the pier and green space.

**Figure 5** shows the existing parking layout. Only spaces and lots with callouts have signage that restricts parking.



FIGURE 5: EXISTING PARKING



### 3.4 | PROPOSED PARKING SUPPLY

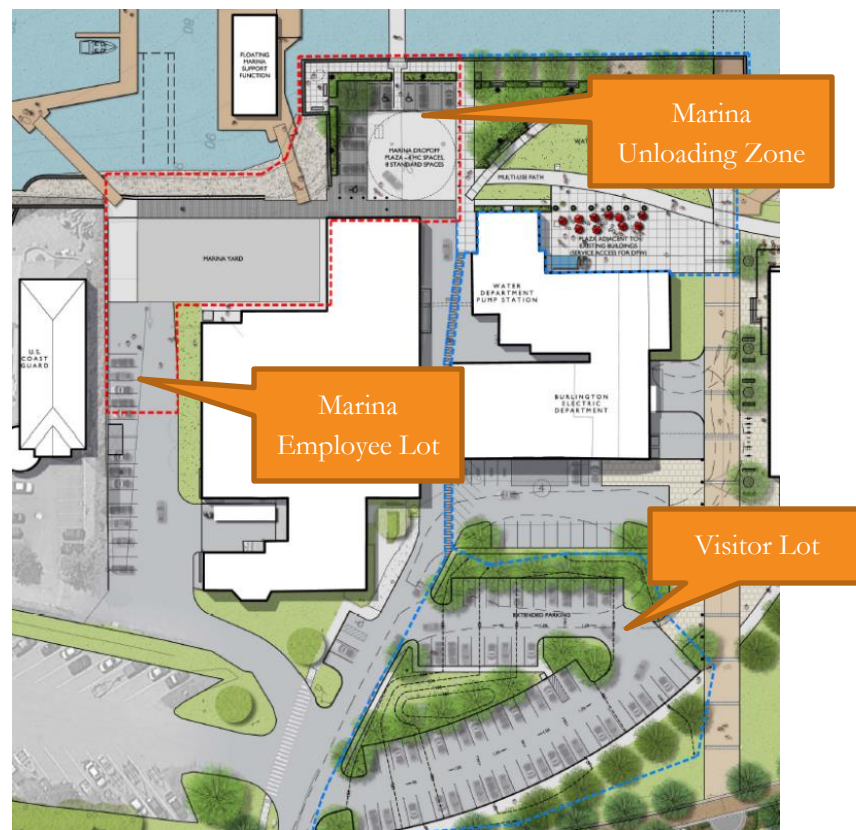
#### MARINA PARKING SUPPLY

The Marina project will construct the following new parking areas:

- **Marina Unloading Zone: 12 spaces** (adjacent to the fishing pier)
  - o 2 handicapped parking spaces for Marina use
  - o 2 handicapped spaces at the entrance to the fishing pier
  - o 8 general spaces for temporary, short-term parking
- **Employee Lot: 4 spaces** (south of the Water Department building)
  - o 4 spaces reserved for employees of the Marina
- **Visitor Lot: 68 spaces** (east of the project site and west of the bike path)

- 42 spaces reserved for the Marina
  - 23 of the reserved spaces are exclusive seasonally reserved spaces (May through October)
  - 19 of the reserved spaces for weekend and holiday use within the season
- 26 spaces for non-Marina users

**FIGURE 6: PROPOSED PARKING**



The parking reserved for Marina use provide 48 parking spaces in total. This is in line with the City's zoning regulations of 0.5 parking spaces per slip based on the 96 seasonal boat slips. The transient boat slips are assumed to generate a negligible parking demand and therefore do not have dedicated parking spaces.

The proximity of other public parking and excellent non-motorized access, as well as public transit to College Street, provide alternative means of accessing the Marina that do not require parking.

## OTHER USERS

The proposed site redevelopment does affect the existing parking supply loosely associated with some of the existing land uses in the area.

The redevelopment of the site and reconfiguration of parking spaces east of the Water and Electric Department buildings reduces the dedicated parking supply from 25 spaces to 20 spaces. Observations made during the collection of traffic and parking data indicate that existing parking demand is less than 20 spaces, suggesting that this reduction can be accommodated.

The sailing center currently has a valid permit for 52 parking spaces. This permit is based on the premise of the redeveloped Moran Plant and the relocated sailing center north of the project site. Currently the 35 spaces west of the Electric Department serve both the sailing center and the waterfront park. While the Moran Plant redevelopment status is unclear, the sailing center relocation is being planned for within this traffic assessment. The parking of the relocated sailing center is proposed to be reduced with a waiver to 26 spaces within the 68 space lot being constructed by the Marina project. The sailing center waiver is being submitted concurrently with the Marina application.

## 3.5 | SAFETY

### SPEED LIMIT

**Lake Street** has a posted speed limit of 20 mph. South of Penny Lane, when cars are parked in the parallel parking spaces on the east side, vehicles generally travel slower than the speed limit to safely pass oncoming vehicles.

**Penny Lane** does not have a posted speed, but because of its short length, the numerous entrances to parking lots off of it, and the crossing of the bike path, vehicles tend to travel at very slow speeds.

**College Street** has a posted speed limit of 25 mph. However, in the segment of College street west of Battery Street, vehicles travel much slower because of how busy the area is and the short distance between crossings.

### SIGHT DISTANCE

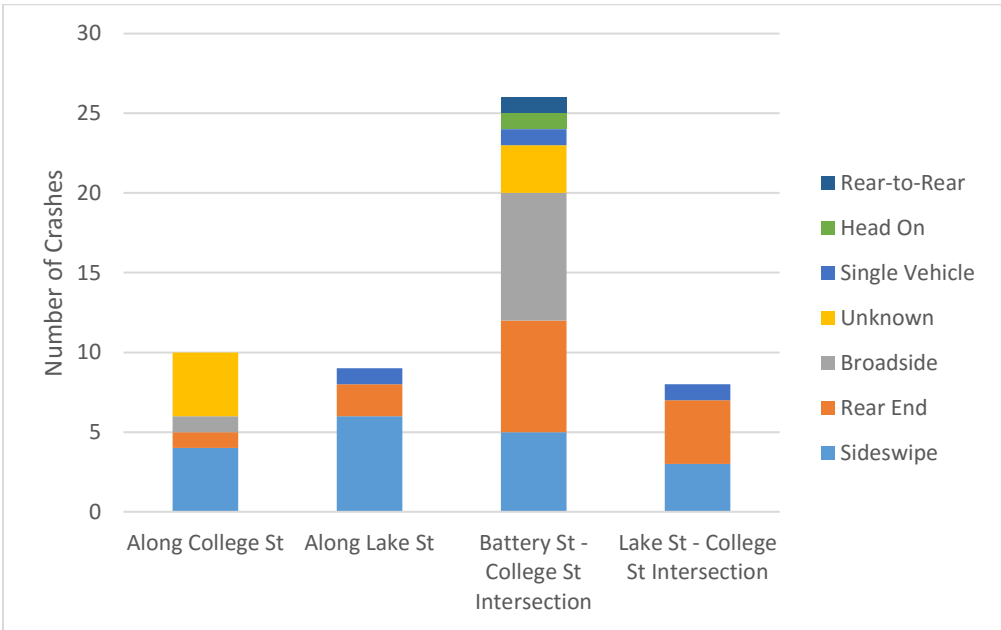
The safe intersection sight distance at the intersection of Penny Lane and Lake Street is in excess of what is required in an urban condition with speeds 20 mph and lower.

### CRASH HISTORY

According to the latest (2010-2014) data from VTrans, there are no high crash locations (HCLs) in between the study intersections or in the vicinity of the proposed Marina.

A summary of reported crashes from the past five years is shown in Figure 7. Crashes in parking lots were not considered. There were no reported crashes on Penny Lane.

FIGURE 7: CRASH HISTORY, JULY 1, 2011 - JULY 1, 2016



### 3.6 | PLANNED DEVELOPMENTS

The **Community Sailing Center** is expected to move to a larger facility just north of the skatepark. The CSC is expanding the size of its physical facility but will not be expanding membership in an amount significant enough to affect this study. In this study, it is assumed that this move will happen by the time the Marina opens in 2018. Thus, traffic associated with the CSC that currently parks in the lot in front of the CSC will continue on Lake Street rather than turn left onto Penny Lane.

The **Moran Plant** has been slated for development since it closed in 1986, and numerous ideas have been proposed, but in the 30 years since, it has not undergone any improvements. As of August 2016, New Moran, Inc. has a permit to redevelop the Moran Plant, but the permit expires on September 17. Due to the Moran Plant's history of plans that have not come to fruition, the nearing permit expiration, and the recent dissolution of the City's memorandum of understanding with New Moran (July 21, 2016), plans for this building are not being included in this study.

## 4.0 ANALYSIS TRAFFIC VOLUMES

This analysis examines design hour vehicle delays and queues at the following three intersections:

1. Battery Street & College Street
2. Lake Street & College Street/Main Street
3. Lake Street & Penny Lane

FIGURE 8: PROJECT LOCATION AND STUDY AREA INTERSECTIONS



Based on count data, the nature of the proposed use, and discussions with the City of Burlington, it was determined that the PM peak hours and Saturday<sup>1</sup> midday peak hours have the highest combination of background and site generated traffic. Thus traffic impacts during these two time periods are examined in this study. The Saturday peak hour was found using tube data from a 2008 study. Tube data at Battery Street / College Street intersection was from noon to 6pm and reached a peak between 2:15pm and 4:15pm. To be conservative data was collected for the 2:00 – 4:30 PM timeframe.

<sup>1</sup> Laura Wheelock, City of Burlington DPW confirmed Saturday is more active than Sunday in the study area.



## 4.2 | ANALYSIS SCENARIOS

Vehicle delays and queues are examined first with baseline, **No Build** scenario, traffic volumes, which represent the anticipated design hour conditions in the target study years, 2018 and 2023 without the proposed development in place.

Once baseline conditions are established, anticipated traffic associated with the proposed development is added to the No Build scenario volumes to create **Build** scenario traffic volumes, which are in turn used to project intersection delays and levels of service with the proposed development in place.

A detailed description of the elements that contribute to the No Build and Build scenario traffic volumes is presented below.

## 4.3 | BACKGROUND TRAFFIC VOLUMES AND ADJUSTMENTS

Traffic count data was collected by RSG during the months of July and August 2016 during non-holiday weekdays and weekend periods.

Following VTrans traffic study guidelines, observed peak hour traffic volumes were adjusted to represent the design hour volume (DHV)<sup>2</sup> in 2018 and 2023. Design hour adjustment factors are based on VTrans automatic traffic recorder (ATR) D455, located on Battery Street approximately just south of College Street. The calculations to adjust observed traffic volumes to the DHV are as follows:

1. The most recently observed AADT at ATR D455 was 15,000 vehicles in 2013. This AADT was adjusted to 2016 using a growth factor of 1.01, equaling a **2016 estimated AADT of 15,150 vehicles.**
2. The k factor of Battery Street is 0.1061, based on its characterization within the urban poll group. Using this k factor and the 2016 AADT, the  $DHV = AADT * k$  leads to a **DHV of  $15,150 * 0.1061 = 1,610$  vehicles.**
3. Because ATR D455 is south of the College Street intersection, vehicles in RSG's 2016 Battery Street-College Street traffic count that entered the intersection from the south or exited the intersection heading south were added together. The total number of vehicles from the **peak hour of this count that likely passed ATR D455 are 1,439 vehicles.** The adjustment factor between 1,580 and 1,439 is 1.12.
4. The future 2018 year was selected for full opening. An annual growth rate of 0.5% was used to obtain a two-year growth factor of 1.01. The Battery Street intersection were increased by  $1.12 * 1.01 = 13\%$  **to adjust to the DHV.** This growth rate was assumed to continue and is applied to represent the background growth between 2018 and 2023.
5. This adjustment factor was then applied to all study areas intersections.

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<sup>2</sup> The DHV is the 30th highest hour of traffic for the year and is used as the design standard in Vermont.

#### 4.4 | TRIP GENERATION

Trip generation refers to the number of new vehicle trips originating at or destined for a particular development. To estimate the number of new vehicle trips for the proposed Marina, we examined trip generation rates presented in the Institute of Transportation Engineer's *Trip Generation Manual*.<sup>3</sup>

Applying trip generation rates for ITE Land Use 420 (Marina), the 96 seasonal berth Marina is anticipated to generate approximately 20 new vehicle trips during the PM peak hour and approximately 26 vehicle trips during the Saturday peak hour. **Figure 9** presents the projected trip generation.

**FIGURE 9: TRIP GENERATION SUMMARY**

| Day                | Trips/Berth | Trips |
|--------------------|-------------|-------|
| Weekday            | 2.96        | 284   |
| Saturday           | 3.22        | 309   |
| PM Peak Hour       | 0.21        | 20    |
| Saturday Peak Hour | 0.27        | 26    |

**Figure 10** and **Figure 11** present a map of the estimated distribution of project-generated trips. Trips entering and exiting the site access are distributed onto the roadway network based on background traffic volumes.

<sup>3</sup> Institute of Transportation Engineers, *Trip Generation* 9th Edition (Washington, D.C.: Institute of Transportation Engineers, 2012).



FIGURE 10: DISTRIBUTION OF SITE-GENERATED TRIPS (PM PEAK HOUR)

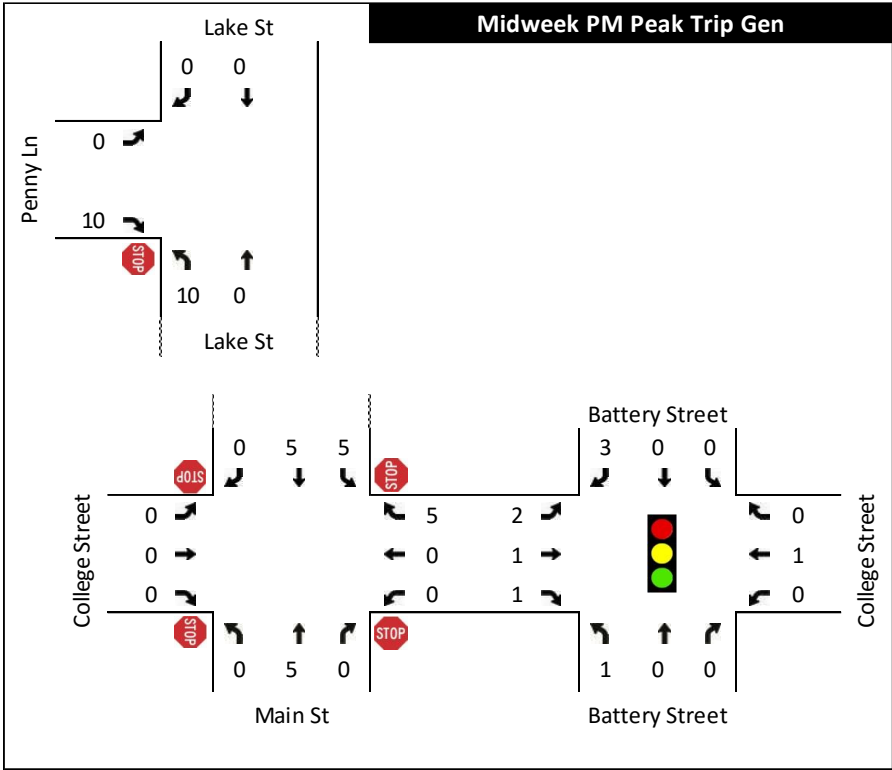
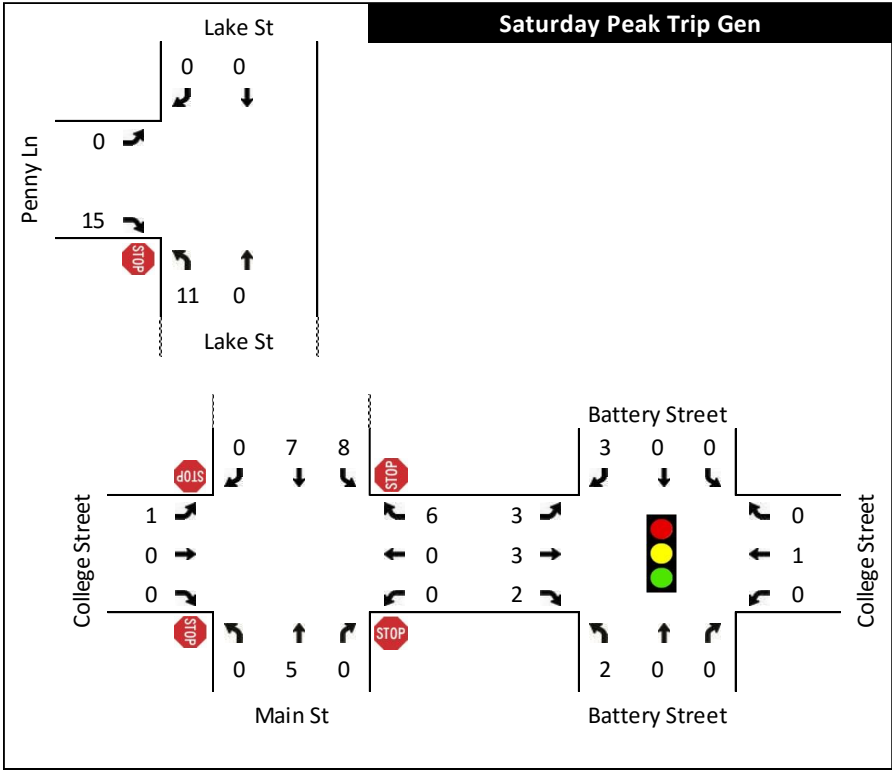


FIGURE 11: DISTRIBUTION OF SITE-GENERATED TRIPS (SATURDAY PEAK HOUR)



## 4.5 | TRIP RE-DISTRIBUTION

As part of the development of the Marina, parking spaces will be relocated and a new waterfront park/plaza will be built. Those who currently park in one of the parking lots (not on Lake Street) to access the fishing pier or existing green space are expected to instead park on Lake Street once the Marina and new park/plaza area is built. No new trips are expected from the new park/plaza.

Independent of the Marina's development, the Community Sailing Center is expected to relocate north of its current space by the time the Marina is operating. As noted earlier, the CSC will not be expanding membership in an amount significant enough to affect this study. Thus, no new trips to the CSC are being included in this study. However, parking and drop off associated with the CSC will change. Traffic currently associated with the CSC, the fishing pier, and the small waterfront park will use the new 68 space lot and the public parking spaces on Lake Street, with the vast majority continuing onto Lake Street rather than onto Penny Lane.

RSG observed current peak hour users of Penny Lane and estimated that approximately 75% of traffic on Penny Lane was associated with the Sailing Center uses with the remaining 25% associated with park use, fishing pier, and sightseeing. A small number of trips are still estimated to use Penny Lane for dropping off and return to Lake Street to park.

Additionally, the operating hours of the Sailing Center and the parking lot observations suggest that the Sailing Center spaces in the Penny Lane parking lot (68 space lot) would fill up before the PM peak hour.

**Figure 12** and **Figure 13** show the estimated re-distribution of existing Penny Lane traffic.

FIGURE 12: RE-DISTRIBUTION OF TRIPS (PM PEAK HOUR)

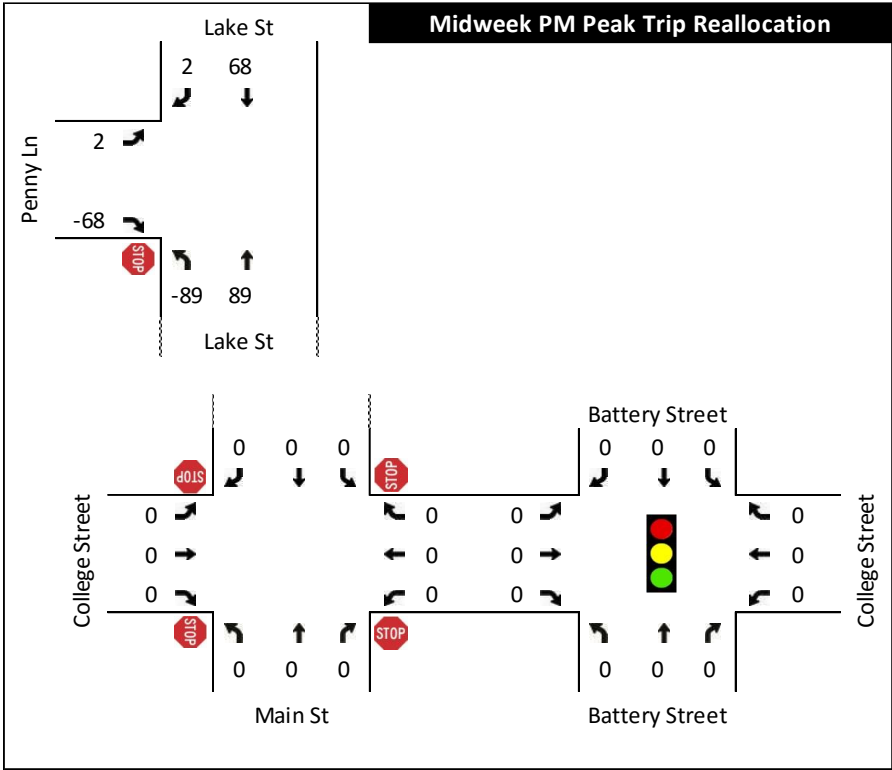
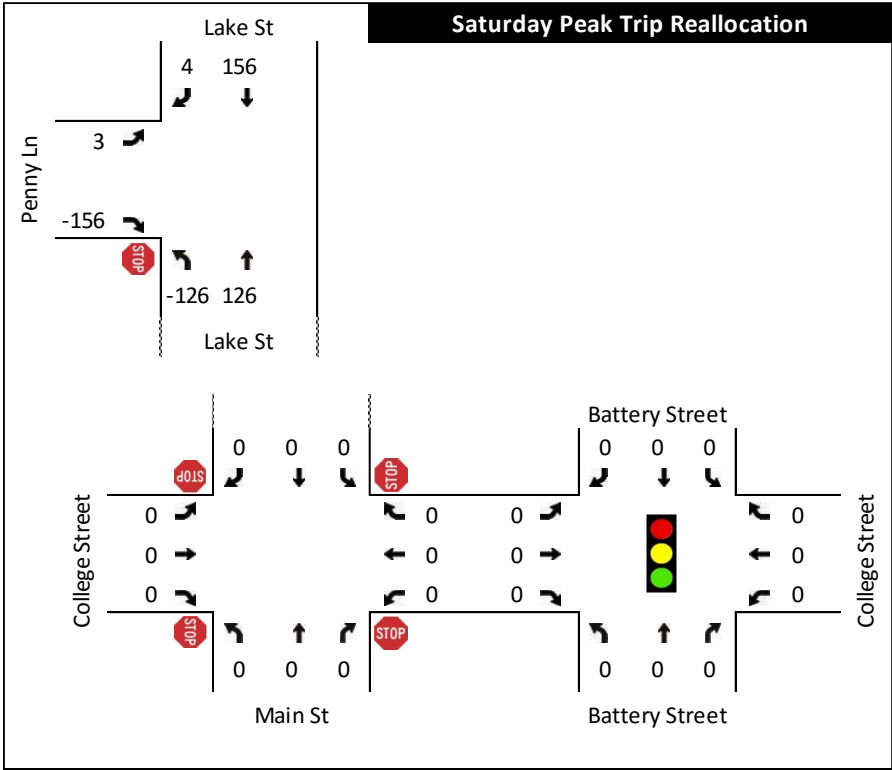


FIGURE 13: RE-DISTRIBUTION OF TRIPS (SATURDAY PEAK HOUR)



## 4.6 | SCENARIO VOLUME GRAPHICS

**Figure 14** through **Figure 21** present the No Build and Build scenario traffic volumes at the three study area intersections. **No Build** traffic volumes include the raw count volumes, adjusted to design hour conditions, and the trip redistribution associated with the Community Sailing Center's relocation and the changed parking situation for visitors of the fishing pier and other waterfront uses. **Build** scenario volumes represent the addition of project-generated traffic to the No Build traffic volumes.

With the addition of site-generated traffic, volumes entering and exiting the project site increase in the Build scenario and these trips are carried out through the neighboring intersections.

**FIGURE 14: 2018 PM PEAK HOUR NO BUILD**

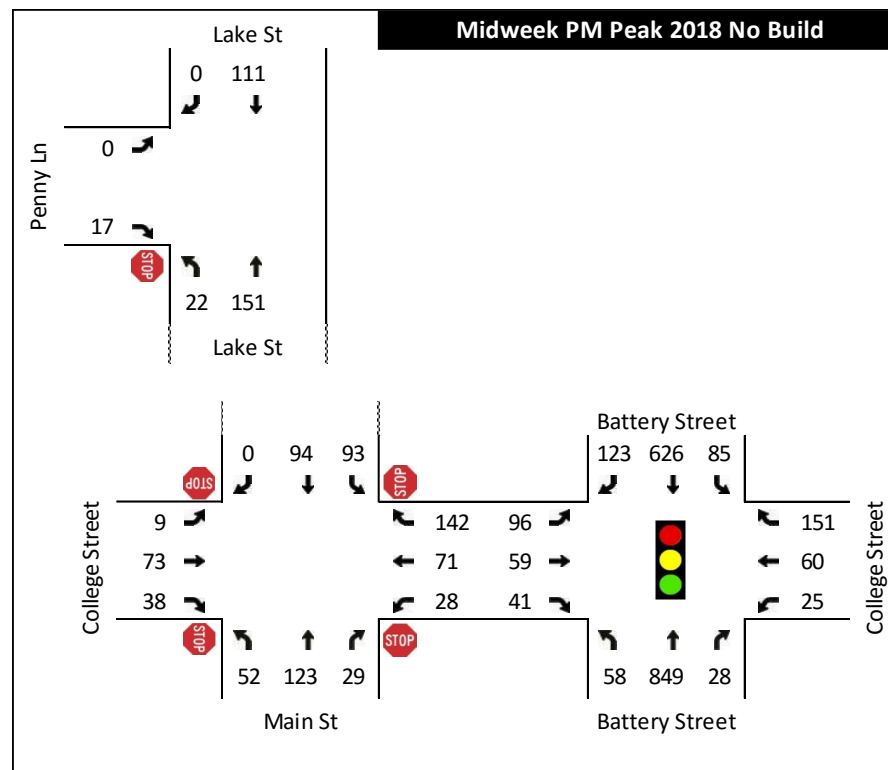


FIGURE 15: 2018 SATURDAY PEAK HOUR NO BUILD

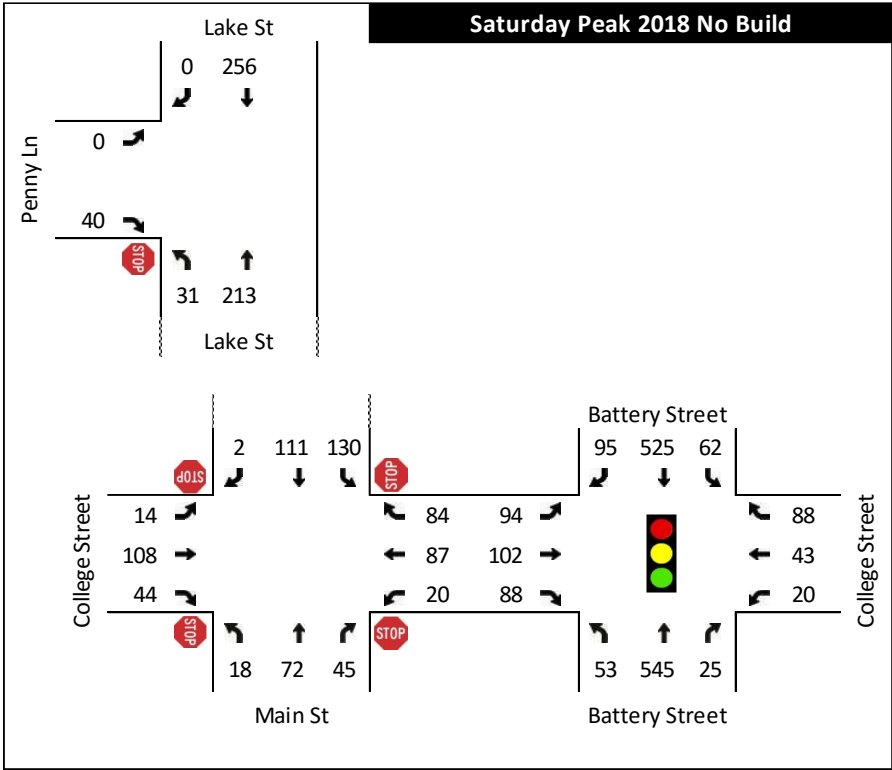


FIGURE 16: 2018 PM PEAK HOUR BUILD

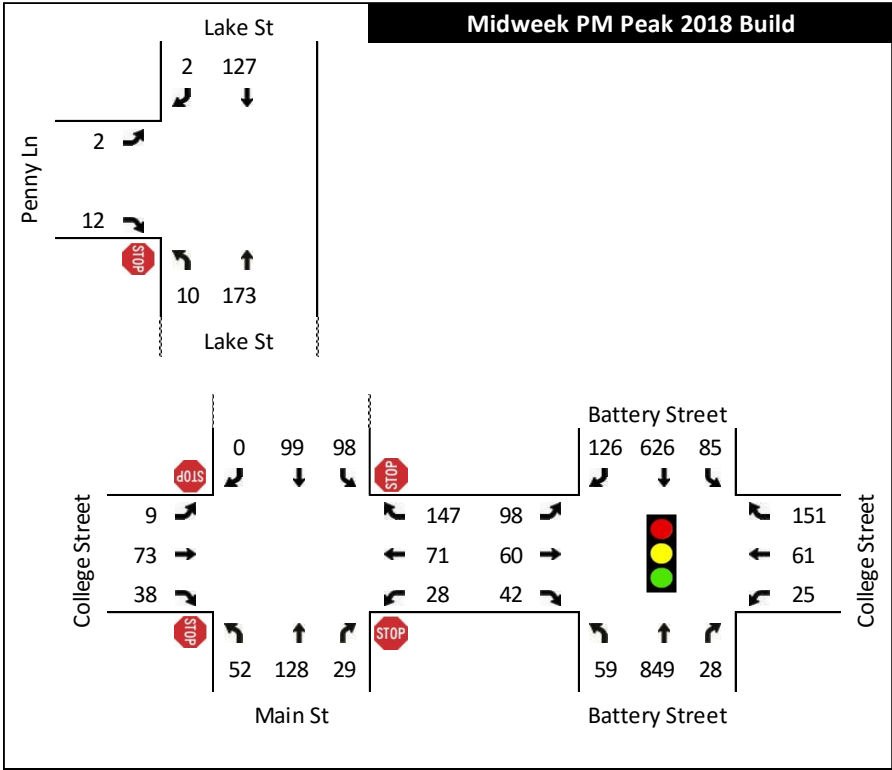


FIGURE 17: 2018 SATURDAY PEAK HOUR BUILD

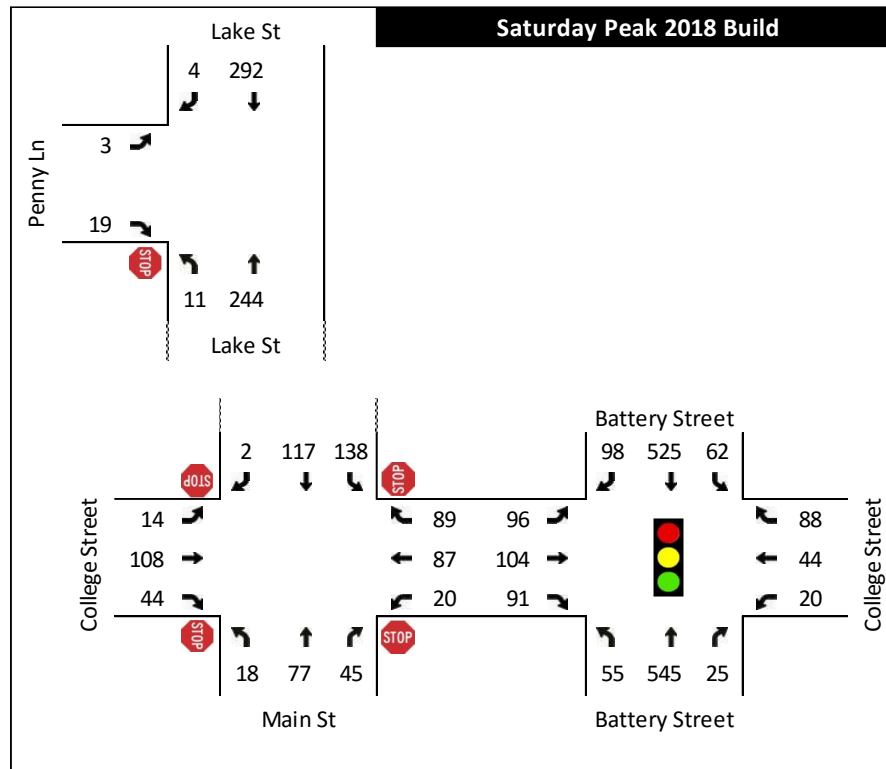


FIGURE 18: 2023 PM PEAK HOUR NO BUILD

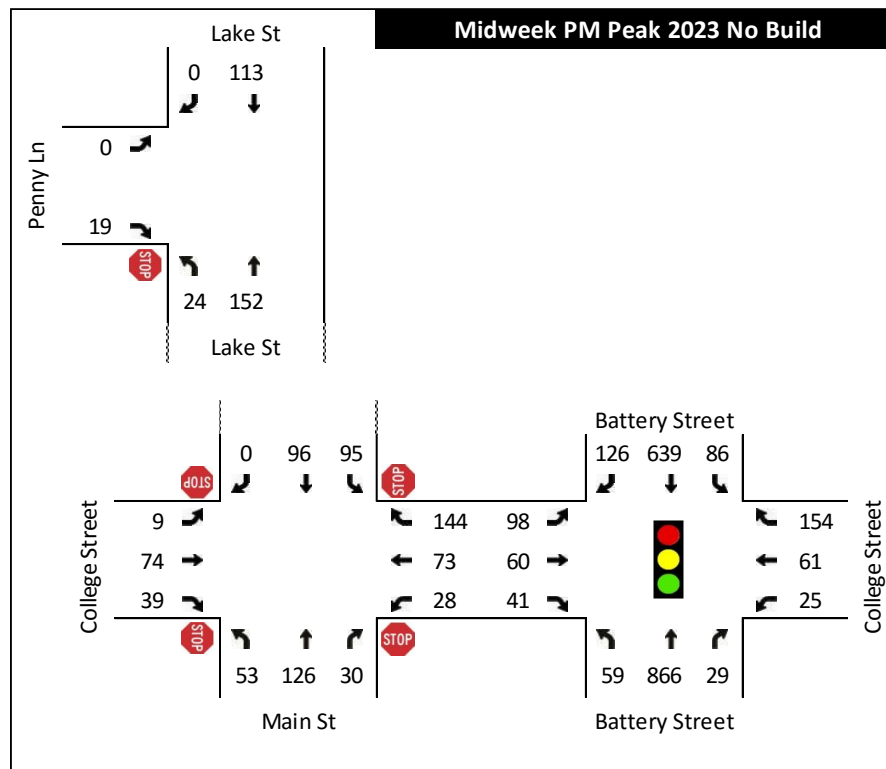


FIGURE 19: 2023 SATURDAY PEAK HOUR NO BUILD

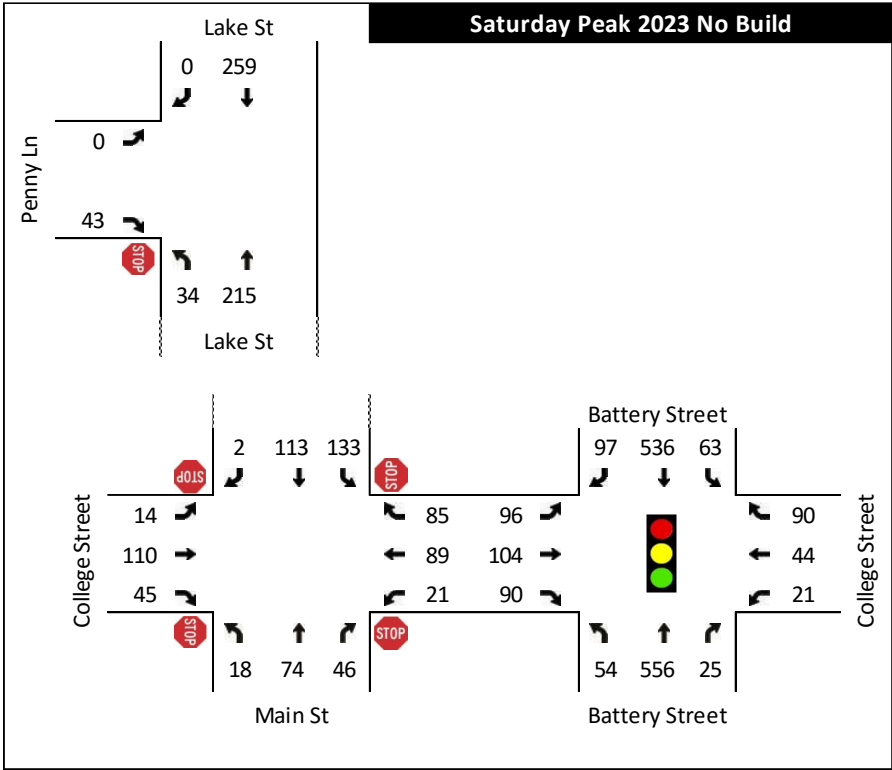


FIGURE 20: 2023 PM PEAK HOUR BUILD

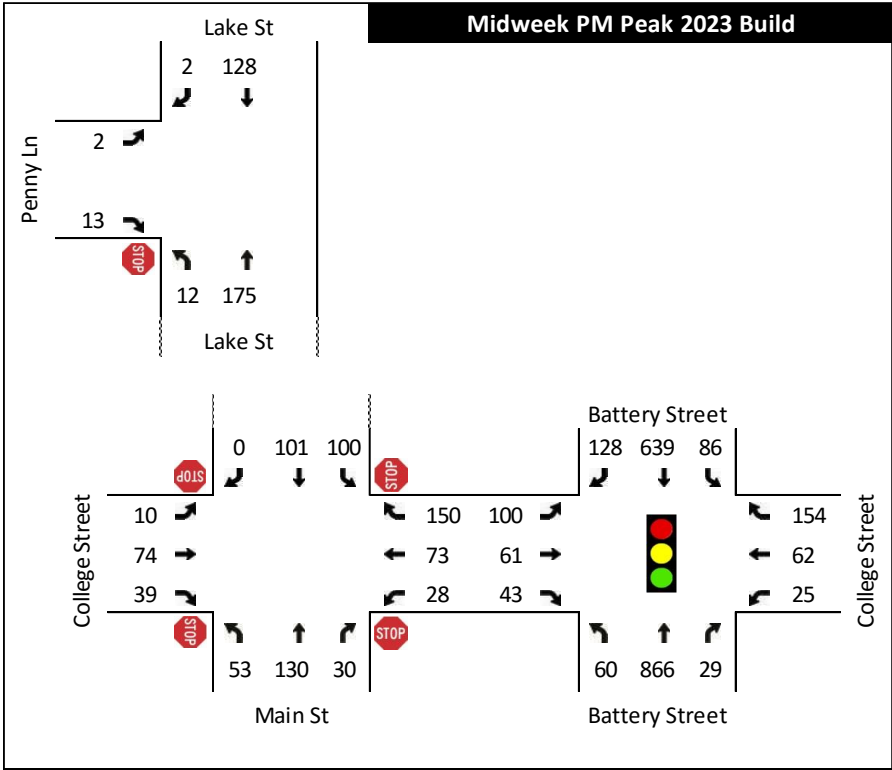
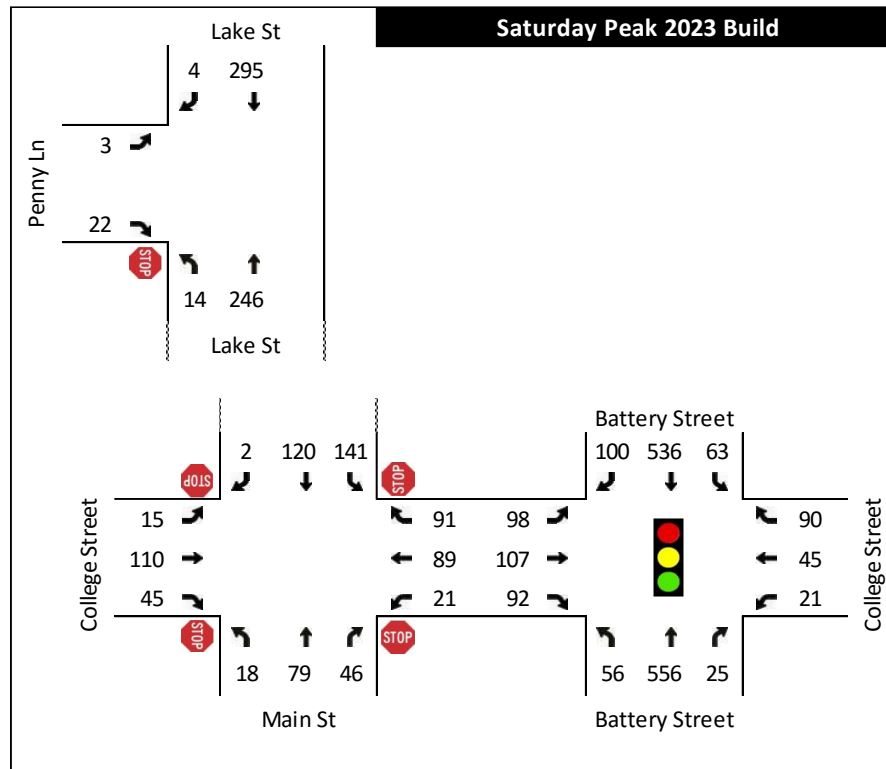




FIGURE 21: 2023 SATURDAY PEAK HOUR BUILD



## 5.0 CONGESTION ANALYSIS

### 5.1 | LEVEL-OF-SERVICE DEFINITION

Level-of-service (LOS) is a qualitative measure describing the operating conditions as perceived by motorists driving in a traffic stream. LOS is calculated using the procedures outlined in the 2000 and 2010 Highway Capacity Manuals.<sup>4</sup> In addition to traffic volumes, key inputs include the number of lanes at each intersection, traffic control type (signalized or unsignalized), and the traffic signal timing plans.

The 2010 Highway Capacity Manual defines six qualitative grades to describe the level of service at an intersection. Level-of-Service is based on the average control delay per vehicle.

**Figure 22** shows the various LOS grades and descriptions for signalized and unsignalized intersections.

**FIGURE 22: LEVEL-OF-SERVICE CRITERIA FOR SIGNALIZED AND UNSIGNALIZED INTERSECTIONS**

| LOS | CHARACTERISTICS    | UNSIGNALIZED      | SIGNALIZED        |
|-----|--------------------|-------------------|-------------------|
|     |                    | TOTAL DELAY (SEC) | TOTAL DELAY (SEC) |
| A   | Little or no delay | ≤ 10.0            | ≤ 10.0            |
| B   | Short delays       | 10.1-15.0         | 10.1-20.0         |
| C   | Average delays     | 15.1-25.0         | 20.1-35.0         |
| D   | Long delays        | 25.1-35.0         | 35.1-55.0         |
| E   | Very long delays   | 35.1-50.0         | 55.1-80.0         |
| F   | Extreme delays     | > 50.0            | > 80.0            |

The delay thresholds for LOS at signalized and unsignalized intersections differ because of the driver's expectations of the operating efficiency for the respective traffic control conditions. According to HCM procedures, an overall LOS cannot be calculated for two-way stop-controlled intersections because not all movements experience delay. In signalized and all-way stop-controlled intersections, all movements experience delay and an overall LOS can be calculated.

The VTrans policy on level of service for **Signalized and All-Way Stop Intersections** is:

- Overall LOS C should be maintained for state-maintained highways and other streets accessing the state's facilities
- Reduced LOS may be acceptable on a case-by-case basis when considering, at minimum, current and future traffic volumes, delays, volume to capacity ratios, crash rates, and negative impacts as a result of improvement necessary to achieve LOS C.

<sup>4</sup> The HCM 2010 does not provide methodologies for calculating intersection delays at certain intersection types including signalized intersections with exclusive pedestrian phases and signalized intersections with non NEMA-standard phasing. Because of these limitations, HCM 2000 methodologies are employed where necessary.

The VTrans policy on level of service for **Two-Way and One-Way Stop Intersections** is:

- LOS D should be maintained for side roads with volumes exceeding 100 vehicles/hour for a single lane approach (150 vehicles/hour for a two-lane approach) at two-way stop-controlled intersections. No LOS criteria are in effect for volumes less than these.

Detailed Synchro LOS worksheets are available in the Appendix.

## 5.2 | LEVEL-OF-SERVICE RESULTS

The Highway Capacity Manual congestion reports within Synchro (v8), a traffic analysis software package from Trafficware, routinely relied upon by transportation engineering professionals, were used to assess traffic congestion at the study intersections.

During the both the weekday PM peak hour and Saturday peak hour all intersections are expected to operate at acceptable levels of congestion without or with the proposed Marina.

**Figure 23** and **Figure 24** present the LOS results during the weekday AM and PM peak hours, respectively.

**FIGURE 23: PM PEAK HOUR LOS RESULTS**

| Intersections                                                                                                            | PM Peak Hour  |       |      |            |       |      |               |       |      |            |       |      |
|--------------------------------------------------------------------------------------------------------------------------|---------------|-------|------|------------|-------|------|---------------|-------|------|------------|-------|------|
|                                                                                                                          | 2018 No Build |       |      | 2018 Build |       |      | 2023 No Build |       |      | 2023 Build |       |      |
|                                                                                                                          | LOS           | Delay | v/c  | LOS        | Delay | v/c  | LOS           | Delay | v/c  | LOS        | Delay | v/c  |
|  <b>College St &amp; Battery St</b>   |               |       |      |            |       |      |               |       |      |            |       |      |
| Overall                                                                                                                  | B             | 19    | 0.51 | B          | 19    | 0.51 | B             | 19    | 0.52 | B          | 19    | 0.52 |
| EB, along College St                                                                                                     | C             | 29    | 0.38 | C          | 29    | 0.39 | C             | 30    | 0.40 | C          | 30    | 0.41 |
| WB, along College St                                                                                                     | C             | 26    | 0.20 | C          | 26    | 0.20 | C             | 27    | 0.21 | C          | 27    | 0.21 |
| NB, along Battery St                                                                                                     | B             | 17    | 0.60 | B          | 17    | 0.61 | B             | 16    | 0.61 | B          | 16    | 0.61 |
| SB, along Battery St                                                                                                     | B             | 18    | 0.65 | B          | 18    | 0.65 | B             | 18    | 0.65 | B          | 18    | 0.65 |
|  <b>College St &amp; Lake/Main St</b> |               |       |      |            |       |      |               |       |      |            |       |      |
| EB, along College St                                                                                                     | A             | 9     | 0.17 | A          | 9     | 0.17 | A             | 9     | 0.18 | A          | 9     | 0.18 |
| WB, along College St                                                                                                     | A             | 10    | 0.32 | B          | 10    | 0.33 | B             | 10    | 0.33 | B          | 10    | 0.34 |
| NB, from Main St                                                                                                         | B             | 10    | 0.29 | B          | 10    | 0.30 | B             | 10    | 0.30 | B          | 10    | 0.31 |
| SB, from Lake St                                                                                                         | B             | 10    | 0.27 | B          | 10    | 0.29 | B             | 10    | 0.28 | B          | 11    | 0.30 |
|  <b>Lake St &amp; Penny St</b>        |               |       |      |            |       |      |               |       |      |            |       |      |
| EB, from Penny Ln                                                                                                        | A             | 9     | 0.02 | A          | 9     | 0.02 | A             | 9     | 0.02 | A          | 9     | 0.02 |
| NBL, from Lake St                                                                                                        | A             | 7     | 0.02 | A          | 8     | 0.01 | A             | 8     | 0.02 | A          | 8     | 0.01 |

**FIGURE 24: SATURDAY PEAK HOUR LOS RESULTS**

| Intersections                                                                                                            | Saturday Peak Hour |       |      |            |       |      |               |       |      |            |       |      |
|--------------------------------------------------------------------------------------------------------------------------|--------------------|-------|------|------------|-------|------|---------------|-------|------|------------|-------|------|
|                                                                                                                          | 2018 No Build      |       |      | 2018 Build |       |      | 2023 No Build |       |      | 2023 Build |       |      |
|                                                                                                                          | LOS                | Delay | v/c  | LOS        | Delay | v/c  | LOS           | Delay | v/c  | LOS        | Delay | v/c  |
|  <b>College St &amp; Battery St</b>   |                    |       |      |            |       |      |               |       |      |            |       |      |
| Overall                                                                                                                  | C                  | 22    | 0.41 | C          | 22    | 0.42 | C             | 22    | 0.42 | C          | 22    | 0.42 |
| EB, along College St                                                                                                     | C                  | 20    | 0.29 | C          | 21    | 0.29 | C             | 21    | 0.30 | C          | 21    | 0.31 |
| WB, along College St                                                                                                     | B                  | 18    | 0.11 | B          | 18    | 0.11 | B             | 19    | 0.11 | B          | 19    | 0.12 |
| NB, along Battery St                                                                                                     | C                  | 23    | 0.55 | C          | 23    | 0.55 | C             | 22    | 0.54 | C          | 22    | 0.55 |
| SB, along Battery St                                                                                                     | C                  | 24    | 0.61 | C          | 24    | 0.61 | C             | 23    | 0.61 | C          | 23    | 0.61 |
|  <b>College St &amp; Lake/Main St</b> |                    |       |      |            |       |      |               |       |      |            |       |      |
| EB, along College St                                                                                                     | A                  | 10    | 0.23 | A          | 10    | 0.24 | A             | 10    | 0.24 | A          | 10    | 0.25 |
| WB, along College St                                                                                                     | A                  | 10    | 0.26 | A          | 10    | 0.27 | A             | 10    | 0.27 | A          | 10    | 0.28 |
| NB, from Main St                                                                                                         | A                  | 9     | 0.19 | A          | 9     | 0.20 | A             | 9     | 0.19 | A          | 9     | 0.20 |
| SB, from Lake St                                                                                                         | B                  | 11    | 0.35 | B          | 11    | 0.37 | B             | 11    | 0.36 | B          | 11    | 0.38 |
|  <b>Lake St &amp; Penny St</b>        |                    |       |      |            |       |      |               |       |      |            |       |      |
| EB, from Penny Ln                                                                                                        | A                  | 10    | 0.05 | B          | 10    | 0.03 | A             | 10    | 0.06 | B          | 10    | 0.04 |
| NBL, from Lake St                                                                                                        | A                  | 8     | 0.02 | A          | 8     | 0.01 | A             | 8     | 0.03 | A          | 8     | 0.01 |

## 6.0 QUEUING ANALYSIS

In addition to the delay congestion analysis, estimated average maximum queues were evaluated using SimTraffic.<sup>5</sup>

Detailed SimTraffic queuing worksheets are available in the Appendix.

**FIGURE 25: AVERAGE MAXIMUM QUEUE LENGTHS (VEHICLES)**

|                           |    | PM Peak Hour |       |          |       | Saturday Peak Hour |       |          |       |
|---------------------------|----|--------------|-------|----------|-------|--------------------|-------|----------|-------|
|                           |    | 2018         |       | 2023     |       | 2018               |       | 2023     |       |
|                           |    | No Build     | Build | No Build | Build | No Build           | Build | No Build | Build |
| College St & Battery St   | EB | 4            | 4     | 5        | 4     | 5                  | 5     | 5        | 6     |
|                           | WB | 5            | 5     | 5        | 5     | 3                  | 3     | 3        | 3     |
|                           | NB | 9            | 9     | 9        | 9     | 7                  | 7     | 7        | 7     |
|                           | SB | 8            | 8     | 8        | 8     | 7                  | 7     | 7        | 7     |
| College St & Lake/Main St | EB | 2            | 2     | 2        | 2     | 4                  | 3     | 4        | 4     |
|                           | WB | 3            | 4     | 3        | 4     | 4                  | 4     | 4        | 4     |
|                           | NB | 3            | 4     | 3        | 4     | 3                  | 3     | 3        | 3     |
|                           | SB | 3            | 4     | 4        | 4     | 10                 | 12    | 12       | 15    |
| Lake St & Penny St        | EB | 0            | 0     | 1        | 0     | 1                  | 1     | 1        | 1     |
|                           | NB | 0            | 0     | 0        | 0     | 0                  | 0     | 1        | 0     |
|                           | SB | 0            | 0     | 0        | 0     | 0                  | 0     | 0        | 0     |

Queues are projected to experience negligible changes associated with the impact of the Marina traffic.

The largest increase in queueing occurs for the southbound approach along Lake Street at the intersection with College Street. Queues are expected to be ten vehicles or greater during the Saturday peak hour without or with the proposed Marina. The predominant source of the queues is the presence of pedestrians, both at the Lake Street - College Street intersection and the number of pedestrians crossing Battery Street reducing the capacity for turning vehicles from College Street.

<sup>5</sup> Ten hour-long simulations were averaged together to estimate queue lengths. As each run is different, a difference in a few cars should not be seen as significant.

## 7.0 SUMMARY & CONCLUSIONS

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Burlington Harbor Marina, LLC has retained RSG to conduct a traffic impact study to understand and assess the effects of its proposed Burlington Harbor Marina in the Waterfront North area of Burlington, Vermont.

The proposed project would construct a 160 boat slip marina with 96 slips reserved for seasonal rentals and 64 slips for transient users arriving by boat. The Marina will be open May through October.

Key project findings, presented in greater detail below, include:

- Based on the expected vehicle demand for the 96 seasonal berth rentals the Marina is expected to generate 20 trips during the weekday PM peak hour and 26 trips during the Saturday peak hour.
- During the weekday PM peak hour, we project the addition of site generated traffic to the adjacent road network will increase delays on local roadways by less than 1 second or less in both 2018 and 2023.
- Acceptable overall and movement delays for the study intersections are expected with or without the addition of project generated traffic during both the weekday and Saturday peak hours.
- Acceptable queues are expected for all study intersection movements, although an increase of three car lengths is anticipated in 2023 during the Saturday peak hour at the southbound approach to College Street – Lake Street.

We conclude the proposed project will not cause undue adverse traffic congestion or safety conditions and will not unnecessarily or unreasonably endanger the public investment in roads, highways, and related infrastructure.

## APPENDICES

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**APPENDIX A:** Raw Counts

**APPENDIX B:** Crash Reports

**APPENDIX C:** Synchro Reports

**APPENDIX D:** SimTraffic Reports



## APPENDIX A

# RAW COUNTS

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## Raw Counts

| Midweek PM Peak Hour                      |                        |      |      |      |
|-------------------------------------------|------------------------|------|------|------|
| Battery St / College St                   |                        |      |      |      |
|                                           | EB                     | WB   | NB   | SB   |
| L                                         | 85                     | 22   | 51   | 75   |
| T                                         | 52                     | 53   | 751  | 554  |
| R                                         | 36                     | 134  | 25   | 109  |
| Enter                                     | 173                    | 209  | 827  | 738  |
| Exit                                      | 152                    | 213  | 970  | 612  |
| % Trucks                                  | 1.7%                   | 1.4% | 2.2% | 1.1% |
| Peds                                      | 59                     | 19   | 136  | 232  |
| Peak Hour                                 | 4:45 PM - 5:45 PM Peak |      |      |      |
| Lake St / College St                      |                        |      |      |      |
|                                           | EB                     | WB   | NB   | SB   |
| L                                         | 8                      | 23   | 46   | 86   |
| T                                         | 67                     | 59   | 109  | 83   |
| R                                         | 34                     | 117  | 27   | 0    |
| Enter                                     | 109                    | 199  | 182  | 169  |
| Exit                                      | 180                    | 105  | 234  | 140  |
| % Trucks                                  | 0.9%                   | 1.5% | 0.5% | 0.6% |
| Peds                                      | 8                      | 10   | 170  | 324  |
| Peak Hour                                 | 4:45 PM - 5:45 PM Peak |      |      |      |
| Lake St / Penny Ln (Lake = N/S, Penny=EB) |                        |      |      |      |
|                                           | EB                     | WB   | NB   | SB   |
| L                                         | 0                      | 0    | 79   | 0    |
| T                                         | 0                      | 0    | 74   | 52   |
| R                                         | 62                     | 0    | 0    | 0    |
| Enter                                     | 0                      | 0    | 153  | 0    |
| Exit                                      | 0                      | 0    | 0    | 114  |

| Saturday Peak Hour                        |                        |      |      |      |
|-------------------------------------------|------------------------|------|------|------|
| Battery St / College St                   |                        |      |      |      |
|                                           | EB                     | WB   | NB   | SB   |
| L                                         | 83                     | 18   | 47   | 55   |
| T                                         | 90                     | 38   | 482  | 465  |
| R                                         | 78                     | 78   | 22   | 84   |
| Enter                                     | 251                    | 134  | 551  | 604  |
| Exit                                      | 167                    | 169  | 643  | 561  |
| % Trucks                                  | 2.4%                   | 3.7% | 3.3% | 1.7% |
| Peds                                      | 123                    | 40   | 253  | 396  |
| Peak Hour                                 | 3:30 PM - 4:30 PM Peak |      |      |      |
| Lake St / College St                      |                        |      |      |      |
|                                           | EB                     | WB   | NB   | SB   |
| L                                         | 12                     | 17   | 16   | 106  |
| T                                         | 88                     | 73   | 64   | 98   |
| R                                         | 39                     | 70   | 37   | 2    |
| Enter                                     | 139                    | 160  | 117  | 206  |
| Exit                                      | 231                    | 91   | 146  | 154  |
| % Trucks                                  | 3.6%                   | 0.0% | 0.0% | 1.0% |
| Peds                                      | 85                     | 63   | 309  | 423  |
| Peak Hour                                 | 3:30 PM - 4:30 PM Peak |      |      |      |
| Lake St / Penny Ln (Lake = N/S, Penny=EB) |                        |      |      |      |
|                                           | EB                     | WB   | NB   | SB   |
| L                                         | 0                      | 0    | 111  | 0    |
| T                                         | 0                      | 0    | 105  | 121  |
| R                                         | 141                    | 0    | 0    | 0    |
| Enter                                     | 0                      | 0    | 216  | 0    |
| Exit                                      | 0                      | 0    | 0    | 262  |



## APPENDIX B

# CRASH REPORTS

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Reported Crashes in Study Area  
7/1/2011 - 7/1/2016

| Date       | Report Number | Street     | Intersection      | Intersection With<br>(or Nearest<br>Intersection) | Location                             | Collision Type | Direction of Collision - Specific                         | Unusual Circumstances   |
|------------|---------------|------------|-------------------|---------------------------------------------------|--------------------------------------|----------------|-----------------------------------------------------------|-------------------------|
| 7/17/2011  | 2011BU16020   | Battery St | Four-Way          | College St                                        | Battery St - College St Intersection | Rear End       | Rear End                                                  | None                    |
| 8/20/2011  | 2011BU19081   | College St | T-Intersection    | 1 College St                                      | Along College St                     | Broadside      | Left Turn and Thru, Angle Broadside                       | Resulted in Injury      |
| 9/21/2011  | 2011BU22124   | College St | Four-Way          | Battery St                                        | Battery St - College St Intersection | Sideswipe      | Same Direction Sideswipe                                  | None                    |
| 4/23/2012  | 2012BU009592  | College St | Not at a junction | Battery St                                        | Along College St                     | Unknown        | Unknown                                                   | None                    |
| 6/2/2012   | 2012BU013251  | Battery St | Four-Way          | College St                                        | Battery St - College St Intersection | Broadside      | Left Turn and Thru, Angle Broadside                       | Wet; Resulted in Injury |
| 6/13/2012  | 2012BU014332  | College St | Not at a junction | Battery St                                        | Along College St                     | Rear End       | Rear End                                                  | None                    |
| 7/5/2012   | 2012BU016467  | Battery St | Four-Way          | College St                                        | Battery St - College St Intersection | Other          | Rear-to-Rear                                              | None                    |
| 8/16/2012  | 2012BU020532  | College St | Four-Way          | Lake St                                           | Lake St - College St Intersection    | Single Vehicle | Single Vehicle Crash                                      | Resulted in Injury      |
| 9/21/2012  | 2012BU024430  | College St | Not at a junction | Battery St                                        | Along College St                     | Sideswipe      | Same Direction Sideswipe                                  | None                    |
| 10/24/2012 | 2012BU027431  | Battery St | Four-Way          | College St                                        | Battery St - College St Intersection | Single Vehicle | Single Vehicle Crash                                      | Resulted in Injury      |
| 12/29/2012 | 2012BU032626  | Battery St | Four-Way          | College St                                        | Battery St - College St Intersection | Rear End       | Rear End                                                  | Snow                    |
| 1/28/2013  | 2013BU002232  | College St | Four-Way          | Battery St                                        | Battery St - College St Intersection | Broadside      | Right Turn and Thru, Broadside                            | Snow                    |
| 1/28/2013  | 2013BU002243  | Lake St    | Not at a junction | Depot St                                          | Along Lake St                        | Single Vehicle | Single Vehicle Crash                                      | Snow                    |
| 2/8/2013   | 2013BU003008  | College St | Four-Way          | Battery St                                        | Battery St - College St Intersection | Rear End       | Rear End                                                  | Snow                    |
| 5/1/2013   | 2013BU010016  | Lake St    | Not at a junction | 60 Lake St                                        | Along Lake St                        | Sideswipe      | Same Direction Sideswipe                                  | None                    |
| 5/3/2013   | 2013BU010232  | College St | Four-Way          | Lake St                                           | Lake St - College St Intersection    | Sideswipe      | Opp Direction Sideswipe                                   | None                    |
| 5/3/2013   | 2013BU010232  | College St | Four-Way          | College St                                        | Lake St - College St Intersection    | Sideswipe      | Opp Direction Sideswipe                                   | None                    |
| 5/14/2013  | 2013BU011445  | Lake St    | T-Intersection    | 60 Lake St                                        | Along Lake St                        | Sideswipe      | Same Direction Sideswipe                                  | None                    |
| 6/27/2013  | 2013BU015921  | College St | Four-Way          | Lake St                                           | Lake St - College St Intersection    | Rear End       | Rear End                                                  | None                    |
| 7/6/2013   | 2013BU016951  | College St | Four-Way          | Lake St                                           | Lake St - College St Intersection    | Rear End       | Rear End                                                  | None                    |
| 7/13/2013  | 2013BU017633  | College St | Not at a junction | Lake St                                           | Along College St                     | Sideswipe      | Same Direction Sideswipe                                  | None                    |
| 10/7/2013  | 2013BU027099  | College St | Unknown           | Battery St                                        | Along College St                     | Unknown        | Unknown                                                   | None                    |
| 10/7/2013  | 2013BU027100  | Battery St | Four-Way          | College St                                        | Battery St - College St Intersection | Unknown        | Unknown                                                   | None                    |
| 10/10/2013 | 2013BU027420  | College St | Not at a junction | 1 College St                                      | Along College St                     | Sideswipe      | Opp Direction Sideswipe                                   | None                    |
| 11/30/2013 | 2013BU031878  | College St | Unknown           | Battery St                                        | Along College St                     | Unknown        | Unknown                                                   | None                    |
| 1/2/2014   | 2014BU000161  | Battery St | Four-Way          | College St                                        | Battery St - College St Intersection | Unknown        | Unknown                                                   | Snow                    |
| 1/3/2014   | 2014BU000197  | College St | Four-Way          | Battery St                                        | Battery St - College St Intersection | Rear End       | Rear End                                                  | Snow                    |
| 2/23/2014  | 2014BU004759  | College St | Not at a junction | Battery St                                        | Along College St                     | Unknown        | Unknown                                                   | None                    |
| 5/31/2014  | 2014BU013912  | College St | Not at a junction | Battery St                                        | Along College St                     | Sideswipe      | Same Direction Sideswipe                                  | None                    |
| 6/11/2014  | 2014BU015135  | Lake St    | Not at a junction | College St                                        | Along Lake St                        | Sideswipe      | Same Direction Sideswipe                                  | None                    |
| 6/19/2014  | 2014BU015959  | Lake St    | Four-Way          | College St                                        | Lake St - College St Intersection    | Sideswipe      | Same Direction Sideswipe                                  | Resulted in Injury      |
| 7/22/2014  | 2014BU019514  | Battery St | Four-Way          | College St                                        | Battery St - College St Intersection | Sideswipe      | Same Direction Sideswipe                                  | None                    |
| 8/8/2014   | 2014BU021501  | College St | Four-Way          | Battery St                                        | Battery St - College St Intersection | Broadside      | Left Turn and Thru, Angle Broadside                       | None                    |
| 8/29/2014  | 2014BU023987  | Lake St    | Not at a junction | College St                                        | Along Lake St                        | Sideswipe      | Same Direction Sideswipe                                  | None                    |
| 9/4/2014   | 2014BU024646  | College St | Four-Way          | Battery St                                        | Battery St - College St Intersection | Rear End       | Rear End                                                  | None                    |
| 9/8/2014   | 2014BU025140  | Lake St    | Not at a junction | College St                                        | Along Lake St                        | Rear End       | Rear End                                                  | None                    |
| 10/2/2014  | 2014BU027880  | Lake St    | Not at a junction | College St                                        | Along Lake St                        | Rear End       | Rear End                                                  | None                    |
| 11/1/2014  | 2014BU031134  | Battery St | Four-Way          | College St                                        | Battery St - College St Intersection | Rear End       | Rear End                                                  | Wet                     |
| 11/19/2014 | 2014BU032714  | Battery St | Four-Way          | College St                                        | Battery St - College St Intersection | Broadside      | No Turns, Thru moves only, Broadside                      | Resulted in Injury      |
| 1/5/2015   | 2015BU000342  | Battery St | Four-Way          | College St                                        | Battery St - College St Intersection | Sideswipe      | Same Direction Sideswipe                                  | Resulted in Injury      |
| 2/8/2015   | 2015BU003202  | College St | Four-Way          | Battery St                                        | Battery St - College St Intersection | Other          | Head On                                                   | Wet                     |
| 3/20/2015  | 2015BU006730  | College St | Four-Way          | Battery St                                        | Battery St - College St Intersection | Unknown        | Unknown                                                   | None                    |
| 4/25/2015  | 2015BU010286  | Battery St | Four-Way          | College St                                        | Battery St - College St Intersection | Broadside      | No Turns, Thru moves only, Broadside                      | None                    |
| 6/6/2015   | 2015BU014921  | College St | Four-Way          | Battery St                                        | Battery St - College St Intersection | Broadside      | No Turns, Thru moves only, Broadside                      | Resulted in Injury      |
| 7/4/2015   | 2015BU017817  | Battery St | Four-Way          | College St                                        | Battery St - College St Intersection | Sideswipe      | Opp Direction Sideswipe                                   | Resulted in Injury      |
| 9/18/2015  | 2015BU026605  | Lake St    | Not at a junction | College St                                        | Along Lake St                        | Sideswipe      | Left Turn and Thru, Same Direction Sideswipe/Angle Crash  | None                    |
| 11/4/2015  | 2015BU031795  | Battery St | Four-Way          | College St                                        | Battery St - College St Intersection | Sideswipe      | Right Turn and Thru, Same Direction Sideswipe/Angle Crash | None                    |
| 11/21/2015 | 2015BU033609  | Battery St | Four-Way          | College St                                        | Battery St - College St Intersection | Broadside      | Right Turn and Thru, Broadside                            | None                    |
| 4/15/2016  | 2016BU009825  | Battery St | Four-Way          | College St                                        | Battery St - College St Intersection | Rear End       | Rear End                                                  | None                    |
| 5/12/2016  | 2016BU012942  | Lake St    | Not at a junction | College St                                        | Along Lake St                        | Sideswipe      | Same Direction Sideswipe                                  | None                    |
| 5/13/2016  | 2016BU013145  | College St | Four-Way          | Lake St                                           | Lake St - College St Intersection    | Rear End       | Rear End                                                  | None                    |
| 6/20/2016  | 2016BU017715  | Battery St | Four-Way          | College St                                        | Battery St - College St Intersection | Broadside      | Left Turn and Thru, Angle Broadside                       | None                    |
| 6/29/2016  | 2016BU018696  | College St | Four-Way          | Lake St                                           | Lake St - College St Intersection    | Rear End       | Rear End                                                  | None                    |



## APPENDIX C

# SYNCHRO REPORTS

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# HCM Signalized Intersection Capacity Analysis

## 1: Battery St & College St

9/14/2016



| Movement               | EBL   | EBT  | EBR  | WBL  | WBT  | WBR  | NBL  | NBT  | NBR  | SBL  | SBT   | SBR  |
|------------------------|-------|------|------|------|------|------|------|------|------|------|-------|------|
| Lane Configurations    |       |      |      |      |      |      |      |      |      |      |       |      |
| Traffic Volume (vph)   | 96    | 59   | 41   | 25   | 60   | 151  | 58   | 849  | 28   | 85   | 626   | 123  |
| Future Volume (vph)    | 96    | 59   | 41   | 25   | 60   | 151  | 58   | 849  | 28   | 85   | 626   | 123  |
| Ideal Flow (vphpl)     | 1900  | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900  | 1900 |
| Total Lost time (s)    | 5.0   | 5.0  |      |      | 5.0  | 5.0  |      | 5.0  |      |      | 5.0   |      |
| Lane Util. Factor      | 1.00  | 1.00 |      |      | 1.00 | 1.00 |      | 0.95 |      |      | 0.95  |      |
| Frpb, ped/bikes        | 1.00  | 0.91 |      |      | 1.00 | 0.68 |      | 1.00 |      |      | 0.98  |      |
| Flpb, ped/bikes        | 0.72  | 1.00 |      |      | 0.95 | 1.00 |      | 1.00 |      |      | 1.00  |      |
| Frt                    | 1.00  | 0.94 |      |      | 1.00 | 0.85 |      | 1.00 |      |      | 0.98  |      |
| Flt Protected          | 0.95  | 1.00 |      |      | 0.99 | 1.00 |      | 1.00 |      |      | 0.99  |      |
| Satd. Flow (prot)      | 1283  | 1596 |      |      | 1757 | 1095 |      | 3498 |      |      | 3390  |      |
| Flt Permitted          | 0.70  | 1.00 |      |      | 0.91 | 1.00 |      | 0.84 |      |      | 0.71  |      |
| Satd. Flow (perm)      | 948   | 1596 |      |      | 1619 | 1095 |      | 2947 |      |      | 2416  |      |
| Peak-hour factor, PHF  | 1.00  | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00  | 1.00 |
| Adj. Flow (vph)        | 96    | 59   | 41   | 25   | 60   | 151  | 58   | 849  | 28   | 85   | 626   | 123  |
| RTOR Reduction (vph)   | 0     | 26   | 0    | 0    | 0    | 111  | 0    | 3    | 0    | 0    | 18    | 0    |
| Lane Group Flow (vph)  | 96    | 74   | 0    | 0    | 85   | 40   | 0    | 932  | 0    | 0    | 816   | 0    |
| Confl. Peds. (#/hr)    | 232   |      | 136  | 136  |      | 232  | 59   |      | 19   | 19   |       | 59   |
| Heavy Vehicles (%)     | 2%    | 2%   | 2%   | 1%   | 1%   | 1%   | 2%   | 2%   | 2%   | 1%   | 1%    | 1%   |
| Turn Type              | Perm  | NA   |      | Perm | NA   | Perm | Perm | NA   |      | Perm | NA    |      |
| Protected Phases       |       | 4    |      |      | 4    |      |      | 2    |      |      | 2     |      |
| Permitted Phases       | 4     |      |      | 4    |      | 4    | 2    |      |      | 2    |       |      |
| Actuated Green, G (s)  | 23.9  | 23.9 |      |      | 23.9 | 23.9 |      | 47.1 |      |      | 47.1  |      |
| Effective Green, g (s) | 23.9  | 23.9 |      |      | 23.9 | 23.9 |      | 47.1 |      |      | 47.1  |      |
| Actuated g/C Ratio     | 0.27  | 0.27 |      |      | 0.27 | 0.27 |      | 0.52 |      |      | 0.52  |      |
| Clearance Time (s)     | 5.0   | 5.0  |      |      | 5.0  | 5.0  |      | 5.0  |      |      | 5.0   |      |
| Vehicle Extension (s)  | 3.0   | 3.0  |      |      | 3.0  | 3.0  |      | 3.0  |      |      | 3.0   |      |
| Lane Grp Cap (vph)     | 251   | 423  |      |      | 429  | 290  |      | 1542 |      |      | 1264  |      |
| v/s Ratio Prot         |       | 0.05 |      |      |      |      |      |      |      |      |       |      |
| v/s Ratio Perm         | c0.10 |      |      |      | 0.05 | 0.04 |      | 0.32 |      |      | c0.34 |      |
| v/c Ratio              | 0.38  | 0.18 |      |      | 0.20 | 0.14 |      | 0.60 |      |      | 0.65  |      |
| Uniform Delay, d1      | 27.0  | 25.5 |      |      | 25.6 | 25.2 |      | 15.0 |      |      | 15.4  |      |
| Progression Factor     | 1.00  | 1.00 |      |      | 1.00 | 1.00 |      | 1.00 |      |      | 1.00  |      |
| Incremental Delay, d2  | 4.4   | 0.9  |      |      | 1.0  | 1.0  |      | 1.8  |      |      | 2.6   |      |
| Delay (s)              | 31.4  | 26.4 |      |      | 26.7 | 26.2 |      | 16.7 |      |      | 18.0  |      |
| Level of Service       | C     | C    |      |      | C    | C    |      | B    |      |      | B     |      |
| Approach Delay (s)     |       | 28.8 |      |      | 26.4 |      |      | 16.7 |      |      | 18.0  |      |
| Approach LOS           |       | C    |      |      | C    |      |      | B    |      |      | B     |      |

### Intersection Summary

|                                   |       |                           |      |
|-----------------------------------|-------|---------------------------|------|
| HCM 2000 Control Delay            | 19.3  | HCM 2000 Level of Service | B    |
| HCM 2000 Volume to Capacity ratio | 0.51  |                           |      |
| Actuated Cycle Length (s)         | 90.0  | Sum of lost time (s)      | 12.0 |
| Intersection Capacity Utilization | 77.9% | ICU Level of Service      | D    |
| Analysis Period (min)             | 15    |                           |      |

c Critical Lane Group

Intersection

Intersection Delay, s/veh 9.9

Intersection LOS A

| Movement            | EBU  | EBL  | EBT  | EBR  | WBU  | WBL  | WBT  | WBR  | NBU  | NBL  | NBT  | NBR  | SBU  | SBL  | SBT  | SBR  |
|---------------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| Lane Configurations |      |      | ↕    |      |      |      | ↕    |      |      |      | ↕    |      |      |      | ↕    |      |
| Traffic Vol, veh/h  | 0    | 9    | 73   | 38   | 0    | 28   | 71   | 142  | 0    | 52   | 123  | 29   | 0    | 93   | 94   | 0    |
| Future Vol, veh/h   | 0    | 9    | 73   | 38   | 0    | 28   | 71   | 142  | 0    | 52   | 123  | 29   | 0    | 93   | 94   | 0    |
| Peak Hour Factor    | 0.92 | 1.00 | 1.00 | 1.00 | 0.92 | 1.00 | 1.00 | 1.00 | 0.92 | 1.00 | 1.00 | 1.00 | 0.92 | 1.00 | 1.00 | 1.00 |
| Heavy Vehicles, %   | 2    | 1    | 1    | 1    | 2    | 2    | 2    | 2    | 2    | 1    | 1    | 1    | 2    | 1    | 1    | 1    |
| Mvmt Flow           | 0    | 9    | 73   | 38   | 0    | 28   | 71   | 142  | 0    | 52   | 123  | 29   | 0    | 93   | 94   | 0    |
| Number of Lanes     | 0    | 0    | 1    | 0    | 0    | 0    | 1    | 0    | 0    | 0    | 1    | 0    | 0    | 0    | 1    | 0    |

| Approach                   | EB  | WB | NB   | SB   |
|----------------------------|-----|----|------|------|
| Opposing Approach          | WB  | EB | SB   | NB   |
| Opposing Lanes             | 1   | 1  | 1    | 1    |
| Conflicting Approach Left  | SB  | NB | EB   | WB   |
| Conflicting Lanes Left     | 1   | 1  | 1    | 1    |
| Conflicting Approach Right | NB  | SB | WB   | EB   |
| Conflicting Lanes Right    | 1   | 1  | 1    | 1    |
| HCM Control Delay          | 9.2 | 10 | 10.1 | 10.1 |
| HCM LOS                    | A   | A  | B    | B    |

| Lane                   | NBLn1 | EBLn1 | WBLn1 | SBLn1 |
|------------------------|-------|-------|-------|-------|
| Vol Left, %            | 25%   | 7%    | 12%   | 50%   |
| Vol Thru, %            | 60%   | 61%   | 29%   | 50%   |
| Vol Right, %           | 14%   | 32%   | 59%   | 0%    |
| Sign Control           | Stop  | Stop  | Stop  | Stop  |
| Traffic Vol by Lane    | 204   | 120   | 241   | 187   |
| LT Vol                 | 52    | 9     | 28    | 93    |
| Through Vol            | 123   | 73    | 71    | 94    |
| RT Vol                 | 29    | 38    | 142   | 0     |
| Lane Flow Rate         | 204   | 120   | 241   | 187   |
| Geometry Grp           | 1     | 1     | 1     | 1     |
| Degree of Util (X)     | 0.283 | 0.168 | 0.317 | 0.267 |
| Departure Headway (Hd) | 4.993 | 5.029 | 4.735 | 5.143 |
| Convergence, Y/N       | Yes   | Yes   | Yes   | Yes   |
| Cap                    | 710   | 703   | 750   | 690   |
| Service Time           | 3.089 | 3.129 | 2.819 | 3.242 |
| HCM Lane V/C Ratio     | 0.287 | 0.171 | 0.321 | 0.271 |
| HCM Control Delay      | 10.1  | 9.2   | 10    | 10.1  |
| HCM Lane LOS           | B     | A     | A     | B     |
| HCM 95th-tile Q        | 1.2   | 0.6   | 1.4   | 1.1   |

Intersection

Int Delay, s/veh 1

| Movement                 | EBL                                                                               | EBR  | NBL  | NBT                                                                               | SBT                                                                                 | SBR  |
|--------------------------|-----------------------------------------------------------------------------------|------|------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|------|
| Lane Configurations      |  |      |      |  |  |      |
| Traffic Vol, veh/h       | 0                                                                                 | 17   | 22   | 151                                                                               | 111                                                                                 | 0    |
| Future Vol, veh/h        | 0                                                                                 | 17   | 22   | 151                                                                               | 111                                                                                 | 0    |
| Conflicting Peds, #/hr   | 0                                                                                 | 0    | 0    | 0                                                                                 | 0                                                                                   | 0    |
| Sign Control             | Stop                                                                              | Stop | Free | Free                                                                              | Free                                                                                | Free |
| RT Channelized           | -                                                                                 | None | -    | None                                                                              | -                                                                                   | None |
| Storage Length           | 0                                                                                 | -    | -    | -                                                                                 | -                                                                                   | -    |
| Veh in Median Storage, # | 0                                                                                 | -    | -    | 0                                                                                 | 0                                                                                   | -    |
| Grade, %                 | 0                                                                                 | -    | -    | 0                                                                                 | 0                                                                                   | -    |
| Peak Hour Factor         | 100                                                                               | 100  | 100  | 100                                                                               | 100                                                                                 | 100  |
| Heavy Vehicles, %        | 0                                                                                 | 0    | 0    | 0                                                                                 | 0                                                                                   | 0    |
| Mvmt Flow                | 0                                                                                 | 17   | 22   | 151                                                                               | 111                                                                                 | 0    |

| Major/Minor          | Minor2 |     | Major1 |   | Major2 |   |
|----------------------|--------|-----|--------|---|--------|---|
| Conflicting Flow All | 306    | 111 | 111    | 0 | -      | 0 |
| Stage 1              | 111    | -   | -      | - | -      | - |
| Stage 2              | 195    | -   | -      | - | -      | - |
| Critical Hdwy        | 6.4    | 6.2 | 4.1    | - | -      | - |
| Critical Hdwy Stg 1  | 5.4    | -   | -      | - | -      | - |
| Critical Hdwy Stg 2  | 5.4    | -   | -      | - | -      | - |
| Follow-up Hdwy       | 3.5    | 3.3 | 2.2    | - | -      | - |
| Pot Cap-1 Maneuver   | 690    | 948 | 1492   | - | -      | - |
| Stage 1              | 919    | -   | -      | - | -      | - |
| Stage 2              | 843    | -   | -      | - | -      | - |
| Platoon blocked, %   |        |     |        | - | -      | - |
| Mov Cap-1 Maneuver   | 679    | 948 | 1492   | - | -      | - |
| Mov Cap-2 Maneuver   | 679    | -   | -      | - | -      | - |
| Stage 1              | 919    | -   | -      | - | -      | - |
| Stage 2              | 830    | -   | -      | - | -      | - |

| Approach             | EB  | NB  | SB |
|----------------------|-----|-----|----|
| HCM Control Delay, s | 8.9 | 0.9 | 0  |
| HCM LOS              | A   |     |    |

| Minor Lane/Major Mvmt | NBL   | NBT | EBLn1 | SBT | SBR |
|-----------------------|-------|-----|-------|-----|-----|
| Capacity (veh/h)      | 1492  | -   | 948   | -   | -   |
| HCM Lane V/C Ratio    | 0.015 | -   | 0.018 | -   | -   |
| HCM Control Delay (s) | 7.4   | 0   | 8.9   | -   | -   |
| HCM Lane LOS          | A     | A   | A     | -   | -   |
| HCM 95th %tile Q(veh) | 0     | -   | 0.1   | -   | -   |



# HCM Signalized Intersection Capacity Analysis

## 1: Battery St & College St

9/14/2016

|                                   |  |  |  |  |  |  |  |  |  |  |  |  |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Movement                          | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations               |  |  |                                                                                   |                                                                                   |  |  |                                                                                    |  |  |                                                                                     |  |  |
| Traffic Volume (vph)              | 98                                                                                | 60                                                                                | 42                                                                                | 25                                                                                | 61                                                                                | 151                                                                               | 59                                                                                 | 849                                                                                 | 28                                                                                  | 85                                                                                  | 626                                                                                 | 126                                                                                 |
| Future Volume (vph)               | 98                                                                                | 60                                                                                | 42                                                                                | 25                                                                                | 61                                                                                | 151                                                                               | 59                                                                                 | 849                                                                                 | 28                                                                                  | 85                                                                                  | 626                                                                                 | 126                                                                                 |
| Ideal Flow (vphpl)                | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                               | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Total Lost time (s)               | 5.0                                                                               | 5.0                                                                               |                                                                                   |                                                                                   | 5.0                                                                               | 5.0                                                                               |                                                                                    | 5.0                                                                                 |                                                                                     |                                                                                     | 5.0                                                                                 |                                                                                     |
| Lane Util. Factor                 | 1.00                                                                              | 1.00                                                                              |                                                                                   |                                                                                   | 1.00                                                                              | 1.00                                                                              |                                                                                    | 0.95                                                                                |                                                                                     |                                                                                     | 0.95                                                                                |                                                                                     |
| Frpb, ped/bikes                   | 1.00                                                                              | 0.91                                                                              |                                                                                   |                                                                                   | 1.00                                                                              | 0.68                                                                              |                                                                                    | 1.00                                                                                |                                                                                     |                                                                                     | 0.98                                                                                |                                                                                     |
| Flpb, ped/bikes                   | 0.73                                                                              | 1.00                                                                              |                                                                                   |                                                                                   | 0.95                                                                              | 1.00                                                                              |                                                                                    | 1.00                                                                                |                                                                                     |                                                                                     | 1.00                                                                                |                                                                                     |
| Frt                               | 1.00                                                                              | 0.94                                                                              |                                                                                   |                                                                                   | 1.00                                                                              | 0.85                                                                              |                                                                                    | 1.00                                                                                |                                                                                     |                                                                                     | 0.98                                                                                |                                                                                     |
| Flt Protected                     | 0.95                                                                              | 1.00                                                                              |                                                                                   |                                                                                   | 0.99                                                                              | 1.00                                                                              |                                                                                    | 1.00                                                                                |                                                                                     |                                                                                     | 0.99                                                                                |                                                                                     |
| Satd. Flow (prot)                 | 1283                                                                              | 1595                                                                              |                                                                                   |                                                                                   | 1759                                                                              | 1095                                                                              |                                                                                    | 3498                                                                                |                                                                                     |                                                                                     | 3387                                                                                |                                                                                     |
| Flt Permitted                     | 0.70                                                                              | 1.00                                                                              |                                                                                   |                                                                                   | 0.91                                                                              | 1.00                                                                              |                                                                                    | 0.84                                                                                |                                                                                     |                                                                                     | 0.71                                                                                |                                                                                     |
| Satd. Flow (perm)                 | 947                                                                               | 1595                                                                              |                                                                                   |                                                                                   | 1621                                                                              | 1095                                                                              |                                                                                    | 2937                                                                                |                                                                                     |                                                                                     | 2416                                                                                |                                                                                     |
| Peak-hour factor, PHF             | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                               | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                |
| Adj. Flow (vph)                   | 98                                                                                | 60                                                                                | 42                                                                                | 25                                                                                | 61                                                                                | 151                                                                               | 59                                                                                 | 849                                                                                 | 28                                                                                  | 85                                                                                  | 626                                                                                 | 126                                                                                 |
| RTOR Reduction (vph)              | 0                                                                                 | 26                                                                                | 0                                                                                 | 0                                                                                 | 0                                                                                 | 111                                                                               | 0                                                                                  | 3                                                                                   | 0                                                                                   | 0                                                                                   | 19                                                                                  | 0                                                                                   |
| Lane Group Flow (vph)             | 98                                                                                | 76                                                                                | 0                                                                                 | 0                                                                                 | 86                                                                                | 40                                                                                | 0                                                                                  | 933                                                                                 | 0                                                                                   | 0                                                                                   | 818                                                                                 | 0                                                                                   |
| Confl. Peds. (#/hr)               | 232                                                                               |                                                                                   | 136                                                                               | 136                                                                               |                                                                                   | 232                                                                               | 59                                                                                 |                                                                                     | 19                                                                                  | 19                                                                                  |                                                                                     | 59                                                                                  |
| Heavy Vehicles (%)                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 1%                                                                                | 1%                                                                                | 1%                                                                                | 2%                                                                                 | 2%                                                                                  | 2%                                                                                  | 1%                                                                                  | 1%                                                                                  | 1%                                                                                  |
| Turn Type                         | Perm                                                                              | NA                                                                                |                                                                                   | Perm                                                                              | NA                                                                                | Perm                                                                              | Perm                                                                               | NA                                                                                  |                                                                                     | Perm                                                                                | NA                                                                                  |                                                                                     |
| Protected Phases                  |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   | 4                                                                                 |                                                                                   |                                                                                    | 2                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     |
| Permitted Phases                  | 4                                                                                 |                                                                                   |                                                                                   | 4                                                                                 |                                                                                   | 4                                                                                 | 2                                                                                  |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     |                                                                                     |
| Actuated Green, G (s)             | 23.8                                                                              | 23.8                                                                              |                                                                                   |                                                                                   | 23.8                                                                              | 23.8                                                                              |                                                                                    | 47.2                                                                                |                                                                                     |                                                                                     | 47.2                                                                                |                                                                                     |
| Effective Green, g (s)            | 23.8                                                                              | 23.8                                                                              |                                                                                   |                                                                                   | 23.8                                                                              | 23.8                                                                              |                                                                                    | 47.2                                                                                |                                                                                     |                                                                                     | 47.2                                                                                |                                                                                     |
| Actuated g/C Ratio                | 0.26                                                                              | 0.26                                                                              |                                                                                   |                                                                                   | 0.26                                                                              | 0.26                                                                              |                                                                                    | 0.52                                                                                |                                                                                     |                                                                                     | 0.52                                                                                |                                                                                     |
| Clearance Time (s)                | 5.0                                                                               | 5.0                                                                               |                                                                                   |                                                                                   | 5.0                                                                               | 5.0                                                                               |                                                                                    | 5.0                                                                                 |                                                                                     |                                                                                     | 5.0                                                                                 |                                                                                     |
| Vehicle Extension (s)             | 3.0                                                                               | 3.0                                                                               |                                                                                   |                                                                                   | 3.0                                                                               | 3.0                                                                               |                                                                                    | 3.0                                                                                 |                                                                                     |                                                                                     | 3.0                                                                                 |                                                                                     |
| Lane Grp Cap (vph)                | 250                                                                               | 421                                                                               |                                                                                   |                                                                                   | 428                                                                               | 289                                                                               |                                                                                    | 1540                                                                                |                                                                                     |                                                                                     | 1267                                                                                |                                                                                     |
| v/s Ratio Prot                    |                                                                                   | 0.05                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| v/s Ratio Perm                    | c0.10                                                                             |                                                                                   |                                                                                   |                                                                                   | 0.05                                                                              | 0.04                                                                              |                                                                                    | 0.32                                                                                |                                                                                     |                                                                                     | c0.34                                                                               |                                                                                     |
| v/c Ratio                         | 0.39                                                                              | 0.18                                                                              |                                                                                   |                                                                                   | 0.20                                                                              | 0.14                                                                              |                                                                                    | 0.61                                                                                |                                                                                     |                                                                                     | 0.65                                                                                |                                                                                     |
| Uniform Delay, d1                 | 27.2                                                                              | 25.6                                                                              |                                                                                   |                                                                                   | 25.7                                                                              | 25.3                                                                              |                                                                                    | 14.9                                                                                |                                                                                     |                                                                                     | 15.4                                                                                |                                                                                     |
| Progression Factor                | 1.00                                                                              | 1.00                                                                              |                                                                                   |                                                                                   | 1.00                                                                              | 1.00                                                                              |                                                                                    | 1.00                                                                                |                                                                                     |                                                                                     | 1.00                                                                                |                                                                                     |
| Incremental Delay, d2             | 4.6                                                                               | 0.9                                                                               |                                                                                   |                                                                                   | 1.1                                                                               | 1.0                                                                               |                                                                                    | 1.8                                                                                 |                                                                                     |                                                                                     | 2.6                                                                                 |                                                                                     |
| Delay (s)                         | 31.7                                                                              | 26.5                                                                              |                                                                                   |                                                                                   | 26.8                                                                              | 26.3                                                                              |                                                                                    | 16.7                                                                                |                                                                                     |                                                                                     | 17.9                                                                                |                                                                                     |
| Level of Service                  | C                                                                                 | C                                                                                 |                                                                                   |                                                                                   | C                                                                                 | C                                                                                 |                                                                                    | B                                                                                   |                                                                                     |                                                                                     | B                                                                                   |                                                                                     |
| Approach Delay (s)                |                                                                                   | 29.1                                                                              |                                                                                   |                                                                                   | 26.4                                                                              |                                                                                   |                                                                                    | 16.7                                                                                |                                                                                     |                                                                                     | 17.9                                                                                |                                                                                     |
| Approach LOS                      |                                                                                   | C                                                                                 |                                                                                   |                                                                                   | C                                                                                 |                                                                                   |                                                                                    | B                                                                                   |                                                                                     |                                                                                     | B                                                                                   |                                                                                     |
| <b>Intersection Summary</b>       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| HCM 2000 Control Delay            |                                                                                   | 19.3                                                                              |                                                                                   |                                                                                   | HCM 2000 Level of Service                                                         |                                                                                   |                                                                                    | B                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| HCM 2000 Volume to Capacity ratio |                                                                                   | 0.51                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Actuated Cycle Length (s)         |                                                                                   | 90.0                                                                              |                                                                                   |                                                                                   | Sum of lost time (s)                                                              |                                                                                   |                                                                                    | 12.0                                                                                |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Intersection Capacity Utilization |                                                                                   | 78.1%                                                                             |                                                                                   |                                                                                   | ICU Level of Service                                                              |                                                                                   |                                                                                    | D                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Analysis Period (min)             |                                                                                   | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| c Critical Lane Group             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |

HCM 2010 AWSC  
2: Main St/Lake St & College St

9/14/2016

Intersection

Intersection Delay, s/veh10.2

Intersection LOS B

| Movement            | EBU  | EBL  | EBT                                                                               | EBR  | WBU  | WBL  | WBT                                                                               | WBR  | NBU  | NBL  | NBT                                                                                 | NBR  | SBU  | SBL  | SBT                                                                                 | SBR  |
|---------------------|------|------|-----------------------------------------------------------------------------------|------|------|------|-----------------------------------------------------------------------------------|------|------|------|-------------------------------------------------------------------------------------|------|------|------|-------------------------------------------------------------------------------------|------|
| Lane Configurations |      |      |  |      |      |      |  |      |      |      |  |      |      |      |  |      |
| Traffic Vol, veh/h  | 0    | 9    | 73                                                                                | 38   | 0    | 28   | 71                                                                                | 147  | 0    | 52   | 128                                                                                 | 29   | 0    | 98   | 99                                                                                  | 0    |
| Future Vol, veh/h   | 0    | 9    | 73                                                                                | 38   | 0    | 28   | 71                                                                                | 147  | 0    | 52   | 128                                                                                 | 29   | 0    | 98   | 99                                                                                  | 0    |
| Peak Hour Factor    | 0.92 | 1.00 | 1.00                                                                              | 1.00 | 0.92 | 1.00 | 1.00                                                                              | 1.00 | 0.92 | 1.00 | 1.00                                                                                | 1.00 | 0.92 | 1.00 | 1.00                                                                                | 1.00 |
| Heavy Vehicles, %   | 2    | 1    | 1                                                                                 | 1    | 2    | 2    | 2                                                                                 | 2    | 2    | 1    | 1                                                                                   | 1    | 2    | 1    | 1                                                                                   | 1    |
| Mvmt Flow           | 0    | 9    | 73                                                                                | 38   | 0    | 28   | 71                                                                                | 147  | 0    | 52   | 128                                                                                 | 29   | 0    | 98   | 99                                                                                  | 0    |
| Number of Lanes     | 0    | 0    | 1                                                                                 | 0    | 0    | 0    | 1                                                                                 | 0    | 0    | 0    | 1                                                                                   | 0    | 0    | 0    | 1                                                                                   | 0    |

| Approach                   | EB  | WB   | NB   | SB   |
|----------------------------|-----|------|------|------|
| Opposing Approach          | WB  | EB   | SB   | NB   |
| Opposing Lanes             | 1   | 1    | 1    | 1    |
| Conflicting Approach Left  | SB  | NB   | EB   | WB   |
| Conflicting Lanes Left     | 1   | 1    | 1    | 1    |
| Conflicting Approach Right | NB  | SB   | WB   | EB   |
| Conflicting Lanes Right    | 1   | 1    | 1    | 1    |
| HCM Control Delay          | 9.3 | 10.3 | 10.3 | 10.4 |
| HCM LOS                    | A   | B    | B    | B    |

| Lane                   | NBLn1 | EBLn1 | WBLn1 | SBLn1 |
|------------------------|-------|-------|-------|-------|
| Vol Left, %            | 25%   | 7%    | 11%   | 50%   |
| Vol Thru, %            | 61%   | 61%   | 29%   | 50%   |
| Vol Right, %           | 14%   | 32%   | 60%   | 0%    |
| Sign Control           | Stop  | Stop  | Stop  | Stop  |
| Traffic Vol by Lane    | 209   | 120   | 246   | 197   |
| LT Vol                 | 52    | 9     | 28    | 98    |
| Through Vol            | 128   | 73    | 71    | 99    |
| RT Vol                 | 29    | 38    | 147   | 0     |
| Lane Flow Rate         | 209   | 120   | 246   | 197   |
| Geometry Grp           | 1     | 1     | 1     | 1     |
| Degree of Util (X)     | 0.298 | 0.173 | 0.333 | 0.288 |
| Departure Headway (Hd) | 5.141 | 5.189 | 4.875 | 5.272 |
| Convergence, Y/N       | Yes   | Yes   | Yes   | Yes   |
| Cap                    | 702   | 691   | 740   | 682   |
| Service Time           | 3.155 | 3.219 | 2.886 | 3.3   |
| HCM Lane V/C Ratio     | 0.298 | 0.174 | 0.332 | 0.289 |
| HCM Control Delay      | 10.3  | 9.3   | 10.3  | 10.4  |
| HCM Lane LOS           | B     | A     | B     | B     |
| HCM 95th-tile Q        | 1.2   | 0.6   | 1.5   | 1.2   |

Intersection

Int Delay, s/veh 0.6

| Movement                 | EBL                                                                               | EBR  | NBL  | NBT                                                                               | SBT                                                                                 | SBR  |
|--------------------------|-----------------------------------------------------------------------------------|------|------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|------|
| Lane Configurations      |  |      |      |  |  |      |
| Traffic Vol, veh/h       | 2                                                                                 | 12   | 10   | 173                                                                               | 127                                                                                 | 2    |
| Future Vol, veh/h        | 2                                                                                 | 12   | 10   | 173                                                                               | 127                                                                                 | 2    |
| Conflicting Peds, #/hr   | 0                                                                                 | 0    | 0    | 0                                                                                 | 0                                                                                   | 0    |
| Sign Control             | Stop                                                                              | Stop | Free | Free                                                                              | Free                                                                                | Free |
| RT Channelized           | -                                                                                 | None | -    | None                                                                              | -                                                                                   | None |
| Storage Length           | 0                                                                                 | -    | -    | -                                                                                 | -                                                                                   | -    |
| Veh in Median Storage, # | 0                                                                                 | -    | -    | 0                                                                                 | 0                                                                                   | -    |
| Grade, %                 | 0                                                                                 | -    | -    | 0                                                                                 | 0                                                                                   | -    |
| Peak Hour Factor         | 100                                                                               | 100  | 100  | 100                                                                               | 100                                                                                 | 100  |
| Heavy Vehicles, %        | 0                                                                                 | 0    | 0    | 0                                                                                 | 0                                                                                   | 0    |
| Mvmt Flow                | 2                                                                                 | 12   | 10   | 173                                                                               | 127                                                                                 | 2    |

| Major/Minor          | Minor2 |     | Major1 |   | Major2 |   |
|----------------------|--------|-----|--------|---|--------|---|
| Conflicting Flow All | 321    | 128 | 129    | 0 | -      | 0 |
| Stage 1              | 128    | -   | -      | - | -      | - |
| Stage 2              | 193    | -   | -      | - | -      | - |
| Critical Hdwy        | 6.4    | 6.2 | 4.1    | - | -      | - |
| Critical Hdwy Stg 1  | 5.4    | -   | -      | - | -      | - |
| Critical Hdwy Stg 2  | 5.4    | -   | -      | - | -      | - |
| Follow-up Hdwy       | 3.5    | 3.3 | 2.2    | - | -      | - |
| Pot Cap-1 Maneuver   | 677    | 927 | 1469   | - | -      | - |
| Stage 1              | 903    | -   | -      | - | -      | - |
| Stage 2              | 845    | -   | -      | - | -      | - |
| Platoon blocked, %   |        |     |        | - | -      | - |
| Mov Cap-1 Maneuver   | 672    | 927 | 1469   | - | -      | - |
| Mov Cap-2 Maneuver   | 672    | -   | -      | - | -      | - |
| Stage 1              | 903    | -   | -      | - | -      | - |
| Stage 2              | 838    | -   | -      | - | -      | - |

| Approach             | EB  | NB  | SB |
|----------------------|-----|-----|----|
| HCM Control Delay, s | 9.2 | 0.4 | 0  |
| HCM LOS              | A   |     |    |

| Minor Lane/Major Mvmt | NBL   | NBT | EBLn1 | SBT | SBR |
|-----------------------|-------|-----|-------|-----|-----|
| Capacity (veh/h)      | 1469  | -   | 879   | -   | -   |
| HCM Lane V/C Ratio    | 0.007 | -   | 0.016 | -   | -   |
| HCM Control Delay (s) | 7.5   | 0   | 9.2   | -   | -   |
| HCM Lane LOS          | A     | A   | A     | -   | -   |
| HCM 95th %tile Q(veh) | 0     | -   | 0     | -   | -   |

# HCM Signalized Intersection Capacity Analysis

## 1: Battery St & College St

9/14/2016

|                                   |  |  |  |  |  |  |  |  |  |  |  |  |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Movement                          | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations               |  |  |                                                                                   |                                                                                   |  |  |                                                                                    |  |  |                                                                                     |  |  |
| Traffic Volume (vph)              | 94                                                                                | 102                                                                               | 88                                                                                | 20                                                                                | 43                                                                                | 88                                                                                | 53                                                                                 | 545                                                                                 | 25                                                                                  | 62                                                                                  | 525                                                                                 | 95                                                                                  |
| Future Volume (vph)               | 94                                                                                | 102                                                                               | 88                                                                                | 20                                                                                | 43                                                                                | 88                                                                                | 53                                                                                 | 545                                                                                 | 25                                                                                  | 62                                                                                  | 525                                                                                 | 95                                                                                  |
| Ideal Flow (vphpl)                | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                               | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Total Lost time (s)               | 5.0                                                                               | 5.0                                                                               |                                                                                   |                                                                                   | 5.0                                                                               | 5.0                                                                               |                                                                                    | 5.0                                                                                 |                                                                                     |                                                                                     | 5.0                                                                                 |                                                                                     |
| Lane Util. Factor                 | 1.00                                                                              | 1.00                                                                              |                                                                                   |                                                                                   | 1.00                                                                              | 1.00                                                                              |                                                                                    | 0.95                                                                                |                                                                                     |                                                                                     | 0.95                                                                                |                                                                                     |
| Frpb, ped/bikes                   | 1.00                                                                              | 0.85                                                                              |                                                                                   |                                                                                   | 1.00                                                                              | 0.64                                                                              |                                                                                    | 1.00                                                                                |                                                                                     |                                                                                     | 0.96                                                                                |                                                                                     |
| Flpb, ped/bikes                   | 0.67                                                                              | 1.00                                                                              |                                                                                   |                                                                                   | 0.93                                                                              | 1.00                                                                              |                                                                                    | 0.99                                                                                |                                                                                     |                                                                                     | 1.00                                                                                |                                                                                     |
| Frt                               | 1.00                                                                              | 0.93                                                                              |                                                                                   |                                                                                   | 1.00                                                                              | 0.85                                                                              |                                                                                    | 0.99                                                                                |                                                                                     |                                                                                     | 0.98                                                                                |                                                                                     |
| Flt Protected                     | 0.95                                                                              | 1.00                                                                              |                                                                                   |                                                                                   | 0.98                                                                              | 1.00                                                                              |                                                                                    | 1.00                                                                                |                                                                                     |                                                                                     | 1.00                                                                                |                                                                                     |
| Satd. Flow (prot)                 | 1188                                                                              | 1475                                                                              |                                                                                   |                                                                                   | 1666                                                                              | 988                                                                               |                                                                                    | 3426                                                                                |                                                                                     |                                                                                     | 3285                                                                                |                                                                                     |
| Flt Permitted                     | 0.72                                                                              | 1.00                                                                              |                                                                                   |                                                                                   | 0.90                                                                              | 1.00                                                                              |                                                                                    | 0.82                                                                                |                                                                                     |                                                                                     | 0.82                                                                                |                                                                                     |
| Satd. Flow (perm)                 | 895                                                                               | 1475                                                                              |                                                                                   |                                                                                   | 1521                                                                              | 988                                                                               |                                                                                    | 2835                                                                                |                                                                                     |                                                                                     | 2703                                                                                |                                                                                     |
| Peak-hour factor, PHF             | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                               | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                |
| Adj. Flow (vph)                   | 94                                                                                | 102                                                                               | 88                                                                                | 20                                                                                | 43                                                                                | 88                                                                                | 53                                                                                 | 545                                                                                 | 25                                                                                  | 62                                                                                  | 525                                                                                 | 95                                                                                  |
| RTOR Reduction (vph)              | 0                                                                                 | 26                                                                                | 0                                                                                 | 0                                                                                 | 0                                                                                 | 54                                                                                | 0                                                                                  | 5                                                                                   | 0                                                                                   | 0                                                                                   | 21                                                                                  | 0                                                                                   |
| Lane Group Flow (vph)             | 94                                                                                | 164                                                                               | 0                                                                                 | 0                                                                                 | 63                                                                                | 34                                                                                | 0                                                                                  | 618                                                                                 | 0                                                                                   | 0                                                                                   | 661                                                                                 | 0                                                                                   |
| Confl. Peds. (#/hr)               | 396                                                                               |                                                                                   | 253                                                                               | 253                                                                               |                                                                                   | 396                                                                               | 123                                                                                |                                                                                     | 40                                                                                  | 40                                                                                  |                                                                                     | 123                                                                                 |
| Heavy Vehicles (%)                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 4%                                                                                | 4%                                                                                | 4%                                                                                | 3%                                                                                 | 3%                                                                                  | 3%                                                                                  | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  |
| Turn Type                         | Perm                                                                              | NA                                                                                |                                                                                   | Perm                                                                              | NA                                                                                | Perm                                                                              | Perm                                                                               | NA                                                                                  |                                                                                     | Perm                                                                                | NA                                                                                  |                                                                                     |
| Protected Phases                  |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   | 4                                                                                 |                                                                                   |                                                                                    | 2                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     |
| Permitted Phases                  | 4                                                                                 |                                                                                   |                                                                                   | 4                                                                                 |                                                                                   | 4                                                                                 | 2                                                                                  |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     |                                                                                     |
| Actuated Green, G (s)             | 35.0                                                                              | 35.0                                                                              |                                                                                   |                                                                                   | 35.0                                                                              | 35.0                                                                              |                                                                                    | 36.0                                                                                |                                                                                     |                                                                                     | 36.0                                                                                |                                                                                     |
| Effective Green, g (s)            | 35.0                                                                              | 35.0                                                                              |                                                                                   |                                                                                   | 35.0                                                                              | 35.0                                                                              |                                                                                    | 36.0                                                                                |                                                                                     |                                                                                     | 36.0                                                                                |                                                                                     |
| Actuated g/C Ratio                | 0.39                                                                              | 0.39                                                                              |                                                                                   |                                                                                   | 0.39                                                                              | 0.39                                                                              |                                                                                    | 0.40                                                                                |                                                                                     |                                                                                     | 0.40                                                                                |                                                                                     |
| Clearance Time (s)                | 5.0                                                                               | 5.0                                                                               |                                                                                   |                                                                                   | 5.0                                                                               | 5.0                                                                               |                                                                                    | 5.0                                                                                 |                                                                                     |                                                                                     | 5.0                                                                                 |                                                                                     |
| Vehicle Extension (s)             | 3.0                                                                               | 3.0                                                                               |                                                                                   |                                                                                   | 3.0                                                                               | 3.0                                                                               |                                                                                    | 3.0                                                                                 |                                                                                     |                                                                                     | 3.0                                                                                 |                                                                                     |
| Lane Grp Cap (vph)                | 348                                                                               | 573                                                                               |                                                                                   |                                                                                   | 591                                                                               | 384                                                                               |                                                                                    | 1134                                                                                |                                                                                     |                                                                                     | 1081                                                                                |                                                                                     |
| v/s Ratio Prot                    |                                                                                   | c0.11                                                                             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| v/s Ratio Perm                    | 0.11                                                                              |                                                                                   |                                                                                   |                                                                                   | 0.04                                                                              | 0.03                                                                              |                                                                                    | 0.22                                                                                |                                                                                     |                                                                                     | c0.24                                                                               |                                                                                     |
| v/c Ratio                         | 0.27                                                                              | 0.29                                                                              |                                                                                   |                                                                                   | 0.11                                                                              | 0.09                                                                              |                                                                                    | 0.55                                                                                |                                                                                     |                                                                                     | 0.61                                                                                |                                                                                     |
| Uniform Delay, d1                 | 18.8                                                                              | 18.9                                                                              |                                                                                   |                                                                                   | 17.5                                                                              | 17.4                                                                              |                                                                                    | 20.7                                                                                |                                                                                     |                                                                                     | 21.4                                                                                |                                                                                     |
| Progression Factor                | 1.00                                                                              | 1.00                                                                              |                                                                                   |                                                                                   | 1.00                                                                              | 1.00                                                                              |                                                                                    | 1.00                                                                                |                                                                                     |                                                                                     | 1.00                                                                                |                                                                                     |
| Incremental Delay, d2             | 1.9                                                                               | 1.3                                                                               |                                                                                   |                                                                                   | 0.4                                                                               | 0.5                                                                               |                                                                                    | 1.9                                                                                 |                                                                                     |                                                                                     | 2.6                                                                                 |                                                                                     |
| Delay (s)                         | 20.7                                                                              | 20.2                                                                              |                                                                                   |                                                                                   | 17.9                                                                              | 17.9                                                                              |                                                                                    | 22.6                                                                                |                                                                                     |                                                                                     | 24.0                                                                                |                                                                                     |
| Level of Service                  | C                                                                                 | C                                                                                 |                                                                                   |                                                                                   | B                                                                                 | B                                                                                 |                                                                                    | C                                                                                   |                                                                                     |                                                                                     | C                                                                                   |                                                                                     |
| Approach Delay (s)                |                                                                                   | 20.3                                                                              |                                                                                   |                                                                                   | 17.9                                                                              |                                                                                   |                                                                                    | 22.6                                                                                |                                                                                     |                                                                                     | 24.0                                                                                |                                                                                     |
| Approach LOS                      |                                                                                   | C                                                                                 |                                                                                   |                                                                                   | B                                                                                 |                                                                                   |                                                                                    | C                                                                                   |                                                                                     |                                                                                     | C                                                                                   |                                                                                     |
| <b>Intersection Summary</b>       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| HCM 2000 Control Delay            |                                                                                   |                                                                                   | 22.4                                                                              |                                                                                   |                                                                                   |                                                                                   | HCM 2000 Level of Service                                                          |                                                                                     |                                                                                     |                                                                                     | C                                                                                   |                                                                                     |
| HCM 2000 Volume to Capacity ratio |                                                                                   |                                                                                   | 0.41                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Actuated Cycle Length (s)         |                                                                                   |                                                                                   | 90.0                                                                              |                                                                                   |                                                                                   |                                                                                   | Sum of lost time (s)                                                               |                                                                                     |                                                                                     | 12.0                                                                                |                                                                                     |                                                                                     |
| Intersection Capacity Utilization |                                                                                   |                                                                                   | 70.2%                                                                             |                                                                                   |                                                                                   |                                                                                   | ICU Level of Service                                                               |                                                                                     |                                                                                     | C                                                                                   |                                                                                     |                                                                                     |
| Analysis Period (min)             |                                                                                   |                                                                                   | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| c Critical Lane Group             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |

Intersection

Intersection Delay, s/veh 9.9

Intersection LOS A

| Movement            | EBU  | EBL  | EBT  | EBR  | WBU  | WBL  | WBT  | WBR  | NBU  | NBL  | NBT  | NBR  | SBU  | SBL  | SBT  | SBR  |
|---------------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| Lane Configurations |      |      | ↕    |      |      |      | ↕    |      |      |      | ↕    |      |      |      | ↕    |      |
| Traffic Vol, veh/h  | 0    | 14   | 108  | 44   | 0    | 20   | 87   | 84   | 0    | 18   | 72   | 45   | 0    | 130  | 111  | 2    |
| Future Vol, veh/h   | 0    | 14   | 108  | 44   | 0    | 20   | 87   | 84   | 0    | 18   | 72   | 45   | 0    | 130  | 111  | 2    |
| Peak Hour Factor    | 0.92 | 1.00 | 1.00 | 1.00 | 0.92 | 1.00 | 1.00 | 1.00 | 0.92 | 1.00 | 1.00 | 1.00 | 0.92 | 1.00 | 1.00 | 1.00 |
| Heavy Vehicles, %   | 2    | 4    | 4    | 4    | 2    | 0    | 0    | 0    | 2    | 0    | 0    | 0    | 2    | 1    | 1    | 1    |
| Mvmt Flow           | 0    | 14   | 108  | 44   | 0    | 20   | 87   | 84   | 0    | 18   | 72   | 45   | 0    | 130  | 111  | 2    |
| Number of Lanes     | 0    | 0    | 1    | 0    | 0    | 0    | 1    | 0    | 0    | 0    | 1    | 0    | 0    | 0    | 1    | 0    |

| Approach                   | EB  | WB  | NB  | SB   |
|----------------------------|-----|-----|-----|------|
| Opposing Approach          | WB  | EB  | SB  | NB   |
| Opposing Lanes             | 1   | 1   | 1   | 1    |
| Conflicting Approach Left  | SB  | NB  | EB  | WB   |
| Conflicting Lanes Left     | 1   | 1   | 1   | 1    |
| Conflicting Approach Right | NB  | SB  | WB  | EB   |
| Conflicting Lanes Right    | 1   | 1   | 1   | 1    |
| HCM Control Delay          | 9.6 | 9.6 | 9.1 | 10.8 |
| HCM LOS                    | A   | A   | A   | B    |

| Lane                   | NBLn1 | EBLn1 | WBLn1 | SBLn1 |
|------------------------|-------|-------|-------|-------|
| Vol Left, %            | 13%   | 8%    | 10%   | 53%   |
| Vol Thru, %            | 53%   | 65%   | 46%   | 46%   |
| Vol Right, %           | 33%   | 27%   | 44%   | 1%    |
| Sign Control           | Stop  | Stop  | Stop  | Stop  |
| Traffic Vol by Lane    | 135   | 166   | 191   | 243   |
| LT Vol                 | 18    | 14    | 20    | 130   |
| Through Vol            | 72    | 108   | 87    | 111   |
| RT Vol                 | 45    | 44    | 84    | 2     |
| Lane Flow Rate         | 135   | 166   | 191   | 243   |
| Geometry Grp           | 1     | 1     | 1     | 1     |
| Degree of Util (X)     | 0.184 | 0.231 | 0.255 | 0.341 |
| Departure Headway (Hd) | 4.917 | 5.007 | 4.812 | 5.05  |
| Convergence, Y/N       | Yes   | Yes   | Yes   | Yes   |
| Cap                    | 721   | 709   | 737   | 705   |
| Service Time           | 3.012 | 3.097 | 2.899 | 3.135 |
| HCM Lane V/C Ratio     | 0.187 | 0.234 | 0.259 | 0.345 |
| HCM Control Delay      | 9.1   | 9.6   | 9.6   | 10.8  |
| HCM Lane LOS           | A     | A     | A     | B     |
| HCM 95th-tile Q        | 0.7   | 0.9   | 1     | 1.5   |

| Intersection             |                                                                                   |        |       |                                                                                   |                                                                                     |      |
|--------------------------|-----------------------------------------------------------------------------------|--------|-------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|------|
| Int Delay, s/veh         | 1.2                                                                               |        |       |                                                                                   |                                                                                     |      |
| Movement                 | EBL                                                                               | EBR    | NBL   | NBT                                                                               | SBT                                                                                 | SBR  |
| Lane Configurations      |  |        |       |  |  |      |
| Traffic Vol, veh/h       | 0                                                                                 | 40     | 31    | 213                                                                               | 256                                                                                 | 0    |
| Future Vol, veh/h        | 0                                                                                 | 40     | 31    | 213                                                                               | 256                                                                                 | 0    |
| Conflicting Peds, #/hr   | 0                                                                                 | 0      | 0     | 0                                                                                 | 0                                                                                   | 0    |
| Sign Control             | Stop                                                                              | Stop   | Free  | Free                                                                              | Free                                                                                | Free |
| RT Channelized           | -                                                                                 | None   | -     | None                                                                              | -                                                                                   | None |
| Storage Length           | 0                                                                                 | -      | -     | -                                                                                 | -                                                                                   | -    |
| Veh in Median Storage, # | 0                                                                                 | -      | -     | 0                                                                                 | 0                                                                                   | -    |
| Grade, %                 | 0                                                                                 | -      | -     | 0                                                                                 | 0                                                                                   | -    |
| Peak Hour Factor         | 100                                                                               | 100    | 100   | 100                                                                               | 100                                                                                 | 100  |
| Heavy Vehicles, %        | 0                                                                                 | 0      | 0     | 0                                                                                 | 0                                                                                   | 0    |
| Mvmt Flow                | 0                                                                                 | 40     | 31    | 213                                                                               | 256                                                                                 | 0    |
| Major/Minor              | Minor2                                                                            | Major1 |       | Major2                                                                            |                                                                                     |      |
| Conflicting Flow All     | 531                                                                               | 256    | 256   | 0                                                                                 | -                                                                                   | 0    |
| Stage 1                  | 256                                                                               | -      | -     | -                                                                                 | -                                                                                   | -    |
| Stage 2                  | 275                                                                               | -      | -     | -                                                                                 | -                                                                                   | -    |
| Critical Hdwy            | 6.4                                                                               | 6.2    | 4.1   | -                                                                                 | -                                                                                   | -    |
| Critical Hdwy Stg 1      | 5.4                                                                               | -      | -     | -                                                                                 | -                                                                                   | -    |
| Critical Hdwy Stg 2      | 5.4                                                                               | -      | -     | -                                                                                 | -                                                                                   | -    |
| Follow-up Hdwy           | 3.5                                                                               | 3.3    | 2.2   | -                                                                                 | -                                                                                   | -    |
| Pot Cap-1 Maneuver       | 512                                                                               | 788    | 1321  | -                                                                                 | -                                                                                   | -    |
| Stage 1                  | 791                                                                               | -      | -     | -                                                                                 | -                                                                                   | -    |
| Stage 2                  | 776                                                                               | -      | -     | -                                                                                 | -                                                                                   | -    |
| Platoon blocked, %       |                                                                                   |        |       | -                                                                                 | -                                                                                   | -    |
| Mov Cap-1 Maneuver       | 498                                                                               | 788    | 1321  | -                                                                                 | -                                                                                   | -    |
| Mov Cap-2 Maneuver       | 498                                                                               | -      | -     | -                                                                                 | -                                                                                   | -    |
| Stage 1                  | 791                                                                               | -      | -     | -                                                                                 | -                                                                                   | -    |
| Stage 2                  | 755                                                                               | -      | -     | -                                                                                 | -                                                                                   | -    |
| Approach                 | EB                                                                                | NB     |       | SB                                                                                |                                                                                     |      |
| HCM Control Delay, s     | 9.8                                                                               | 1      |       | 0                                                                                 |                                                                                     |      |
| HCM LOS                  | A                                                                                 |        |       |                                                                                   |                                                                                     |      |
| Minor Lane/Major Mvmt    | NBL                                                                               | NBT    | EBLn1 | SBT                                                                               | SBR                                                                                 |      |
| Capacity (veh/h)         | 1321                                                                              | -      | 788   | -                                                                                 | -                                                                                   |      |
| HCM Lane V/C Ratio       | 0.023                                                                             | -      | 0.051 | -                                                                                 | -                                                                                   |      |
| HCM Control Delay (s)    | 7.8                                                                               | 0      | 9.8   | -                                                                                 | -                                                                                   |      |
| HCM Lane LOS             | A                                                                                 | A      | A     | -                                                                                 | -                                                                                   |      |
| HCM 95th %tile Q(veh)    | 0.1                                                                               | -      | 0.2   | -                                                                                 | -                                                                                   |      |

# HCM Signalized Intersection Capacity Analysis

## 1: Battery St & College St

9/14/2016

|                                   |  |  |  |  |  |  |  |  |  |  |  |  |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Movement                          | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations               |  |  |                                                                                   |                                                                                   |  |  |                                                                                    |  |  |                                                                                     |  |  |
| Traffic Volume (vph)              | 96                                                                                | 104                                                                               | 91                                                                                | 20                                                                                | 44                                                                                | 88                                                                                | 55                                                                                 | 545                                                                                 | 25                                                                                  | 62                                                                                  | 525                                                                                 | 98                                                                                  |
| Future Volume (vph)               | 96                                                                                | 104                                                                               | 91                                                                                | 20                                                                                | 44                                                                                | 88                                                                                | 55                                                                                 | 545                                                                                 | 25                                                                                  | 62                                                                                  | 525                                                                                 | 98                                                                                  |
| Ideal Flow (vphpl)                | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                               | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Total Lost time (s)               | 5.0                                                                               | 5.0                                                                               |                                                                                   |                                                                                   | 5.0                                                                               | 5.0                                                                               |                                                                                    | 5.0                                                                                 |                                                                                     |                                                                                     | 5.0                                                                                 |                                                                                     |
| Lane Util. Factor                 | 1.00                                                                              | 1.00                                                                              |                                                                                   |                                                                                   | 1.00                                                                              | 1.00                                                                              |                                                                                    | 0.95                                                                                |                                                                                     |                                                                                     | 0.95                                                                                |                                                                                     |
| Frpb, ped/bikes                   | 1.00                                                                              | 0.85                                                                              |                                                                                   |                                                                                   | 1.00                                                                              | 0.64                                                                              |                                                                                    | 1.00                                                                                |                                                                                     |                                                                                     | 0.95                                                                                |                                                                                     |
| Flpb, ped/bikes                   | 0.67                                                                              | 1.00                                                                              |                                                                                   |                                                                                   | 0.93                                                                              | 1.00                                                                              |                                                                                    | 0.99                                                                                |                                                                                     |                                                                                     | 1.00                                                                                |                                                                                     |
| Frt                               | 1.00                                                                              | 0.93                                                                              |                                                                                   |                                                                                   | 1.00                                                                              | 0.85                                                                              |                                                                                    | 0.99                                                                                |                                                                                     |                                                                                     | 0.98                                                                                |                                                                                     |
| Flt Protected                     | 0.95                                                                              | 1.00                                                                              |                                                                                   |                                                                                   | 0.98                                                                              | 1.00                                                                              |                                                                                    | 1.00                                                                                |                                                                                     |                                                                                     | 1.00                                                                                |                                                                                     |
| Satd. Flow (prot)                 | 1189                                                                              | 1472                                                                              |                                                                                   |                                                                                   | 1670                                                                              | 988                                                                               |                                                                                    | 3425                                                                                |                                                                                     |                                                                                     | 3279                                                                                |                                                                                     |
| Flt Permitted                     | 0.72                                                                              | 1.00                                                                              |                                                                                   |                                                                                   | 0.90                                                                              | 1.00                                                                              |                                                                                    | 0.82                                                                                |                                                                                     |                                                                                     | 0.82                                                                                |                                                                                     |
| Satd. Flow (perm)                 | 895                                                                               | 1472                                                                              |                                                                                   |                                                                                   | 1525                                                                              | 988                                                                               |                                                                                    | 2804                                                                                |                                                                                     |                                                                                     | 2698                                                                                |                                                                                     |
| Peak-hour factor, PHF             | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                               | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                |
| Adj. Flow (vph)                   | 96                                                                                | 104                                                                               | 91                                                                                | 20                                                                                | 44                                                                                | 88                                                                                | 55                                                                                 | 545                                                                                 | 25                                                                                  | 62                                                                                  | 525                                                                                 | 98                                                                                  |
| RTOR Reduction (vph)              | 0                                                                                 | 27                                                                                | 0                                                                                 | 0                                                                                 | 0                                                                                 | 54                                                                                | 0                                                                                  | 5                                                                                   | 0                                                                                   | 0                                                                                   | 22                                                                                  | 0                                                                                   |
| Lane Group Flow (vph)             | 96                                                                                | 168                                                                               | 0                                                                                 | 0                                                                                 | 64                                                                                | 34                                                                                | 0                                                                                  | 620                                                                                 | 0                                                                                   | 0                                                                                   | 663                                                                                 | 0                                                                                   |
| Confl. Peds. (#/hr)               | 396                                                                               |                                                                                   | 253                                                                               | 253                                                                               |                                                                                   | 396                                                                               | 123                                                                                |                                                                                     | 40                                                                                  | 40                                                                                  |                                                                                     | 123                                                                                 |
| Heavy Vehicles (%)                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 4%                                                                                | 4%                                                                                | 4%                                                                                | 3%                                                                                 | 3%                                                                                  | 3%                                                                                  | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  |
| Turn Type                         | Perm                                                                              | NA                                                                                |                                                                                   | Perm                                                                              | NA                                                                                | Perm                                                                              | Perm                                                                               | NA                                                                                  |                                                                                     | Perm                                                                                | NA                                                                                  |                                                                                     |
| Protected Phases                  |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   | 4                                                                                 |                                                                                   |                                                                                    | 2                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     |
| Permitted Phases                  | 4                                                                                 |                                                                                   |                                                                                   | 4                                                                                 |                                                                                   | 4                                                                                 | 2                                                                                  |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     |                                                                                     |
| Actuated Green, G (s)             | 34.9                                                                              | 34.9                                                                              |                                                                                   |                                                                                   | 34.9                                                                              | 34.9                                                                              |                                                                                    | 36.1                                                                                |                                                                                     |                                                                                     | 36.1                                                                                |                                                                                     |
| Effective Green, g (s)            | 34.9                                                                              | 34.9                                                                              |                                                                                   |                                                                                   | 34.9                                                                              | 34.9                                                                              |                                                                                    | 36.1                                                                                |                                                                                     |                                                                                     | 36.1                                                                                |                                                                                     |
| Actuated g/C Ratio                | 0.39                                                                              | 0.39                                                                              |                                                                                   |                                                                                   | 0.39                                                                              | 0.39                                                                              |                                                                                    | 0.40                                                                                |                                                                                     |                                                                                     | 0.40                                                                                |                                                                                     |
| Clearance Time (s)                | 5.0                                                                               | 5.0                                                                               |                                                                                   |                                                                                   | 5.0                                                                               | 5.0                                                                               |                                                                                    | 5.0                                                                                 |                                                                                     |                                                                                     | 5.0                                                                                 |                                                                                     |
| Vehicle Extension (s)             | 3.0                                                                               | 3.0                                                                               |                                                                                   |                                                                                   | 3.0                                                                               | 3.0                                                                               |                                                                                    | 3.0                                                                                 |                                                                                     |                                                                                     | 3.0                                                                                 |                                                                                     |
| Lane Grp Cap (vph)                | 347                                                                               | 570                                                                               |                                                                                   |                                                                                   | 591                                                                               | 383                                                                               |                                                                                    | 1124                                                                                |                                                                                     |                                                                                     | 1082                                                                                |                                                                                     |
| v/s Ratio Prot                    |                                                                                   | c0.11                                                                             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| v/s Ratio Perm                    | 0.11                                                                              |                                                                                   |                                                                                   |                                                                                   | 0.04                                                                              | 0.03                                                                              |                                                                                    | 0.22                                                                                |                                                                                     |                                                                                     | c0.25                                                                               |                                                                                     |
| v/c Ratio                         | 0.28                                                                              | 0.29                                                                              |                                                                                   |                                                                                   | 0.11                                                                              | 0.09                                                                              |                                                                                    | 0.55                                                                                |                                                                                     |                                                                                     | 0.61                                                                                |                                                                                     |
| Uniform Delay, d1                 | 18.9                                                                              | 19.0                                                                              |                                                                                   |                                                                                   | 17.6                                                                              | 17.5                                                                              |                                                                                    | 20.7                                                                                |                                                                                     |                                                                                     | 21.4                                                                                |                                                                                     |
| Progression Factor                | 1.00                                                                              | 1.00                                                                              |                                                                                   |                                                                                   | 1.00                                                                              | 1.00                                                                              |                                                                                    | 1.00                                                                                |                                                                                     |                                                                                     | 1.00                                                                                |                                                                                     |
| Incremental Delay, d2             | 2.0                                                                               | 1.3                                                                               |                                                                                   |                                                                                   | 0.4                                                                               | 0.5                                                                               |                                                                                    | 2.0                                                                                 |                                                                                     |                                                                                     | 2.6                                                                                 |                                                                                     |
| Delay (s)                         | 20.9                                                                              | 20.4                                                                              |                                                                                   |                                                                                   | 18.0                                                                              | 17.9                                                                              |                                                                                    | 22.7                                                                                |                                                                                     |                                                                                     | 24.0                                                                                |                                                                                     |
| Level of Service                  | C                                                                                 | C                                                                                 |                                                                                   |                                                                                   | B                                                                                 | B                                                                                 |                                                                                    | C                                                                                   |                                                                                     |                                                                                     | C                                                                                   |                                                                                     |
| Approach Delay (s)                |                                                                                   | 20.5                                                                              |                                                                                   |                                                                                   | 17.9                                                                              |                                                                                   |                                                                                    | 22.7                                                                                |                                                                                     |                                                                                     | 24.0                                                                                |                                                                                     |
| Approach LOS                      |                                                                                   | C                                                                                 |                                                                                   |                                                                                   | B                                                                                 |                                                                                   |                                                                                    | C                                                                                   |                                                                                     |                                                                                     | C                                                                                   |                                                                                     |
| <b>Intersection Summary</b>       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| HCM 2000 Control Delay            |                                                                                   |                                                                                   | 22.4                                                                              |                                                                                   |                                                                                   |                                                                                   | HCM 2000 Level of Service                                                          |                                                                                     |                                                                                     |                                                                                     | C                                                                                   |                                                                                     |
| HCM 2000 Volume to Capacity ratio |                                                                                   |                                                                                   | 0.42                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Actuated Cycle Length (s)         |                                                                                   |                                                                                   | 90.0                                                                              |                                                                                   |                                                                                   |                                                                                   | Sum of lost time (s)                                                               |                                                                                     |                                                                                     | 12.0                                                                                |                                                                                     |                                                                                     |
| Intersection Capacity Utilization |                                                                                   |                                                                                   | 70.4%                                                                             |                                                                                   |                                                                                   |                                                                                   | ICU Level of Service                                                               |                                                                                     |                                                                                     | C                                                                                   |                                                                                     |                                                                                     |
| Analysis Period (min)             |                                                                                   |                                                                                   | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| c Critical Lane Group             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |

Intersection

Intersection Delay, s/veh10.1

Intersection LOS B

| Movement            | EBU  | EBL  | EBT  | EBR  | WBU  | WBL  | WBT  | WBR  | NBU  | NBL  | NBT  | NBR  | SBU  | SBL  | SBT  | SBR  |
|---------------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| Lane Configurations |      |      | ↕    |      |      |      | ↕    |      |      |      | ↕    |      |      |      | ↕    |      |
| Traffic Vol, veh/h  | 0    | 14   | 108  | 44   | 0    | 20   | 87   | 89   | 0    | 18   | 77   | 45   | 0    | 138  | 117  | 2    |
| Future Vol, veh/h   | 0    | 14   | 108  | 44   | 0    | 20   | 87   | 89   | 0    | 18   | 77   | 45   | 0    | 138  | 117  | 2    |
| Peak Hour Factor    | 0.92 | 1.00 | 1.00 | 1.00 | 0.92 | 1.00 | 1.00 | 1.00 | 0.92 | 1.00 | 1.00 | 1.00 | 0.92 | 1.00 | 1.00 | 1.00 |
| Heavy Vehicles, %   | 2    | 4    | 4    | 4    | 2    | 0    | 0    | 0    | 2    | 0    | 0    | 0    | 2    | 1    | 1    | 1    |
| Mvmt Flow           | 0    | 14   | 108  | 44   | 0    | 20   | 87   | 89   | 0    | 18   | 77   | 45   | 0    | 138  | 117  | 2    |
| Number of Lanes     | 0    | 0    | 1    | 0    | 0    | 0    | 1    | 0    | 0    | 0    | 1    | 0    | 0    | 0    | 1    | 0    |

| Approach                   | EB  | WB  | NB  | SB   |
|----------------------------|-----|-----|-----|------|
| Opposing Approach          | WB  | EB  | SB  | NB   |
| Opposing Lanes             | 1   | 1   | 1   | 1    |
| Conflicting Approach Left  | SB  | NB  | EB  | WB   |
| Conflicting Lanes Left     | 1   | 1   | 1   | 1    |
| Conflicting Approach Right | NB  | SB  | WB  | EB   |
| Conflicting Lanes Right    | 1   | 1   | 1   | 1    |
| HCM Control Delay          | 9.8 | 9.7 | 9.3 | 11.1 |
| HCM LOS                    | A   | A   | A   | B    |

| Lane                   | NBLn1 | EBLn1 | WBLn1 | SBLn1 |
|------------------------|-------|-------|-------|-------|
| Vol Left, %            | 13%   | 8%    | 10%   | 54%   |
| Vol Thru, %            | 55%   | 65%   | 44%   | 46%   |
| Vol Right, %           | 32%   | 27%   | 45%   | 1%    |
| Sign Control           | Stop  | Stop  | Stop  | Stop  |
| Traffic Vol by Lane    | 140   | 166   | 196   | 257   |
| LT Vol                 | 18    | 14    | 20    | 138   |
| Through Vol            | 77    | 108   | 87    | 117   |
| RT Vol                 | 45    | 44    | 89    | 2     |
| Lane Flow Rate         | 140   | 166   | 196   | 257   |
| Geometry Grp           | 1     | 1     | 1     | 1     |
| Degree of Util (X)     | 0.197 | 0.239 | 0.265 | 0.362 |
| Departure Headway (Hd) | 5.068 | 5.175 | 4.965 | 5.184 |
| Convergence, Y/N       | Yes   | Yes   | Yes   | Yes   |
| Cap                    | 711   | 699   | 727   | 699   |
| Service Time           | 3.078 | 3.175 | 2.965 | 3.184 |
| HCM Lane V/C Ratio     | 0.197 | 0.237 | 0.27  | 0.368 |
| HCM Control Delay      | 9.3   | 9.8   | 9.7   | 11.1  |
| HCM Lane LOS           | A     | A     | A     | B     |
| HCM 95th-tile Q        | 0.7   | 0.9   | 1.1   | 1.7   |



| Intersection             |                                                                                   |        |       |                                                                                   |                                                                                     |      |
|--------------------------|-----------------------------------------------------------------------------------|--------|-------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|------|
| Int Delay, s/veh         | 0.5                                                                               |        |       |                                                                                   |                                                                                     |      |
| Movement                 | EBL                                                                               | EBR    | NBL   | NBT                                                                               | SBT                                                                                 | SBR  |
| Lane Configurations      |  |        |       |  |  |      |
| Traffic Vol, veh/h       | 3                                                                                 | 19     | 11    | 244                                                                               | 292                                                                                 | 4    |
| Future Vol, veh/h        | 3                                                                                 | 19     | 11    | 244                                                                               | 292                                                                                 | 4    |
| Conflicting Peds, #/hr   | 0                                                                                 | 0      | 0     | 0                                                                                 | 0                                                                                   | 0    |
| Sign Control             | Stop                                                                              | Stop   | Free  | Free                                                                              | Free                                                                                | Free |
| RT Channelized           | -                                                                                 | None   | -     | None                                                                              | -                                                                                   | None |
| Storage Length           | 0                                                                                 | -      | -     | -                                                                                 | -                                                                                   | -    |
| Veh in Median Storage, # | 0                                                                                 | -      | -     | 0                                                                                 | 0                                                                                   | -    |
| Grade, %                 | 0                                                                                 | -      | -     | 0                                                                                 | 0                                                                                   | -    |
| Peak Hour Factor         | 100                                                                               | 100    | 100   | 100                                                                               | 100                                                                                 | 100  |
| Heavy Vehicles, %        | 0                                                                                 | 0      | 0     | 0                                                                                 | 0                                                                                   | 0    |
| Mvmt Flow                | 3                                                                                 | 19     | 11    | 244                                                                               | 292                                                                                 | 4    |
| Major/Minor              | Minor2                                                                            | Major1 |       | Major2                                                                            |                                                                                     |      |
| Conflicting Flow All     | 560                                                                               | 294    | 296   | 0                                                                                 | -                                                                                   | 0    |
| Stage 1                  | 294                                                                               | -      | -     | -                                                                                 | -                                                                                   | -    |
| Stage 2                  | 266                                                                               | -      | -     | -                                                                                 | -                                                                                   | -    |
| Critical Hdwy            | 7.1                                                                               | 6.2    | 4.1   | -                                                                                 | -                                                                                   | -    |
| Critical Hdwy Stg 1      | 6.1                                                                               | -      | -     | -                                                                                 | -                                                                                   | -    |
| Critical Hdwy Stg 2      | 6.1                                                                               | -      | -     | -                                                                                 | -                                                                                   | -    |
| Follow-up Hdwy           | 3.5                                                                               | 3.3    | 2.2   | -                                                                                 | -                                                                                   | -    |
| Pot Cap-1 Maneuver       | 442                                                                               | 750    | 1277  | -                                                                                 | -                                                                                   | -    |
| Stage 1                  | 719                                                                               | -      | -     | -                                                                                 | -                                                                                   | -    |
| Stage 2                  | 744                                                                               | -      | -     | -                                                                                 | -                                                                                   | -    |
| Platoon blocked, %       |                                                                                   |        |       | -                                                                                 | -                                                                                   | -    |
| Mov Cap-1 Maneuver       | 439                                                                               | 750    | 1277  | -                                                                                 | -                                                                                   | -    |
| Mov Cap-2 Maneuver       | 439                                                                               | -      | -     | -                                                                                 | -                                                                                   | -    |
| Stage 1                  | 712                                                                               | -      | -     | -                                                                                 | -                                                                                   | -    |
| Stage 2                  | 737                                                                               | -      | -     | -                                                                                 | -                                                                                   | -    |
| Approach                 | EB                                                                                | NB     |       | SB                                                                                |                                                                                     |      |
| HCM Control Delay, s     | 10.4                                                                              | 0.3    |       | 0                                                                                 |                                                                                     |      |
| HCM LOS                  | B                                                                                 |        |       |                                                                                   |                                                                                     |      |
| Minor Lane/Major Mvmt    | NBL                                                                               | NBT    | EBLn1 | SBT                                                                               | SBR                                                                                 |      |
| Capacity (veh/h)         | 1277                                                                              | -      | 684   | -                                                                                 | -                                                                                   |      |
| HCM Lane V/C Ratio       | 0.009                                                                             | -      | 0.032 | -                                                                                 | -                                                                                   |      |
| HCM Control Delay (s)    | 7.8                                                                               | 0      | 10.4  | -                                                                                 | -                                                                                   |      |
| HCM Lane LOS             | A                                                                                 | A      | B     | -                                                                                 | -                                                                                   |      |
| HCM 95th %tile Q(veh)    | 0                                                                                 | -      | 0.1   | -                                                                                 | -                                                                                   |      |

# HCM Signalized Intersection Capacity Analysis

## 1: Battery St & College St

9/14/2016

|                                   |  |  |  |  |  |  |  |  |  |  |  |  |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Movement                          | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations               |  |  |                                                                                   |                                                                                   |  |  |                                                                                    |  |  |                                                                                     |  |  |
| Traffic Volume (vph)              | 98                                                                                | 60                                                                                | 41                                                                                | 25                                                                                | 61                                                                                | 154                                                                               | 59                                                                                 | 866                                                                                 | 29                                                                                  | 86                                                                                  | 639                                                                                 | 126                                                                                 |
| Future Volume (vph)               | 98                                                                                | 60                                                                                | 41                                                                                | 25                                                                                | 61                                                                                | 154                                                                               | 59                                                                                 | 866                                                                                 | 29                                                                                  | 86                                                                                  | 639                                                                                 | 126                                                                                 |
| Ideal Flow (vphpl)                | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                               | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Total Lost time (s)               | 5.0                                                                               | 5.0                                                                               |                                                                                   |                                                                                   | 5.0                                                                               | 5.0                                                                               |                                                                                    | 5.0                                                                                 |                                                                                     |                                                                                     | 5.0                                                                                 |                                                                                     |
| Lane Util. Factor                 | 1.00                                                                              | 1.00                                                                              |                                                                                   |                                                                                   | 1.00                                                                              | 1.00                                                                              |                                                                                    | 0.95                                                                                |                                                                                     |                                                                                     | 0.95                                                                                |                                                                                     |
| Frpb, ped/bikes                   | 1.00                                                                              | 0.91                                                                              |                                                                                   |                                                                                   | 1.00                                                                              | 0.68                                                                              |                                                                                    | 1.00                                                                                |                                                                                     |                                                                                     | 0.98                                                                                |                                                                                     |
| Flpb, ped/bikes                   | 0.73                                                                              | 1.00                                                                              |                                                                                   |                                                                                   | 0.95                                                                              | 1.00                                                                              |                                                                                    | 1.00                                                                                |                                                                                     |                                                                                     | 1.00                                                                                |                                                                                     |
| Frt                               | 1.00                                                                              | 0.94                                                                              |                                                                                   |                                                                                   | 1.00                                                                              | 0.85                                                                              |                                                                                    | 1.00                                                                                |                                                                                     |                                                                                     | 0.98                                                                                |                                                                                     |
| Flt Protected                     | 0.95                                                                              | 1.00                                                                              |                                                                                   |                                                                                   | 0.99                                                                              | 1.00                                                                              |                                                                                    | 1.00                                                                                |                                                                                     |                                                                                     | 0.99                                                                                |                                                                                     |
| Satd. Flow (prot)                 | 1283                                                                              | 1599                                                                              |                                                                                   |                                                                                   | 1759                                                                              | 1095                                                                              |                                                                                    | 3498                                                                                |                                                                                     |                                                                                     | 3390                                                                                |                                                                                     |
| Flt Permitted                     | 0.70                                                                              | 1.00                                                                              |                                                                                   |                                                                                   | 0.91                                                                              | 1.00                                                                              |                                                                                    | 0.84                                                                                |                                                                                     |                                                                                     | 0.71                                                                                |                                                                                     |
| Satd. Flow (perm)                 | 947                                                                               | 1599                                                                              |                                                                                   |                                                                                   | 1620                                                                              | 1095                                                                              |                                                                                    | 2936                                                                                |                                                                                     |                                                                                     | 2404                                                                                |                                                                                     |
| Peak-hour factor, PHF             | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                               | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                |
| Adj. Flow (vph)                   | 98                                                                                | 60                                                                                | 41                                                                                | 25                                                                                | 61                                                                                | 154                                                                               | 59                                                                                 | 866                                                                                 | 29                                                                                  | 86                                                                                  | 639                                                                                 | 126                                                                                 |
| RTOR Reduction (vph)              | 0                                                                                 | 25                                                                                | 0                                                                                 | 0                                                                                 | 0                                                                                 | 114                                                                               | 0                                                                                  | 3                                                                                   | 0                                                                                   | 0                                                                                   | 18                                                                                  | 0                                                                                   |
| Lane Group Flow (vph)             | 98                                                                                | 76                                                                                | 0                                                                                 | 0                                                                                 | 86                                                                                | 40                                                                                | 0                                                                                  | 951                                                                                 | 0                                                                                   | 0                                                                                   | 833                                                                                 | 0                                                                                   |
| Confl. Peds. (#/hr)               | 232                                                                               |                                                                                   | 136                                                                               | 136                                                                               |                                                                                   | 232                                                                               | 59                                                                                 |                                                                                     | 19                                                                                  | 19                                                                                  |                                                                                     | 59                                                                                  |
| Heavy Vehicles (%)                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 1%                                                                                | 1%                                                                                | 1%                                                                                | 2%                                                                                 | 2%                                                                                  | 2%                                                                                  | 1%                                                                                  | 1%                                                                                  | 1%                                                                                  |
| Turn Type                         | Perm                                                                              | NA                                                                                |                                                                                   | Perm                                                                              | NA                                                                                | Perm                                                                              | Perm                                                                               | NA                                                                                  |                                                                                     | Perm                                                                                | NA                                                                                  |                                                                                     |
| Protected Phases                  |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   | 4                                                                                 |                                                                                   |                                                                                    | 2                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     |
| Permitted Phases                  | 4                                                                                 |                                                                                   |                                                                                   | 4                                                                                 |                                                                                   | 4                                                                                 | 2                                                                                  |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     |                                                                                     |
| Actuated Green, G (s)             | 23.2                                                                              | 23.2                                                                              |                                                                                   |                                                                                   | 23.2                                                                              | 23.2                                                                              |                                                                                    | 47.8                                                                                |                                                                                     |                                                                                     | 47.8                                                                                |                                                                                     |
| Effective Green, g (s)            | 23.2                                                                              | 23.2                                                                              |                                                                                   |                                                                                   | 23.2                                                                              | 23.2                                                                              |                                                                                    | 47.8                                                                                |                                                                                     |                                                                                     | 47.8                                                                                |                                                                                     |
| Actuated g/C Ratio                | 0.26                                                                              | 0.26                                                                              |                                                                                   |                                                                                   | 0.26                                                                              | 0.26                                                                              |                                                                                    | 0.53                                                                                |                                                                                     |                                                                                     | 0.53                                                                                |                                                                                     |
| Clearance Time (s)                | 5.0                                                                               | 5.0                                                                               |                                                                                   |                                                                                   | 5.0                                                                               | 5.0                                                                               |                                                                                    | 5.0                                                                                 |                                                                                     |                                                                                     | 5.0                                                                                 |                                                                                     |
| Vehicle Extension (s)             | 3.0                                                                               | 3.0                                                                               |                                                                                   |                                                                                   | 3.0                                                                               | 3.0                                                                               |                                                                                    | 3.0                                                                                 |                                                                                     |                                                                                     | 3.0                                                                                 |                                                                                     |
| Lane Grp Cap (vph)                | 244                                                                               | 412                                                                               |                                                                                   |                                                                                   | 417                                                                               | 282                                                                               |                                                                                    | 1559                                                                                |                                                                                     |                                                                                     | 1276                                                                                |                                                                                     |
| v/s Ratio Prot                    |                                                                                   | 0.05                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| v/s Ratio Perm                    | c0.10                                                                             |                                                                                   |                                                                                   |                                                                                   | 0.05                                                                              | 0.04                                                                              |                                                                                    | 0.32                                                                                |                                                                                     |                                                                                     | c0.35                                                                               |                                                                                     |
| v/c Ratio                         | 0.40                                                                              | 0.18                                                                              |                                                                                   |                                                                                   | 0.21                                                                              | 0.14                                                                              |                                                                                    | 0.61                                                                                |                                                                                     |                                                                                     | 0.65                                                                                |                                                                                     |
| Uniform Delay, d1                 | 27.7                                                                              | 26.0                                                                              |                                                                                   |                                                                                   | 26.2                                                                              | 25.7                                                                              |                                                                                    | 14.6                                                                                |                                                                                     |                                                                                     | 15.1                                                                                |                                                                                     |
| Progression Factor                | 1.00                                                                              | 1.00                                                                              |                                                                                   |                                                                                   | 1.00                                                                              | 1.00                                                                              |                                                                                    | 1.00                                                                                |                                                                                     |                                                                                     | 1.00                                                                                |                                                                                     |
| Incremental Delay, d2             | 4.9                                                                               | 1.0                                                                               |                                                                                   |                                                                                   | 1.1                                                                               | 1.0                                                                               |                                                                                    | 1.8                                                                                 |                                                                                     |                                                                                     | 2.6                                                                                 |                                                                                     |
| Delay (s)                         | 32.5                                                                              | 27.0                                                                              |                                                                                   |                                                                                   | 27.3                                                                              | 26.8                                                                              |                                                                                    | 16.4                                                                                |                                                                                     |                                                                                     | 17.8                                                                                |                                                                                     |
| Level of Service                  | C                                                                                 | C                                                                                 |                                                                                   |                                                                                   | C                                                                                 | C                                                                                 |                                                                                    | B                                                                                   |                                                                                     |                                                                                     | B                                                                                   |                                                                                     |
| Approach Delay (s)                |                                                                                   | 29.7                                                                              |                                                                                   |                                                                                   | 27.0                                                                              |                                                                                   |                                                                                    | 16.4                                                                                |                                                                                     |                                                                                     | 17.8                                                                                |                                                                                     |
| Approach LOS                      |                                                                                   | C                                                                                 |                                                                                   |                                                                                   | C                                                                                 |                                                                                   |                                                                                    | B                                                                                   |                                                                                     |                                                                                     | B                                                                                   |                                                                                     |
| <b>Intersection Summary</b>       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| HCM 2000 Control Delay            |                                                                                   |                                                                                   | 19.2                                                                              |                                                                                   |                                                                                   |                                                                                   | HCM 2000 Level of Service                                                          |                                                                                     |                                                                                     | B                                                                                   |                                                                                     |                                                                                     |
| HCM 2000 Volume to Capacity ratio |                                                                                   |                                                                                   | 0.52                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Actuated Cycle Length (s)         |                                                                                   |                                                                                   | 90.0                                                                              |                                                                                   |                                                                                   |                                                                                   | Sum of lost time (s)                                                               |                                                                                     |                                                                                     | 12.0                                                                                |                                                                                     |                                                                                     |
| Intersection Capacity Utilization |                                                                                   |                                                                                   | 79.0%                                                                             |                                                                                   |                                                                                   |                                                                                   | ICU Level of Service                                                               |                                                                                     |                                                                                     | D                                                                                   |                                                                                     |                                                                                     |
| Analysis Period (min)             |                                                                                   |                                                                                   | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| c Critical Lane Group             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |

Intersection

Intersection Delay, s/veh10.1

Intersection LOS B

| Movement            | EBU  | EBL  | EBT  | EBR  | WBU  | WBL  | WBT  | WBR  | NBU  | NBL  | NBT  | NBR  | SBU  | SBL  | SBT  | SBR  |
|---------------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| Lane Configurations |      |      | ↕    |      |      |      | ↕    |      |      |      | ↕    |      |      |      | ↕    |      |
| Traffic Vol, veh/h  | 0    | 9    | 74   | 39   | 0    | 28   | 73   | 144  | 0    | 53   | 126  | 30   | 0    | 95   | 96   | 0    |
| Future Vol, veh/h   | 0    | 9    | 74   | 39   | 0    | 28   | 73   | 144  | 0    | 53   | 126  | 30   | 0    | 95   | 96   | 0    |
| Peak Hour Factor    | 0.92 | 1.00 | 1.00 | 1.00 | 0.92 | 1.00 | 1.00 | 1.00 | 0.92 | 1.00 | 1.00 | 1.00 | 0.92 | 1.00 | 1.00 | 1.00 |
| Heavy Vehicles, %   | 2    | 1    | 1    | 1    | 2    | 2    | 2    | 2    | 2    | 1    | 1    | 1    | 2    | 1    | 1    | 1    |
| Mvmt Flow           | 0    | 9    | 74   | 39   | 0    | 28   | 73   | 144  | 0    | 53   | 126  | 30   | 0    | 95   | 96   | 0    |
| Number of Lanes     | 0    | 0    | 1    | 0    | 0    | 0    | 1    | 0    | 0    | 0    | 1    | 0    | 0    | 0    | 1    | 0    |

| Approach                   | EB  | WB   | NB   | SB   |
|----------------------------|-----|------|------|------|
| Opposing Approach          | WB  | EB   | SB   | NB   |
| Opposing Lanes             | 1   | 1    | 1    | 1    |
| Conflicting Approach Left  | SB  | NB   | EB   | WB   |
| Conflicting Lanes Left     | 1   | 1    | 1    | 1    |
| Conflicting Approach Right | NB  | SB   | WB   | EB   |
| Conflicting Lanes Right    | 1   | 1    | 1    | 1    |
| HCM Control Delay          | 9.3 | 10.3 | 10.3 | 10.3 |
| HCM LOS                    | A   | B    | B    | B    |

| Lane                   | NBLn1 | EBLn1 | WBLn1 | SBLn1 |
|------------------------|-------|-------|-------|-------|
| Vol Left, %            | 25%   | 7%    | 11%   | 50%   |
| Vol Thru, %            | 60%   | 61%   | 30%   | 50%   |
| Vol Right, %           | 14%   | 32%   | 59%   | 0%    |
| Sign Control           | Stop  | Stop  | Stop  | Stop  |
| Traffic Vol by Lane    | 209   | 122   | 245   | 191   |
| LT Vol                 | 53    | 9     | 28    | 95    |
| Through Vol            | 126   | 74    | 73    | 96    |
| RT Vol                 | 30    | 39    | 144   | 0     |
| Lane Flow Rate         | 209   | 122   | 245   | 191   |
| Geometry Grp           | 1     | 1     | 1     | 1     |
| Degree of Util (X)     | 0.298 | 0.175 | 0.331 | 0.28  |
| Departure Headway (Hd) | 5.13  | 5.165 | 4.867 | 5.272 |
| Convergence, Y/N       | Yes   | Yes   | Yes   | Yes   |
| Cap                    | 702   | 694   | 742   | 682   |
| Service Time           | 3.144 | 3.199 | 2.88  | 3.3   |
| HCM Lane V/C Ratio     | 0.298 | 0.176 | 0.33  | 0.28  |
| HCM Control Delay      | 10.3  | 9.3   | 10.3  | 10.3  |
| HCM Lane LOS           | B     | A     | B     | B     |
| HCM 95th-tile Q        | 1.2   | 0.6   | 1.5   | 1.1   |

Intersection

Int Delay, s/veh 1.1

| Movement                 | EBL                                                                               | EBR  | NBL  | NBT                                                                               | SBT                                                                                 | SBR  |
|--------------------------|-----------------------------------------------------------------------------------|------|------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|------|
| Lane Configurations      |  |      |      |  |  |      |
| Traffic Vol, veh/h       | 0                                                                                 | 19   | 24   | 152                                                                               | 113                                                                                 | 0    |
| Future Vol, veh/h        | 0                                                                                 | 19   | 24   | 152                                                                               | 113                                                                                 | 0    |
| Conflicting Peds, #/hr   | 0                                                                                 | 0    | 0    | 0                                                                                 | 0                                                                                   | 0    |
| Sign Control             | Stop                                                                              | Stop | Free | Free                                                                              | Free                                                                                | Free |
| RT Channelized           | -                                                                                 | None | -    | None                                                                              | -                                                                                   | None |
| Storage Length           | 0                                                                                 | -    | -    | -                                                                                 | -                                                                                   | -    |
| Veh in Median Storage, # | 0                                                                                 | -    | -    | 0                                                                                 | 0                                                                                   | -    |
| Grade, %                 | 0                                                                                 | -    | -    | 0                                                                                 | 0                                                                                   | -    |
| Peak Hour Factor         | 100                                                                               | 100  | 100  | 100                                                                               | 100                                                                                 | 100  |
| Heavy Vehicles, %        | 0                                                                                 | 0    | 0    | 0                                                                                 | 0                                                                                   | 0    |
| Mvmt Flow                | 0                                                                                 | 19   | 24   | 152                                                                               | 113                                                                                 | 0    |

| Major/Minor          | Minor2 |     | Major1 |   | Major2 |   |
|----------------------|--------|-----|--------|---|--------|---|
| Conflicting Flow All | 313    | 113 | 113    | 0 | -      | 0 |
| Stage 1              | 113    | -   | -      | - | -      | - |
| Stage 2              | 200    | -   | -      | - | -      | - |
| Critical Hdwy        | 6.4    | 6.2 | 4.1    | - | -      | - |
| Critical Hdwy Stg 1  | 5.4    | -   | -      | - | -      | - |
| Critical Hdwy Stg 2  | 5.4    | -   | -      | - | -      | - |
| Follow-up Hdwy       | 3.5    | 3.3 | 2.2    | - | -      | - |
| Pot Cap-1 Maneuver   | 684    | 945 | 1489   | - | -      | - |
| Stage 1              | 917    | -   | -      | - | -      | - |
| Stage 2              | 838    | -   | -      | - | -      | - |
| Platoon blocked, %   |        |     |        | - | -      | - |
| Mov Cap-1 Maneuver   | 672    | 945 | 1489   | - | -      | - |
| Mov Cap-2 Maneuver   | 672    | -   | -      | - | -      | - |
| Stage 1              | 917    | -   | -      | - | -      | - |
| Stage 2              | 823    | -   | -      | - | -      | - |

| Approach             | EB  | NB | SB |
|----------------------|-----|----|----|
| HCM Control Delay, s | 8.9 | 1  | 0  |
| HCM LOS              | A   |    |    |

| Minor Lane/Major Mvmt | NBL   | NBT | EBLn1 | SBT | SBR |
|-----------------------|-------|-----|-------|-----|-----|
| Capacity (veh/h)      | 1489  | -   | 945   | -   | -   |
| HCM Lane V/C Ratio    | 0.016 | -   | 0.02  | -   | -   |
| HCM Control Delay (s) | 7.5   | 0   | 8.9   | -   | -   |
| HCM Lane LOS          | A     | A   | A     | -   | -   |
| HCM 95th %tile Q(veh) | 0     | -   | 0.1   | -   | -   |

# HCM Signalized Intersection Capacity Analysis

## 1: Battery St & College St

9/14/2016

|                                   |  |  |  |  |  |  |  |  |  |  |  |  |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Movement                          | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations               |  |  |                                                                                   |                                                                                   |  |  |                                                                                     |  |  |                                                                                     |  |  |
| Traffic Volume (vph)              | 100                                                                               | 61                                                                                | 43                                                                                | 25                                                                                | 62                                                                                | 154                                                                               | 60                                                                                  | 866                                                                                 | 29                                                                                  | 86                                                                                  | 639                                                                                 | 128                                                                                 |
| Future Volume (vph)               | 100                                                                               | 61                                                                                | 43                                                                                | 25                                                                                | 62                                                                                | 154                                                                               | 60                                                                                  | 866                                                                                 | 29                                                                                  | 86                                                                                  | 639                                                                                 | 128                                                                                 |
| Ideal Flow (vphpl)                | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Total Lost time (s)               | 5.0                                                                               | 5.0                                                                               |                                                                                   |                                                                                   | 5.0                                                                               | 5.0                                                                               |                                                                                     | 5.0                                                                                 |                                                                                     |                                                                                     | 5.0                                                                                 |                                                                                     |
| Lane Util. Factor                 | 1.00                                                                              | 1.00                                                                              |                                                                                   |                                                                                   | 1.00                                                                              | 1.00                                                                              |                                                                                     | 0.95                                                                                |                                                                                     |                                                                                     | 0.95                                                                                |                                                                                     |
| Frpb, ped/bikes                   | 1.00                                                                              | 0.91                                                                              |                                                                                   |                                                                                   | 1.00                                                                              | 0.68                                                                              |                                                                                     | 1.00                                                                                |                                                                                     |                                                                                     | 0.98                                                                                |                                                                                     |
| Flpb, ped/bikes                   | 0.73                                                                              | 1.00                                                                              |                                                                                   |                                                                                   | 0.95                                                                              | 1.00                                                                              |                                                                                     | 1.00                                                                                |                                                                                     |                                                                                     | 1.00                                                                                |                                                                                     |
| Frt                               | 1.00                                                                              | 0.94                                                                              |                                                                                   |                                                                                   | 1.00                                                                              | 0.85                                                                              |                                                                                     | 1.00                                                                                |                                                                                     |                                                                                     | 0.98                                                                                |                                                                                     |
| Flt Protected                     | 0.95                                                                              | 1.00                                                                              |                                                                                   |                                                                                   | 0.99                                                                              | 1.00                                                                              |                                                                                     | 1.00                                                                                |                                                                                     |                                                                                     | 0.99                                                                                |                                                                                     |
| Satd. Flow (prot)                 | 1284                                                                              | 1594                                                                              |                                                                                   |                                                                                   | 1760                                                                              | 1095                                                                              |                                                                                     | 3498                                                                                |                                                                                     |                                                                                     | 3387                                                                                |                                                                                     |
| Flt Permitted                     | 0.70                                                                              | 1.00                                                                              |                                                                                   |                                                                                   | 0.91                                                                              | 1.00                                                                              |                                                                                     | 0.83                                                                                |                                                                                     |                                                                                     | 0.71                                                                                |                                                                                     |
| Satd. Flow (perm)                 | 947                                                                               | 1594                                                                              |                                                                                   |                                                                                   | 1621                                                                              | 1095                                                                              |                                                                                     | 2927                                                                                |                                                                                     |                                                                                     | 2404                                                                                |                                                                                     |
| Peak-hour factor, PHF             | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                |
| Adj. Flow (vph)                   | 100                                                                               | 61                                                                                | 43                                                                                | 25                                                                                | 62                                                                                | 154                                                                               | 60                                                                                  | 866                                                                                 | 29                                                                                  | 86                                                                                  | 639                                                                                 | 128                                                                                 |
| RTOR Reduction (vph)              | 0                                                                                 | 26                                                                                | 0                                                                                 | 0                                                                                 | 0                                                                                 | 114                                                                               | 0                                                                                   | 3                                                                                   | 0                                                                                   | 0                                                                                   | 18                                                                                  | 0                                                                                   |
| Lane Group Flow (vph)             | 100                                                                               | 78                                                                                | 0                                                                                 | 0                                                                                 | 87                                                                                | 40                                                                                | 0                                                                                   | 952                                                                                 | 0                                                                                   | 0                                                                                   | 835                                                                                 | 0                                                                                   |
| Confl. Peds. (#/hr)               | 232                                                                               |                                                                                   | 136                                                                               | 136                                                                               |                                                                                   | 232                                                                               | 59                                                                                  |                                                                                     | 19                                                                                  | 19                                                                                  |                                                                                     | 59                                                                                  |
| Heavy Vehicles (%)                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 1%                                                                                | 1%                                                                                | 1%                                                                                | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  | 1%                                                                                  | 1%                                                                                  | 1%                                                                                  |
| Turn Type                         | Perm                                                                              | NA                                                                                |                                                                                   | Perm                                                                              | NA                                                                                | Perm                                                                              | Perm                                                                                | NA                                                                                  |                                                                                     | Perm                                                                                | NA                                                                                  |                                                                                     |
| Protected Phases                  |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   | 4                                                                                 |                                                                                   |                                                                                     | 2                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     |
| Permitted Phases                  | 4                                                                                 |                                                                                   |                                                                                   | 4                                                                                 |                                                                                   | 4                                                                                 | 2                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     |                                                                                     |
| Actuated Green, G (s)             | 23.1                                                                              | 23.1                                                                              |                                                                                   |                                                                                   | 23.1                                                                              | 23.1                                                                              |                                                                                     | 47.9                                                                                |                                                                                     |                                                                                     | 47.9                                                                                |                                                                                     |
| Effective Green, g (s)            | 23.1                                                                              | 23.1                                                                              |                                                                                   |                                                                                   | 23.1                                                                              | 23.1                                                                              |                                                                                     | 47.9                                                                                |                                                                                     |                                                                                     | 47.9                                                                                |                                                                                     |
| Actuated g/C Ratio                | 0.26                                                                              | 0.26                                                                              |                                                                                   |                                                                                   | 0.26                                                                              | 0.26                                                                              |                                                                                     | 0.53                                                                                |                                                                                     |                                                                                     | 0.53                                                                                |                                                                                     |
| Clearance Time (s)                | 5.0                                                                               | 5.0                                                                               |                                                                                   |                                                                                   | 5.0                                                                               | 5.0                                                                               |                                                                                     | 5.0                                                                                 |                                                                                     |                                                                                     | 5.0                                                                                 |                                                                                     |
| Vehicle Extension (s)             | 3.0                                                                               | 3.0                                                                               |                                                                                   |                                                                                   | 3.0                                                                               | 3.0                                                                               |                                                                                     | 3.0                                                                                 |                                                                                     |                                                                                     | 3.0                                                                                 |                                                                                     |
| Lane Grp Cap (vph)                | 243                                                                               | 409                                                                               |                                                                                   |                                                                                   | 416                                                                               | 281                                                                               |                                                                                     | 1557                                                                                |                                                                                     |                                                                                     | 1279                                                                                |                                                                                     |
| v/s Ratio Prot                    |                                                                                   | 0.05                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| v/s Ratio Perm                    | c0.11                                                                             |                                                                                   |                                                                                   |                                                                                   | 0.05                                                                              | 0.04                                                                              |                                                                                     | 0.33                                                                                |                                                                                     |                                                                                     | c0.35                                                                               |                                                                                     |
| v/c Ratio                         | 0.41                                                                              | 0.19                                                                              |                                                                                   |                                                                                   | 0.21                                                                              | 0.14                                                                              |                                                                                     | 0.61                                                                                |                                                                                     |                                                                                     | 0.65                                                                                |                                                                                     |
| Uniform Delay, d1                 | 27.8                                                                              | 26.1                                                                              |                                                                                   |                                                                                   | 26.3                                                                              | 25.8                                                                              |                                                                                     | 14.6                                                                                |                                                                                     |                                                                                     | 15.1                                                                                |                                                                                     |
| Progression Factor                | 1.00                                                                              | 1.00                                                                              |                                                                                   |                                                                                   | 1.00                                                                              | 1.00                                                                              |                                                                                     | 1.00                                                                                |                                                                                     |                                                                                     | 1.00                                                                                |                                                                                     |
| Incremental Delay, d2             | 5.1                                                                               | 1.0                                                                               |                                                                                   |                                                                                   | 1.1                                                                               | 1.0                                                                               |                                                                                     | 1.8                                                                                 |                                                                                     |                                                                                     | 2.6                                                                                 |                                                                                     |
| Delay (s)                         | 32.9                                                                              | 27.2                                                                              |                                                                                   |                                                                                   | 27.4                                                                              | 26.8                                                                              |                                                                                     | 16.4                                                                                |                                                                                     |                                                                                     | 17.7                                                                                |                                                                                     |
| Level of Service                  | C                                                                                 | C                                                                                 |                                                                                   |                                                                                   | C                                                                                 | C                                                                                 |                                                                                     | B                                                                                   |                                                                                     |                                                                                     | B                                                                                   |                                                                                     |
| Approach Delay (s)                |                                                                                   | 30.0                                                                              |                                                                                   |                                                                                   | 27.0                                                                              |                                                                                   |                                                                                     | 16.4                                                                                |                                                                                     |                                                                                     | 17.7                                                                                |                                                                                     |
| Approach LOS                      |                                                                                   | C                                                                                 |                                                                                   |                                                                                   | C                                                                                 |                                                                                   |                                                                                     | B                                                                                   |                                                                                     |                                                                                     | B                                                                                   |                                                                                     |
| <b>Intersection Summary</b>       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| HCM 2000 Control Delay            |                                                                                   |                                                                                   | 19.3                                                                              |                                                                                   |                                                                                   |                                                                                   | HCM 2000 Level of Service                                                           |                                                                                     |                                                                                     | B                                                                                   |                                                                                     |                                                                                     |
| HCM 2000 Volume to Capacity ratio |                                                                                   |                                                                                   | 0.52                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Actuated Cycle Length (s)         |                                                                                   |                                                                                   | 90.0                                                                              |                                                                                   |                                                                                   |                                                                                   | Sum of lost time (s)                                                                |                                                                                     |                                                                                     | 12.0                                                                                |                                                                                     |                                                                                     |
| Intersection Capacity Utilization |                                                                                   |                                                                                   | 79.1%                                                                             |                                                                                   |                                                                                   |                                                                                   | ICU Level of Service                                                                |                                                                                     |                                                                                     | D                                                                                   |                                                                                     |                                                                                     |
| Analysis Period (min)             |                                                                                   |                                                                                   | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| c Critical Lane Group             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |

Intersection

Intersection Delay, s/veh10.4

Intersection LOS B

| Movement            | EBU  | EBL  | EBT  | EBR  | WBU  | WBL  | WBT  | WBR  | NBU  | NBL  | NBT  | NBR  | SBU  | SBL  | SBT  | SBR  |
|---------------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| Lane Configurations |      |      | ↕    |      |      |      | ↕    |      |      |      | ↕    |      |      |      | ↕    |      |
| Traffic Vol, veh/h  | 0    | 10   | 74   | 39   | 0    | 28   | 73   | 150  | 0    | 53   | 130  | 30   | 0    | 100  | 101  | 0    |
| Future Vol, veh/h   | 0    | 10   | 74   | 39   | 0    | 28   | 73   | 150  | 0    | 53   | 130  | 30   | 0    | 100  | 101  | 0    |
| Peak Hour Factor    | 0.92 | 1.00 | 1.00 | 1.00 | 0.92 | 1.00 | 1.00 | 1.00 | 0.92 | 1.00 | 1.00 | 1.00 | 0.92 | 1.00 | 1.00 | 1.00 |
| Heavy Vehicles, %   | 2    | 1    | 1    | 1    | 2    | 2    | 2    | 2    | 2    | 1    | 1    | 1    | 2    | 1    | 1    | 1    |
| Mvmt Flow           | 0    | 10   | 74   | 39   | 0    | 28   | 73   | 150  | 0    | 53   | 130  | 30   | 0    | 100  | 101  | 0    |
| Number of Lanes     | 0    | 0    | 1    | 0    | 0    | 0    | 1    | 0    | 0    | 0    | 1    | 0    | 0    | 0    | 1    | 0    |

| Approach                   | EB  | WB   | NB   | SB   |
|----------------------------|-----|------|------|------|
| Opposing Approach          | WB  | EB   | SB   | NB   |
| Opposing Lanes             | 1   | 1    | 1    | 1    |
| Conflicting Approach Left  | SB  | NB   | EB   | WB   |
| Conflicting Lanes Left     | 1   | 1    | 1    | 1    |
| Conflicting Approach Right | NB  | SB   | WB   | EB   |
| Conflicting Lanes Right    | 1   | 1    | 1    | 1    |
| HCM Control Delay          | 9.4 | 10.5 | 10.5 | 10.6 |
| HCM LOS                    | A   | B    | B    | B    |

| Lane                   | NBLn1 | EBLn1 | WBLn1 | SBLn1 |
|------------------------|-------|-------|-------|-------|
| Vol Left, %            | 25%   | 8%    | 11%   | 50%   |
| Vol Thru, %            | 61%   | 60%   | 29%   | 50%   |
| Vol Right, %           | 14%   | 32%   | 60%   | 0%    |
| Sign Control           | Stop  | Stop  | Stop  | Stop  |
| Traffic Vol by Lane    | 213   | 123   | 251   | 201   |
| LT Vol                 | 53    | 10    | 28    | 100   |
| Through Vol            | 130   | 74    | 73    | 101   |
| RT Vol                 | 30    | 39    | 150   | 0     |
| Lane Flow Rate         | 213   | 123   | 251   | 201   |
| Geometry Grp           | 1     | 1     | 1     | 1     |
| Degree of Util (X)     | 0.305 | 0.179 | 0.343 | 0.296 |
| Departure Headway (Hd) | 5.163 | 5.228 | 4.921 | 5.309 |
| Convergence, Y/N       | Yes   | Yes   | Yes   | Yes   |
| Cap                    | 697   | 686   | 735   | 677   |
| Service Time           | 3.194 | 3.262 | 2.921 | 3.34  |
| HCM Lane V/C Ratio     | 0.306 | 0.179 | 0.341 | 0.297 |
| HCM Control Delay      | 10.5  | 9.4   | 10.5  | 10.6  |
| HCM Lane LOS           | B     | A     | B     | B     |
| HCM 95th-tile Q        | 1.3   | 0.6   | 1.5   | 1.2   |

Intersection

Int Delay, s/veh 0.7

| Movement                 | EBL                                                                               | EBR  | NBL  | NBT                                                                               | SBT                                                                                 | SBR  |
|--------------------------|-----------------------------------------------------------------------------------|------|------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|------|
| Lane Configurations      |  |      |      |  |  |      |
| Traffic Vol, veh/h       | 2                                                                                 | 13   | 12   | 175                                                                               | 128                                                                                 | 2    |
| Future Vol, veh/h        | 2                                                                                 | 13   | 12   | 175                                                                               | 128                                                                                 | 2    |
| Conflicting Peds, #/hr   | 0                                                                                 | 0    | 0    | 0                                                                                 | 0                                                                                   | 0    |
| Sign Control             | Stop                                                                              | Stop | Free | Free                                                                              | Free                                                                                | Free |
| RT Channelized           | -                                                                                 | None | -    | None                                                                              | -                                                                                   | None |
| Storage Length           | 0                                                                                 | -    | -    | -                                                                                 | -                                                                                   | -    |
| Veh in Median Storage, # | 0                                                                                 | -    | -    | 0                                                                                 | 0                                                                                   | -    |
| Grade, %                 | 0                                                                                 | -    | -    | 0                                                                                 | 0                                                                                   | -    |
| Peak Hour Factor         | 100                                                                               | 100  | 100  | 100                                                                               | 100                                                                                 | 100  |
| Heavy Vehicles, %        | 0                                                                                 | 0    | 0    | 0                                                                                 | 0                                                                                   | 0    |
| Mvmt Flow                | 2                                                                                 | 13   | 12   | 175                                                                               | 128                                                                                 | 2    |

| Major/Minor          | Minor2 |     | Major1 |   | Major2 |   |
|----------------------|--------|-----|--------|---|--------|---|
| Conflicting Flow All | 328    | 129 | 130    | 0 | -      | 0 |
| Stage 1              | 129    | -   | -      | - | -      | - |
| Stage 2              | 199    | -   | -      | - | -      | - |
| Critical Hdwy        | 6.4    | 6.2 | 4.1    | - | -      | - |
| Critical Hdwy Stg 1  | 5.4    | -   | -      | - | -      | - |
| Critical Hdwy Stg 2  | 5.4    | -   | -      | - | -      | - |
| Follow-up Hdwy       | 3.5    | 3.3 | 2.2    | - | -      | - |
| Pot Cap-1 Maneuver   | 671    | 926 | 1468   | - | -      | - |
| Stage 1              | 902    | -   | -      | - | -      | - |
| Stage 2              | 839    | -   | -      | - | -      | - |
| Platoon blocked, %   |        |     |        | - | -      | - |
| Mov Cap-1 Maneuver   | 665    | 926 | 1468   | - | -      | - |
| Mov Cap-2 Maneuver   | 665    | -   | -      | - | -      | - |
| Stage 1              | 902    | -   | -      | - | -      | - |
| Stage 2              | 831    | -   | -      | - | -      | - |

| Approach             | EB  | NB  | SB |
|----------------------|-----|-----|----|
| HCM Control Delay, s | 9.2 | 0.5 | 0  |
| HCM LOS              | A   |     |    |

| Minor Lane/Major Mvmt | NBL   | NBT | EBLn1 | SBT | SBR |
|-----------------------|-------|-----|-------|-----|-----|
| Capacity (veh/h)      | 1468  | -   | 880   | -   | -   |
| HCM Lane V/C Ratio    | 0.008 | -   | 0.017 | -   | -   |
| HCM Control Delay (s) | 7.5   | 0   | 9.2   | -   | -   |
| HCM Lane LOS          | A     | A   | A     | -   | -   |
| HCM 95th %tile Q(veh) | 0     | -   | 0.1   | -   | -   |

# HCM Signalized Intersection Capacity Analysis

## 1: Battery St & College St

9/14/2016

|                                   |  |  |  |  |  |  |  |  |  |  |  |  |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Movement                          | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations               |  |  |                                                                                   |                                                                                   |  |  |                                                                                    |  |  |                                                                                     |  |  |
| Traffic Volume (vph)              | 96                                                                                | 104                                                                               | 90                                                                                | 21                                                                                | 44                                                                                | 90                                                                                | 54                                                                                 | 556                                                                                 | 25                                                                                  | 63                                                                                  | 536                                                                                 | 97                                                                                  |
| Future Volume (vph)               | 96                                                                                | 104                                                                               | 90                                                                                | 21                                                                                | 44                                                                                | 90                                                                                | 54                                                                                 | 556                                                                                 | 25                                                                                  | 63                                                                                  | 536                                                                                 | 97                                                                                  |
| Ideal Flow (vphpl)                | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                               | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Total Lost time (s)               | 5.0                                                                               | 5.0                                                                               |                                                                                   |                                                                                   | 5.0                                                                               | 5.0                                                                               |                                                                                    | 5.0                                                                                 |                                                                                     |                                                                                     | 5.0                                                                                 |                                                                                     |
| Lane Util. Factor                 | 1.00                                                                              | 1.00                                                                              |                                                                                   |                                                                                   | 1.00                                                                              | 1.00                                                                              |                                                                                    | 0.95                                                                                |                                                                                     |                                                                                     | 0.95                                                                                |                                                                                     |
| Frpb, ped/bikes                   | 1.00                                                                              | 0.85                                                                              |                                                                                   |                                                                                   | 1.00                                                                              | 0.64                                                                              |                                                                                    | 1.00                                                                                |                                                                                     |                                                                                     | 0.96                                                                                |                                                                                     |
| Flpb, ped/bikes                   | 0.67                                                                              | 1.00                                                                              |                                                                                   |                                                                                   | 0.93                                                                              | 1.00                                                                              |                                                                                    | 0.99                                                                                |                                                                                     |                                                                                     | 1.00                                                                                |                                                                                     |
| Frt                               | 1.00                                                                              | 0.93                                                                              |                                                                                   |                                                                                   | 1.00                                                                              | 0.85                                                                              |                                                                                    | 0.99                                                                                |                                                                                     |                                                                                     | 0.98                                                                                |                                                                                     |
| Flt Protected                     | 0.95                                                                              | 1.00                                                                              |                                                                                   |                                                                                   | 0.98                                                                              | 1.00                                                                              |                                                                                    | 1.00                                                                                |                                                                                     |                                                                                     | 1.00                                                                                |                                                                                     |
| Satd. Flow (prot)                 | 1189                                                                              | 1475                                                                              |                                                                                   |                                                                                   | 1665                                                                              | 988                                                                               |                                                                                    | 3427                                                                                |                                                                                     |                                                                                     | 3285                                                                                |                                                                                     |
| Flt Permitted                     | 0.71                                                                              | 1.00                                                                              |                                                                                   |                                                                                   | 0.89                                                                              | 1.00                                                                              |                                                                                    | 0.82                                                                                |                                                                                     |                                                                                     | 0.82                                                                                |                                                                                     |
| Satd. Flow (perm)                 | 895                                                                               | 1475                                                                              |                                                                                   |                                                                                   | 1512                                                                              | 988                                                                               |                                                                                    | 2829                                                                                |                                                                                     |                                                                                     | 2699                                                                                |                                                                                     |
| Peak-hour factor, PHF             | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                               | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                |
| Adj. Flow (vph)                   | 96                                                                                | 104                                                                               | 90                                                                                | 21                                                                                | 44                                                                                | 90                                                                                | 54                                                                                 | 556                                                                                 | 25                                                                                  | 63                                                                                  | 536                                                                                 | 97                                                                                  |
| RTOR Reduction (vph)              | 0                                                                                 | 27                                                                                | 0                                                                                 | 0                                                                                 | 0                                                                                 | 56                                                                                | 0                                                                                  | 5                                                                                   | 0                                                                                   | 0                                                                                   | 21                                                                                  | 0                                                                                   |
| Lane Group Flow (vph)             | 96                                                                                | 167                                                                               | 0                                                                                 | 0                                                                                 | 65                                                                                | 34                                                                                | 0                                                                                  | 630                                                                                 | 0                                                                                   | 0                                                                                   | 675                                                                                 | 0                                                                                   |
| Confl. Peds. (#/hr)               | 396                                                                               |                                                                                   | 253                                                                               | 253                                                                               |                                                                                   | 396                                                                               | 123                                                                                |                                                                                     | 40                                                                                  | 40                                                                                  |                                                                                     | 123                                                                                 |
| Heavy Vehicles (%)                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 4%                                                                                | 4%                                                                                | 4%                                                                                | 3%                                                                                 | 3%                                                                                  | 3%                                                                                  | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  |
| Turn Type                         | Perm                                                                              | NA                                                                                |                                                                                   | Perm                                                                              | NA                                                                                | Perm                                                                              | Perm                                                                               | NA                                                                                  |                                                                                     | Perm                                                                                | NA                                                                                  |                                                                                     |
| Protected Phases                  |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   | 4                                                                                 |                                                                                   |                                                                                    | 2                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     |
| Permitted Phases                  | 4                                                                                 |                                                                                   |                                                                                   | 4                                                                                 |                                                                                   | 4                                                                                 | 2                                                                                  |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     |                                                                                     |
| Actuated Green, G (s)             | 34.1                                                                              | 34.1                                                                              |                                                                                   |                                                                                   | 34.1                                                                              | 34.1                                                                              |                                                                                    | 36.9                                                                                |                                                                                     |                                                                                     | 36.9                                                                                |                                                                                     |
| Effective Green, g (s)            | 34.1                                                                              | 34.1                                                                              |                                                                                   |                                                                                   | 34.1                                                                              | 34.1                                                                              |                                                                                    | 36.9                                                                                |                                                                                     |                                                                                     | 36.9                                                                                |                                                                                     |
| Actuated g/C Ratio                | 0.38                                                                              | 0.38                                                                              |                                                                                   |                                                                                   | 0.38                                                                              | 0.38                                                                              |                                                                                    | 0.41                                                                                |                                                                                     |                                                                                     | 0.41                                                                                |                                                                                     |
| Clearance Time (s)                | 5.0                                                                               | 5.0                                                                               |                                                                                   |                                                                                   | 5.0                                                                               | 5.0                                                                               |                                                                                    | 5.0                                                                                 |                                                                                     |                                                                                     | 5.0                                                                                 |                                                                                     |
| Vehicle Extension (s)             | 3.0                                                                               | 3.0                                                                               |                                                                                   |                                                                                   | 3.0                                                                               | 3.0                                                                               |                                                                                    | 3.0                                                                                 |                                                                                     |                                                                                     | 3.0                                                                                 |                                                                                     |
| Lane Grp Cap (vph)                | 339                                                                               | 558                                                                               |                                                                                   |                                                                                   | 572                                                                               | 374                                                                               |                                                                                    | 1159                                                                                |                                                                                     |                                                                                     | 1106                                                                                |                                                                                     |
| v/s Ratio Prot                    |                                                                                   | c0.11                                                                             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| v/s Ratio Perm                    | 0.11                                                                              |                                                                                   |                                                                                   |                                                                                   | 0.04                                                                              | 0.03                                                                              |                                                                                    | 0.22                                                                                |                                                                                     |                                                                                     | c0.25                                                                               |                                                                                     |
| v/c Ratio                         | 0.28                                                                              | 0.30                                                                              |                                                                                   |                                                                                   | 0.11                                                                              | 0.09                                                                              |                                                                                    | 0.54                                                                                |                                                                                     |                                                                                     | 0.61                                                                                |                                                                                     |
| Uniform Delay, d1                 | 19.4                                                                              | 19.6                                                                              |                                                                                   |                                                                                   | 18.1                                                                              | 18.0                                                                              |                                                                                    | 20.2                                                                                |                                                                                     |                                                                                     | 20.9                                                                                |                                                                                     |
| Progression Factor                | 1.00                                                                              | 1.00                                                                              |                                                                                   |                                                                                   | 1.00                                                                              | 1.00                                                                              |                                                                                    | 1.00                                                                                |                                                                                     |                                                                                     | 1.00                                                                                |                                                                                     |
| Incremental Delay, d2             | 2.1                                                                               | 1.4                                                                               |                                                                                   |                                                                                   | 0.4                                                                               | 0.5                                                                               |                                                                                    | 1.8                                                                                 |                                                                                     |                                                                                     | 2.5                                                                                 |                                                                                     |
| Delay (s)                         | 21.5                                                                              | 21.0                                                                              |                                                                                   |                                                                                   | 18.5                                                                              | 18.5                                                                              |                                                                                    | 22.0                                                                                |                                                                                     |                                                                                     | 23.4                                                                                |                                                                                     |
| Level of Service                  | C                                                                                 | C                                                                                 |                                                                                   |                                                                                   | B                                                                                 | B                                                                                 |                                                                                    | C                                                                                   |                                                                                     |                                                                                     | C                                                                                   |                                                                                     |
| Approach Delay (s)                |                                                                                   | 21.1                                                                              |                                                                                   |                                                                                   | 18.5                                                                              |                                                                                   |                                                                                    | 22.0                                                                                |                                                                                     |                                                                                     | 23.4                                                                                |                                                                                     |
| Approach LOS                      |                                                                                   | C                                                                                 |                                                                                   |                                                                                   | B                                                                                 |                                                                                   |                                                                                    | C                                                                                   |                                                                                     |                                                                                     | C                                                                                   |                                                                                     |
| <b>Intersection Summary</b>       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| HCM 2000 Control Delay            |                                                                                   |                                                                                   | 22.1                                                                              |                                                                                   |                                                                                   |                                                                                   | HCM 2000 Level of Service                                                          |                                                                                     |                                                                                     |                                                                                     | C                                                                                   |                                                                                     |
| HCM 2000 Volume to Capacity ratio |                                                                                   |                                                                                   | 0.42                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Actuated Cycle Length (s)         |                                                                                   |                                                                                   | 90.0                                                                              |                                                                                   |                                                                                   |                                                                                   | Sum of lost time (s)                                                               |                                                                                     |                                                                                     | 12.0                                                                                |                                                                                     |                                                                                     |
| Intersection Capacity Utilization |                                                                                   |                                                                                   | 71.9%                                                                             |                                                                                   |                                                                                   |                                                                                   | ICU Level of Service                                                               |                                                                                     |                                                                                     | C                                                                                   |                                                                                     |                                                                                     |
| Analysis Period (min)             |                                                                                   |                                                                                   | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| c Critical Lane Group             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |



Intersection

Intersection Delay, s/veh10.1

Intersection LOS B

| Movement            | EBU  | EBL  | EBT  | EBR  | WBU  | WBL  | WBT  | WBR  | NBU  | NBL  | NBT  | NBR  | SBU  | SBL  | SBT  | SBR  |
|---------------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| Lane Configurations |      |      | ↕    |      |      |      | ↕    |      |      |      | ↕    |      |      |      | ↕    |      |
| Traffic Vol, veh/h  | 0    | 14   | 110  | 45   | 0    | 21   | 89   | 85   | 0    | 18   | 74   | 46   | 0    | 133  | 113  | 2    |
| Future Vol, veh/h   | 0    | 14   | 110  | 45   | 0    | 21   | 89   | 85   | 0    | 18   | 74   | 46   | 0    | 133  | 113  | 2    |
| Peak Hour Factor    | 0.92 | 1.00 | 1.00 | 1.00 | 0.92 | 1.00 | 1.00 | 1.00 | 0.92 | 1.00 | 1.00 | 1.00 | 0.92 | 1.00 | 1.00 | 1.00 |
| Heavy Vehicles, %   | 2    | 4    | 4    | 4    | 2    | 0    | 0    | 0    | 2    | 0    | 0    | 0    | 2    | 1    | 1    | 1    |
| Mvmt Flow           | 0    | 14   | 110  | 45   | 0    | 21   | 89   | 85   | 0    | 18   | 74   | 46   | 0    | 133  | 113  | 2    |
| Number of Lanes     | 0    | 0    | 1    | 0    | 0    | 0    | 1    | 0    | 0    | 0    | 1    | 0    | 0    | 0    | 1    | 0    |

| Approach                   | EB  | WB  | NB  | SB |
|----------------------------|-----|-----|-----|----|
| Opposing Approach          | WB  | EB  | SB  | NB |
| Opposing Lanes             | 1   | 1   | 1   | 1  |
| Conflicting Approach Left  | SB  | NB  | EB  | WB |
| Conflicting Lanes Left     | 1   | 1   | 1   | 1  |
| Conflicting Approach Right | NB  | SB  | WB  | EB |
| Conflicting Lanes Right    | 1   | 1   | 1   | 1  |
| HCM Control Delay          | 9.8 | 9.8 | 9.3 | 11 |
| HCM LOS                    | A   | A   | A   | B  |

| Lane                   | NBLn1 | EBLn1 | WBLn1 | SBLn1 |
|------------------------|-------|-------|-------|-------|
| Vol Left, %            | 13%   | 8%    | 11%   | 54%   |
| Vol Thru, %            | 54%   | 65%   | 46%   | 46%   |
| Vol Right, %           | 33%   | 27%   | 44%   | 1%    |
| Sign Control           | Stop  | Stop  | Stop  | Stop  |
| Traffic Vol by Lane    | 138   | 169   | 195   | 248   |
| LT Vol                 | 18    | 14    | 21    | 133   |
| Through Vol            | 74    | 110   | 89    | 113   |
| RT Vol                 | 46    | 45    | 85    | 2     |
| Lane Flow Rate         | 138   | 169   | 195   | 248   |
| Geometry Grp           | 1     | 1     | 1     | 1     |
| Degree of Util (X)     | 0.194 | 0.241 | 0.268 | 0.35  |
| Departure Headway (Hd) | 5.048 | 5.141 | 4.945 | 5.19  |
| Convergence, Y/N       | Yes   | Yes   | Yes   | Yes   |
| Cap                    | 712   | 701   | 729   | 697   |
| Service Time           | 3.068 | 3.147 | 2.95  | 3.19  |
| HCM Lane V/C Ratio     | 0.194 | 0.241 | 0.267 | 0.356 |
| HCM Control Delay      | 9.3   | 9.8   | 9.8   | 11    |
| HCM Lane LOS           | A     | A     | A     | B     |
| HCM 95th-tile Q        | 0.7   | 0.9   | 1.1   | 1.6   |

Intersection

Int Delay, s/veh 1.3

| Movement                 | EBL                                                                               | EBR  | NBL  | NBT                                                                               | SBT                                                                                 | SBR  |
|--------------------------|-----------------------------------------------------------------------------------|------|------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|------|
| Lane Configurations      |  |      |      |  |  |      |
| Traffic Vol, veh/h       | 0                                                                                 | 43   | 34   | 215                                                                               | 259                                                                                 | 0    |
| Future Vol, veh/h        | 0                                                                                 | 43   | 34   | 215                                                                               | 259                                                                                 | 0    |
| Conflicting Peds, #/hr   | 0                                                                                 | 0    | 0    | 0                                                                                 | 0                                                                                   | 0    |
| Sign Control             | Stop                                                                              | Stop | Free | Free                                                                              | Free                                                                                | Free |
| RT Channelized           | -                                                                                 | None | -    | None                                                                              | -                                                                                   | None |
| Storage Length           | 0                                                                                 | -    | -    | -                                                                                 | -                                                                                   | -    |
| Veh in Median Storage, # | 0                                                                                 | -    | -    | 0                                                                                 | 0                                                                                   | -    |
| Grade, %                 | 0                                                                                 | -    | -    | 0                                                                                 | 0                                                                                   | -    |
| Peak Hour Factor         | 100                                                                               | 100  | 100  | 100                                                                               | 100                                                                                 | 100  |
| Heavy Vehicles, %        | 0                                                                                 | 0    | 0    | 0                                                                                 | 0                                                                                   | 0    |
| Mvmt Flow                | 0                                                                                 | 43   | 34   | 215                                                                               | 259                                                                                 | 0    |

| Major/Minor          | Minor2 |     | Major1 |   | Major2 |   |
|----------------------|--------|-----|--------|---|--------|---|
| Conflicting Flow All | 542    | 259 | 259    | 0 | -      | 0 |
| Stage 1              | 259    | -   | -      | - | -      | - |
| Stage 2              | 283    | -   | -      | - | -      | - |
| Critical Hdwy        | 6.4    | 6.2 | 4.1    | - | -      | - |
| Critical Hdwy Stg 1  | 5.4    | -   | -      | - | -      | - |
| Critical Hdwy Stg 2  | 5.4    | -   | -      | - | -      | - |
| Follow-up Hdwy       | 3.5    | 3.3 | 2.2    | - | -      | - |
| Pot Cap-1 Maneuver   | 505    | 785 | 1317   | - | -      | - |
| Stage 1              | 789    | -   | -      | - | -      | - |
| Stage 2              | 770    | -   | -      | - | -      | - |
| Platoon blocked, %   |        |     |        | - | -      | - |
| Mov Cap-1 Maneuver   | 490    | 785 | 1317   | - | -      | - |
| Mov Cap-2 Maneuver   | 490    | -   | -      | - | -      | - |
| Stage 1              | 789    | -   | -      | - | -      | - |
| Stage 2              | 748    | -   | -      | - | -      | - |

| Approach             | EB  | NB  | SB |
|----------------------|-----|-----|----|
| HCM Control Delay, s | 9.9 | 1.1 | 0  |
| HCM LOS              | A   |     |    |

| Minor Lane/Major Mvmt | NBL   | NBT | EBLn1 | SBT | SBR |
|-----------------------|-------|-----|-------|-----|-----|
| Capacity (veh/h)      | 1317  | -   | 785   | -   | -   |
| HCM Lane V/C Ratio    | 0.026 | -   | 0.055 | -   | -   |
| HCM Control Delay (s) | 7.8   | 0   | 9.9   | -   | -   |
| HCM Lane LOS          | A     | A   | A     | -   | -   |
| HCM 95th %tile Q(veh) | 0.1   | -   | 0.2   | -   | -   |

# HCM Signalized Intersection Capacity Analysis

## 1: Battery St & College St

9/14/2016

|                                   |  |  |  |  |  |  |  |  |  |  |  |  |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Movement                          | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations               |  |  |                                                                                   |                                                                                   |  |  |                                                                                    |  |  |                                                                                     |  |  |
| Traffic Volume (vph)              | 98                                                                                | 106                                                                               | 92                                                                                | 21                                                                                | 45                                                                                | 90                                                                                | 56                                                                                 | 556                                                                                 | 25                                                                                  | 63                                                                                  | 536                                                                                 | 100                                                                                 |
| Future Volume (vph)               | 98                                                                                | 106                                                                               | 92                                                                                | 21                                                                                | 45                                                                                | 90                                                                                | 56                                                                                 | 556                                                                                 | 25                                                                                  | 63                                                                                  | 536                                                                                 | 100                                                                                 |
| Ideal Flow (vphpl)                | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                               | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Total Lost time (s)               | 5.0                                                                               | 5.0                                                                               |                                                                                   |                                                                                   | 5.0                                                                               | 5.0                                                                               |                                                                                    | 5.0                                                                                 |                                                                                     |                                                                                     | 5.0                                                                                 |                                                                                     |
| Lane Util. Factor                 | 1.00                                                                              | 1.00                                                                              |                                                                                   |                                                                                   | 1.00                                                                              | 1.00                                                                              |                                                                                    | 0.95                                                                                |                                                                                     |                                                                                     | 0.95                                                                                |                                                                                     |
| Frpb, ped/bikes                   | 1.00                                                                              | 0.85                                                                              |                                                                                   |                                                                                   | 1.00                                                                              | 0.64                                                                              |                                                                                    | 1.00                                                                                |                                                                                     |                                                                                     | 0.95                                                                                |                                                                                     |
| Flpb, ped/bikes                   | 0.67                                                                              | 1.00                                                                              |                                                                                   |                                                                                   | 0.93                                                                              | 1.00                                                                              |                                                                                    | 0.99                                                                                |                                                                                     |                                                                                     | 1.00                                                                                |                                                                                     |
| Frt                               | 1.00                                                                              | 0.93                                                                              |                                                                                   |                                                                                   | 1.00                                                                              | 0.85                                                                              |                                                                                    | 0.99                                                                                |                                                                                     |                                                                                     | 0.98                                                                                |                                                                                     |
| Flt Protected                     | 0.95                                                                              | 1.00                                                                              |                                                                                   |                                                                                   | 0.98                                                                              | 1.00                                                                              |                                                                                    | 1.00                                                                                |                                                                                     |                                                                                     | 1.00                                                                                |                                                                                     |
| Satd. Flow (prot)                 | 1190                                                                              | 1474                                                                              |                                                                                   |                                                                                   | 1668                                                                              | 988                                                                               |                                                                                    | 3426                                                                                |                                                                                     |                                                                                     | 3279                                                                                |                                                                                     |
| Flt Permitted                     | 0.71                                                                              | 1.00                                                                              |                                                                                   |                                                                                   | 0.89                                                                              | 1.00                                                                              |                                                                                    | 0.81                                                                                |                                                                                     |                                                                                     | 0.82                                                                                |                                                                                     |
| Satd. Flow (perm)                 | 895                                                                               | 1474                                                                              |                                                                                   |                                                                                   | 1516                                                                              | 988                                                                               |                                                                                    | 2798                                                                                |                                                                                     |                                                                                     | 2694                                                                                |                                                                                     |
| Peak-hour factor, PHF             | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                               | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                |
| Adj. Flow (vph)                   | 98                                                                                | 106                                                                               | 92                                                                                | 21                                                                                | 45                                                                                | 90                                                                                | 56                                                                                 | 556                                                                                 | 25                                                                                  | 63                                                                                  | 536                                                                                 | 100                                                                                 |
| RTOR Reduction (vph)              | 0                                                                                 | 27                                                                                | 0                                                                                 | 0                                                                                 | 0                                                                                 | 56                                                                                | 0                                                                                  | 5                                                                                   | 0                                                                                   | 0                                                                                   | 21                                                                                  | 0                                                                                   |
| Lane Group Flow (vph)             | 98                                                                                | 171                                                                               | 0                                                                                 | 0                                                                                 | 66                                                                                | 34                                                                                | 0                                                                                  | 632                                                                                 | 0                                                                                   | 0                                                                                   | 678                                                                                 | 0                                                                                   |
| Confl. Peds. (#/hr)               | 396                                                                               |                                                                                   | 253                                                                               | 253                                                                               |                                                                                   | 396                                                                               | 123                                                                                |                                                                                     | 40                                                                                  | 40                                                                                  |                                                                                     | 123                                                                                 |
| Heavy Vehicles (%)                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 4%                                                                                | 4%                                                                                | 4%                                                                                | 3%                                                                                 | 3%                                                                                  | 3%                                                                                  | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  |
| Turn Type                         | Perm                                                                              | NA                                                                                |                                                                                   | Perm                                                                              | NA                                                                                | Perm                                                                              | Perm                                                                               | NA                                                                                  |                                                                                     | Perm                                                                                | NA                                                                                  |                                                                                     |
| Protected Phases                  |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   | 4                                                                                 |                                                                                   |                                                                                    | 2                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     |
| Permitted Phases                  | 4                                                                                 |                                                                                   |                                                                                   | 4                                                                                 |                                                                                   | 4                                                                                 | 2                                                                                  |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     |                                                                                     |
| Actuated Green, G (s)             | 34.0                                                                              | 34.0                                                                              |                                                                                   |                                                                                   | 34.0                                                                              | 34.0                                                                              |                                                                                    | 37.0                                                                                |                                                                                     |                                                                                     | 37.0                                                                                |                                                                                     |
| Effective Green, g (s)            | 34.0                                                                              | 34.0                                                                              |                                                                                   |                                                                                   | 34.0                                                                              | 34.0                                                                              |                                                                                    | 37.0                                                                                |                                                                                     |                                                                                     | 37.0                                                                                |                                                                                     |
| Actuated g/C Ratio                | 0.38                                                                              | 0.38                                                                              |                                                                                   |                                                                                   | 0.38                                                                              | 0.38                                                                              |                                                                                    | 0.41                                                                                |                                                                                     |                                                                                     | 0.41                                                                                |                                                                                     |
| Clearance Time (s)                | 5.0                                                                               | 5.0                                                                               |                                                                                   |                                                                                   | 5.0                                                                               | 5.0                                                                               |                                                                                    | 5.0                                                                                 |                                                                                     |                                                                                     | 5.0                                                                                 |                                                                                     |
| Vehicle Extension (s)             | 3.0                                                                               | 3.0                                                                               |                                                                                   |                                                                                   | 3.0                                                                               | 3.0                                                                               |                                                                                    | 3.0                                                                                 |                                                                                     |                                                                                     | 3.0                                                                                 |                                                                                     |
| Lane Grp Cap (vph)                | 338                                                                               | 556                                                                               |                                                                                   |                                                                                   | 572                                                                               | 373                                                                               |                                                                                    | 1150                                                                                |                                                                                     |                                                                                     | 1107                                                                                |                                                                                     |
| v/s Ratio Prot                    |                                                                                   | c0.12                                                                             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| v/s Ratio Perm                    | 0.11                                                                              |                                                                                   |                                                                                   |                                                                                   | 0.04                                                                              | 0.03                                                                              |                                                                                    | 0.23                                                                                |                                                                                     |                                                                                     | c0.25                                                                               |                                                                                     |
| v/c Ratio                         | 0.29                                                                              | 0.31                                                                              |                                                                                   |                                                                                   | 0.12                                                                              | 0.09                                                                              |                                                                                    | 0.55                                                                                |                                                                                     |                                                                                     | 0.61                                                                                |                                                                                     |
| Uniform Delay, d1                 | 19.6                                                                              | 19.7                                                                              |                                                                                   |                                                                                   | 18.2                                                                              | 18.0                                                                              |                                                                                    | 20.2                                                                                |                                                                                     |                                                                                     | 20.9                                                                                |                                                                                     |
| Progression Factor                | 1.00                                                                              | 1.00                                                                              |                                                                                   |                                                                                   | 1.00                                                                              | 1.00                                                                              |                                                                                    | 1.00                                                                                |                                                                                     |                                                                                     | 1.00                                                                                |                                                                                     |
| Incremental Delay, d2             | 2.2                                                                               | 1.4                                                                               |                                                                                   |                                                                                   | 0.4                                                                               | 0.5                                                                               |                                                                                    | 1.9                                                                                 |                                                                                     |                                                                                     | 2.5                                                                                 |                                                                                     |
| Delay (s)                         | 21.7                                                                              | 21.2                                                                              |                                                                                   |                                                                                   | 18.6                                                                              | 18.5                                                                              |                                                                                    | 22.1                                                                                |                                                                                     |                                                                                     | 23.4                                                                                |                                                                                     |
| Level of Service                  | C                                                                                 | C                                                                                 |                                                                                   |                                                                                   | B                                                                                 | B                                                                                 |                                                                                    | C                                                                                   |                                                                                     |                                                                                     | C                                                                                   |                                                                                     |
| Approach Delay (s)                |                                                                                   | 21.3                                                                              |                                                                                   |                                                                                   | 18.6                                                                              |                                                                                   |                                                                                    | 22.1                                                                                |                                                                                     |                                                                                     | 23.4                                                                                |                                                                                     |
| Approach LOS                      |                                                                                   | C                                                                                 |                                                                                   |                                                                                   | B                                                                                 |                                                                                   |                                                                                    | C                                                                                   |                                                                                     |                                                                                     | C                                                                                   |                                                                                     |
| <b>Intersection Summary</b>       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| HCM 2000 Control Delay            |                                                                                   |                                                                                   | 22.2                                                                              |                                                                                   |                                                                                   |                                                                                   | HCM 2000 Level of Service                                                          |                                                                                     |                                                                                     |                                                                                     | C                                                                                   |                                                                                     |
| HCM 2000 Volume to Capacity ratio |                                                                                   |                                                                                   | 0.42                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Actuated Cycle Length (s)         |                                                                                   |                                                                                   | 90.0                                                                              |                                                                                   |                                                                                   |                                                                                   | Sum of lost time (s)                                                               |                                                                                     |                                                                                     | 12.0                                                                                |                                                                                     |                                                                                     |
| Intersection Capacity Utilization |                                                                                   |                                                                                   | 72.1%                                                                             |                                                                                   |                                                                                   |                                                                                   | ICU Level of Service                                                               |                                                                                     |                                                                                     | C                                                                                   |                                                                                     |                                                                                     |
| Analysis Period (min)             |                                                                                   |                                                                                   | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| c Critical Lane Group             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |

Intersection

Intersection Delay, s/veh10.3

Intersection LOS B

| Movement            | EBU  | EBL  | EBT  | EBR  | WBU  | WBL  | WBT  | WBR  | NBU  | NBL  | NBT  | NBR  | SBU  | SBL  | SBT  | SBR  |
|---------------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| Lane Configurations |      |      | ↕    |      |      |      | ↕    |      |      |      | ↕    |      |      |      | ↕    |      |
| Traffic Vol, veh/h  | 0    | 15   | 110  | 45   | 0    | 21   | 89   | 91   | 0    | 18   | 79   | 46   | 0    | 140  | 120  | 2    |
| Future Vol, veh/h   | 0    | 15   | 110  | 45   | 0    | 21   | 89   | 91   | 0    | 18   | 79   | 46   | 0    | 140  | 120  | 2    |
| Peak Hour Factor    | 0.92 | 1.00 | 1.00 | 1.00 | 0.92 | 1.00 | 1.00 | 1.00 | 0.92 | 1.00 | 1.00 | 1.00 | 0.92 | 1.00 | 1.00 | 1.00 |
| Heavy Vehicles, %   | 2    | 4    | 4    | 4    | 2    | 0    | 0    | 0    | 2    | 0    | 0    | 0    | 2    | 1    | 1    | 1    |
| Mvmt Flow           | 0    | 15   | 110  | 45   | 0    | 21   | 89   | 91   | 0    | 18   | 79   | 46   | 0    | 140  | 120  | 2    |
| Number of Lanes     | 0    | 0    | 1    | 0    | 0    | 0    | 1    | 0    | 0    | 0    | 1    | 0    | 0    | 0    | 1    | 0    |

| Approach                   | EB  | WB | NB  | SB   |
|----------------------------|-----|----|-----|------|
| Opposing Approach          | WB  | EB | SB  | NB   |
| Opposing Lanes             | 1   | 1  | 1   | 1    |
| Conflicting Approach Left  | SB  | NB | EB  | WB   |
| Conflicting Lanes Left     | 1   | 1  | 1   | 1    |
| Conflicting Approach Right | NB  | SB | WB  | EB   |
| Conflicting Lanes Right    | 1   | 1  | 1   | 1    |
| HCM Control Delay          | 9.9 | 10 | 9.4 | 11.4 |
| HCM LOS                    | A   | A  | A   | B    |

| Lane                   | NBLn1 | EBLn1 | WBLn1 | SBLn1 |
|------------------------|-------|-------|-------|-------|
| Vol Left, %            | 13%   | 9%    | 10%   | 53%   |
| Vol Thru, %            | 55%   | 65%   | 44%   | 46%   |
| Vol Right, %           | 32%   | 26%   | 45%   | 1%    |
| Sign Control           | Stop  | Stop  | Stop  | Stop  |
| Traffic Vol by Lane    | 143   | 170   | 201   | 262   |
| LT Vol                 | 18    | 15    | 21    | 140   |
| Through Vol            | 79    | 110   | 89    | 120   |
| RT Vol                 | 46    | 45    | 91    | 2     |
| Lane Flow Rate         | 143   | 170   | 201   | 262   |
| Geometry Grp           | 1     | 1     | 1     | 1     |
| Degree of Util (X)     | 0.203 | 0.246 | 0.279 | 0.38  |
| Departure Headway (Hd) | 5.109 | 5.207 | 5.005 | 5.22  |
| Convergence, Y/N       | Yes   | Yes   | Yes   | Yes   |
| Cap                    | 702   | 690   | 720   | 692   |
| Service Time           | 3.14  | 3.239 | 3.021 | 3.231 |
| HCM Lane V/C Ratio     | 0.204 | 0.246 | 0.279 | 0.379 |
| HCM Control Delay      | 9.4   | 9.9   | 10    | 11.4  |
| HCM Lane LOS           | A     | A     | A     | B     |
| HCM 95th-tile Q        | 0.8   | 1     | 1.1   | 1.8   |

| Intersection             |                                                                                   |        |       |                                                                                   |                                                                                     |      |
|--------------------------|-----------------------------------------------------------------------------------|--------|-------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|------|
| Int Delay, s/veh         | 0.6                                                                               |        |       |                                                                                   |                                                                                     |      |
| Movement                 | EBL                                                                               | EBR    | NBL   | NBT                                                                               | SBT                                                                                 | SBR  |
| Lane Configurations      |  |        |       |  |  |      |
| Traffic Vol, veh/h       | 3                                                                                 | 22     | 14    | 246                                                                               | 295                                                                                 | 4    |
| Future Vol, veh/h        | 3                                                                                 | 22     | 14    | 246                                                                               | 295                                                                                 | 4    |
| Conflicting Peds, #/hr   | 0                                                                                 | 0      | 0     | 0                                                                                 | 0                                                                                   | 0    |
| Sign Control             | Stop                                                                              | Stop   | Free  | Free                                                                              | Free                                                                                | Free |
| RT Channelized           | -                                                                                 | None   | -     | None                                                                              | -                                                                                   | None |
| Storage Length           | 0                                                                                 | -      | -     | -                                                                                 | -                                                                                   | -    |
| Veh in Median Storage, # | 0                                                                                 | -      | -     | 0                                                                                 | 0                                                                                   | -    |
| Grade, %                 | 0                                                                                 | -      | -     | 0                                                                                 | 0                                                                                   | -    |
| Peak Hour Factor         | 100                                                                               | 100    | 100   | 100                                                                               | 100                                                                                 | 100  |
| Heavy Vehicles, %        | 0                                                                                 | 0      | 0     | 0                                                                                 | 0                                                                                   | 0    |
| Mvmt Flow                | 3                                                                                 | 22     | 14    | 246                                                                               | 295                                                                                 | 4    |
| Major/Minor              | Minor2                                                                            | Major1 |       | Major2                                                                            |                                                                                     |      |
| Conflicting Flow All     | 571                                                                               | 297    | 299   | 0                                                                                 | -                                                                                   | 0    |
| Stage 1                  | 297                                                                               | -      | -     | -                                                                                 | -                                                                                   | -    |
| Stage 2                  | 274                                                                               | -      | -     | -                                                                                 | -                                                                                   | -    |
| Critical Hdwy            | 6.4                                                                               | 6.2    | 4.1   | -                                                                                 | -                                                                                   | -    |
| Critical Hdwy Stg 1      | 5.4                                                                               | -      | -     | -                                                                                 | -                                                                                   | -    |
| Critical Hdwy Stg 2      | 5.4                                                                               | -      | -     | -                                                                                 | -                                                                                   | -    |
| Follow-up Hdwy           | 3.5                                                                               | 3.3    | 2.2   | -                                                                                 | -                                                                                   | -    |
| Pot Cap-1 Maneuver       | 486                                                                               | 747    | 1274  | -                                                                                 | -                                                                                   | -    |
| Stage 1                  | 758                                                                               | -      | -     | -                                                                                 | -                                                                                   | -    |
| Stage 2                  | 777                                                                               | -      | -     | -                                                                                 | -                                                                                   | -    |
| Platoon blocked, %       |                                                                                   |        |       | -                                                                                 | -                                                                                   | -    |
| Mov Cap-1 Maneuver       | 480                                                                               | 747    | 1274  | -                                                                                 | -                                                                                   | -    |
| Mov Cap-2 Maneuver       | 480                                                                               | -      | -     | -                                                                                 | -                                                                                   | -    |
| Stage 1                  | 758                                                                               | -      | -     | -                                                                                 | -                                                                                   | -    |
| Stage 2                  | 767                                                                               | -      | -     | -                                                                                 | -                                                                                   | -    |
| Approach                 | EB                                                                                | NB     |       | SB                                                                                |                                                                                     |      |
| HCM Control Delay, s     | 10.3                                                                              | 0.4    |       | 0                                                                                 |                                                                                     |      |
| HCM LOS                  | B                                                                                 |        |       |                                                                                   |                                                                                     |      |
| Minor Lane/Major Mvmt    | NBL                                                                               | NBT    | EBLn1 | SBT                                                                               | SBR                                                                                 |      |
| Capacity (veh/h)         | 1274                                                                              | -      | 700   | -                                                                                 | -                                                                                   |      |
| HCM Lane V/C Ratio       | 0.011                                                                             | -      | 0.036 | -                                                                                 | -                                                                                   |      |
| HCM Control Delay (s)    | 7.9                                                                               | 0      | 10.3  | -                                                                                 | -                                                                                   |      |
| HCM Lane LOS             | A                                                                                 | A      | B     | -                                                                                 | -                                                                                   |      |
| HCM 95th %tile Q(veh)    | 0                                                                                 | -      | 0.1   | -                                                                                 | -                                                                                   |      |



## APPENDIX D

# SIMTRAFFIC REPORTS

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# Queuing and Blocking Report

## No Build

8/11/2016

### Intersection: 1: Battery St & College St

| Movement              | EB  | EB  | WB   | WB | NB  | NB  | SB   | SB   |
|-----------------------|-----|-----|------|----|-----|-----|------|------|
| Directions Served     | L   | TR  | LT   | R  | LT  | TR  | LT   | TR   |
| Maximum Queue (ft)    | 172 | 95  | 227  | 52 | 316 | 293 | 282  | 263  |
| Average Queue (ft)    | 76  | 62  | 98   | 44 | 187 | 162 | 166  | 137  |
| 95th Queue (ft)       | 150 | 109 | 190  | 51 | 282 | 265 | 256  | 236  |
| Link Distance (ft)    | 165 |     | 1214 |    | 988 | 988 | 1012 | 1012 |
| Upstream Blk Time (%) | 1   |     |      |    |     |     |      |      |
| Queuing Penalty (veh) | 2   |     |      |    |     |     |      |      |
| Storage Bay Dist (ft) |     | 70  |      | 20 |     |     |      |      |
| Storage Blk Time (%)  | 13  | 10  | 43   | 32 |     |     |      |      |
| Queuing Penalty (veh) | 13  | 9   | 65   | 27 |     |     |      |      |

### Intersection: 2: Main St/Lake St & College St

| Movement              | EB  | WB  | NB  | SB   |
|-----------------------|-----|-----|-----|------|
| Directions Served     | LTR | LTR | LTR | LTR  |
| Maximum Queue (ft)    | 85  | 155 | 156 | 179  |
| Average Queue (ft)    | 35  | 67  | 68  | 68   |
| 95th Queue (ft)       | 67  | 126 | 125 | 143  |
| Link Distance (ft)    | 314 | 165 | 434 | 1540 |
| Upstream Blk Time (%) |     | 0   |     |      |
| Queuing Penalty (veh) |     | 1   |     |      |
| Storage Bay Dist (ft) |     |     |     |      |
| Storage Blk Time (%)  |     |     |     |      |
| Queuing Penalty (veh) |     |     |     |      |

### Intersection: 3: Lake St & Penny Ln

| Movement              | EB  | NB  | SB  |
|-----------------------|-----|-----|-----|
| Directions Served     | LR  | LT  | TR  |
| Maximum Queue (ft)    | 27  | 35  | 2   |
| Average Queue (ft)    | 9   | 3   | 0   |
| 95th Queue (ft)       | 27  | 20  | 2   |
| Link Distance (ft)    | 547 | 125 | 446 |
| Upstream Blk Time (%) |     |     |     |
| Queuing Penalty (veh) |     |     |     |
| Storage Bay Dist (ft) |     |     |     |
| Storage Blk Time (%)  |     |     |     |
| Queuing Penalty (veh) |     |     |     |

### Network Summary

Network wide Queuing Penalty: 118

## Queuing and Blocking Report

Build

8/11/2016

### Intersection: 1: Battery St & College St

| Movement              | EB  | EB  | WB   | WB | NB  | NB  | SB   | SB   |
|-----------------------|-----|-----|------|----|-----|-----|------|------|
| Directions Served     | L   | TR  | LT   | R  | LT  | TR  | LT   | TR   |
| Maximum Queue (ft)    | 172 | 95  | 221  | 52 | 320 | 280 | 285  | 273  |
| Average Queue (ft)    | 84  | 62  | 102  | 44 | 188 | 161 | 166  | 138  |
| 95th Queue (ft)       | 157 | 109 | 188  | 52 | 279 | 258 | 251  | 236  |
| Link Distance (ft)    | 165 |     | 1214 |    | 988 | 988 | 1012 | 1012 |
| Upstream Blk Time (%) | 2   |     |      |    |     |     |      |      |
| Queuing Penalty (veh) | 4   |     |      |    |     |     |      |      |
| Storage Bay Dist (ft) |     | 70  |      | 20 |     |     |      |      |
| Storage Blk Time (%)  | 17  | 8   | 43   | 32 |     |     |      |      |
| Queuing Penalty (veh) | 18  | 8   | 64   | 28 |     |     |      |      |

### Intersection: 2: Main St/Lake St & College St

| Movement              | EB  | WB  | NB  | SB   |
|-----------------------|-----|-----|-----|------|
| Directions Served     | LTR | LTR | LTR | LTR  |
| Maximum Queue (ft)    | 87  | 171 | 164 | 165  |
| Average Queue (ft)    | 35  | 77  | 75  | 72   |
| 95th Queue (ft)       | 67  | 141 | 132 | 135  |
| Link Distance (ft)    | 314 | 165 | 434 | 1540 |
| Upstream Blk Time (%) |     | 1   |     |      |
| Queuing Penalty (veh) |     | 2   |     |      |
| Storage Bay Dist (ft) |     |     |     |      |
| Storage Blk Time (%)  |     |     |     |      |
| Queuing Penalty (veh) |     |     |     |      |

### Intersection: 3: Lake St & Penny Ln

| Movement              | EB  | NB  |
|-----------------------|-----|-----|
| Directions Served     | LR  | LT  |
| Maximum Queue (ft)    | 27  | 39  |
| Average Queue (ft)    | 7   | 3   |
| 95th Queue (ft)       | 25  | 18  |
| Link Distance (ft)    | 547 | 125 |
| Upstream Blk Time (%) |     |     |
| Queuing Penalty (veh) |     |     |
| Storage Bay Dist (ft) |     |     |
| Storage Blk Time (%)  |     |     |
| Queuing Penalty (veh) |     |     |

### Network Summary

Network wide Queuing Penalty: 124



# Queuing and Blocking Report

## No Build

8/11/2016

### Intersection: 1: Battery St & College St

| Movement              | EB  | EB  | WB   | WB | NB  | NB  | SB   | SB   |
|-----------------------|-----|-----|------|----|-----|-----|------|------|
| Directions Served     | L   | TR  | LT   | R  | LT  | TR  | LT   | TR   |
| Maximum Queue (ft)    | 181 | 95  | 157  | 56 | 259 | 228 | 231  | 216  |
| Average Queue (ft)    | 109 | 84  | 58   | 39 | 149 | 114 | 135  | 100  |
| 95th Queue (ft)       | 194 | 112 | 123  | 59 | 229 | 204 | 211  | 191  |
| Link Distance (ft)    | 165 |     | 1214 |    | 988 | 988 | 1012 | 1012 |
| Upstream Blk Time (%) | 4   |     |      |    |     |     |      |      |
| Queuing Penalty (veh) | 12  |     |      |    |     |     |      |      |
| Storage Bay Dist (ft) |     | 70  |      | 20 |     |     |      |      |
| Storage Blk Time (%)  | 13  | 26  | 29   | 15 |     |     |      |      |
| Queuing Penalty (veh) | 24  | 24  | 26   | 9  |     |     |      |      |

### Intersection: 2: Main St/Lake St & College St

| Movement              | EB  | WB  | NB  | SB   |
|-----------------------|-----|-----|-----|------|
| Directions Served     | LTR | LTR | LTR | LTR  |
| Maximum Queue (ft)    | 185 | 166 | 131 | 416  |
| Average Queue (ft)    | 72  | 73  | 62  | 192  |
| 95th Queue (ft)       | 154 | 136 | 109 | 377  |
| Link Distance (ft)    | 314 | 165 | 434 | 1540 |
| Upstream Blk Time (%) | 0   | 1   |     |      |
| Queuing Penalty (veh) | 0   | 2   |     |      |
| Storage Bay Dist (ft) |     |     |     |      |
| Storage Blk Time (%)  |     |     |     |      |
| Queuing Penalty (veh) |     |     |     |      |

### Intersection: 3: Lake St & Penny Ln

| Movement              | EB  | NB  |
|-----------------------|-----|-----|
| Directions Served     | LR  | LT  |
| Maximum Queue (ft)    | 41  | 61  |
| Average Queue (ft)    | 17  | 9   |
| 95th Queue (ft)       | 36  | 37  |
| Link Distance (ft)    | 547 | 125 |
| Upstream Blk Time (%) |     |     |
| Queuing Penalty (veh) |     |     |
| Storage Bay Dist (ft) |     |     |
| Storage Blk Time (%)  |     |     |
| Queuing Penalty (veh) |     |     |

### Network Summary

Network wide Queuing Penalty: 97

### Intersection: 1: Battery St & College St

| Movement              | EB  | EB  | WB   | WB | NB  | NB  | SB   | SB   |
|-----------------------|-----|-----|------|----|-----|-----|------|------|
| Directions Served     | L   | TR  | LT   | R  | LT  | TR  | LT   | TR   |
| Maximum Queue (ft)    | 179 | 95  | 166  | 64 | 260 | 235 | 224  | 217  |
| Average Queue (ft)    | 107 | 81  | 61   | 39 | 149 | 111 | 134  | 108  |
| 95th Queue (ft)       | 195 | 113 | 127  | 62 | 224 | 204 | 208  | 193  |
| Link Distance (ft)    | 165 |     | 1214 |    | 988 | 988 | 1012 | 1012 |
| Upstream Blk Time (%) | 5   |     |      |    |     |     |      |      |
| Queuing Penalty (veh) | 13  |     |      |    |     |     |      |      |
| Storage Bay Dist (ft) |     | 70  |      | 20 |     |     |      |      |
| Storage Blk Time (%)  | 12  | 28  | 30   | 14 |     |     |      |      |
| Queuing Penalty (veh) | 23  | 27  | 27   | 9  |     |     |      |      |

### Intersection: 2: Main St/Lake St & College St

| Movement              | EB  | WB  | NB  | SB   |
|-----------------------|-----|-----|-----|------|
| Directions Served     | LTR | LTR | LTR | LTR  |
| Maximum Queue (ft)    | 161 | 162 | 132 | 504  |
| Average Queue (ft)    | 69  | 73  | 63  | 247  |
| 95th Queue (ft)       | 134 | 132 | 113 | 543  |
| Link Distance (ft)    | 314 | 165 | 434 | 1540 |
| Upstream Blk Time (%) |     | 1   |     |      |
| Queuing Penalty (veh) |     | 1   |     |      |
| Storage Bay Dist (ft) |     |     |     |      |
| Storage Blk Time (%)  |     |     |     |      |
| Queuing Penalty (veh) |     |     |     |      |

### Intersection: 3: Lake St & Penny Ln

| Movement              | EB  | NB  |
|-----------------------|-----|-----|
| Directions Served     | LR  | LT  |
| Maximum Queue (ft)    | 36  | 35  |
| Average Queue (ft)    | 13  | 3   |
| 95th Queue (ft)       | 32  | 20  |
| Link Distance (ft)    | 547 | 125 |
| Upstream Blk Time (%) |     |     |
| Queuing Penalty (veh) |     |     |
| Storage Bay Dist (ft) |     |     |
| Storage Blk Time (%)  |     |     |
| Queuing Penalty (veh) |     |     |

### Network Summary

Network wide Queuing Penalty: 100

# Queuing and Blocking Report

## No Build

8/11/2016

### Intersection: 1: Battery St & College St

| Movement              | EB  | EB  | WB   | WB | NB  | NB  | SB   | SB   |
|-----------------------|-----|-----|------|----|-----|-----|------|------|
| Directions Served     | L   | TR  | LT   | R  | LT  | TR  | LT   | TR   |
| Maximum Queue (ft)    | 178 | 95  | 214  | 58 | 318 | 275 | 300  | 267  |
| Average Queue (ft)    | 92  | 67  | 96   | 45 | 187 | 158 | 163  | 136  |
| 95th Queue (ft)       | 172 | 115 | 179  | 52 | 278 | 255 | 256  | 232  |
| Link Distance (ft)    | 165 |     | 1214 |    | 988 | 988 | 1012 | 1012 |
| Upstream Blk Time (%) | 3   |     |      |    |     |     |      |      |
| Queuing Penalty (veh) | 6   |     |      |    |     |     |      |      |
| Storage Bay Dist (ft) |     | 70  |      | 20 |     |     |      |      |
| Storage Blk Time (%)  | 22  | 9   | 41   | 31 |     |     |      |      |
| Queuing Penalty (veh) | 22  | 9   | 64   | 27 |     |     |      |      |

### Intersection: 2: Main St/Lake St & College St

| Movement              | EB  | WB  | NB  | SB   |
|-----------------------|-----|-----|-----|------|
| Directions Served     | LTR | LTR | LTR | LTR  |
| Maximum Queue (ft)    | 77  | 151 | 157 | 168  |
| Average Queue (ft)    | 36  | 65  | 69  | 72   |
| 95th Queue (ft)       | 65  | 114 | 121 | 133  |
| Link Distance (ft)    | 314 | 165 | 434 | 1540 |
| Upstream Blk Time (%) |     | 0   |     |      |
| Queuing Penalty (veh) |     | 1   |     |      |
| Storage Bay Dist (ft) |     |     |     |      |
| Storage Blk Time (%)  |     |     |     |      |
| Queuing Penalty (veh) |     |     |     |      |

### Intersection: 3: Lake St & Penny Ln

| Movement              | EB  | NB  |
|-----------------------|-----|-----|
| Directions Served     | LR  | LT  |
| Maximum Queue (ft)    | 27  | 40  |
| Average Queue (ft)    | 12  | 4   |
| 95th Queue (ft)       | 31  | 23  |
| Link Distance (ft)    | 547 | 125 |
| Upstream Blk Time (%) |     |     |
| Queuing Penalty (veh) |     |     |
| Storage Bay Dist (ft) |     |     |
| Storage Blk Time (%)  |     |     |
| Queuing Penalty (veh) |     |     |

### Network Summary

Network wide Queuing Penalty: 128

### Intersection: 1: Battery St & College St

| Movement              | EB  | EB  | WB   | WB | NB  | NB  | SB   | SB   |
|-----------------------|-----|-----|------|----|-----|-----|------|------|
| Directions Served     | L   | TR  | LT   | R  | LT  | TR  | LT   | TR   |
| Maximum Queue (ft)    | 177 | 95  | 247  | 59 | 352 | 296 | 262  | 235  |
| Average Queue (ft)    | 87  | 65  | 107  | 44 | 185 | 158 | 163  | 136  |
| 95th Queue (ft)       | 165 | 110 | 204  | 54 | 286 | 258 | 243  | 224  |
| Link Distance (ft)    | 165 |     | 1214 |    | 988 | 988 | 1012 | 1012 |
| Upstream Blk Time (%) | 2   |     |      |    |     |     |      |      |
| Queuing Penalty (veh) | 4   |     |      |    |     |     |      |      |
| Storage Bay Dist (ft) |     | 70  |      | 20 |     |     |      |      |
| Storage Blk Time (%)  | 18  | 9   | 44   | 33 |     |     |      |      |
| Queuing Penalty (veh) | 19  | 9   | 68   | 29 |     |     |      |      |

### Intersection: 2: Main St/Lake St & College St

| Movement              | EB  | WB  | NB  | SB   |
|-----------------------|-----|-----|-----|------|
| Directions Served     | LTR | LTR | LTR | LTR  |
| Maximum Queue (ft)    | 80  | 153 | 164 | 181  |
| Average Queue (ft)    | 35  | 71  | 72  | 75   |
| 95th Queue (ft)       | 63  | 124 | 128 | 141  |
| Link Distance (ft)    | 314 | 165 | 434 | 1540 |
| Upstream Blk Time (%) |     | 0   |     |      |
| Queuing Penalty (veh) |     | 0   |     |      |
| Storage Bay Dist (ft) |     |     |     |      |
| Storage Blk Time (%)  |     |     |     |      |
| Queuing Penalty (veh) |     |     |     |      |

### Intersection: 3: Lake St & Penny Ln

| Movement              | EB  | NB  |
|-----------------------|-----|-----|
| Directions Served     | LR  | LT  |
| Maximum Queue (ft)    | 24  | 43  |
| Average Queue (ft)    | 8   | 2   |
| 95th Queue (ft)       | 26  | 17  |
| Link Distance (ft)    | 547 | 125 |
| Upstream Blk Time (%) |     |     |
| Queuing Penalty (veh) |     |     |
| Storage Bay Dist (ft) |     |     |
| Storage Blk Time (%)  |     |     |
| Queuing Penalty (veh) |     |     |

### Network Summary

Network wide Queuing Penalty: 130

# Queuing and Blocking Report

## No Build

8/11/2016

### Intersection: 1: Battery St & College St

| Movement              | EB  | EB  | WB   | WB | NB  | NB  | SB   | SB   |
|-----------------------|-----|-----|------|----|-----|-----|------|------|
| Directions Served     | L   | TR  | LT   | R  | LT  | TR  | LT   | TR   |
| Maximum Queue (ft)    | 181 | 95  | 160  | 64 | 248 | 217 | 255  | 229  |
| Average Queue (ft)    | 107 | 83  | 61   | 39 | 145 | 111 | 141  | 111  |
| 95th Queue (ft)       | 192 | 111 | 126  | 61 | 225 | 203 | 224  | 201  |
| Link Distance (ft)    | 165 |     | 1214 |    | 988 | 988 | 1012 | 1012 |
| Upstream Blk Time (%) | 5   |     |      |    |     |     |      |      |
| Queuing Penalty (veh) | 13  |     |      |    |     |     |      |      |
| Storage Bay Dist (ft) |     | 70  |      | 20 |     |     |      |      |
| Storage Blk Time (%)  | 13  | 27  | 32   | 14 |     |     |      |      |
| Queuing Penalty (veh) | 25  | 26  | 28   | 9  |     |     |      |      |

### Intersection: 2: Main St/Lake St & College St

| Movement              | EB  | WB  | NB  | SB   |
|-----------------------|-----|-----|-----|------|
| Directions Served     | LTR | LTR | LTR | LTR  |
| Maximum Queue (ft)    | 194 | 162 | 142 | 501  |
| Average Queue (ft)    | 76  | 73  | 64  | 244  |
| 95th Queue (ft)       | 149 | 133 | 114 | 524  |
| Link Distance (ft)    | 314 | 165 | 434 | 1540 |
| Upstream Blk Time (%) |     | 1   |     |      |
| Queuing Penalty (veh) |     | 1   |     |      |
| Storage Bay Dist (ft) |     |     |     |      |
| Storage Blk Time (%)  |     |     |     |      |
| Queuing Penalty (veh) |     |     |     |      |

### Intersection: 3: Lake St & Penny Ln

| Movement              | EB  | NB  | SB  |
|-----------------------|-----|-----|-----|
| Directions Served     | LR  | LT  | TR  |
| Maximum Queue (ft)    | 45  | 58  | 2   |
| Average Queue (ft)    | 18  | 10  | 0   |
| 95th Queue (ft)       | 38  | 40  | 2   |
| Link Distance (ft)    | 547 | 125 | 446 |
| Upstream Blk Time (%) |     |     |     |
| Queuing Penalty (veh) |     |     |     |
| Storage Bay Dist (ft) |     |     |     |
| Storage Blk Time (%)  |     |     |     |
| Queuing Penalty (veh) |     |     |     |

### Network Summary

Network wide Queuing Penalty: 103

### Intersection: 1: Battery St & College St

| Movement              | EB  | EB  | WB   | WB | NB  | NB  | SB   | SB   |
|-----------------------|-----|-----|------|----|-----|-----|------|------|
| Directions Served     | L   | TR  | LT   | R  | LT  | TR  | LT   | TR   |
| Maximum Queue (ft)    | 180 | 95  | 153  | 64 | 272 | 236 | 236  | 224  |
| Average Queue (ft)    | 110 | 83  | 65   | 39 | 146 | 108 | 136  | 109  |
| 95th Queue (ft)       | 195 | 111 | 128  | 61 | 227 | 202 | 216  | 199  |
| Link Distance (ft)    | 165 |     | 1214 |    | 988 | 988 | 1012 | 1012 |
| Upstream Blk Time (%) | 4   |     |      |    |     |     |      |      |
| Queuing Penalty (veh) | 13  |     |      |    |     |     |      |      |
| Storage Bay Dist (ft) |     | 70  |      | 20 |     |     |      |      |
| Storage Blk Time (%)  | 11  | 30  | 33   | 15 |     |     |      |      |
| Queuing Penalty (veh) | 22  | 29  | 30   | 10 |     |     |      |      |

### Intersection: 2: Main St/Lake St & College St

| Movement              | EB  | WB  | NB  | SB   |
|-----------------------|-----|-----|-----|------|
| Directions Served     | LTR | LTR | LTR | LTR  |
| Maximum Queue (ft)    | 176 | 160 | 158 | 551  |
| Average Queue (ft)    | 76  | 77  | 66  | 300  |
| 95th Queue (ft)       | 150 | 142 | 127 | 640  |
| Link Distance (ft)    | 314 | 165 | 434 | 1540 |
| Upstream Blk Time (%) |     | 1   |     |      |
| Queuing Penalty (veh) |     | 2   |     |      |
| Storage Bay Dist (ft) |     |     |     |      |
| Storage Blk Time (%)  |     |     |     |      |
| Queuing Penalty (veh) |     |     |     |      |

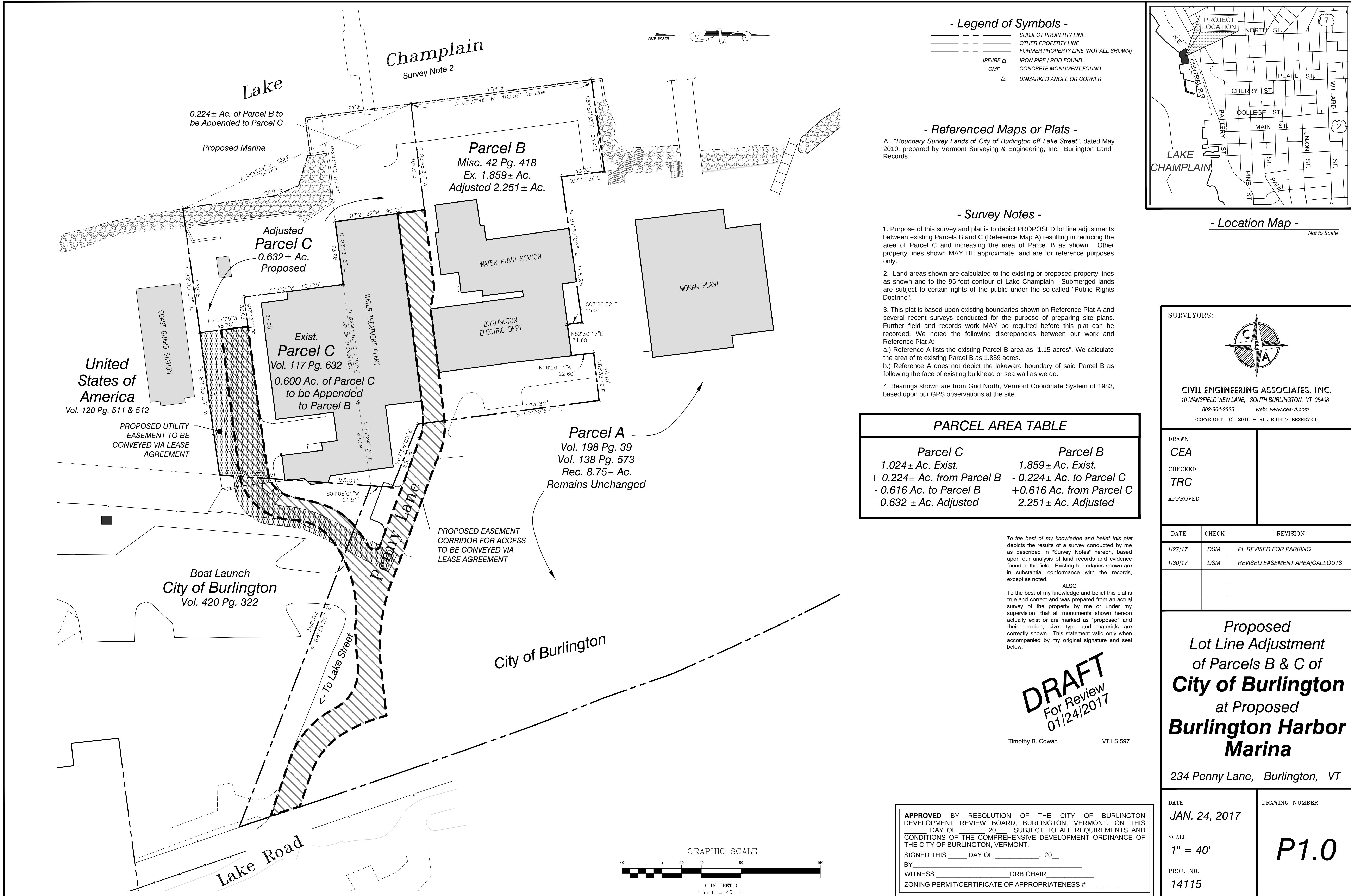
### Intersection: 3: Lake St & Penny Ln

| Movement              | EB  | NB  |
|-----------------------|-----|-----|
| Directions Served     | LR  | LT  |
| Maximum Queue (ft)    | 33  | 48  |
| Average Queue (ft)    | 13  | 4   |
| 95th Queue (ft)       | 33  | 24  |
| Link Distance (ft)    | 547 | 125 |
| Upstream Blk Time (%) |     |     |
| Queuing Penalty (veh) |     |     |
| Storage Bay Dist (ft) |     |     |
| Storage Blk Time (%)  |     |     |
| Queuing Penalty (veh) |     |     |

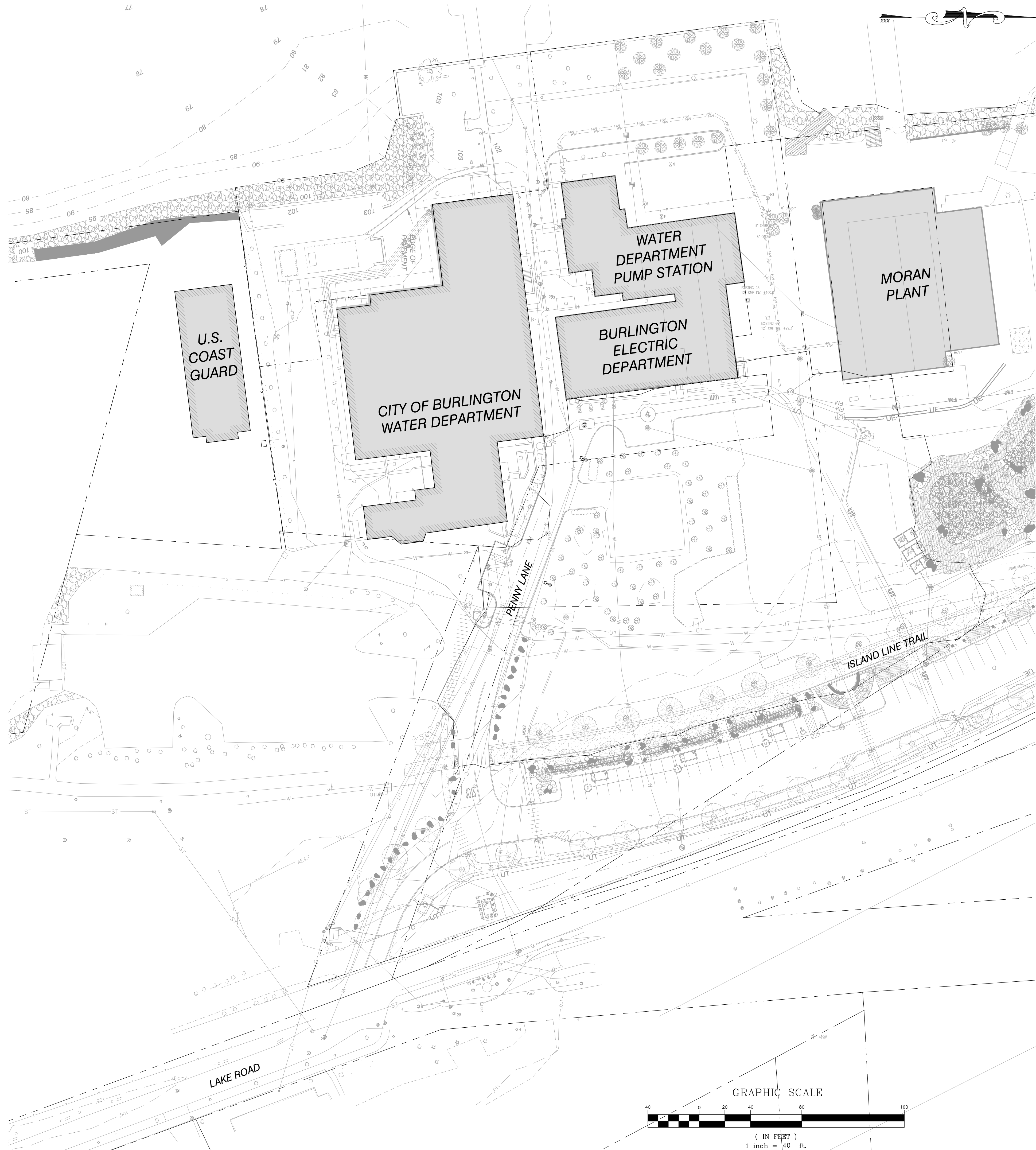
### Network Summary

Network wide Queuing Penalty: 106









NOTES

1. UTILITIES SHOWN DO NOT PURPORT TO CONSTITUTE OR REPRESENT ALL UTILITIES LOCATED UPON OR ADJACENT TO THE SURVEYED PREMISES. EXISTING UTILITY LOCATIONS ARE APPROXIMATE ONLY. THE CONTRACTOR SHALL FIELD VERIFY ALL UTILITY CONFLICTS. ALL DISCREPANCIES SHALL BE REPORTED TO THE ENGINEER. THE CONTRACTOR SHALL CONTACT DIG SAFE (888-344-7233) PRIOR TO ANY CONSTRUCTION.
2. THIS PLAN IS NOT A BOUNDARY SURVEY AND IS NOT INTENDED TO BE USED AS ONE.
3. PROPERTY LINE INFORMATION IS APPROXIMATE AND BASED ON EXISTING TAX MAP INFORMATION. THIS PLAN IS NOT A BOUNDARY SURVEY AND IS NOT INTENDED TO BE USED AS ONE.

SITE ENGINEER:



CIVIL ENGINEERING ASSOCIATES, INC.  
10 MANSFIELD VIEW LANE, SOUTH BURLINGTON, VT 05403  
802-864-2323 FAX: 802-864-2271 web: www.cea-vt.com

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DRAWN  
SAL  
CHECKED  
DSM  
APPROVED  
DSM

OWNER:

**BURLINGTON  
HARBOR MARINA  
LLC**

1 CHURCH STREET  
BURLINGTON VT 05401

PROJECT:

**BURLINGTON  
HARBOR MARINA**

234 PENNY LANE  
BURLINGTON VT 05401



LOCATION MAP

1" = 2000'

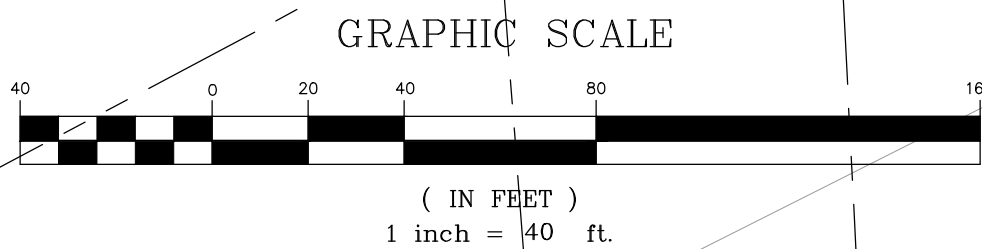
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|         |         |               |
|         |         |               |

**EXISTING  
CONDITIONS  
OVERALL SITE  
PLAN**

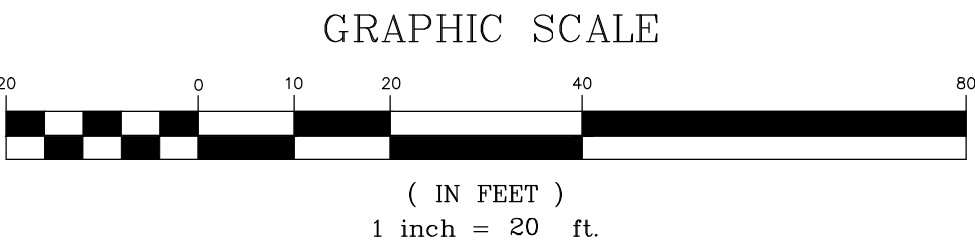
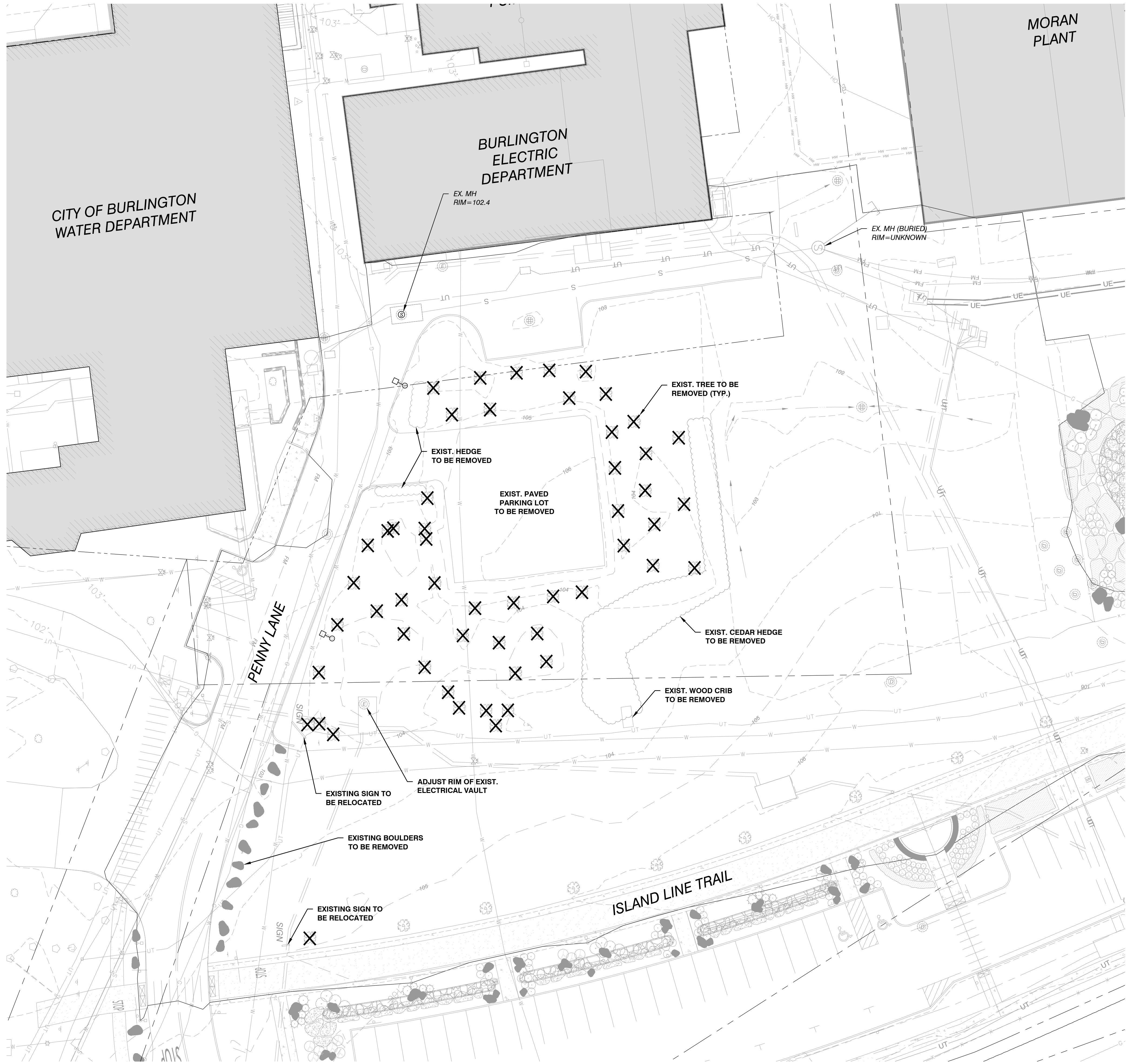
DATE  
JAN. 13, 2017  
SCALE  
1" = 40'  
PROJ. NO.  
14115

DRAWING NUMBER

**C1.0**







SITE ENGINEER:



CIVIL ENGINEERING ASSOCIATES, INC.  
10 MANSFIELD VIEW LANE, SOUTH BURLINGTON, VT 05403  
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|                 |  |
|-----------------|--|
| DRAWN<br>SAL    |  |
| CHECKED<br>DSM  |  |
| APPROVED<br>DSM |  |

OWNER:

**BURLINGTON  
HARBOR MARINA  
LLC**  
1 CHURCH STREET  
BURLINGTON VT 05401

PROJECT:

**BURLINGTON  
HARBOR MARINA**

234 PENNY LANE  
BURLINGTON VT 05401



LOCATION MAP

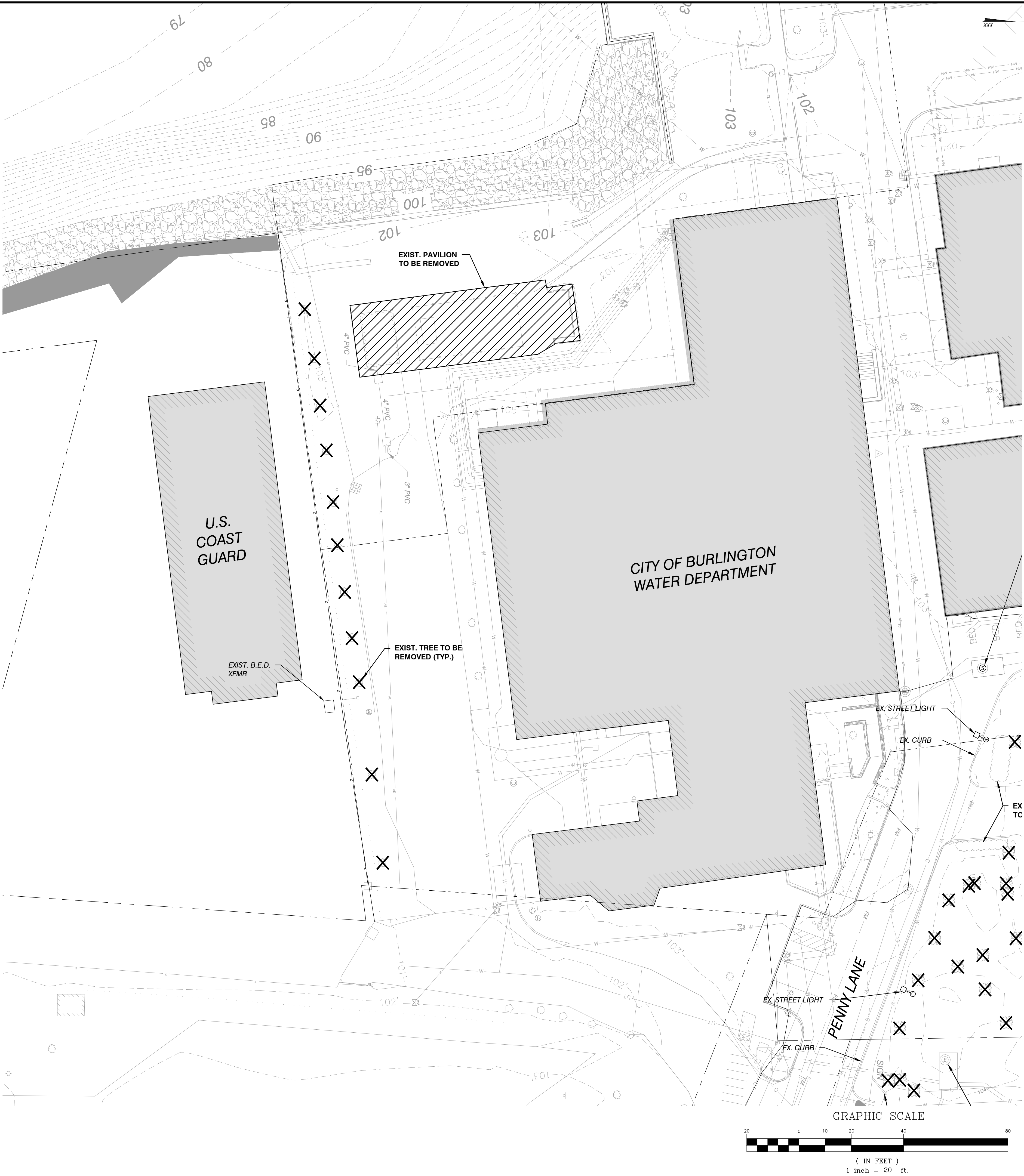
1" = 2000'

| DATE    | CHECKED | REVISION      |
|---------|---------|---------------|
| 1/24/17 | DSM     | MISC. CHANGES |
|         |         |               |
|         |         |               |
|         |         |               |
|         |         |               |
|         |         |               |
|         |         |               |

**EXISTING  
CONDITIONS/  
DEMOLITION  
PARTIAL SITE PLAN**

|                       |                               |
|-----------------------|-------------------------------|
| DATE<br>JAN. 13, 2017 | DRAWING NUMBER<br><b>C1.1</b> |
| SCALE<br>1" = 20'     |                               |
| PROJ. NO.<br>14115    |                               |





SITE ENGINEER:



CIVIL ENGINEERING ASSOCIATES, INC.  
10 MANSFIELD VIEW LANE, SOUTH BURLINGTON, VT 05403  
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DRAWN

SAL

CHECKED

DSM

APPROVED

DSM

OWNER:

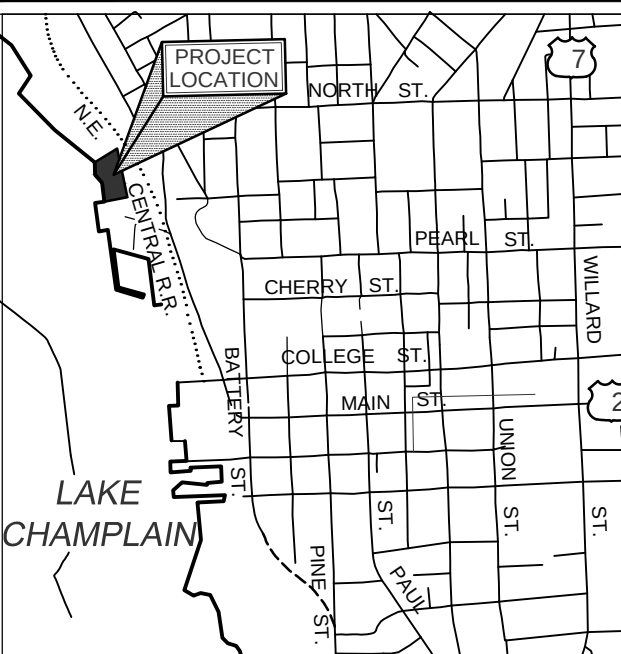
**BURLINGTON  
HARBOR MARINA  
LLC**

1 CHURCH STREET  
BURLINGTON VT 05401

PROJECT:

**BURLINGTON  
HARBOR MARINA**

234 PENNY LANE  
BURLINGTON VT 05401



LOCATION MAP

1" = 2000'

| DATE    | CHECKED | REVISION      |
|---------|---------|---------------|
| 1/24/17 | DSM     | MISC. CHANGES |
|         |         |               |
|         |         |               |
|         |         |               |
|         |         |               |
|         |         |               |
|         |         |               |
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**EXISTING  
CONDITIONS  
PARTIAL SITE PLAN**

DATE  
JAN. 13, 2017

SCALE  
1" = 20'

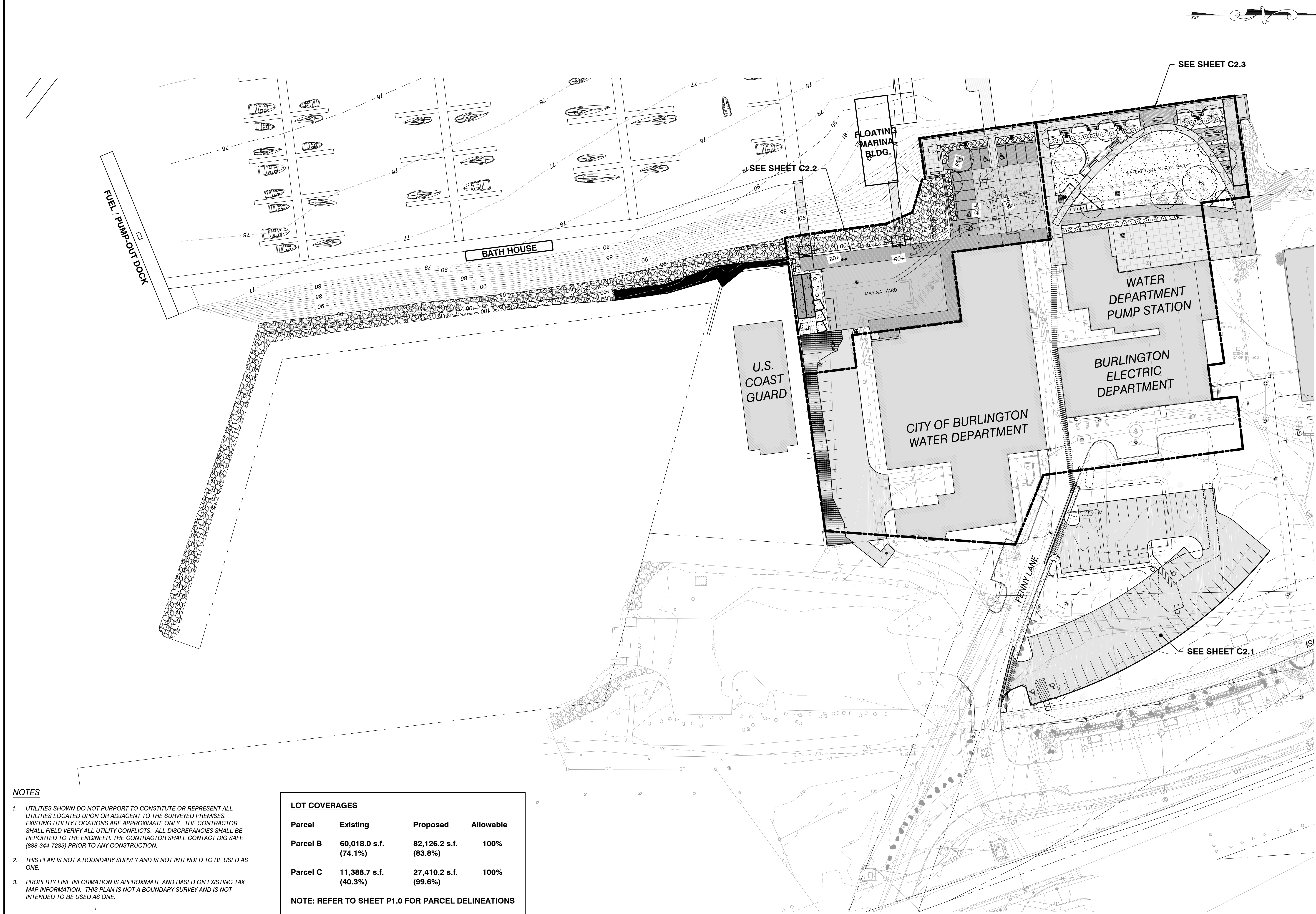
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14115

DRAWING NUMBER

**C1.2**



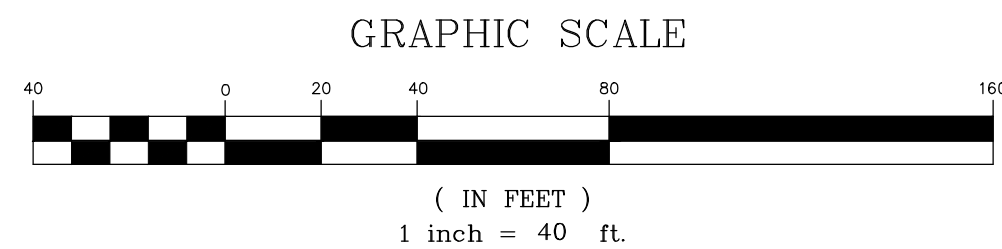
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NOTES

- UTILITIES SHOWN DO NOT PURPORT TO CONSTITUTE OR REPRESENT ALL UTILITIES LOCATED UPON OR ADJACENT TO THE SURVEYED PREMISES. EXISTING UTILITY LOCATIONS ARE APPROXIMATE ONLY. THE CONTRACTOR SHALL FIELD VERIFY ALL UTILITY CONFLICTS. ALL DISCREPANCIES SHALL BE REPORTED TO THE ENGINEER. THE CONTRACTOR SHALL CONTACT DIG SAFE (888-344-7233) PRIOR TO ANY CONSTRUCTION.
- THIS PLAN IS NOT A BOUNDARY SURVEY AND IS NOT INTENDED TO BE USED AS ONE.
- PROPERTY LINE INFORMATION IS APPROXIMATE AND BASED ON EXISTING TAX MAP INFORMATION. THIS PLAN IS NOT A BOUNDARY SURVEY AND IS NOT INTENDED TO BE USED AS ONE.

| LOT COVERAGES                                     |                          |                          |           |
|---------------------------------------------------|--------------------------|--------------------------|-----------|
| Parcel                                            | Existing                 | Proposed                 | Allowable |
| Parcel B                                          | 60,018.0 s.f.<br>(74.1%) | 82,126.2 s.f.<br>(83.8%) | 100%      |
| Parcel C                                          | 11,388.7 s.f.<br>(40.3%) | 27,410.2 s.f.<br>(99.6%) | 100%      |
| NOTE: REFER TO SHEET P1.0 FOR PARCEL DELINEATIONS |                          |                          |           |



SITE ENGINEER:  
  
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OWNER:  
**BURLINGTON  
HARBOR MARINA  
LLC**  
1 CHURCH STREET  
BURLINGTON VT 05401

PROJECT:  
**BURLINGTON  
HARBOR MARINA**  
  
234 PENNY LANE  
BURLINGTON VT 05401



LOCATION MAP  
1" = 2000'

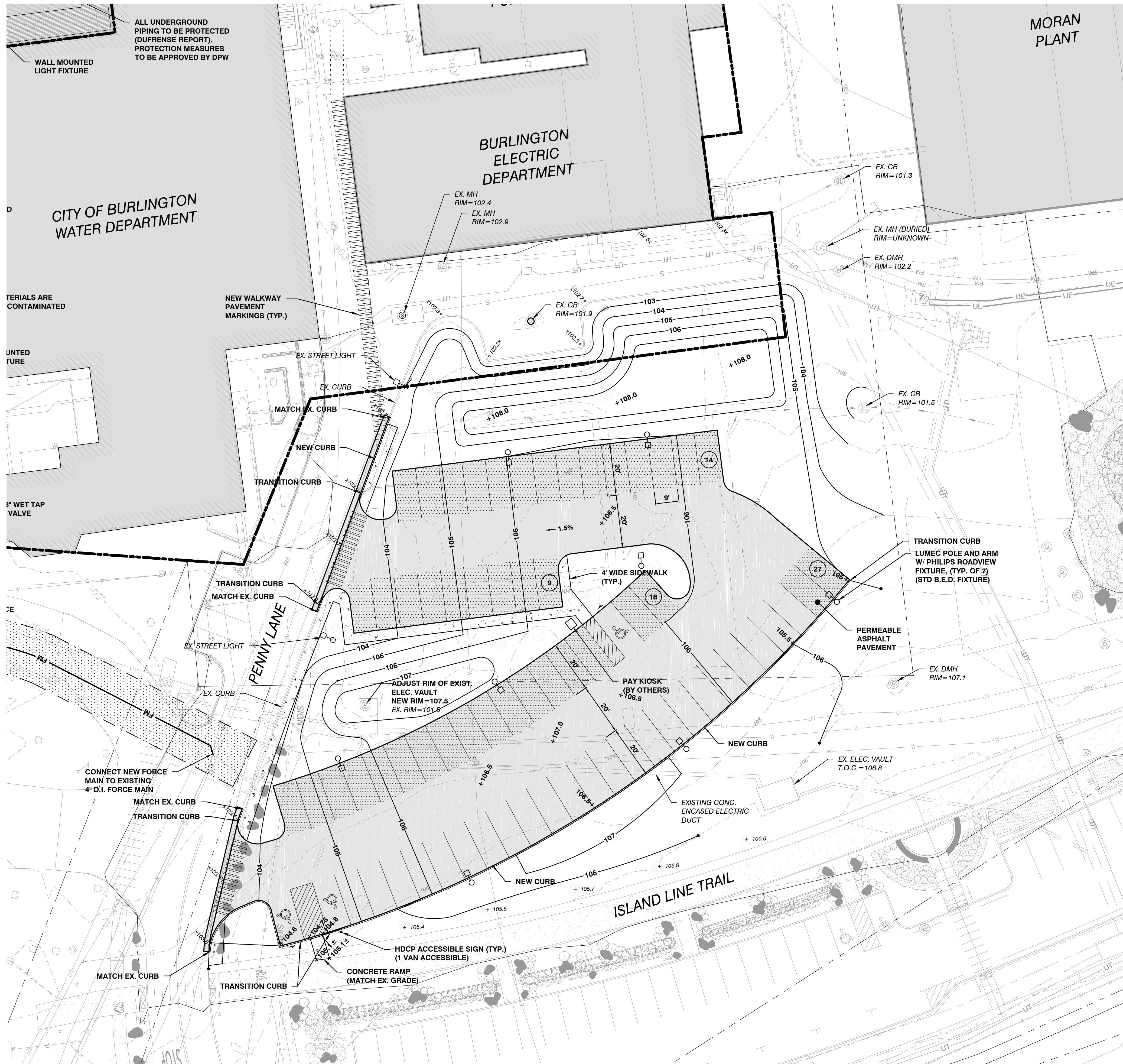
| DATE    | CHECKED | REVISION               |
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| 1/24/17 | DSM     | MISC. CHANGES          |
| 1/27/17 | DSM     | PL REVISED FOR PARKING |
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|         |         |                        |
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**PROPOSED  
CONDITIONS  
OVERALL SITE  
PLAN**

DATE  
JAN. 13, 2017  
  
SCALE  
1" = 40'  
  
PROJ. NO.  
14115

DRAWING NUMBER  
  
**C2.0**





OFF STREET PARKING REQUIREMENTS

|                                |           |
|--------------------------------|-----------|
| MARINA                         |           |
| 96 SEASONAL SLIPS (0.5 / SLIP) | 48 SPACES |
| (PER WAIVER)                   |           |
| MARINA                         |           |
| EAST LOT                       | 42 SPACES |
| SOUTH LOT (EMPLOYEE)           | 4 SPACES  |
| PLAZA LOT (HDCP ACCESS.)       | 2 SPACES  |
|                                | 48 SPACES |
| BIKE PARKING                   |           |
| SHORT TERM (100 USERS x 0.1)   | 10 SPACES |
| LONG TERM (1/10) (EMPLOYEE)    | 1 SPACES  |
| TOTAL REQUIRED                 | 11 SPACES |
| TOTAL PROVIDED                 | 11 SPACES |

WFN (EAST LOT) PARKING SUMMARY

MIN. REQUIRED SPACES  
42 MARINA  
26 COMMUNITY SAILING CENTER  
68 REQUIRED SPACES  
68 PROPOSED SPACES  
73 PREVIOUSLY PERMITTED SPACES

3 ACCESSIBLE SPACES REQUIRED (TOTAL)  
3 ACCESSIBLE SPACES PROVIDED (TOTAL)  
1 VAN ACCESSIBLE SPACE REQUIRED  
1 VAN ACCESSIBLE SPACES PROVIDED

EAST LOT PARKING RESERVED SPACES

- 23 SPACES FOR EXCLUSIVE MARINA USE  
MAY TO OCT.
- 19 SPACES FOR EXCLUSIVE MARINA USE  
WEEKENDS AND HOLIDAYS - MAY TO OCT.

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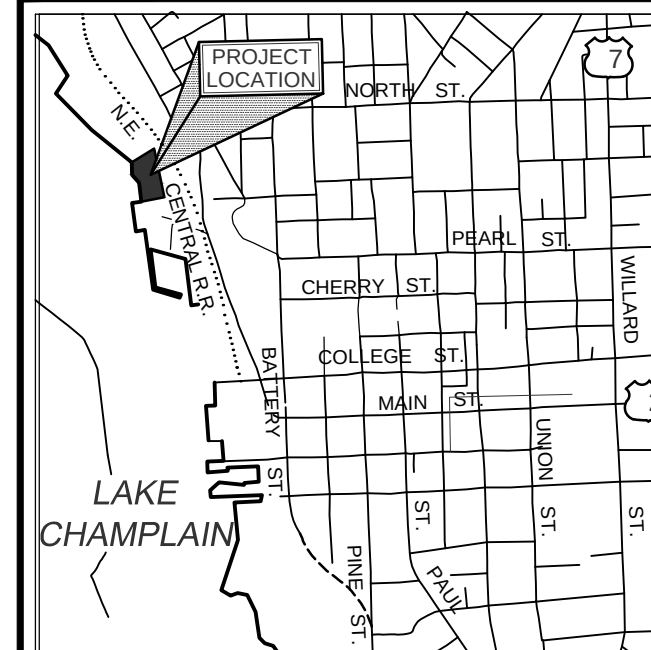
BURLINGTON  
HARBOR MARINA  
LLC

1 CHURCH STREET  
BURLINGTON VT 05401

PROJECT:

BURLINGTON  
HARBOR MARINA

234 PENNY LANE  
BURLINGTON VT 05401



LOCATION MAP

1" = 2000'

| DATE    | CHECKED | REVISION      |
|---------|---------|---------------|
| 1/24/17 | DSM     | MISC. CHANGES |
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PROPOSED  
CONDITIONS  
PARTIAL SITE PLAN

DATE

JAN. 13, 2017

SCALE

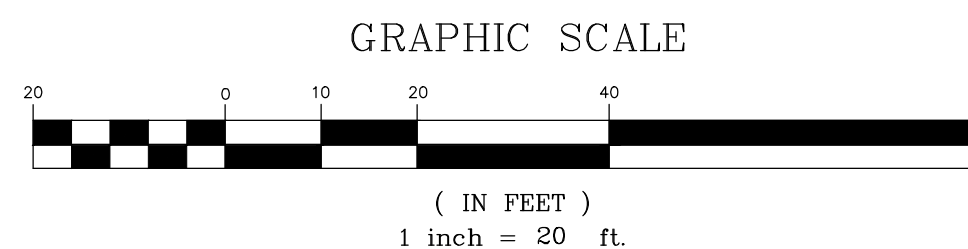
1" = 20'

PROJ. NO.

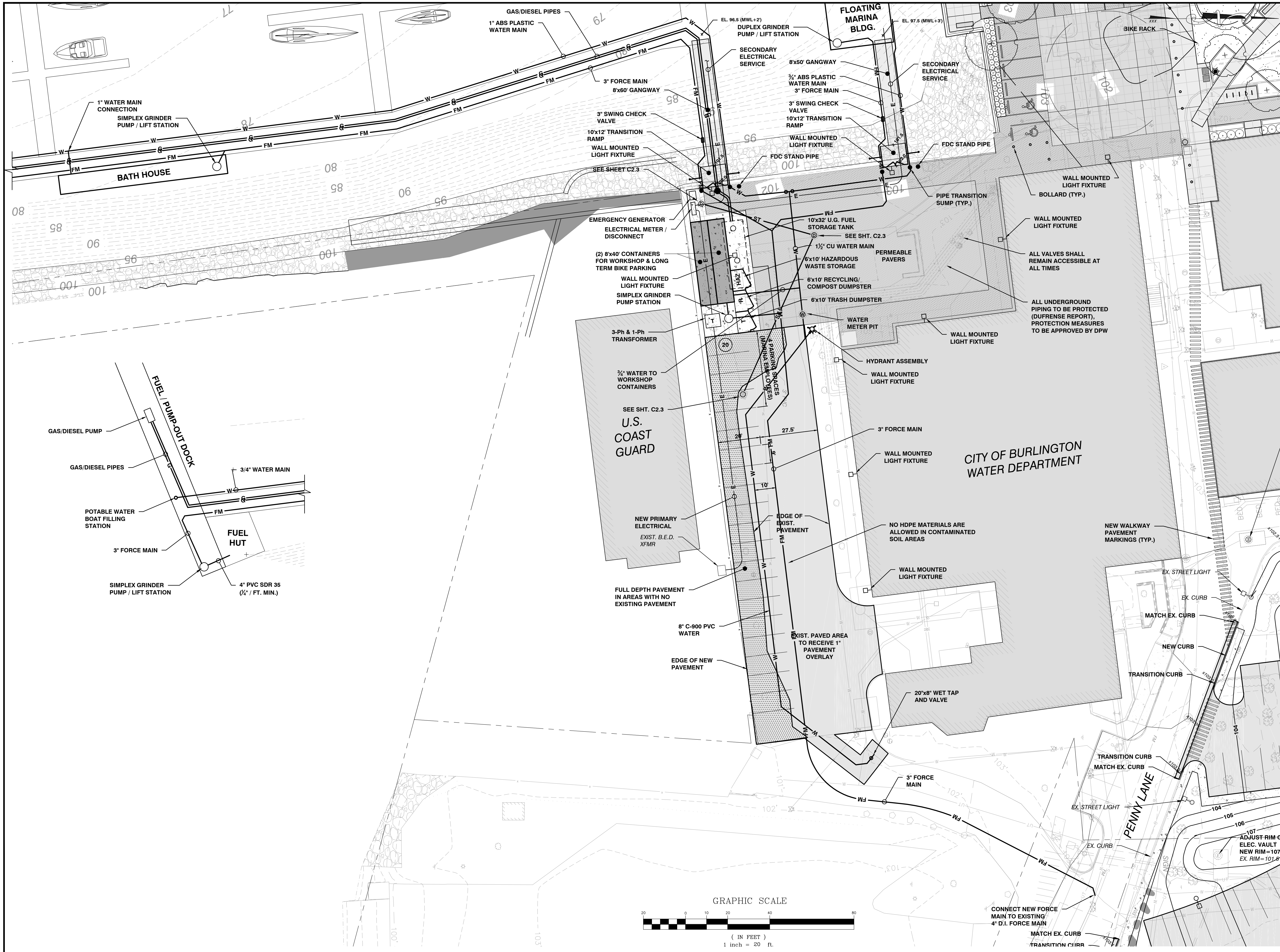
14115

DRAWING NUMBER

C2.1







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BURLINGTON VT 05401

PROJECT:

**BURLINGTON  
HARBOR MARINA**

234 PENNY LANE  
BURLINGTON VT 05401



LOCATION MAP

1" = 2000'

| DATE    | CHECKED | REVISION      |
|---------|---------|---------------|
| 1/24/17 | DSM     | MISC. CHANGES |
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**PROPOSED  
CONDITIONS  
PARTIAL SITE PLAN**

DATE  
JAN. 13, 2017

SCALE

1" = 20'

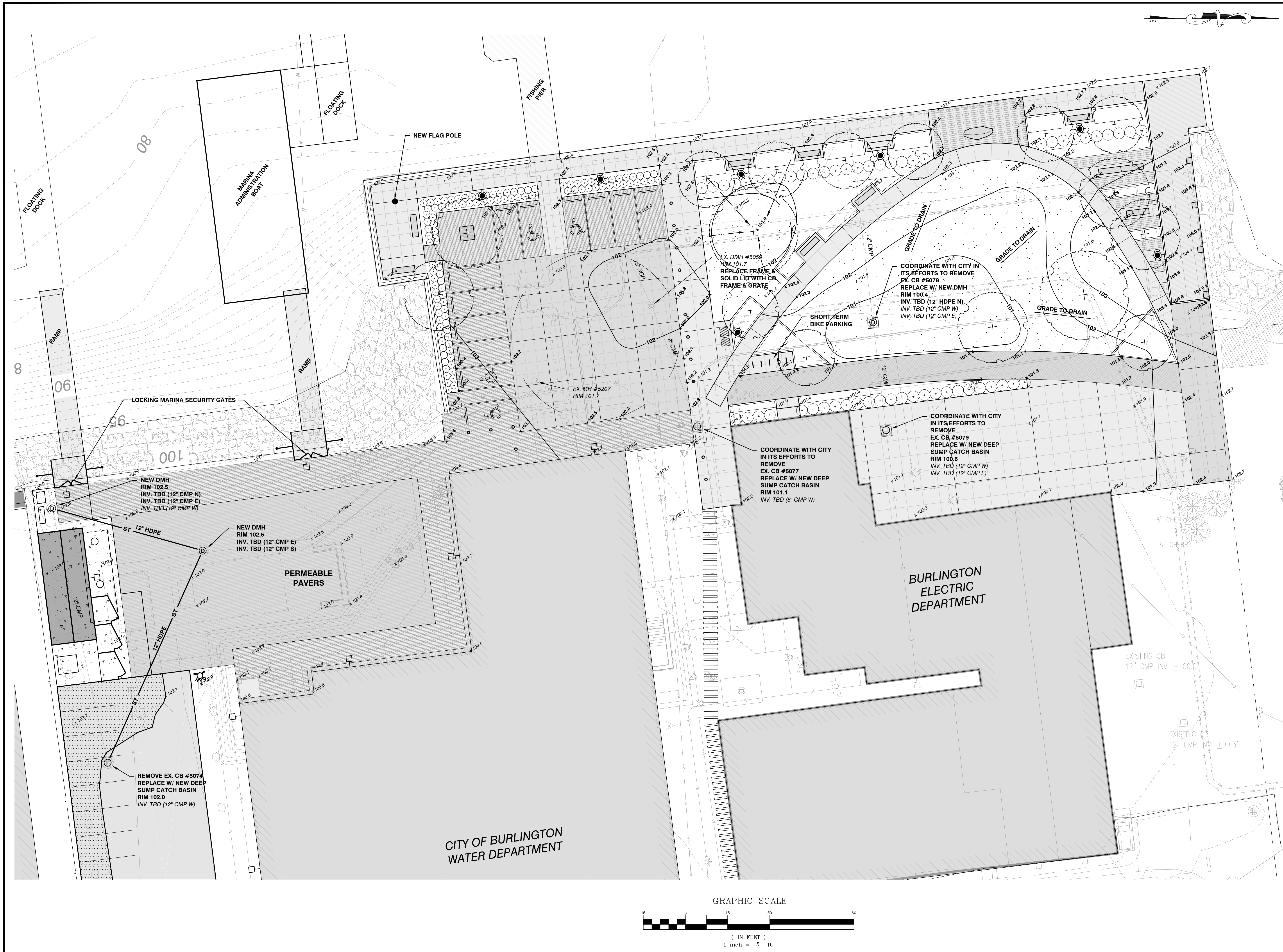
PROJ. NO.

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**C2.2**





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BURLINGTON VT 05401

PROJECT:  
  
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HARBOR MARINA**  
  
234 PENNY LANE  
BURLINGTON VT 05401

  
**LOCATION MAP**  
1" = 2000'

| DATE    | CHECKED | REVISION      |
|---------|---------|---------------|
| 1/24/17 | DSM     | MISC. CHANGES |
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PROPOSED  
CONDITIONS  
PARTIAL SITE PLAN

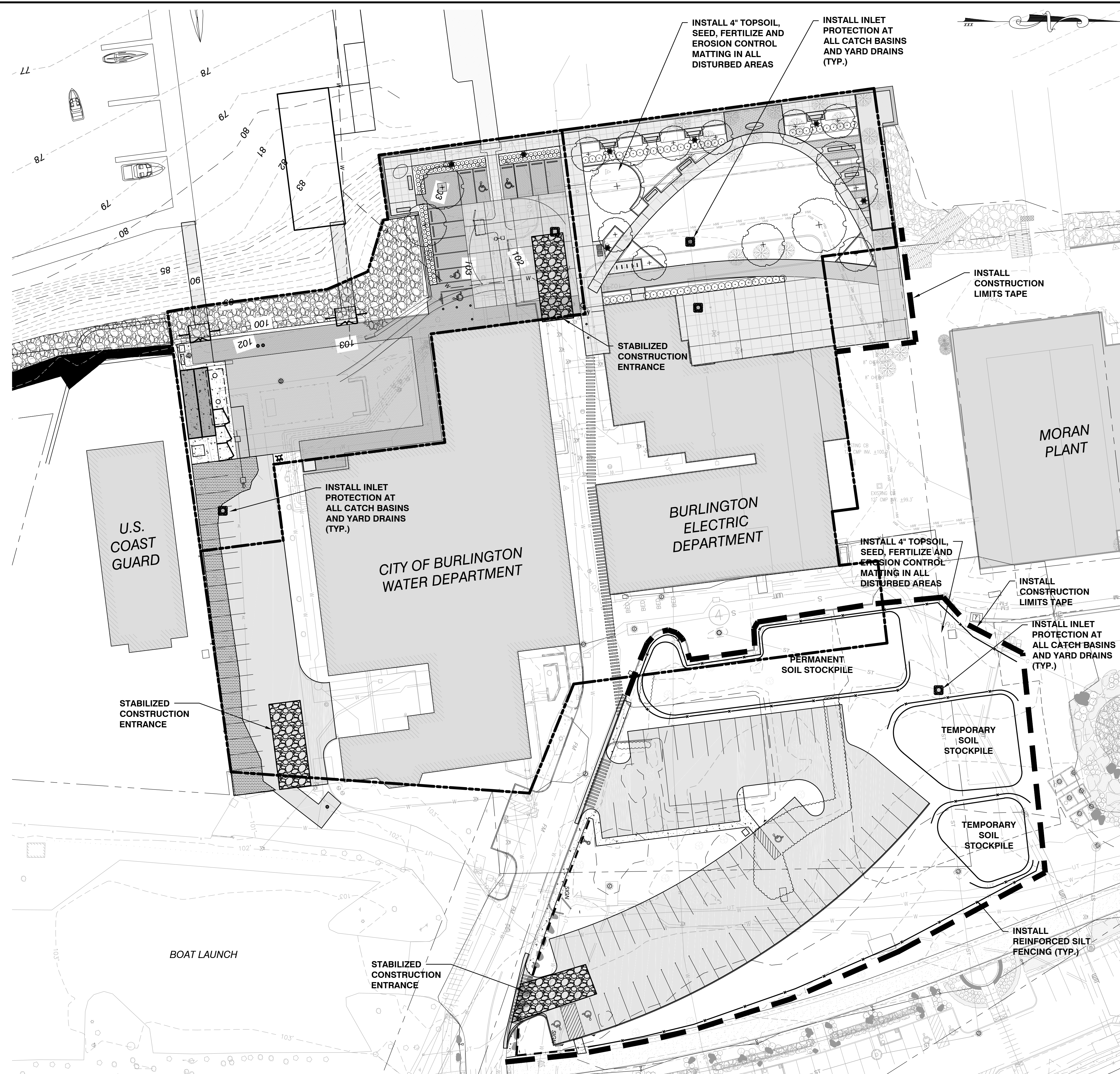
DATE  
JAN. 13, 2017

SCALE  
1" = 15'

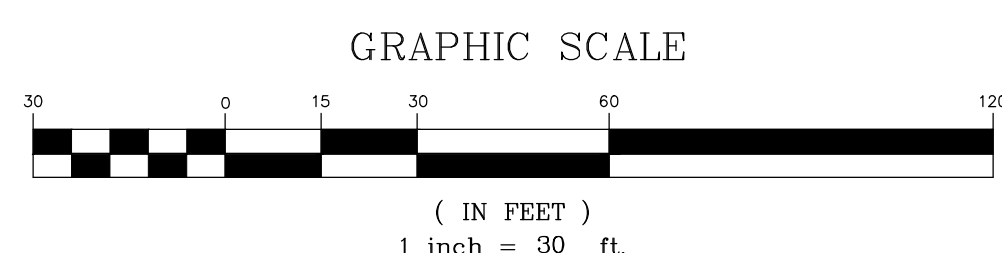
PROJ. NO.  
14115

DRAWING NUMBER  
  
**C2.3**





NOTE:  
ALL CONTAMINATED SOILS SHALL BE MANAGED  
PER THE 'CORRECTIVE ACTION PLAN, MORAN  
CENTER AND WATERFRONT NORTH' GUIDELINES



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1 CHURCH STREET  
BURLINGTON VT 05401

PROJECT:  
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HARBOR MARINA**  
  
234 PENNY LANE  
BURLINGTON VT 05401

LOCATION MAP  
1" = 2000'

| DATE    | CHECKED | REVISION      |
|---------|---------|---------------|
| 1/24/17 | DSM     | MISC. CHANGES |
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PROPOSED  
EPSC PLAN

DATE  
JAN. 13, 2017

SCALE  
1" = 30'

PROJ. NO.  
14115

DRAWING NUMBER  
**C3.0**



#### Introduction

This project is subject to the terms and conditions of the authorization from the State of Vermont to discharge construction related storm water runoff.

Coverage under the State Construction General Permit 3-9020 is required for any construction activity that disturbs 1 or more acres of land, or is part of a larger development plan that will disturb 1 or more acres.

This project has been deemed to qualify as a Low Risk Site which is subject to the erosion prevention and sediment control (EPSC) standards set for in the State of Vermont's

#### Low Risk Site Handbook for Erosion Prevention and Sediment Control

The following narrative and implementation requirements represent the minimum standard for which this site is required to be maintained as regulated by the State of Vermont.

Any best management practices (BMP's) depicted on the project's EPSC Site plan which go beyond the Handbook requirements are considered to be integral to the management of the site and represent components of the municipal EPSC approval for the project which shall be implemented.

The EPSC plan depicts one snap shot in time of the site. All construction sites are fluid in their day to day exposures and risks as it relates to minimizing sediment loss from the site. **It is the responsibility of the Contractor to implement the necessary BMP's to comply with the Low Risk Handbook standards outlined on this sheet based on the interim site disturbance conditions which may or may not be shown on the EPSC Site Plan.**

Specific BMP's which are critical to allowing the project to be considered a Low risk site include the items checked below:

- Limit the amount of disturbed earth to two acres or less at any one time.
- There shall be a maximum of 7 consecutive days of disturbed earth exposure in any location before temporary or final stabilization is implemented.

- Mark Site Boundaries

#### Purpose:

Mark the site boundaries to identify the limits of construction. Delineating your site will help to limit the area of disturbance, preserve existing vegetation and limit erosion potential on the site.

#### How to comply:

Before beginning construction, walk the site boundaries and flag trees, post signs, or install orange safety fence. Fence is required on any boundary within 50 feet of a stream, lake, pond or wetland, unless the area is already developed (existing roads, buildings, etc.)

- Limit Disturbance Area

#### Purpose:

Limit the amount of soil exposed at one time to reduce the potential erosion on site.

#### Requirements:

The permitted disturbance area is specified on the site's written authorization to discharge. Only the acreage listed on the authorization form may be exposed at any given time.

#### How to comply:

Plan ahead and phase the construction activities to ensure that no more than the permitted acreage is disturbed at one time. Be sure to properly stabilize exposed soil with seed and mulch or erosion control matting before beginning work in a new section of the site.

- Stabilize Construction Entrance

#### Purpose:

A stabilized construction entrance helps remove mud from vehicle wheels to prevent tracking onto streets.

#### Requirements:

If there will be any vehicle traffic off of the construction site, you must install a stabilized construction entrance before construction begins.

#### How to install

**Rock Size:** Use a mix of 1 to 4 inch stone

**Depth:** 8 inches minimum

**Width:** 12 feet minimum

**Length:** 40 feet minimum (or length of driveway, if shorter)

**Geotextile:** Place filter cloth under entire gravel bed

#### Maintenance:

Redress with clean stone as required to keep sediment from tracking onto the street.

- Install Silt Fence

#### Purpose:

Silt fences intercept runoff and allow suspended sediment to settle out.

#### Requirements:

Silt fence must be installed:

- on the downhill side of the construction activities
- between any ditch, swale, storm sewer inlet, or waters of the State and the disturbed soil

*\* Hay bales must not be used as sediment barriers due to their tendency to degrade and fall apart.*

#### Where to place:

- Place silt fence on the downhill edge of bare soil. At the bottom of slopes, place fence 10 feet downhill from the end of the slope (if space is available).
- Ensure the silt fence catches all runoff from bare soil.
- Maximum drainage area is ¼ acre for 100 feet of silt fence.
- Install silt fence across the slope (not up and down hills)
- Install multiple rows of silt fence on long hills to break up flow.
- Do not install silt fence across ditches, channels, or streams or in stream buffers.

#### How to install silt fence:

- Dig a trench 6 inches deep across the slope
- Unroll silt fence along the trench
- Ensure stakes are on the downhill side of the fence
- Join fencing by rolling the end stakes together
- Drive stakes in against downhill side of trench
- Drive stakes until 16 inches of fabric is in trench
- Push fabric into trench; spread along bottom
- Fill trench with soil and pack down

#### Maintenance:

- Remove accumulated sediment before it is halfway up the fence.
- Ensure that silt fence is trenched in ground and there are no gaps.

- Divert Upland Runoff

#### Purpose:

Diversion berms intercept runoff from above the construction site and direct it around the disturbed area. This prevents clean water from becoming muddied with soil from the construction site.

#### Requirements:

If storm water runs onto your site from upslope areas and your site meets the following two conditions, you must install a diversion berm before disturbing any soil.

- You plan to have one or more acres of soil exposed at any one time (excluding roads).
- Average slope of the disturbed area is 20% or steeper.

#### How to install:

- Compact the berm with a shovel or earth-moving equipment.
- Seed and mulch berm or cover with erosion control matting immediately after installation.
- Stabilize the flow channel with seed and straw mulch or erosion control matting. Line the channel with 4 inch stone if the channel slope is greater than 20%.
- Ensure the berm drains to an outlet stabilized with riprap. Ensure that there is no erosion at the outlet.
- The diversion berm shall remain in place until the disturbed areas are completely stabilized.

- Slow Down Channelized Runoff

#### Purpose:

Stone check dams reduce erosion in drainage channels by slowing down the storm water flow.

#### Requirements:

If there is a concentrated flow (e.g. in a ditch or channel) of storm water on your site, then you must install stone check dams. Hay bales must not be used as check dams.

#### How to install:

**Height:** No greater than 2 feet. Center of dam should be 9 inches lower than the side elevation

**Side slopes:** 2:1 or flatter

**Stone size:** Use a mixture of 2 to 9 inch stone

**Width:** Dams should span the width of the channel and extend up the sides of the banks

**Spacing:** Space the dams so that the bottom (toe) of the upstream dam is at the elevation of the top (crest) of the downstream dam. This spacing is equal to the height of the check dam divided by the channel slope.

Spacing (in feet) = Height of check dam (in feet)/Slope in channel (ft/ft)

#### Maintenance:

Remove sediment accumulated behind the dam as needed to allow channel to drain through the stone check dam and prevent large flows from carrying sediment over the dam. If significant erosion occurs between check dams, a liner of stone should be installed.

- Construct Permanent Controls

#### Purpose:

Permanent storm water treatment practices are constructed to maintain water quality, ensure groundwater flows, and prevent downstream flooding. Practices include detention ponds and wetlands, infiltration basins, and storm water filters.

#### Requirements:

If the total impervious\* area on your site, or within the common plan of development, will be 1 or more acres, you must apply for a State Storm water Discharge Permit and construct permanent storm water treatment practices on your site. These practices must be installed before the construction of any impervious surfaces.

#### How to comply:

Contact the Vermont Storm water Program and follow the requirements in the Vermont Storm water Management Manual. The Storm water Management Manual is available at: [www.vtwaterquality.org/stormwater.htm](http://www.vtwaterquality.org/stormwater.htm)

\*An impervious surface is a manmade surface, including, but not limited to, paved and unpaved roads, parking areas, roofs, driveways, and walkways, from which precipitation runs off rather than infiltrates.

- Stabilize Exposed Soil

#### Purpose:

Seeding and mulching, applying erosion control matting, and hydrosseeding are all methods to stabilize exposed soil. Mulches and matting protect the soil surface while grass is establishing.

#### Requirements:

All areas of disturbance must have temporary or permanent stabilization within 7, 14, or 21 days of initial disturbance, as stated in the project authorization. After this time, any disturbance in the area must be stabilized at the end of each work day.

The following exceptions apply:

- Stabilization is not required if earthwork is to continue in the area within the next 24 hours and there is no precipitation forecast for the next 24 hours.
- Stabilization is not required if the work is occurring in a self-contained excavation (i.e. no outlet) with a depth of 2 feet or greater (e.g. house foundation excavation, utility trenches).

All areas of disturbance must have permanent stabilization within 48 hours of reaching final grade.

#### How to comply:

Prepare bare soil for seeding by grading the top 3 to 6 inches of soil and removing any large rocks or debris.

#### Seeding Rates for Temporary Stabilization

April 15 - Sept. 15 -- Ryegrass (annual or perennial): 20 lbs/acre

Sept. 15 - April 15 -- Winter rye: 120 lbs/acre

#### Seeding Rates for Final Stabilization:Choose

| Seeding Rates for Final Stabilization: |               |            |                    |  |
|----------------------------------------|---------------|------------|--------------------|--|
| Choose from:                           | Variety       | Lbs. /acre | Lbs. /1000 sq. ft. |  |
| Birds foot trefoil                     | Empire/Pardue | 51         | 0.1                |  |
| or                                     |               |            |                    |  |
| Common white clover                    | Common        | 8          | 0.2                |  |
| plus                                   |               |            |                    |  |
| Tall Fescue                            | KY-31/Rebel   | 10         | 0.25               |  |
| plus                                   |               |            |                    |  |
| Redtop                                 | Common        | 2          |                    |  |
| or                                     |               |            |                    |  |
| Ryegrass (perennial)                   | Pennfine/Linn | 5          | 0.1                |  |

1-Mtx2.5 each of Empire and Pardue OR 2.5 lbs. of Birds foot and 2.5 lbs. white clover per acre

#### Mulching Rates

April 15 - Sept. 15 -- Hay or Straw: 1 inch deep (1-2 bales/1000 s.f.)  
Sept.15 - April 15 -- Hay or Straw: 2 in. deep (2-4 bales/1000 s.f.)

#### Erosion Control Matting

As per manufacturer's instructions

#### Hydrosseed

As per manufacturer's instructions

- Winter Stabilization

#### Purpose:

Managing construction sites to minimize erosion and prevent sediment loading of waters is a year-round challenge. In Vermont, this challenge becomes even greater during the late fall, winter, and early spring months.

'Winter construction' as discussed here, describes the period between October 15 and April 15, when erosion prevention and sediment control is significantly more difficult.

Rains in late fall, thaws throughout the winter, and spring melt and rains can produce significant flows over frozen and saturated ground, greatly increasing the potential for erosion.

#### Requirements for Winter Shutdown:

For those projects that will complete earth disturbance activities prior to the winter period (October 15), the following requirements must be adhered to:

- For areas to be stabilized by vegetation, seeding shall be completed no later than September 15 to ensure adequate growth and cover.
- If seeding is not completed by September 15, additional non-vegetative protection must be used to stabilize the site for the winter period. This includes use of Erosion Control Matting or netting of a heavy mulch layer. Seeding with winter rye is recommended to allow for early germination during wet spring conditions.
- Where mulch is specified, apply roughly 2 inches with an 80-90% cover. Mulch should be tracked in or stabilized with netting in open areas vulnerable to wind.

#### Requirements for Winter Construction

If construction activities involving earth disturbance continue past October 15 or begin before April 15, the following requirements must be adhered to:

- Enlarged access points, stabilized to provide for snow stockpiling.
- Limits of disturbance moved or replaced to reflect boundary of winter work.
- A snow management plan prepared with adequate storage and control of meltwater, requiring cleared snow to be stored down slope of all areas of disturbance and out of storm water treatment structures.
- A minimum 25 foot buffer shall be maintained from perimeter controls such as silt fence.
- In areas of disturbance that drain to a water body within 100 feet, two rows of silt fence must be installed along the contour.
- Drainage structures must be kept open and free of snow and ice dams.
- Silt fence and other practices requiring earth disturbance must be installed ahead of frozen ground.
- Mulch used for temporary stabilization must be applied at double the standard rate, or a minimum of 3 inches with an 80-90% cover.
- To ensure cover of disturbed soil in advance of a melt event, areas of disturbed soil must be stabilized at the end of each work day, with the following exceptions:
  - If no precipitation within 24 hours is forecast and work will resume in the same disturbed area within 24 hours, daily stabilization is not necessary.
  - Disturbed areas that collect and retain runoff, such as house foundations or open utility trenches.
- Prior to stabilization, snow or ice must be removed to less than 1 inch thickness.
- Use stone to stabilize areas such as the perimeter of buildings under construction or where construction vehicle traffic is anticipated. Stone paths should be 10 to 20 feet wide to accommodate vehicular traffic.

- Stabilize Soil at Final Grade

#### Purpose:

Stabilizing the site with seed and mulch or erosion control matting when it reaches final grade is the best way to prevent erosion while construction continues.

#### Requirements:

Within 48 hours of final grading, the exposed soil must be seeded and mulched or covered with erosion control matting.

#### How to comply:

Bring the site or sections of the site to final grade as soon as possible after construction is completed. This will reduce the need for additional sediment and erosion control measures and will reduce the total disturbed area.

For seeding and mulching rates, follow the specifications under Rule 8, Stabilizing Exposed Soil.

- Dewatering Activities

#### Purpose:

Treat water pumped from dewatering activities so that it is clear when leaving the construction site.

#### Requirements:

Water from dewatering activities that flows off of the construction site must be clear. Water must not be pumped into storm sewers, lakes, or wetlands unless the water is clear.

#### How to comply:

Using sock filters or sediment filter bags on dewatering discharge hoses or pipes, discharge water into silt fence enclosures installed in vegetated areas away from waterways. Remove accumulated sediment after the water has dispersed and stabilize the area with seed and mulch.

- Inspect Your Site

#### Purpose:

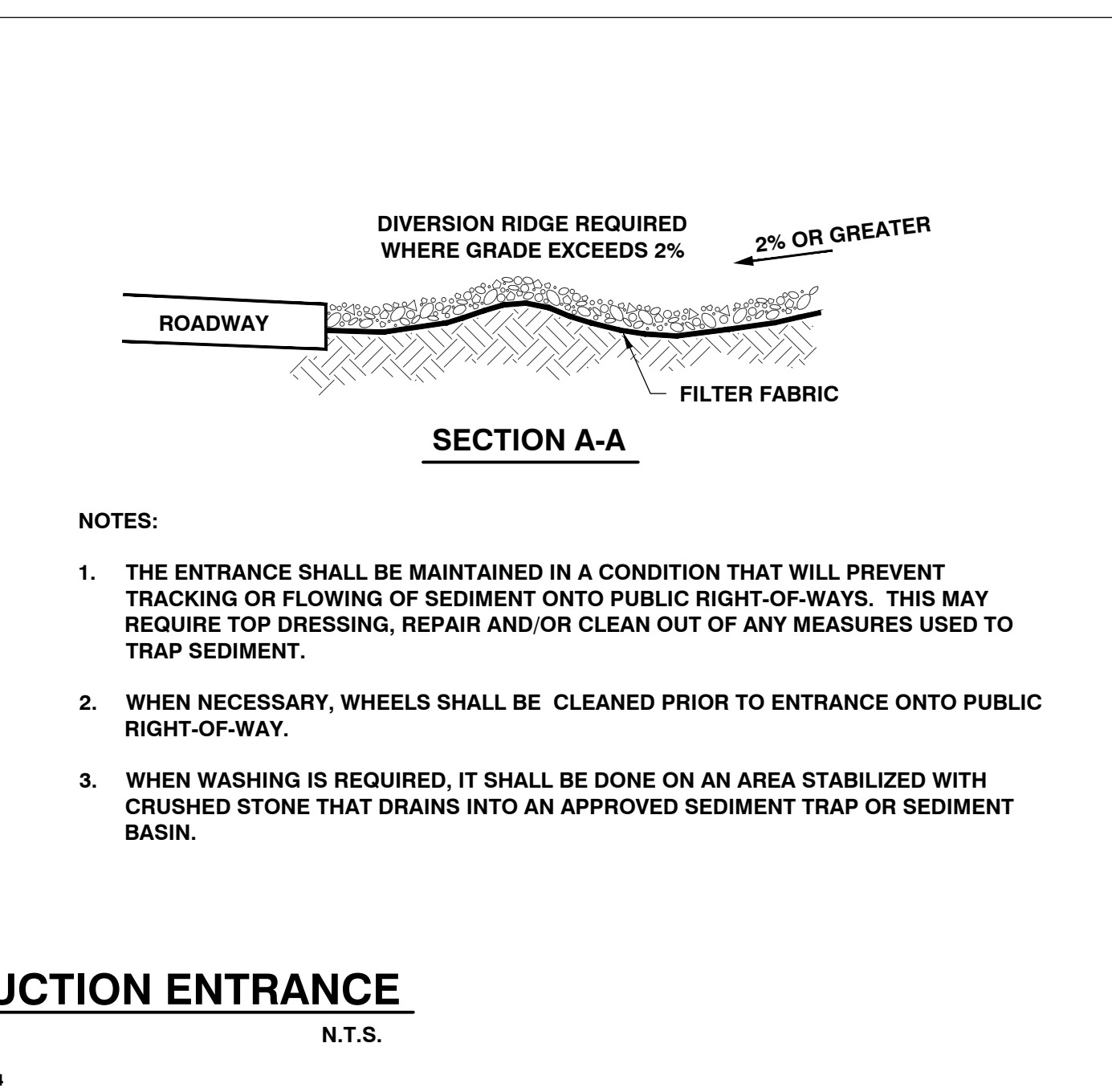
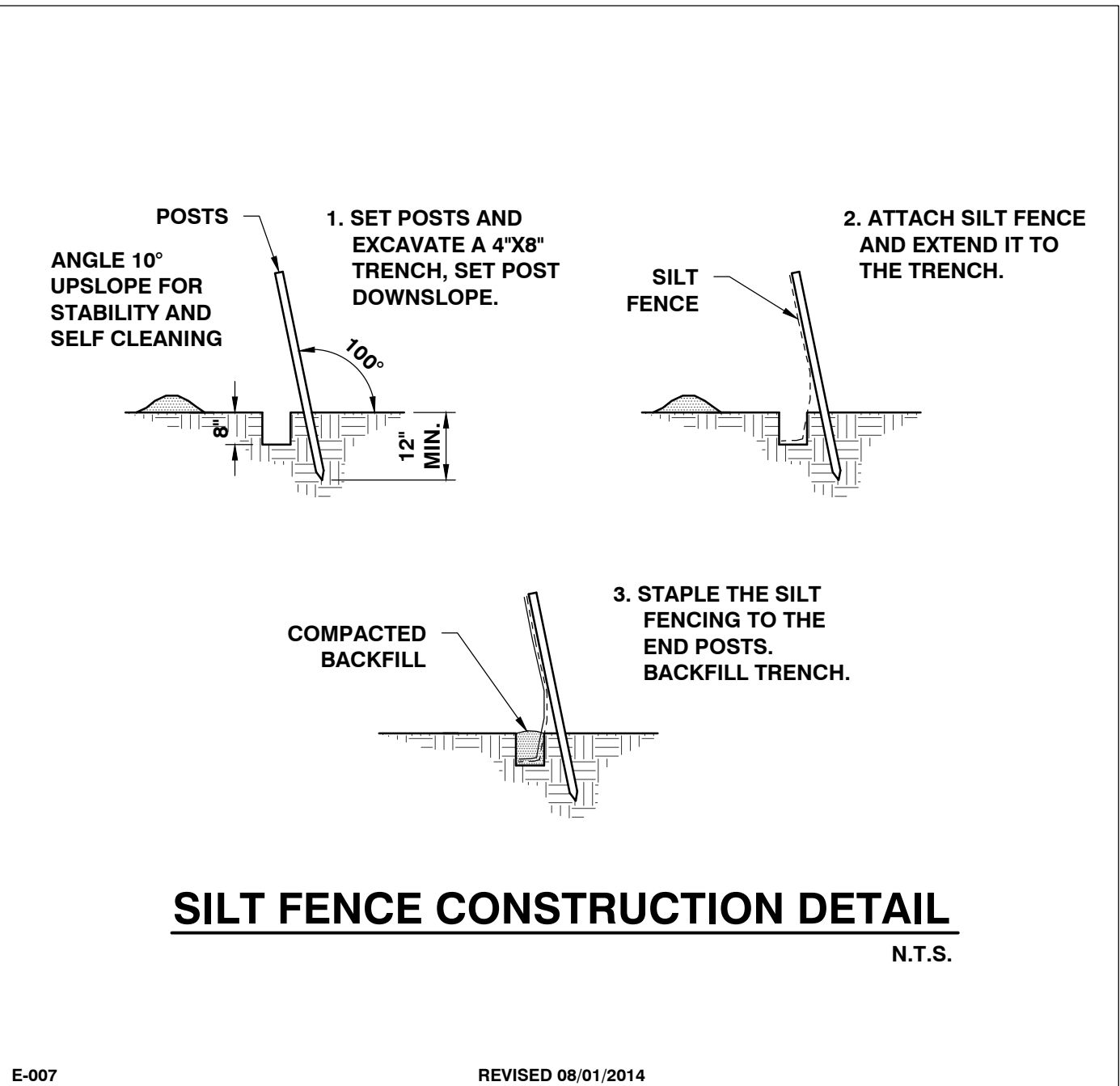
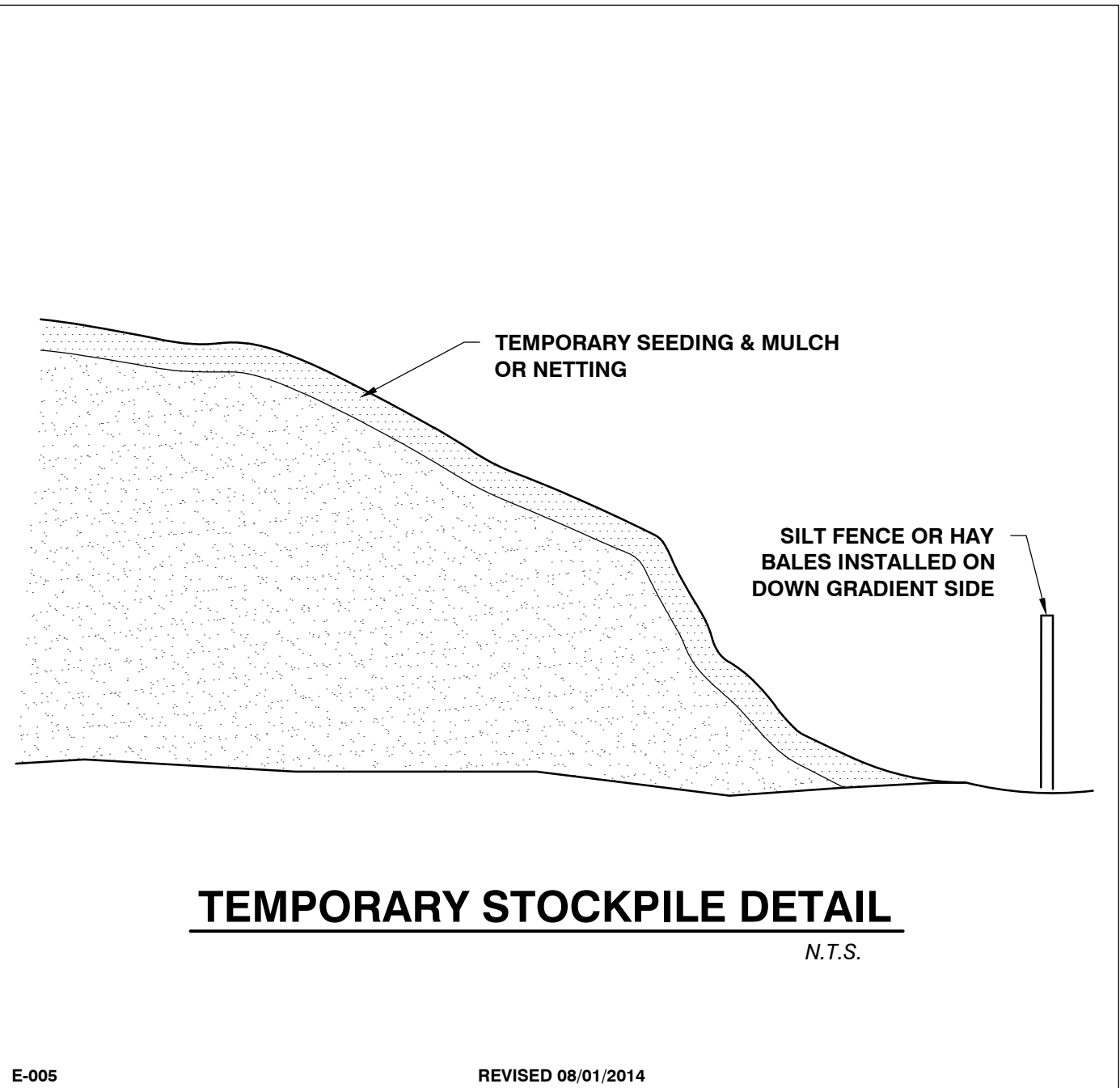
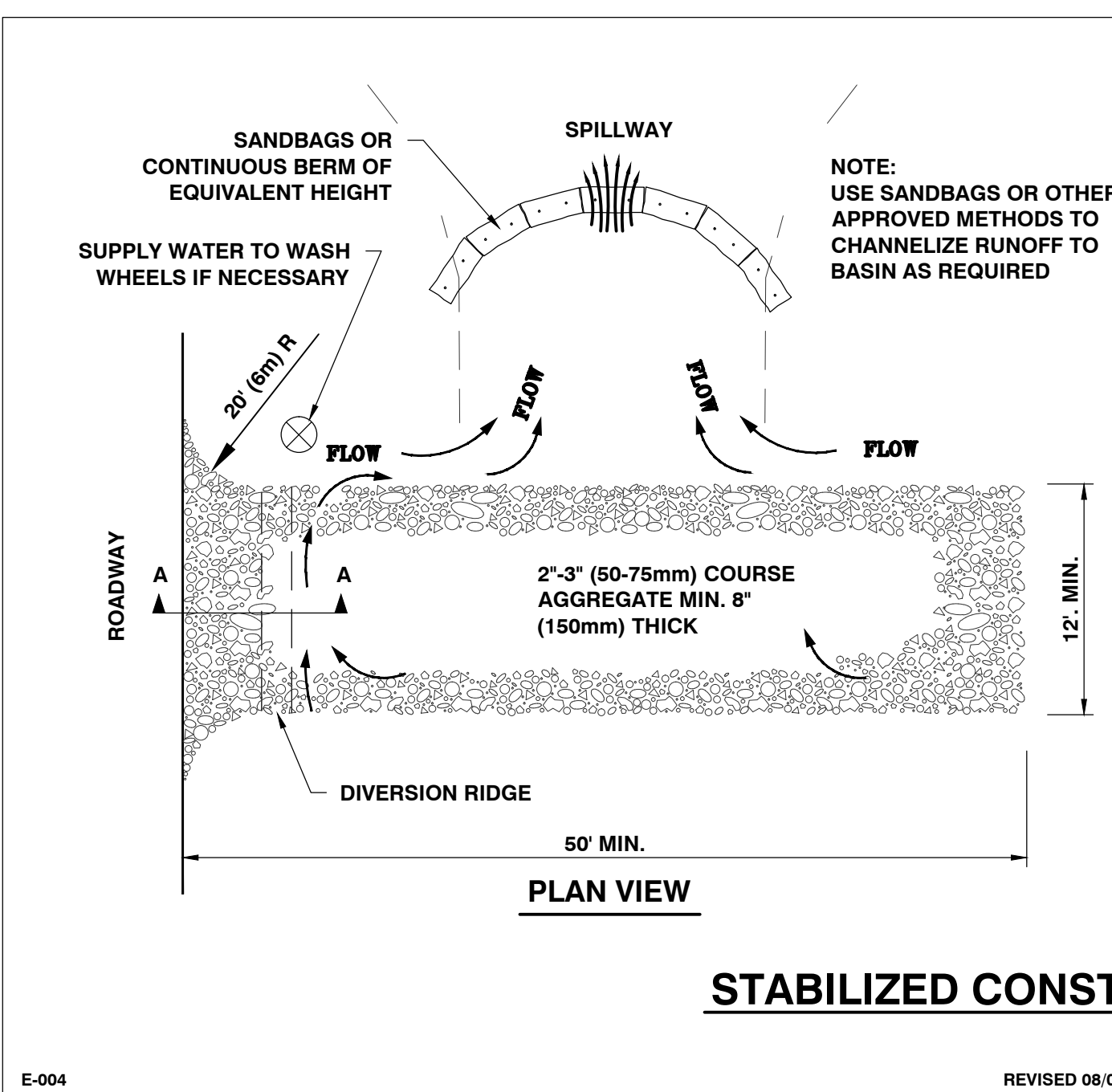
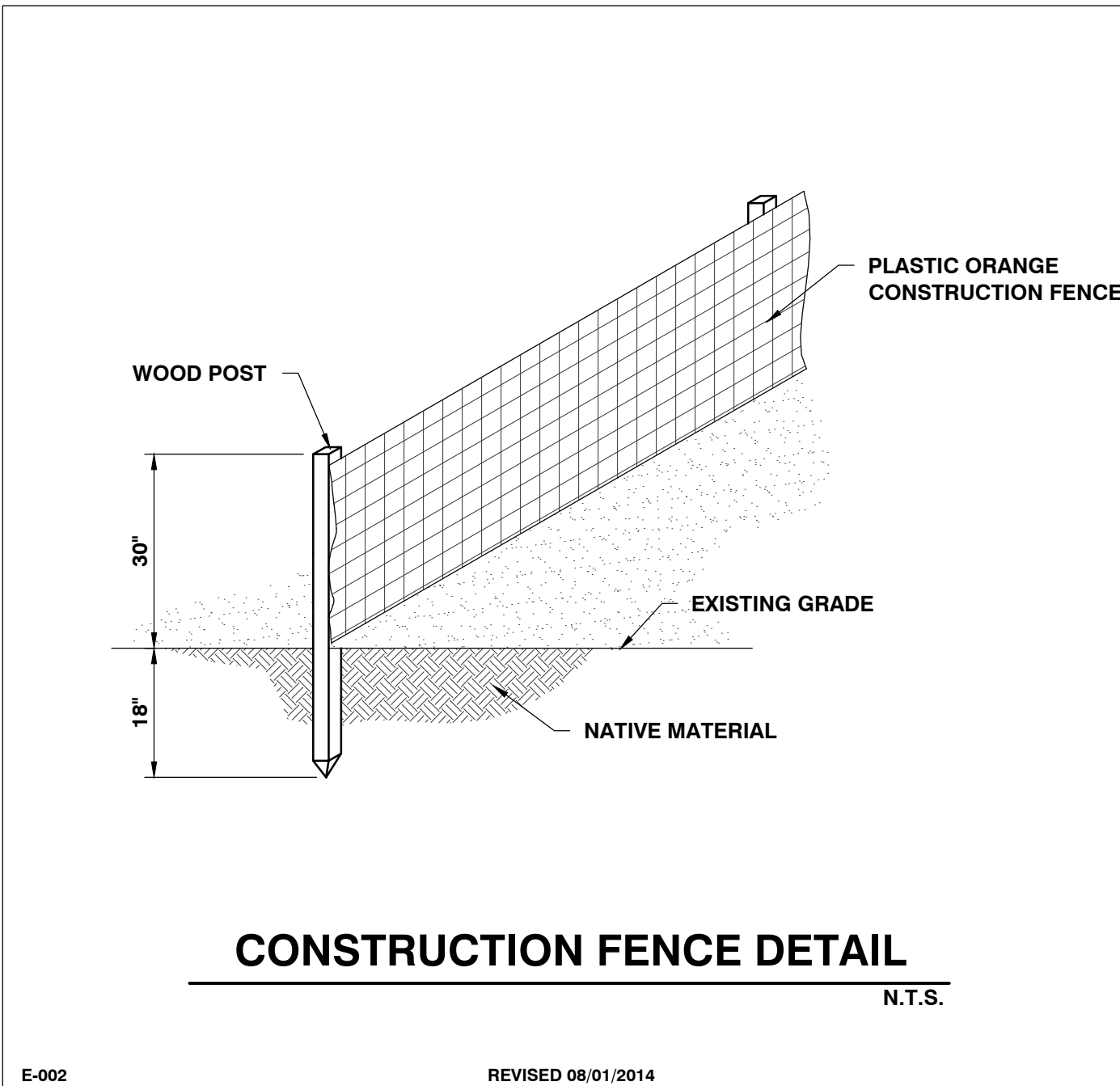
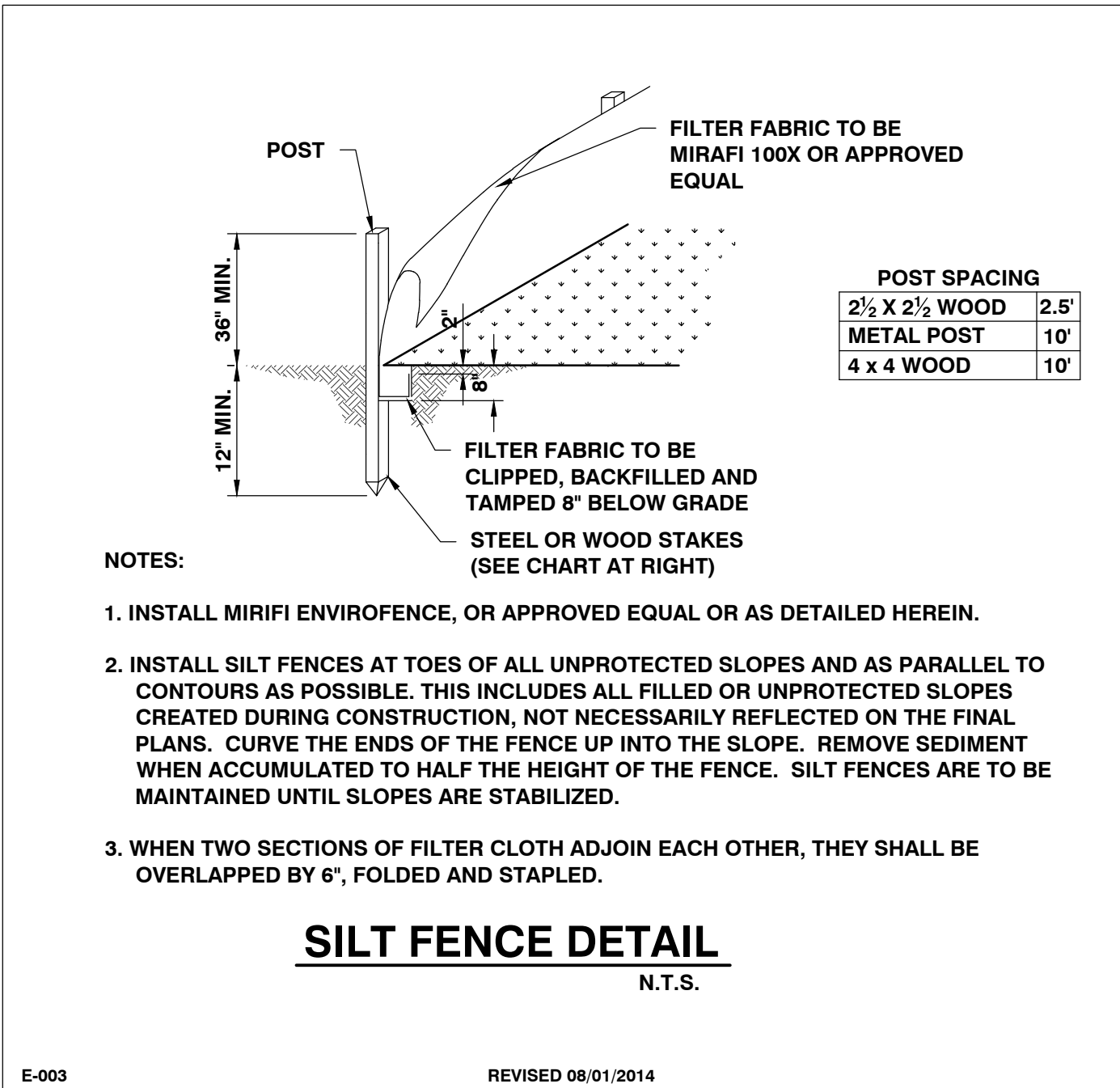
Perform site inspections to ensure that all sediment and erosion control practices are functioning properly. Regular inspections and maintenance of practices will help to reduce costs and protect water quality.

#### Requirements:

Inspect the site at least once every 7 days and after every rainfall or snow melt that results in a discharge from the site. Perform maintenance to ensure that practices are functioning according to the specifications outlined in this handbook.

In the event of a noticeable sediment discharge from the construction site, you must take immediate action to inspect and maintain existing erosion prevention and sediment control practices. Any visibly discolored storm water runoff to waters of the State must be reported.

Forms for reporting discharges are available at: [www.vtwaterquality.org/stormwater.htm](http://www.vtwaterquality.org/stormwater.htm)



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DATE CHECKED REVISION

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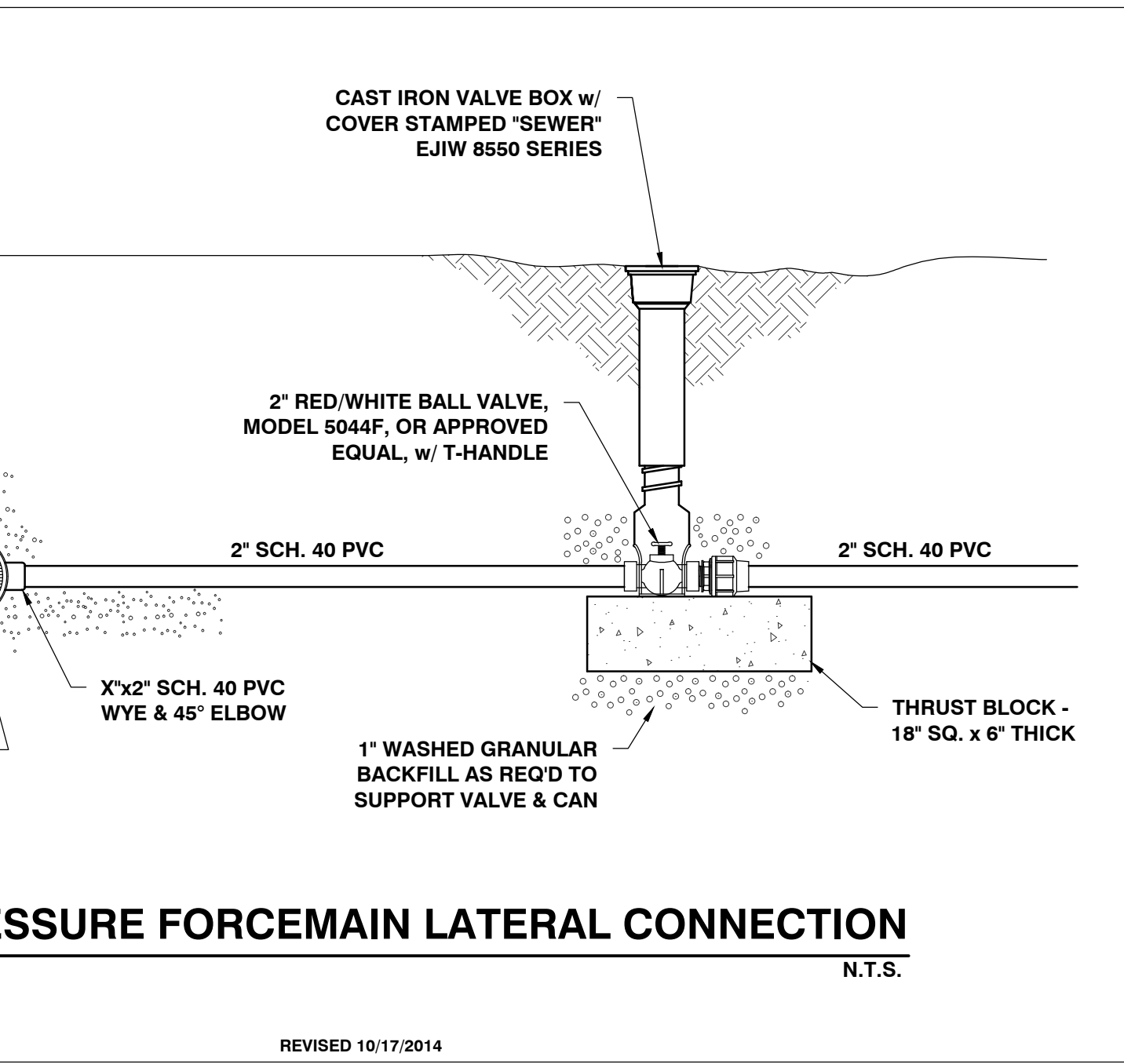
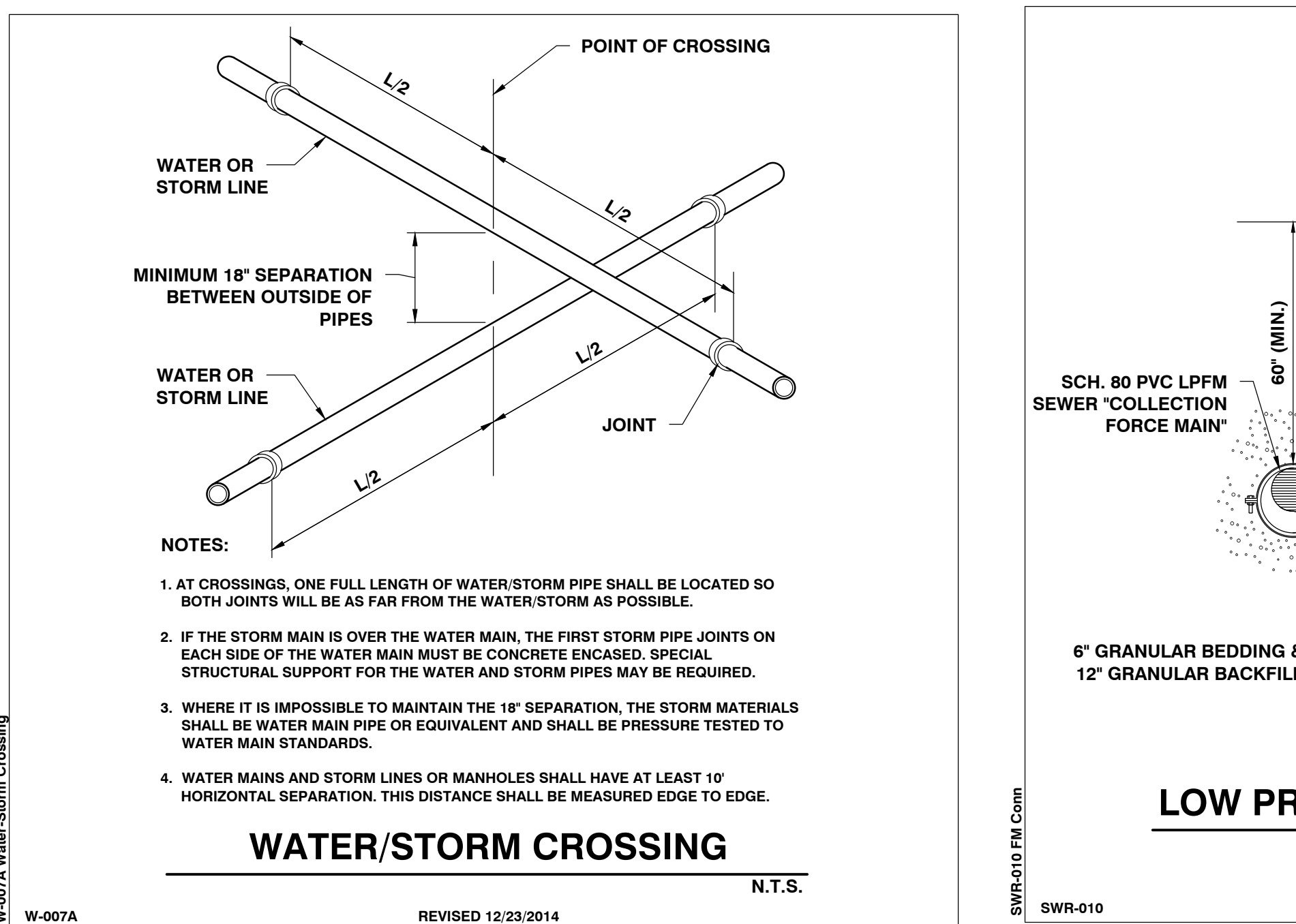
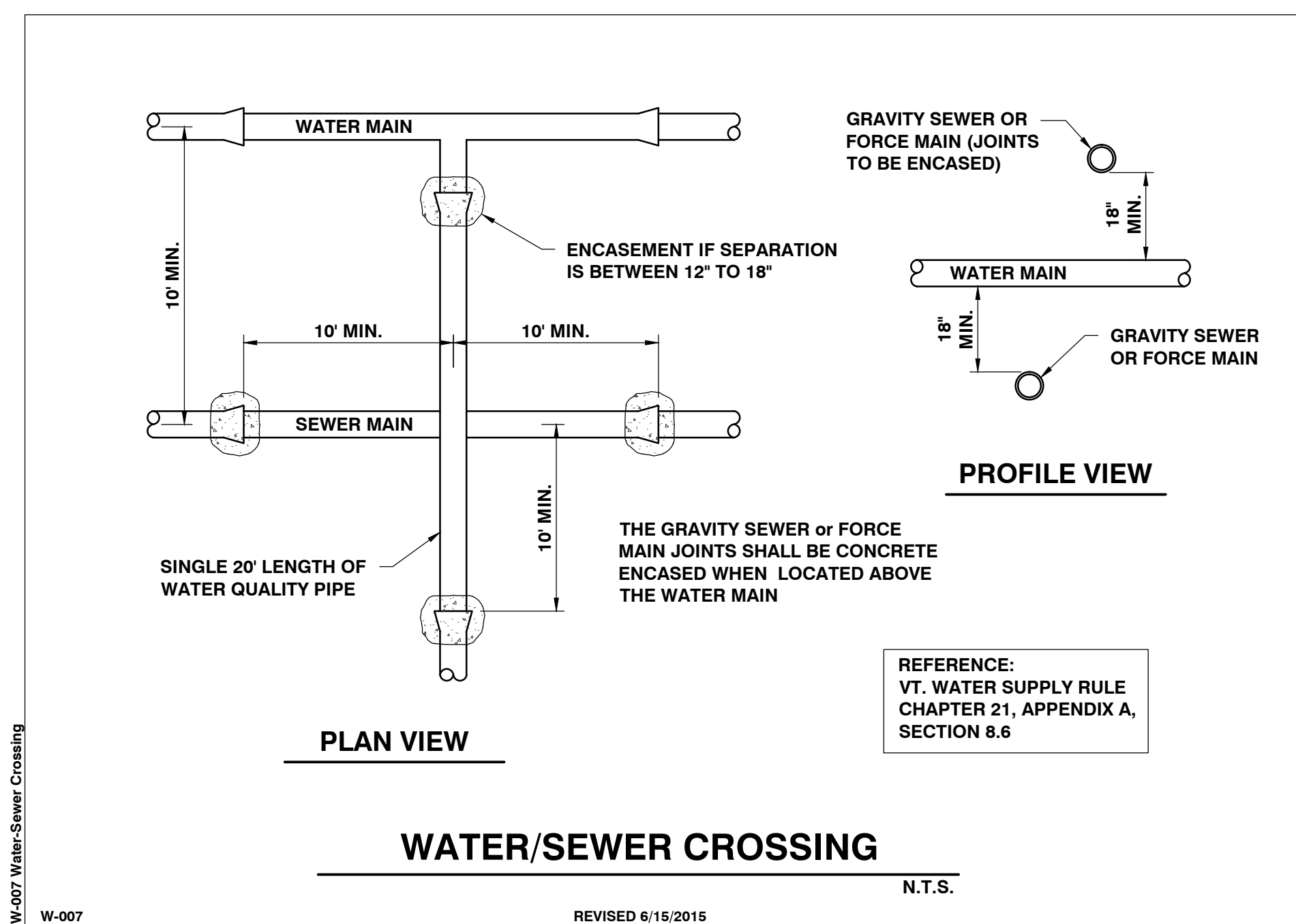
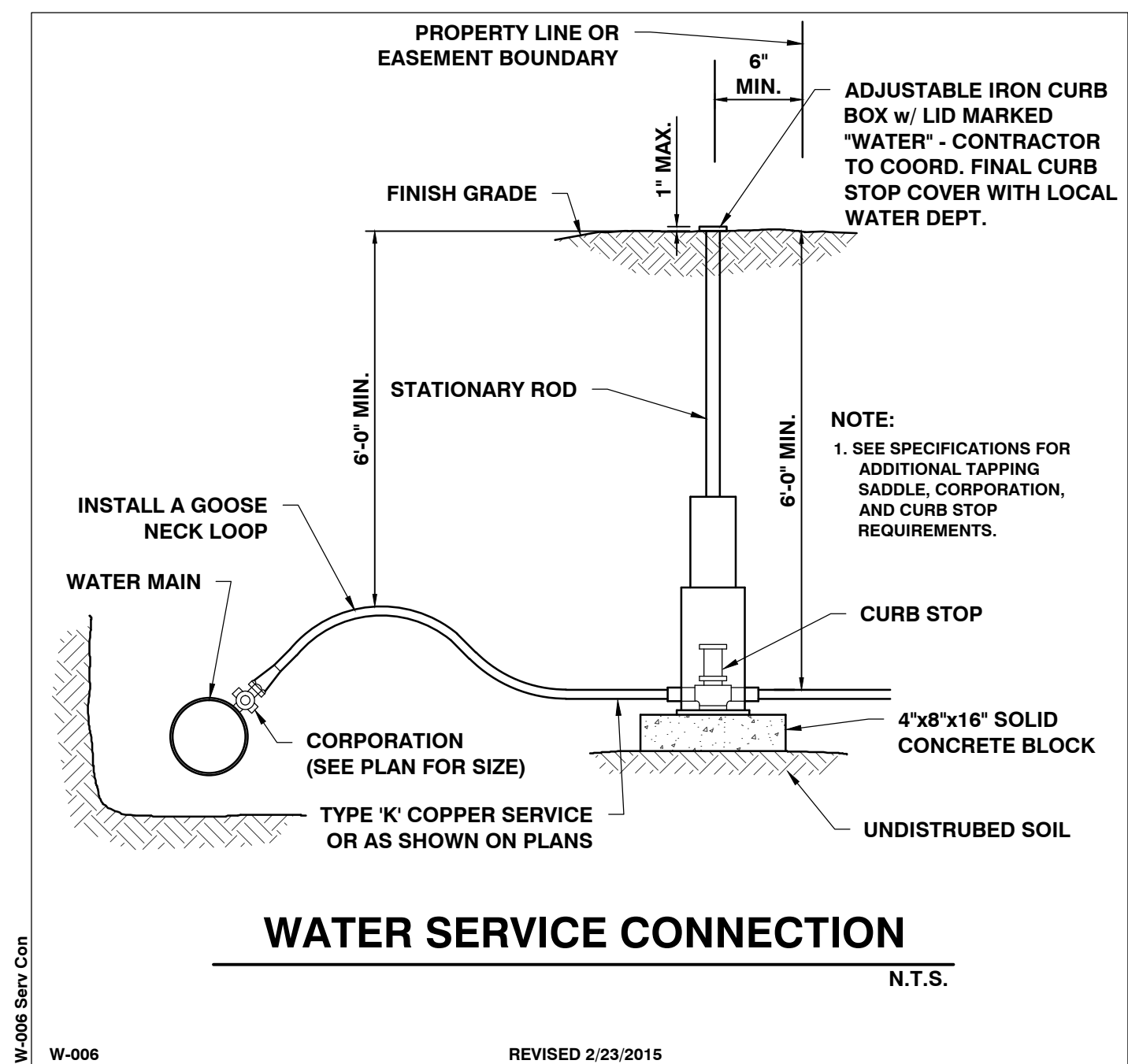
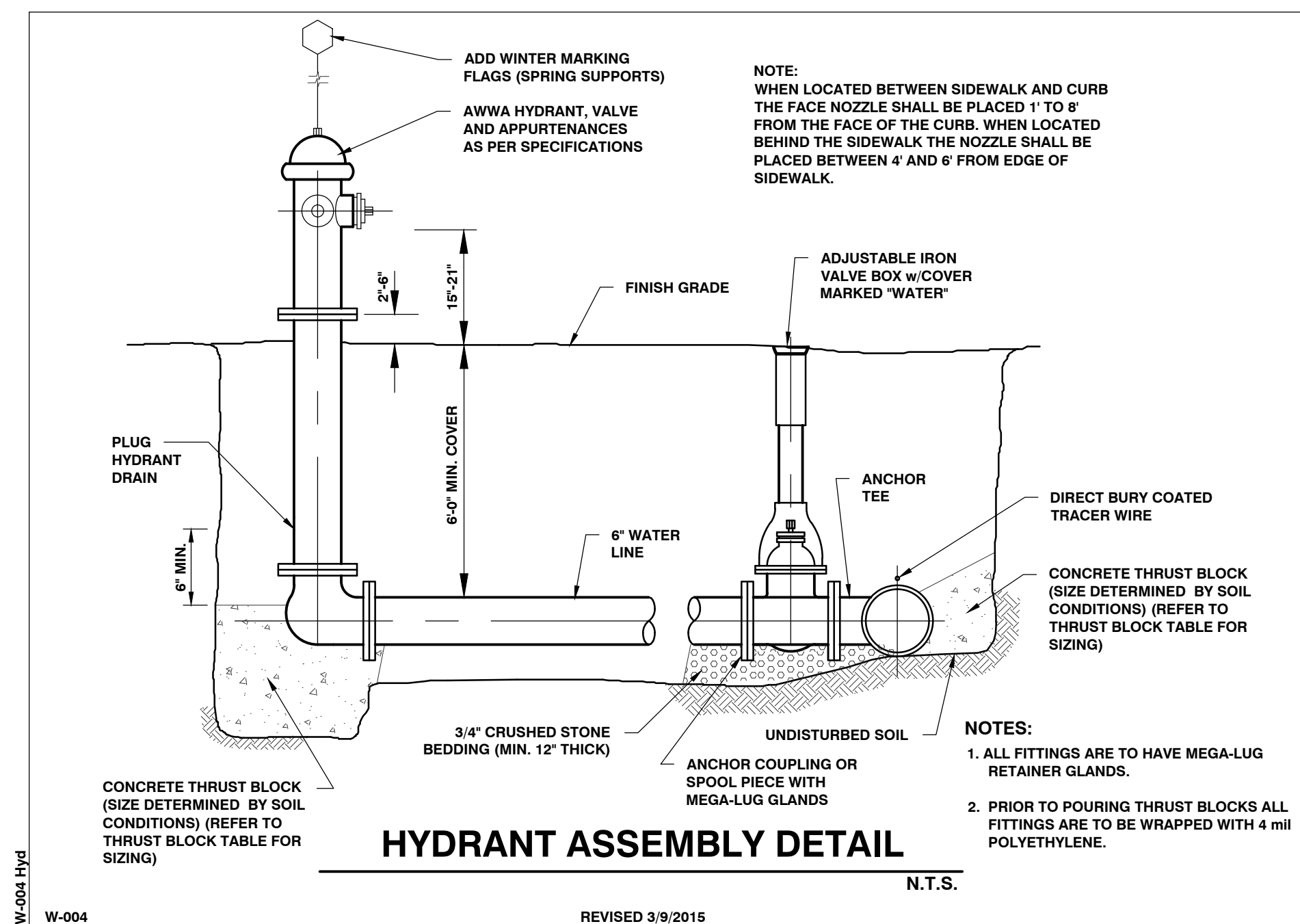
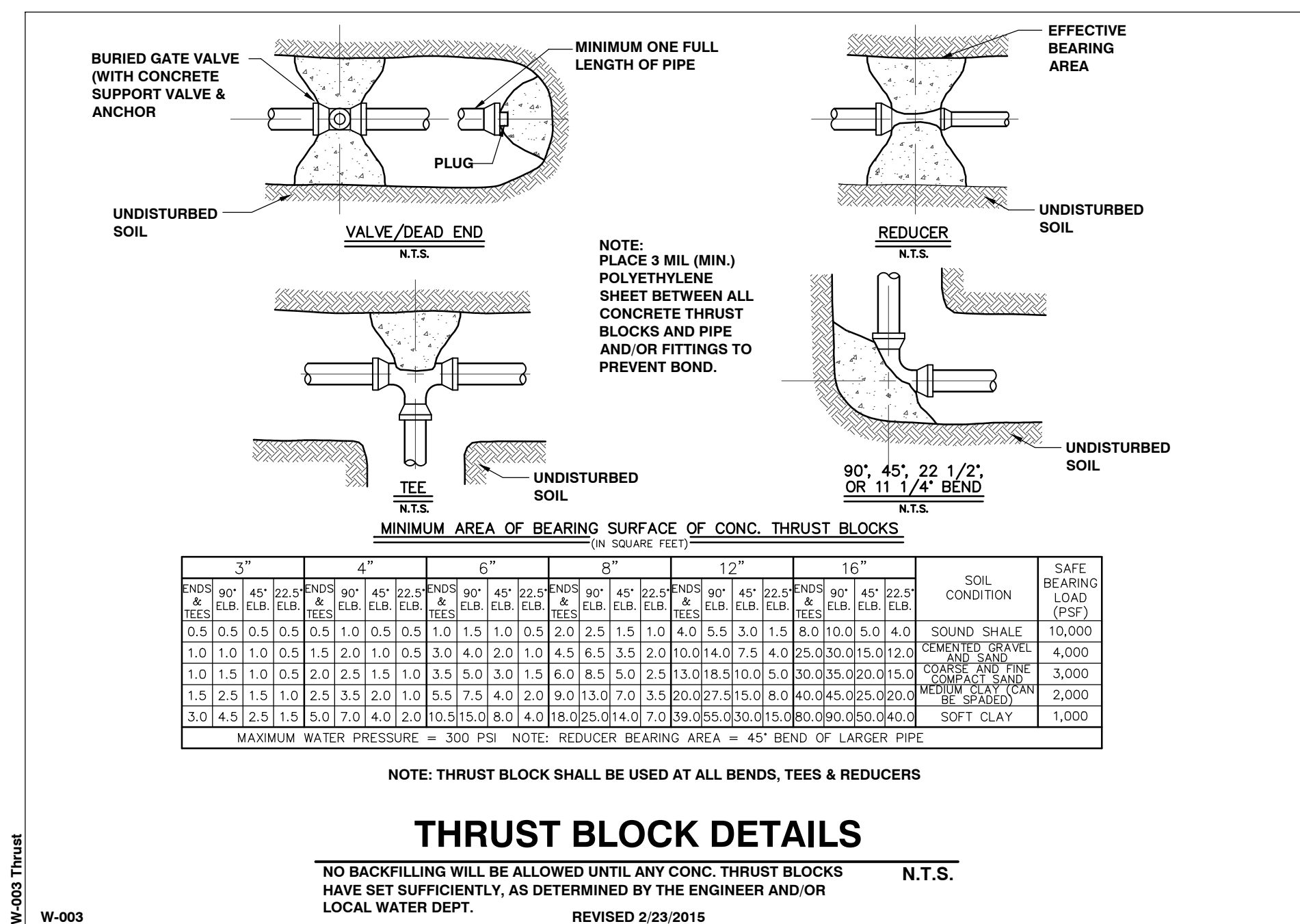
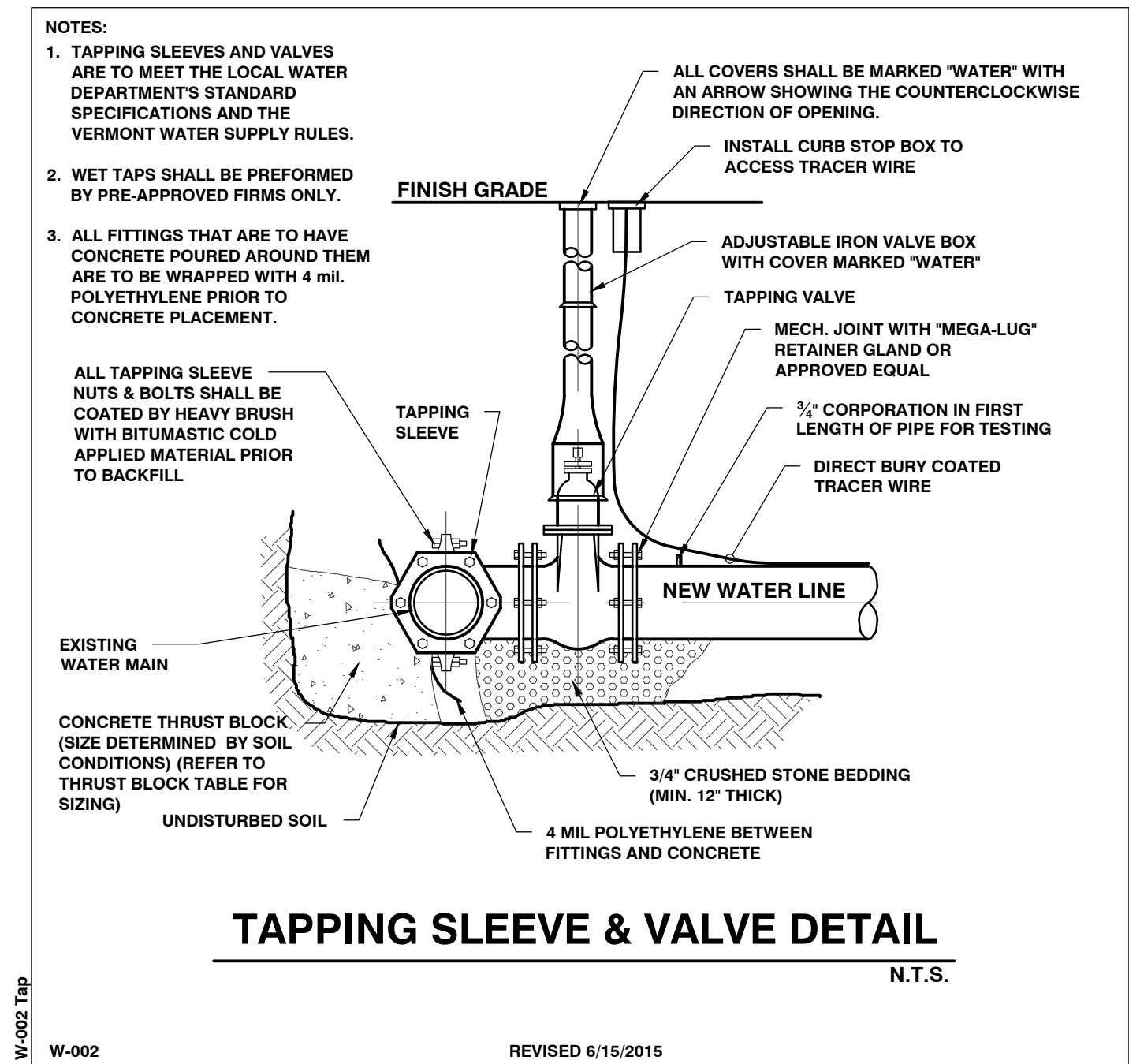
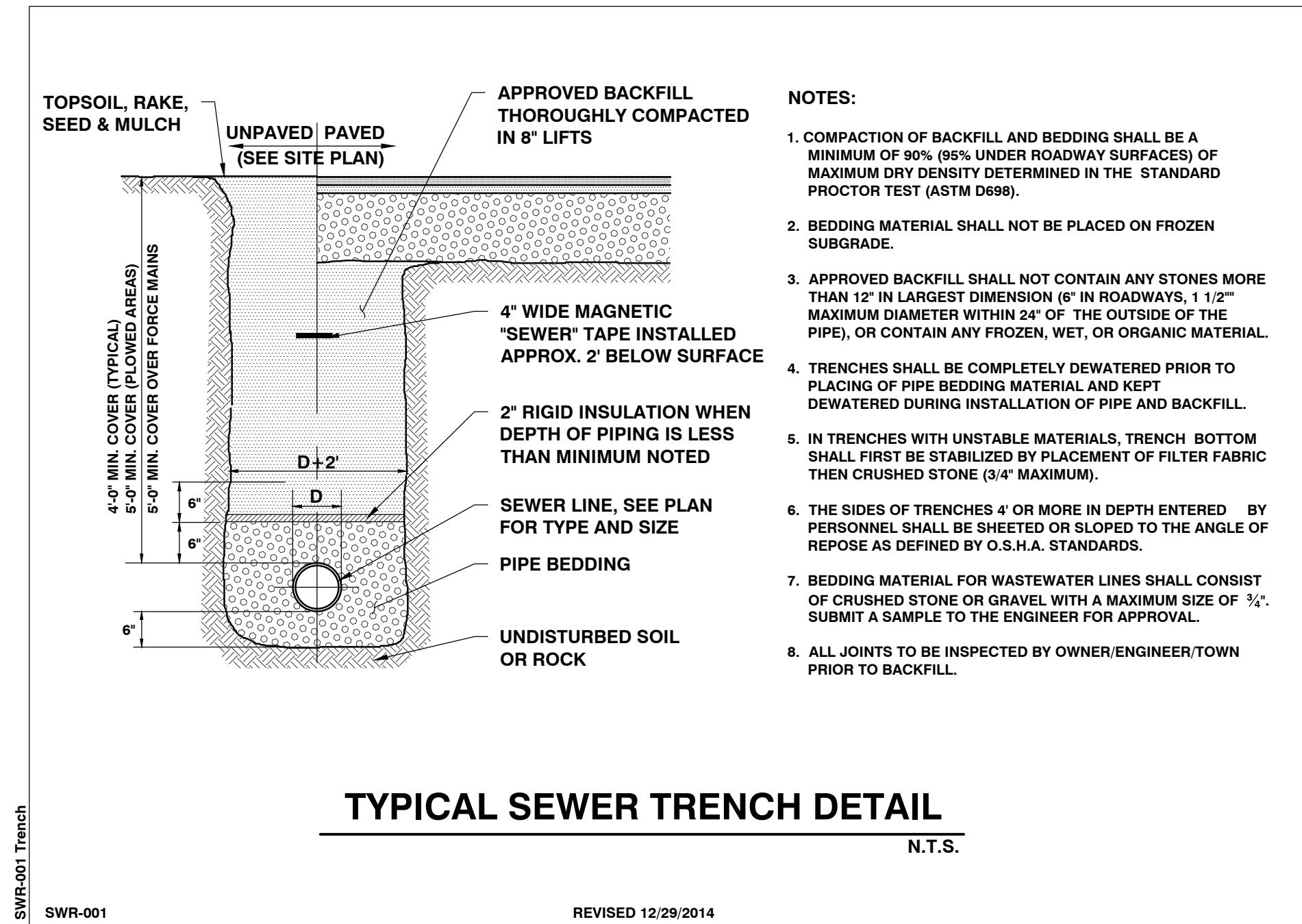
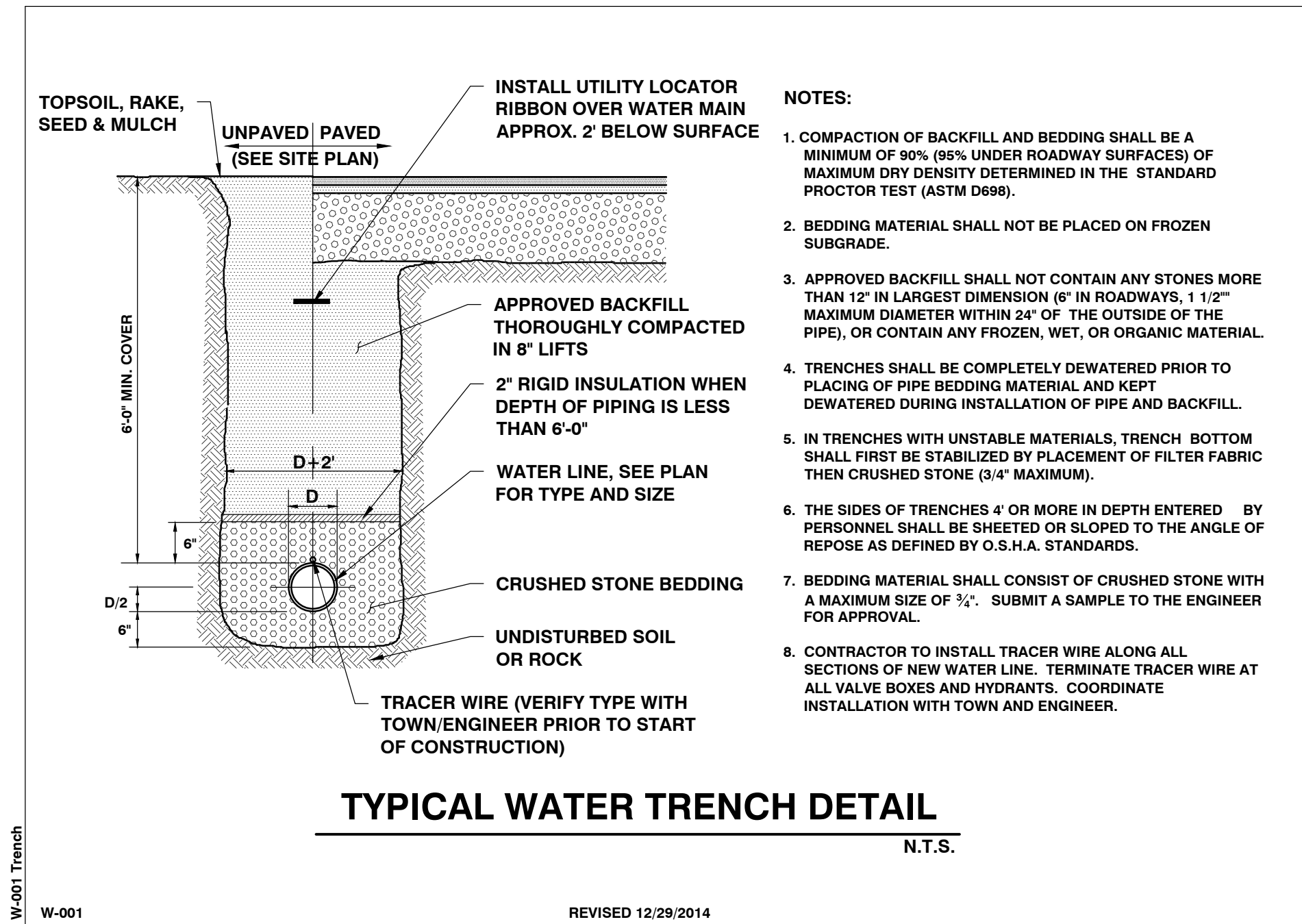
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SITE ENGINEER:

CIVIL ENGINEERING ASSOCIATES, INC.  
10 MANSFIELD VIEW LANE, SOUTH BURLINGTON, VT 05403  
802-864-2323 FAX: 802-864-2271 web: www.cae-vt.com

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OWNER:

**BURLINGTON HARBOR MARINA LLC**  
1 CHURCH STREET  
BURLINGTON VT 05401

PROJECT:

**BURLINGTON HARBOR MARINA**

234 PENNY LANE  
BURLINGTON VT 05401

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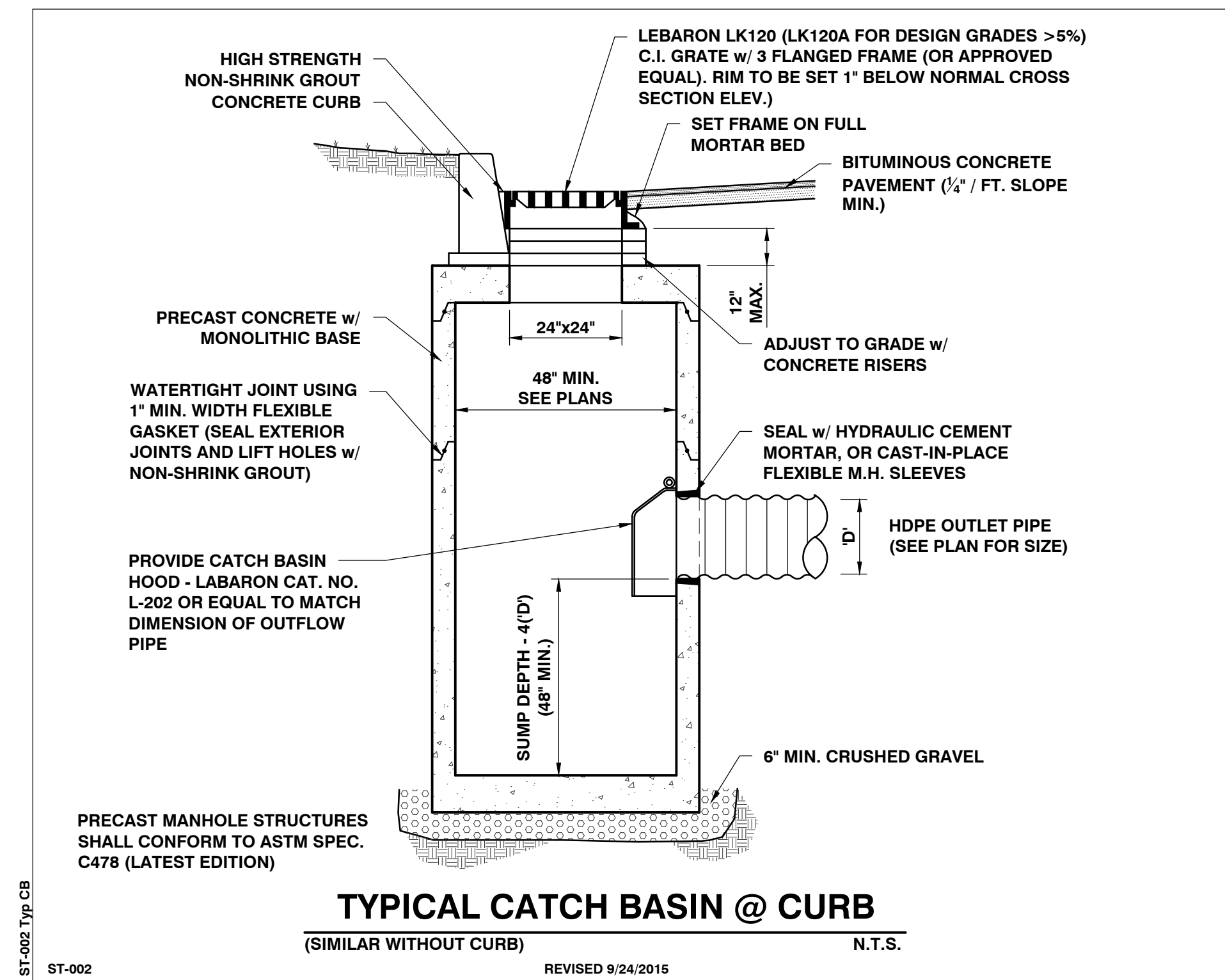
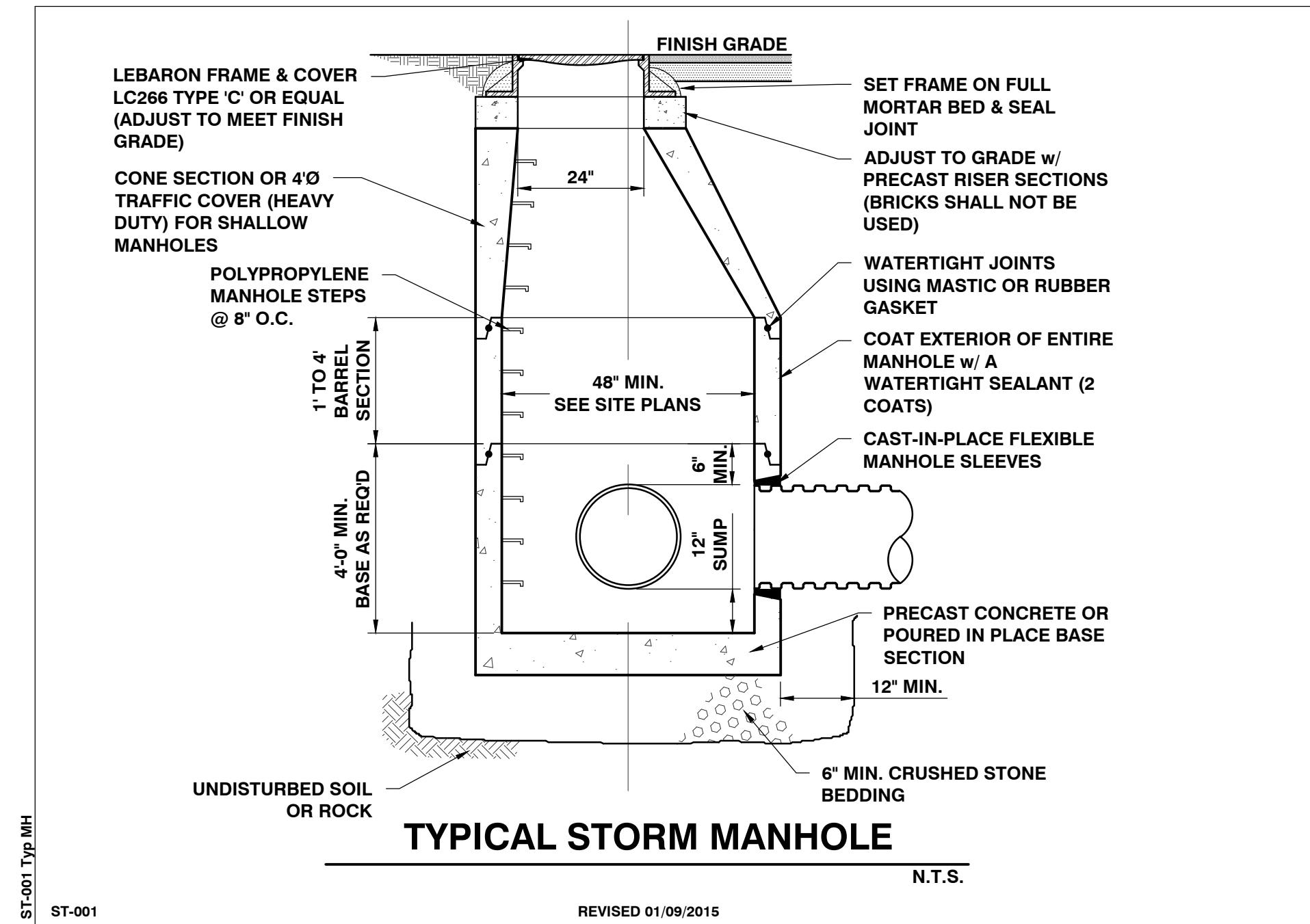
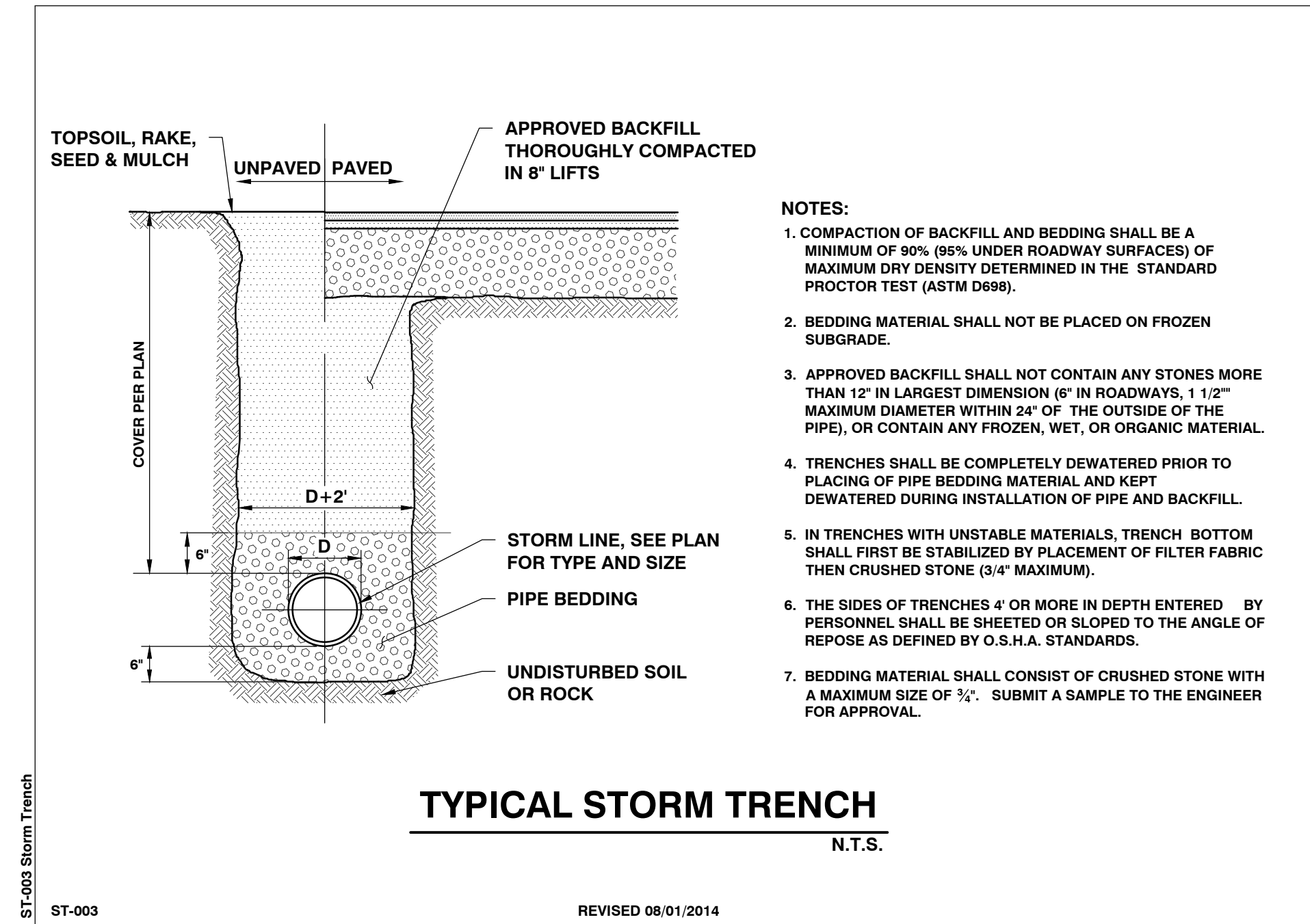
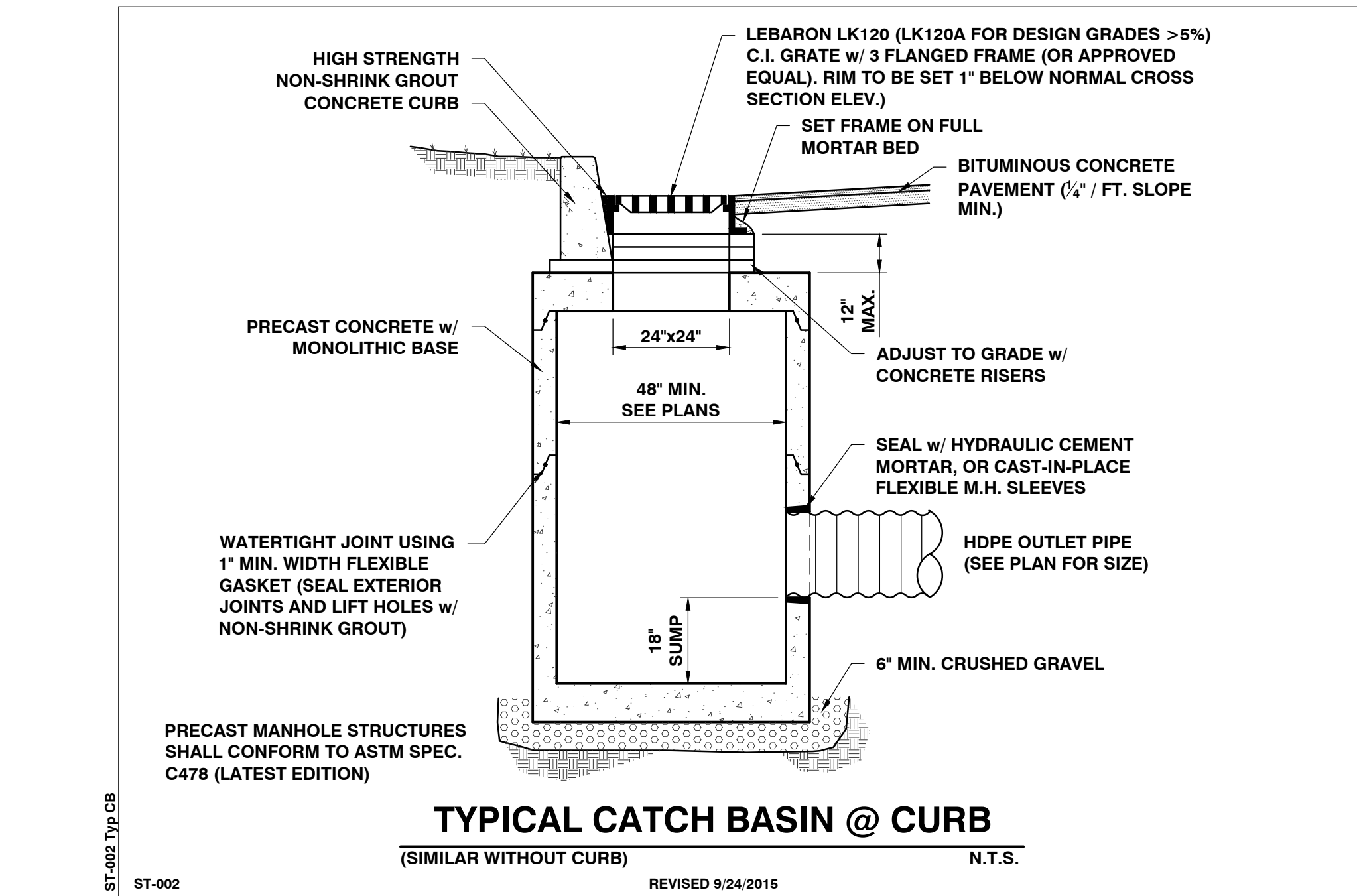
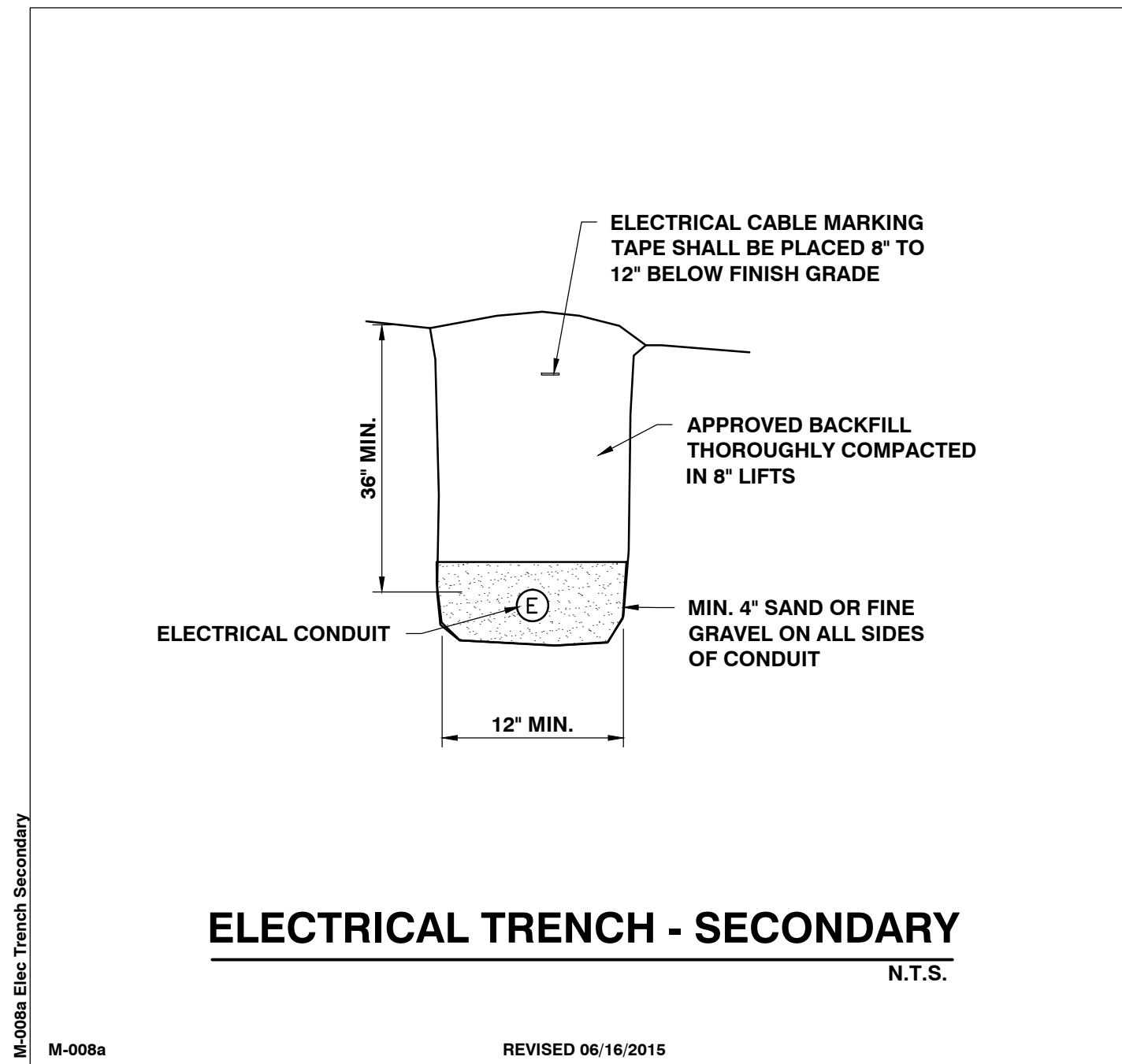
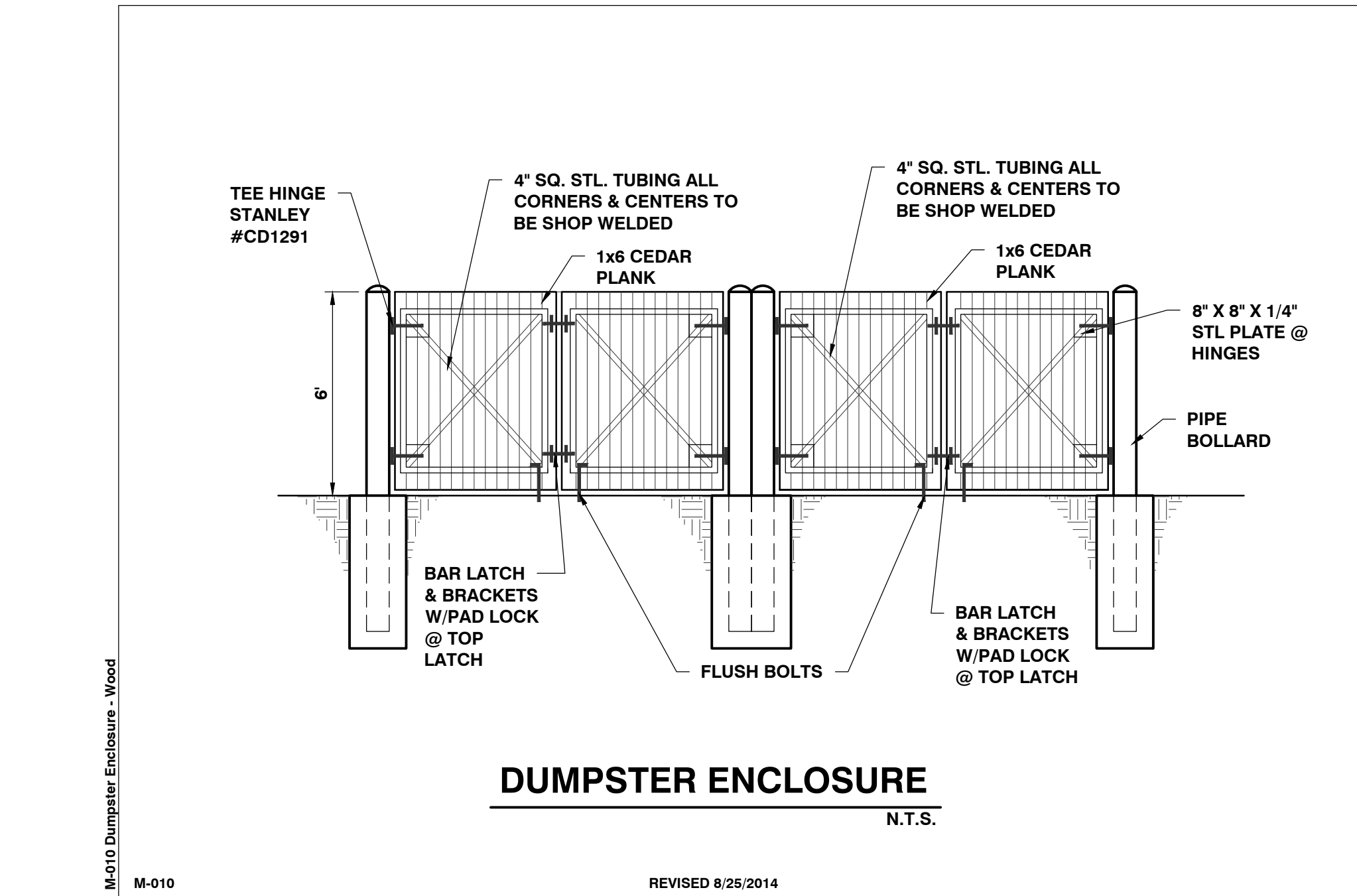
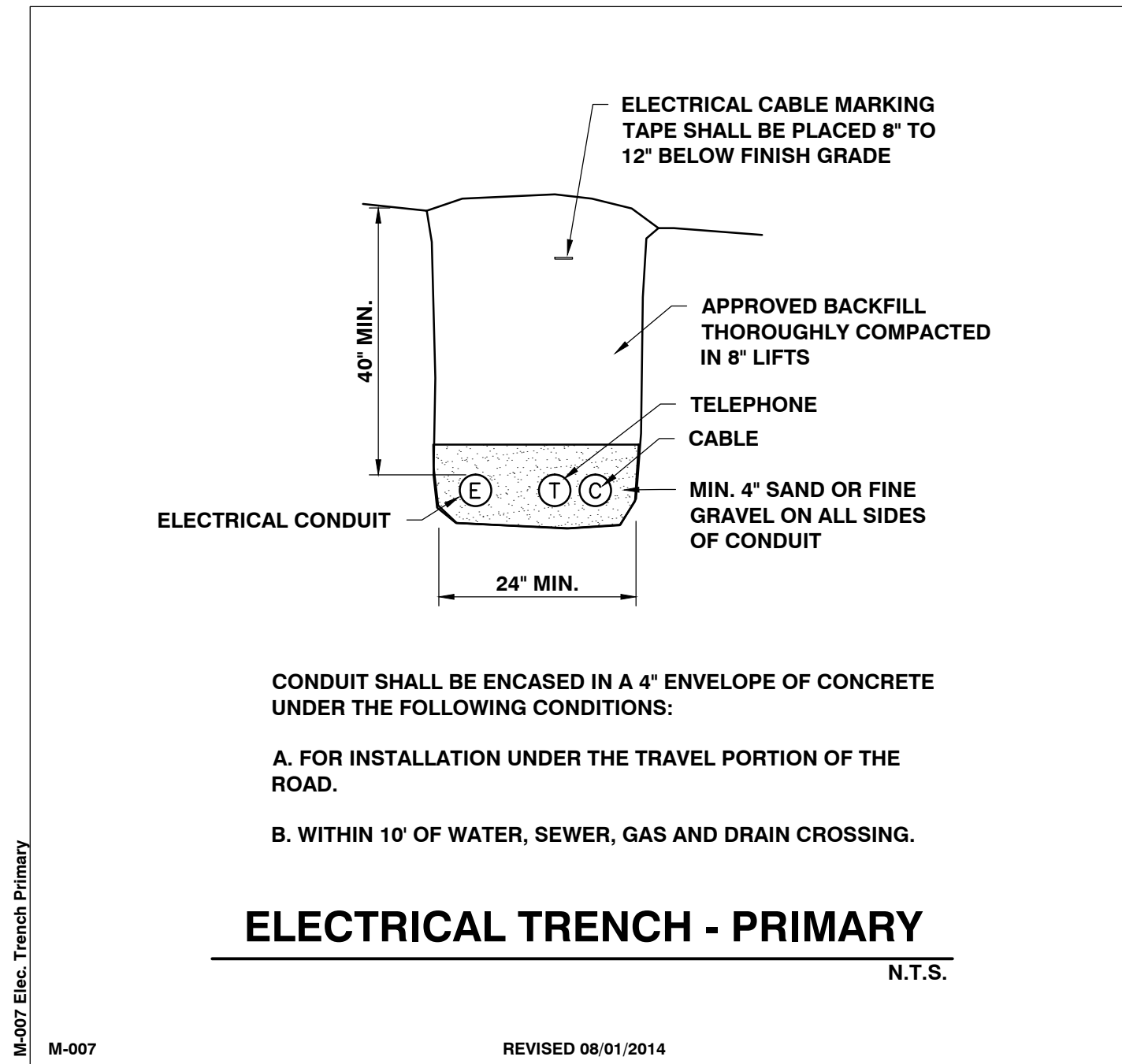
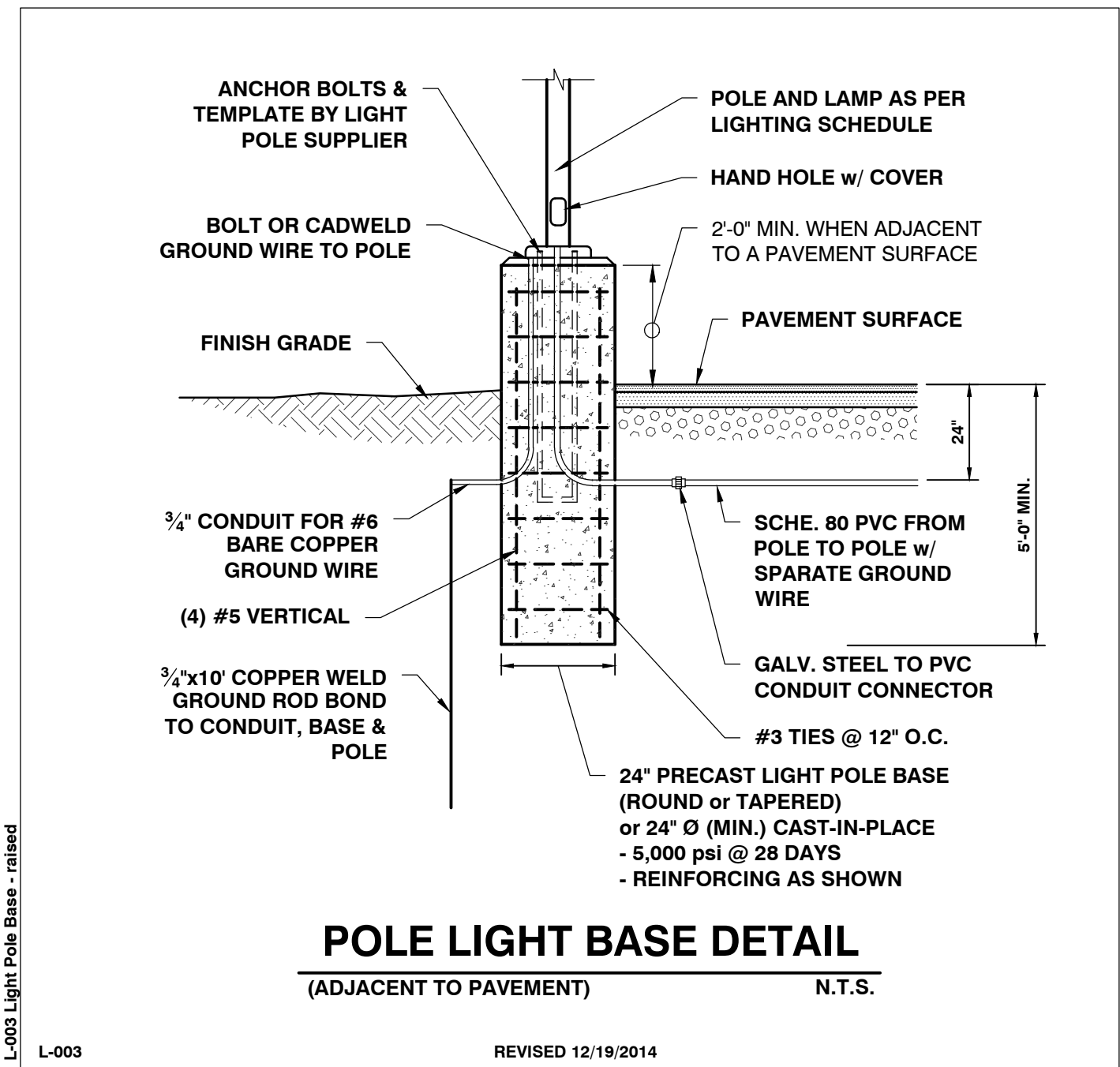
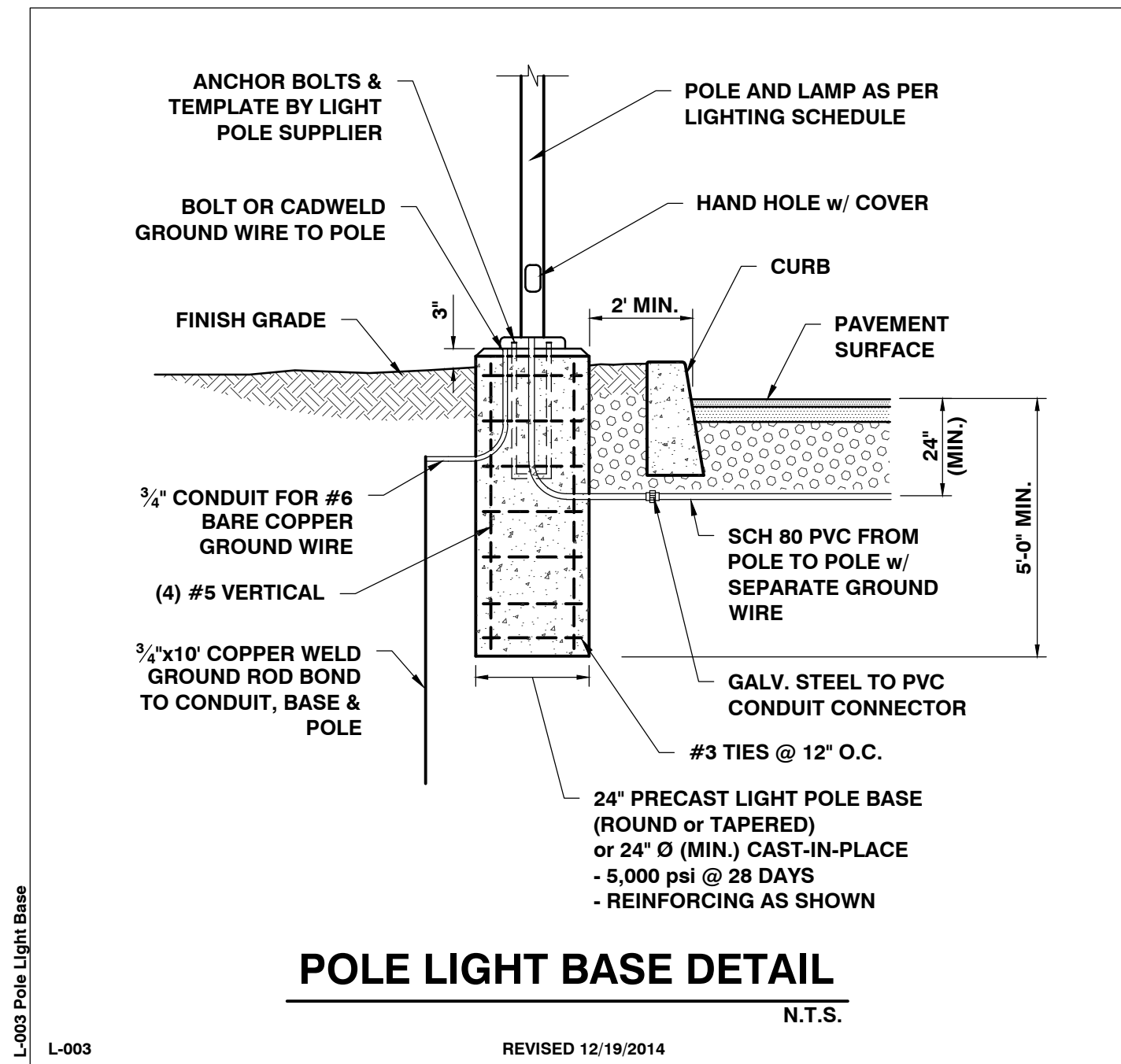
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SITE ENGINEER:

CIVIL ENGINEERING ASSOCIATES, INC.  
10 MANSFIELD VIEW LANE, SOUTH BURLINGTON, VT 05403  
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OWNER:

**BURLINGTON  
HARBOR MARINA  
LLC**

1 CHURCH STREET  
BURLINGTON VT 05401

PROJECT:

**BURLINGTON  
HARBOR MARINA**

234 PENNY LANE  
BURLINGTON VT 05401

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**DETAILS**

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14115

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**C4.2**



PROJECT COORDINATION    UPDATED 8/5/16

PART 1 – GENERAL

1.01 MEETINGS & PROJECT ACCESS

- A. The Owner shall be notified five (5) days prior to commencement of Work by the Contractor.
- B. The Contractor will coordinate with the Owner to arrange an on-site pre-construction meeting prior to commencement of any work. Job superintendents and subcontractors shall be included in this meeting.
- C. The Contractor will coordinate all phases of the Work, so as not to interfere with the normal work procedures in the area.
- D. The Contractor shall conduct his work in such a manner as to not interfere with or endanger work or traffic in areas adjacent to the construction area, except as permitted by the Owner. The Contractor shall so arrange his construction operations as to provide access for emergency vehicles and equipment to the work site at all times.

1.02 LABOR

- A. The Contractor and subcontractors will employ mechanics skilled in their respective trades.
- B. All labor will be performed in a neat and workmanlike manner.

1.03 PROTECTION OF PERSONS AND PROPERTY

- A. The Contractor shall be responsible for initiating, maintaining, and supervising all O.S.H.A. safety precautions in connection with the Work.
- B. Fire Protection: The Contractor shall take all necessary precautions to prevent fires adjacent to the Work and shall provide adequate facilities for extinguishing fires. The Contractor shall also prevent fires in project related buildings and shall prevent the spread of fires to areas outside the limits of the Work.
- C. Safety Precautions: Prior to commencement of Work, the Contractor shall be familiar with all safety regulations and practices applicable with construction operations. No additional payments will be made for equipment and procedures necessitated by these safety precautions.

1.04 CORRECTION OF WORK

- A. The Contractor shall promptly correct all Work rejected by the Owner as defective or as failing to conform to the Contract Documents. The Contractor shall bear all cost of correcting such rejected Work.

1.05 WEATHER CONDITIONS

- A. No Work shall be done when, in the opinion of the Owner, the weather is unsuitable. No concrete, earth backfill, embankment, or paving shall be placed upon frozen material. If there is delay or interruption in the Work due to weather conditions, the necessary precautions must be taken to bond new Work to old.
- B. Protection Against Water and Storm: The Contractor shall take all precautions to prevent damage to the Work by storms or by water entering the site of the Work directly or through the ground. In case of damage by storm or water, the Contractor, at his own expense, shall make repairs or replacements or rebuild such parts of the Work as the Engineer may require in order that the finished work may be completed as required by the Drawings and Specifications.

1.06 DISPOSAL OF DEBRIS

- A. All debris and excess materials, other than that which is authorized to be reused, become the property of the Contractor and shall be promptly removed from the property. The Contractor shall receive title to all debris and/or excess material. The Owner will not be responsible for any loss or damage to debris or excess material owned by the Contractor.

1.07 PROJECT LAYOUT

- A. The Contractor shall be responsible for providing all necessary survey staking.
1. Locate and protect control points before starting work on the site.
2. Preserve permanent reference points during progress of the Work.
3. Establish a minimum of two permanent benchmarks on the site, referenced to data established by survey control points.
- a. Record locations, with horizontal and vertical data, on Project Record Documents.

1.08 TESTING

- A. The Contractor is responsible for obtaining testing and inspection services.

**SITE CLEARING**

PART 1 – GENERAL

1.01 SUMMARY

- A. Section includes:

1. Remove surface debris.
2. Clear site of plant life and grass.
3. Remove trees and shrubs.
4. Remove root system of trees and shrubs.

PART 2 – PRODUCTS

Not used.

PART 3 – EXECUTION

3.01 PROTECTION

- A. Protect utilities that remain from damage.
- B. Protect trees, plant growth, and features designated to remain as final landscaping.
- C. Protect bench marks and existing structures from damage or displacement.
- D. Use means necessary to prevent dust becoming a nuisance to the public, to neighbors, and to other work being performed on or near the site.
- E. Maintain access to the site at all times.

3.02 CLEARING

- A. Clear areas required for access to site and execution of Work.
- B. Remove trees and shrubs within marked areas. Remove stumps, roots and tap roots and other projections 14" or greater in diameter to 2'-0" below the excavated surfaces in cut areas and 2'-0" below the exposed subgrade in fill areas.

3.03 REMOVAL

- A. Remove debris, rock, and extracted plant life from site.
- B. The Contractor shall coordinate Work with the Engineer and Owner in establishing suitable areas within the property limits for depositing debris, rocks and extracted plant life. The Contractor shall be responsible for backfilling (capping) and grading all waste sites.

3.04 UTILITIES

- A. Coordinate with utility companies and agencies as required.

**SITE EARTHWORK**

PART 1 – GENERAL

1.01 SUMMARY

- A. Section includes:
1. All excavation (unless covered in other sections of these specifications), removal and stockpile of topsoil, stabilization fabric, and other miscellaneous and appurtenant works.
2. Site filling.
3. Roadway structural sections.

1.02 PROTECTION

- A. Protect bench marks and existing structures.
- B. Protect above or below grade utilities which are to remain.

1.03 SUBMITTALS

- A. Testing laboratory reports indicating that material for backfill meets requirements of this Section.
- B. Field density test reports of site fill in place.
- C. Field density test reports for roadway structural sections in place.
- D. Stabilization Fabric: Submit copies of manufacturer's specifications and installation instructions.

PART 2 – PRODUCTS – For permeable pavement areas see sheets C6.0 & C6.1

2.01 STRUCTURAL FILL – CRUSHED GRAVEL (AOT SPEC. 704.05, FINE)

- A. All materials shall be secured from approved sources. This gravel shall consist of angular and round fragments of hard durable rock of uniform quality throughout, reasonably free from thin elongated pieces, soft or disintegrated stone, dirt, organic or other objectionable matter. This material shall meet the following grading requirements:

| Sieve Designation | Percent by Weight<br>Passing Square Mesh Sieve |
|-------------------|------------------------------------------------|
| 2"                | 100                                            |
| 1 1/2"            | 90 – 100                                       |
| No. 4             | 30 – 60                                        |
| No. 100           | 0 – 12                                         |
| No. 200           | 0 – 6                                          |

2.02 CRUSHED GRAVEL (AOT SPEC. 704.05, COARSE)

- A. This material shall meet the following grading requirements:

| Sieve Designation | Percent by Weight<br>Passing Square Mesh Sieve |
|-------------------|------------------------------------------------|
| 4"                | 95 – 100                                       |
| No. 4             | 25 – 50                                        |
| No. 100           | 0 – 12                                         |
| No. 200           | 0 – 6                                          |

At least 50% by mass (weight) of the material coarser than the No. 4 sieve shall have at least one fractured face.

2.03 COMPACTED FILL/GRANULAR BORROW

- A. This material shall be free of shale, clay, friable material, debris, and organic matter, graded in accordance with ANSI/ASTM C136 within the following limits:

| Sieve Designation | Percent by Weight<br>Passing Square Mesh Sieve |
|-------------------|------------------------------------------------|
| 3"                | 100                                            |
| 3/4"              | 75 – 100                                       |
| No. 4             | 20 – 100                                       |
| No. 100           | 0 – 20                                         |
| No. 200           | 0 – 6                                          |

2.04 DRAINAGE COURSE (AOT SPEC. 704.16)

- A. Rock for drainage applications shall be produced from natural gravels or crushed quarried rock and shall consist of clean, hard, sound, and durable material. It shall be obtained from

approved sources and shall meet the following grading requirements:

| Sieve Designation | Percent by Weight<br>Passing Square Mesh Sieve |
|-------------------|------------------------------------------------|
| 1"                | 100                                            |
| 3/4"              | 90 – 100                                       |
| 3/8"              | 20 – 55                                        |
| No. 4             | 0 – 10                                         |
| No. 8             | 0 – 10                                         |

2.5. DENSE GRADED CRUSHED STONE

- A. Dense Graded Crushed Stone should consist of a well graded crushed run stone and should meet the requirements for Vermont AOT Standard Specifications Item 704.06 Dense Graded Crushed Stone for Subbase and the gradation requirements shown in Table 704.06A of the Vermont AOT Standard Specifications.

| Sieve Designation | Percent Finer by Weight |
|-------------------|-------------------------|
| 3 1/2"            | 100                     |
| 3"                | 90 – 100                |
| 2"                | 75 – 100                |
| 1"                | 50 – 80                 |
| 1/2"              | 30 – 60                 |
| No. 4             | 15 – 40                 |
| No. 200           | 0 – 6                   |

2.1. RECYCLED ASPHALT PAVEMENT (RAP) 1 1/2" MINUS CRUSHED ASPHALT

- A. This material shall be free of Portland Cement and approved by the engineer prior to installation. This material shall not be mixed with gravel and shall meet the following grading requirements:

| Sieve Designation | Percent by Weight<br>Passing Square Mesh Sieve |
|-------------------|------------------------------------------------|
| 2"                | 100                                            |
| 1 1/2"            | 90 – 100                                       |
| No. 4             | 30 – 60                                        |
| No. 100           | 0 – 12                                         |
| No. 200           | 0 – 6                                          |

2.6 SAND BORROW AND CUSHION

- A. Sand Borrow shall consist of material reasonably free from silt, loam, clay, or organic matter. It shall be obtained from approved sources and shall meet the requirements for Vermont AOT Standard Specifications and the gradation requirements shown in Table 703.03A of the Vermont AOT Standard Specifications.

| Sieve Designation | Percent Finer by Weight |
|-------------------|-------------------------|
| 2"                | 100                     |
| 1 1/2"            | 90 – 100                |
| 1/2"              | 70 – 100                |
| No. 4             | 60 – 100                |
| No. 100           | 0 – 20                  |
| No. 200           | 0 – 8                   |

2.07 GEOTEXTILE

- A. Subsurface Drainage Geotextile: Nonwoven needle-punched geotextile, manufactured for subsurface drainage applications, made from polyolefins or polyesters; with elongation greater than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:

1. Survivability: Class 3; AASHTO M 288.
2. Grab Tensile Strength: 157 lbf; ASTM D 4632.
3. Sewn Seam Strength: 142 lbf; ASTM D 4632.
4. Tear Strength: 56 lbf; ASTM D 4533.
5. Puncture Strength: 56 lbf; ASTM D 4833.
6. Apparent Opening Size: No. 70 sieve, maximum; ASTM D 4751.
7. Permittivity: 0.5 per second, minimum; ASTM D 4491.
8. UV Stability: 50 percent after 500 hours' exposure; ASTM D 4355.
- B. Separation Geotextile: Woven geotextile fabric, manufactured for separation applications, made from polyolefins or polyesters; with elongation less than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:

1. Survivability: Class 3; AASHTO M 288.
2. Grab Tensile Strength: 200 lbf; ASTM D 4632.
3. Sewn Seam Strength: 222 lbf; ASTM D 4632.
4. Tear Strength: 75 lbf; ASTM D 4533.
5. Puncture Strength: 90 lbf; ASTM D 4833.
6. Apparent Opening Size: No. 40 sieve, maximum; ASTM D 4751.
7. Permittivity: 0.02 per second, minimum; ASTM D 4491.
8. UV Stability: 50 percent after 500 hours' exposure; ASTM D 4355.
9. Weight: 4.0 oz/yd² minimum.

PART 3 – EXECUTION

3.01 PREPARATION

- A. Identify required lines, levels, contours, and datum.
- B. Identify known below grade utilities. Stake and flag locations.
- C. Maintain and protect existing utilities remaining which pass through work area.

- D. Upon discovery of unknown utility or concealed conditions, discontinue affected work; notify Engineer.

3.02 EROSION CONTROL

- A. Erosion control must be installed prior to beginning any earthwork operations.

3.03 TOPSOIL EXCAVATION

- A. Excavate topsoil from areas to be excavated, re-landscaped or regraded and stockpile in areas designated on site or as directed by the Engineer.

- B. Maintain the stockpile in a manner which will not obstruct the natural flow of drainage.

1. Maintain stockpile free from debris and trash.
2. Keep the topsoil damp to prevent dust and drying out.

3.04 SUBSOIL EXCAVATION

- A. Excavate subsoil from areas to be regraded in accordance with plans.
- B. Excavate subsoil required to accommodate site structures, construction operations, roads, and parking areas.
- C. Grade top perimeter of excavation to prevent surface water from draining into excavation.
- D. Notify engineer of unexpected subsurface conditions and discontinue affected work in area until notified to resume work.
- E. Correct areas over-excavated by error as directed by the Engineer.

3.05 DITCHES

- A. Cut accurately to the cross-sections, grades, and elevations shown.
- B. Maintain excavations free from detrimental quantities of leaves, sticks, trash, and other debris until completion of the work.
- C. Dispose of excavated materials as shown on the drawings or directed by the Engineer; except do not, in any case, deposit materials less than three feet from the edge of a ditch.

3.06 ROADWAY EMBANKMENTS AND BERMS

- A. When embankments are to be made on a hillside, the slope of the original ground on which the embankments are to be constructed shall be stepped and properly drained as the fill is constructed so that adverse movements of the slopes do not occur.
- B. Any excavated rock, ledge, boulders, and stone, except where required in the construction of other items or otherwise directed, shall be used in the construction of embankments to the extent of the project requirements and generally shall be placed so as to form the base of an embankment.
- C. Frozen material shall not be used in the construction of embankments, nor shall the embankments or successive layers of the embankments be placed upon frozen material. Placement of material other than rock shall stop when the sustained air temperature, below 32 degrees Fahrenheit, prohibits the obtaining of the required compaction. If the material is otherwise acceptable, it shall be stockpiled and reserved for future use when its condition is acceptable for use in embankments.
- D. When an embankment is to be constructed across a swamp, muck, or areas of unstable soils, the unsuitable material shall be excavated to reach soils of adequate bearing capacity and the embankment begun. Alternative methods, such as use of a stabilization fabric in place of excavation and backfill, may be utilized only after approval of same by the Engineer.

- E. Material being placed in embankments shall be placed in horizontal layers of uniform thickness across the full width of the embankment. Stumps, trees, rubbish, and other unsuitable material shall not be placed in embankments.

- F. Embankment areas shall be placed in eight-inch maximum lifts. Effective spreading equipment shall be used on each layer to obtain uniform thickness prior to compaction. Each layer shall be kept crowned to shed water to the outside edge of embankment and continuous leveling and manipulating will be required to assure uniform density. The entire area of each layer shall be uniformly compacted to at least the required minimum density by use of compaction equipment consisting of rollers, compactors, or a combination thereof. Earth-moving and other equipment not specifically manufactured for compaction purposes will not be considered as compaction equipment.

- G. All fill material shall be compacted at a moisture content suitable for obtaining the required density. In no case shall the moisture content in each layer under construction be more than three percent above the optimum moisture content and shall be less than that quantity that will cause the embankment to become unstable during compaction. Sponginess, shoving, or other displacement under heavy equipment shall be considered evidence for an engineering determination of lack of stability under this requirement, and further placement of material in the area affected shall be stopped or retarded to allow the material to stabilize.

- H. When the moisture content of the material in the layer under construction is less than the amount necessary to obtain satisfactory compaction by mechanical compaction methods, water shall be added by pressure distributors or other approved equipment. Water may also be added in excavation or borrow pits. The water shall be uniformly and thoroughly incorporated into the soil by disc, harrowing, blading, or by other approved methods. This manipulation may be omitted for sands and gravel. When the moisture content of the material is in excess of three percent above optimum moisture content, dry material shall be thoroughly incorporated into the wet material, or the wet material shall be aerated by disk, harrowing, blading, rotary mixing, or by other approved methods; or compaction of the layer of wet material shall be deferred until the layer has dried to the required moisture content by evaporation.

3.07 COMPACTION REQUIREMENTS

- A. All backfills and fills shall be compacted in even lifts (12" maximum) to attain the required densities as follows:

| Location                                            | Modified Proctor<br>ASTM D-1557 |
|-----------------------------------------------------|---------------------------------|
| Subgrade (8") and Gravel for Roads and Parking Lots | 95%                             |
| General Embankments                                 | 90%                             |

**UTILITY TRENCHING AND BACKFILLING**

PART 1 – GENERAL

1.01 SUMMARY

- A. Section includes:
1. Trench, backfill, and compact as specified herein and as needed for installation of underground utilities.
- B. Use equipment adequate in size, capacity, and numbers to accomplish the work in a timely manner.
- C. Comply with all requirements of governmental agencies having jurisdiction.

PART 2 – PRODUCTS

2.01 SOIL MATERIALS

- A. Fill and backfill materials:
1. Provide backfill materials free from organic matter and deleterious substances, containing no rocks or lumps over 6" in greatest dimension.
2. Fill material is subject to the approval of the Engineer, and is that material removed from excavations or imported from off-site borrow areas, predominantly granular, non-expansive soil free from roots and other deleterious matter.
3. Do not permit rocks having a dimension greater than 2" within 2' of the outside of pipe.
4. Cohesionless material used for backfill: Provide sand free from organic material and other foreign matter, and as approved by the Engineer.

PART 3 – EXECUTION

3.01 PROCEDURES

- A. Existing Utilities:
1. Unless shown to be removed, protect active utility lines shown on the drawings or otherwise made known to the Contractor prior to trenching. If damaged, repair or replace at no additional cost to the Owner.
2. When existing underground utilities, which are not scheduled for removal or abandonment, are encountered in the excavation, they shall be adequately supported and protected from damage. Any damage to utilities shall be repaired promptly at no additional cost to the Owner.
3. If the service is interrupted as a result of work under this section, immediately restore service by repairing the damaged utility at no additional cost to the Owner.
4. If existing utilities are found to interfere with the permanent facilities being constructed under this section, immediately notify the Engineer and secure his instructions.
5. Do not proceed with permanent relocation of utilities until written instructions are received from the Engineer.
- B. Protection of persons and property:
1. Barricade open holes and depressions occurring as part of the work, and post warning lights on property adjacent to or with public access.
2. Operate warning lights during hours from dusk to dawn each day and as otherwise required.
3. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, washout, and other hazards created by operations under this section.
- C. Dewatering: The Contractor, at all times, shall conduct his operations so as to prevent the accumulation of water, ice, and snow in excavations or in the vicinity of excavated areas, and to prevent water from interfering with the progress of quality of the work. Under no conditions shall water be allowed to rise in open trenches after pipe has been placed.
- D. Accumulated water, ice, and snow shall be promptly removed and disposed of by pumping or other approved means. Disposal shall be carried out in a manner which will not create a hazard to public health, nor cause injury to public or private property, work completed or in progress, or public streets, nor cause any interference in the use of streets and road by the public. Pipes under construction shall not be used for drainage of excavations.

- E. Maintain access to adjacent areas at all time.

3.02 TRENCHING

- A. Care shall be exercised by the Contractor to avoid disrupting the operation of existing facilities without prior written approval of the Engineer.
- B. Provide sheeting and shoring necessary for protection of the work and for the safety of personnel.

SITE ENGINEER:



**CIVIL ENGINEERING ASSOCIATES, INC.**  
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OWNER:

**BURLINGTON  
HARBOR MARINA  
LLC**  
**1 CHURCH STREET  
BURLINGTON VT 05401**

PROJECT:

**BURLINGTON  
HARBOR MARINA**

**234 PENNY LANE  
BURLINGTON VT 05401**

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**SITE  
SPECIFICATIONS**

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| DATE<br><b>JAN. 13, 2017</b> | DRAWING NUMBER<br><b>C5.0</b> |
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| PROD. NO.<br><b>14115</b>    |                               |











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| <p>the end of the test period, the structure shall be refilled to the top of the cone measuring the volume of water added.</p> <p>2. This amount shall be converted to a 24-hour rate and the leakage determined on the basis of depth and size of structure. The leakage for each structure shall not exceed one gallon per vertical foot per 15 linear feet of wall (as measured in plan view) for a 24 hour period for exfiltration and there shall be no visible infiltration.</p> <p>C. Air Test: Alternatively, the manhole may be tested for leakage using the following procedure:</p> <p>1. All lifting hole and exterior joints shall be filled and pointed with an approved non-shrinking mortar. The completed manhole shall not be backfilled prior to testing. Structures that have been backfilled shall be excavated to expose the entire exterior prior to vacuum testing or the manhole shall be tested for leakage by means of a hydrostatic test.</p> <p>2. All pipes and other openings in the manhole shall be suitably plugged in a manner to prevent displacement.</p> <p>3. A plate with an inflatable rubber ring the size of the top of the manhole shall be installed by inflating the ring with air to a pressure adequate to prevent leakage of air between the rubber ring and the manhole wall.</p> <p>4. Air shall then be pumped out of the manhole through an opening in the plate until a vacuum is created inside of the manhole equal to 10 inches of mercury on an approved vacuum gauge. The removal of the air shall then be stopped and the test time begun.</p> <p>5. The vacuum must not drop below 9 inches of mercury within a 2 minute test period. If more than 1 inch of drop in vacuum occurs within the 2 minute test period the manhole has failed the test and shall be repaired or reconstructed and retested.</p> <p>D. Following satisfactory test results, the manhole may be backfilled.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |  | <p>same container as the pump shaft seal.</p> <p>D. Provide 100% spare lamps and fuses for control panel.</p> <p>E. Provide all lubricants required for initial operation.</p> <p>F. Provide one (1) spare input and output card, processor, and power supply for the Programmable logic controller (PLC) system.</p> <p>G. Provide one (1) spare level transducer.</p> <p>4.01 O &amp; M MANUALS</p> <p>A. Installation of all mechanical equipment shall be done in accordance with written instructions provided by the manufacturer. Installation instructions shall be delivered with the station.</p> <p>B. The manufacturer shall provide 5 copies of a complete and detailed operating and maintenance manual. This manual shall provide all design criteria, general operating procedures, maintenance and servicing procedures for all major components, and as-built drawings of the contributory gravity sewer system, the pumping station and force main. All instructions and parts lists shall be prepared for the specific equipment furnished and shall not refer to similar equipment. Operating manuals must be submitted to the Town prior to final acceptance of the station.</p> <p>4.02 POLYETHYLENE (PE3408) SANITARY SEWER FORCE MAINS</p> <p>A. This specification covers requirements for PE3408 high density polyethylene sanitary sewer force mains. All work shall be performed in accordance with these specifications and manufacturer requirements.</p> <p>B. <u>Referenced Standards.</u> All standard specifications, i.e., Federal, ANSI, ASTM, etc., made a portion of these Specifications by reference, shall be the latest edition and revision thereof.</p> <p>C. <u>Warranty and Acceptance.</u> The Contractor shall warrant all work to be free from defects in workmanship and materials for a period of one year from the date of completion of all construction. If work meets these specifications, a letter of acceptance, subject to the one year warranty period, shall be given at the time of completion. A final acceptance letter shall be given upon final inspection at the end of the one year warranty period, provided the work still complies with these specifications. In the event deficiencies are discovered during the warranty period, they shall be corrected by the Contractor without additional charge to the owner before final acceptance. During the warranty period, the Project Engineer shall determine if warranty repairs or replacement work shall be performed by the Contractor. The decision of the Project Engineer shall be binding upon the Contractor.</p> <p>D. <u>Polyethylene Pipe and Fittings</u></p> <p>1. <u>Qualification of Manufacturers.</u> The Manufacturer shall have manufacturing and quality control facilities capable of producing and assuring the quality of the pipe and fittings required by these Specifications. The manufacturer's production facilities shall be open for inspection by the Owner or his Authorized Representative. Qualified manufacturers shall be approved by the Project Engineer.</p> <p>2. <u>Materials.</u> Materials used for the manufacture of polyethylene pipe and fittings shall be PE3408 high density polyethylene (SDR 11 or better) meeting cell classification 345444C or 345444E per ASTM D 3350; and shall be listed in the name of the pipe and fitting manufacturer in Plastics Pipe Institute's TR-4, <u>Recommended Hydrostatic Strengths and Design Stresses for Thermoplastic Pipe and Fitting</u></p> |  | <p>retesting shall be at the requestor's expense, and shall be performed in accordance with the Specifications.</p> <p>E. Joining</p> <p>1. <u>Heat Fusion Joining.</u> Joints between plain end pipes and fittings shall be made by butt fusion, electrofusion couplings and joints between the main and saddle branch fittings shall be made using saddle fusion procedures that are recommended by the pipe and fitting manufacturer. The Contractor shall ensure that persons making heat fusion joints have received training in the manufacturer's recommended procedure. The Contractor shall maintain records of trained personnel and shall certify that training was received not more than 12 months before commencing construction. External and internal beads shall not be removed.</p> <p>2. <u>Butt Fusion of Unlike Wall Thicknesses.</u> Fusions of different wall thickness are acceptable, as long as the difference is limited to a one SDR difference, i.e. SDR 11 to SDR 9. Transitions between unlike wall thicknesses greater than one SDR shall be made with a transition nipple (a short length of the heavier wall pipe with one end machined to the lighter wall) or by mechanical means.</p> <p>3. <u>Joining by Other Means.</u> Polyethylene pipe and fittings may be joined together or to other materials by means of (a) flanged connections (flange adapters and backup rings), (b) mechanical couplings designed for joining polyethylene pipe or for joining polyethylene pipe to another material, or (c) electrofusion. When joining by other means, the installation instructions of the joining device manufacturer shall be followed. All connections shall maintain the total pressure rating of the force main.</p> <p>4. <u>Mechanical Joint Installation.</u> Mechanical joints shall be installed in accordance with the manufacturer's recommended procedure. When an OD compression mechanical coupling is used, a stiffener shall be installed in the bore of the polyethylene pipe.</p> <p>5. <u>Branch Connections.</u> Branch connections to the main shall be made with saddle fittings or tees. Polyethylene saddle fittings shall be saddle fused to the main pipe.</p> <p>4.03 HORIZONTAL DIRECTIONAL DRILLING W/ POLYETHYLENE PIPE</p> <p>A. Directional boring with PE3408 pipe shall be completed in accordance with the manufacturer's requirements and shall not in any way affect the joint connections or the overall strength characteristics of the pipe.</p> <p>B. References:</p> <p>"Mini-Horizontal Directional Drilling Manual" published by North American Society for Trenchless Technology (NASTT).</p> <p>"Guidelines for a Successful Directional Crossing Bid Package" published by Directional Crossing Contractors Association (DCCA).</p> <p>"Polyethylene Pipe for Horizontal Directional Drilling" of the Plastic Pipe Institute's Handbook of Polyethylene Piping.</p> <p>C. <u>Quality Control.</u> All directional boring shall be completed in such a way as not to jeopardize the existing infrastructure/facilities, such as the roadway, utility poles, subsurface utilities, structures/foundations, or significant landscaping. Prior to directional drilling, all potential conflicts shall be field verified.</p> <p>D. General</p> <p>1. Directional drilling shall be performed in a manner required to install HDPE utility line as indicated on the drawings. Furnish all manpower and equipment required to perform the pipeline installation. The operation shall include all excavation and dewatering, drilling calculations, pilot hole, and pullback operations. Contractor shall be responsible for type of reamer, diameter, and other pertinent operations required for a complete installation. Contractor shall be responsible for mobilizing on-site with a full range of drill stems and reaming heads to allow for various factors which may occur. Drill stems shall be of proper size and diameter to allow for full thrust and torque capabilities of the drilling machines.</p> <p>2. Contractor shall perform utility survey to locate information concerning existing utility lines located in the areas of the directional drilling work.</p> <p>3. Directional drilling shall be accomplished by drilling from one side of the crossing to the other using an approved method. One method shall be drilling a small diameter pilot hole along the proposed utility route. Steering shall be accomplished by using drilling mud which is pumped into the drill pipe to provide rotational energy in a drill bit at the end of the drill pipe. A jet bit shall force the mud through small orifices and jet away the earth and to allow the drilled path to curve in the proper direction as the drill pipe is thrust forward. An electronic survey instrument shall be placed inside the drill pipe head. The instrument shall signal a computer of the drilled paths magnetic azimuth, vertical inclination, and orientation of the bend. This data shall be used by the drilling contractor to calculate location of the drill bit and allow steering adjustments to be made.</p> <p>4. After completing the pilot hole, larger diameter reaming heads shall be pulled back in order to enlarge the hole as required to allow for the pipe pullback. The Contractor shall be responsible for multiple reaming operations as required to complete the work. Pull back operations shall be carried out as soon as possible following the final prerig. During this phase of the work, the Contractor shall continue his work operations without interruption regardless of the day of week or hour of the day. A pullback head shall be attached to the pipe to allow fastening to the swivel head reamer. The head shall be closed to prevent drilling mud from entering the main during the pullback operation.</p> <p>5. Upon completion of the drilling operations, the equipment and materials used shall be removed from the site and the areas disturbed shall be restored to original conditions. The main shall be tested in accordance with Section 02730 of the Specifications. If the main fails the testing, it shall be removed and the work repeated at no additional cost to the Owner.</p> |  | <p><b>WATER SUPPLY SYSTEM</b></p> <p>PART 1 – GENERAL</p> <p>1.01 SUMMARY</p> <p>A. Section includes:</p> <p>1. Pipe Materials</p> <p>2. Hydrants</p> <p>3. Valves</p> <p>4. Fittings</p> <p>5. All other appurtenances necessary to complete the water main system as shown on the Contract Plans.</p> <p>1.02 SUBMITTALS</p> <p>A. Product Data: Submit published data from manufacturers of products and accessories specified, indicating compliance with requirements to the Engineer and local municipality.</p> <p>1.03 QUALITY ASSURANCE</p> <p>A. All materials and the installation procedure shall be in accordance with the Department of Environmental Conservation, Water Supply Division and the applicable construction ordinances of the local municipality.</p> <p>PART 2 – PRODUCTS</p> <p>2.01 GENERAL</p> <p>A. Furnish ells, tees, reducing tees, wyes, couplings, increasers, crosses, transitions and end caps of the same type and class of material as the conduit, or of material having equal or superior physical and chemical properties as acceptable to the Engineer as necessary to complete the water system.</p> <p>2.02 WATER MAIN MATERIAL</p> <p><u>C-900 PVC WATER MAIN</u></p> <p>A. Pipe shall be C-900 (DR-14 200 psi) PVC (sizes as shown on the plans) conforming to current AWWA C-900, latest revision and shall be UL and FM approved. Larger size mains will be required if necessary to allow withdrawal of the required fire flow while maintaining the minimum pressure specified in the VT Water Supply Rule, Chapter 21, 8.1.1. Any proposed departure from minimum requirements shall be justified by hydraulic analysis and future water use assessment, and will be considered only in special circumstances (VT Water Supply Rule, Chapter 21 8.1.4). Push-on joint accessories shall conform to applicable requirements of ANSI/AWWA C111/A21.11.</p> <p>B. When a pipe material is specifically noted on the contract drawings, the contractor/developer shall not have the option of utilizing any other pipe material. Galvanized pipe or fittings shall not be used in any water system owned or maintained by the Town. The Town Water Department requires the use of polyethylene pipe sleeve encasements and/or alternate pipe materials in known or suspected corrosive soil conditions.</p> <p><u>DUCTILE IRON WATER PIPE</u></p> <p>A. Pipe shall be Tyton Ductile Iron Class 52 (sizes as shown on the plans) conforming to current ANSI/AWWA C151/A21.51 latest revision. Push-on joint pipe shall be minimum thickness Class 52. Push-on joint accessories shall conform to applicable requirements of ANSI/AWWA C111/A21.11.</p> <p>B. Pipe shall be cement mortar lined on the inside in accordance with ANSI Specification A21.4 except that the cement lining thickness shall not be less than 1/8 inch. A plus tolerance of 1/8 inch will be permitted.</p> <p>C. Pipe shall be given an exterior petroleum asphaltic coating in accordance with ANSI/AWWA Specification C151/ASNI A21.51.</p> <p>D. Pipe shall be poly wrapped with a minimum thickness of 4 mil poly in accordance with AWWA Specification C105 / ANSI A21.5, unless approved otherwise.</p> <p>2.03 FITTINGS</p> <p>A. Ductile iron fittings shall conform to ANSI/AWWA C110/A21.10, 350 PSI working pressure. Ductile iron fittings larger than twelve inches (12") shall have a standard body length equal to Class 250 Cast Iron fittings. Cast Iron Class 250 fittings will be allowed in lieu of ductile iron fittings larger than twelve inches (12"). Ductile iron fittings shall be rated for 250 p.s.i. However, twelve inch (12") and smaller may be rated for 350 p.s.i. with the use of special gaskets. All ductile iron compact fittings shall conforming to AWWA/ANSI C153/A21.53 standards.</p> <p>B. Anchor tees shall be standard mechanical joint tees except that the branch is plain Class 250 cast iron or Class 350 ductile iron, cement lined, conforming to ANSI/AWWA C110/A21.10, C111/A21.11, and C104/A21.4. Anchor tees shall be Clow F-1217, U.S. Pipe U5-92 or equal.</p> <p>C. Mechanical Joint restraints shall be incorporated into the design of the follower gland and shall include a restraining mechanism which, when actuated, imparts multiple wedging action against the pipe increasing its resistance as the pressure increases. Flexibility of the joint shall be maintained after burial. Glands shall be manufactured of ductile iron, and have a minimum working pressure of 350 psi. Twist off nuts (i.e. mega-lug) or equal shall be used to ensure proper actuating of the restraining devices. Contractors may also use approved grip ring (or equal) retainer glands.</p> <p>D. Bolts shall conform to ANSI Specification A21.10.</p> <p>E. Pipeline couplings shall conform to AWWA Standards C110 and ANSI A21.10. Mechanical joint connecting pieces of proper diameter shall be installed in accordance with the manufacturer recommendations and at locations directed by the plans or the Town Water Department.</p> <p>F. All fittings shall be restrained; double poly wrapped and have</p> |  |
| <p>concrete thrust blocks poured in place as defined herein.</p> <p>2.04 TAPPING SLEEVES AND VALVES</p> <p>A. The Town Water Department shall be notified whenever a proposed tap is to be made on any transmission main within the municipal system.</p> <p>B. Only approved tapping companies shall be allowed to perform wet taps on any Town Water Department water mains.</p> <p>C. All materials used when tapping for a branch connection or interconnection from any Town Water Department water transmission or distribution pipelines shall be specified below</p> <p>2.05 TAPPING SLEEVES</p> <p>For use on existing asbestos cement, gray cast iron, ductile iron or PVC C-900 pipe:</p> <p>A. Tapping sleeves shall be of the split sleeve design, constructed with two solid half-sleeves bolted together. Sleeves shall be constructed of ductile iron, shall have a working pressure of at least 250 psi, and shall have mechanical joint ends with end and side gasket seats.</p> <p>B. All iron body tapping sleeves shall be provided with a 3/4" NPT test plug, or other provisions must be made for air testing the valve and sleeve at maximum working pressure, prior to tapping.</p> <p>C. All bolts and nuts for mechanical joints of tapping sleeves shall be of high-strength cast iron or high-strength, low-alloy steel conforming to ANSI/AWWA C111/A21.11.</p> <p>D. All bolts and nuts for flanged joints of tapping sleeves shall be of high-strength, low carbon steel conforming to ANSI/AWWA C110/A21.10.</p> <p>E. All bolts and nuts shall be sound, clean, and coated with a rust-resistant lubricant; their surfaces shall be free of objectionable protrusions that would interfere with their fit in the made-up mechanical or flanged joint.</p> <p>2.06 TAPPING VALVES</p> <p>A. Tapping valves shall conform to ANSI/AWWA C509 Standard for Resilient-Seated Gate Valves for Water and Sewage Systems, except as modified herein. Valves shall open counterclockwise and shall have a minimum working pressure of 200 psi. Inlet flanges shall be Class 125 conforming to ANSI Specification B16.1 or ANSI/AWWA C110/A21.10, and outlet connection shall be Standardized Mechanical Joint unless specified otherwise on the drawings for the type of pipe required for the branch or lateral pipeline.</p> <p>B. Tapping valves over sixteen inches (16") diameter shall be installed with their stems horizontal, shall be equipped with rollers, tracks and scrapers, and shall be provided with bypass valves unless otherwise specified.</p> <p>C. Buried tapping valves shall be provided with a two inch (2") square wrench nut and shall be installed with a cast iron valve box as required to allow positive access to the valve operating nut at all times. In installations where the depth from grade to top of valve operating nut is greater than 5'0", a valve stem riser shall be provided and installed such that the depth from valve stem riser nut to grade is from four feet to five feet (4'-5'), (minimum length of valve stem riser is two feet (2')). Valve stem riser shall be of high strength steel and of welded construction.</p> <p>D. All contractors (or others) who apply for water line tapping permits shall submit complete specifications of the tapping material they intend to use at the time the tapping permit application is submitted on 8 1/2" x 11" shop drawing sheets</p> <p>E. All bolts and nuts used with all pipe sleeves shall, upon final tightening and testing, be brush coated heavily with bitumastic cold-applied material to thoroughly cover all exposed surfaces of the bolts and nuts.</p> <p>2.07 GATE VALVES-RESILIENT SEAT</p> <p>A. Valves shall be manufactured to meet all requirements of AWWA Specification C509, latest edition. Valves twelve inches (12") and smaller shall be bubble tight, zero leakage at 200 psi working pressure. Valves shall have non-rising stems, open counter clockwise, and provide a two inch (2") square operating nut with arrow cast in the metal indicating direction of opening. Each valve shall have maker's name, pressure rating and year in which manufactured cast on the body. Prior to shipment from the factory, each valve shall be tested by hydrostatic pressure equal to twice the specified working pressure. Gate valves shall be Mueller, Kennedy, AFC, or approved equal.</p> <p>B. Buried valves shall be installed with a gate valve box.</p> <p>C. Gate valves shall normally be placed a maximum of five hundred feet (500') apart. Tee intersections shall have a minimum of three (3) gate valves. Cross sections (four way intersections) shall have a minimum of four (4) valves.</p> <p>D. The Town Water Department may require all bolts, studs and nuts be made from a corrosion resistant-material stainless steel.</p> <p>2.08 VALVE BOXES</p> <p>A. Valve boxes shall be of the three-piece Cast iron slide-type with a minimum inside shaft diameter of five and one quarter inches (5 1/4") and a six foot (6') trench depth. Valve boxes shall not transfer loads onto the valve.</p> <p>B. Valve boxes shall have a cast iron cover, marked "WATER". The boxes shall be dirt tight with the top of the cover flush with the top of the box rim. countersunk brass pentagon plug for paved or concrete areas, and standard two holes for grass areas. Curb box couplings and extensions will be the same material as the curb box. Both cover and upper section of the box shall be able to be located with an aqua type metal locator.</p> <p>C. All service connections shall be installed to the curb stop for all building lots before the street is paved.</p> <p>D. Valve boxes located in roadways shall have one non-adjusting</p> |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    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| <p>No sanitary sewer shall be placed in service until such time as the Town has given final approval to the sewer installation, including satisfactory completion of all required tests. Service connections shall not be made until all receiving sewer mains have been completed and approved and as-builts received along with GPS coordinates and approved by the Town Wastewater Department.</p> <p>A. Laterals</p> <p>Where required on the plans, sewer service connections for one house shall be constructed of four inch (4") pipe, unless otherwise noted on the plans, of the type material specified under this section. The pipe shall be laid and its joints made as required for sewer construction in this specification. Open ends of pipes shall be properly sealed to prevent damage and intrusion of foreign matter where hookup to the building sewer is not coincident with sewer main construction. Additionally, the Contractor will provide a stable, temporary marker approved by the Town Wastewater Department from the sewer service invert up to six inches (6") above the finish grade and seated securely into the ground for ease in relocating the end of sewer service connection for hooking up the building sewer. Two (2) tie points to permanent objects shall be documented. The tie points shall be submitted to the homeowner and to the Wastewater Department.</p> <p>In the case of reconnection of existing services, such reconnection will be made only after the new sewer main has been completed, tested, and accepted. The excavation, bedding material, installation, and backfill for service connections shall be the same as for sewer mains.</p> <p>B. Cleanouts for Sewers</p> <p>Cleanouts for gravity sewers and force mains shall be provided at locations indicated on the plans or as directed by the Town Wastewater Department. Cleanout frames and covers against each other shall be machined to give continuous contact throughout their circumference. All iron castings shall be thoroughly cleaned and then coated with hot coal tar before being delivered. Individual laterals shall have cleanouts every one hundred feet (100'). Cleanouts shall also be installed in laterals with changes of alignment of 45 degrees or greater.</p> <p>C. Chimneys</p> <p>Chimneys shall be built of four inch (4") pipe and/or as indicated on the contract drawings. Each chimney shall be plugged or capped at end until ready to connect to existing services. Chimneys are required where the vertical drop between the finished grade surface and the main sewer line exceeds fifteen feet (15') at the wye from a service connection.</p> <p>3.10 Force Main</p> <p>After force mains have been laid and the trench backfilled, the pipe shall be subjected to a hydrostatic pressure test in accordance with AWWA Standard for Installation of Cast Iron Water Main, AWWA C600 (latest issue), Section 13. The hydrostatic pressure shall be 150 percent (150%) of normal operational pressure. After the pressure test has been satisfactorily completed, a leakage test shall be conducted in accordance with AWWA C600 (latest issue), Section 13. The minimum test pressure shall be 75 pounds per square inch at the high point in the system.</p> <p>3.11 Wet well</p> <p>The pre-cast concrete wet well shall be externally coated with an asphaltic sealant and tested for water tightness using an approved vacuum or water testing procedure.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |  | <p>PART 4 – PUMP STATION</p> <p>4.00 SPARE PARTS</p> <p>A. A complete replacement pump shaft seal assembly shall be furnished with each lift station. The spare seal shall be securely fastened to the control panel and shall include complete installation instructions.</p> <p>B. Two (2) spare volute gaskets shall be provided.</p> <p>C. A spare filter cone for the seal filter shall be provided in the</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     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UNHSC DESIGN SPECIFICATIONS FOR  
POROUS ASPHALT PAVEMENT AND INFILTRATION BEDS

PART 1 GENERAL

1.1 DESCRIPTION

- A. This specification is intended to be used for porous asphalt pavement in parking lot applications. Stormwater management functions of porous asphalt installations include water quality treatment, peak flow reduction, storm volume reduction via groundwater recharge, and increased hydrograph time lag. This specification is intended for a cold climate application based upon the field experience at the UNHSC porous asphalt parking lot located in Durham, New Hampshire, the specification has been adapted for projects in Vermont where the selection of materials and system design reflects local conditions, constraints, and objectives.
- B. The work of this Section includes subgrade preparation, installation of the underlying porous media beds, and porous asphalt mix (mix) design, production, and installation. Porous media beds refer to the material layers underlying the porous asphalt pavement. Porous asphalt pavement refers to the compacted mix of modified asphalt, aggregate, and additives.
- C. The porous asphalt pavement specified herein is modified after the National Asphalt Pavement Association (NAPA) specification outlined in Design, Construction, and Maintenance Guide for Porous Asphalt Pavements, Information Series 131 (2003) and *Design, Construction, and Maintenance of Open-Graded Friction Courses, Information Series 115* (2002).
- D. Alternative specifications for mix, such as Open Graded Friction Courses (OGFC) from Federal Agencies or state Departments of Transportation (DOT), may be used if approved by the Engineer. The primary requirements for the specifications of the mix are performance grade (PG) asphalt binder, binder content, binder draindown, aggregate gradation, air void content, and retained tensile strength (TSR).

1.2 SUBMITTALS

- A. Submit a list of materials proposed for work under this Section including the name and address of the materials producers and the locations from which the materials are to be obtained.
- B. Submit certificates, signed by the materials producers and the relevant subcontractors, stating that materials meet or exceed the specified requirements, for review and approval by the Engineer.
- C. Submit samples of materials for review and approval by the Engineer. For mix materials, samples may be submitted only to the QA inspector with the Engineer's approval.
- D. Submittal requirements for samples and certificates are summarized in Table 1 and discussed in further detail in the Materials section.

1.3 QC/QA

- A. Use adequate numbers of skilled workers who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work in this section.
- B. Codes and Standards - All materials, methods of construction and workmanship shall conform to applicable requirements of AASHTO and ASTM Standards or other standards as specified.
- C. QC/QA requirements for production of mix are discussed in the Materials section, and for construction of the porous media beds and paving in the Execution section.

Table 1. Submittal requirements.

| Material or Pavement Course*        | Properties to be reported on Certificate**                                                         |
|-------------------------------------|----------------------------------------------------------------------------------------------------|
| choker course, reservoir course     | gradation, max. wash loss, min. durability index, max. abrasion loss, air voids (reservoir course) |
| filter course                       | gradation, permeability/ sat. hydraulic conductivity                                               |
| filter blanket                      | gradation                                                                                          |
| geotextile filter fabric            | manufacturer's certification, AOS/EOS, tensile strength certificate                                |
| stripping paint                     | POAB certification                                                                                 |
| binder                              | gradation, wear, fracture faces (fractured and elongated)                                          |
| coarse aggregate                    | gradation.                                                                                         |
| fine aggregate                      | gradation.                                                                                         |
| silicone                            | manufacturer's certification                                                                       |
| Fibers (optional)                   | manufacturer's certification                                                                       |
| mineral filler (optional)           | manufacturer's certification                                                                       |
| fatty amines (optional anti-strip)  | manufacturer's certification                                                                       |
| hydrated lime (optional anti-strip) | manufacturer's certification                                                                       |

\* Samples of each material shall be submitted to the Engineer (or QA inspector for mix). These samples must be in sufficient volume to perform the standardized tests for each material.  
\*\* At a minimum, more material properties may be required (refer to Materials Section).

1.4 PROJECT CONDITIONS

- A. Site Assessment should be performed per the steps outlined in IS 131 (NAPA, 2003).
- B. Construction Phasing should be performed as outlined in *IS 131* (NAPA, 2003).
- C. Protection of Existing Improvements
- Protect adjacent work from the unintended dispersal/splashing of pavement materials. Remove all stains from exposed surfaces of pavement, structures, and grounds. Remove all waste and spillage. If necessary, limit access to adjacent work/structures with appropriate signage and/or barriers.
  - Proper erosion and sediment control practices shall be provided in accordance with existing regulations. Do not damage or disturb existing improvements or vegetation. Provide suitable protection where required before starting work and maintain protection throughout the course of the work. This includes the regular, appropriate inspection and maintenance of the erosion and sediment control measures.
  - Restore damaged areas, including existing pavement on or adjacent to the site that has been damaged as a result of construction work, to their original condition or repair as directed to the satisfaction of the Engineer at no additional cost.
- D. Safety and Traffic Control
- Notify and cooperate with local authorities and other organizations having jurisdiction when construction work will interfere with existing roads and traffic.
  - Provide temporary barriers, signs, warning lights, flaggers, and other protections as required to assure the safety of persons and vehicles around and within the construction area and to organize the smooth flow of traffic.

E. Weather Limitations

- Porous asphalt, Open graded friction course, or dense-mixed asphalt shall not be placed between November 15 and March 15, or when the ambient air temperature at the pavement site in the shade away from artificial heat is below 16 °C (60 °F) or when the actual ground temperature is below 10 °C (50 °F). Only the Engineer may adjust the air temperature requirement or extend the dates of the pavement season.
- The Contractor shall not pave on days when rain is forecast for the day, unless a change in the weather results in favorable conditions as determined by the Engineer.

1.5 REFERENCES

- A. *General Porous Asphalt Bituminous Paving and Groundwater Infiltration Beds*, specification by UNH Stormwater Center, February, 2005.
- B. *Design, Construction, and Maintenance Guide for Porous Asphalt Pavements, Information Series 131*, National Asphalt Pavement Association (NAPA), 2003.
- C. *Design, Construction, and Maintenance of Open-Graded Friction Courses, information Series 115*, NAPA, 2002.
- D. *Annual Book of ASTM Standards*, American Society for Testing and Materials, Philadelphia, PA, 1997 or latest edition.
- E. *Standards of the American Association of State Highway and Transportation Officials* (AASHTO), 1998 or latest edition.
- F. *Section 401- Plant Mix Pavements - General, in Standard Specifications for Road and Bridge Construction - State of New Hampshire Department of Transportation*, 2006.
- G. *Section 02725 - General Porous Pavement and Groundwater Infiltration Beds*, specification from NAPA Porous Asphalt Seminar handout, Cahill Associates, Inc., 2004.
- H. *Correlations of Permeability and Grain Size*, Russell G. Shepherd, Groundwater 27 (5), 1989. I. Groundwater, R. Allan Freeze and John A. Cherry, 1979.
- I. *Groundwater*, R. Allan Freeze and John A. Cherry, 1979.

PART 2 PRODUCTS

2.1 MATERIALS

A. Porous Media Infiltration Beds

Below the porous asphalt itself are located the porous media infiltration beds (Figure 1), from top to bottom: a 4" – 8" (10 - 20 cm) (minimum) thick layer of choker course of crushed stone (8" is preferable to alleviate compaction issues with the porous asphalt); an 8" to 12" (20 cm to 30 cm) minimum thickness layer of filter course of poorly graded sand (a.k.a. bankrun gravel or modified 304.1); 3" (8 cm) minimum thickness filter blanket that is an intermediate setting bed (pea gravel); and a reservoir course of crushed stone, thickness dependant on required storage and underlying native materials. Alternatively, the pea gravel layer could be thickened and used as the reservoir course depending upon subsoil suitability. This alternative simplifies subbase construction. For lower permeability native soils, perforated or slotted drain pipe is located in the stone reservoir course for drainage. This drain pipe can be daylighted to receiving waters or connected into other stormwater management infrastructure (wetland, storm sewer, etc.). The fine gradation of the filter course is for enhanced filtration and delayed infiltration. The high air void content of the uniformly graded crushed stone reservoir course: maximizes storage of infiltrated water thereby allowing more time for water to infiltrate between storms; and creates a capillary barrier that arrests vertical water movement and in doing so prevents winter freeze-thaw and heaving. The filter blanket is placed to prevent downward migration of filter course material into the reservoir course. The optional underdrain in the reservoir course is for hydraulic relief (typically raised off of the bottom of the reservoir stone layer for enhanced groundwater recharge). Nonwoven geotextile filter fabric (geotextile) is used only for stabilizing the sloping sides of the porous asphalt system excavation and not to be used on the bottom of the system unless needed for structural reasons.

1. Choker Course

Material for the choker course and reservoir course shall meet the following:

Maximum Wash Loss of 0.5%  
Minimum Durability Index of 35  
Maximum Abrasion Loss of 10% for 100 revolutions, and maximum of 50% for 500 revolutions.

Material for the choker course and reservoir course shall have the AASHTO No. 57 and AASHTO No. 3 gradations, respectively, as specified in Table 2. If the AASHTO No. 3 gradation cannot be met, AASHTO No. 5 is acceptable with approval of the Engineer. AASHTO no. 3 is also suitable for the choker course.

2. Filter course material

Filter course material shall have a hydraulic conductivity (also referred to as coefficient of permeability) of 10 to 60 ft/day at 95% standard proctor compaction unless otherwise approved by the Engineer. Great care needs to be used to not over compact materials. Overcompaction results with loss of infiltration capacity. The filter course material is commonly referred to as a bankrun gravel (modified NHDOT 304.1). In order to select an appropriate gradation, coefficient of permeability may be estimated through an equation that relates gradation to permeability, such as described in Correlations of Permeability and Grain Size (Shepherd, 1989) or in Section 8.7 Estimation of Saturated Hydraulic Conductivity (Freeze and Cherry, 1979). The hydraulic conductivity should be determined by ASTM D2434 and reported to the Engineer.

3. Filter blanket material

Filter blanket material between the filter course and the reservoir course shall be an intermediate size between the finer filter course above, and the coarser reservoir course below, for the purpose of preventing the migration of a fine setting bed into the coarser reservoir material. An acceptable gradation shall be calculated based on selected gradations of the filter course and reservoir course using criteria outlined in the HEC 11 (Brown and Clyde, 1989). A pea-gravel with a median particle diameter of 3/8" (9.5 mm) is commonplace.

4. Reservoir Course

Reservoir course thickness is dependent upon the following criteria (that vary from site to site):

- A 4" (10 cm) minimum thickness of reservoir course acts as a capillary barrier for frost heave protection. The reservoir course is located at the interface between subbase and native materials.
- 4-in. (10 cm) minimum thickness if the underlying native materials are either well drained (Hydrologic Group A soils).
- 8-in. (30 cm) minimum thickness if subdrains are installed. Subdrains insure that the subbase is well drained

- Subdrains, if included, are elevated a minimum of 4" (10 cm) from the reservoir course bottom to provide storage and infiltration for the water quality volume. If the system is lined,

- Subbase thickness is determined from subbase materials having sufficient void space to store the design storm,

Example: If the 25-year storm is 5.1" (13 cm) of rainfall depth, and the reservoir void space is 30%, then the minimum subbase thickness = 5.1"/0.3 = 17" (43.2 cm).

- Favement system and subbase thickness are > 0.65 \* design frost depth for area.

Example: Durham, New Hampshire, 48" (122 cm) = D<sub>maximum frost</sub>, therefore the minimum depth to the bottom of the subbase = 0.65(48") = 32" (81 cm).

Table 2. Gradations and compaction of choker, filter, and reservoir course materials.

| US Standard Sieve Size<br>Inches/mm       | Percent Passing (%)              |                                         |                                    |                                                 |
|-------------------------------------------|----------------------------------|-----------------------------------------|------------------------------------|-------------------------------------------------|
|                                           | Choker Course<br>(AASHTO No. 57) | Filter Course<br>(Modified NHDOT 304.1) | Reservoir Course<br>(AASHTO No. 3) | Reservoir Course Alternative*<br>(AASHTO No. 5) |
| 6/150                                     | -                                | 100                                     | -                                  | -                                               |
| 2 1/2/63                                  | -                                | -                                       | 100                                | -                                               |
| 2/50                                      | -                                | -                                       | 90 – 100                           | -                                               |
| 1 1/2/37.5                                | 100                              | -                                       | 35 – 70                            | 100                                             |
| 1/25                                      | 95 - 100                         | -                                       | 0 – 15                             | 90 – 100                                        |
| 3/4/19                                    | -                                | -                                       | -                                  | 20 - 55                                         |
| 5/8/9.5                                   | 25 - 60                          | -                                       | 0 - 5                              | 0 - 10                                          |
| #4/4.75                                   | 0 - 10                           | 70-100                                  | -                                  | 0 - 5                                           |
| #8/2.36                                   | 0 - 5                            | -                                       | -                                  | -                                               |
| #300/0.075                                | -                                | 0 – 6**                                 | -                                  | -                                               |
| % Compaction<br>ASTM D698 /<br>AASHTO T99 | 95                               | 95                                      | 95                                 | 95                                              |

\* Alternate gradations (e.g. AASHTO No. 5) may be accepted upon Engineer's approval.

\*\* Preferably less than 4% fines

5. Non-woven geotextile filter fabric

Filter fabric is only recommended for the sloping sides of the porous asphalt system excavation. It shall be Mirafi 160N, or approved equal and shall conform to the specifications in Table 3. Mirafi ® 160N is a non-woven geotextile composed of polypropylene fibers, which are formed into a stable network such that the fibers retain their relative position. 160N is inert to biological degradation and resists naturally encountered chemicals, alkalis, and acids.

6. Alternative Applications and Residential Driveways.

The recommendations above are based on a commercial parking application for both traffic and contaminant load. Alternative applications such as residential driveways and low use applications may justify the use of alternative subbase thicknesses for the porous media beds, filter blanket, and geotextiles. Residential driveway applications have been designed with a subbase limited to only an 8" compacted choker course. Variations should consider structural load requirements for material thickness, and contaminant load for filter course thickness. A reduced total system thickness (Section 2.1.3.f) will subject the pavement to greater freeze thaw susceptibility.

Table 3. Non-woven geotextile filter fabric properties.

| Mechanical Properties        | Test Method | Unit                                      | Minimum Average Roll Values<br>MD** CD** |             |
|------------------------------|-------------|-------------------------------------------|------------------------------------------|-------------|
| Grab Tensile Strength        | ASTM D 4632 | kN (lbs)                                  | 0.71 (160)                               | 0.71 (160)  |
| Grab Tensile Elongation      | ASTM D 4632 | %                                         | 50                                       | 50          |
| Trapezoid Shear Strength     | ASTM D 4533 | kN (lbs)                                  | 0.27 (60)                                | 0.27 (60)   |
| Multi-Point Burst Strength   | ASTM D 3786 | kPa (psi)                                 | 2100 (305)                               | 2100 (305)  |
| Puncture Strength            | ASTM D 4833 | kN (lbs)                                  | 0.42 (95)                                | 0.42 (95)   |
| Apparent Opening Size (AOS)  | ASTM D 4751 | mm (US Sieve)                             | 0.212 (70)                               | 0.212 (70)  |
| Permeability                 | ASTM D 4491 | sec <sup>-1</sup>                         | 1.4                                      | 1.4         |
| Permeability                 | ASTM D 4491 | cm/sec                                    | 0.22                                     | 0.22        |
| Flow Rate                    | ASTM D 4491 | lpm/m <sup>2</sup> (gpm/ft <sup>2</sup> ) | 4.477 (110)                              | 4.477 (110) |
| UV Resistance (at 500 hours) | ASTM D 4355 | % strength retained                       | 70                                       | 70          |

| Physical Properties             | Test Method | Unit                                   | Typical Value       |
|---------------------------------|-------------|----------------------------------------|---------------------|
| Weight                          | ASTM D 5261 | g/m <sup>2</sup> (oz/yd <sup>2</sup> ) | 217 (6.4)           |
| Thickness                       | ASTM D 5199 | mm (inches)                            | 1.9 (75)            |
| Roll dimension (width x length) |             | m (ft)                                 | 4.5 x 91 (15 x 300) |
| Roll area                       |             | m <sup>2</sup> (yd <sup>2</sup> )      | 410 (500)           |
| Estimated roll weight           |             | kg (lb)                                | 99 (217)            |

\*MD - Machine Direction, \*\*CD - Cross-machine Direction

B. Porous Asphalt Mix

1. Mix materials

Mix materials consist of modified performance grade asphalt binder (PGAB), coarse and fine aggregates, and optional additives such as silicone, fibers, mineral fillers, fatty amines, and hydrated lime. Materials shall meet the requirements of the NAPA's Design, Construction, and Maintenance of Open-Graded Friction Courses, Information Series 115 (2002), except where noted otherwise below or approved in writing by the Engineer.

2. Polymer Modified PGAB and Mix Designs.

The asphalt binder shall be a polymer and/or fiber modified Performance Graded asphalt binder (PGAB) used in the production of Superpave Hot Mix Asphalt (HMA) mixtures. Ideally for maximum durability, the PGAB shall be two grades stiffer than that required for dense mix asphalt(DMA) parking lot installations, which is often achieved by adding a polymer and/or fiber. Mix designs will meet or exceed criteria listed in Table 5

The PGAB polymer modifiers are to be either styrene butadiene rubber (SBR) or styrene butadiene styrene (SBS). SBS is typically reserved for large projects as terminal pre-blending is required. SBR is feasible for smaller projects as it can be blended at the plant or terminal blended. The quantity of rubber solids in the SBR shall typically be 1.5-3% by weight of the bitumen content of the mix.

The dosage of fiber additives shall be either 0.3 percent cellulose fibers or 0.4 percent mineral fibers by total mixture mass. Fibers are a simple addition either manually for a batch plant or automated for larger drum plants. The binder shall meet the requirements of AASHTO M320.

The PGAB may be pre-blended or post-blended. The pre-blended binder can be pre-blended at the source or at a terminal. For post-blended addition, the modifier can either be in-line blended or injected into the pugmill at the plant.

Table 4. Post-Blended SBR Binder QC Plan requirements.

The QC Plan will contain:

- Company name and address
- Plant location and address
- Type of Facility
- Contact information for the Quality Control Plan Administrator
- QC Tests to be performed on each PGAB
- Name(s) of QC Testing Lab to perform QC and Process Control testing.
- Actions to be taken for PG Binders and SBR in Non compliance
- List of mechanical controls (requirements below)
- List of process controls and documentation (requirements below)

- Liquid SBR no-flow alert system with an "alert" located in the control room and automatic documentation of a no flow situation on the printout
- Provide means of calibrating the liquid SBR metering system to a delivery tolerance of 1%
- A batching tolerance at the end of each day's production must be within 0.5% of the amount of SBR solids specified.
- Mag-flow meter (other metering system may be considered)
- Method of sampling liquid SBR.

- Printouts of liquid SBR and PG binder quantities must be synchronized within one minute of each other
- SBR supplier certification showing the percent of SBR solids in liquid SBR
- Test results of a lab sample blended with the specified dosage of SBR. At a minimum, provide the name of the PGAB and liquid SBR suppliers, and PGAB information such as grade and lot number, and SBR product name used for the sample.
- MSDS sheet for liquid SBR.
- Handling, storage, and usage requirements will be followed as required by the liquid SBR manufacturer
- At a minimum, provide a table showing proposed rate of SBR liquid (L/min.) in relation to HMA production rate (tons per hour, TPH) for the % solids in liquid SBR, quantity of SBR specified for HMA production, and the specific gravity of the SBR.

- QC or QC Plan Administrator must be responsible for documenting quantities, ensuring actual use is within tolerance, etc. All printouts, calculations, supplier certifications etc. must be filed and retained as part of the QCT's daily diary/reports.

- Method and frequency of testing at the HMA plant, including initial testing and specification testing.

\*This Plan shall be submitted to the Engineer 10 days before production.

3. Anti-Stripping Mix Additives.

The mix shall be tested for moisture susceptibility and asphalt stripping from the aggregate by AASHTO T283. If the retained tensile strength (TSR) < 80% upon testing, a heat stable additive shall be furnished to improve the anti-stripping properties of the asphalt binder. Test with one freeze-thaw cycle (rather than five recommended in NAPA IS 115). The amount and type of additive (e.g. fatty amines or hydrated lime) to be used shall be based on the manufacturer's recommendations, the mix design test results, and shall be approved by the Engineer.

Silicone shall be added to the binder at the rate of 1.5 mL/m3 (1 oz. per 5000 gal). Fibers may be added per manufacturer and NAPA IS 115 recommendation if the draindown requirement cannot be met (<0.3% via ASTM D6390) provided that the air void content requirement is met (>18%, or >18% as tested with CoreLok device). Additives should be added per the relevant DOT specification and NAPA IS 115.

4. Coarse Aggregate.

Coarse aggregate shall be that part of the aggregate retained on the No. 8 sieve; it shall consist of clean, tough, durable fragments of crushed stone, or crushed gravel of uniform quality throughout. Coarse aggregate shall be crushed stone or crushed gravel and shall have a percentage of wear as determined by AASHTO T96 of not more than 40 percent. In the mixture, at least 75 percent, by mass (weight), of the material coarser than the 4.75 mm (No. 4) sieve shall have at least two fractured faces, and 90 percent shall have one or more fractured faces (ASTM D5821). Coarse aggregate shall be free from clay balls, organic matter, deleterious substances, and a not more than 8.0% of flat or elongated pieces (>3:1) as specified in ASTM D4791.

5. Fine Aggregate.

The fine aggregate shall be that part of the aggregate mixture passing the No. 8 sieve and shall consist of sand, screenings, or combination thereof with uniform quality throughout. Fine aggregate shall consist of durable particles, free from injurious foreign matter. Screenings shall be of the same or similar materials as specified for coarse aggregate. The plasticity index of that part of the fine aggregate passing the No. 40 sieve shall be not more than 6 when tested in accordance with AASHTO T90. Fine aggregate from the total mixture shall meet plasticity requirements.

6. Porous Asphalt Mix Design Criteria.

The Contractor shall submit a mix design at least 10 working days prior to the beginning of production. The Contractor shall make available samples of coarse aggregate, fine aggregate, mineral filler, fibers and a sample of the PGAB that will be used in the design of the mixture. A certificate of analysis (COA) of the PGAB will be submitted with the mix design. The COA will be certified by a laboratory meeting the requirements of AASHTO R18. The Laboratory will be certified by the state DOT, regional equivalent (e.g. NETTCP), and/or qualified under ASTM D3666. Technicians will be certified by the regional certification agency (e.g. NETTCP) in the discipline of HMA Plant Technician.

Bulk specific gravity (SG) used in air void content calculations shall not be determined and results will not be accepted using AASHTO T166 (saturated surface dry), since it is not intended for open graded specimens (>10% AV). Bulk SG shall be calculated using AASHTO T275 (paraffin wax) or ASTM D6752 (automatic vacuum sealing, e.g. CoreLok). Air void content shall be calculated from the bulk SG and maximum theoretical SG (AASHTO T209) using ASTM D3203.

The materials shall be combined and graded to meet the composition limits by mass (weight) as shown in Table 5.

Table 5: Porous Asphalt Mix Design Criteria.

| Sieve Size (inch/mm)                                     | Percent Passing (%)            |
|----------------------------------------------------------|--------------------------------|
| 0.75/19                                                  | 100                            |
| 0.50/12.5                                                | 85-100                         |
| 0.375/9.5                                                | 55-75                          |
| No.4/4.75                                                | 10-25                          |
| No.8/2.36                                                | 5-10                           |
| No.20/0.075 (#200)                                       | 2-4                            |
| Binder Content (AASHTO T164)                             | 6 - 6.5%                       |
| Fiber Content by Total Mixture Mass                      | 0.3% cellulose or 0.4% mineral |
| Rubber Solids (SBR) Content by Weight of the Bitumen     | 1.5-3% or TBD                  |
| Air Void Content (ASTM D6752/AASHTO T275)                | 16.0-22.0%                     |
| Draindown (ASTM D6390)*                                  | ≤ 0.3 %                        |
| Retained Tensile Strength (AASHTO 283)**                 | ≥ 80 %                         |
| Cantabro abrasion test on unaged samples (ASTM D7064-04) | ≤ 20%                          |
| Cantabro abrasion test on 7 day aged samples             | ≤ 30%                          |

\*Cellulose or mineral fibers may be used to reduce draindown.  
\*\*If the TSR (retained tensile strength) values fall below 80% when tested per NAPA IS 131 (with a single freeze thaw cycle rather than 5), then in Step 4, the contractor shall employ an anti-strip additive, such as hydrated lime (ASTM C977) or a fatty amine, to raise the TSR value above 80%.

SITE ENGINEER:



CIVIL ENGINEERING ASSOCIATES, INC.  
10 MANSFIELD VIEW LANE, SOUTH BURLINGTON, VT 05403  
802-864-2323 FAX: 802-864-2271 web: www.ccaa-vt.com

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DRAWN

SAL

CHECKED

DSM

APPROVED

DSM

OWNER:

BURLINGTON  
HARBOR MARINA  
LLC  
1 CHURCH STREET  
BURLINGTON VT 05401

PROJECT:

BURLINGTON  
HARBOR MARINA

234 PENNY LANE  
BURLINGTON VT 05401

| DATE | CHECKED | REVISION |
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PERMEABLE  
PAVEMENT  
SPECIFICATIONS &  
DETAILS

DATE

JAN. 13, 2017

SCALE

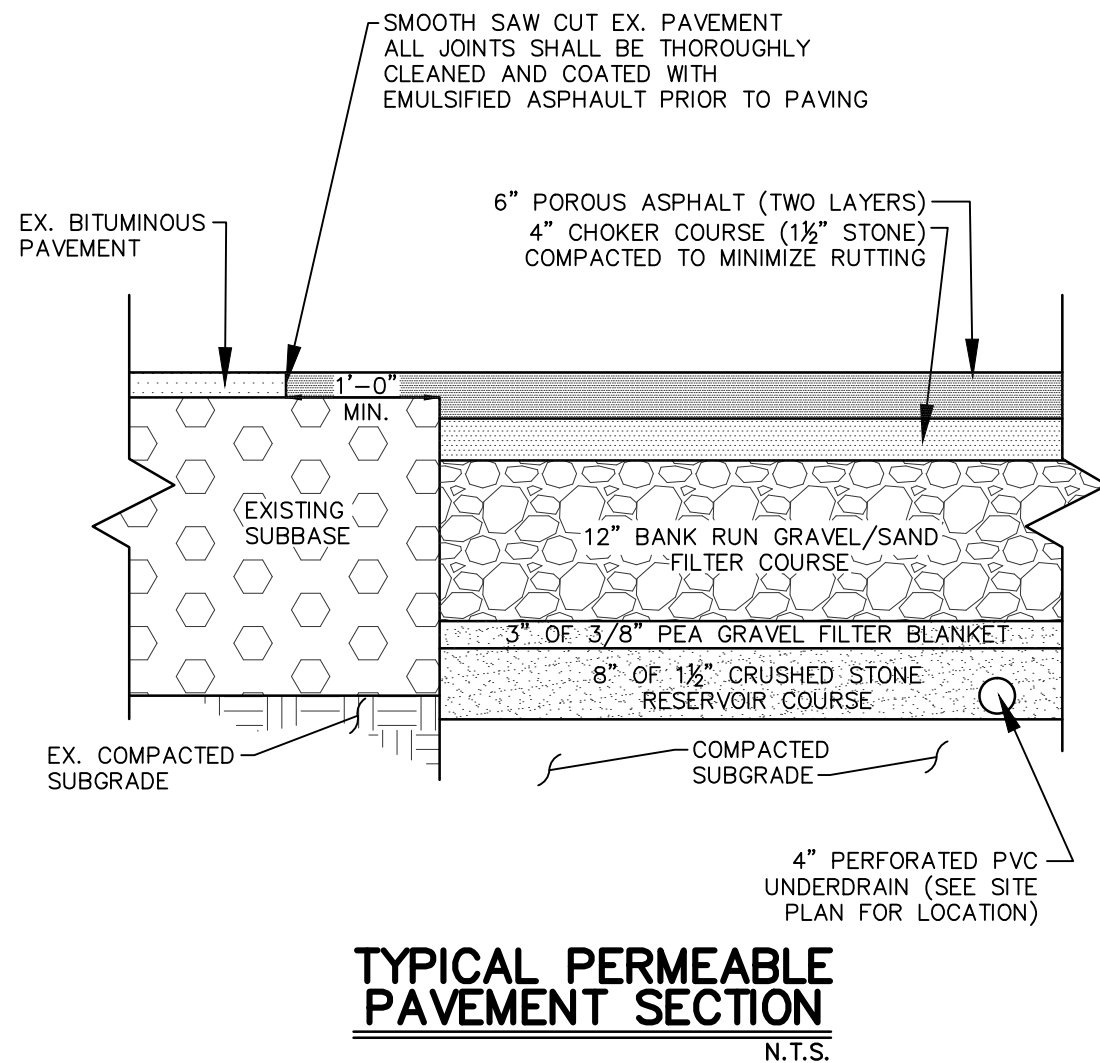
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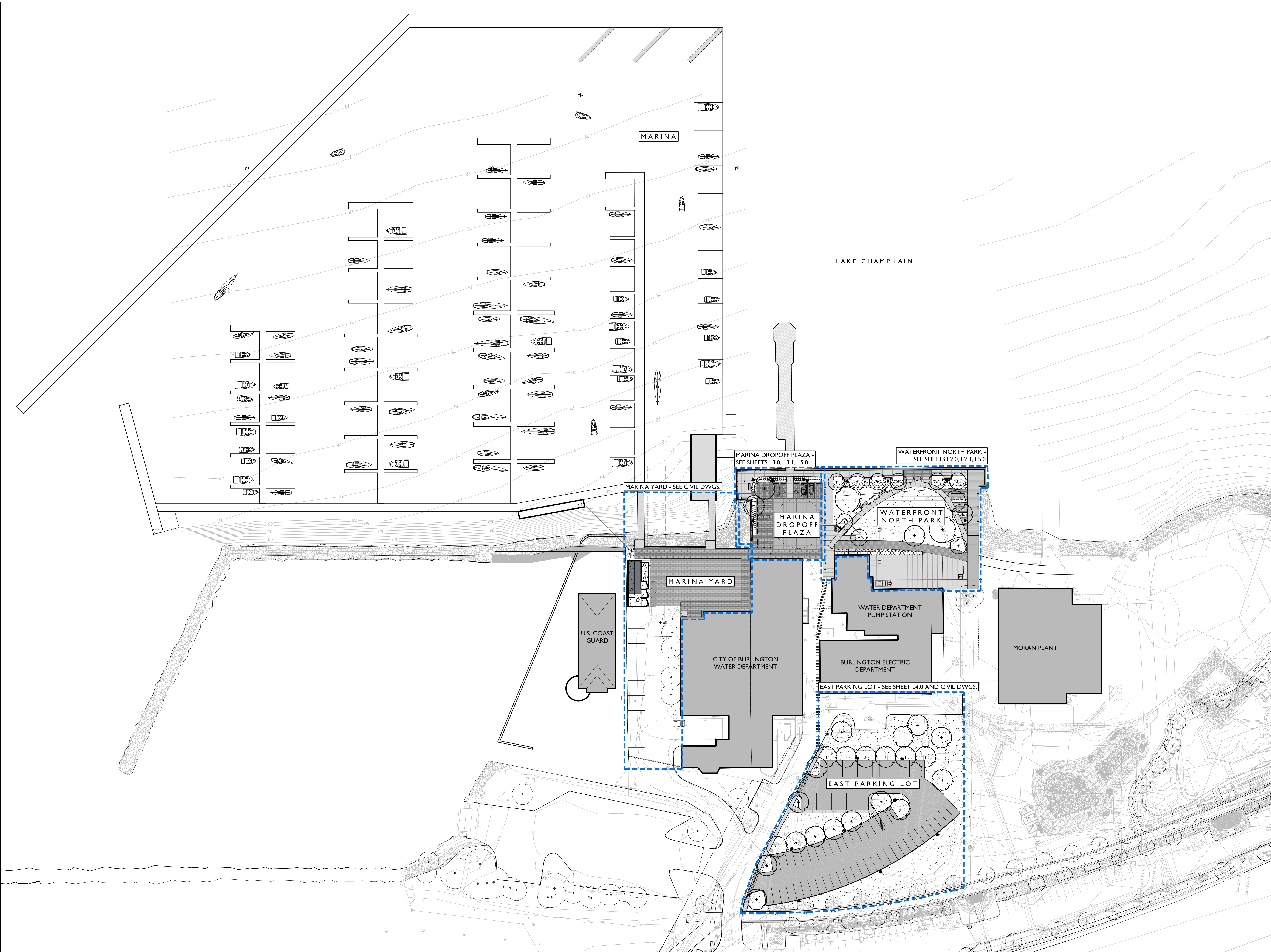


TYPICAL PERMEABLE  
PAVEMENT SECTION  
N.T.S.









PERMITTING  
PLAN  
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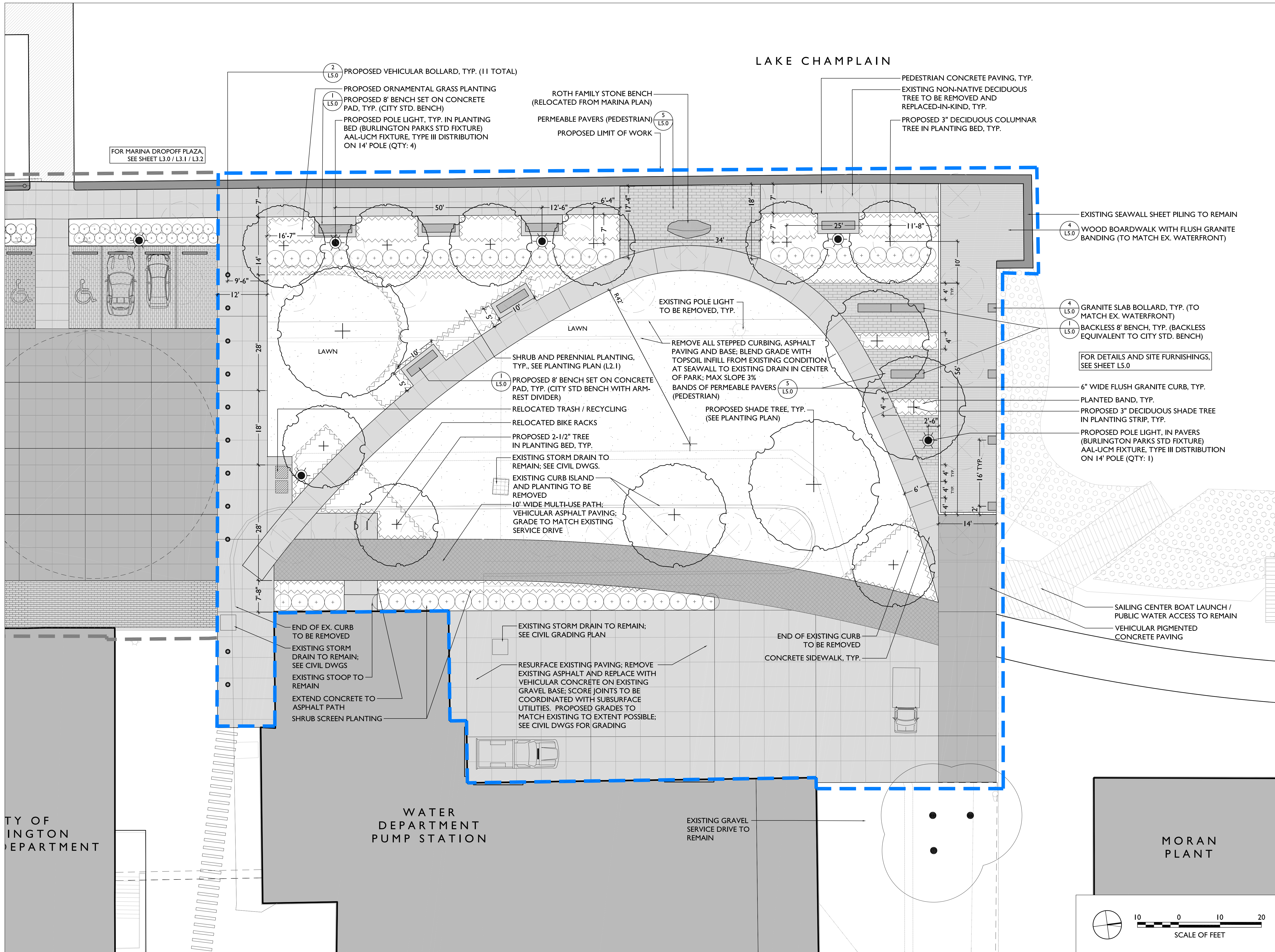
BURLINGTON  
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MARINA

OVERALL  
SITE PLAN

REVISIONS

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PERMITTING  
PLAN  
01/13/17  
(NOT FOR  
CONSTRUCTION)

BURLINGTON  
HARBOR  
MARINA

WATERFRONT  
NORTH PARK  
LAYOUT AND  
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REVISIONS

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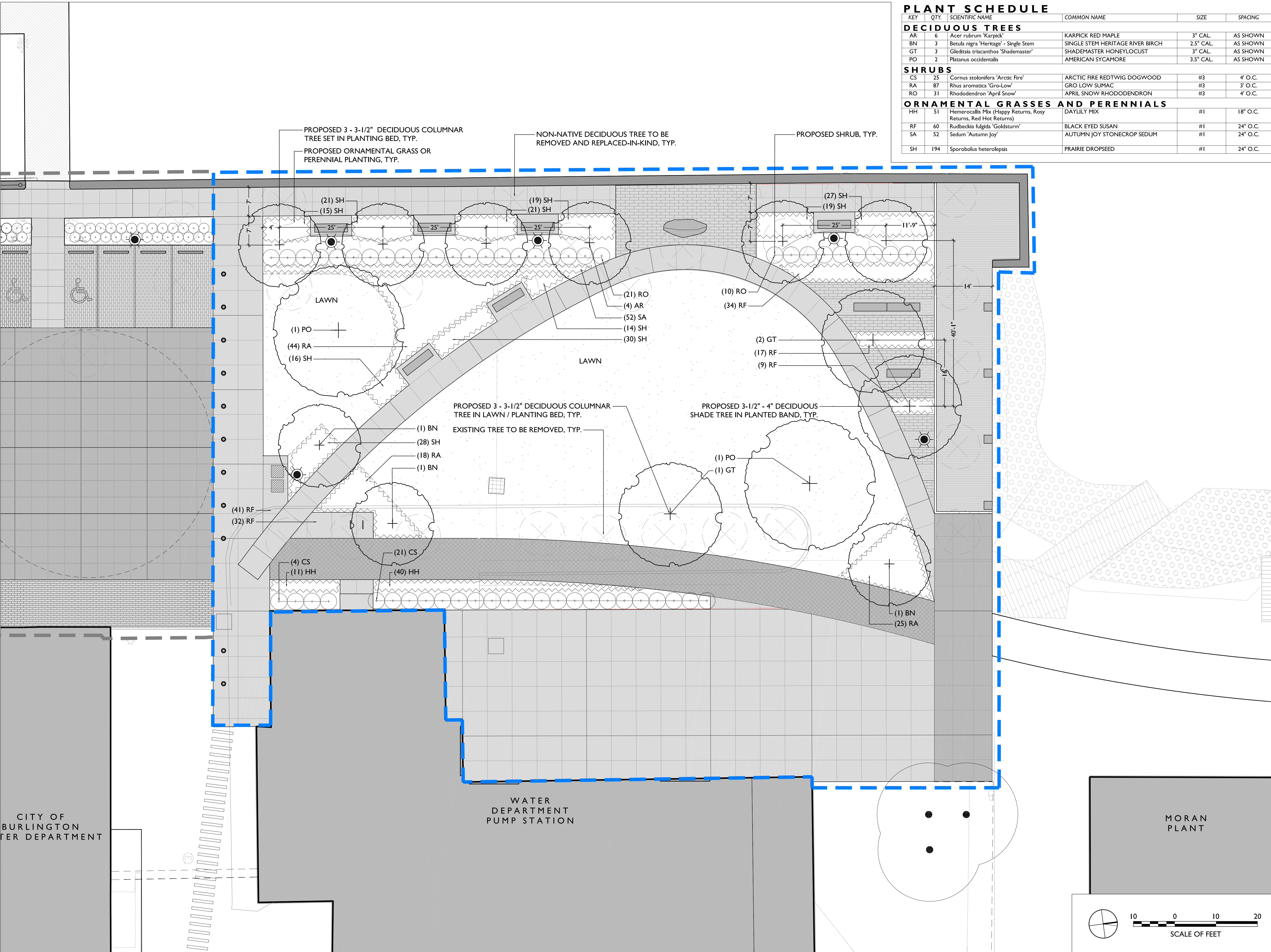
JOB NO. 423

SCALE 1" = 10'-0"

DATE 01.13.17

L2.0





PLANT SCHEDULE

| KEY                               | QTY. | SCIENTIFIC NAME                                                 | COMMON NAME                      | SIZE      | SPACING  |
|-----------------------------------|------|-----------------------------------------------------------------|----------------------------------|-----------|----------|
| DECIDUOUS TREES                   |      |                                                                 |                                  |           |          |
| AR                                | 6    | Acer rubrum 'Karpick'                                           | KARPICK RED MAPLE                | 3" CAL.   | AS SHOWN |
| BN                                | 3    | Betula nigra 'Heritage' - Single Stem                           | SINGLE STEM HERITAGE RIVER BIRCH | 2.5" CAL. | AS SHOWN |
| GT                                | 3    | Gleditsia triacanthos 'Shademaster'                             | SHADEMASTER HONEYLOCUST          | 3" CAL.   | AS SHOWN |
| PO                                | 2    | Platanus occidentalis                                           | AMERICAN SYCAMORE                | 3.5" CAL. | AS SHOWN |
| SHRUBS                            |      |                                                                 |                                  |           |          |
| CS                                | 25   | Cornus stolonifera 'Arctic Fire'                                | ARCTIC FIRE REDTWIG DOGWOOD      | #3        | 4" O.C.  |
| RA                                | 87   | Rhus aromatica 'Gro-Low'                                        | GRO LOW SUMAC                    | #3        | 3" O.C.  |
| RO                                | 31   | Rhododendron 'April Snow'                                       | APRIL SNOW RHODODENDRON          | #3        | 4" O.C.  |
| ORNAMENTAL GRASSES AND PERENNIALS |      |                                                                 |                                  |           |          |
| HH                                | 51   | Hemerocallis Mix (Happy Returns, Rosy Returns, Red Hot Returns) | DAYLILY MIX                      | #1        | 18" O.C. |
| RF                                | 60   | Rudbeckia fulgida 'Goldsturm'                                   | BLACK EYED SUSAN                 | #1        | 24" O.C. |
| SA                                | 52   | Sedum 'Autumn Joy'                                              | AUTUMN JOY STONECROP SEDUM       | #1        | 24" O.C. |
| SH                                | 194  | Sporobolus heterolepis                                          | PRAIRIE DROPSEED                 | #1        | 24" O.C. |

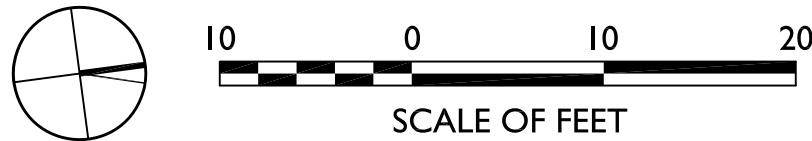
PERMITTING  
PLAN  
01/13/17  
(NOT FOR  
CONSTRUCTION)

BURLINGTON  
HARBOR  
MARINA

WATERFRONT  
NORTH PARK  
PLANTING PLAN

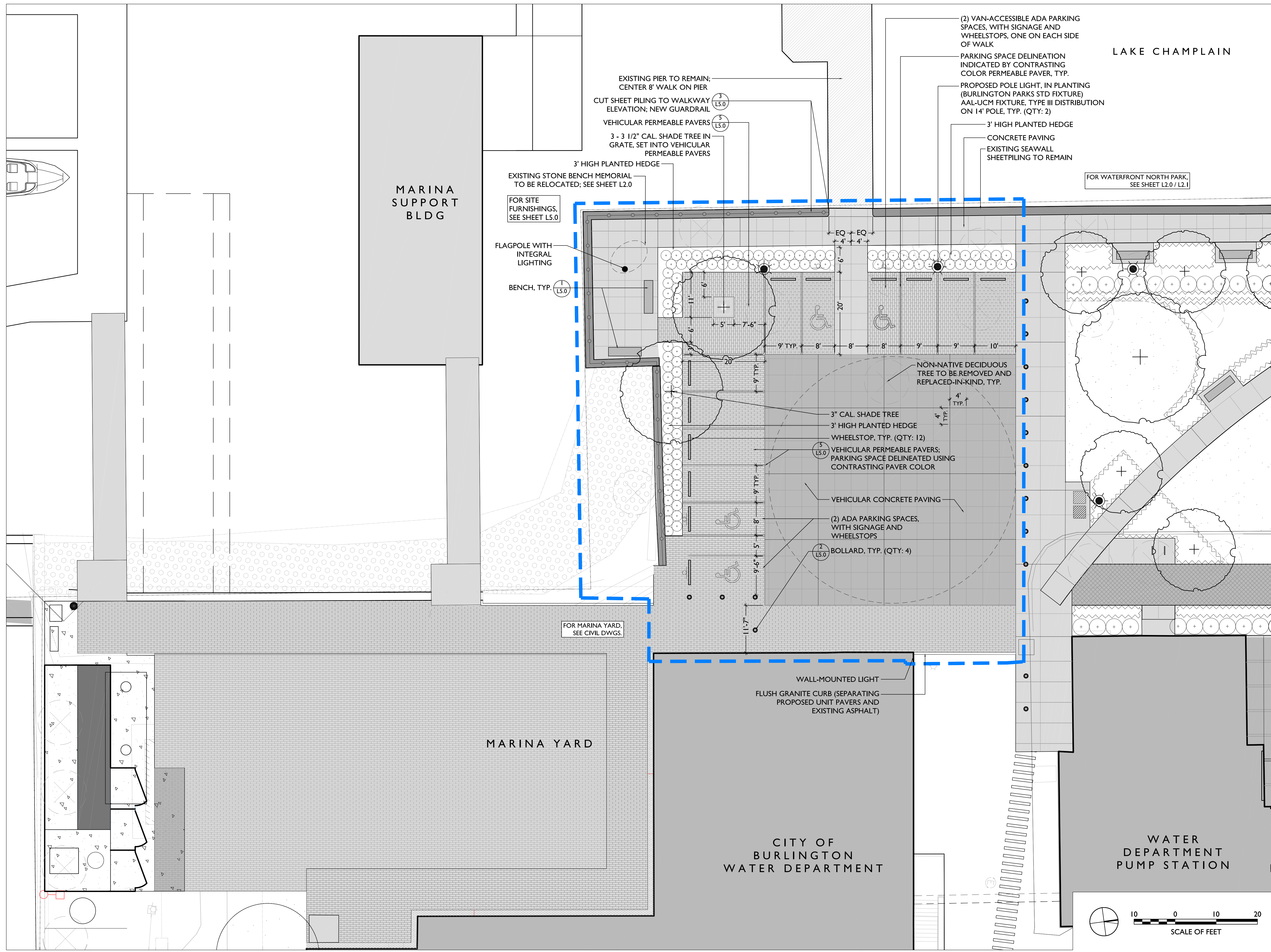
REVISIONS

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## L3.0





## PLANT SCHEDULE

| KEY                                  | QTY. | SCIENTIFIC NAME                          | COMMON NAME             | SIZE          | SPACING  |
|--------------------------------------|------|------------------------------------------|-------------------------|---------------|----------|
| <b>DECIDUOUS TREES</b>               |      |                                          |                         |               |          |
| GT                                   | 2    | Gleditsia triacanthos 'Shademaster'      | SHADEMASTER HONEYLOCUST | 3 - 3.5" CAL. | AS SHOWN |
| <b>SHRUBS AND ORNAMENTAL GRASSES</b> |      |                                          |                         |               |          |
| CK                                   | 46   | Calamagrostis acutiflora 'Karl Foerster' | FEATHER REED GRASS      | #2            | 30" O.C. |
| PO                                   | 61   | Physocarpus opulifolius 'Little Devil'   | LITTLE DEVIL NINEBARK   | #3            | 30" O.C. |

**WAGNERHODGSON**  
LANDSCAPE ARCHITECTS

T802.864.0010 F802.864.6267 [www.wagnerhodgson.com](http://www.wagnerhodgson.com)

PERMITTING  
PLAN  
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CONSTRUCTION)

# BURLINGTON HARBOR MARINA

# MARINA DROPOFF PLAZA PLANTING PLAN

## REVISIONS

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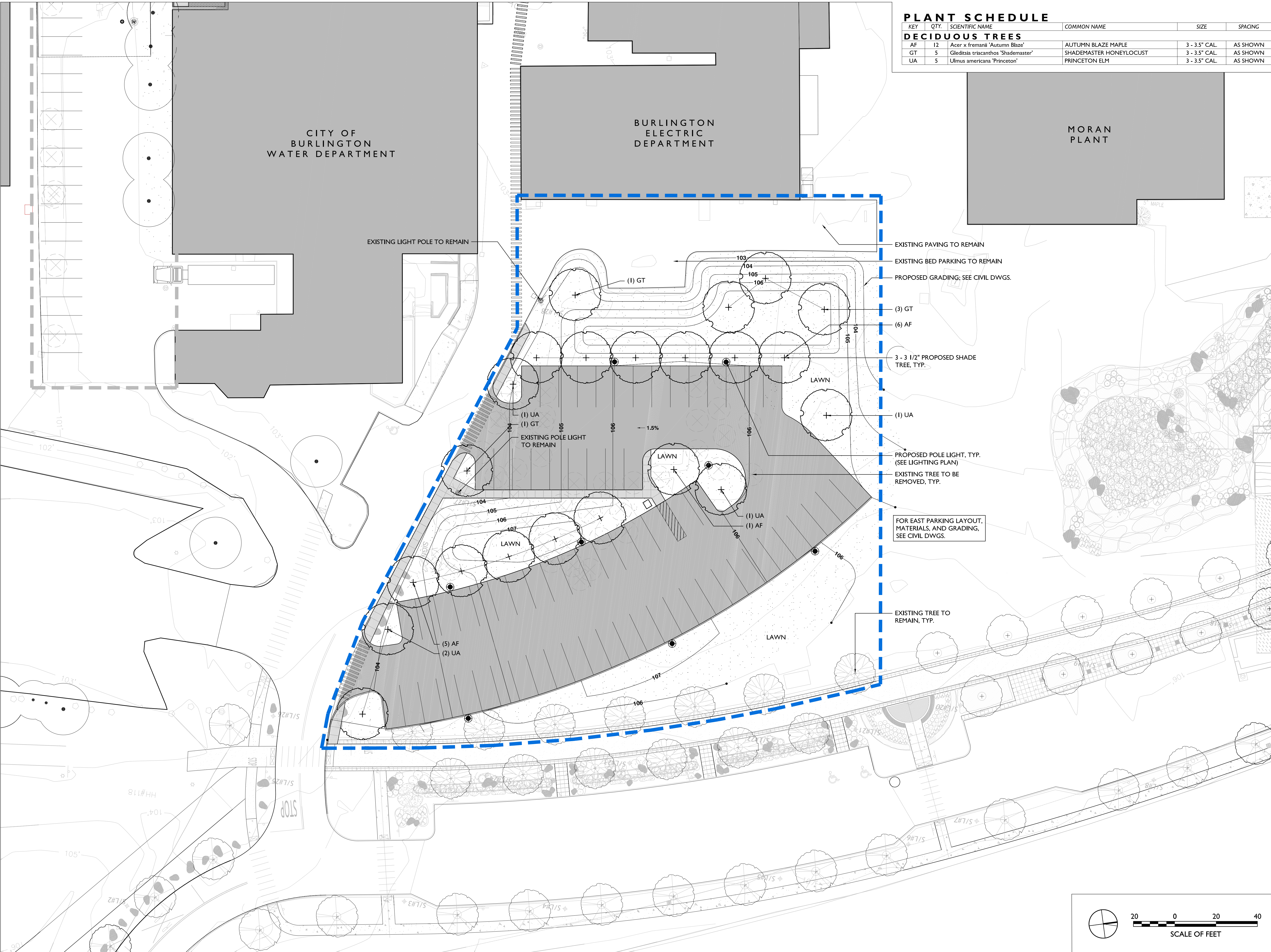
UB NO. 423

SCALE 1" = 10'-0"

DATE 01/13/17

### L3.1





| PLANT SCHEDULE  |      |                                     |                         |               |          |
|-----------------|------|-------------------------------------|-------------------------|---------------|----------|
| KEY             | QTY. | SCIENTIFIC NAME                     | COMMON NAME             | SIZE          | SPACING  |
| DECIDUOUS TREES |      |                                     |                         |               |          |
| AF              | 12   | Acer x fremanii 'Autumn Blaze'      | AUTUMN BLAZE MAPLE      | 3 - 3.5" CAL. | AS SHOWN |
| GT              | 5    | Gleditsia triacanthos 'Shademaster' | SHADEMASTER HONEYLOCUST | 3 - 3.5" CAL. | AS SHOWN |
| UA              | 5    | Ulmus americana 'Princeton'         | PRINCETON ELM           | 3 - 3.5" CAL. | AS SHOWN |

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**PERMITTING PLAN**  
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**BURLINGTON HARBOR MARINA**

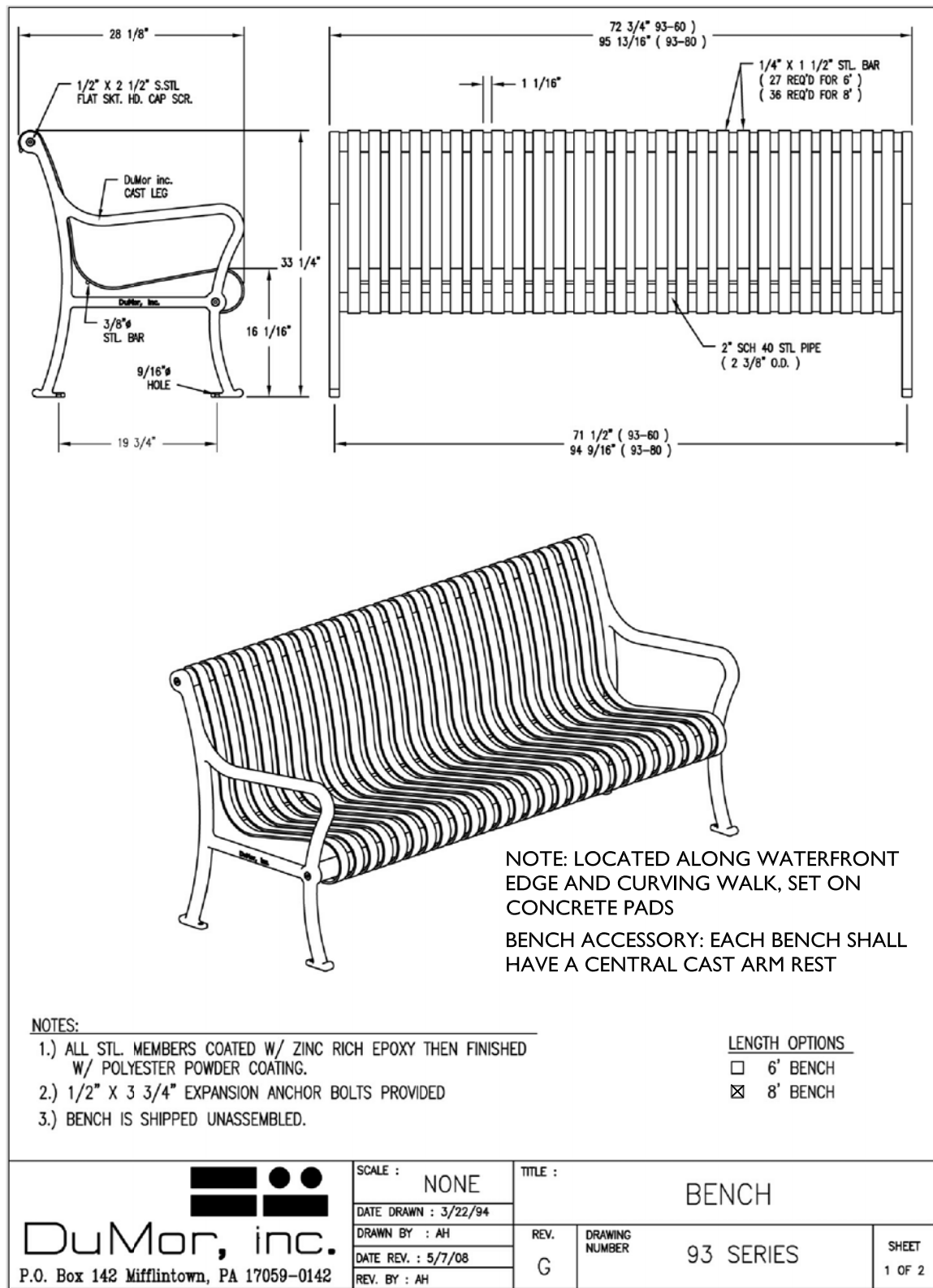
**EAST PARKING PLANTING PLAN**

| REVISIONS |
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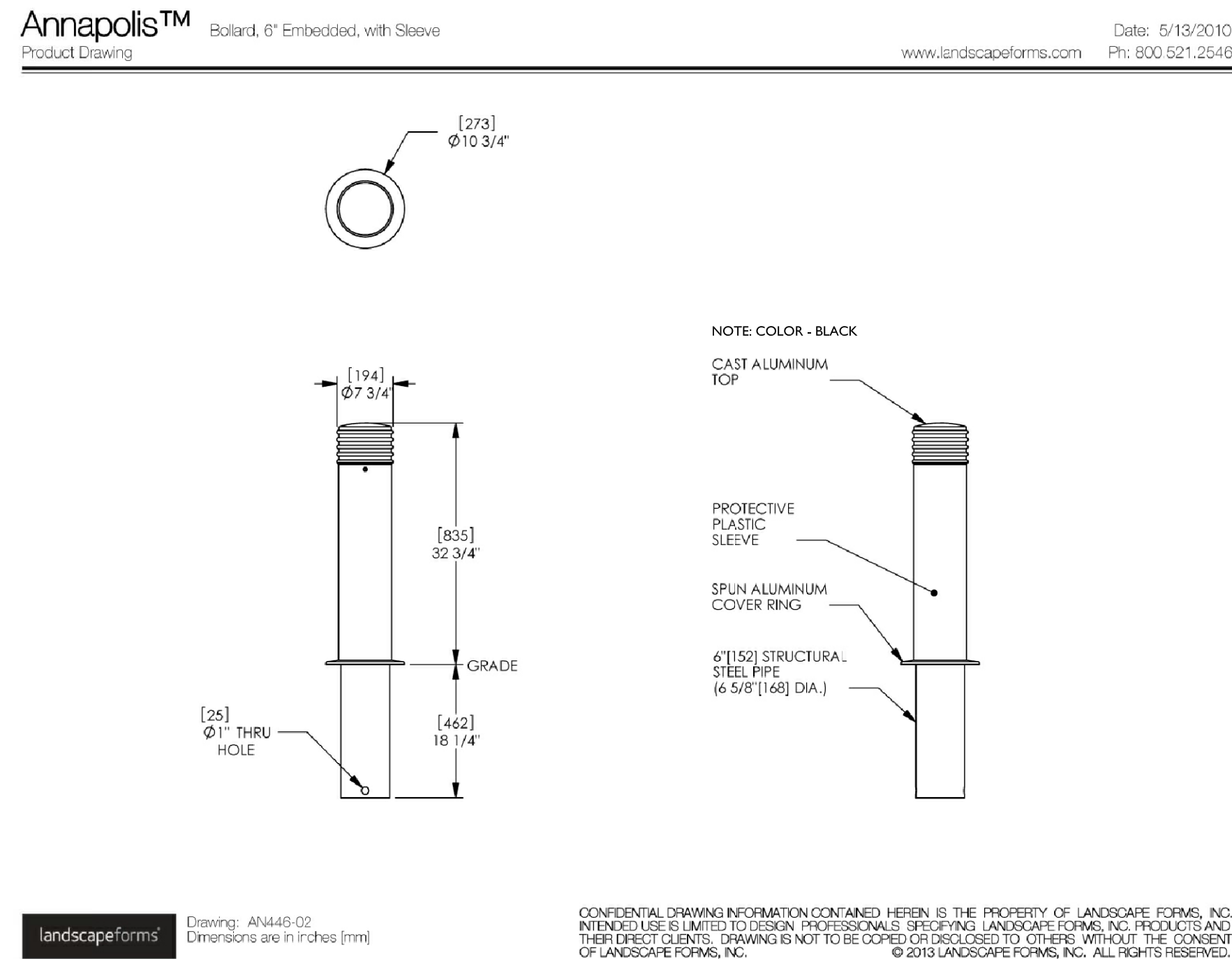
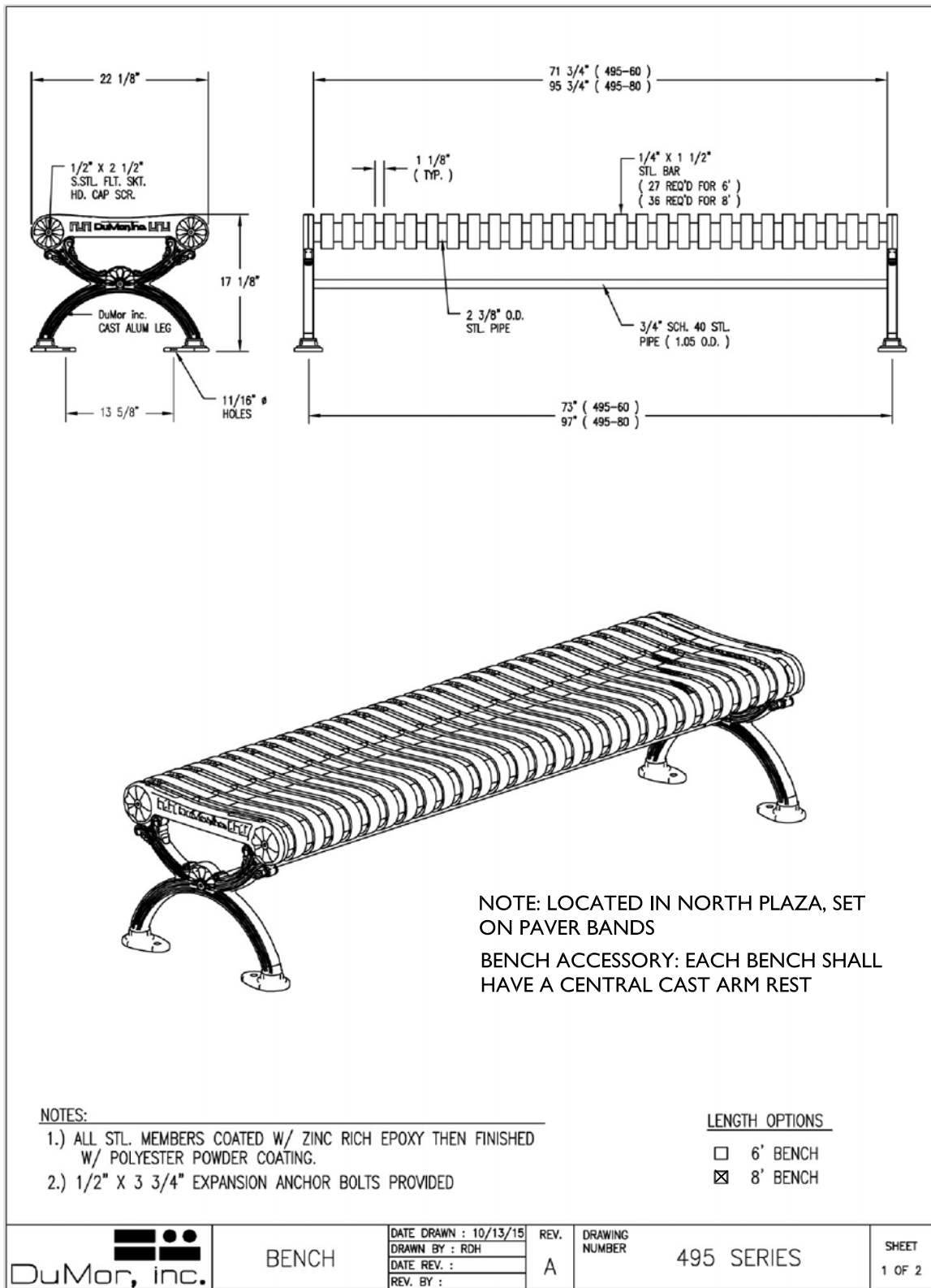
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| JOB NO. 423                     |             |
| SCALE 1" = 20'-0"               |             |
| DATE 01.13.17                   |             |

**L4.0**





1 BENCH, TYP.  
\*NOT TO SCALE



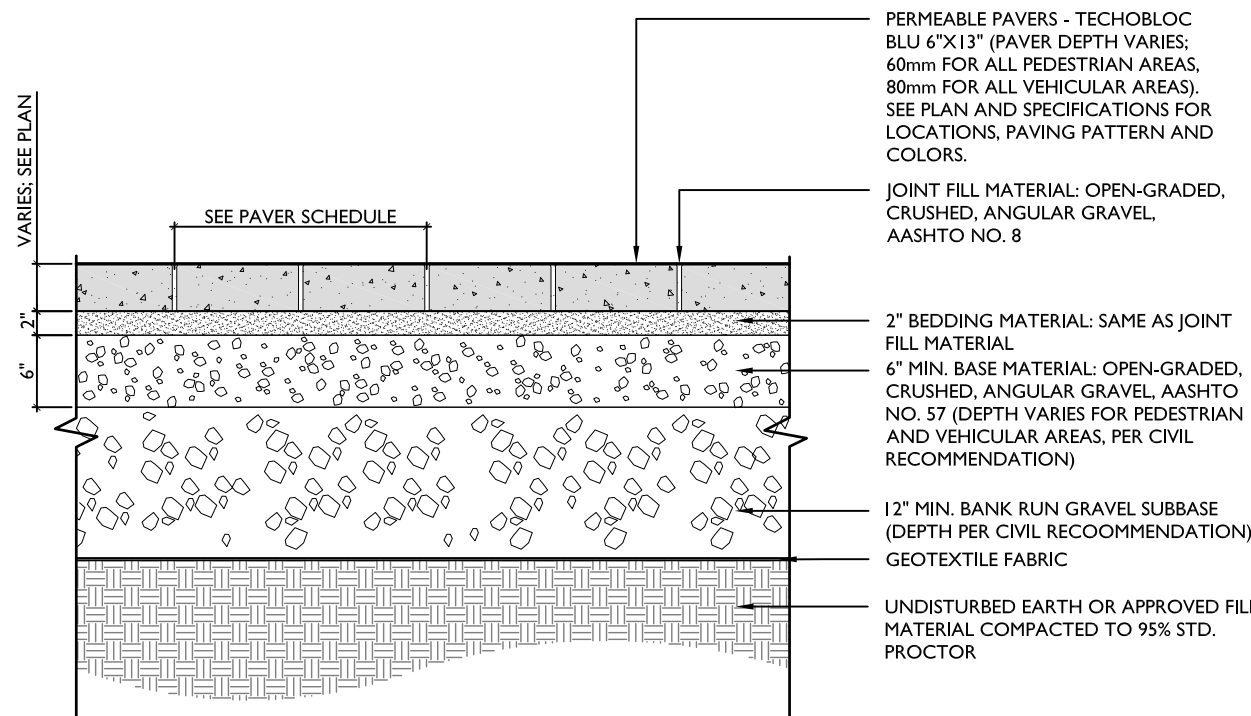
2 BOLLARD, TYP.  
\*NOT TO SCALE



3 TOP OF SEAWALL RAILING @ DROPOFF PLAZA  
\*NOT TO SCALE



4 BOARDWALK WITH GRANITE SLAB BOLLARDS  
\*NOT TO SCALE



5 PERMEABLE PAVING  
3/4" = 1'-0"

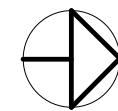
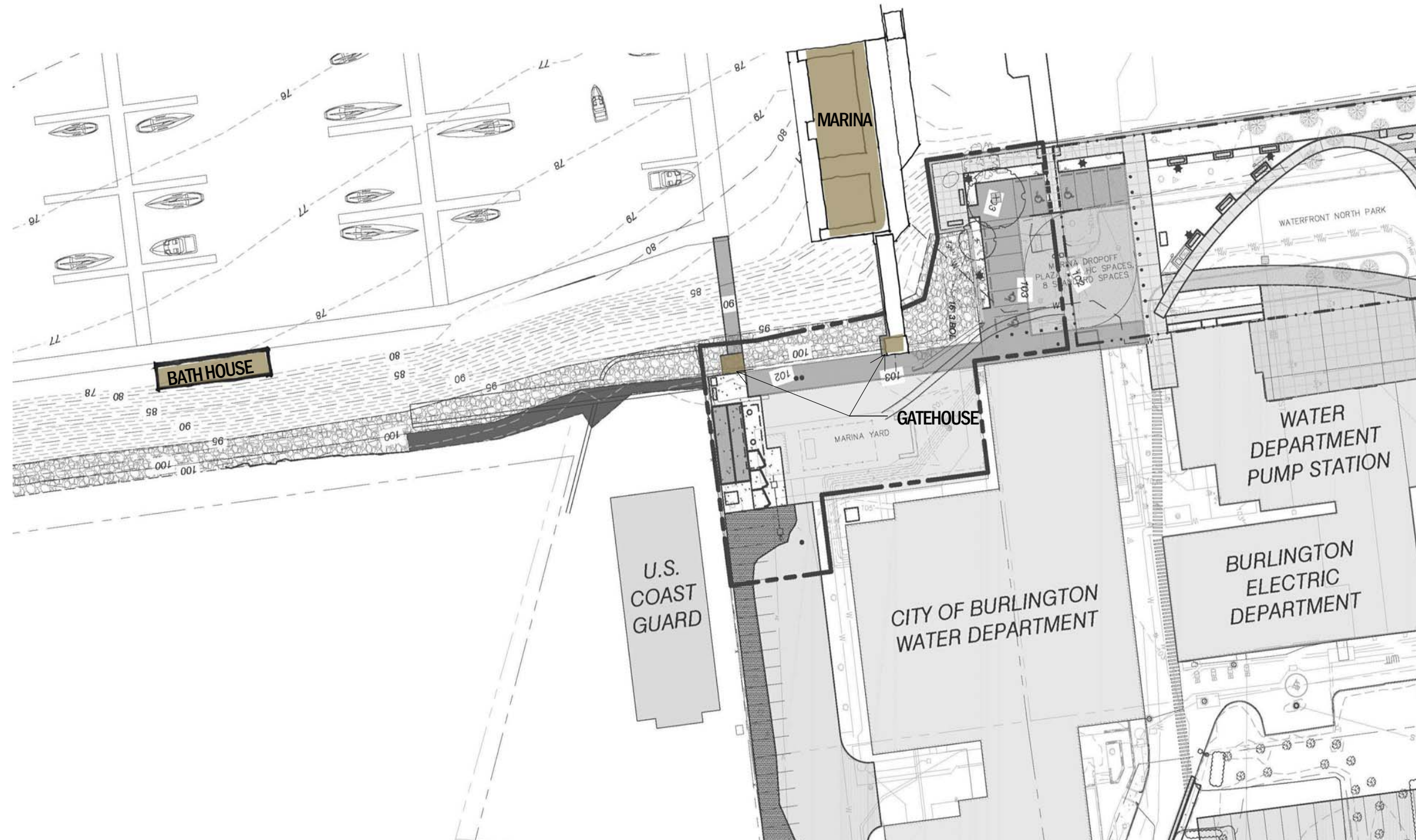
PERMITTING  
DETAILS  
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CONSTRUCTION)

## BURLINGTON HARBOR MARINA

### PROPOSED PRODUCT DETAILS

#### REVISIONS





PROJECT NORTH

GRAPHIC SCALE



1 of 5

# BURLINGTON HARBOR MARINA

BURLINGTON, VT

NOV. 21, 2016  
A1524

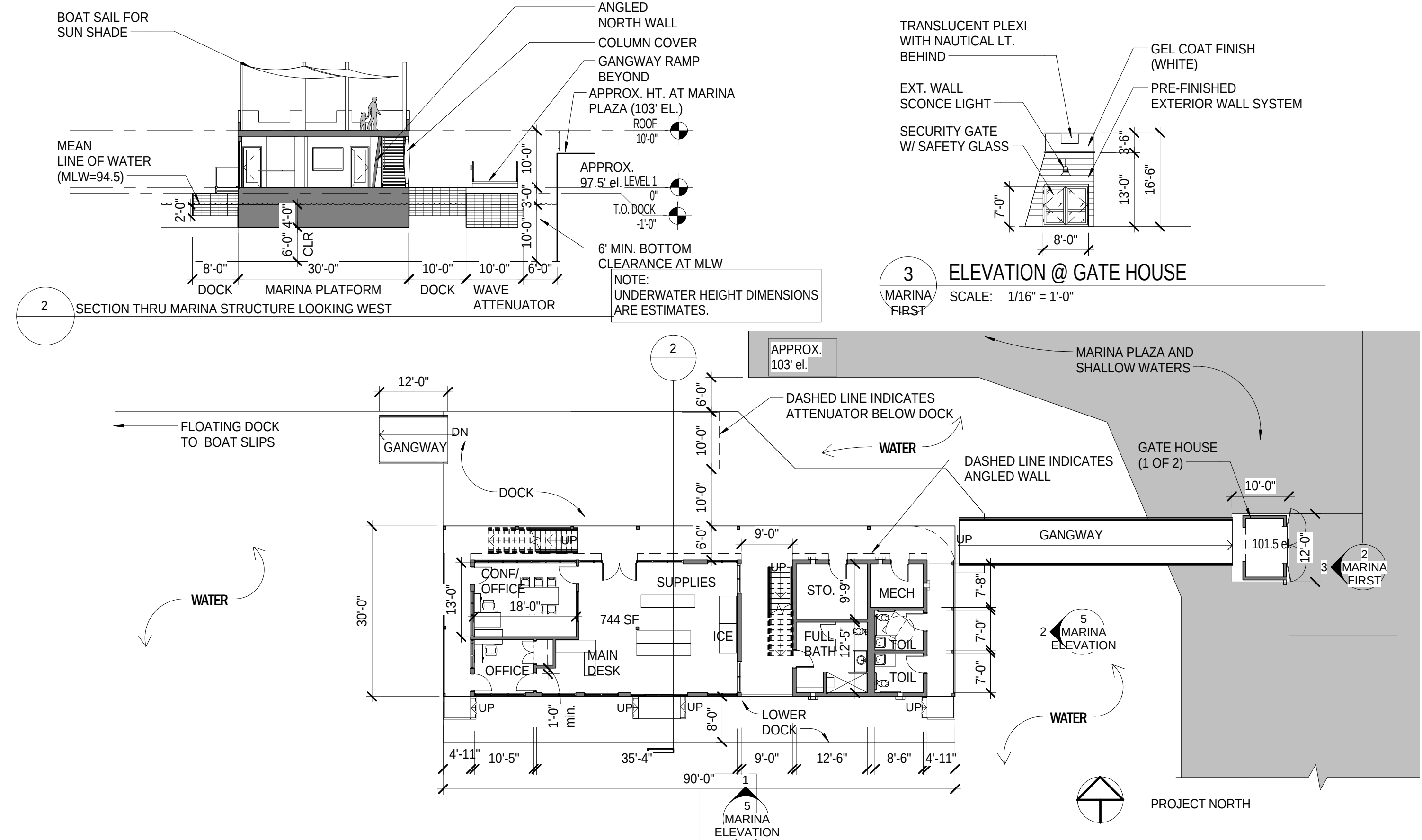
## SITE CONCEPT PLAN

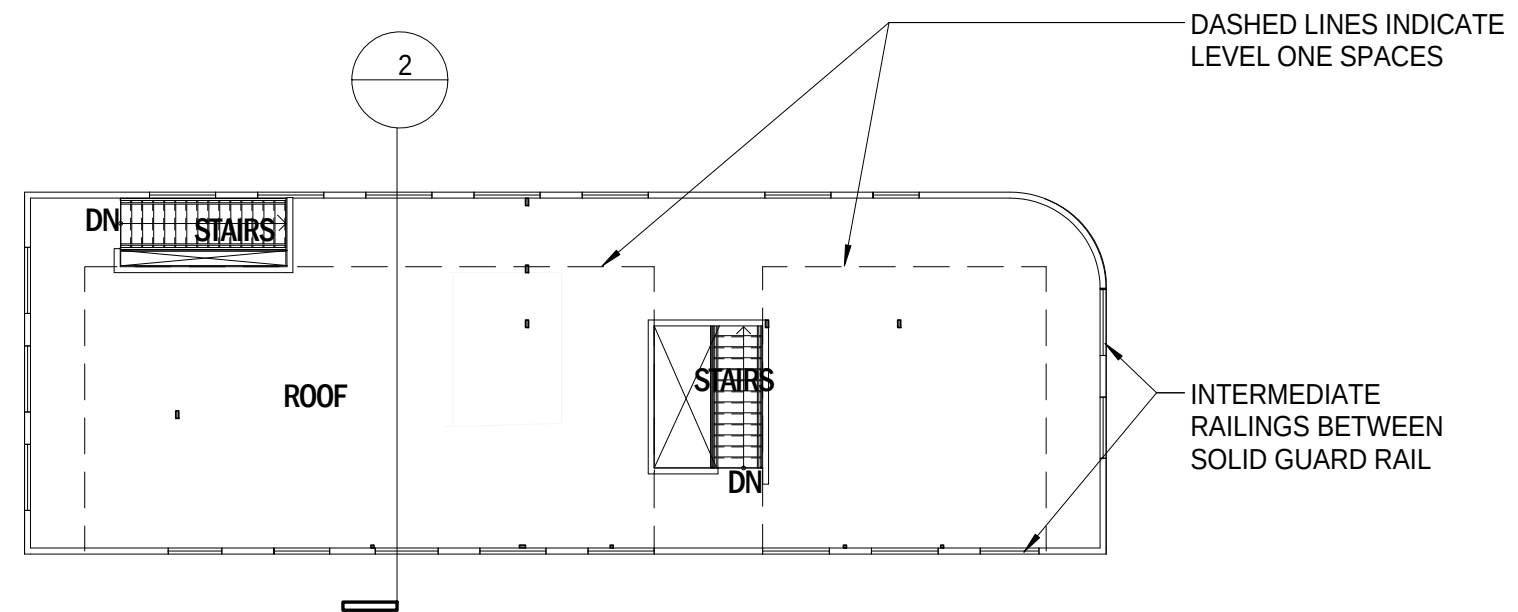
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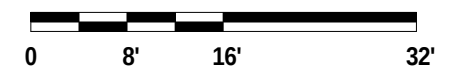






PROJECT NORTH

GRAPHIC SCALE



3 of 5

**BURLINGTON HARBOR MARINA**  
BURLINGTON, VT

NOV. 21, 2016

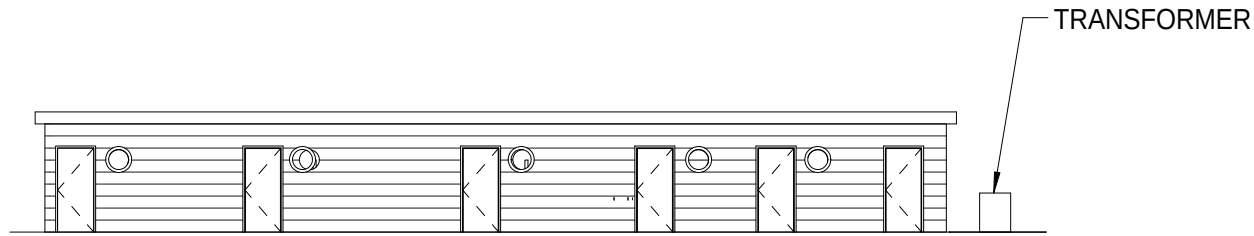
A1524

MARINA SERVICE CENTER CONCEPT - ROOF PLAN

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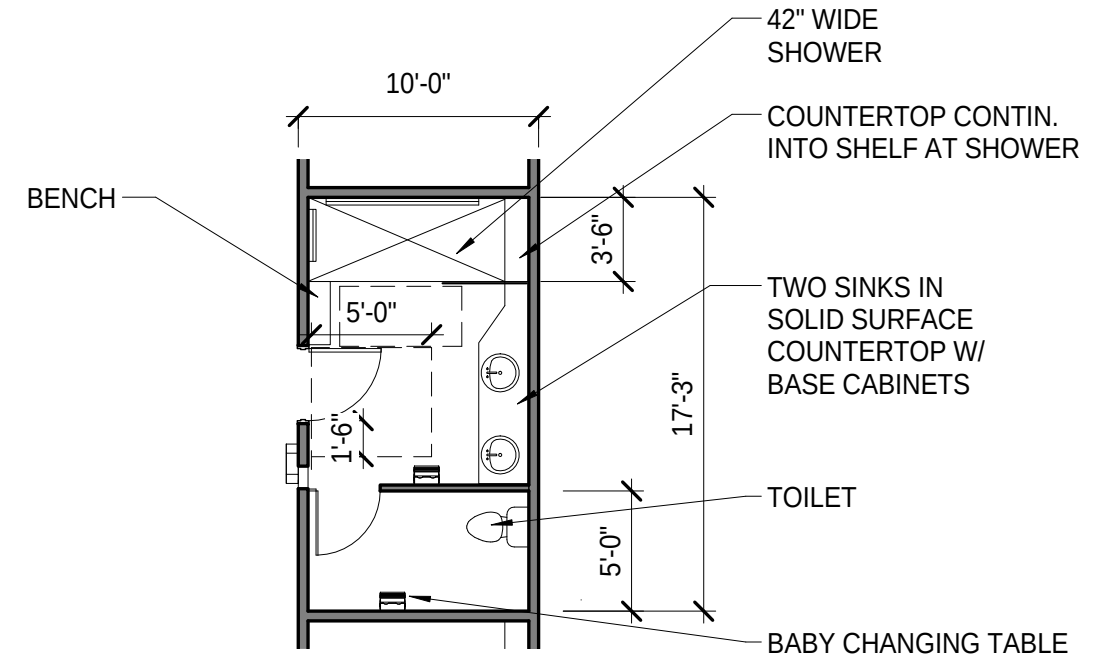
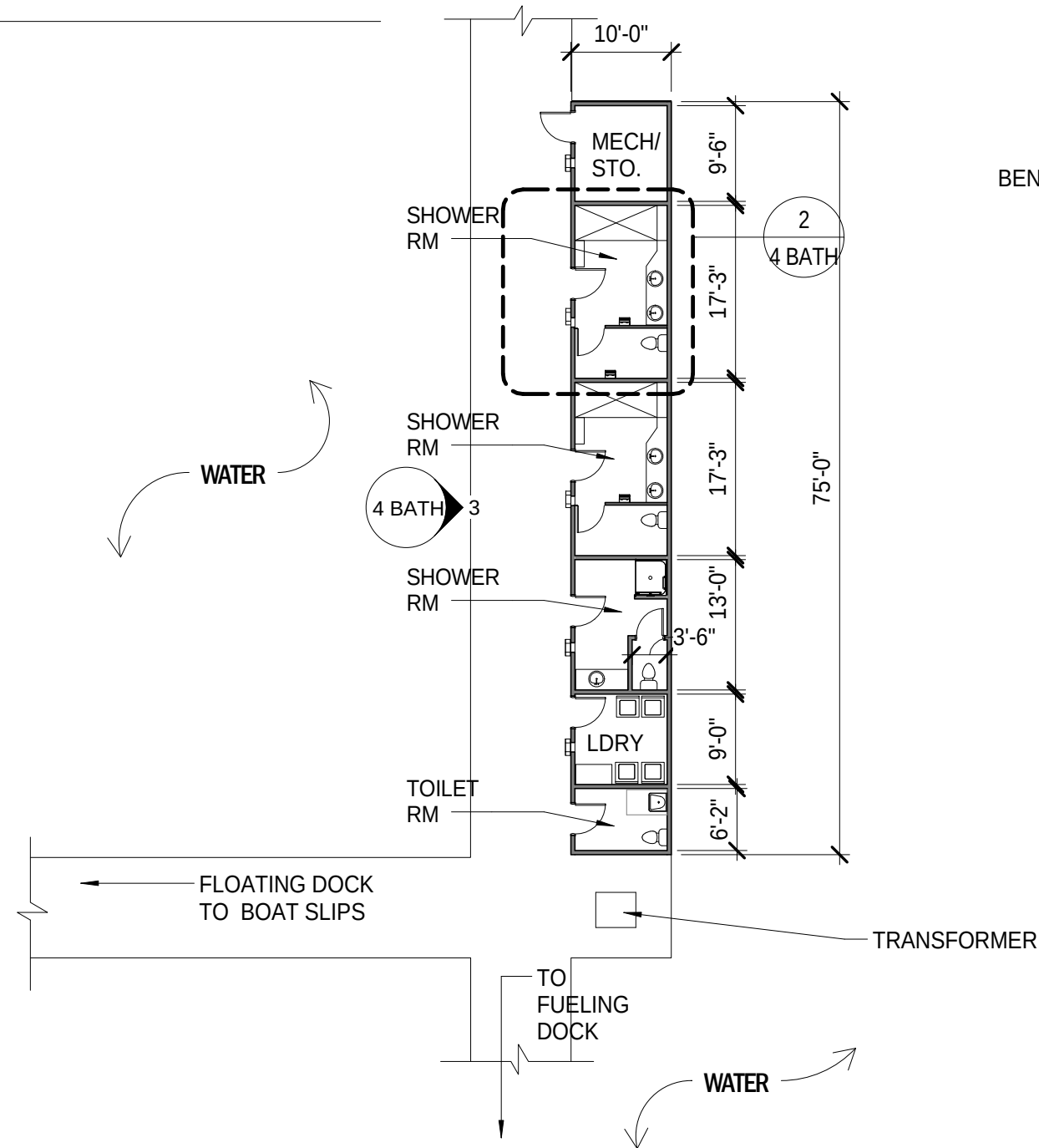
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**3**  
4  
BATH

**BATHHOUSE WEST ELEVATION**

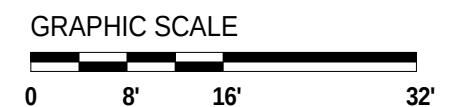
SCALE: 1/16" = 1'-0"



**2**  
4  
BATH

**BATH HOUSE TYPICAL SHOWER ROOM**

SCALE: 1/8" = 1'-0"



4 of 5

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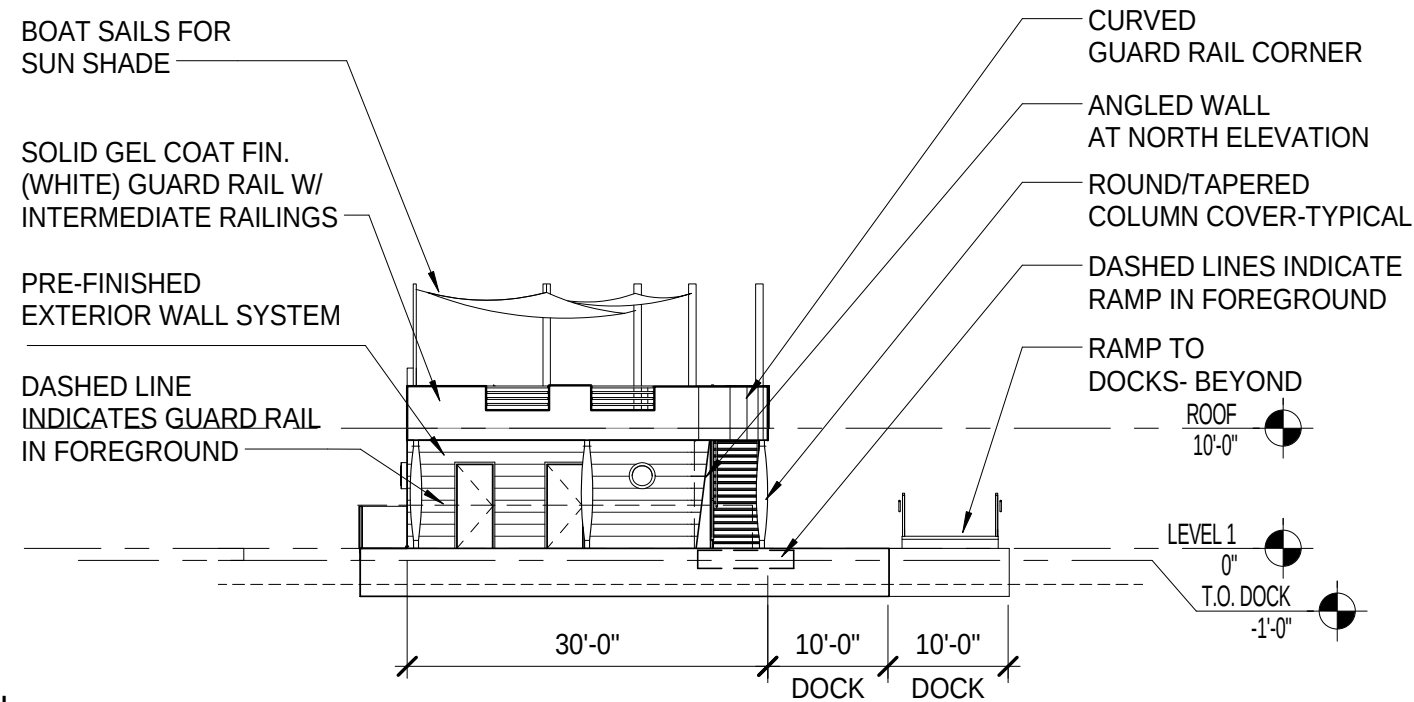
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**BURLINGTON HARBOR MARINA**  
BURLINGTON, VT

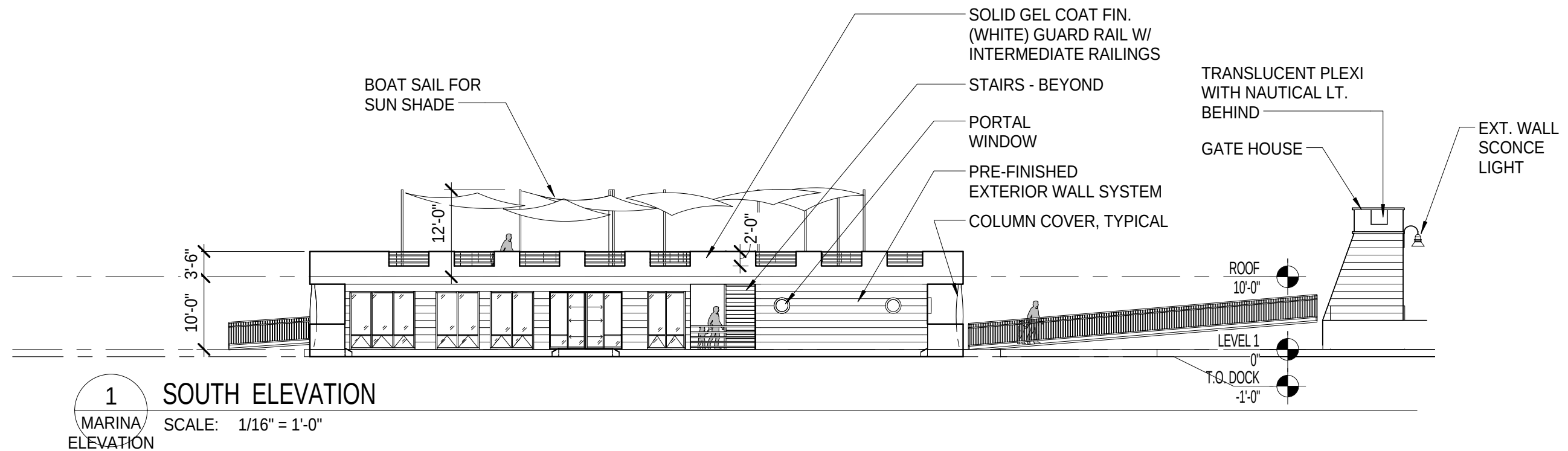
NOV. 21, 2016

A1524

**BATH HOUSE CONCEPT PLAN**



**2 EAST ELEVATION**  
MARINA ELEVATION  
SCALE: 1/16" = 1'-0"



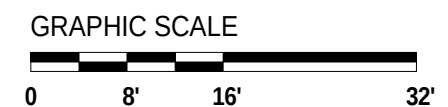
**1 SOUTH ELEVATION**  
MARINA ELEVATION  
SCALE: 1/16" = 1'-0"



**BURLINGTON HARBOR MARINA**  
BURLINGTON, VT

MARINA SERVICE CENTER CONCEPT - SOUTH ELEVATION

NOV. 21, 2016  
A1524



5 of 5

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**Waterfront North Park** | Marina Dropoff Plaza and Support Building (looking southwest)

01/26/2017

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LANDSCAPE ARCHITECTURE





**Waterfront North Park | Roth Family Memorial Bench (Relocation Sketch, looking west)**

01/13/2017

**WAGNERHODGSON**  
LANDSCAPE ARCHITECTURE





## Burlington Department of Public Works

### Stormwater Program

234 Penny Lane (Water Plant)

Burlington, VT 05401

PH: 802-863-4501 Email: [stormwater@burlingtonvt.gov](mailto:stormwater@burlingtonvt.gov)



## Standard Erosion Prevention & Sediment Control (EPSC) Plan

This questionnaire and associated EPSC plan sheets are required for projects

- on properties other than single family (R1) or duplexes (R2) that require a level II or III Certificate of Appropriateness or Major Impact zoning applications and involve 5000 sq. ft. or more of earth disturbance; or
- any activity where a zoning permit is not required but where the project involves 10,000 sq. ft. or more of earth disturbance; or
- if requested by the Stormwater Program due to project characteristics such as slope, soils or proximity to drainage structures or waterbodies.

Please note that you must submit EPSC plan and detail sheets as outlined in section A below.

All projects involving redevelopment or addition of impervious surface must submit the stormwater management screening project (attached) for evaluation or meet with the Stormwater Program to determine the stormwater management requirements for your project.

1. Project Location 234 Penny Lane
2. Zoning Permit Address (if different from above): \_\_\_\_\_
3. Brief Project Description (i.e. building construction, subdivision, site work)  
Construction of new marina. Site improvements include marina yard with associated utilities,  
public park & plaza and 68 space parking lot.
4. Owner Name: Burlington Harbor Marina, LLC (Lessee)
5. Owner Mailing Address: 25 Cherry St Burlington Vermont 05482
6. Owner Phone: 802 863-1333 6. Owner email: jwallace@gmavt.net
7. Contractor Name: \_\_\_\_\_ ☒ Contractor not known at this time
8. Contractor Phone: \_\_\_\_\_ 9. Contractor Email: \_\_\_\_\_
10. Estimated Project Start Date June 2017 Estimated End Date June 2018
11. Area of Land Disturbance 45482 sq. ft.
12. Total proposed (existing + new) amount of impervious: 97494 sq. ft.
14. Does your project require a State Construction Stormwater Permit (9020 or INDC) ? ☒ Yes ☐ No  
(You will be required to submit proof of your authorization to discharge prior to initiation of earth disturbance).

### A. REQUIRED PLAN SHEETS:

15. Plan sheet(s) MUST BE ATTACHED showing the following:

- |                                                                                   |                                                                                          |
|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|
| <input checked="" type="checkbox"/> Limits of disturbance                         | <input checked="" type="checkbox"/> Direction of stormwater flow on site                 |
| <input checked="" type="checkbox"/> Location of stockpiles (if any)               | <input checked="" type="checkbox"/> Location of sediment control BMP's (silt fence etc.) |
| <input checked="" type="checkbox"/> Location of stabilized construction entrances | <input checked="" type="checkbox"/> Stabilization measures                               |
| <input type="checkbox"/> Phasing plan (if appropriate)                            |                                                                                          |

\*impervious = any surface off of which water runs off rather than infiltrates, including, but not limited to rooftops and paved/unpaved (gravel/packed dirt) driveways, walkways and patios

16. Detail sheet MUST BE ATTACHED and include details for all EPSC measures listed on the EPSC Plan Sheet.

Additionally, notes must be included related to:

- ☐ Daily inspection of roadways and sweeping as necessary
- ☒ Dewatering measures (if applicable)
- ☒ Temporary site stabilization requirements
- ☒ Final site stabilization requirements
- ☒ Winter site stabilization (for disturbance after November 1)
- ☒ Inspection requirements

**B. EPSC QUESTIONNAIRE (See last page for typical solutions to these questions)**

A) Do you anticipate the need for any dewatering of excavations during the construction? ☐ Yes ☒ No

- If yes, please indicate which plan sheet has details for how dewatering operations will be managed to prevent the discharge of sediment laden water. Sheet(s): \_\_\_\_\_

B) Will excavated soil be stockpiled on the site? ☒ Yes ☐ No If yes, show locations and EPSC measures for the stockpile on plan sheet(s)

- If no, where is the ultimate disposal of excess soil? \_\_\_\_\_

C) Do you plan to park construction vehicles on or disturb City owned property like the greenbelt area? ☐ Yes ☒ No

- If yes, tell us how you agree to repair all disturbances or damage to City owned property and provide a written approval from the City allowing construction vehicles to park on City owned property.

Note - parking on City land but in new parking lot area

- If no, then please monitor all construction and visitor vehicles and advise all not to park on City owned property.

D) Will stockpiles or disturbed soils be present and/or exposed after Nov. 1<sup>st</sup> of any construction year? ☐ Yes ☒ No

- If yes, tell us how you plan to stabilize any stockpile and/or disturbed soils.

**Do you agree to abide by the following conditions?**

☒ Y ☐ N Applicant will call 863-4501 or email [gjohnson@burlingtonvt.gov](mailto:gjohnson@burlingtonvt.gov) at least 24 hours prior to initiating earth disturbance and submit the **name and contact (cell phone and email) of the erosion control coordinator for the project**

☒ Y ☐ N Applicant will post the attached notice in a visible location

☒ Y ☐ N I acknowledge that it is the responsibility of the owner and his/her representatives to ensure that:

- sediment does not enter surface water bodies (streams, ditches, ponds, lakes, wetlands etc.)
- sediment does not enter City conveyance infrastructure (catch basins, sewers etc.) and
- All sediment must be removed from the city ROW (sidewalks and roadways) by the end of each work day.

☒ Y ☐ N Sediment control measures will be installed prior to the initiation of earth disturbance.



- ☒Y ☐N During the non-winter construction season (April 15 – November 1): After an initial **14 day** period of initial disturbance, temporary or permanent stabilization (mulching, erosion control matting or tarps for stockpiles, or other approved method) of exposed areas and stockpiles will occur at the end of each work day unless:
- o Earthwork is to continue in the area within the next 24 hours **and** there is NO liquid precipitation forecast for the next 24 hours; or
  - o If work is occurring in a self contained excavation (no outlet) with a depth of 2 feet or greater (e.g. house foundation excavation or utility trenches).
- ☒Y ☐N During the winter construction period from November 1 to April 15, any **new disturbance** must be temporarily or permanently stabilized (mulching, erosion control matting or tarps for stockpiles, or other approved method) will occur at the end of each work day unless:
- o Earthwork is to continue in the area within the next 24 hours **and** there is NO liquid precipitation forecast for the next 24 hours; or
  - o If work is occurring in a self-contained excavation (no outlet) with a depth of 2 feet or greater (e.g. house foundation excavation or utility trenches)
- ☒Y ☐N The perimeter of the site and all BMPs will be inspected at the **end of each workday** to ensure that sediment will not leave the site. If sediment has travelled beyond the site boundary, it shall be swept up or otherwise removed and deposited on-site in an upgradient area at the **end of each work day**.
- ☒Y ☐N The owner and his/her representatives shall abide by the best management practices (BMPs) indicated in this plan and conditions and in the Vermont DEC Low Risk Site Handbook for Erosion Prevention and Sediment Control (2006). Contact 802-863-4501 for a hard copy or go to the web:  
[http://vtwaterquality.org/stormwater/docs/construction/sw\\_low\\_risk\\_site\\_handbook.pdf](http://vtwaterquality.org/stormwater/docs/construction/sw_low_risk_site_handbook.pdf)
- ☒Y ☐N **If soils will be exposed after November 1st and winter construction has not been permitted the project will notify DPW prior to October 15<sup>th</sup> and ensure that sediment control is installed PRIOR to soil freezing.** If the project is completed during the winter months, an additional inspection will be required to ensure that the site is buttoned up for the winter.
- ☒Y ☐N Within 48 hours of reaching final grading, the exposed soil will be seeded and mulched or covered with erosion control matting (for slopes steeper than 3:1 or high wind prone areas). Erosion control matting is preferred.
- ☒Y ☐N The owner will contact DPW to schedule a stabilization inspection when site work is finished and stabilization measures (seeding and mulching or matting) have been installed.

#### AGREEMENT

By filling out and signing this plan, I agree to abide by the terms and conditions outlined above. Failure to follow this plan can result in a stop work order by the City of Burlington, fines, or both.

By: ☒ Owner ☐ Contractor

Jack Wallace - Managing member

Name

  
Signature

1-30-17  
Date

Additional Conditions of Approval:

## **Burlington Harbor Marina**

**Existing Conditions:** Description of existing conditions, description of existing stormwater system existing drainage issues, connectivity to City system

The site is located on two parcels of land owned by the City of Burlington abutting Lake Champlain. There are three primary project components and the following will describe the stormwater management within each one.

1. Employee Parking Lot east of buildings. This area currently hosts a 3,950 SF satellite bit. conc. parking lot and green space area that is served by Penny Lane. Stormwater from this areas flows via sheet flow from the parking lot in an easterly direction to an existing catch basin. Flows are then conveyed from this structure via a series of 18" HDPE pipes to Lake Champlain at an outfall located at the north end of the Fishing Pier parking lot.
2. Fishing Pier Parking Lot - This 10,370 SF parking lot for the Fishing Pier and 6,840 SF lot and circulation area for the Water Department Pump Station building currently benefits from two separate collection and conveyance systems that discharge to outfalls to Lake Champlain. The Middle parking lot system includes two catch basins which in turn are conveyed through a series of 12" CMP's to the outfall. The south system located at the south end of the parking lot receives flows from the west end of Penny Lane and conveys these flows and that from one catch basin within the parking to a drainage manhole and then via a 15" RCP to the outfall located just north of the fishing pier.
3. Picnic Shelter Pavilion Area and Water Dept. Parking Lot. – The existing 2,790 SF Pavilion shelter and connector walkways is located between the lake and the Water Dept. Parking lot to the east. Under existing conditions, runoff from the parking lot is collected in a sole catch basin located in the southwest corner of the facility and is conveyed in a 12" CMP to the Lake Champlain outfall. The remaining area near the shelter either drain back to the sole catch basin or sheet flow to the lake.

**Proposed Conditions:** description of proposed conditions, brief description of proposed stormwater system, proposed method of discharge to receiving water or City system (overland flow, direct connection via pipe, existing or new manhole or CB). General Statement: The underlying sand subgrade of the site provide suitable infiltration rates in support of the use of permeable pavement and permeable pavers without the use of underdrains.

1. Employee Parking Lot east of buildings. Consistent with the original WAN approval, this area will be redeveloped with an expanded parking lot. The shape of the lot has been reconfigured to enable a sweeping pedestrian access to be installed along the east edge of the facility from Penny Lane to the Moran Plant.

This 21,430 SF parking facility constructed with pervious pavement will replace the existing 3,950 SF impervious parking lot.

A small amount of curbing will be installed on Penny Lane to provide transition curbing from Penny Lane into the new parking facility.

2. Fishing Pier Parking Lot - The existing parking lot is being removed in favor of:
  - a. The creation of the Waterfront Park North within the northern two-thirds of the project site. This will include the creation of new green space and a series of hardscape access ways and sitting areas. A series of trees will be placed in a stone dust surface treatment along the west edge of the park. This site will continue to sheet flow toward the existing CB location.
  - b. The existing bit. conc. located on the west side of the Water Department Pump Station Building is proposed to be resurfaced with CIP concrete. No change in sheet flow away from the building is proposed.
  - c. The far southern third of the site will be converted into a marina drop-off area that integrates with the access way to the Fishing Pier. The proposed surfaces include pervious pavers in the parking locations, and impervious pavers in the inner and outer limits of the drop-off area. 5' green space bands line the outside edges of the parking spaces. Infiltration into the planting bands will be promoted for those portions of the impervious



perimeter walkway. The pervious pavers will minimize the surface flows to the existing catch basin located at the west end of Penny Lane.

Not including the 5,810 SF of resurfacing of the existing bit. conc. surface north of the Pump Station building, the total proposed impervious surface area here is 12,388 SF.

3. Picnic Shelter Pavilion Area and Water Dept. Parking Lot. – The existing Pavilion will be removed in favor of the creation of the Mariana Yard. The majority of the yard area will be comprised of 8,120 SF of permeable pavers. The far south end of the parking lot green space will be converted into 2,770 SF of impervious bit. conc. surface in support of improving Water Dept. delivery truck circulation and parking opportunities in this area. The south end of the Marina Yard is proposed to be comprised of 2,110 SF of impermeable concrete surface.

The existing catch basin located at the southwest corner of the existing parking lot will be replaced with a deep sump catch basin in support of reducing the sediment load discharges to the lake.

The construction of the concrete pavement at the south end of the Marina yard offsets the existing impervious associated with the Pavilion on this portion of the property. The expansion of the south parking lot surface represents an increase in impervious area to the existing 6,825 SF parking lot. Combined with the proposed 2,770 SF expansion of the lot, the contributory surface area to the proposed deep sump catch basin remains less than the 0.25 acre design threshold set forth in the State's draft Stormwater Manual.



# Stormwater Management Plan Pre-Screening

Please provide the following information to the Stormwater Program ([stormwater@burlingtonvt.gov](mailto:stormwater@burlingtonvt.gov), ph: 863-4501) in order to determine what the requirements will be for your project.

- General Information
  - o Project Address:
  - o Owner:
  - o Engineer:
  - o Brief project description:

- Stormwater Management Plan
  - o Impervious<sup>1</sup> change summary

| Condition           | Type                      | Total Impervious (s.f.) |
|---------------------|---------------------------|-------------------------|
| Existing Conditions | Existing Impervious       |                         |
| Proposed            | Total Proposed (1+2+3)    |                         |
|                     | 1) New <sup>2</sup>       |                         |
|                     | 2) Existing to Remain     |                         |
|                     | 3) Redeveloped            |                         |
| Net New             | Total Proposed – Existing |                         |

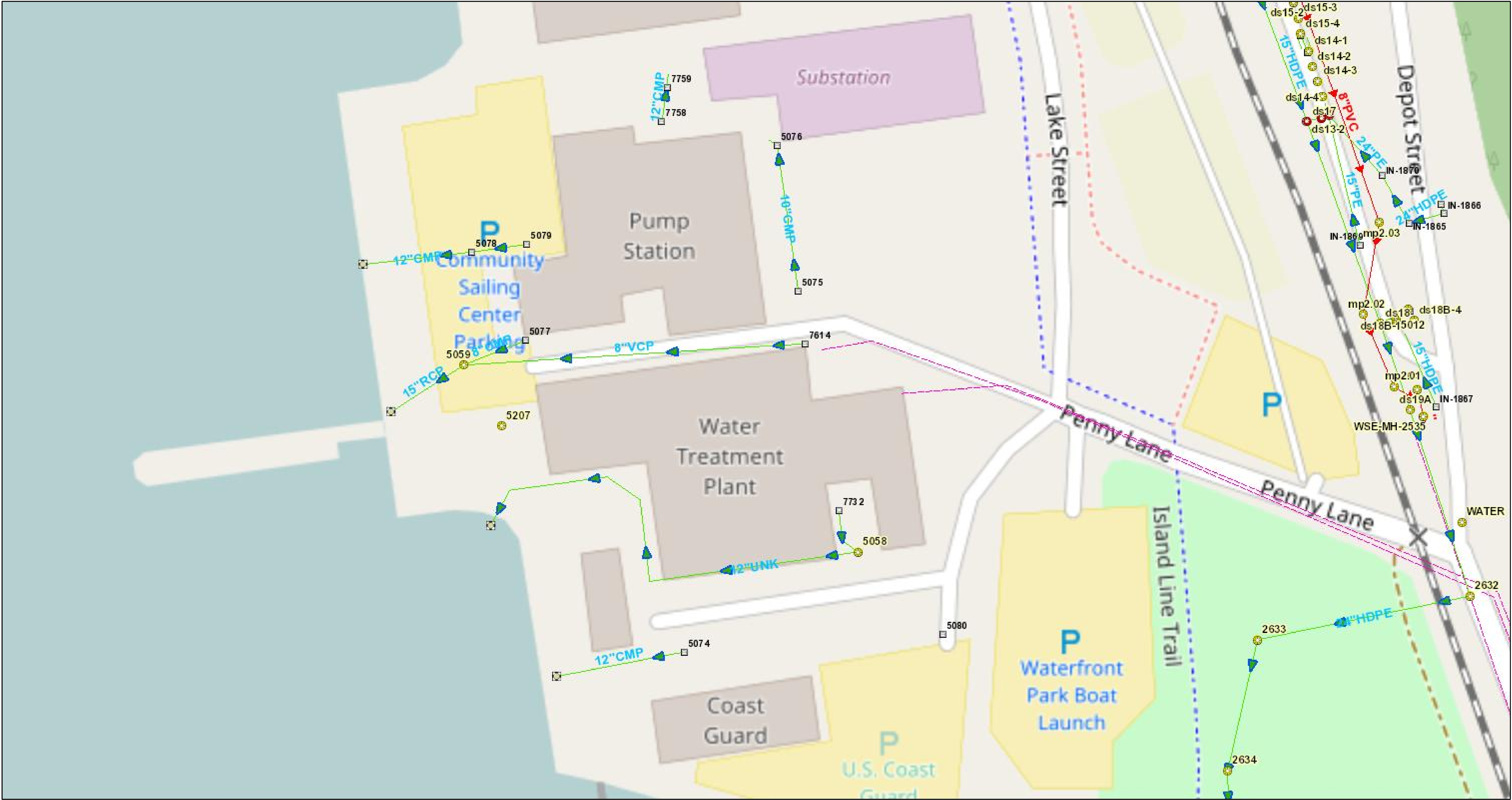
*If available at this time:*

- Existing conditions: *description of existing conditions, description of existing stormwater system, existing drainage issues, current connectivity to City system*
- Proposed Conditions: *description of proposed conditions, brief description of proposed stormwater system, proposed method of discharge to receiving water or City system (overland flow, direct connection via pipe, existing or new manhole or CB)*

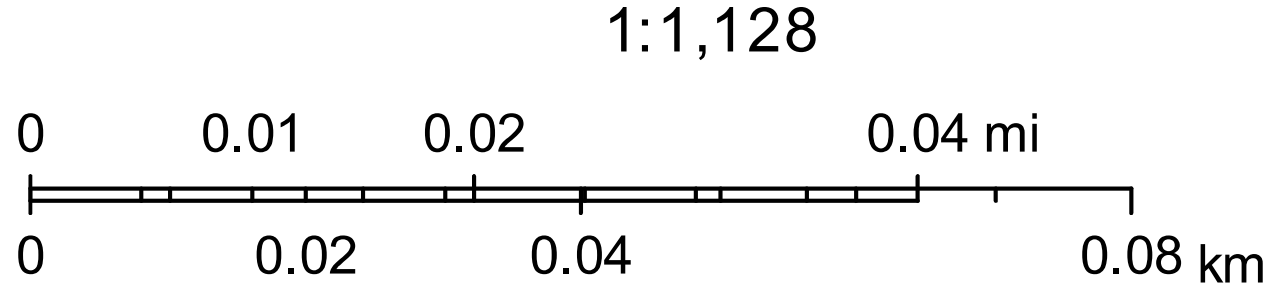
<sup>1</sup> Impervious = any surface off of which water runs off rather than infiltrates, including, but not limited to rooftops and paved/unpaved (gravel/packed dirt) driveways, walkways and patios

<sup>2</sup> Impervious where there is not currently impervious

CollectionSystem with Street Map



October 31, 2016

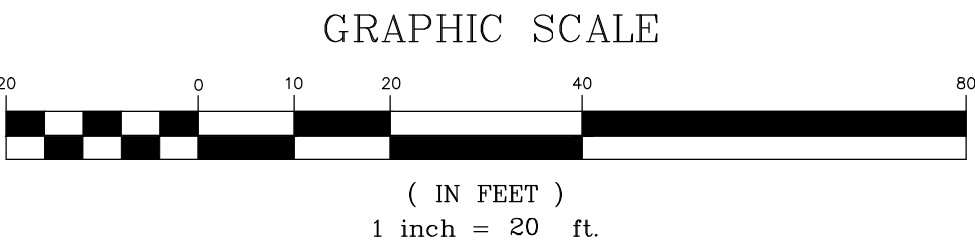
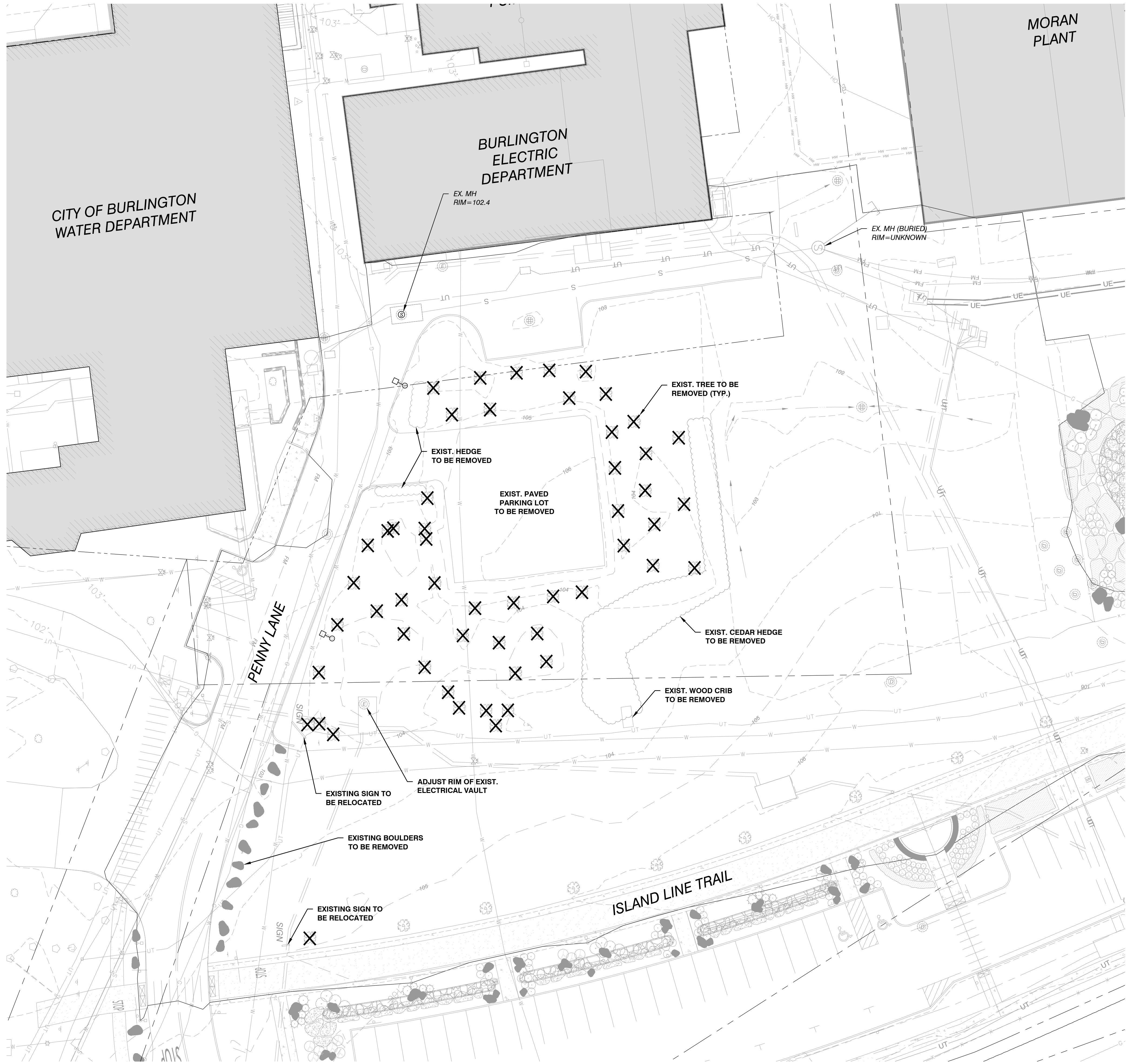


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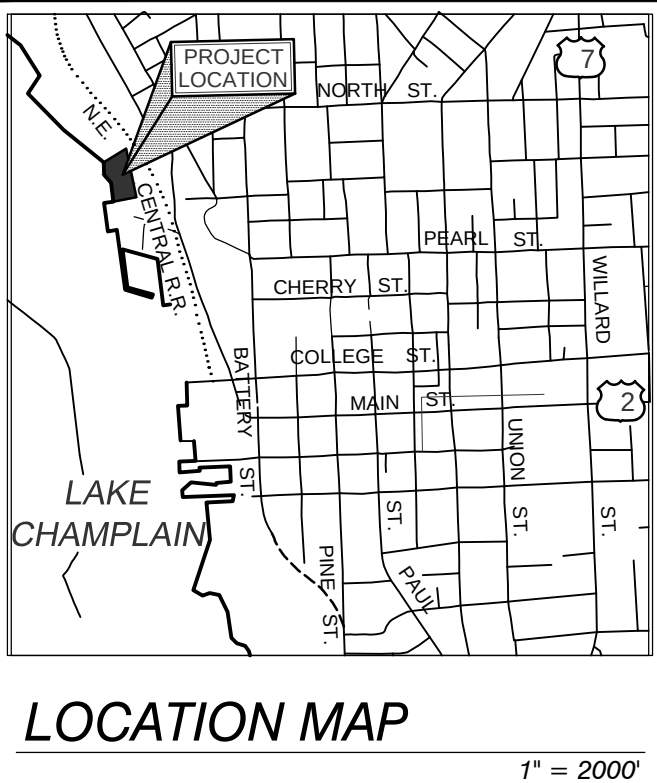
OWNER:

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LLC**  
1 CHURCH STREET  
BURLINGTON VT 05401

PROJECT:

**BURLINGTON  
HARBOR MARINA**

234 PENNY LANE  
BURLINGTON VT 05401

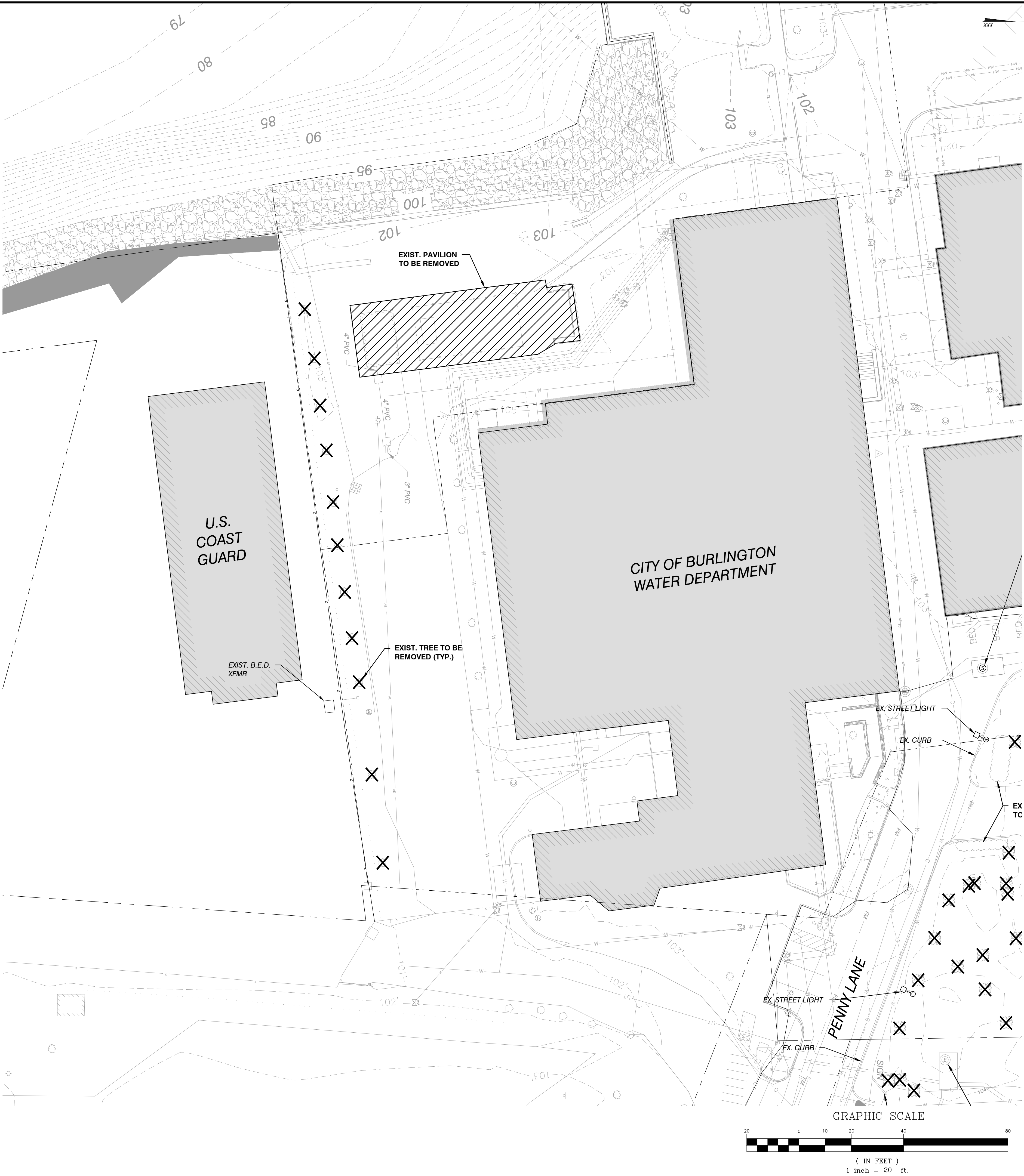


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| SCALE<br>1" = 20'     |                               |
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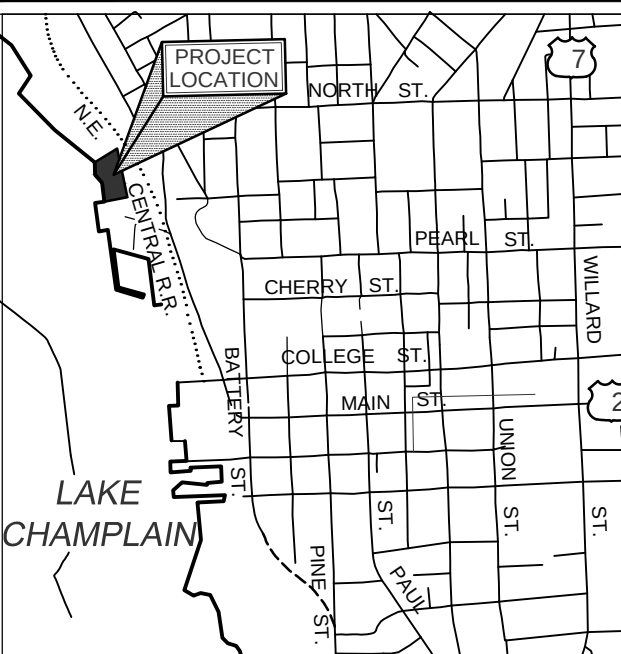
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PROJECT:

**BURLINGTON  
HARBOR MARINA**

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BURLINGTON VT 05401



LOCATION MAP

1" = 2000'

| DATE    | CHECKED | REVISION      |
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**EXISTING  
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DATE  
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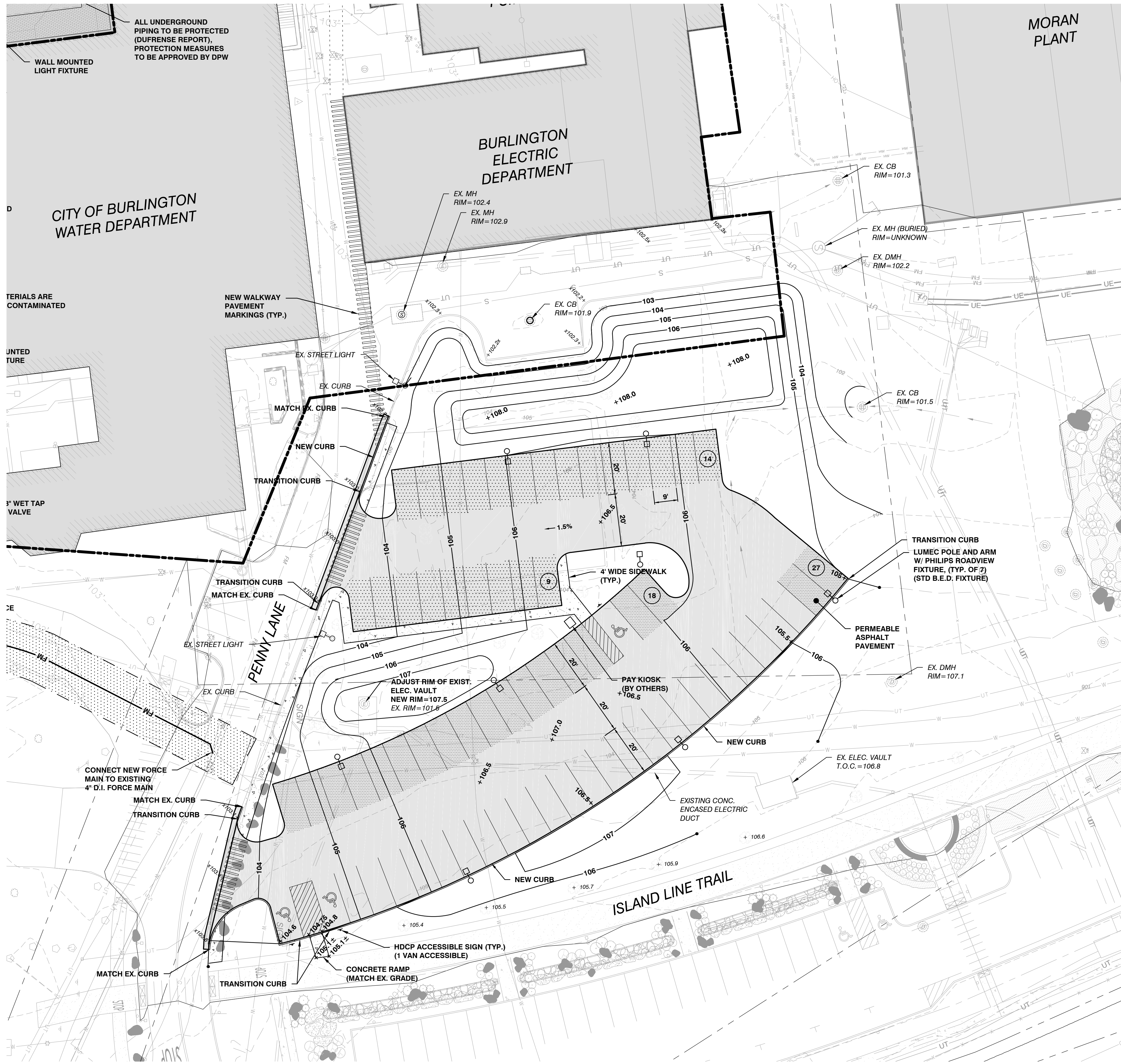
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PROJ. NO.  
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DRAWING NUMBER

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OFF STREET PARKING REQUIREMENTS

|                                |           |
|--------------------------------|-----------|
| MARINA                         |           |
| 96 SEASONAL SLIPS (0.5 / SLIP) | 48 SPACES |
| (PER WAIVER)                   |           |
| MARINA                         |           |
| EAST LOT                       | 42 SPACES |
| SOUTH LOT (EMPLOYEE)           | 4 SPACES  |
| PLAZA LOT (HDCP ACCESS.)       | 2 SPACES  |
|                                | 48 SPACES |
| BIKE PARKING                   |           |
| SHORT TERM (100 USERS x 0.1)   | 10 SPACES |
| LONG TERM (1/10) (EMPLOYEE)    | 1 SPACES  |
| TOTAL REQUIRED                 | 11 SPACES |
| TOTAL PROVIDED                 | 11 SPACES |

WFN (EAST LOT) PARKING SUMMARY

MIN. REQUIRED SPACES  
42 MARINA  
26 COMMUNITY SAILING CENTER  
68 REQUIRED SPACES  
68 PROPOSED SPACES  
73 PREVIOUSLY PERMITTED SPACES

3 ACCESSIBLE SPACES REQUIRED (TOTAL)  
3 ACCESSIBLE SPACES PROVIDED (TOTAL)  
1 VAN ACCESSIBLE SPACE REQUIRED  
1 VAN ACCESSIBLE SPACES PROVIDED

EAST LOT PARKING RESERVED SPACES

- 23 SPACES FOR EXCLUSIVE MARINA USE  
MAY TO OCT.
- 19 SPACES FOR EXCLUSIVE MARINA USE  
WEEKENDS AND HOLIDAYS - MAY TO OCT.

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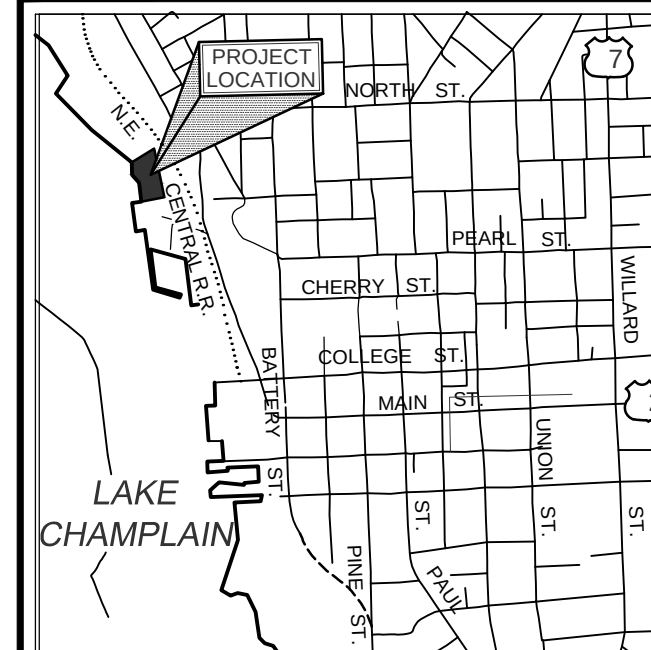
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1 CHURCH STREET  
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PROJECT:

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LOCATION MAP

1" = 2000'

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PROPOSED  
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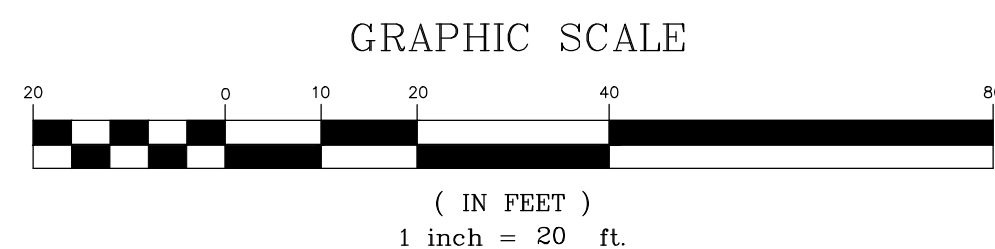
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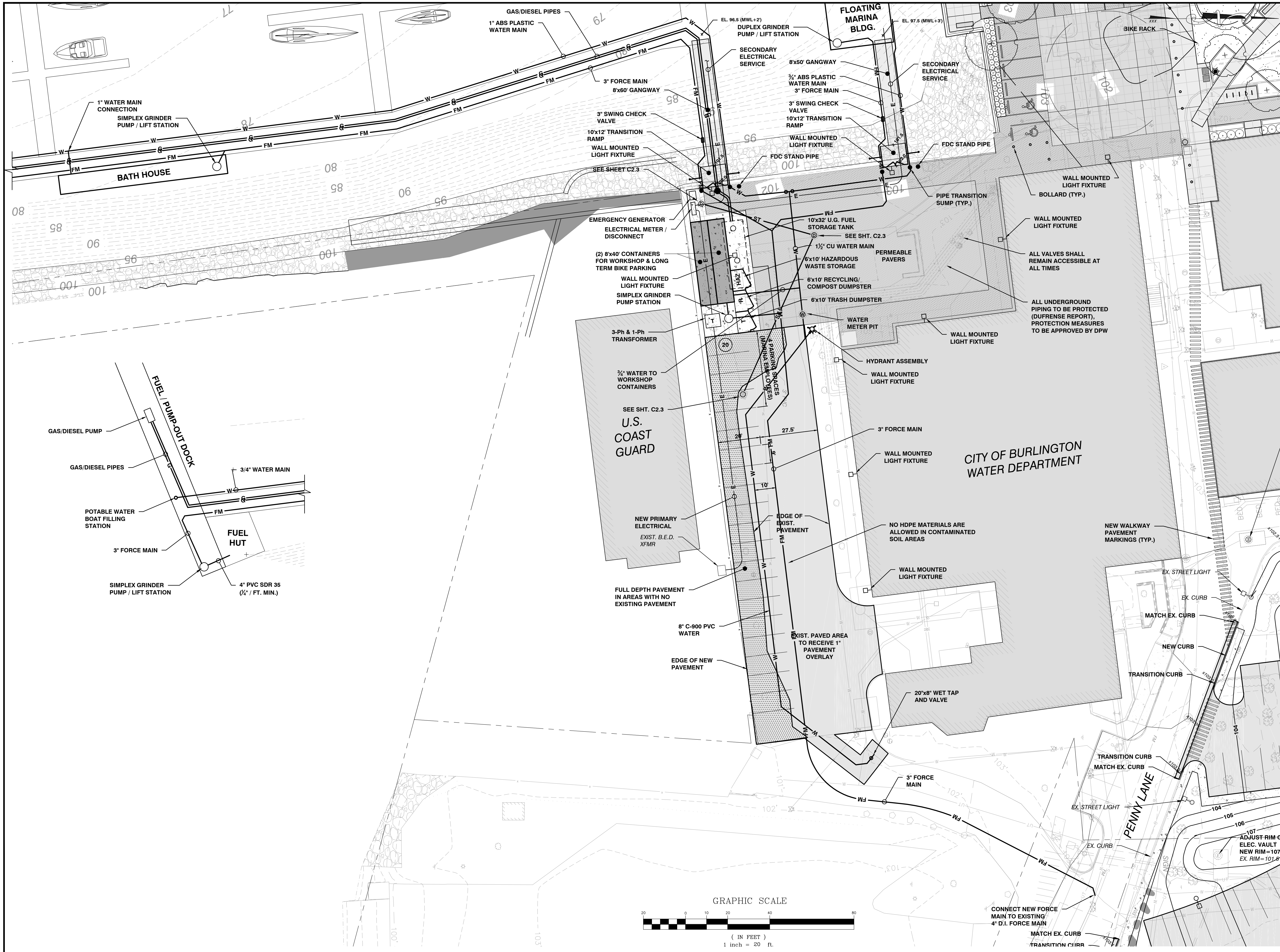
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LOCATION MAP

1" = 2000'

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**PROPOSED  
CONDITIONS  
PARTIAL SITE PLAN**

DATE  
JAN. 13, 2017

SCALE

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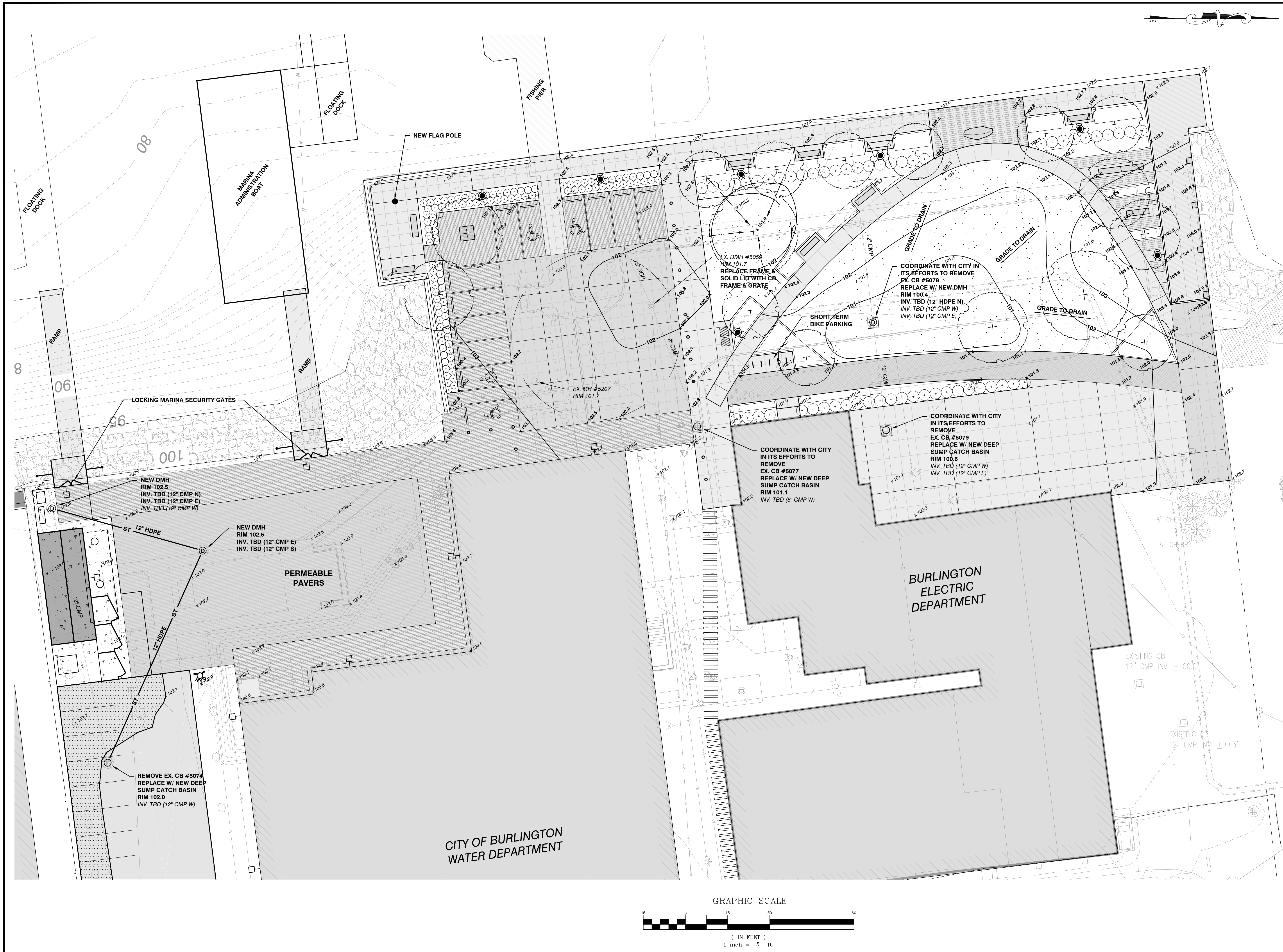
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**C2.2**





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1 CHURCH STREET  
BURLINGTON VT 05401

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234 PENNY LANE  
BURLINGTON VT 05401



LOCATION MAP  
1" = 2000'

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PROPOSED CONDITIONS  
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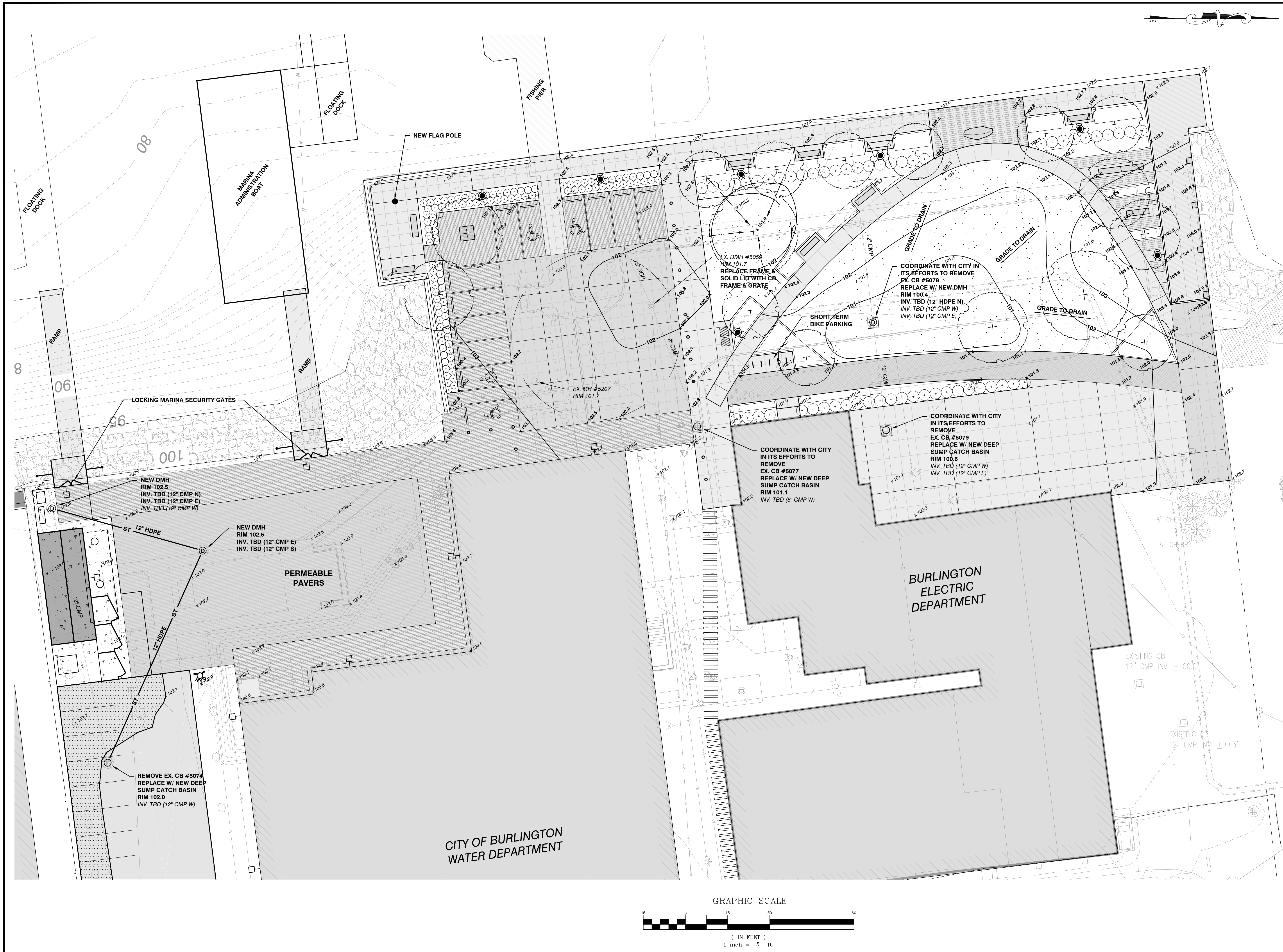
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PROJ. NO.  
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234 PENNY LANE  
BURLINGTON VT 05401

LOCATION MAP  
1" = 2000'

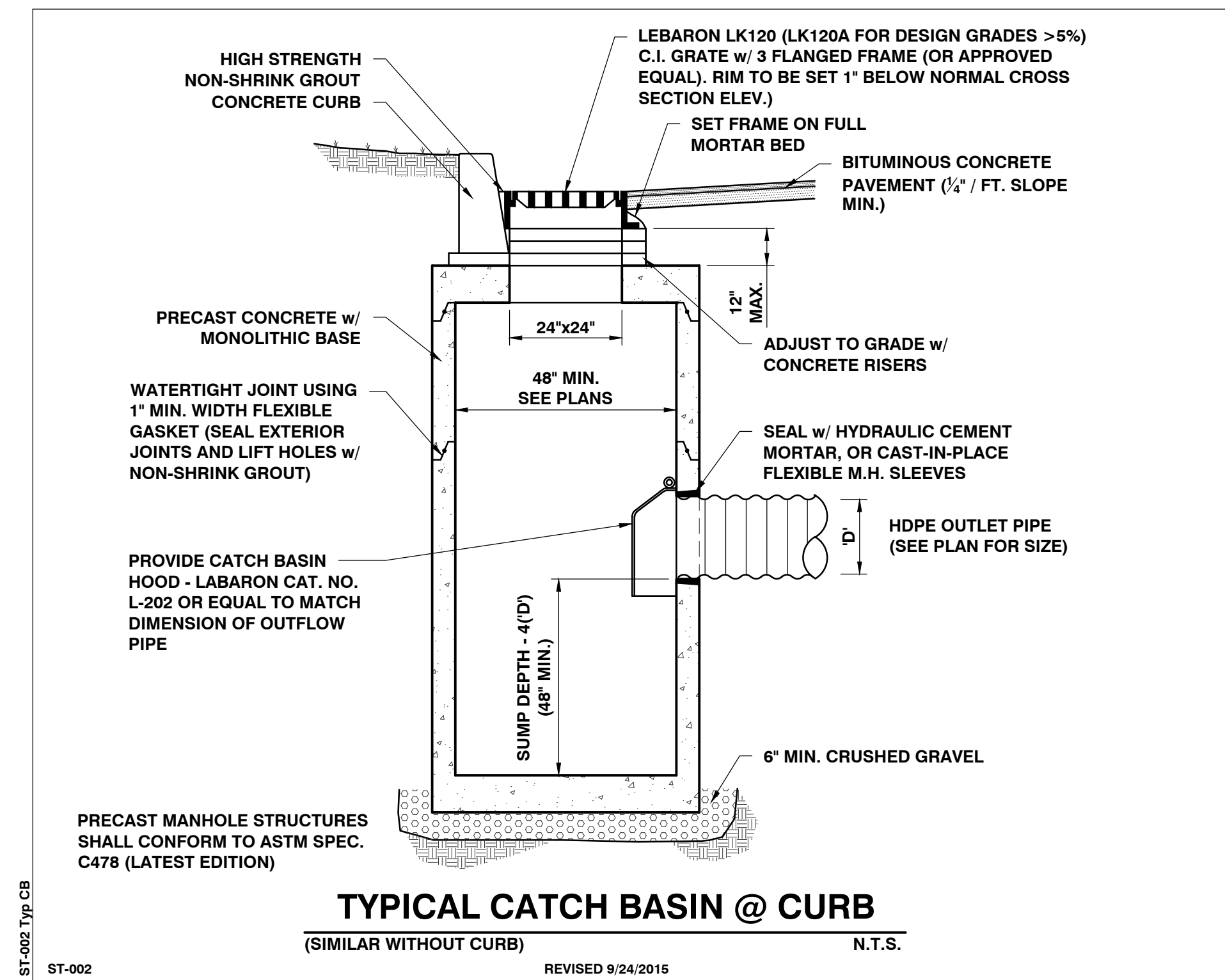
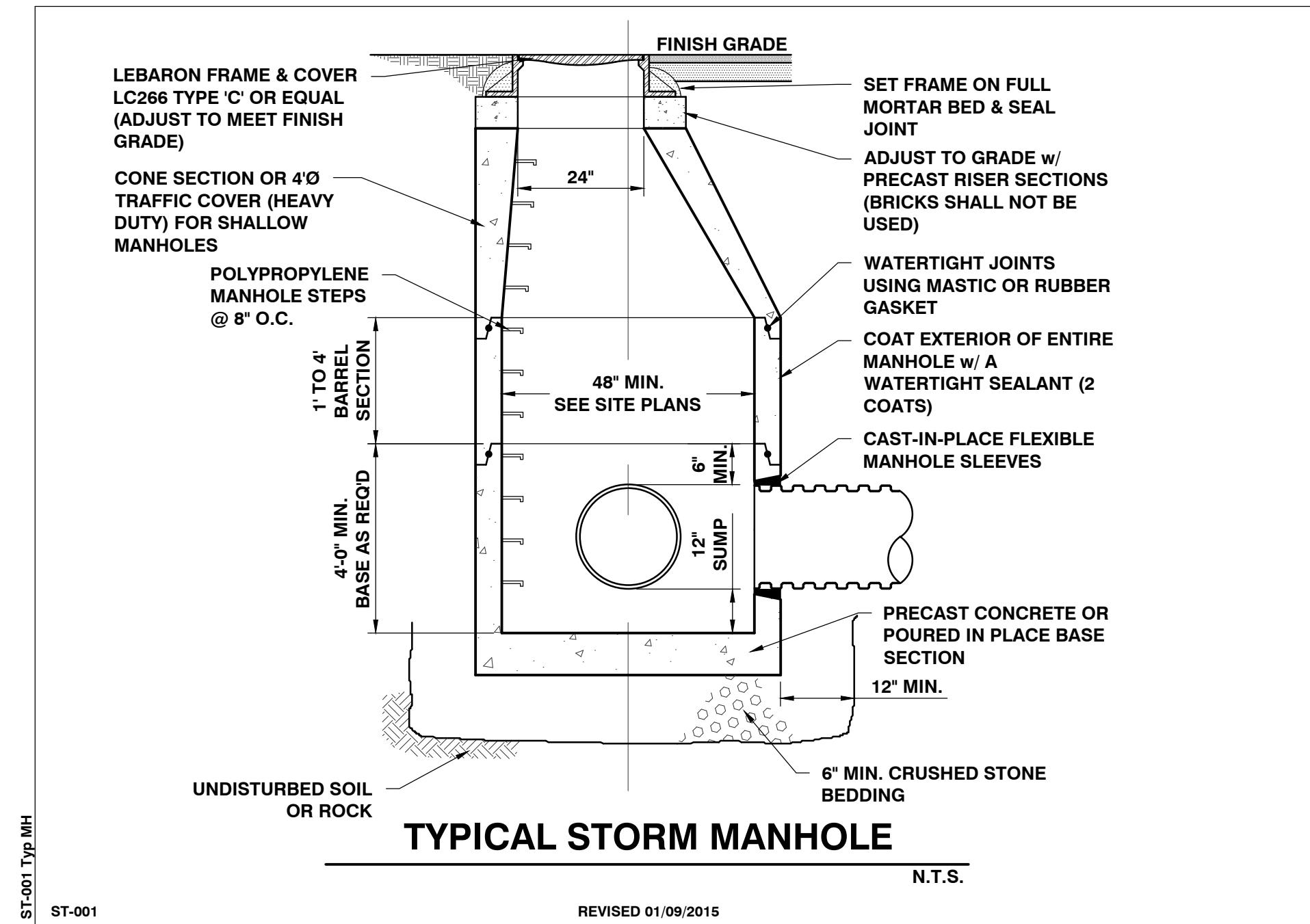
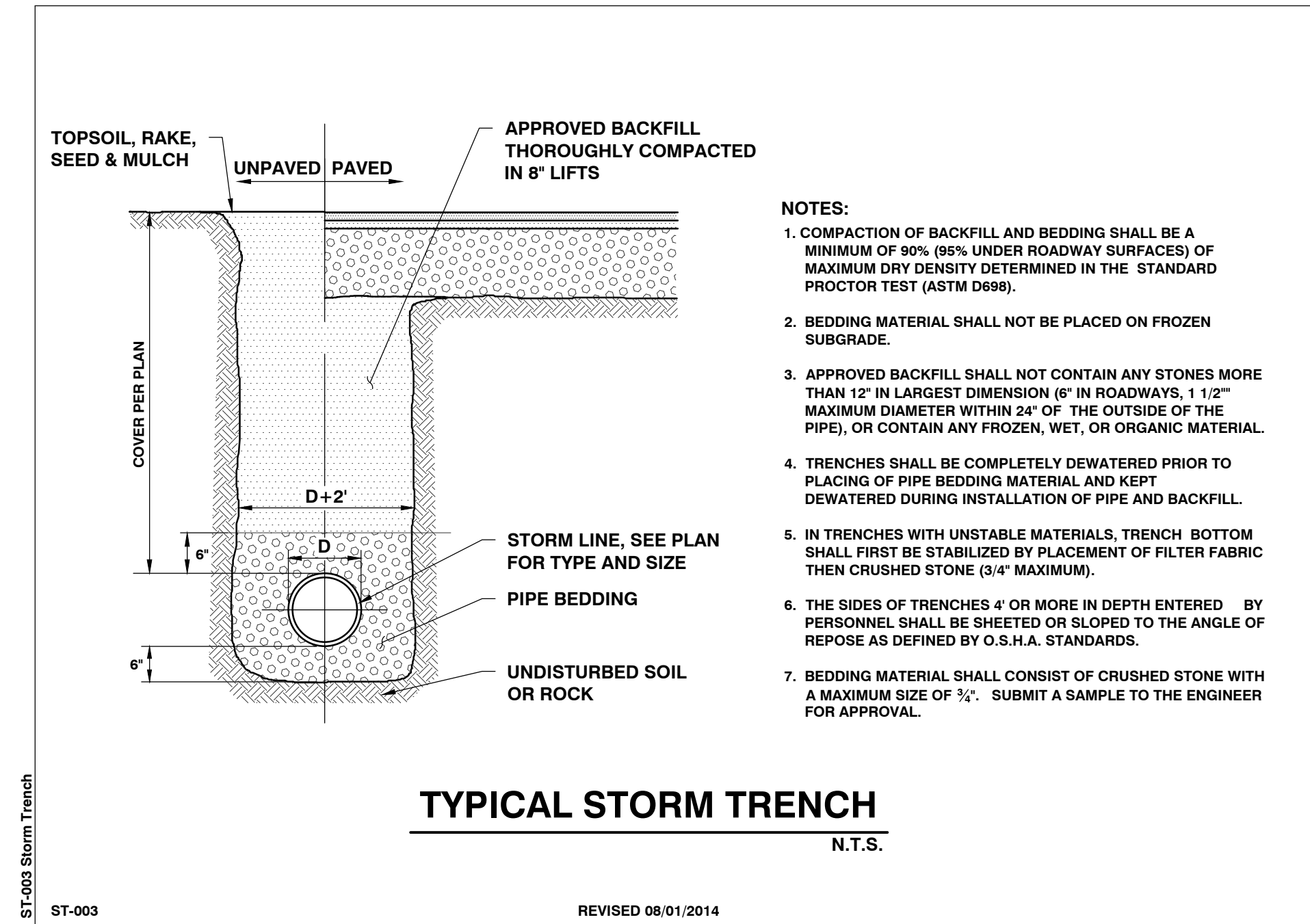
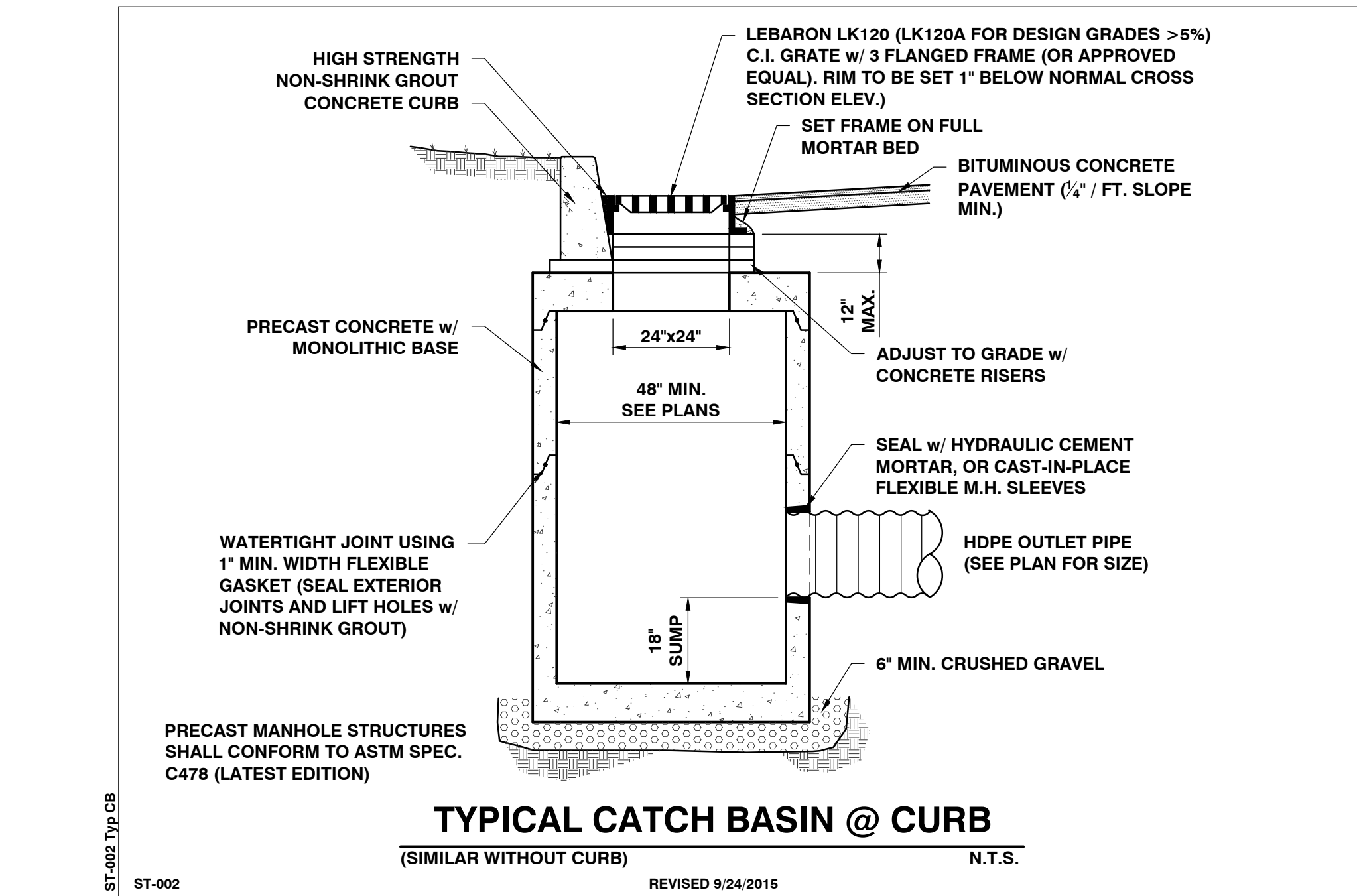
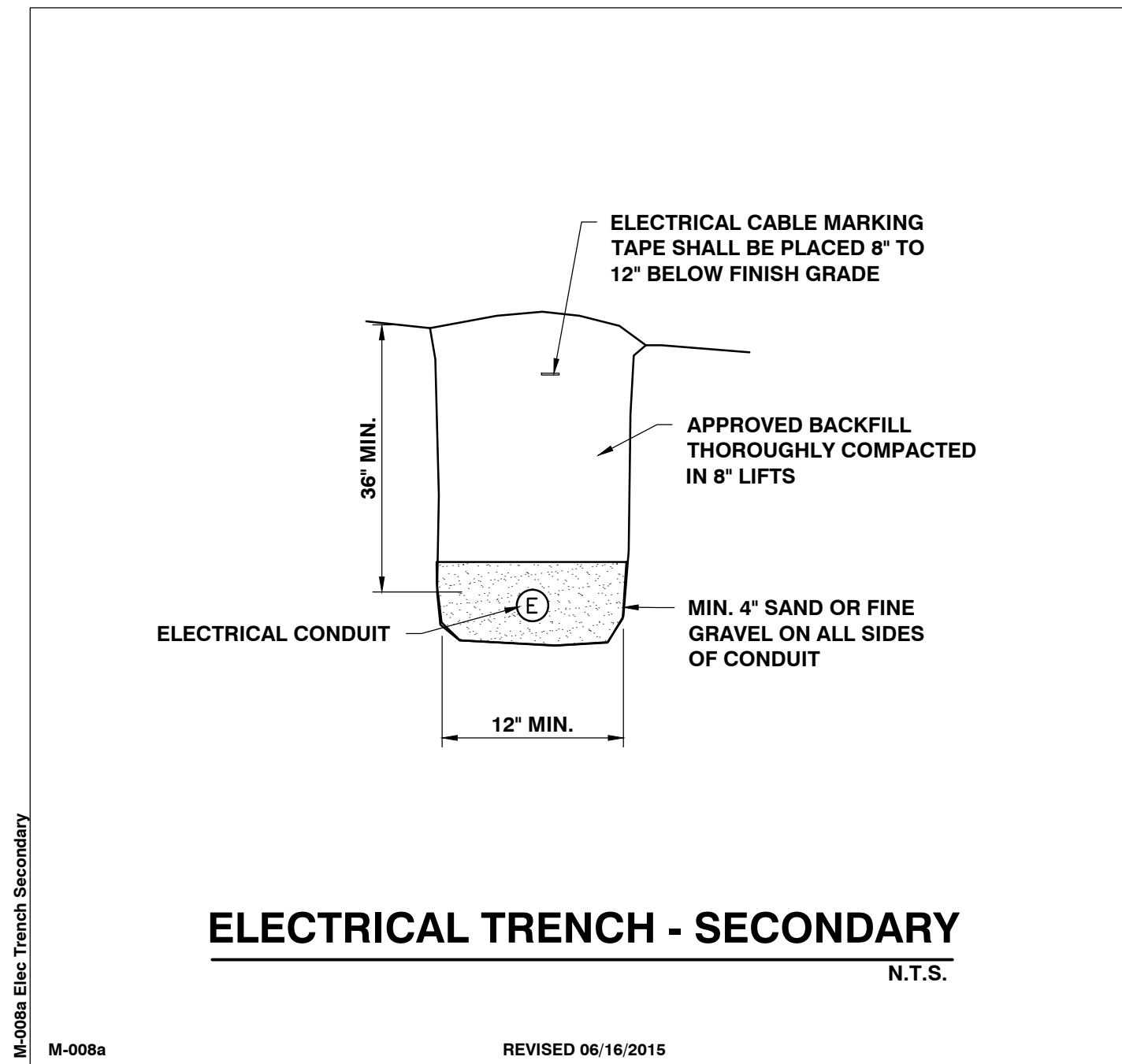
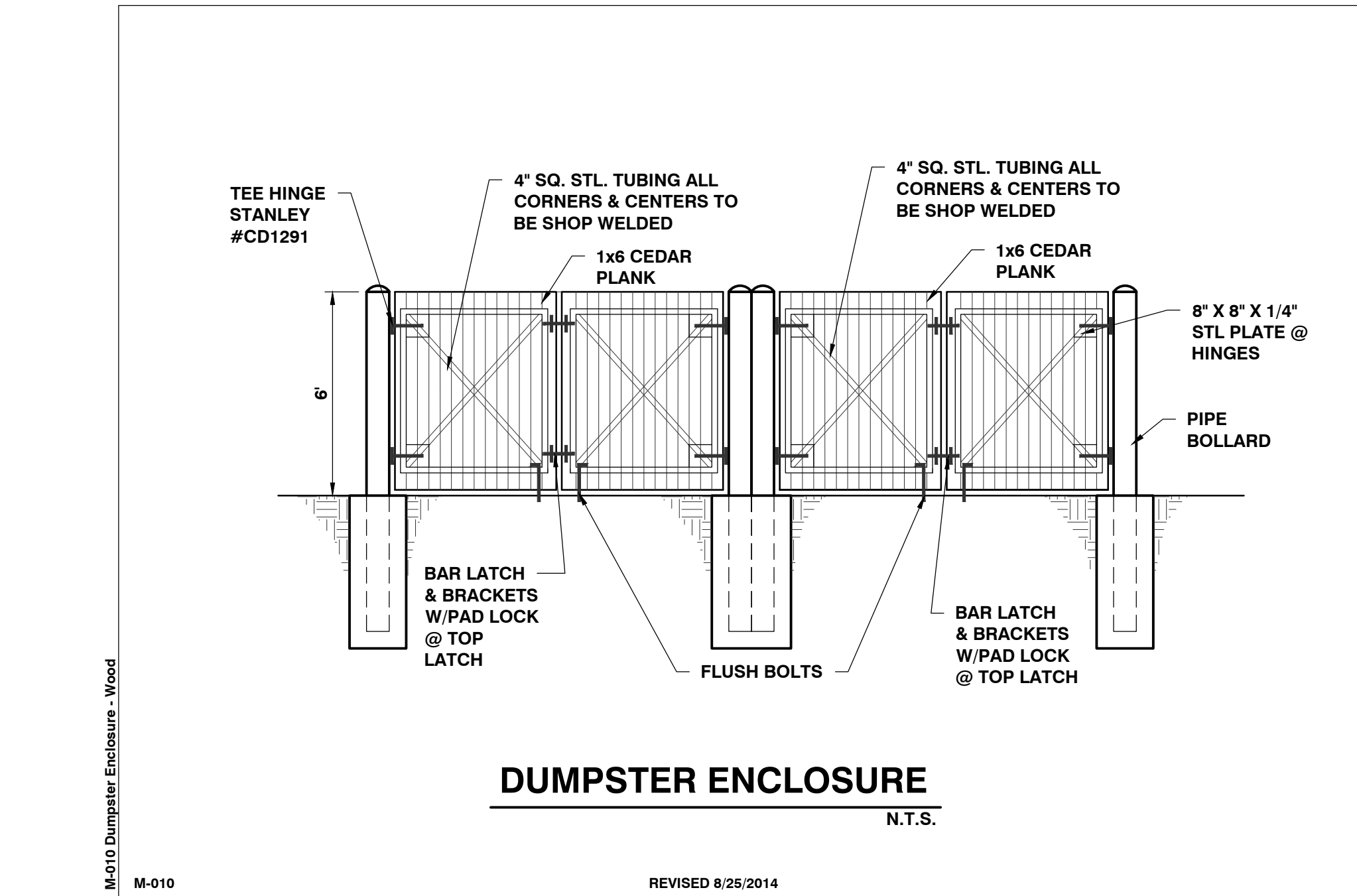
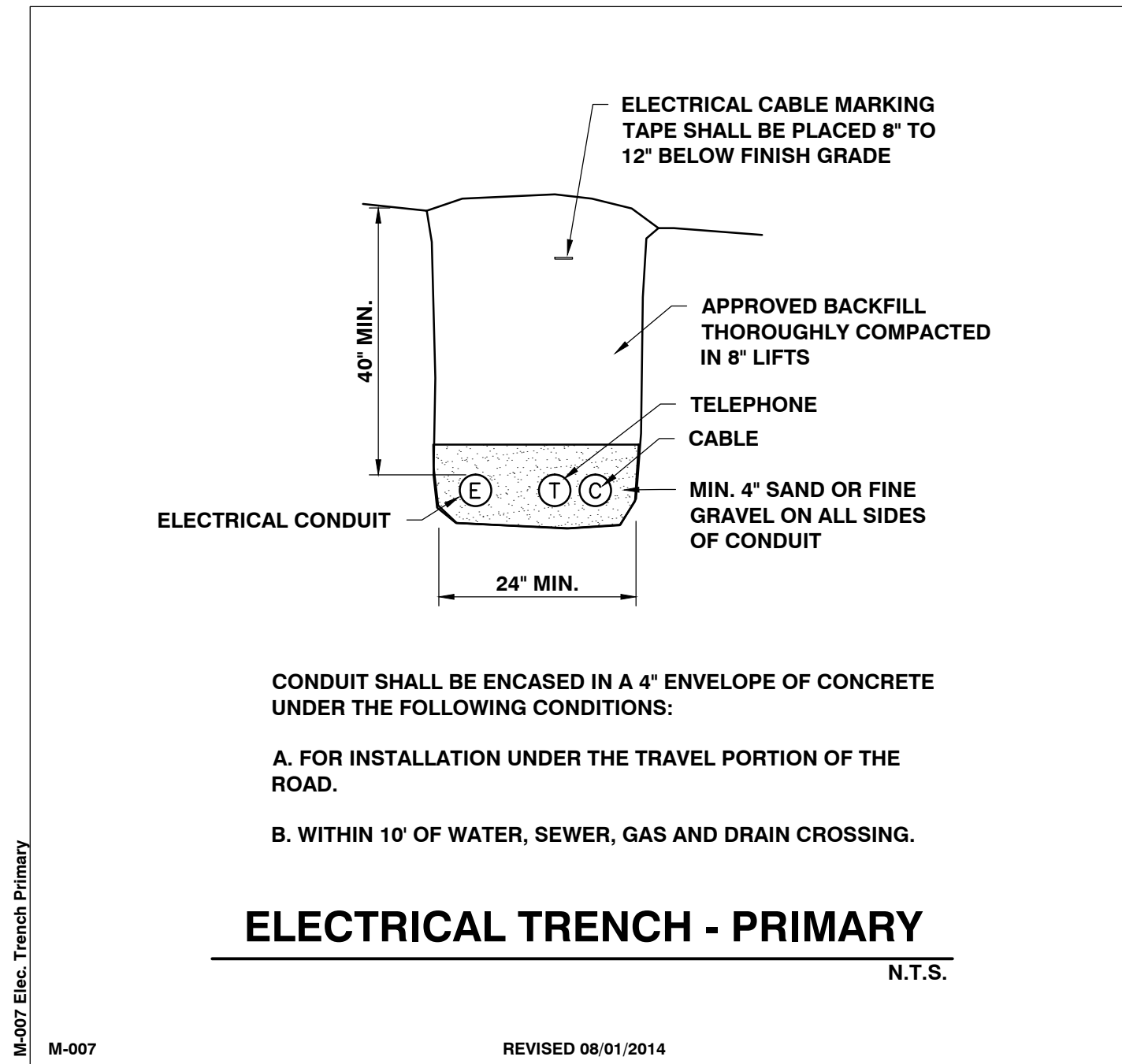
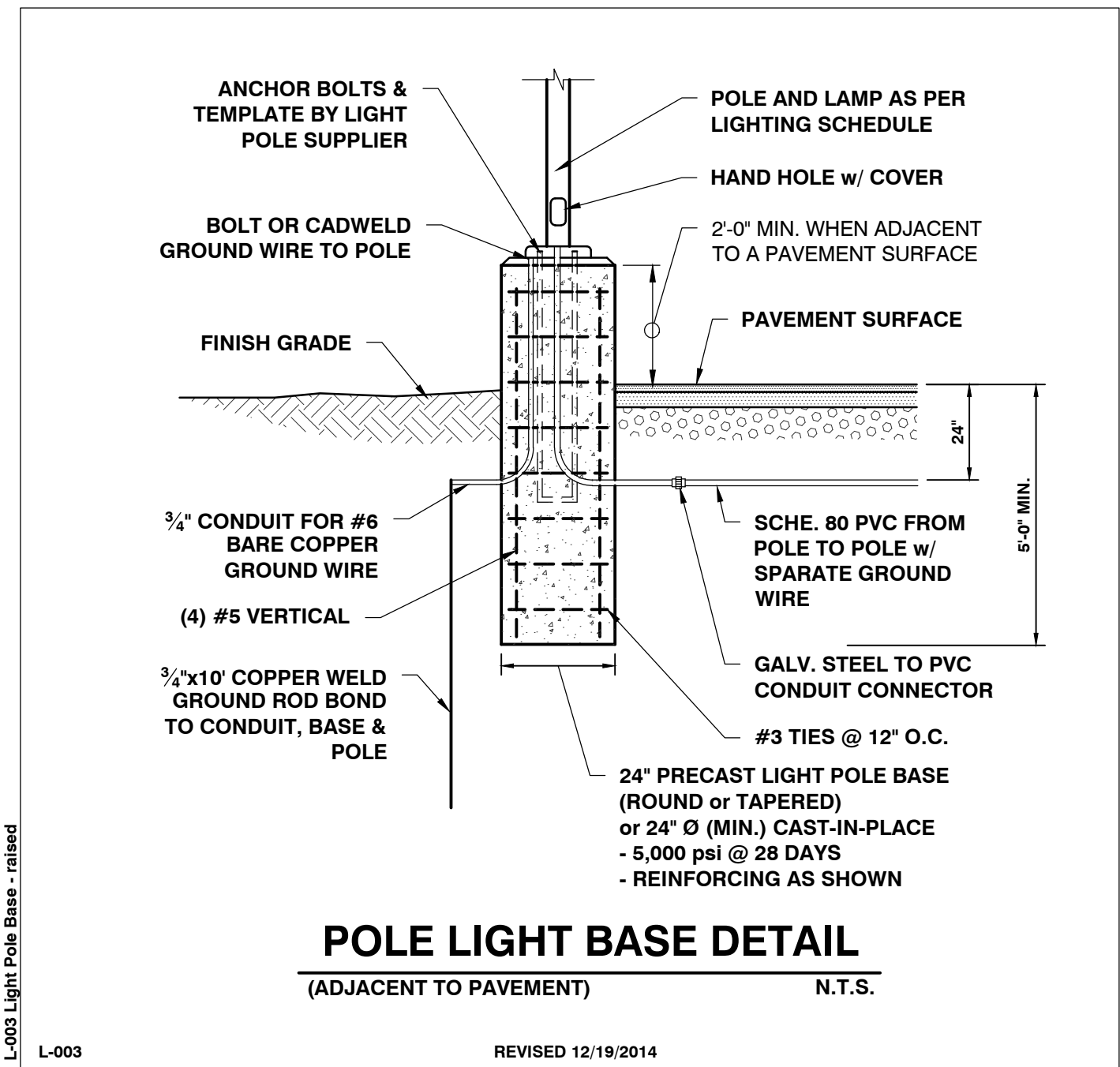
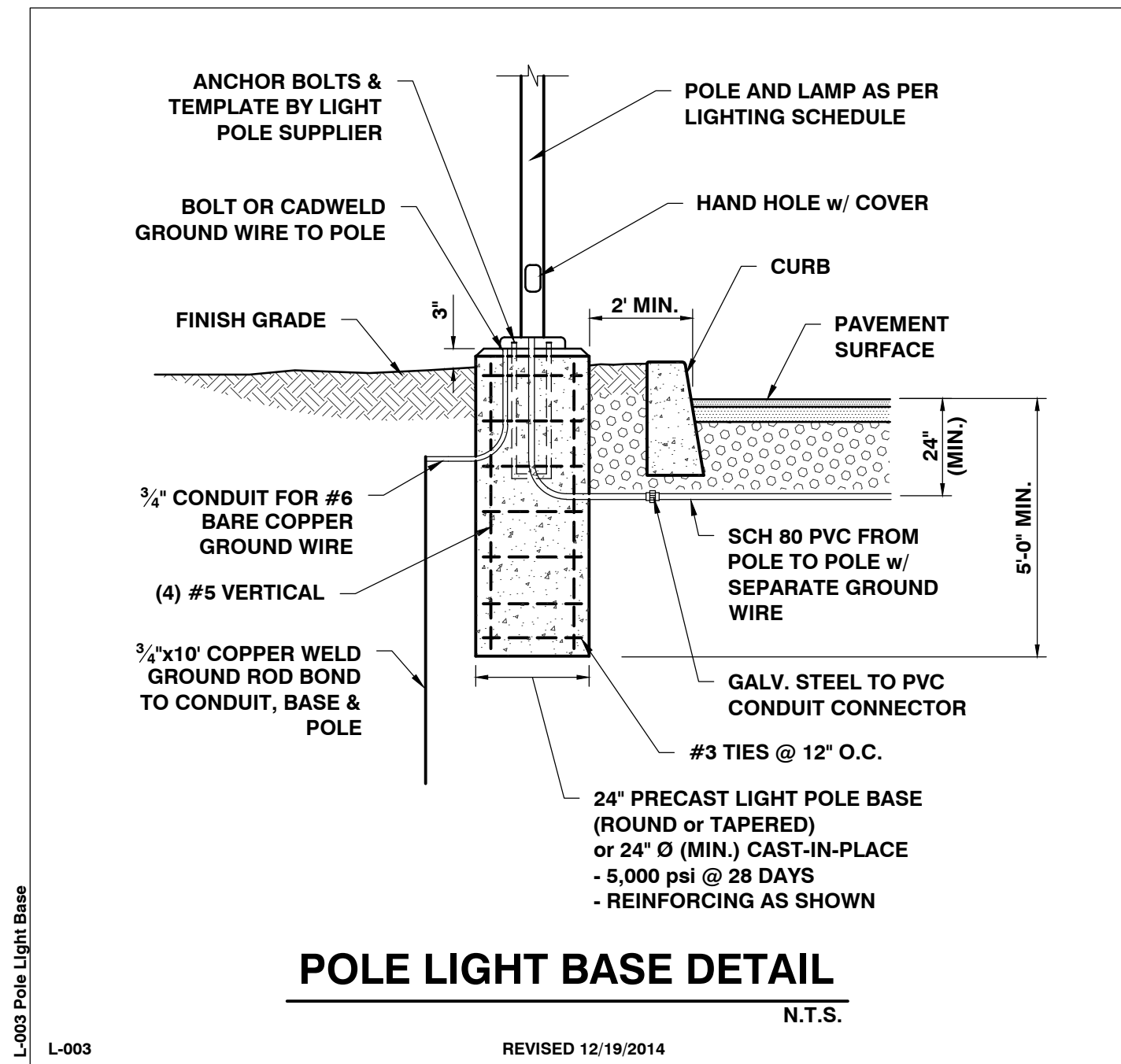
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PROPOSED  
CONDITIONS  
PARTIAL SITE PLAN

DATE  
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SCALE  
1" = 15'  
  
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**C2.3**





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**DETAILS**

DATE  
JAN. 13, 2017

SCALE  
AS SHOWN

PROJ. NO.  
14115

DRAWING NUMBER  
**C4.2**



UNHSC DESIGN SPECIFICATIONS FOR  
POROUS ASPHALT PAVEMENT AND INFILTRATION BEDS

PART 1 GENERAL

1.1 DESCRIPTION

- A. This specification is intended to be used for porous asphalt pavement in parking lot applications. Stormwater management functions of porous asphalt installations include water quality treatment, peak flow reduction, storm volume reduction via groundwater recharge, and increased hydrograph time lag. This specification is intended for a cold climate application based upon the field experience at the UNHSC porous asphalt parking lot located in Durham, New Hampshire, the specification has been adapted for projects in Vermont where the selection of materials and system design reflects local conditions, constraints, and objectives.
- B. The work of this Section includes subgrade preparation, installation of the underlying porous media beds, and porous asphalt mix (mix) design, production, and installation. Porous media beds refer to the material layers underlying the porous asphalt pavement. Porous asphalt pavement refers to the compacted mix of modified asphalt, aggregate, and additives.
- C. The porous asphalt pavement specified herein is modified after the National Asphalt Pavement Association (NAPA) specification outlined in Design, Construction, and Maintenance Guide for Porous Asphalt Pavements, Information Series 131 (2003) and *Design, Construction, and Maintenance of Open-Graded Friction Courses, Information Series 115* (2002).
- D. Alternative specifications for mix, such as Open Graded Friction Courses (OGFC) from Federal Agencies or state Departments of Transportation (DOT), may be used if approved by the Engineer. The primary requirements for the specifications of the mix are performance grade (PG) asphalt binder, binder content, binder draindown, aggregate gradation, air void content, and retained tensile strength (TSR).

1.2 SUBMITTALS

- A. Submit a list of materials proposed for work under this Section including the name and address of the materials producers and the locations from which the materials are to be obtained.
- B. Submit certificates, signed by the materials producers and the relevant subcontractors, stating that materials meet or exceed the specified requirements, for review and approval by the Engineer.
- C. Submit samples of materials for review and approval by the Engineer. For mix materials, samples may be submitted only to the QA inspector with the Engineer's approval.
- D. Submittal requirements for samples and certificates are summarized in Table 1 and discussed in further detail in the Materials section.

1.3 QC/QA

- A. Use adequate numbers of skilled workers who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work in this section.
- B. Codes and Standards - All materials, methods of construction and workmanship shall conform to applicable requirements of AASHTO and ASTM Standards or other standards as specified.
- C. QC/QA requirements for production of mix are discussed in the Materials section, and for construction of the porous media beds and paving in the Execution section.

Table 1. Submittal requirements.

| Material or Pavement Course*        | Properties to be reported on Certificate**                                                         |
|-------------------------------------|----------------------------------------------------------------------------------------------------|
| choker course, reservoir course     | gradation, max. wash loss, min. durability index, max. abrasion loss, air voids (reservoir course) |
| filter course                       | gradation, permeability/ sat. hydraulic conductivity                                               |
| filter blanket                      | gradation                                                                                          |
| geotextile filter fabric            | manufacturer's certification, AOS/EOS, tensile strength certificate                                |
| stripping paint                     | POAB certification                                                                                 |
| binder                              | gradation, wear, fracture faces (fractured and elongated)                                          |
| coarse aggregate                    | gradation.                                                                                         |
| fine aggregate                      | gradation.                                                                                         |
| silicone                            | manufacturer's certification                                                                       |
| Fibers (optional)                   | manufacturer's certification                                                                       |
| mineral filler (optional)           | manufacturer's certification                                                                       |
| fatty amines (optional anti-strip)  | manufacturer's certification                                                                       |
| hydrated lime (optional anti-strip) | manufacturer's certification                                                                       |

\* Samples of each material shall be submitted to the Engineer (or QA inspector for mix). These samples must be in sufficient volume to perform the standardized tests for each material.  
\*\* At a minimum, more material properties may be required (refer to Materials Section).

1.4 PROJECT CONDITIONS

- A. Site Assessment should be performed per the steps outlined in IS 131 (NAPA, 2003).
- B. Construction Phasing should be performed as outlined in *IS 131* (NAPA, 2003).
- C. Protection of Existing Improvements
- Protect adjacent work from the unintended dispersal/splashing of pavement materials. Remove all stains from exposed surfaces of pavement, structures, and grounds. Remove all waste and spillage. If necessary, limit access to adjacent work/structures with appropriate signage and/or barriers.
  - Proper erosion and sediment control practices shall be provided in accordance with existing regulations. Do not damage or disturb existing improvements or vegetation. Provide suitable protection where required before starting work and maintain protection throughout the course of the work. This includes the regular, appropriate inspection and maintenance of the erosion and sediment control measures.
  - Restore damaged areas, including existing pavement on or adjacent to the site that has been damaged as a result of construction work, to their original condition or repair as directed to the satisfaction of the Engineer at no additional cost.
- D. Safety and Traffic Control
- Notify and cooperate with local authorities and other organizations having jurisdiction when construction work will interfere with existing roads and traffic.
  - Provide temporary barriers, signs, warning lights, flaggers, and other protections as required to assure the safety of persons and vehicles around and within the construction area and to organize the smooth flow of traffic.

E. Weather Limitations

- Porous asphalt, Open graded friction course, or dense-mixed asphalt shall not be placed between November 15 and March 15, or when the ambient air temperature at the pavement site in the shade away from artificial heat is below 16 °C (60 °F) or when the actual ground temperature is below 10 °C (50 °F). Only the Engineer may adjust the air temperature requirement or extend the dates of the pavement season.
- The Contractor shall not pave on days when rain is forecast for the day, unless a change in the weather results in favorable conditions as determined by the Engineer.

1.5 REFERENCES

- A. *General Porous Asphalt Bituminous Paving and Groundwater Infiltration Beds*, specification by UNH Stormwater Center, February, 2005.
- B. *Design, Construction, and Maintenance Guide for Porous Asphalt Pavements, Information Series 131*, National Asphalt Pavement Association (NAPA), 2003.
- C. *Design, Construction, and Maintenance of Open-Graded Friction Courses, information Series 115*, NAPA, 2002.
- D. *Annual Book of ASTM Standards*, American Society for Testing and Materials, Philadelphia, PA, 1997 or latest edition.
- E. *Standards of the American Association of State Highway and Transportation Officials* (AASHTO), 1998 or latest edition.
- F. *Section 401- Plant Mix Pavements - General, in Standard Specifications for Road and Bridge Construction - State of New Hampshire Department of Transportation*, 2006.
- G. *Section 02725 - General Porous Pavement and Groundwater Infiltration Beds*, specification from NAPA Porous Asphalt Seminar handout, Cahill Associates, Inc., 2004.
- H. *Correlations of Permeability and Grain Size*, Russell G. Shepherd, Groundwater 27 (5), 1989. I. Groundwater, R. Allan Freeze and John A. Cherry, 1979.
- I. *Groundwater*, R. Allan Freeze and John A. Cherry, 1979.

PART 2 PRODUCTS

2.1 MATERIALS

A. Porous Media Infiltration Beds

Below the porous asphalt itself are located the porous media infiltration beds (Figure 1), from top to bottom: a 4" – 8" (10 - 20 cm) (minimum) thick layer of choker course of crushed stone (8" is preferable to alleviate compaction issues with the porous asphalt); an 8" to 12" (20 cm to 30 cm) minimum thickness layer of filter course of poorly graded sand (a.k.a. bankrun gravel or modified 304.1); 3" (8 cm) minimum thickness filter blanket that is an intermediate setting bed (pea gravel); and a reservoir course of crushed stone, thickness dependant on required storage and underlying native materials. Alternatively, the pea gravel layer could be thickened and used as the reservoir course depending upon subsoil suitability. This alternative simplifies subbase construction. For lower permeability native soils, perforated or slotted drain pipe is located in the stone reservoir course for drainage. This drain pipe can be daylighted to receiving waters or connected into other stormwater management infrastructure (wetland, storm sewer, etc.). The fine gradation of the filter course is for enhanced filtration and delayed infiltration. The high air void content of the uniformly graded crushed stone reservoir course: maximizes storage of infiltrated water thereby allowing more time for water to infiltrate between storms; and creates a capillary barrier that arrests vertical water movement and in doing so prevents winter freeze-thaw and heaving. The filter blanket is placed to prevent downward migration of filter course material into the reservoir course. The optional underdrain in the reservoir course is for hydraulic relief (typically raised off of the bottom of the reservoir stone layer for enhanced groundwater recharge). Nonwoven geotextile filter fabric (geotextile) is used only for stabilizing the sloping sides of the porous asphalt system excavation and not to be used on the bottom of the system unless needed for structural reasons.

1. Choker Course

Material for the choker course and reservoir course shall meet the following:

Maximum Wash Loss of 0.5%  
Minimum Durability Index of 35  
Maximum Abrasion Loss of 10% for 100 revolutions, and maximum of 50% for 500 revolutions.

Material for the choker course and reservoir course shall have the AASHTO No. 57 and AASHTO No. 3 gradations, respectively, as specified in Table 2. If the AASHTO No. 3 gradation cannot be met, AASHTO No. 5 is acceptable with approval of the Engineer. AASHTO no. 3 is also suitable for the choker course.

2. Filter course material

Filter course material shall have a hydraulic conductivity (also referred to as coefficient of permeability) of 10 to 60 ft/day at 95% standard proctor compaction unless otherwise approved by the Engineer. Great care needs to be used to not over compact materials. Overcompaction results with loss of infiltration capacity. The filter course material is commonly referred to as a bankrun gravel (modified NHDOT 304.1). In order to select an appropriate gradation, coefficient of permeability may be estimated through an equation that relates gradation to permeability, such as described in Correlations of Permeability and Grain Size (Shepherd, 1989) or in Section 8.7 Estimation of Saturated Hydraulic Conductivity (Freeze and Cherry, 1979). The hydraulic conductivity should be determined by ASTM D2434 and reported to the Engineer.

3. Filter blanket material

Filter blanket material between the filter course and the reservoir course shall be an intermediate size between the finer filter course above, and the coarser reservoir course below, for the purpose of preventing the migration of a fine setting bed into the coarser reservoir material. An acceptable gradation shall be calculated based on selected gradations of the filter course and reservoir course using criteria outlined in the HEC 11 (Brown and Clyde, 1989). A pea-gravel with a median particle diameter of 3/8" (9.5 mm) is commonplace.

4. Reservoir Course

Reservoir course thickness is dependent upon the following criteria (that vary from site to site):

- A 4" (10 cm) minimum thickness of reservoir course acts as a capillary barrier for frost heave protection. The reservoir course is located at the interface between subbase and native materials.
- 4-in. (10 cm) minimum thickness if the underlying native materials are either well drained (Hydrologic Group A soils).
- 8-in. (30 cm) minimum thickness if subdrains are installed. Subdrains insure that the subbase is well drained

- Subdrains, if included, are elevated a minimum of 4" (10 cm) from the reservoir course bottom to provide storage and infiltration for the water quality volume. If the system is lined,

- Subbase thickness is determined from subbase materials having sufficient void space to store the design storm,

Example: If the 25-year storm is 5.1" (13 cm) of rainfall depth, and the reservoir void space is 30%, then the minimum subbase thickness = 5.1"/0.3 = 17" (43.2 cm).

- F pavement system and subbase thickness are > 0.65 \* design frost depth for area.

Example: Durham, New Hampshire, 48" (122 cm) = D<sub>maximum frost</sub>, therefore the minimum depth to the bottom of the subbase = 0.65(48") = 32" (81 cm).

Table 2. Gradations and compaction of choker, filter, and reservoir course materials.

| US Standard Sieve Size<br>Inches/mm       | Percent Passing (%)              |                                         |                                    |                                                 |
|-------------------------------------------|----------------------------------|-----------------------------------------|------------------------------------|-------------------------------------------------|
|                                           | Choker Course<br>(AASHTO No. 57) | Filter Course<br>(Modified NHDOT 304.1) | Reservoir Course<br>(AASHTO No. 3) | Reservoir Course Alternative*<br>(AASHTO No. 5) |
| 6/150                                     | -                                | 100                                     | -                                  | -                                               |
| 2 1/2/63                                  | -                                | -                                       | 100                                | -                                               |
| 2/50                                      | -                                | -                                       | 90 – 100                           | -                                               |
| 1 1/2/37.5                                | 100                              | -                                       | 35 – 70                            | 100                                             |
| 1/25                                      | 95 - 100                         | -                                       | 0 – 15                             | 90 – 100                                        |
| 3/4/19                                    | -                                | -                                       | -                                  | 20 - 55                                         |
| 5/8/9.5                                   | 25 - 60                          | -                                       | 0 - 5                              | 0 - 10                                          |
| #4/4.75                                   | 0 - 10                           | 70-100                                  | -                                  | 0 - 5                                           |
| #8/2.36                                   | 0 - 5                            | -                                       | -                                  | -                                               |
| #300/0.075                                | -                                | 0 – 6**                                 | -                                  | -                                               |
| % Compaction<br>ASTM D698 /<br>AASHTO T99 | 95                               | 95                                      | 95                                 | 95                                              |

\* Alternate gradations (e.g. AASHTO No. 5) may be accepted upon Engineer's approval.  
\*\* Preferably less than 4% fines

5. Non-woven geotextile filter fabric

Filter fabric is only recommended for the sloping sides of the porous asphalt system excavation. It shall be Mirafi 160N, or approved equal and shall conform to the specifications in Table 3. Mirafi ® 160N is a non-woven geotextile composed of polypropylene fibers, which are formed into a stable network such that the fibers retain their relative position. 160N is inert to biological degradation and resists naturally encountered chemicals, alkalis, and acids.

6. Alternative Applications and Residential Driveways.

The recommendations above are based on a commercial parking application for both traffic and contaminant load. Alternative applications such as residential driveways and low use applications may justify the use of alternative subbase thicknesses for the porous media beds, filter blanket, and geotextiles. Residential driveway applications have been designed with a subbase limited to only an 8" compacted choker course. Variations should consider structural load requirements for material thickness, and contaminant load for filter course thickness. A reduced total system thickness (Section 2.1.3.f) will subject the pavement to greater freeze thaw susceptibility.

Table 3. Non-woven geotextile filter fabric properties.

| Mechanical Properties        | Test Method | Unit                                      | Minimum Average Roll Values<br>MD** CD** |             |
|------------------------------|-------------|-------------------------------------------|------------------------------------------|-------------|
| Grab Tensile Strength        | ASTM D 4632 | kN (lbs)                                  | 0.71 (160)                               | 0.71 (160)  |
| Grab Tensile Elongation      | ASTM D 4632 | %                                         | 50                                       | 50          |
| Trapezoid Shear Strength     | ASTM D 4533 | kN (lbs)                                  | 0.27 (60)                                | 0.27 (60)   |
| Multi-Edge Burst Strength    | ASTM D 3786 | kPa (psi)                                 | 2100 (305)                               | 2100 (305)  |
| Puncture Strength            | ASTM D 4833 | kN (lbs)                                  | 0.42 (95)                                | 0.42 (95)   |
| Apparent Opening Size (AOS)  | ASTM D 4751 | mm (US Sieve)                             | 0.212 (70)                               | 0.212 (70)  |
| Permeability                 | ASTM D 4491 | sec <sup>-1</sup>                         | 1.4                                      | 1.4         |
| Permeability                 | ASTM D 4491 | cm/sec                                    | 0.22                                     | 0.22        |
| Flow Rate                    | ASTM D 4491 | lpm/m <sup>2</sup> (gpm/ft <sup>2</sup> ) | 4.477 (110)                              | 4.477 (110) |
| UV Resistance (at 500 hours) | ASTM D 4355 | % strength retained                       | 70                                       | 70          |

| Physical Properties             | Test Method | Unit                                   | Typical Value       |
|---------------------------------|-------------|----------------------------------------|---------------------|
| Weight                          | ASTM D 5261 | g/m <sup>2</sup> (oz/yd <sup>2</sup> ) | 217 (6.4)           |
| Thickness                       | ASTM D 5199 | mm (inches)                            | 1.9 (75)            |
| Roll dimension (width x length) |             | m (ft)                                 | 4.5 x 91 (15 x 300) |
| Roll area                       |             | m <sup>2</sup> (yd <sup>2</sup> )      | 410 (500)           |
| Estimated roll weight           |             | kg (lb)                                | 99 (217)            |

\*MD - Machine Direction, \*\*CD - Cross-machine Direction

B. Porous Asphalt Mix

1. Mix materials

Mix materials consist of modified performance grade asphalt binder (PGAB), coarse and fine aggregates, and optional additives such as silicone, fibers, mineral fillers, fatty amines, and hydrated lime. Materials shall meet the requirements of the NAPA's Design, Construction, and Maintenance of Open-Graded Friction Courses, Information Series 115 (2002), except where noted otherwise below or approved in writing by the Engineer.

2. Polymer Modified PGAB and Mix Designs.

The asphalt binder shall be a polymer and/or fiber modified Performance Graded asphalt binder (PGAB) used in the production of Superpave Hot Mix Asphalt (HMA) mixtures. Ideally for maximum durability, the PGAB shall be two grades stiffer than that required for dense mix asphalt(DMA) parking lot installations, which is often achieved by adding a polymer and/or fiber. Mix designs will meet or exceed criteria listed in Table 5

The PGAB polymer modifiers are to be either styrene butadiene rubber (SBR) or styrene butadiene styrene (SBS). SBS is typically reserved for large projects as terminal pre-blending is required. SBR is feasible for smaller projects as it can be blended at the plant or terminal blended. The quantity of rubber solids in the SBR shall typically be 1.5-3% by weight of the bitumen content of the mix.

The dosage of fiber additives shall be either 0.3 percent cellulose fibers or 0.4 percent mineral fibers by total mixture mass. Fibers are a simple addition either manually for a batch plant or automated for larger drum plants. The binder shall meet the requirements of AASHTO M320.

The PGAB may be pre-blended or post-blended. The pre-blended binder can be pre-blended at the source or at a terminal. For post-blended addition, the modifier can either be in-line blended or injected into the pugmill at the plant.

Table 4. Post-Blended SBR Binder QC Plan requirements.

The QC Plan will contain:

- Company name and address
- Plant location and address
- Type of Facility
- Contact information for the Quality Control Plan Administrator
- QC Tests to be performed on each PGAB
- Name(s) of QC Testing Lab to perform QC and Process Control testing.
- Actions to be taken for PG Binders and SBR in Non compliance
- List of mechanical controls (requirements below)
- List of process controls and documentation (requirements below)
- List of Mechanical Controls
- Liquid SBR no-flow alert system with an "alert" located in the control room and automatic documentation of a no flow situation on the printout
- Provide means of calibrating the liquid SBR metering system to a delivery tolerance of 1%
- A batching tolerance at the end of each day's production must be within 0.5% of the amount of SBR solids specified.
- Mag-flow meter (other metering system may be considered)
- Method of sampling liquid SBR.

List of Process Controls and Documentation

- Printouts of liquid SBR and PG binder quantities must be synchronized within one minute of each other
- SBR supplier certification showing the percent of SBR solids in liquid SBR
- Test results of a lab sample blended with the specified dosage of SBR. At a minimum, provide the name of the PGAB and liquid SBR suppliers, and PGAB information such as grade and lot number, and SBR product name used for the sample.
- MSDS sheet for liquid SBR.
- Handling, storage, and usage requirements will be followed as required by the liquid SBR manufacturer
- At a minimum, provide a table showing proposed rate of SBR liquid (L/min.) in relation to HMA production rate (tons per hour, TPH) for the % solids in liquid SBR, quantity of SBR specified for HMA production, and the specific gravity of the SBR.
- QCT or QC Plan Administrator must be responsible for documenting quantities, ensuring actual use is within tolerance, etc. All printouts, calculations, supplier certifications etc. must be filed and retained as part of the QCT's daily diary/reports.
- Method and frequency of testing at the HMA plant, including initial testing and specification testing.

\*This Plan shall be submitted to the Engineer 10 days before production.

3. Anti-Stripping Mix Additives.

The mix shall be tested for moisture susceptibility and asphalt stripping from the aggregate by AASHTO T283. If the retained tensile strength (TSR) < 80% upon testing, a heat stable additive shall be furnished to improve the anti-stripping properties of the asphalt binder. Test with one freeze-thaw cycle (rather than five recommended in NAPA IS 115). The amount and type of additive (e.g. fatty amines or hydrated lime) to be used shall be based on the manufacturer's recommendations, the mix design test results, and shall be approved by the Engineer.

Silicone shall be added to the binder at the rate of 1.5 mL/m3 (1 oz. per 5000 gal). Fibers may be added per manufacturer and NAPA IS 115 recommendation if the draindown requirement cannot be met (<0.3% via ASTM D6390) provided that the air void content requirement is met (>18%, or >18% as tested with CoreLok device). Additives should be added per the relevant DOT specification and NAPA IS 115.

4. Coarse Aggregate.

Coarse aggregate shall be that part of the aggregate retained on the No. 8 sieve; it shall consist of clean, tough, durable fragments of crushed stone, or crushed gravel of uniform quality throughout. Coarse aggregate shall be crushed stone or crushed gravel and shall have a percentage of wear as determined by AASHTO T96 of not more than 40 percent. In the mixture, at least 75 percent, by mass (weight), of the material coarser than the 4.75 mm (No. 4) sieve shall have at least two fractured faces, and 90 percent shall have one or more fractured faces (ASTM D5821). Coarse aggregate shall be free from clay balls, organic matter, deleterious substances, and a not more than 8.0% of flat or elongated pieces (>3:1) as specified in ASTM D4791.

5. Fine Aggregate.

The fine aggregate shall be that part of the aggregate mixture passing the No. 8 sieve and shall consist of sand, screenings, or combination thereof with uniform quality throughout. Fine aggregate shall consist of durable particles, free from injurious foreign matter. Screenings shall be of the same or similar materials as specified for coarse aggregate. The plasticity index of that part of the fine aggregate passing the No. 40 sieve shall be not more than 6 when tested in accordance with AASHTO T90. Fine aggregate from the total mixture shall meet plasticity requirements.

6. Porous Asphalt Mix Design Criteria.

The Contractor shall submit a mix design at least 10 working days prior to the beginning of production. The Contractor shall make available samples of coarse aggregate, fine aggregate, mineral filler, fibers and a sample of the PGAB that will be used in the design of the mixture. A certificate of analysis (COA) of the PGAB will be submitted with the mix design. The COA will be certified by a laboratory meeting the requirements of AASHTO R18. The Laboratory will be certified by the state DOT, regional equivalent (e.g. NETTCP), and/or qualified under ASTM D3666. Technicians will be certified by the regional certification agency (e.g. NETTCP) in the discipline of HMA Plant Technician.

Bulk specific gravity (SG) used in air void content calculations shall not be determined and results will not be accepted using AASHTO T166 (saturated surface dry), since it is not intended for open graded specimens (>10% AV). Bulk SG shall be calculated using AASHTO T275 (paraffin wax) or ASTM D6752 (automatic vacuum sealing, e.g. CoreLok). Air void content shall be calculated from the bulk SG and maximum theoretical SG (AASHTO T209) using ASTM D3203.

The materials shall be combined and graded to meet the composition limits by mass (weight) as shown in Table 5.

Table 5: Porous Asphalt Mix Design Criteria.

| Sieve Size (inch/mm)                                     | Percent Passing (%)            |
|----------------------------------------------------------|--------------------------------|
| 0.75/19                                                  | 100                            |
| 0.50/12.5                                                | 85-100                         |
| 0.375/9.5                                                | 55-75                          |
| No.4/4.75                                                | 10-25                          |
| No.8/2.36                                                | 5-10                           |
| No.20/0.075 (#200)                                       | 2-4                            |
| Binder Content (AASHTO T164)                             | 6 - 6.5%                       |
| Fiber Content by Total Mixture Mass                      | 0.3% cellulose or 0.4% mineral |
| Rubber Solids (SBR) Content by Weight of the Bitumen     | 1.5-3% or TBD                  |
| Air Void Content (ASTM D6752/AASHTO T275)                | 16.0-22.0%                     |
| Draindown (ASTM D6390)*                                  | ≤ 0.3 %                        |
| Retained Tensile Strength (AASHTO 283)**                 | ≥ 80 %                         |
| Cantabro abrasion test on unaged samples (ASTM D7064-04) | ≤ 20%                          |
| Cantabro abrasion test on 7 day aged samples             | ≤ 30%                          |

\*Cellulose or mineral fibers may be used to reduce draindown.  
\*\*If the TSR (retained tensile strength) values fall below 80% when tested per NAPA IS 131 (with a single freeze thaw cycle rather than 5), then in Step 4, the contractor shall employ an anti-strip additive, such as hydrated lime (ASTM C977) or a fatty amine, to raise the TSR value above 80%.

SITE ENGINEER:



CIVIL ENGINEERING ASSOCIATES, INC.  
10 MANSFIELD VIEW LANE, SOUTH BURLINGTON, VT 05403  
802-864-2323 FAX: 802-864-2271 web: www.ccaa-vt.com

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DRAWN

SAL

CHECKED

DSM

APPROVED

DSM

OWNER:

BURLINGTON  
HARBOR MARINA  
LLC  
1 CHURCH STREET  
BURLINGTON VT 05401

PROJECT:

BURLINGTON  
HARBOR MARINA

234 PENNY LANE  
BURLINGTON VT 05401

| DATE | CHECKED | REVISION |
|------|---------|----------|
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PERMEABLE  
PAVEMENT  
SPECIFICATIONS &  
DETAILS

DATE

JAN. 13, 2017

SCALE

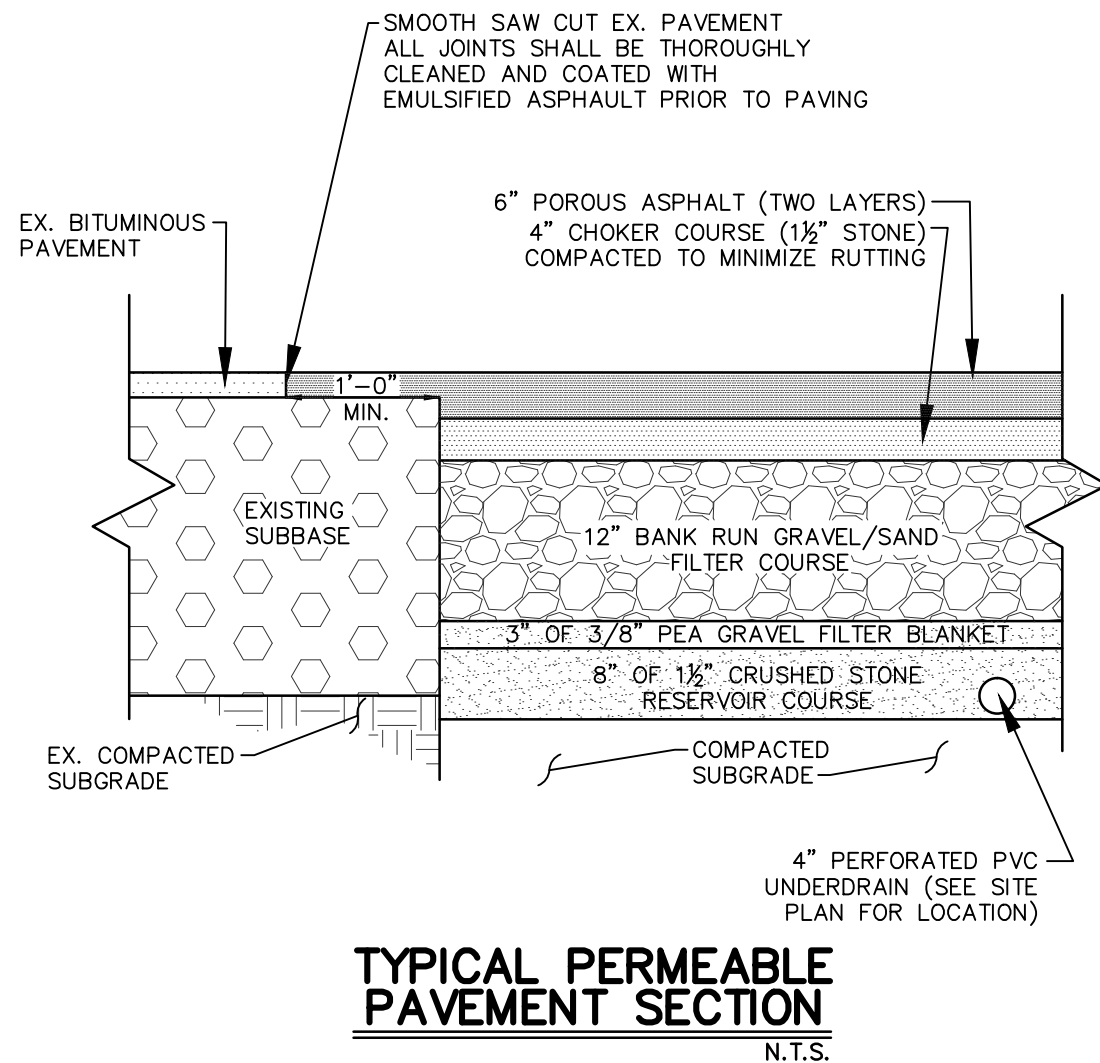
AS SHOWN

PROJ. NO.

14115

DRAWING NUMBER

C6.0



TYPICAL PERMEABLE  
PAVEMENT SECTION  
N.T.S.









# Stormwater Management Plan Submission Requirements

Note, due to the varying requirements for each receiving system, it is best to review your project with the Stormwater Manager prior to submission of your project to the City of Burlington.

- General Information
  - o Project Address
  - o Owner
  - o Engineer
  - o Brief project description
  - o Receiving system identification
    - Combined Sewer (Main, North or East Plant)
    - Separate Storm (Lake, Winooski, Englesby, Centennial, Wetland, unnamed tributary)
- Existing conditions: description of existing conditions, description of existing stormwater system existing drainage issues, connectivity to City system
- Proposed Conditions: description of proposed conditions, brief description of proposed stormwater system, proposed method of discharge to receiving water or City system (overland flow, direct connection via pipe, existing or new manhole or CB)
- Stormwater Management Plan
  - o Impervious change summary

| Condition           | Type                      | Total Impervious (s.f.) | Effective Impervious <sup>1</sup> (s.f) |
|---------------------|---------------------------|-------------------------|-----------------------------------------|
| Existing Conditions | Existing Impervious       |                         |                                         |
| Proposed            | Total Proposed (1+2+3)    |                         |                                         |
|                     | 1) New <sup>2</sup>       |                         |                                         |
|                     | 2) Existing to Remain     |                         |                                         |
|                     | 3) Redeveloped            |                         |                                         |
| Net New             | Total Proposed – Existing |                         |                                         |

- o Stormwater Management Summary (indicate method and what amounts of impervious are being addressed for each standard)

| Standard                   | Amount of impervious managed |                                 |
|----------------------------|------------------------------|---------------------------------|
|                            | Net New impervious           | Redeveloped/Existing impervious |
| Water Quality/Grit Removal |                              |                                 |
| Runoff Reduction           |                              |                                 |
| Q1 peak control/reduction  |                              |                                 |
| Q10 peak control/reduction |                              |                                 |
| Other                      |                              |                                 |

<sup>1</sup> The area of impervious that generates runoff that would reach the collection system or an adjacent property boundary (without proposed stormwater management); may be via pipe connection or via sheet flow to roadway/curb/gutter or adjacent property.

<sup>2</sup> Impervious where there is not currently impervious

- Management Methods
  - Water Quality/Grit/Other
  - Runoff Reduction (infiltration, evapotranspiration processes)
  - Detention
  - Other
- Calculations/Model Results
  - Water Quality volume calculations
  - Other calculations as appropriate
  - PDFs of appropriate model results
- o Required Plans
  - Existing conditions
  - Proposed conditions
  - Stormwater Details
- o Stormwater Operation and Maintenance Plan
  - Simplified Plan showing the locations of all features of the stormwater system (manholes, tanks, rain gardens, catch basins, grit chambers, sand filters etc.) and assigning a unique identifier to each
  - Inspection Form/Table indicating
    - Frequency of inspection for each feature
    - What specifically needs to be inspected (plants, depth of grit, drain time)
    - Maintenance triggers (> 50% of sump depth, infiltration not draining in 24 (48) hours etc)
- o Confirmation that any covered parking/parking garage drainage is connected to an Oil/Grit separator and discharges to the sanitary sewer



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BURLINGTON HARBOR WATERFRONT - EAST PARKING  
PROPOSED LIGHTING DESIGN

J & M LIGHTING DESIGN, INC  
207-967-5223  
jmlight2@roadrunner.com

DEC. 19, 2016

NOT FOR CONSTRUCTION FOR PLANNING BOARD APPROVAL

PROJECT: BURLINGTON HARBOR WATERFRONT -EAST PARKING  
BURLINGTON, VT.

SECTION 5.5.2 OUTDOOR LIGHTING

SEC. 5.5.2-a Site Plan Review Required

SEC. 5.5.2-b Exemptions  
Project claims no exemptions

SEC. 5.5.2-c Lighting Prohibited  
Project is in compliance, no items on the project are falling within these criteria.

SEC. 5.5.2-d Lighting Plan Submission Requirements

SEC. 5.5.2-1- A site plan showing:

- A. See Attached site plan illustrates area being illuminated.
- B. Point by Point photometric analysis spacing is 2' x 2' grid.
  - Maximum: 1.2 foot-candles
  - Minimum: 0.2 foot-candles
  - Average: 0.58 foot-candles
- C. Calculation of the initial and mean lamps lumens per net acre across the entire site.

NET AREA = 0.7395 acres

TYPE B-4 = 3434 initial lumens X 2 = 6,868 total

TYPE B-4-HS= 2196 initial Lumens X 3 = 6,588 total

TYPE B-3 = 3108 initial Lumens X 3 = 9,324 total

GRAND TOTAL 22,780 INITIAL LUMENS

Mean lumens  $22,780 \times .80 = 18,224$  mean lumens

30,804.6 LUMENS PER ACRE INITIAL

Drawing TYPE B-4, B-4-HS, B-5 are LED using a depreciation factor of .80.

- D. The number, type, location, and mounting height.
  - All luminaires are in compliance with City of Burlington criteria.
  - All luminaires are DLC

Drawing TYPE B-4

Philips RVS-3532LED4K-LE4-UNIV-CLO-RC-BKTX

MOUNTING HEIGHT: 25' FROM FLAT OPTICAL ASSEMBLY TO THE  
GROUND

ARM LENGTH: 6'-0" (AC-6-1A-BKTX)

PHOTOMETRIC FILE: RVS-35W-32LED4K-R-LE4

TEST NO.: S1210243-R1

MOUNTING HEIGHT 25'-0" ABOVE GRADE

QUANTITY: 2

Drawing TYPE B-4-HS

Philips RVS-3532LED4K-LE4-HS-UNIV-CLO-RC-BKTX

MOUNTING HEIGHT: 25' FROM FLAT OPTICAL ASSEMBLY TO THE  
GROUND

ARM LENGTH: 6'-0" (AC-6-1A-BKTX)

PHOTOMETRIC FILE: RVS-35W-32LED4K-R-LE4-HS

TEST NO.: S1210262-R1

MOUNTING HEIGHT 25'-0" ABOVE GRADE

QUANTITY: 3

Drawing TYPE B-5

Philips RVS-3532LED4K-LE5-UNIV-CLO-RC-BKTX

MOUNTING HEIGHT: 25' FROM FLAT OPTICAL ASSEMBLY TO THE  
GROUND

ARM LENGTH: 6'-0" (AC-6-1A-BKTX)

PHOTOMETRIC FILE: RVS-35W-32LED4K-R-LE5

TEST NO.: S1210301-R1

MOUNTING HEIGHT 25'-0" ABOVE GRADE

QUANTITY: 3

SEC. 5.5.2-2

Vertical surfaces are not being illuminated by this proposed design.

SEC. 5.5.2-3

See attached documents Exhibit A

SEC. 5.5.2-4

To be determined by Administrative Officer

SEC. 5.5.2-e General Outdoor Lighting Standards

SEC. 5.5.2-1 Standard used was IES RP-33-2014 Lighting for Exterior Environments

SEC. 5.5.2-2 Standard used was IES RP-20-2014 Lighting for Parking Facilities

SEC. 5.5.2-3 Outdoor Lighting Manual for Vermont Municipalities edition 1996

SEC. 5.5.2-4 Fixtures used on this project comply with current BUG ratings rather than  
deprecated "Full cut-off" "Cut-Off" criteria.

Drawing TYPE B-4 B1-U0-G1

Drawing TYPE B-4-HS B0-U0-G1

Drawing TYPE B-5 B2-U0-G1

Light levels on adjacent property are in compliance with the 0.1 foot-candle 20  
feet beyond the development site.

SEC. 5.5.2-5 All LED luminaires are in compliance with a minimum CRI of 70 (75 CRI typical)  
for the drawing TYPE B series of luminaires.

SEC. 5.5.2-6 Illumination levels are the highest levels measured horizontally at ground level.  
The print-out assumes a flat site. Levels might fluctuate 20% over the life of the  
LED, about 70,000 hours.

SEC. 5.5.2-7 The project is in compliance with no laser light sources.

SEC. 5.5.2-8 There are no flag poles on this project.

SEC. 5.5.2-9 There shall be no neon tubing or banding on this project.

SEC. 5.5.2-f Specific Outdoor Lighting Standards



SEC. 5.5.2-f-1 Parking Lot Lighting

- A. Street lighting pole height complies with the 25'-0" requirement for the parking areas
- B. Project complies with criteria of illumination levels do not exceed 4 initial foot-candles at any point.

"East Parking" Calculated 1.2 foot-candles maximum

- C. Illumination levels are for the functional area of the parking
  - D. Maximum to minimum uniformity ratios are under the 20:1 calculated at 6:00:1.
  - E. Illumination shall be reduced to 50% one hour after the end of public business hours
- Project, as proposed, is not in compliance.

No parking garages are part of this project

SEC. 5.5.2-f-2 Walkway Lighting

Not applicable

SEC. 5.5.2-f-3 Lighting of Gasoline Fueling Pump Islands and Canopies

Not applicable

SEC. 5.5.2-f-4 Other Vehicular Canopies:

Not applicable

SEC. 5.5.2-f-5 Parking Garage Lighting

Not applicable

SEC. 5.5.2-f-6 Lighting of Exterior Sales/Display Areas

Not applicable

SEC. 5.5.2-f-7 Security

Not applicable

SEC. 5.5.2-f-8 Outdoor Recreational Facility Lighting

Not applicable

SEC. 5.5.2-f-9 Lighting of Building Facades

Not applicable

SEC. 5.5.2-g Exception

We are only using LED technologies on this project

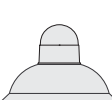
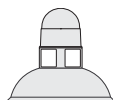
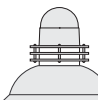
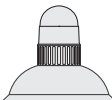
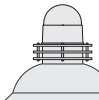
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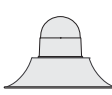
- DLC qualified
- Up to 1000' wireless communication
- Motion sensing up to 40' mounting height
- Superior BUG ratings
- Types II, III, IV, V and custom distributions
- IP66, 3G vibration housing
- 20kV/10kA surge suppression
- 2700 – 5000K CCT
- >560 nm Amber
- Custom lumen packages
- Integral thermal protection
- 0-10V dimmable
- 13 standard powder coat finishes

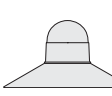
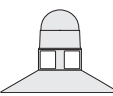


### SPECIFICATIONS

|                           |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |
|---------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
|                           |  |  |  |  |  |
| ANGLED HOOD CONFIGURATION | UCM-ANG                                                                           | UCM-WND-ANG                                                                       | UCM-SR-ANG                                                                        | UCM-VSL-ANG                                                                         | UCM-LUM-ANG                                                                         |
| DIAMETER                  | 20"/508mm                                                                         | 20"/508mm                                                                         | 20"/508mm                                                                         | 20"/508mm                                                                           | 20"/508mm                                                                           |
| HEIGHT                    | 14.7"/373mm                                                                       | 20.5"/520mm                                                                       | 20.7"/526mm                                                                       | 20.5"/521mm                                                                         | 20.6"/523mm                                                                         |
| WEIGHT                    | 18.25 lbs/8.28kg                                                                  | 21.75 lbs/9.86kg                                                                  | 25 lbs/11.3kg                                                                     | 22.25 lbs/10.1kg                                                                    | 24.25 lbs/11kg                                                                      |
| EPA                       | .60                                                                               | .72                                                                               | .74                                                                               | .72                                                                                 | .74                                                                                 |

|                         |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
|                         |  |  |  |  |  |
| BELL HOOD CONFIGURATION | UCM-BEL                                                                           | UCM-WND-BEL                                                                       | UCM-SR-BEL                                                                        | UCM-VSL-BEL                                                                         | UCM-LUM-BEL                                                                         |
| DIAMETER                | 24"/610mm                                                                         | 24"/610mm                                                                         | 24"/610mm                                                                         | 24"/610mm                                                                           | 24"/610mm                                                                           |
| HEIGHT                  | 15.8"/401mm                                                                       | 21.4"/543mm                                                                       | 21.6"/549mm                                                                       | 19.37"/492mm                                                                        | 21.5"/546mm                                                                         |
| WEIGHT                  | 20.25 lbs/9.2kg                                                                   | 23.5 lbs/10.6kg                                                                   | 27 lbs/12.25kg                                                                    | 24.25 lbs/11kg                                                                      | 26 lbs/11.8kg                                                                       |
| EPA                     | .73                                                                               | .85                                                                               | .87                                                                               | .85                                                                                 | .85                                                                                 |

|                          |                                                                                    |                                                                                    |                                                                                    |                                                                                      |                                                                                      |
|--------------------------|------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
|                          |  |  |  |  |  |
| FLARE HOOD CONFIGURATION | UCM-FLR                                                                            | UCM-WND-FLR                                                                        | UCM-SR-FLR                                                                         | UCM-VSL-FLR                                                                          | UCM-LUM-FLR                                                                          |
| DIAMETER                 | 22"/559mm                                                                          | 22"/559mm                                                                          | 22"/559mm                                                                          | 22"/559mm                                                                            | 22"/559mm                                                                            |
| HEIGHT                   | 14.5"/368mm                                                                        | 19.8"/503mm                                                                        | 20.1"/510mm                                                                        | 19.8"/503mm                                                                          | 20"/508mm                                                                            |
| WEIGHT                   | 18.5 lbs/8.4kg                                                                     | 21.75 lbs/9.87kg                                                                   | 25.25 lbs/10.1kg                                                                   | 21.75 lbs/9.86kg                                                                     | 24.25 lbs/11kg                                                                       |
| EPA                      | .53                                                                                | .65                                                                                | .67                                                                                | .65                                                                                  | .67                                                                                  |

|                             |                                                                                     |                                                                                     |                                                                                     |                                                                                       |                                                                                       |
|-----------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
|                             |  |  |  |  |  |
| STRAIGHT HOOD CONFIGURATION | UCM-STR                                                                             | UCM-WND-STR                                                                         | UCM-SR-STR                                                                          | UCM-VSL-STR                                                                           | UCM-LUM-STR                                                                           |
| DIAMETER                    | 24"/610mm                                                                           | 24"/610mm                                                                           | 24"/610mm                                                                           | 24"/610mm                                                                             | 24"/610mm                                                                             |
| HEIGHT                      | 14"/355mm                                                                           | 19.8"/503mm                                                                         | 20"/508mm                                                                           | 19.8"/503mm                                                                           | 19.9"/505mm                                                                           |
| WEIGHT                      | 20 lbs/9.07kg                                                                       | 23.25 lbs/10.55kg                                                                   | 26.75 lbs/12.13kg                                                                   | 23.75 lbs/10.77kg                                                                     | 25.75 lbs/11.68kg                                                                     |
| EPA                         | .59                                                                                 | .71                                                                                 | .73                                                                                 | .71                                                                                   | .73                                                                                   |

|                                 |                                                                                     |                                                                                     |                                                                                     |                                                                                       |                                                                                       |
|---------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
|                                 |  |  |  |  |  |
| SKIRTED BELL HOOD CONFIGURATION | UCM-SKB                                                                             | UCM-WND-SKB                                                                         | UCM-SR-SKB                                                                          | UCM-VSL-SKB                                                                           | UCM-LUM-SKB                                                                           |
| DIAMETER                        | 24"/610mm                                                                           | 24"/610mm                                                                           | 24"/610mm                                                                           | 24"/610mm                                                                             | 24"/610mm                                                                             |
| HEIGHT                          | 19.7"/500mm                                                                         | 23.9"/607mm                                                                         | 24.2"/615mm                                                                         | 23.9"/607mm                                                                           | 24.1"/612mm                                                                           |
| WEIGHT                          | 20.5 lbs/9.3kg                                                                      | 23.75 lbs/10.77kg                                                                   | 27 lbs/12.25kg                                                                      | 24.25 lbs/11kg                                                                        | 26.25 lbs/11.9kg                                                                      |
| EPA                             | .90                                                                                 | 1.03                                                                                | 1.05                                                                                | 1.03                                                                                  | 1.05                                                                                  |

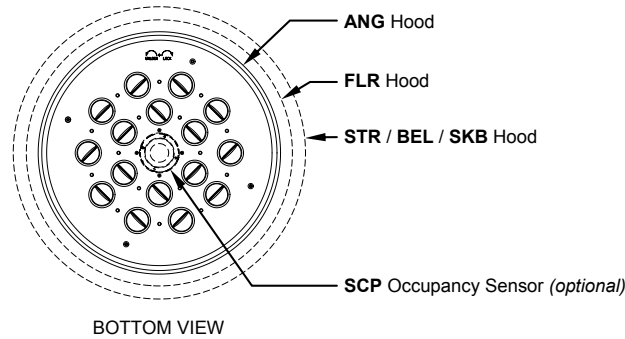


3000K unlit or 3000K without luminous element only  
MO-XX30 configurations only



ARCHITECTURAL AREA LIGHTING  
16555 East Gale Ave. | City of Industry | CA 91745  
P 626.968.5666 | F 626.369.2695 | www.aal.net  
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JOB \_\_\_\_\_  
TYPE \_\_\_\_\_  
NOTES \_\_\_\_\_



## ORDERING INFORMATION

| 1     | 2    | 3            | 4   | 5             | 6      | 7       | 8       | 9       | 10       |
|-------|------|--------------|-----|---------------|--------|---------|---------|---------|----------|
| UCM   | STR  | T4-32LED     | 4K  | 450           | BLT    |         |         | 120     | SLA17    |
| MODEL | Hood | Distribution | CCT | Lumen Package | Finish | Options | Control | Voltage | Mounting |

### 1. MODEL

|         |                                              |
|---------|----------------------------------------------|
| UCM     | Universe medium without luminous element     |
| UCM-WND | Universe medium with luminous window         |
| UCM-SR  | Universe medium with luminous solid rings    |
| UCM-VSL | Universe medium with luminous vertical slots |
| UCM-LUM | Universe medium with luminous rings          |

### 2. HOOD (May choose one)

|          |                                                      |
|----------|------------------------------------------------------|
| FLR      | Flared hood                                          |
| FLR-STSS | Flared hood in natural brushed stainless steel       |
| FLR-COP  | Flared hood in natural brushed copper                |
| ANG      | Angled hood                                          |
| ANG-STSS | Angled hood in natural brushed stainless steel       |
| ANG-COP  | Angled hood in natural brushed copper                |
| STR      | Straight hood                                        |
| STR-STSS | Straight hood in natural brushed stainless steel     |
| STR-COP  | Straight hood in natural brushed copper              |
| BEL      | Bell hood                                            |
| BEL-STSS | Bell hood in natural brushed stainless steel         |
| BEL-COP  | Bell hood in natural brushed copper                  |
| SKB      | Skirted bell hood                                    |
| SKB-STSS | Skirted bell hood in natural brushed stainless steel |
| SKB-COP  | Skirted bell hood in natural brushed copper          |

### 3. DISTRIBUTION

MicroCore Precision aimed optics

|          |                     |
|----------|---------------------|
| T2-32LED | Type 2              |
| T3-32LED | Type 3              |
| T4-32LED | Type 4              |
| T5-32LED | Type 5              |
| TX-32LED | Custom <sup>1</sup> |

### 4. COLOR TEMPERATURE

|     |                                          |
|-----|------------------------------------------|
| 3K  | 3000K                                    |
| 4K  | 4000K                                    |
| 5K  | 5000K                                    |
| 27K | 2700K <sup>1</sup>                       |
| 35K | 3500K <sup>1</sup>                       |
| AM  | >560 nm monochromatic amber <sup>1</sup> |

### 5. LUMEN PACKAGE

|     |                                              |
|-----|----------------------------------------------|
| 700 | 71 watts                                     |
| 450 | 48 watts                                     |
| XMA | Custom wattage or drive current <sup>1</sup> |

### 6. FINISH

#### Standard Color

|     |                  |
|-----|------------------|
| WH  | Arctic White     |
| BL  | Black            |
| BLT | Matte Black      |
| DB  | Dark Bronze      |
| DGN | Dark Green       |
| TT  | Titanium         |
| WDB | Weathered Bronze |
| MDB | Bronze Metallic  |
| VBU | Verde Blue       |
| CRT | Corten           |
| MAL | Matte Aluminum   |
| MG  | Medium Grey      |
| AGN | Antique Green    |
| LG  | Light Grey       |

#### Premium Color

|        |                   |
|--------|-------------------|
| SHK    | Shamrock          |
| SPP    | Salt and Pepper   |
| SFM    | Seafoam           |
| WCP    | Weathered Copper  |
| RAL    | RAL 4 digit Color |
| CUSTOM | Custom Color      |

### 7. OPTIONS (May choose as noted)

|     |                                       |
|-----|---------------------------------------|
| FTG | Flat clear glass lens <sup>1</sup>    |
| FLD | Flat diffused glass lens <sup>3</sup> |
| SAG | Sag clear glass lens <sup>1,3</sup>   |
| HSS | House Side shield for Type 4          |
| SLC | Unlit (luminous) element              |
| R80 | 80 CRI minimum <sup>1</sup>           |
| BL  | Blue inner lens                       |
| RD  | Red inner lens                        |
| GRN | Green inner lens                      |

### 8. CONTROLS – (May choose as noted)

|           |                                                       |
|-----------|-------------------------------------------------------|
| WIR       | wiScape connectivity                                  |
| WIRSC     | wiScape connectivity, integral motion sensor          |
| SCP       | Integral photo-control and motion sensor <sup>4</sup> |
| SCPREMOTE | Handheld commissioning tool <sup>4</sup>              |

### 9. VOLTAGE

|         |                   |
|---------|-------------------|
| 120-277 | 120-277 VAC input |
| 347     | 347 VAC input     |
| 480     | 480 VAC input     |

### 9. MOUNTING

#### POLE MOUNT

|            |           |            |
|------------|-----------|------------|
| SLA2       | SLA3      | SLA4       |
| SLA4-2     | SLA7      | SLA7-2     |
| SLA7(5)    | SLA7(5)-2 | SLA8D      |
| SLA9       | SLA9-2    | SLA10      |
| SLA10-2    | SLA16     | SLA16-2    |
| SLA17      | SLA17-2   | SLA17(5)   |
| SLA17(5)-2 | SLA18     | SLA18-2    |
| SLA20      | SLA20-2   | SLA20A     |
| SLA20A-2   | SLA20B    | SLA20B-2   |
| SLA20C     | SLA20C-2  | SLA20D     |
| SLA20D-2   | SLA22D    | SLA24      |
| SLA24-2    | SLA24(5)  | SLA24(5)-2 |
| TRA4       | TRA7      | TRA7-2     |
| TRA8       | TRA8-2    | TRA9       |
| TRA9-2     |           |            |

#### WALL MOUNT

|        |       |       |
|--------|-------|-------|
| WMA4   | WMA5  | WMA6  |
| WMA8   | WMA9D | WMA10 |
| WMA11  | WMA12 | WMA16 |
| WMA17  | WMA18 | WMA20 |
| WMA22D | WMA24 | WMA37 |
| WMA38  | WMA39 |       |

<sup>1</sup> Contact factory

<sup>2</sup> Not for AM color temperature

<sup>3</sup> Not for WIR, WIRSC or SCP control options

<sup>4</sup> Handheld commissioning tool is required to separately configure or adjust any number of SCP sensors.



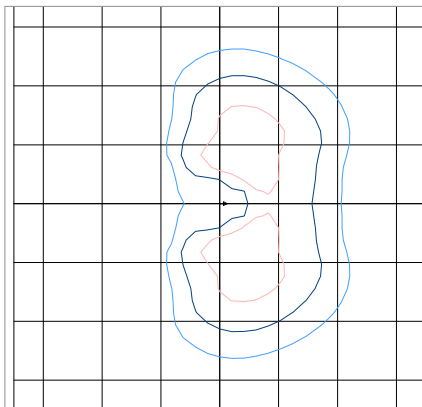
## LUMINAIRE PERFORMANCE (CONTINUED) Actual measured performance to be within +/-3% of the stated values

| Configuration         |                   |                             |                             | Ordering Code               | 32LED-5K-700         |                 |   |      |      | 32LED-4K-700          |                 |   |      |      | 32LED-3K-700       |                 |   |   |   |
|-----------------------|-------------------|-----------------------------|-----------------------------|-----------------------------|----------------------|-----------------|---|------|------|-----------------------|-----------------|---|------|------|--------------------|-----------------|---|---|---|
| System Watts          | Luminous Element  | Lens                        | Distribution                |                             | Bright White (5000K) |                 |   |      |      | Neutral White (4000K) |                 |   |      |      | Warm White (3000K) |                 |   |   |   |
|                       |                   |                             |                             |                             | Delivered Lumens     | Efficacy (Lm/W) | B | U    | G    | Delivered Lumens      | Efficacy (Lm/W) | B | U    | G    | Delivered Lumens   | Efficacy (Lm/W) | B | U | G |
| 47                    | (None)            | (None)                      | Type II                     | UCM-[HOOD]-T2               | 4844                 | 103             | 2 | 0    | 2    | 4830                  | 103             | 2 | 0    | 2    | 4607               | 98              | 2 | 0 | 2 |
|                       |                   |                             | Type III                    | UCM-[HOOD]-T3               | 4805                 | 102             | 1 | 0    | 2    | 4791                  | 102             | 1 | 0    | 2    | 4570               | 97              | 1 | 0 | 2 |
|                       |                   |                             | TYPE IV                     | UCM-[HOOD]-T4               | 4805                 | 102             | 1 | 0    | 2    | 4791                  | 102             | 1 | 0    | 2    | 4570               | 97              | 1 | 0 | 2 |
|                       |                   |                             | TYPE V                      | UCM-[HOOD]-T5               | 4839                 | 103             | 3 | 0    | 1    | 4825                  | 103             | 3 | 0    | 1    | 4602               | 98              | 3 | 0 | 1 |
|                       |                   | Clear Flat                  | Type IV, HSS                | UCM-[HOOD]-T4-(...-HSS)     | 3539                 | 75              | 0 | 0    | 2    | 3529                  | 75              | 0 | 0    | 2    | 3327               | 71              | 0 | 0 | 2 |
|                       |                   |                             | Type II                     | UCM-[HOOD]-T2-(...-CLR)     | 4180                 | 89              | 1 | 1    | 1    | 4168                  | 89              | 1 | 1    | 1    | 3976               | 85              | 1 | 1 | 1 |
|                       |                   |                             | Type III                    | UCM-[HOOD]-T3-(...-CLR)     | 4147                 | 88              | 1 | 1    | 1    | 4135                  | 88              | 1 | 1    | 1    | 3944               | 84              | 1 | 1 | 1 |
|                       |                   |                             | Type IV                     | UCM-[HOOD]-T4-(...-CLR)     | 4147                 | 88              | 1 | 1    | 1    | 4135                  | 88              | 1 | 1    | 1    | 3944               | 84              | 1 | 1 | 1 |
|                       |                   | Diffused Flat               | TYPE V                      | UCM-[HOOD]-T5-(...-CLR)     | 4176                 | 89              | 2 | 0    | 1    | 4164                  | 89              | 2 | 0    | 1    | 3972               | 85              | 2 | 0 | 1 |
|                       |                   |                             | Type II                     | UCM-[HOOD]-T2-(...-FLD)     | 3376                 | 72              | 1 | 1    | 1    | 3367                  | 72              | 1 | 1    | 1    | 3211               | 68              | 1 | 1 | 1 |
|                       |                   |                             | Type III                    | UCM-[HOOD]-T3-(...-FLD)     | 3349                 | 71              | 1 | 1    | 1    | 3340                  | 71              | 1 | 1    | 1    | 3185               | 68              | 1 | 1 | 1 |
|                       |                   |                             | Type IV                     | UCM-[HOOD]-T4-(...-FLD)     | 3349                 | 71              | 1 | 1    | 1    | 3340                  | 71              | 1 | 1    | 1    | 3185               | 68              | 1 | 1 | 1 |
| 49                    | WND<br>4 Windows  | (None)                      | Type V                      | UCM-[HOOD]-T5-(...-FLD)     | 3373                 | 72              | 1 | 0    | 1    | 3363                  | 72              | 1 | 0    | 1    | 3208               | 68              | 1 | 0 | 1 |
|                       |                   |                             | Type II                     | UCM-WND-[HOOD]-T2           | 4772                 | 97              | 2 | 1    | 2    | 4758                  | 97              | 2 | 1    | 2    | 4538               | 93              | 2 | 1 | 2 |
|                       |                   |                             | Type III                    | UCM-WND-[HOOD]-T3           | 4820                 | 98              | 1 | 1    | 2    | 4806                  | 98              | 1 | 1    | 2    | 4584               | 94              | 1 | 1 | 2 |
|                       |                   |                             | Type IV                     | UCM-WND-[HOOD]-T4           | 4792                 | 98              | 1 | 1    | 2    | 4778                  | 98              | 1 | 1    | 2    | 4558               | 93              | 1 | 1 | 2 |
|                       |                   | Clear Flat                  | Type V                      | UCM-WND-[HOOD]-T5           | 4783                 | 98              | 3 | 2    | 2    | 4769                  | 97              | 3 | 2    | 2    | 4549               | 93              | 3 | 2 | 2 |
|                       |                   |                             | Type IV, HSS                | UCM-WND-[HOOD]-T4-(...-HSS) | 3552                 | 72              | 0 | 1    | 2    | 3542                  | 72              | 0 | 1    | 2    | 3378               | 69              | 0 | 1 | 2 |
|                       |                   |                             | Type II                     | UCM-WND-[HOOD]-T2-(...-CLR) | 4269                 | 87              | 1 | 1    | 1    | 4256                  | 87              | 1 | 1    | 1    | 4060               | 83              | 1 | 1 | 1 |
|                       |                   |                             | Type III                    | UCM-WND-[HOOD]-T3-(...-CLR) | 4159                 | 85              | 1 | 1    | 1    | 4147                  | 85              | 1 | 1    | 1    | 3956               | 81              | 1 | 1 | 1 |
|                       |                   | Diffused Flat               | Type IV                     | UCM-WND-[HOOD]-T4-(...-CLR) | 3944                 | 80              | 1 | 1    | 1    | 3932                  | 80              | 1 | 1    | 1    | 3751               | 77              | 1 | 1 | 1 |
|                       |                   |                             | Type V                      | UCM-WND-[HOOD]-T5-(...-CLR) | 4235                 | 86              | 1 | 2    | 1    | 4223                  | 86              | 1 | 2    | 1    | 4028               | 82              | 1 | 2 | 1 |
|                       |                   |                             | Type II                     | UCM-WND-[HOOD]-T2-(...-FLD) | 3394                 | 69              | 1 | 1    | 1    | 3384                  | 69              | 1 | 1    | 1    | 3228               | 66              | 1 | 1 | 1 |
|                       |                   |                             | Type III                    | UCM-WND-[HOOD]-T3-(...-FLD) | 3425                 | 70              | 1 | 1    | 1    | 3415                  | 70              | 1 | 1    | 1    | 3257               | 66              | 1 | 1 | 1 |
|                       | SR<br>Solid Rings | (None)                      | TYPE IV                     | UCM-WND-[HOOD]-T4-(...-FLD) | 3335                 | 68              | 1 | 1    | 1    | 3325                  | 68              | 1 | 1    | 1    | 3171               | 65              | 1 | 1 | 1 |
|                       |                   |                             | Type V                      | UCM-WND-[HOOD]-T5-(...-FLD) | 3450                 | 70              | 2 | 1    | 1    | 3440                  | 70              | 2 | 1    | 1    | 3281               | 67              | 2 | 1 | 1 |
|                       |                   |                             | Type II                     | UCM-SR-[HOOD]-T2            | 4716                 | 96              | 2 | 1    | 2    | 4702                  | 96              | 2 | 1    | 2    | 4485               | 92              | 2 | 1 | 2 |
|                       |                   |                             | TYPE III                    | UCM-SR-[HOOD]-T3            | 4763                 | 97              | 1 | 1    | 2    | 4750                  | 97              | 1 | 1    | 2    | 4530               | 92              | 1 | 1 | 2 |
|                       |                   | Clear Flat                  | TYPE IV                     | UCM-SR-[HOOD]-T4            | 4736                 | 97              | 1 | 1    | 2    | 4722                  | 96              | 1 | 1    | 2    | 4504               | 92              | 1 | 1 | 2 |
|                       |                   |                             | TYPE V                      | UCM-SR-[HOOD]-T5            | 4727                 | 96              | 3 | 1    | 2    | 4713                  | 96              | 3 | 1    | 2    | 4496               | 92              | 3 | 1 | 2 |
|                       |                   |                             | TYPE IV, HSS                | UCM-SR-[HOOD]-T4-(...-HSS)  | 3537                 | 72              | 0 | 1    | 2    | 3527                  | 72              | 0 | 1    | 2    | 3364               | 69              | 0 | 1 | 2 |
|                       |                   |                             | Type II                     | UCM-SR-[HOOD]-T2-(...-CLR)  | 4785                 | 98              | 1 | 1    | 1    | 4771                  | 97              | 1 | 1    | 1    | 4551               | 93              | 1 | 1 | 1 |
|                       |                   | Diffused Flat               | TYPE III                    | UCM-SR-[HOOD]-T3-(...-CLR)  | 4663                 | 95              | 1 | 1    | 1    | 4649                  | 95              | 1 | 1    | 1    | 4435               | 91              | 1 | 1 | 1 |
|                       |                   |                             | TYPE IV                     | UCM-SR-[HOOD]-T4-(...-CLR)  | 4421                 | 90              | 1 | 1    | 1    | 4408                  | 90              | 1 | 1    | 1    | 4205               | 86              | 1 | 1 | 1 |
|                       |                   |                             | TYPE V                      | UCM-SR-[HOOD]-T5-(...-CLR)  | 4192                 | 86              | 2 | 1    | 1    | 4180                  | 85              | 2 | 1    | 1    | 3987               | 81              | 2 | 1 | 1 |
|                       |                   |                             | Type II                     | UCM-SR-[HOOD]-T2-(...-FLD)  | 3364                 | 69              | 1 | 1    | 1    | 3355                  | 68              | 1 | 1    | 1    | 3200               | 65              | 1 | 1 | 1 |
| VSL<br>Vertical Slots | (None)            | TYPE III                    | UCM-SR-[HOOD]-T3-(...-FLD)  | 3395                        | 69                   | 1               | 1 | 1    | 3385 | 69                    | 1               | 1 | 1    | 3229 | 66                 | 1               | 1 | 1 |   |
|                       |                   | TYPE IV                     | UCM-SR-[HOOD]-T4-(...-FLD)  | 3306                        | 67                   | 1               | 1 | 1    | 3296 | 67                    | 1               | 1 | 1    | 3144 | 64                 | 1               | 1 | 1 |   |
|                       |                   | Type V                      | UCM-SR-[HOOD]-T5-(...-FLD)  | 3420                        | 70                   | 1               | 1 | 1    | 3410 | 70                    | 1               | 1 | 1    | 3253 | 66                 | 1               | 1 | 1 |   |
|                       |                   | Type II                     | UCM-VSL-[HOOD]-T2           | 4725                        | 96                   | 2               | 0 | 2    | 4711 | 96                    | 2               | 0 | 2    | 4494 | 92                 | 2               | 0 | 2 |   |
|                       | Clear Flat        | TYPE III                    | UCM-VSL-[HOOD]-T3           | 4772                        | 97                   | 1               | 1 | 2    | 4759 | 97                    | 1               | 1 | 2    | 4539 | 93                 | 1               | 1 | 2 |   |
|                       |                   | TYPE IV                     | UCM-VSL-[HOOD]-T4           | 4745                        | 97                   | 1               | 1 | 2    | 4731 | 97                    | 1               | 1 | 2    | 4513 | 92                 | 1               | 1 | 2 |   |
|                       |                   | TYPE V                      | UCM-VSL-[HOOD]-T5           | 4736                        | 97                   | 3               | 0 | 2    | 4722 | 96                    | 3               | 0 | 2    | 4504 | 92                 | 3               | 0 | 2 |   |
|                       |                   | TYPE V, HSS                 | UCM-VSL-[HOOD]-T4-(...-HSS) | 3562                        | 73                   | 0               | 1 | 2    | 3552 | 72                    | 0               | 1 | 2    | 3388 | 69                 | 0               | 1 | 2 |   |
|                       | Diffused Flat     | Type II                     | UCM-VSL-[HOOD]-T2-(...-CLR) | 4223                        | 86                   | 1               | 1 | 1    | 4210 | 86                    | 1               | 1 | 1    | 4016 | 82                 | 1               | 1 | 1 |   |
|                       |                   | TYPE III                    | UCM-VSL-[HOOD]-T3-(...-CLR) | 4114                        | 84                   | 1               | 1 | 1    | 4102 | 84                    | 1               | 1 | 1    | 3913 | 80                 | 1               | 1 | 1 |   |
|                       |                   | TYPE IV                     | UCM-VSL-[HOOD]-T4-(...-CLR) | 3901                        | 80                   | 1               | 1 | 1    | 3890 | 79                    | 1               | 1 | 1    | 3710 | 76                 | 1               | 1 | 1 |   |
|                       |                   | TYPE V                      | UCM-VSL-[HOOD]-T5-(...-CLR) | 4189                        | 85                   | 2               | 0 | 1    | 4177 | 85                    | 2               | 0 | 1    | 3984 | 81                 | 2               | 0 | 1 |   |
| LUM<br>Luminous Rings | (None)            | Type II                     | UCM-VSL-[HOOD]-T2-(...-FLD) | 3367                        | 69                   | 1               | 1 | 1    | 3358 | 69                    | 1               | 1 | 1    | 3203 | 65                 | 1               | 1 | 1 |   |
|                       |                   | TYPE III                    | UCM-VSL-[HOOD]-T3-(...-FLD) | 3398                        | 69                   | 1               | 1 | 1    | 3388 | 69                    | 1               | 1 | 1    | 3232 | 66                 | 1               | 1 | 1 |   |
|                       |                   | TYPE IV                     | UCM-VSL-[HOOD]-T4-(...-FLD) | 3308                        | 68                   | 1               | 1 | 1    | 3299 | 67                    | 1               | 1 | 1    | 3147 | 64                 | 1               | 1 | 1 |   |
|                       |                   | TYPE V                      | UCM-VSL-[HOOD]-T5-(...-FLD) | 3423                        | 70                   | 1               | 0 | 1    | 3413 | 70                    | 1               | 0 | 1    | 3256 | 66                 | 1               | 0 | 1 |   |
|                       | Clear Flat        | Type II                     | UCM-LUM-[HOOD]-T2           | 4809                        | 98                   | 2               | 1 | 2    | 4795 | 98                    | 2               | 1 | 2    | 4574 | 93                 | 2               | 1 | 2 |   |
|                       |                   | TYPE III                    | UCM-LUM-[HOOD]-T3           | 4646                        | 95                   | 1               | 0 | 2    | 4633 | 95                    | 1               | 0 | 2    | 4419 | 90                 | 1               | 0 | 2 |   |
|                       |                   | TYPE IV                     | UCM-LUM-[HOOD]-T4           | 4701                        | 96                   | 1               | 1 | 2    | 4687 | 96                    | 1               | 1 | 2    | 4471 | 91                 | 1               | 1 | 2 |   |
|                       |                   | TYPE V                      | UCM-LUM-[HOOD]-T5           | 4733                        | 97                   | 3               | 1 | 1    | 4719 | 96                    | 3               | 1 | 1    | 4502 | 92                 | 3               | 1 | 1 |   |
| Diffused Flat         | TYPE V, HSS       | UCM-LUM-[HOOD]-T4-(...-HSS) | 3564                        | 73                          | 0                    | 1               | 2 | 3554 | 73   | 0                     | 1               | 2 | 3390 | 69   | 0                  | 1               | 2 |   |   |
|                       | TYPE II           | UCM-LUM-[HOOD]-T2-(...-CLR) | 4207                        | 86                          | 1                    | 1               | 1 | 4194 | 86   | 1                     | 1               | 1 | 4001 | 82   | 1                  | 1               | 1 |   |   |
|                       | TYPE III          | UCM-LUM-[HOOD]-T3-(...-CLR) | 4131                        | 84                          | 1                    | 1               | 1 | 4119 | 84   | 1                     | 1               | 1 | 3929 | 80   | 1                  | 1               | 1 |   |   |
|                       | TYPE IV           | UCM-LUM-[HOOD]-T4-(...-CLR) | 3911                        | 80                          | 1                    | 1               | 1 | 3900 | 80   | 1                     | 1               | 1 | 3720 | 76   | 1                  | 1               | 1 |   |   |

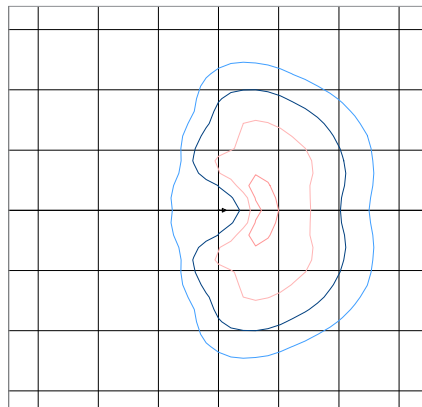
## ELECTRICAL CHARACTERISTICS

| Ordering Code                           |               | Line Input |         | Amps AC   | LED Drive (mA) | System Watts (w) | Min. Power Factor | MAx THD (%) | Driver Operating Temp. Range (°C) | Inrush Current peak |             | Dimming           |                            |
|-----------------------------------------|---------------|------------|---------|-----------|----------------|------------------|-------------------|-------------|-----------------------------------|---------------------|-------------|-------------------|----------------------------|
| MODEL                                   | LUMEN PACKAGE | VAC        | Hz      |           |                |                  |                   |             |                                   | (A)                 | T@ 50% (µs) | Dimming Range (V) | Source / Sink Current (mA) |
| UCM<br>UCM-(...SLC)                     | 700           | 120-277    | 50 / 60 | 0.6 - 0.3 | 650            | 71               | ≥9                | 20          | -30 TO +40                        | 15 - 32             | 100         | 0 - 10            | 1                          |
|                                         |               | 347        |         | 0.2       |                |                  |                   |             |                                   | 32                  | 100         |                   |                            |
|                                         |               | 480        |         | 0.2       |                |                  |                   |             |                                   | 32                  | 100         |                   |                            |
| UCM-WND<br>UCM-SR<br>UCM-VSL<br>UCM-LUM | 700           | 120-277    | 50 / 60 | 0.6 - 0.3 | 450            | 74               | ≥9                | 21          | -30 TO +40                        | 15 - 32             | 100         | 0 - 10            | 1                          |
|                                         |               | 347        |         | 0.2       |                |                  |                   |             |                                   | 32                  | 100         |                   |                            |
|                                         |               | 480        |         | 0.2       |                |                  |                   |             |                                   | 32                  | 100         |                   |                            |
| UCM<br>UCM-(...SLC)                     | 450           | 120-277    | 50 / 60 | 0.4       | 650            | 47               | ≥9                | 22          | -30 TO +40                        | 15 - 32             | 100         | 0 - 10            | 1                          |
|                                         |               | 347        |         | 0.1       |                |                  |                   |             |                                   | 32                  | 100         |                   |                            |
|                                         |               | 480        |         | 0.1       |                |                  |                   |             |                                   | 32                  | 100         |                   |                            |
| UCM-WND<br>UCM-SR<br>UCM-VSL<br>UCM-LUM | 450           | 120-277    | 50 / 60 | 0.2       | 450            | 49               | ≥9                | 23          | -30 TO +40                        | 15 - 32             | 100         | 0 - 10            | 1                          |
|                                         |               | 347        |         | 0.1       |                |                  |                   |             |                                   | 32                  | 100         |                   |                            |
|                                         |               | 480        |         | 0.1       |                |                  |                   |             |                                   | 32                  | 100         |                   |                            |

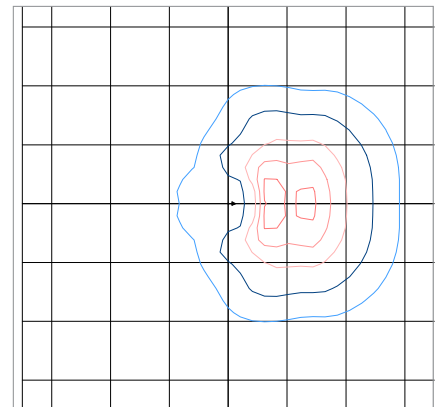
## ISOLINE TEMPLATES 16' Mounting Height



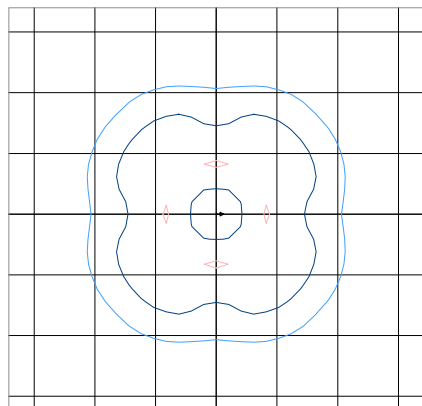
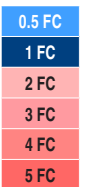
UCM-[HOOD]-T2-32LED-5K-700



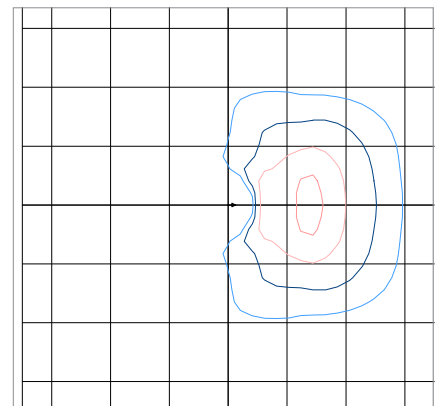
UCM-[HOOD]-T3-32LED-5K-700



UCM-[HOOD]-T4-32LED-5K-700



UCM-[HOOD]-T5-32LED-5K-700

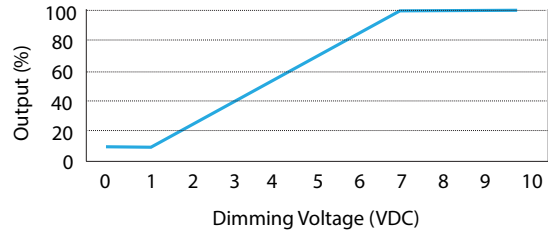


UCM-[HOOD]-T4-32LED-5K-700-HSS

## TM-21 LIFETIME CALCULATION

| Ambient Environment °C | Projected Lumen Maintenance (Khrs) |     |     |     |     | Reported L70 |
|------------------------|------------------------------------|-----|-----|-----|-----|--------------|
|                        | 15                                 | 25  | 50  | 60  | 100 |              |
| 25                     | 98%                                | 97% | 96% | 96% | 93% | >96Khrs.     |
| 40                     | 96%                                | 95% | 93% | 92% | 89% |              |

## DIMMING CURVE



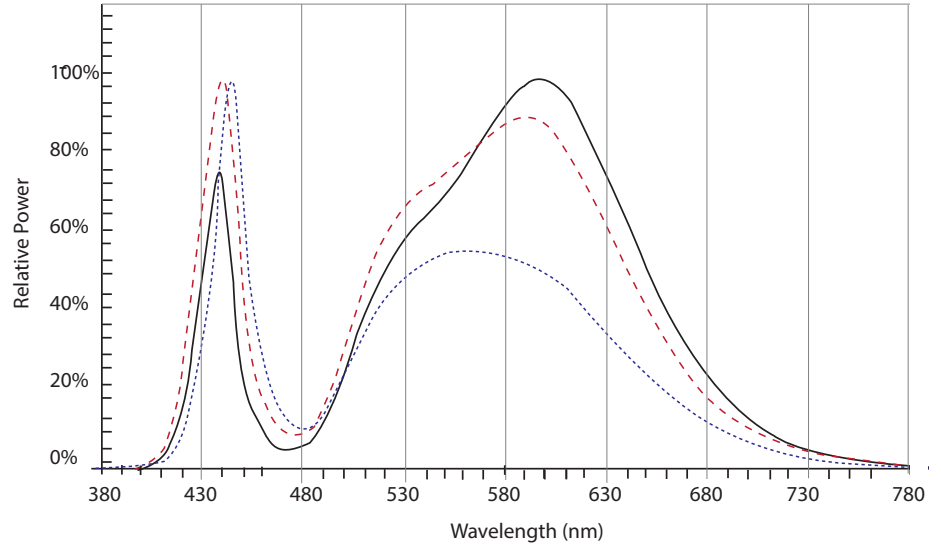
Note: Fixture does not dim to off, fixture dims to 10% minimum output.

## COLOR CHARACTERISTICS

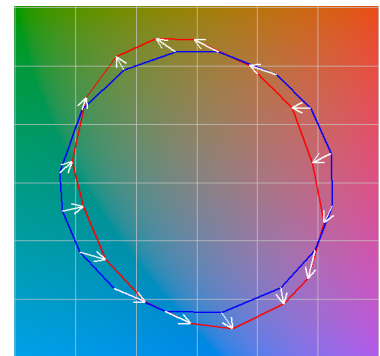
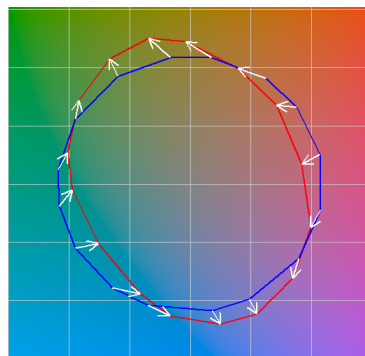
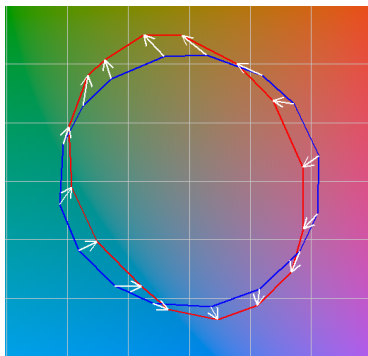
| Value  | Ordering Code |        |        |
|--------|---------------|--------|--------|
|        | 3K            | 4K     | 5K     |
| Rf     | 69            | 69     | 71     |
| Rg     | 99            | 99     | 98     |
| CCT(K) | 3122          | 3852   | 5020   |
| Duv    | 0.001         | 0.0004 | 0.0005 |
| CIE Ra | 74            | 73     | 74     |

Note: TM-30 reported at the discrete LED level, not fixture level.

## SPECTRAL POWER DISTRIBUTION COMPARISON



## COLOR VECTOR GRAPHIC



Reference Illuminant Series3 Series7 Test Source Series4 Series8 Series1 Series5 Series9 Series2 Series6 Series10

XX30

Reference Illuminant Series3 Series7 Test Source Series4 Series8 Series1 Series5 Series9 Series2 Series6 Series10

XX40

Reference Illuminant Series3 Series7 Test Source Series4 Series8 Series1 Series5 Series9 Series2 Series6 Series10

XX50

## SENSOR DETECTION RANGE

|          |       | SENSOR MOUNTING HEIGHT |     |     |     |     |     |     |       |     |       |      | RATIO |
|----------|-------|------------------------|-----|-----|-----|-----|-----|-----|-------|-----|-------|------|-------|
|          |       | 8'                     | 10' | 12' | 14' | 16' | 18' | 20' | 25'   | 30' | 35'   | 40'  |       |
| COVERAGE | SCP   | 20'                    | 25' | 30' | 35' | 40' | 45' | 50' | 62.5' | 75' | 87.5' | 100' | 1:2.5 |
| DIAMETER | WIRSC | 16'                    | 20' | 24' | 28' | 32' | 36' | 50' | N/A   | N/A | N/A   | N/A  | 1:2   |



## SPECIFICATIONS

### HOUSING

- All housing components shall be die-cast aluminum, sealed with continuous silicone rubber gaskets.
- Hood and spacers shall be heavy gauge spun aluminum with hemmed edges for added rigidity.
- Luminous rings shall be clear acrylic with an internal lens.
- Standard configurations do not require a flat lens, optional lenses shall be tempered glass
- All internal and external hardware shall be stainless steel.
- Optical bezel finish shall match the luminaire housing.

### OPTICAL

- Patent pending MicroCore™ LED modules shall independently aim each light emitting diode (LED) in both horizontal rotation and vertical tilt angle.
- LEDs shall be mounted to a metal printed circuit board assembly (PCBA) with a uniform conformal coating over the panel surface and electrical features.
- LED optics shall be clear injection molded PMMA acrylic.
- MicroCore™ PCBA and optic shall be sealed to a die-cast anodized aluminum heat sink with an injection molded silicone rubber gasket. IP66.
- Type 4 distribution with optional House Side Shield not available with clear or diffused glass lenses. Factory installed House Side Shield is optimized for Type 4 distribution and not recommended for use with Type 2 or 3 distribution and not available with type 5 distribution.

### ELECTRICAL

- Luminaires shall have integral surge protection that shall be U.L. recognized and have a surge current rating of 10,000 Amps using the industry standard 8/20uSec wave and surge rating of 372J.
- Drivers shall be U.L. recognized with an inrush current maximum of <20.0 Amps maximum at 230VAC.
- Drivers shall not be compatible with current sourcing dimmers, consult factory for current list of known compatible dimming systems, approved dimmers include Lutron Diva AVTV, Lutron Nova NFTV and NTFTV.

### CONTROLS

- Wireless enabled fixtures shall support bi-directional radio frequency (RF) communications utilizing IEEE 802.15.4 operating in the 2.4GHZ ISM band.
- Up to 1000' wireless range may be reduced by physical obstructions between fixtures.
- Motion sensor shall be flame retardant, UV resistant, impact resistant, recyclable polycarbonate.
- Motion Sensor shall use passive infrared (PIR) sensing technology that reacts to changes in infrared energy (moving body heat) within the coverage area. Careful consideration must be given to obstructions that may block the sensor's line of sight.
- Factory default settings for SCP option shall be:
  - High mode: 10V
  - Low mode: 1V
  - Ramp-up rate: disabled
  - Fade-down rate: disabled
  - Photocell: Off
  - Sensitivity: Full
  - Time Delay: Fade to low: 5 minutes
  - Time Delay: Fade to off: 1 hour

### PHOTOCELL / EGRESS ADAPTERS

- Adapter(s) shall slip over a 4"/100mm DIA. pole with the luminaire or arm slipping over the adapter to add a total of 4.5"/114mm to the overall height. Adapter(s) shall be prewired, independently rotatable 359°, and have a cast access cover with an integral lens and lanyard.
- Photocell adapter shall include an internal twist lock receptacle. Photocell by others.
- Egress adapter shall require an auxiliary 120 volt supply for operation of an integral MR16 lamp in the event of emergency. The lamp may be aimed and locked into position with an adjustment range of 15°-45°. Adapter shall have a socket that accepts miniature bi-pin MR16 lamps up to 50 watts, lamp by others.

### SERVICING

- Luminaire shall have tool-less service access to the gear compartment. Driver and surge suppressor shall be mounted to a prewired tray with quick disconnects that may be removed from the gear compartment.

### ARM MOUNTING

- Luminaire shall be attached to the arm assembly with three stainless steel bolts. The connection shall be sealed with a silicone compression gasket.
- Post top arms and brackets shall slip over a 4"/100mm O.D. or a 5"/127mm as configured and secured with six stainless steel set screws.
- Wall mounted arms and brackets shall require mounting hardware by others.

### FINISH

- Luminaire finish shall consist of a five stage pretreatment regimen with a polymer primer sealer, oven dry off, and top coated with a thermoset super TGIC polyester powder coat finish.
- Luminaire finish shall meet the AAMA 605.2 performance specification which includes passing a 3000 hour salt spray test for corrosion resistance.

### CERTIFICATION

- Luminaire shall be listed with ETL for outdoor, wet location use, UL1598, UL 8750 and Canadian CSA Std. C22.2 no.250.

### WARRANTY / TERMS AND CONDITIONS OF SALE

Download:

<http://www.hubbellighting.com/resources/warranty/>



## DLC QUALIFIED PRODUCTS (Continued)

| Lumen Package | Luminous Element      | CCT         | STR – STRAIGHT HOOD                 |                                         |                                     |
|---------------|-----------------------|-------------|-------------------------------------|-----------------------------------------|-------------------------------------|
|               |                       |             | NO LENS Standard                    | FTG Flat clear glass lens               | FLD Flat diffused glass lens        |
| 700           | (None)                | 4K<br>4000K | UCM-FLR-T2-4K-32LED-450-120-277     |                                         |                                     |
|               |                       |             | UCM-FLR-T3-4K-32LED-450-120-277     |                                         |                                     |
|               |                       |             | UCM-FLR-T4-4K-32LED-450-120-277     |                                         |                                     |
|               |                       | 5K<br>5000K | UCM-FLR-T5-4K-32LED-450-120-277     |                                         |                                     |
|               |                       |             | UCM-FLR-T2-5K-32LED-450-120-277     |                                         |                                     |
|               |                       |             | UCM-FLR-T3-5K-32LED-450-120-277     |                                         |                                     |
|               | 4 Windows<br>WND      | 4K<br>4000K | UCM-FLR-T4-5K-32LED-450-120-277     |                                         |                                     |
|               |                       |             | UCM-FLR-T5-5K-32LED-450-120-277     |                                         |                                     |
|               |                       |             | UCM-WND-FLR-T2-4K-32LED-450-120-277 |                                         |                                     |
|               |                       | 5K<br>5000K | UCM-WND-FLR-T3-4K-32LED-450-120-277 |                                         |                                     |
|               |                       |             | UCM-WND-FLR-T4-4K-32LED-450-120-277 |                                         |                                     |
|               |                       |             | UCM-WND-FLR-T5-4K-32LED-450-120-277 |                                         |                                     |
| 450           | (None)                | 3K<br>3000K | UCM-STR-T2-3K-32LED-450-120-277     |                                         |                                     |
|               |                       |             | UCM-STR-T3-3K-32LED-450-120-277     |                                         |                                     |
|               |                       |             | UCM-STR-T4-3K-32LED-450-120-277     |                                         |                                     |
|               |                       |             | UCM-STR-T5-3K-32LED-450-120-277     |                                         |                                     |
|               |                       | 4K<br>4000K | UCM-STR-T2-4K-32LED-450-120-277     | UCM-STR-T2-4K-32LED-450-FTG-120-277     | UCM-STR-T2-4K-32LED-450-FLD-120-277 |
|               |                       |             | UCM-STR-T3-4K-32LED-450-120-277     | UCM-STR-T3-4K-32LED-450-FTG-120-277     | UCM-STR-T3-4K-32LED-450-FLD-120-277 |
|               |                       |             | UCM-STR-T4-4K-32LED-450-120-277     | UCM-STR-T4-4K-32LED-450-FTG-120-277     | UCM-STR-T4-4K-32LED-450-FLD-120-277 |
|               |                       |             | UCM-STR-T5-4K-32LED-450-120-277     | UCM-STR-T5-4K-32LED-450-FTG-120-277     | UCM-STR-T5-4K-32LED-450-FLD-120-277 |
|               |                       | 5K<br>5000K | UCM-STR-T2-5K-32LED-450-120-277     | UCM-STR-T2-5K-32LED-450-FTG-120-277     | UCM-STR-T2-5K-32LED-450-FLD-120-277 |
|               |                       |             | UCM-STR-T3-5K-32LED-450-120-277     | UCM-STR-T3-5K-32LED-450-FTG-120-277     | UCM-STR-T3-5K-32LED-450-FLD-120-277 |
|               |                       |             | UCM-STR-T4-5K-32LED-450-120-277     | UCM-STR-T4-5K-32LED-450-FTG-120-277     | UCM-STR-T4-5K-32LED-450-FLD-120-277 |
|               |                       |             | UCM-STR-T5-5K-32LED-450-120-277     | UCM-STR-T5-5K-32LED-450-FTG-120-277     | UCM-STR-T5-5K-32LED-450-FLD-120-277 |
|               | 4 Windows<br>WND      | 3K<br>3000K | UCM-WND-STR-T2-3K-32LED-450-120-277 |                                         |                                     |
|               |                       |             | UCM-WND-STR-T3-3K-32LED-450-120-277 |                                         |                                     |
|               |                       |             | UCM-WND-STR-T4-3K-32LED-450-120-277 |                                         |                                     |
|               |                       |             | UCM-WND-STR-T5-3K-32LED-450-120-277 |                                         |                                     |
|               |                       | 4K<br>4000K | UCM-WND-STR-T2-4K-32LED-450-120-277 | UCM-WND-STR-T2-4K-32LED-450-FTG-120-277 |                                     |
|               |                       |             | UCM-WND-STR-T3-4K-32LED-450-120-277 | UCM-WND-STR-T3-4K-32LED-450-FTG-120-277 |                                     |
|               |                       |             | UCM-WND-STR-T4-4K-32LED-450-120-277 |                                         |                                     |
|               |                       |             | UCM-WND-STR-T5-4K-32LED-450-120-277 | UCM-WND-STR-T5-4K-32LED-450-FTG-120-277 |                                     |
|               |                       | 5K<br>5000K | UCM-WND-STR-T2-5K-32LED-450-120-277 | UCM-WND-STR-T2-5K-32LED-450-FTG-120-277 |                                     |
|               |                       |             | UCM-WND-STR-T3-5K-32LED-450-120-277 | UCM-WND-STR-T3-5K-32LED-450-FTG-120-277 |                                     |
|               |                       |             | UCM-WND-STR-T4-5K-32LED-450-120-277 |                                         |                                     |
|               |                       |             | UCM-WND-STR-T5-5K-32LED-450-120-277 | UCM-WND-STR-T5-5K-32LED-450-FTG-120-277 |                                     |
|               | SR<br>Solid Rings     | 3K<br>3000K | UCM-SR-STR-T2-3K-32LED-450-120-277  |                                         |                                     |
|               |                       |             | UCM-SR-STR-T3-3K-32LED-450-120-277  |                                         |                                     |
|               |                       |             | UCM-SR-STR-T4-3K-32LED-450-120-277  |                                         |                                     |
|               |                       |             | UCM-SR-STR-T5-3K-32LED-450-120-277  |                                         |                                     |
|               |                       | 4K<br>4000K | UCM-SR-STR-T2-4K-32LED-450-120-277  | UCM-SR-STR-T2-4K-32LED-450-FTG-120-277  |                                     |
|               |                       |             | UCM-SR-STR-T3-4K-32LED-450-120-277  | UCM-SR-STR-T3-4K-32LED-450-FTG-120-277  |                                     |
|               |                       |             | UCM-SR-STR-T4-4K-32LED-450-120-277  |                                         |                                     |
|               |                       |             | UCM-SR-STR-T5-4K-32LED-450-120-277  |                                         |                                     |
|               |                       | 5K<br>5000K | UCM-SR-STR-T2-5K-32LED-450-120-277  |                                         |                                     |
|               |                       |             | UCM-SR-STR-T3-5K-32LED-450-120-277  |                                         |                                     |
|               |                       |             | UCM-SR-STR-T4-5K-32LED-450-120-277  | UCM-SR-STR-T2-5K-32LED-450-FTG-120-277  |                                     |
|               |                       |             | UCM-SR-STR-T5-5K-32LED-450-120-277  |                                         |                                     |
|               | VSL<br>Vertical Slots | 3K<br>3000K | UCM-VSL-STR-T2-3K-32LED-450-120-277 |                                         |                                     |
|               |                       |             | UCM-VSL-STR-T3-3K-32LED-450-120-277 |                                         |                                     |
|               |                       |             | UCM-VSL-STR-T4-3K-32LED-450-120-277 |                                         |                                     |
|               |                       |             | UCM-VSL-STR-T5-3K-32LED-450-120-277 |                                         |                                     |
|               |                       | 4K<br>4000K | UCM-VSL-STR-T2-4K-32LED-450-120-277 | UCM-VSL-STR-T2-4K-32LED-450-FTG-120-277 |                                     |
|               |                       |             | UCM-VSL-STR-T3-4K-32LED-450-120-277 |                                         |                                     |
|               |                       |             | UCM-VSL-STR-T4-4K-32LED-450-120-277 |                                         |                                     |
|               |                       |             | UCM-VSL-STR-T5-4K-32LED-450-120-277 | UCM-VSL-STR-T5-4K-32LED-450-FTG-120-277 |                                     |
|               |                       | 5K<br>5000K | UCM-VSL-STR-T2-5K-32LED-450-120-277 | UCM-VSL-STR-T2-5K-32LED-450-FTG-120-277 |                                     |
|               |                       |             | UCM-VSL-STR-T3-5K-32LED-450-120-277 |                                         |                                     |
|               |                       |             | UCM-VSL-STR-T4-5K-32LED-450-120-277 |                                         |                                     |
|               |                       |             | UCM-VSL-STR-T5-5K-32LED-450-120-277 | UCM-VSL-STR-T5-5K-32LED-450-FTG-120-277 |                                     |
|               | LUM<br>Luminous Rings | 3K<br>3000K | UCM-LUM-STR-T2-3K-32LED-450-120-277 |                                         |                                     |
|               |                       |             | UCM-LUM-STR-T3-3K-32LED-450-120-277 |                                         |                                     |
|               |                       |             | UCM-LUM-STR-T4-3K-32LED-450-120-277 |                                         |                                     |
|               |                       |             | UCM-LUM-STR-T5-3K-32LED-450-120-277 |                                         |                                     |
|               |                       | 4K<br>4000K | UCM-LUM-STR-T2-4K-32LED-450-120-277 | UCM-LUM-STR-T2-4K-32LED-450-FTG-120-277 |                                     |
|               |                       |             | UCM-LUM-STR-T3-4K-32LED-450-120-277 |                                         |                                     |
|               |                       |             | UCM-LUM-STR-T4-4K-32LED-450-120-277 |                                         |                                     |
|               |                       |             | UCM-LUM-STR-T5-4K-32LED-450-120-277 | UCM-LUM-STR-T5-4K-32LED-450-FTG-120-277 |                                     |
|               |                       | 5K<br>5000K | UCM-LUM-STR-T2-5K-32LED-450-120-277 | UCM-LUM-STR-T2-5K-32LED-450-FTG-120-277 |                                     |
|               |                       |             | UCM-LUM-STR-T3-5K-32LED-450-120-277 |                                         |                                     |
|               |                       |             | UCM-LUM-STR-T4-5K-32LED-450-120-277 |                                         |                                     |
|               |                       |             | UCM-LUM-STR-T5-5K-32LED-450-120-277 | UCM-LUM-STR-T5-5K-32LED-450-FTG-120-277 |                                     |



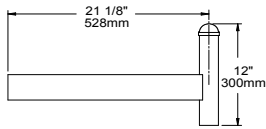
ARCHITECTURAL AREA LIGHTING  
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P 626.968.5666 | F 626.369.2695 | www.aal.net  
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Rev October 26, 2016 8:10 AM

JOB \_\_\_\_\_  
TYPE \_\_\_\_\_  
NOTES \_\_\_\_\_

SLA8D

WT: 5 LBS

EPA: .40

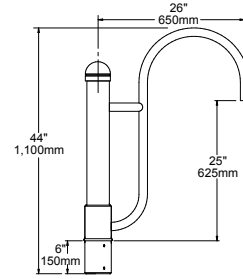


4" OR 5" POLE

SLA9

WT: 18 LBS

EPA: 1.90

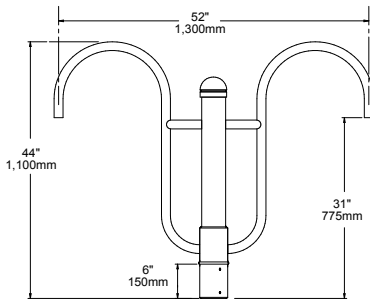


4" POLE

SLA9-2

WT: 24 LBS

EPA: 2.44

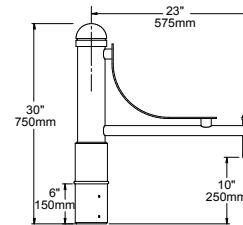


4" POLE

SLA10

WT: 9 LBS

EPA: 1.09

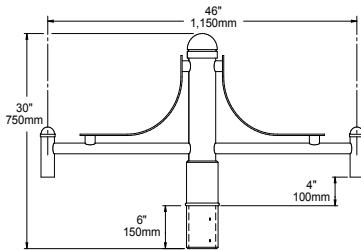


4" POLE

SLA10-2

WT: 16 LBS

EPA: 1.47

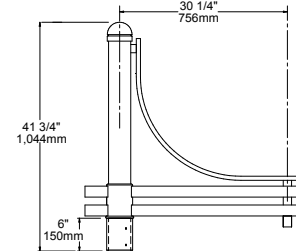


4" POLE

SLA16

WT: 18 LBS

EPA: 2.88

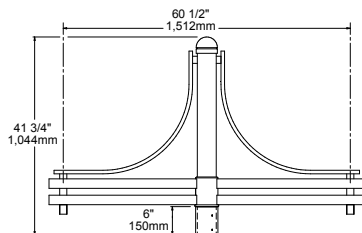


4" POLE

SLA16-2

WT: 28 LBS

EPA: 4.38

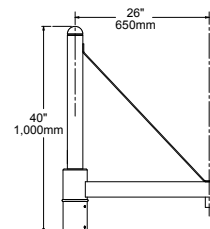


4" POLE

SLA17

WT: 18 LBS

EPA: 1.50



4" POLE

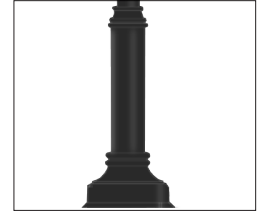


# DB6 – Decorative Pole

TYPE

A-4-HSS- & A-5

## 4" ROUND (RD) & FLUTED (FL) DECORATIVE BASE



DB6

| 1. BASE | 2. POLE  | 3. OAH | 4. COLOR | 5. OPTIONS/ACCESSORIES |         |  |  |
|---------|----------|--------|----------|------------------------|---------|--|--|
| DB6     | 4R14-125 | 14     | BLT      | RBC                    | BBS4-24 |  |  |

| MAXIMUM ALLOWABLE EPA (MPH) |          |            |               |    |      |      |      |      |      |     |     |     |
|-----------------------------|----------|------------|---------------|----|------|------|------|------|------|-----|-----|-----|
| 1. BASE                     | 2. POLE  | 3. OAH     | SHAFT         | WT | 85   | 90   | 100  | 110  | 120  | 130 | 140 | 150 |
| DB6                         | 4R10-125 | 10' (3.1m) | 4" RD x .125" | 50 | 19.4 | 17.1 | 13.5 | 10.8 | 8.9  | 7.4 | 6.3 | 5.5 |
| DB6                         | 4R12-125 | 12' (3.7m) | 4" RD x .125" | 54 | 15.3 | 13.4 | 10.5 | 8.3  | 6.7  | 5.6 | 4.7 | 4.0 |
| DB6                         | 4R14-125 | 14' (4.3m) | 4" RD x .125" | 57 | 12.3 | 10.7 | 8.2  | 6.3  | 5.0  | 4.1 | 3.4 | 2.9 |
| DB6                         | 4R16-125 | 16' (4.9m) | 4" RD x .125" | 61 | 10.0 | 8.6  | 6.4  | 4.8  | 3.6  | 2.9 | 2.4 | 2.0 |
| DB6                         | 4F10-188 | 10' (3.1m) | 4" FL x .188" | 56 | 22.1 | 19.5 | 15.4 | 12.4 | 10.2 | 8.5 | 7.1 | 6.1 |
| DB6                         | 4F12-188 | 12' (3.7m) | 4" FL x .188" | 62 | 17.6 | 15.4 | 12.1 | 9.6  | 7.7  | 6.4 | 5.3 | 4.4 |
| DB6                         | 4F14-188 | 14' (4.3m) | 4" FL x .188" | 67 | 14.3 | 12.5 | 9.6  | 7.5  | 5.9  | 4.8 | 3.9 | 3.2 |
| DB6                         | 4F16-188 | 16' (4.9m) | 4" FL x .188" | 72 | 11.7 | 10.1 | 7.6  | 5.8  | 4.4  | 3.5 | 2.7 | 2.2 |
| DB6                         | 4R10-226 | 10' (3.1m) | 4" RD x .226" | 60 | 23.8 | 21.0 | 16.7 | 13.5 | 11.1 | 9.3 | 8.0 | 6.9 |
| DB6                         | 4R12-226 | 12' (3.7m) | 4" RD x .226" | 66 | 19.2 | 16.9 | 13.3 | 10.6 | 8.6  | 7.2 | 6.1 | 5.3 |
| DB6                         | 4R14-226 | 14' (4.3m) | 4" RD x .226" | 73 | 15.9 | 13.9 | 10.8 | 8.4  | 6.8  | 5.6 | 4.7 | 4.0 |
| DB6                         | 4R16-226 | 16' (4.9m) | 4" RD x .226" | 79 | 12.4 | 12.3 | 9.4  | 7.3  | 5.7  | 4.7 | 4.0 | 3.3 |

Note: Overall height is measured to top of pole.

### SPECIFICATIONS

Base shall be cast aluminum #356 alloy, free of any porosity, foreign materials, or cosmetic fillers. Base casting shall be heat treated to a T-6 condition, and of uniform wall thickness, with no warping or mold shifting.

### WARNINGS

Caution must be exercised in the selection of a design wind speed when the pole is to be installed in a special wind region (as indicated by the wind map) or in an area where wind speed is unpredictable.

AAL recommends consulting a local engineer when the pole is to be installed in an area that may be subject to extreme weather and exposure

Poles installed on structures such as buildings and bridges may be subjected to vibration, oscillations, and other fatigue effects which are not covered by the AAL warranty.

The use of banners or other appendages can severely affect the loading of a pole. No banner or other appendage should be attached to an AAL pole unless approved by AAL.

If the products are to be used on an existing foundation or on other structures, the customer assumes all responsibility for the structural integrity of the existing foundation, anchorage or structures and all the consequences arising therefrom.

### CAUTION

Poles should never be erected without the luminaire installed.

Anchor bolts shall be hot dip galvanized steel. Eight galvanized hex nuts and flat washers, and a bolt circle template shall be provided. Anchor bolt for poles are 3/4" x 24" x 3".

### CERTIFICATION

Certified UL 1598 in accordance with Article 410 of ANSI/NFPA 70, National Electrical Code.

### 2. COLOR

|                      |                            |
|----------------------|----------------------------|
| WH Arctic White      | VBU Verde Blue             |
| BL Black             | CRT Corten                 |
| BLT Matte Black      | MAL Matte Aluminum         |
| DB Dark Bronze       | MG Medium Grey             |
| DGN Dark Green       | AGN Antique Green          |
| TT Titanium          | LG Light Grey              |
| WDB Weathered Bronze | RAL Premium Color          |
| MDB Bronze Metallic  | CUSTOM * * Contact Factory |

### 3. OPTIONS / ACCESSORIES

FH (Flag holder. Specify location on pole)

FS1 (Single weatherproof fuse holder. Fuse by others.)

FS2 (Double weatherproof fuse holder. Fuse by others.)

LR (Ladder rest. Slips over a 4" O.D. pole.)

PCA-T (Rotatable photocell housing. The housing slips over a 4"/100mm O.D. pole. A fixture slips over the 4"/100mm O.D. tenon. Includes an internal twist lock receptacle, and an access cover with integral lens and stainless steel tether. Adds 5"/125mm to the overall height of the pole/fixture assembly. Prewired on the load side and line side for easy installation. Photocell by others.)

PCR (Low profile twist lock photocell receptacle with cast pole cap top. Secures to the top of the pole with three stainless steel set screws. Photocell by others.)

PLT (Plant Hanger. For 4" O.D. poles. (specify location on pole)

RBC (Cast aluminum receptacle housing, integrally welded to the pole. Includes a NEC approved clear weatherproof cover. Does not include a receptacle or internal wiring.)

JOB \_\_\_\_\_  
TYPE \_\_\_\_\_  
NOTES \_\_\_\_\_



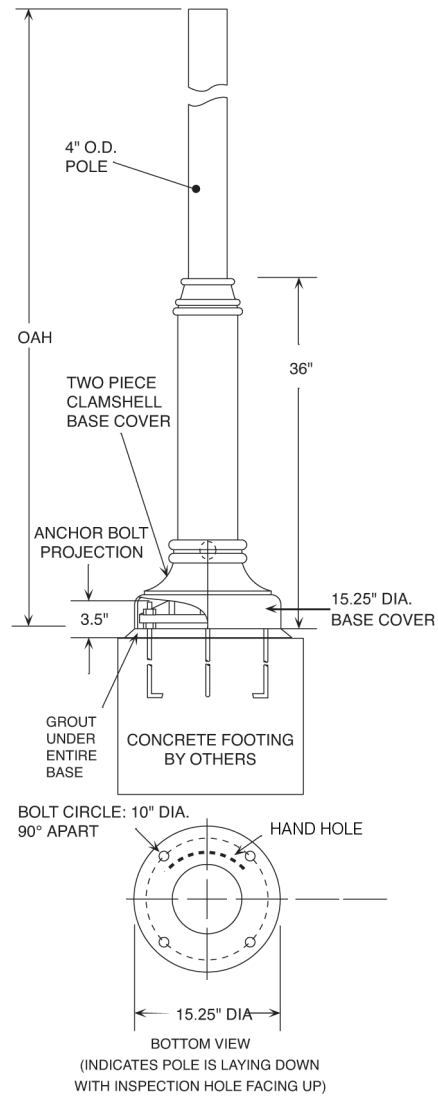
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# DB6 – Decorative Pole

TYPE

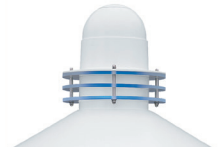
4" ROUND (RD) & FLUTED (FL) DECORATIVE BASE

## DIMENSIONS



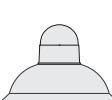
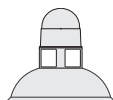
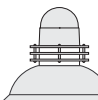
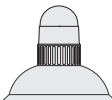
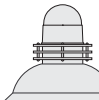
## FEATURES

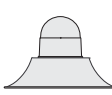
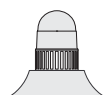
- DLC qualified
- Up to 1000' wireless communication
- Motion sensing up to 40' mounting height
- Superior BUG ratings
- Types II, III, IV, V and custom distributions
- IP66, 3G vibration housing
- 20kV/10kA surge suppression
- 2700 – 5000K CCT
- >560 nm Amber
- Custom lumen packages
- Integral thermal protection
- 0-10V dimmable
- 13 standard powder coat finishes

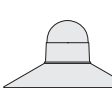
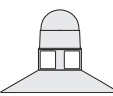


## SPECIFICATIONS

|                           |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |
|---------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
|                           |  |  |  |  |  |
| ANGLED HOOD CONFIGURATION | UCM-ANG                                                                           | UCM-WND-ANG                                                                       | UCM-SR-ANG                                                                        | UCM-VSL-ANG                                                                         | UCM-LUM-ANG                                                                         |
| DIAMETER                  | 20"/508mm                                                                         | 20"/508mm                                                                         | 20"/508mm                                                                         | 20"/508mm                                                                           | 20"/508mm                                                                           |
| HEIGHT                    | 14.7"/373mm                                                                       | 20.5"/520mm                                                                       | 20.7"/526mm                                                                       | 20.5"/521mm                                                                         | 20.6"/523mm                                                                         |
| WEIGHT                    | 18.25 lbs/8.28kg                                                                  | 21.75 lbs/9.86kg                                                                  | 25 lbs/11.3kg                                                                     | 22.25 lbs/10.1kg                                                                    | 24.25 lbs/11kg                                                                      |
| EPA                       | .60                                                                               | .72                                                                               | .74                                                                               | .72                                                                                 | .74                                                                                 |

|                         |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
|                         |  |  |  |  |  |
| BELL HOOD CONFIGURATION | UCM-BEL                                                                           | UCM-WND-BEL                                                                       | UCM-SR-BEL                                                                        | UCM-VSL-BEL                                                                         | UCM-LUM-BEL                                                                         |
| DIAMETER                | 24"/610mm                                                                         | 24"/610mm                                                                         | 24"/610mm                                                                         | 24"/610mm                                                                           | 24"/610mm                                                                           |
| HEIGHT                  | 15.8"/401mm                                                                       | 21.4"/543mm                                                                       | 21.6"/549mm                                                                       | 19.37"/492mm                                                                        | 21.5"/546mm                                                                         |
| WEIGHT                  | 20.25 lbs/9.2kg                                                                   | 23.5 lbs/10.6kg                                                                   | 27 lbs/12.25kg                                                                    | 24.25 lbs/11kg                                                                      | 26 lbs/11.8kg                                                                       |
| EPA                     | .73                                                                               | .85                                                                               | .87                                                                               | .85                                                                                 | .85                                                                                 |

|                          |                                                                                    |                                                                                    |                                                                                    |                                                                                      |                                                                                      |
|--------------------------|------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
|                          |  |  |  |  |  |
| FLARE HOOD CONFIGURATION | UCM-FLR                                                                            | UCM-WND-FLR                                                                        | UCM-SR-FLR                                                                         | UCM-VSL-FLR                                                                          | UCM-LUM-FLR                                                                          |
| DIAMETER                 | 22"/559mm                                                                          | 22"/559mm                                                                          | 22"/559mm                                                                          | 22"/559mm                                                                            | 22"/559mm                                                                            |
| HEIGHT                   | 14.5"/368mm                                                                        | 19.8"/503mm                                                                        | 20.1"/510mm                                                                        | 19.8"/503mm                                                                          | 20"/508mm                                                                            |
| WEIGHT                   | 18.5 lbs/8.4kg                                                                     | 21.75 lbs/9.87kg                                                                   | 25.25 lbs/10.1kg                                                                   | 21.75 lbs/9.86kg                                                                     | 24.25 lbs/11kg                                                                       |
| EPA                      | .53                                                                                | .65                                                                                | .67                                                                                | .65                                                                                  | .67                                                                                  |

|                             |                                                                                     |                                                                                     |                                                                                     |                                                                                       |                                                                                       |
|-----------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
|                             |  |  |  |  |  |
| STRAIGHT HOOD CONFIGURATION | UCM-STR                                                                             | UCM-WND-STR                                                                         | UCM-SR-STR                                                                          | UCM-VSL-STR                                                                           | UCM-LUM-STR                                                                           |
| DIAMETER                    | 24"/610mm                                                                           | 24"/610mm                                                                           | 24"/610mm                                                                           | 24"/610mm                                                                             | 24"/610mm                                                                             |
| HEIGHT                      | 14"/355mm                                                                           | 19.8"/503mm                                                                         | 20"/508mm                                                                           | 19.8"/503mm                                                                           | 19.9"/505mm                                                                           |
| WEIGHT                      | 20 lbs/9.07kg                                                                       | 23.25 lbs/10.55kg                                                                   | 26.75 lbs/12.13kg                                                                   | 23.75 lbs/10.77kg                                                                     | 25.75 lbs/11.68kg                                                                     |
| EPA                         | .59                                                                                 | .71                                                                                 | .73                                                                                 | .71                                                                                   | .73                                                                                   |

|                                 |                                                                                     |                                                                                     |                                                                                     |                                                                                       |                                                                                       |
|---------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
|                                 |  |  |  |  |  |
| SKIRTED BELL HOOD CONFIGURATION | UCM-SKB                                                                             | UCM-WND-SKB                                                                         | UCM-SR-SKB                                                                          | UCM-VSL-SKB                                                                           | UCM-LUM-SKB                                                                           |
| DIAMETER                        | 24"/610mm                                                                           | 24"/610mm                                                                           | 24"/610mm                                                                           | 24"/610mm                                                                             | 24"/610mm                                                                             |
| HEIGHT                          | 19.7"/500mm                                                                         | 23.9"/607mm                                                                         | 24.2"/615mm                                                                         | 23.9"/607mm                                                                           | 24.1"/612mm                                                                           |
| WEIGHT                          | 20.5 lbs/9.3kg                                                                      | 23.75 lbs/10.77kg                                                                   | 27 lbs/12.25kg                                                                      | 24.25 lbs/11kg                                                                        | 26.25 lbs/11.9kg                                                                      |
| EPA                             | .90                                                                                 | 1.03                                                                                | 1.05                                                                                | 1.03                                                                                  | 1.05                                                                                  |



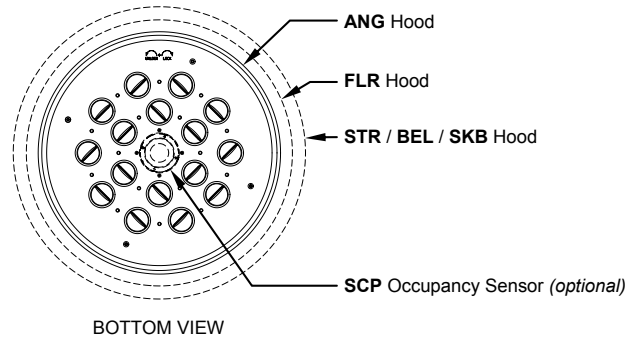
3000K unlit or 3000K without luminous element only  
MO-XX30 configurations only



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JOB \_\_\_\_\_  
TYPE \_\_\_\_\_  
NOTES \_\_\_\_\_





## ORDERING INFORMATION

| 1     | 2    | 3            | 4   | 5             | 6      | 7       | 8       | 9       | 10       |
|-------|------|--------------|-----|---------------|--------|---------|---------|---------|----------|
| UCM   | STR  | T5-32LED     | 4K  | 450           | BLT    |         |         | 120     | SLA17    |
| MODEL | Hood | Distribution | CCT | Lumen Package | Finish | Options | Control | Voltage | Mounting |

### 1. MODEL

|         |                                              |
|---------|----------------------------------------------|
| UCM     | Universe medium without luminous element     |
| UCM-WND | Universe medium with luminous window         |
| UCM-SR  | Universe medium with luminous solid rings    |
| UCM-VSL | Universe medium with luminous vertical slots |
| UCM-LUM | Universe medium with luminous rings          |

### 2. HOOD (May choose one)

|          |                                                      |
|----------|------------------------------------------------------|
| FLR      | Flared hood                                          |
| FLR-STSS | Flared hood in natural brushed stainless steel       |
| FLR-COP  | Flared hood in natural brushed copper                |
| ANG      | Angled hood                                          |
| ANG-STSS | Angled hood in natural brushed stainless steel       |
| ANG-COP  | Angled hood in natural brushed copper                |
| STR      | Straight hood                                        |
| STR-STSS | Straight hood in natural brushed stainless steel     |
| STR-COP  | Straight hood in natural brushed copper              |
| BEL      | Bell hood                                            |
| BEL-STSS | Bell hood in natural brushed stainless steel         |
| BEL-COP  | Bell hood in natural brushed copper                  |
| SKB      | Skirted bell hood                                    |
| SKB-STSS | Skirted bell hood in natural brushed stainless steel |
| SKB-COP  | Skirted bell hood in natural brushed copper          |

### 3. DISTRIBUTION

MicroCore Precision aimed optics

|          |                     |
|----------|---------------------|
| T2-32LED | Type 2              |
| T3-32LED | Type 3              |
| T4-32LED | Type 4              |
| T5-32LED | Type 5              |
| TX-32LED | Custom <sup>1</sup> |

### 4. COLOR TEMPERATURE

|     |                                          |
|-----|------------------------------------------|
| 3K  | 3000K                                    |
| 4K  | 4000K                                    |
| 5K  | 5000K                                    |
| 27K | 2700K <sup>1</sup>                       |
| 35K | 3500K <sup>1</sup>                       |
| AM  | >560 nm monochromatic amber <sup>1</sup> |

### 5. LUMEN PACKAGE

|     |                                              |
|-----|----------------------------------------------|
| 700 | 71 watts                                     |
| 450 | 48 watts                                     |
| XMA | Custom wattage or drive current <sup>1</sup> |

### 6. FINISH

#### Standard Color

|     |                  |
|-----|------------------|
| WH  | Arctic White     |
| BL  | Black            |
| BLT | Matte Black      |
| DB  | Dark Bronze      |
| DGN | Dark Green       |
| TT  | Titanium         |
| WDB | Weathered Bronze |
| MDB | Bronze Metallic  |
| VBU | Verde Blue       |
| CRT | Corten           |
| MAL | Matte Aluminum   |
| MG  | Medium Grey      |
| AGN | Antique Green    |
| LG  | Light Grey       |

#### Premium Color

|        |                   |
|--------|-------------------|
| SHK    | Shamrock          |
| SPP    | Salt and Pepper   |
| SFM    | Seafoam           |
| WCP    | Weathered Copper  |
| RAL    | RAL 4 digit Color |
| CUSTOM | Custom Color      |

### 7. OPTIONS (May choose as noted)

|     |                                       |
|-----|---------------------------------------|
| FTG | Flat clear glass lens <sup>1</sup>    |
| FLD | Flat diffused glass lens <sup>3</sup> |
| SAG | Sag clear glass lens <sup>1,3</sup>   |
| HSS | House Side shield for Type 4          |
| SLC | Unlit (luminous) element              |
| R80 | 80 CRI minimum <sup>1</sup>           |
| BL  | Blue inner lens                       |
| RD  | Red inner lens                        |
| GRN | Green inner lens                      |

### 8. CONTROLS – (May choose as noted)

|           |                                                       |
|-----------|-------------------------------------------------------|
| WIR       | wiScape connectivity                                  |
| WIRSC     | wiScape connectivity, integral motion sensor          |
| SCP       | Integral photo-control and motion sensor <sup>4</sup> |
| SCPREMOTE | Handheld commissioning tool <sup>4</sup>              |

### 9. VOLTAGE

|         |                   |
|---------|-------------------|
| 120-277 | 120-277 VAC input |
| 347     | 347 VAC input     |
| 480     | 480 VAC input     |

### 9. MOUNTING

#### POLE MOUNT

|            |           |            |
|------------|-----------|------------|
| SLA2       | SLA3      | SLA4       |
| SLA4-2     | SLA7      | SLA7-2     |
| SLA7(5)    | SLA7(5)-2 | SLA8D      |
| SLA9       | SLA9-2    | SLA10      |
| SLA10-2    | SLA16     | SLA16-2    |
| SLA17      | SLA17-2   | SLA17(5)   |
| SLA17(5)-2 | SLA18     | SLA18-2    |
| SLA20      | SLA20-2   | SLA20A     |
| SLA20A-2   | SLA20B    | SLA20B-2   |
| SLA20C     | SLA20C-2  | SLA20D     |
| SLA20D-2   | SLA22D    | SLA24      |
| SLA24-2    | SLA24(5)  | SLA24(5)-2 |
| TRA4       | TRA7      | TRA7-2     |
| TRA8       | TRA8-2    | TRA9       |
| TRA9-2     |           |            |

#### WALL MOUNT

|        |       |       |
|--------|-------|-------|
| WMA4   | WMA5  | WMA6  |
| WMA8   | WMA9D | WMA10 |
| WMA11  | WMA12 | WMA16 |
| WMA17  | WMA18 | WMA20 |
| WMA22D | WMA24 | WMA37 |
| WMA38  | WMA39 |       |

<sup>1</sup> Contact factory

<sup>2</sup> Not for AM color temperature

<sup>3</sup> Not for WIR, WIRSC or SCP control options

<sup>4</sup> Handheld commissioning tool is required to separately configure or adjust any number of SCP sensors.

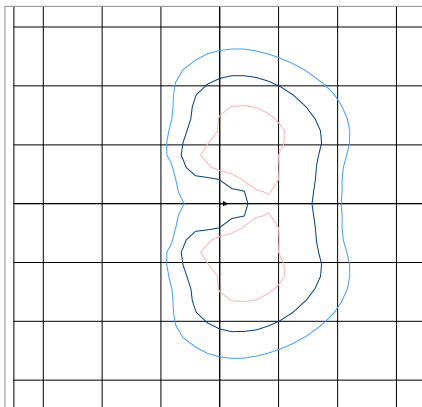
## LUMINAIRE PERFORMANCE (CONTINUED) Actual measured performance to be within +/-3% of the stated values

| Configuration         |                   |               |                             | Ordering Code               | 32LED-5K-700         |                 |   |   |      | 32LED-4K-700          |                 |   |   |      | 32LED-3K-700       |                 |   |   |   |
|-----------------------|-------------------|---------------|-----------------------------|-----------------------------|----------------------|-----------------|---|---|------|-----------------------|-----------------|---|---|------|--------------------|-----------------|---|---|---|
| System Watts          | Luminous Element  | Lens          | Distribution                |                             | Bright White (5000K) |                 |   |   |      | Neutral White (4000K) |                 |   |   |      | Warm White (3000K) |                 |   |   |   |
|                       |                   |               |                             |                             | Delivered Lumens     | Efficacy (Lm/W) | B | U | G    | Delivered Lumens      | Efficacy (Lm/W) | B | U | G    | Delivered Lumens   | Efficacy (Lm/W) | B | U | G |
| 47                    | (None)            | (None)        | Type II                     | UCM-[HOOD]-T2               | 4844                 | 103             | 2 | 0 | 2    | 4830                  | 103             | 2 | 0 | 2    | 4607               | 98              | 2 | 0 | 2 |
|                       |                   |               | Type III                    | UCM-[HOOD]-T3               | 4805                 | 102             | 1 | 0 | 2    | 4791                  | 102             | 1 | 0 | 2    | 4570               | 97              | 1 | 0 | 2 |
|                       |                   |               | TYPE IV                     | UCM-[HOOD]-T4               | 4805                 | 102             | 1 | 0 | 2    | 4791                  | 102             | 1 | 0 | 2    | 4570               | 97              | 1 | 0 | 2 |
|                       |                   |               | TYPE V                      | UCM-[HOOD]-T5               | 4839                 | 103             | 3 | 0 | 1    | 4825                  | 103             | 3 | 0 | 1    | 4602               | 98              | 3 | 0 | 1 |
|                       |                   | Clear Flat    | Type IV, HSS                | UCM-[HOOD]-T4-(...-HSS)     | 3539                 | 75              | 0 | 0 | 2    | 3529                  | 75              | 0 | 0 | 2    | 3327               | 71              | 0 | 0 | 2 |
|                       |                   |               | Type II                     | UCM-[HOOD]-T2-(...-CLR)     | 4180                 | 89              | 1 | 1 | 1    | 4168                  | 89              | 1 | 1 | 1    | 3976               | 85              | 1 | 1 | 1 |
|                       |                   |               | Type III                    | UCM-[HOOD]-T3-(...-CLR)     | 4147                 | 88              | 1 | 1 | 1    | 4135                  | 88              | 1 | 1 | 1    | 3944               | 84              | 1 | 1 | 1 |
|                       |                   |               | Type IV                     | UCM-[HOOD]-T4-(...-CLR)     | 4147                 | 88              | 1 | 1 | 1    | 4135                  | 88              | 1 | 1 | 1    | 3944               | 84              | 1 | 1 | 1 |
|                       |                   | Diffused Flat | TYPE V                      | UCM-[HOOD]-T5-(...-CLR)     | 4176                 | 89              | 2 | 0 | 1    | 4164                  | 89              | 2 | 0 | 1    | 3972               | 85              | 2 | 0 | 1 |
|                       |                   |               | Type II                     | UCM-[HOOD]-T2-(...-FLD)     | 3376                 | 72              | 1 | 1 | 1    | 3367                  | 72              | 1 | 1 | 1    | 3211               | 68              | 1 | 1 | 1 |
|                       |                   |               | Type III                    | UCM-[HOOD]-T3-(...-FLD)     | 3349                 | 71              | 1 | 1 | 1    | 3340                  | 71              | 1 | 1 | 1    | 3185               | 68              | 1 | 1 | 1 |
|                       |                   |               | Type IV                     | UCM-[HOOD]-T4-(...-FLD)     | 3349                 | 71              | 1 | 1 | 1    | 3340                  | 71              | 1 | 1 | 1    | 3185               | 68              | 1 | 1 | 1 |
| 49                    | WND<br>4 Windows  | (None)        | Type V                      | UCM-[HOOD]-T5-(...-FLD)     | 3373                 | 72              | 1 | 0 | 1    | 3363                  | 72              | 1 | 0 | 1    | 3208               | 68              | 1 | 0 | 1 |
|                       |                   |               | Type II                     | UCM-WND-[HOOD]-T2           | 4772                 | 97              | 2 | 1 | 2    | 4758                  | 97              | 2 | 1 | 2    | 4538               | 93              | 2 | 1 | 2 |
|                       |                   |               | Type III                    | UCM-WND-[HOOD]-T3           | 4820                 | 98              | 1 | 1 | 2    | 4806                  | 98              | 1 | 1 | 2    | 4584               | 94              | 1 | 1 | 2 |
|                       |                   |               | Type IV                     | UCM-WND-[HOOD]-T4           | 4792                 | 98              | 1 | 1 | 2    | 4778                  | 98              | 1 | 1 | 2    | 4558               | 93              | 1 | 1 | 2 |
|                       |                   |               | Type V                      | UCM-WND-[HOOD]-T5           | 4783                 | 98              | 3 | 2 | 2    | 4769                  | 97              | 3 | 2 | 2    | 4549               | 93              | 3 | 2 | 2 |
|                       |                   | Clear Flat    | Type IV, HSS                | UCM-WND-[HOOD]-T4-(...-HSS) | 3552                 | 72              | 0 | 1 | 2    | 3542                  | 72              | 0 | 1 | 2    | 3378               | 69              | 0 | 1 | 2 |
|                       |                   |               | Type II                     | UCM-WND-[HOOD]-T2-(...-CLR) | 4269                 | 87              | 1 | 1 | 1    | 4256                  | 87              | 1 | 1 | 1    | 4060               | 83              | 1 | 1 | 1 |
|                       |                   |               | Type III                    | UCM-WND-[HOOD]-T3-(...-CLR) | 4159                 | 85              | 1 | 1 | 1    | 4147                  | 85              | 1 | 1 | 1    | 3956               | 81              | 1 | 1 | 1 |
|                       |                   |               | Type IV                     | UCM-WND-[HOOD]-T4-(...-CLR) | 3944                 | 80              | 1 | 1 | 1    | 3932                  | 80              | 1 | 1 | 1    | 3751               | 77              | 1 | 1 | 1 |
|                       |                   | Diffused Flat | Type V                      | UCM-WND-[HOOD]-T5-(...-CLR) | 4235                 | 86              | 1 | 2 | 1    | 4223                  | 86              | 1 | 2 | 1    | 4028               | 82              | 1 | 2 | 1 |
|                       |                   |               | Type II                     | UCM-WND-[HOOD]-T2-(...-FLD) | 3394                 | 69              | 1 | 1 | 1    | 3384                  | 69              | 1 | 1 | 1    | 3228               | 66              | 1 | 1 | 1 |
|                       |                   |               | Type III                    | UCM-WND-[HOOD]-T3-(...-FLD) | 3425                 | 70              | 1 | 1 | 1    | 3415                  | 70              | 1 | 1 | 1    | 3257               | 66              | 1 | 1 | 1 |
|                       | SR<br>Solid Rings | (None)        | TYPE IV                     | UCM-WND-[HOOD]-T4-(...-FLD) | 3335                 | 68              | 1 | 1 | 1    | 3325                  | 68              | 1 | 1 | 1    | 3171               | 65              | 1 | 1 | 1 |
|                       |                   |               | Type V                      | UCM-WND-[HOOD]-T5-(...-FLD) | 3450                 | 70              | 2 | 1 | 1    | 3440                  | 70              | 2 | 1 | 1    | 3281               | 67              | 2 | 1 | 1 |
|                       |                   |               | Type II                     | UCM-SR-[HOOD]-T2            | 4716                 | 96              | 2 | 1 | 2    | 4702                  | 96              | 2 | 1 | 2    | 4485               | 92              | 2 | 1 | 2 |
|                       |                   |               | TYPE III                    | UCM-SR-[HOOD]-T3            | 4763                 | 97              | 1 | 1 | 2    | 4750                  | 97              | 1 | 1 | 2    | 4530               | 92              | 1 | 1 | 2 |
|                       |                   |               | TYPE IV                     | UCM-SR-[HOOD]-T4            | 4736                 | 97              | 1 | 1 | 2    | 4722                  | 96              | 1 | 1 | 2    | 4504               | 92              | 1 | 1 | 2 |
|                       |                   | Clear Flat    | TYPE V                      | UCM-SR-[HOOD]-T5            | 4727                 | 96              | 3 | 1 | 2    | 4713                  | 96              | 3 | 1 | 2    | 4496               | 92              | 3 | 1 | 2 |
|                       |                   |               | TYPE IV, HSS                | UCM-SR-[HOOD]-T4-(...-HSS)  | 3537                 | 72              | 0 | 1 | 2    | 3527                  | 72              | 0 | 1 | 2    | 3364               | 69              | 0 | 1 | 2 |
|                       |                   |               | Type II                     | UCM-SR-[HOOD]-T2-(...-CLR)  | 4785                 | 98              | 1 | 1 | 1    | 4771                  | 97              | 1 | 1 | 1    | 4551               | 93              | 1 | 1 | 1 |
|                       |                   |               | TYPE III                    | UCM-SR-[HOOD]-T3-(...-CLR)  | 4663                 | 95              | 1 | 1 | 1    | 4649                  | 95              | 1 | 1 | 1    | 4435               | 91              | 1 | 1 | 1 |
|                       |                   | Diffused Flat | TYPE IV                     | UCM-SR-[HOOD]-T4-(...-CLR)  | 4421                 | 90              | 1 | 1 | 1    | 4408                  | 90              | 1 | 1 | 1    | 4205               | 86              | 1 | 1 | 1 |
|                       |                   |               | TYPE V                      | UCM-SR-[HOOD]-T5-(...-CLR)  | 4192                 | 86              | 2 | 1 | 1    | 4180                  | 85              | 2 | 1 | 1    | 3987               | 81              | 2 | 1 | 1 |
|                       |                   |               | Type II                     | UCM-SR-[HOOD]-T2-(...-FLD)  | 3364                 | 69              | 1 | 1 | 1    | 3355                  | 68              | 1 | 1 | 1    | 3200               | 65              | 1 | 1 | 1 |
| VSL<br>Vertical Slots | (None)            | TYPE III      | UCM-SR-[HOOD]-T3-(...-FLD)  | 3395                        | 69                   | 1               | 1 | 1 | 3385 | 69                    | 1               | 1 | 1 | 3229 | 66                 | 1               | 1 | 1 |   |
|                       |                   | TYPE IV       | UCM-SR-[HOOD]-T4-(...-FLD)  | 3306                        | 67                   | 1               | 1 | 1 | 3296 | 67                    | 1               | 1 | 1 | 3144 | 64                 | 1               | 1 | 1 |   |
|                       |                   | Type V        | UCM-SR-[HOOD]-T5-(...-FLD)  | 3420                        | 70                   | 1               | 1 | 1 | 3410 | 70                    | 1               | 1 | 1 | 3253 | 66                 | 1               | 1 | 1 |   |
|                       |                   | TYPE II       | UCM-VSL-[HOOD]-T2           | 4725                        | 96                   | 2               | 0 | 2 | 4711 | 96                    | 2               | 0 | 2 | 4494 | 92                 | 2               | 0 | 2 |   |
|                       |                   | TYPE III      | UCM-VSL-[HOOD]-T3           | 4772                        | 97                   | 1               | 1 | 2 | 4759 | 97                    | 1               | 1 | 2 | 4539 | 93                 | 1               | 1 | 2 |   |
|                       | Clear Flat        | TYPE IV       | UCM-VSL-[HOOD]-T4           | 4745                        | 97                   | 1               | 1 | 2 | 4731 | 97                    | 1               | 1 | 2 | 4513 | 92                 | 1               | 1 | 2 |   |
|                       |                   | TYPE V        | UCM-VSL-[HOOD]-T5           | 4736                        | 97                   | 3               | 0 | 2 | 4722 | 96                    | 3               | 0 | 2 | 4504 | 92                 | 3               | 0 | 2 |   |
|                       |                   | TYPE V, HSS   | UCM-VSL-[HOOD]-T4-(...-HSS) | 3562                        | 73                   | 0               | 1 | 2 | 3552 | 72                    | 0               | 1 | 2 | 3388 | 69                 | 0               | 1 | 2 |   |
|                       |                   | Type II       | UCM-VSL-[HOOD]-T2-(...-CLR) | 4223                        | 86                   | 1               | 1 | 1 | 4210 | 86                    | 1               | 1 | 1 | 4016 | 82                 | 1               | 1 | 1 |   |
|                       | Diffused Flat     | TYPE III      | UCM-VSL-[HOOD]-T3-(...-CLR) | 4114                        | 84                   | 1               | 1 | 1 | 4102 | 84                    | 1               | 1 | 1 | 3913 | 80                 | 1               | 1 | 1 |   |
|                       |                   | TYPE IV       | UCM-VSL-[HOOD]-T4-(...-CLR) | 3901                        | 80                   | 1               | 1 | 1 | 3890 | 79                    | 1               | 1 | 1 | 3710 | 76                 | 1               | 1 | 1 |   |
|                       |                   | TYPE V        | UCM-VSL-[HOOD]-T5-(...-CLR) | 4189                        | 85                   | 2               | 0 | 1 | 4177 | 85                    | 2               | 0 | 1 | 3984 | 81                 | 2               | 0 | 1 |   |
| LUM<br>Luminous Rings | (None)            | Type II       | UCM-VSL-[HOOD]-T2-(...-FLD) | 3367                        | 69                   | 1               | 1 | 1 | 3358 | 69                    | 1               | 1 | 1 | 3203 | 65                 | 1               | 1 | 1 |   |
|                       |                   | TYPE III      | UCM-VSL-[HOOD]-T3-(...-FLD) | 3398                        | 69                   | 1               | 1 | 1 | 3388 | 69                    | 1               | 1 | 1 | 3232 | 66                 | 1               | 1 | 1 |   |
|                       |                   | TYPE IV       | UCM-VSL-[HOOD]-T4-(...-FLD) | 3308                        | 68                   | 1               | 1 | 1 | 3299 | 67                    | 1               | 1 | 1 | 3147 | 64                 | 1               | 1 | 1 |   |
|                       |                   | TYPE V        | UCM-VSL-[HOOD]-T5-(...-FLD) | 3423                        | 70                   | 1               | 0 | 1 | 3413 | 70                    | 1               | 0 | 1 | 3256 | 66                 | 1               | 0 | 1 |   |
|                       |                   | Type II       | UCM-LUM-[HOOD]-T2           | 4809                        | 98                   | 2               | 1 | 2 | 4795 | 98                    | 2               | 1 | 2 | 4574 | 93                 | 2               | 1 | 2 |   |
|                       | Clear Flat        | TYPE III      | UCM-LUM-[HOOD]-T3           | 4646                        | 95                   | 1               | 0 | 2 | 4633 | 95                    | 1               | 0 | 2 | 4419 | 90                 | 1               | 0 | 2 |   |
|                       |                   | TYPE IV       | UCM-LUM-[HOOD]-T4           | 4701                        | 96                   | 1               | 1 | 2 | 4687 | 96                    | 1               | 1 | 2 | 4471 | 91                 | 1               | 1 | 2 |   |
|                       |                   | TYPE V        | UCM-LUM-[HOOD]-T5           | 4733                        | 97                   | 3               | 1 | 1 | 4719 | 96                    | 3               | 1 | 1 | 4502 | 92                 | 3               | 1 | 1 |   |
|                       |                   | TYPE V, HSS   | UCM-LUM-[HOOD]-T4-(...-HSS) | 3564                        | 73                   | 0               | 1 | 2 | 3554 | 73                    | 0               | 1 | 2 | 3390 | 69                 | 0               | 1 | 2 |   |
|                       | Diffused Flat     | Type II       | UCM-LUM-[HOOD]-T2-(...-CLR) | 4207                        | 86                   | 1               | 1 | 1 | 4194 | 86                    | 1               | 1 | 1 | 4001 | 82                 | 1               | 1 | 1 |   |
|                       |                   | TYPE III      | UCM-LUM-[HOOD]-T3-(...-CLR) | 4131                        | 84                   | 1               | 1 | 1 | 4119 | 84                    | 1               | 1 | 1 | 3929 | 80                 | 1               | 1 | 1 |   |
|                       |                   | TYPE IV       | UCM-LUM-[HOOD]-T4-(...-CLR) | 3911                        | 80                   | 1               | 1 | 1 | 3900 | 80                    | 1               | 1 | 1 | 3720 | 76                 | 1               | 1 | 1 |   |

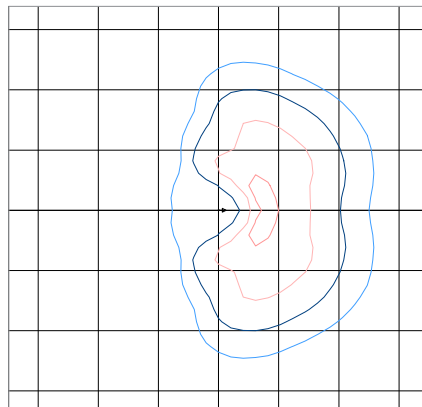
## ELECTRICAL CHARACTERISTICS

| Ordering Code                           |               | Line Input |         | Amps AC   | LED Drive (mA) | System Watts (w) | Min. Power Factor | MAx THD (%) | Driver Operating Temp. Range (°C) | Inrush Current peak |             | Dimming           |                            |
|-----------------------------------------|---------------|------------|---------|-----------|----------------|------------------|-------------------|-------------|-----------------------------------|---------------------|-------------|-------------------|----------------------------|
| MODEL                                   | LUMEN PACKAGE | VAC        | Hz      |           |                |                  |                   |             |                                   | (A)                 | T@ 50% (µs) | Dimming Range (V) | Source / Sink Current (mA) |
| UCM<br>UCM-(...SLC)                     | 700           | 120-277    | 50 / 60 | 0.6 - 0.3 | 650            | 71               | ≥9                | 20          | -30 TO +40                        | 15 - 32             | 100         | 0 - 10            | 1                          |
|                                         |               | 347        |         | 0.2       |                |                  |                   |             |                                   | 32                  | 100         |                   |                            |
|                                         |               | 480        |         | 0.2       |                |                  |                   |             |                                   | 32                  | 100         |                   |                            |
| UCM-WND<br>UCM-SR<br>UCM-VSL<br>UCM-LUM | 700           | 120-277    | 50 / 60 | 0.6 - 0.3 | 450            | 74               | ≥9                | 21          | -30 TO +40                        | 15 - 32             | 100         | 0 - 10            | 1                          |
|                                         |               | 347        |         | 0.2       |                |                  |                   |             |                                   | 32                  | 100         |                   |                            |
|                                         |               | 480        |         | 0.2       |                |                  |                   |             |                                   | 32                  | 100         |                   |                            |
| UCM<br>UCM-(...SLC)                     | 450           | 120-277    | 50 / 60 | 0.4       | 650            | 47               | ≥9                | 22          | -30 TO +40                        | 15 - 32             | 100         | 0 - 10            | 1                          |
|                                         |               | 347        |         | 0.1       |                |                  |                   |             |                                   | 32                  | 100         |                   |                            |
|                                         |               | 480        |         | 0.1       |                |                  |                   |             |                                   | 32                  | 100         |                   |                            |
| UCM-WND<br>UCM-SR<br>UCM-VSL<br>UCM-LUM | 450           | 120-277    | 50 / 60 | 0.2       | 450            | 49               | ≥9                | 23          | -30 TO +40                        | 15 - 32             | 100         | 0 - 10            | 1                          |
|                                         |               | 347        |         | 0.1       |                |                  |                   |             |                                   | 32                  | 100         |                   |                            |
|                                         |               | 480        |         | 0.1       |                |                  |                   |             |                                   | 32                  | 100         |                   |                            |

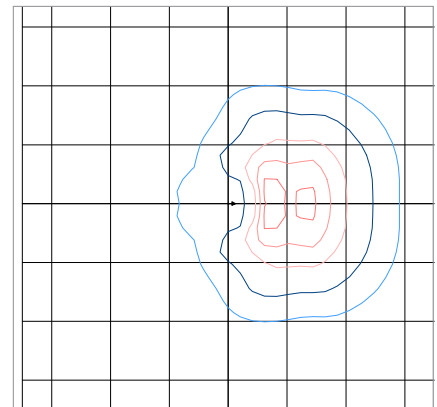
## ISOLINE TEMPLATES 16' Mounting Height



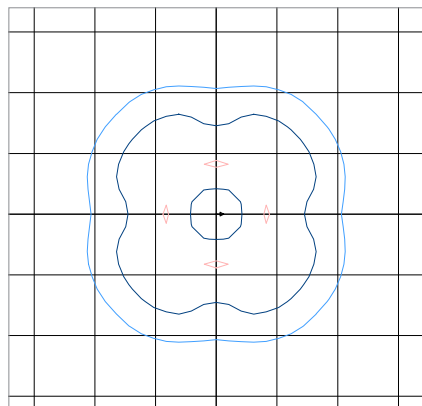
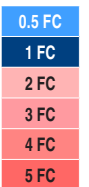
UCM-[HOOD]-T2-32LED-5K-700



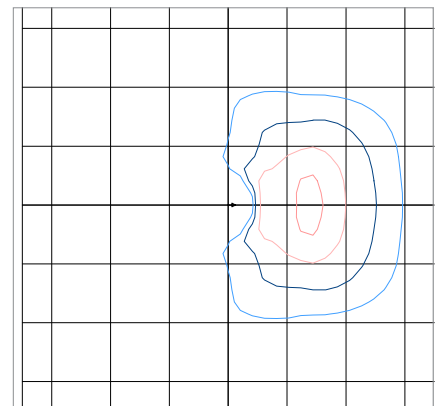
UCM-[HOOD]-T3-32LED-5K-700



UCM-[HOOD]-T4-32LED-5K-700



UCM-[HOOD]-T5-32LED-5K-700



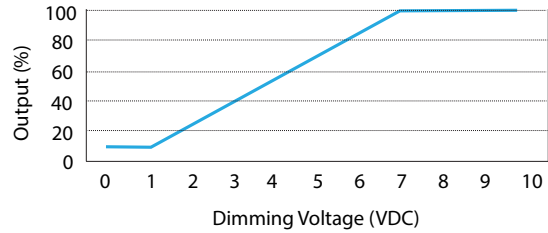
UCM-[HOOD]-T4-32LED-5K-700-HSS



## TM-21 LIFETIME CALCULATION

| Ambient Environment °C | Projected Lumen Maintenance (Khrs) |     |     |     |     | Reported L70 |
|------------------------|------------------------------------|-----|-----|-----|-----|--------------|
|                        | 15                                 | 25  | 50  | 60  | 100 |              |
| 25                     | 98%                                | 97% | 96% | 96% | 93% | >96Khrs.     |
| 40                     | 96%                                | 95% | 93% | 92% | 89% |              |

## DIMMING CURVE



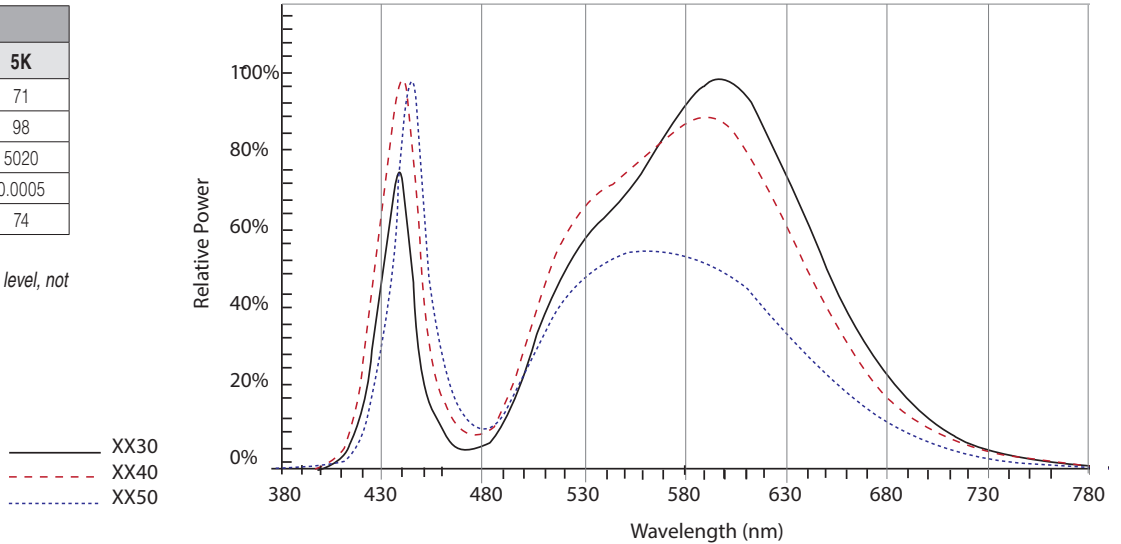
Note: Fixture does not dim to off, fixture dims to 10% minimum output.

## COLOR CHARACTERISTICS

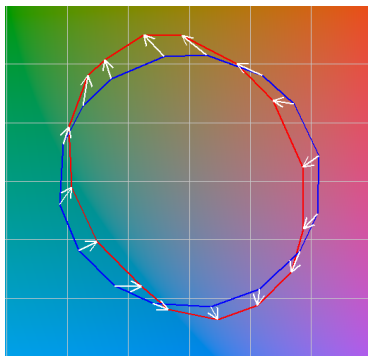
| Value  | Ordering Code |        |        |
|--------|---------------|--------|--------|
|        | 3K            | 4K     | 5K     |
| Rf     | 69            | 69     | 71     |
| Rg     | 99            | 99     | 98     |
| CCT(K) | 3122          | 3852   | 5020   |
| Duv    | 0.001         | 0.0004 | 0.0005 |
| CIE Ra | 74            | 73     | 74     |

Note: TM-30 reported at the discrete LED level, not fixture level.

## SPECTRAL POWER DISTRIBUTION COMPARISON

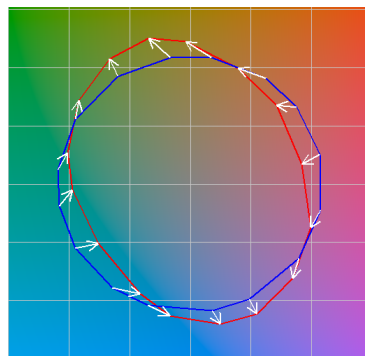


## COLOR VECTOR GRAPHIC



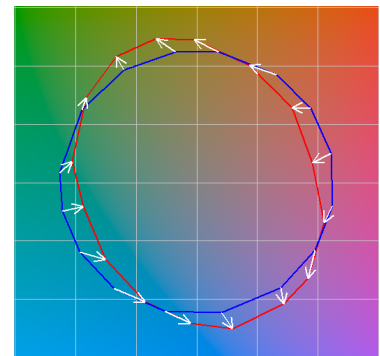
Reference Illuminant Series3 Series7 Test Source Series4 Series8 Series1 Series5 Series9 Series2 Series6 Series10

XX30



Reference Illuminant Series3 Series7 Test Source Series4 Series8 Series1 Series5 Series9 Series2 Series6 Series10

XX40



Reference Illuminant Series3 Series7 Test Source Series4 Series8 Series1 Series5 Series9 Series2 Series6 Series10

XX50

## SENSOR DETECTION RANGE

|          |       | SENSOR MOUNTING HEIGHT |     |     |     |     |     |     |       |     |       |      | RATIO |
|----------|-------|------------------------|-----|-----|-----|-----|-----|-----|-------|-----|-------|------|-------|
|          |       | 8'                     | 10' | 12' | 14' | 16' | 18' | 20' | 25'   | 30' | 35'   | 40'  |       |
| COVERAGE | SCP   | 20'                    | 25' | 30' | 35' | 40' | 45' | 50' | 62.5' | 75' | 87.5' | 100' | 1:2.5 |
| DIAMETER | WIRSC | 16'                    | 20' | 24' | 28' | 32' | 36' | 50' | N/A   | N/A | N/A   | N/A  | 1:2   |

## SPECIFICATIONS

### HOUSING

- All housing components shall be die-cast aluminum, sealed with continuous silicone rubber gaskets.
- Hood and spacers shall be heavy gauge spun aluminum with hemmed edges for added rigidity.
- Luminous rings shall be clear acrylic with an internal lens.
- Standard configurations do not require a flat lens, optional lenses shall be tempered glass
- All internal and external hardware shall be stainless steel.
- Optical bezel finish shall match the luminaire housing.

### OPTICAL

- Patent pending MicroCore™ LED modules shall independently aim each light emitting diode (LED) in both horizontal rotation and vertical tilt angle.
- LEDs shall be mounted to a metal printed circuit board assembly (PCBA) with a uniform conformal coating over the panel surface and electrical features.
- LED optics shall be clear injection molded PMMA acrylic.
- MicroCore™ PCBA and optic shall be sealed to a die-cast anodized aluminum heat sink with an injection molded silicone rubber gasket. IP66.
- Type 4 distribution with optional House Side Shield not available with clear or diffused glass lenses. Factory installed House Side Shield is optimized for Type 4 distribution and not recommended for use with Type 2 or 3 distribution and not available with type 5 distribution.

### ELECTRICAL

- Luminaires shall have integral surge protection that shall be U.L. recognized and have a surge current rating of 10,000 Amps using the industry standard 8/20uSec wave and surge rating of 372J.
- Drivers shall be U.L. recognized with an inrush current maximum of <20.0 Amps maximum at 230VAC.
- Drivers shall not be compatible with current sourcing dimmers, consult factory for current list of known compatible dimming systems, approved dimmers include Lutron Diva AVTV, Lutron Nova NFTV and NTFTV.

### CONTROLS

- Wireless enabled fixtures shall support bi-directional radio frequency (RF) communications utilizing IEEE 802.15.4 operating in the 2.4GHZ ISM band.
- Up to 1000' wireless range may be reduced by physical obstructions between fixtures.
- Motion sensor shall be flame retardant, UV resistant, impact resistant, recyclable polycarbonate.
- Motion Sensor shall use passive infrared (PIR) sensing technology that reacts to changes in infrared energy (moving body heat) within the coverage area. Careful consideration must be given to obstructions that may block the sensor's line of sight.
- Factory default settings for SCP option shall be:
  - High mode: 10V
  - Low mode: 1V
  - Ramp-up rate: disabled
  - Fade-down rate: disabled
  - Photocell: Off
  - Sensitivity: Full
  - Time Delay: Fade to low: 5 minutes
  - Time Delay: Fade to off: 1 hour

### PHOTOCELL / EGRESS ADAPTERS

- Adapter(s) shall slip over a 4"/100mm DIA. pole with the luminaire or arm slipping over the adapter to add a total of 4.5"/114mm to the overall height. Adapter(s) shall be prewired, independently rotatable 359°, and have a cast access cover with an integral lens and lanyard.
- Photocell adapter shall include an internal twist lock receptacle. Photocell by others.
- Egress adapter shall require an auxiliary 120 volt supply for operation of an integral MR16 lamp in the event of emergency. The lamp may be aimed and locked into position with an adjustment range of 15°-45°. Adapter shall have a socket that accepts miniature bi-pin MR16 lamps up to 50 watts, lamp by others.

### SERVICING

- Luminaire shall have tool-less service access to the gear compartment. Driver and surge suppressor shall be mounted to a prewired tray with quick disconnects that may be removed from the gear compartment.

### ARM MOUNTING

- Luminaire shall be attached to the arm assembly with three stainless steel bolts. The connection shall be sealed with a silicone compression gasket.
- Post top arms and brackets shall slip over a 4"/100mm O.D. or a 5"/127mm as configured and secured with six stainless steel set screws.
- Wall mounted arms and brackets shall require mounting hardware by others.

### FINISH

- Luminaire finish shall consist of a five stage pretreatment regimen with a polymer primer sealer, oven dry off, and top coated with a thermoset super TGIC polyester powder coat finish.
- Luminaire finish shall meet the AAMA 605.2 performance specification which includes passing a 3000 hour salt spray test for corrosion resistance.

### CERTIFICATION

- Luminaire shall be listed with ETL for outdoor, wet location use, UL1598, UL 8750 and Canadian CSA Std. C22.2 no.250.

### WARRANTY / TERMS AND CONDITIONS OF SALE

Download:

<http://www.hubbellighting.com/resources/warranty/>



ARCHITECTURAL AREA LIGHTING  
16555 East Gale Ave. | City of Industry | CA 91745  
P 626.968.5666 | F 626.369.2695 | www.aal.net  
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Rev October 26, 2016 8:10 AM

JOB \_\_\_\_\_  
TYPE \_\_\_\_\_  
NOTES \_\_\_\_\_

## DLC QUALIFIED PRODUCTS (Continued)

| Lumen Package | Luminous Element      | CCT         | STR – STRAIGHT HOOD                 |                                         |                                     |
|---------------|-----------------------|-------------|-------------------------------------|-----------------------------------------|-------------------------------------|
|               |                       |             | NO LENS Standard                    | FTG Flat clear glass lens               | FLD Flat diffused glass lens        |
| 700           | (None)                | 4K<br>4000K | UCM-FLR-T2-4K-32LED-450-120-277     |                                         |                                     |
|               |                       |             | UCM-FLR-T3-4K-32LED-450-120-277     |                                         |                                     |
|               |                       |             | UCM-FLR-T4-4K-32LED-450-120-277     |                                         |                                     |
|               |                       | 5K<br>5000K | UCM-FLR-T5-4K-32LED-450-120-277     |                                         |                                     |
|               |                       |             | UCM-FLR-T2-5K-32LED-450-120-277     |                                         |                                     |
|               |                       |             | UCM-FLR-T3-5K-32LED-450-120-277     |                                         |                                     |
|               | 4 Windows<br>WND      | 4K<br>4000K | UCM-FLR-T4-5K-32LED-450-120-277     |                                         |                                     |
|               |                       |             | UCM-FLR-T5-5K-32LED-450-120-277     |                                         |                                     |
|               |                       |             | UCM-WND-FLR-T2-4K-32LED-450-120-277 |                                         |                                     |
|               |                       | 5K<br>5000K | UCM-WND-FLR-T3-4K-32LED-450-120-277 |                                         |                                     |
|               |                       |             | UCM-WND-FLR-T4-4K-32LED-450-120-277 |                                         |                                     |
|               |                       |             | UCM-WND-FLR-T5-4K-32LED-450-120-277 |                                         |                                     |
| 450           | (None)                | 3K<br>3000K | UCM-STR-T2-3K-32LED-450-120-277     |                                         |                                     |
|               |                       |             | UCM-STR-T3-3K-32LED-450-120-277     |                                         |                                     |
|               |                       |             | UCM-STR-T4-3K-32LED-450-120-277     |                                         |                                     |
|               |                       |             | UCM-STR-T5-3K-32LED-450-120-277     |                                         |                                     |
|               |                       | 4K<br>4000K | UCM-STR-T2-4K-32LED-450-120-277     | UCM-STR-T2-4K-32LED-450-FTG-120-277     | UCM-STR-T2-4K-32LED-450-FLD-120-277 |
|               |                       |             | UCM-STR-T3-4K-32LED-450-120-277     | UCM-STR-T3-4K-32LED-450-FTG-120-277     | UCM-STR-T3-4K-32LED-450-FLD-120-277 |
|               |                       |             | UCM-STR-T4-4K-32LED-450-120-277     | UCM-STR-T4-4K-32LED-450-FTG-120-277     | UCM-STR-T4-4K-32LED-450-FLD-120-277 |
|               |                       |             | UCM-STR-T5-4K-32LED-450-120-277     | UCM-STR-T5-4K-32LED-450-FTG-120-277     | UCM-STR-T5-4K-32LED-450-FLD-120-277 |
|               |                       | 5K<br>5000K | UCM-STR-T2-5K-32LED-450-120-277     | UCM-STR-T2-5K-32LED-450-FTG-120-277     | UCM-STR-T2-5K-32LED-450-FLD-120-277 |
|               |                       |             | UCM-STR-T3-5K-32LED-450-120-277     | UCM-STR-T3-5K-32LED-450-FTG-120-277     | UCM-STR-T3-5K-32LED-450-FLD-120-277 |
|               |                       |             | UCM-STR-T4-5K-32LED-450-120-277     | UCM-STR-T4-5K-32LED-450-FTG-120-277     | UCM-STR-T4-5K-32LED-450-FLD-120-277 |
|               |                       |             | UCM-STR-T5-5K-32LED-450-120-277     | UCM-STR-T5-5K-32LED-450-FTG-120-277     | UCM-STR-T5-5K-32LED-450-FLD-120-277 |
|               | 4 Windows<br>WND      | 3K<br>3000K | UCM-WND-STR-T2-3K-32LED-450-120-277 |                                         |                                     |
|               |                       |             | UCM-WND-STR-T3-3K-32LED-450-120-277 |                                         |                                     |
|               |                       |             | UCM-WND-STR-T4-3K-32LED-450-120-277 |                                         |                                     |
|               |                       |             | UCM-WND-STR-T5-3K-32LED-450-120-277 |                                         |                                     |
|               |                       | 4K<br>4000K | UCM-WND-STR-T2-4K-32LED-450-120-277 | UCM-WND-STR-T2-4K-32LED-450-FTG-120-277 |                                     |
|               |                       |             | UCM-WND-STR-T3-4K-32LED-450-120-277 | UCM-WND-STR-T3-4K-32LED-450-FTG-120-277 |                                     |
|               |                       |             | UCM-WND-STR-T4-4K-32LED-450-120-277 |                                         |                                     |
|               |                       |             | UCM-WND-STR-T5-4K-32LED-450-120-277 | UCM-WND-STR-T5-4K-32LED-450-FTG-120-277 |                                     |
|               |                       | 5K<br>5000K | UCM-WND-STR-T2-5K-32LED-450-120-277 | UCM-WND-STR-T2-5K-32LED-450-FTG-120-277 |                                     |
|               |                       |             | UCM-WND-STR-T3-5K-32LED-450-120-277 | UCM-WND-STR-T3-5K-32LED-450-FTG-120-277 |                                     |
|               |                       |             | UCM-WND-STR-T4-5K-32LED-450-120-277 |                                         |                                     |
|               |                       |             | UCM-WND-STR-T5-5K-32LED-450-120-277 | UCM-WND-STR-T5-5K-32LED-450-FTG-120-277 |                                     |
|               | SR<br>Solid Rings     | 3K<br>3000K | UCM-SR-STR-T2-3K-32LED-450-120-277  |                                         |                                     |
|               |                       |             | UCM-SR-STR-T3-3K-32LED-450-120-277  |                                         |                                     |
|               |                       |             | UCM-SR-STR-T4-3K-32LED-450-120-277  |                                         |                                     |
|               |                       |             | UCM-SR-STR-T5-3K-32LED-450-120-277  |                                         |                                     |
|               |                       | 4K<br>4000K | UCM-SR-STR-T2-4K-32LED-450-120-277  | UCM-SR-STR-T2-4K-32LED-450-FTG-120-277  |                                     |
|               |                       |             | UCM-SR-STR-T3-4K-32LED-450-120-277  | UCM-SR-STR-T3-4K-32LED-450-FTG-120-277  |                                     |
|               |                       |             | UCM-SR-STR-T4-4K-32LED-450-120-277  |                                         |                                     |
|               |                       |             | UCM-SR-STR-T5-4K-32LED-450-120-277  |                                         |                                     |
|               |                       | 5K<br>5000K | UCM-SR-STR-T2-5K-32LED-450-120-277  |                                         |                                     |
|               |                       |             | UCM-SR-STR-T3-5K-32LED-450-120-277  |                                         |                                     |
|               |                       |             | UCM-SR-STR-T4-5K-32LED-450-120-277  | UCM-SR-STR-T2-5K-32LED-450-FTG-120-277  |                                     |
|               |                       |             | UCM-SR-STR-T5-5K-32LED-450-120-277  |                                         |                                     |
|               | VSL<br>Vertical Slots | 3K<br>3000K | UCM-VSL-STR-T2-3K-32LED-450-120-277 |                                         |                                     |
|               |                       |             | UCM-VSL-STR-T3-3K-32LED-450-120-277 |                                         |                                     |
|               |                       |             | UCM-VSL-STR-T4-3K-32LED-450-120-277 |                                         |                                     |
|               |                       |             | UCM-VSL-STR-T5-3K-32LED-450-120-277 |                                         |                                     |
|               |                       | 4K<br>4000K | UCM-VSL-STR-T2-4K-32LED-450-120-277 | UCM-VSL-STR-T2-4K-32LED-450-FTG-120-277 |                                     |
|               |                       |             | UCM-VSL-STR-T3-4K-32LED-450-120-277 |                                         |                                     |
|               |                       |             | UCM-VSL-STR-T4-4K-32LED-450-120-277 |                                         |                                     |
|               |                       |             | UCM-VSL-STR-T5-4K-32LED-450-120-277 | UCM-VSL-STR-T5-4K-32LED-450-FTG-120-277 |                                     |
|               |                       | 5K<br>5000K | UCM-VSL-STR-T2-5K-32LED-450-120-277 | UCM-VSL-STR-T2-5K-32LED-450-FTG-120-277 |                                     |
|               |                       |             | UCM-VSL-STR-T3-5K-32LED-450-120-277 |                                         |                                     |
|               |                       |             | UCM-VSL-STR-T4-5K-32LED-450-120-277 |                                         |                                     |
|               |                       |             | UCM-VSL-STR-T5-5K-32LED-450-120-277 | UCM-VSL-STR-T5-5K-32LED-450-FTG-120-277 |                                     |
|               | LUM<br>Luminous Rings | 3K<br>3000K | UCM-LUM-STR-T2-3K-32LED-450-120-277 |                                         |                                     |
|               |                       |             | UCM-LUM-STR-T3-3K-32LED-450-120-277 |                                         |                                     |
|               |                       |             | UCM-LUM-STR-T4-3K-32LED-450-120-277 |                                         |                                     |
|               |                       |             | UCM-LUM-STR-T5-3K-32LED-450-120-277 |                                         |                                     |
|               |                       | 4K<br>4000K | UCM-LUM-STR-T2-4K-32LED-450-120-277 | UCM-LUM-STR-T2-4K-32LED-450-FTG-120-277 |                                     |
|               |                       |             | UCM-LUM-STR-T3-4K-32LED-450-120-277 |                                         |                                     |
|               |                       |             | UCM-LUM-STR-T4-4K-32LED-450-120-277 |                                         |                                     |
|               |                       |             | UCM-LUM-STR-T5-4K-32LED-450-120-277 | UCM-LUM-STR-T5-4K-32LED-450-FTG-120-277 |                                     |
|               |                       | 5K<br>5000K | UCM-LUM-STR-T2-5K-32LED-450-120-277 | UCM-LUM-STR-T2-5K-32LED-450-FTG-120-277 |                                     |
|               |                       |             | UCM-LUM-STR-T3-5K-32LED-450-120-277 |                                         |                                     |
|               |                       |             | UCM-LUM-STR-T4-5K-32LED-450-120-277 |                                         |                                     |
|               |                       |             | UCM-LUM-STR-T5-5K-32LED-450-120-277 | UCM-LUM-STR-T5-5K-32LED-450-FTG-120-277 |                                     |



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Rev October 26, 2016 8:10 AM

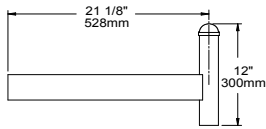
JOB \_\_\_\_\_  
TYPE \_\_\_\_\_  
NOTES \_\_\_\_\_



SLA8D

WT: 5 LBS

EPA: .40

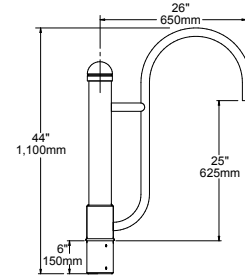


4" OR 5" POLE

SLA9

WT: 18 LBS

EPA: 1.90

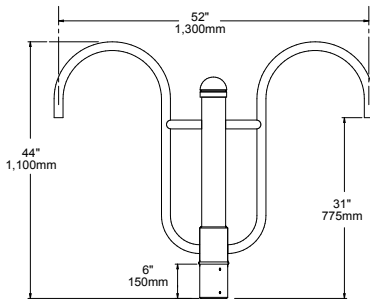


4" POLE

SLA9-2

WT: 24 LBS

EPA: 2.44

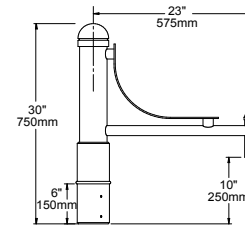


4" POLE

SLA10

WT: 9 LBS

EPA: 1.09

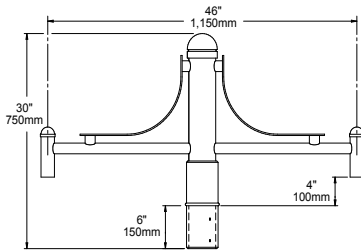


4" POLE

SLA10-2

WT: 16 LBS

EPA: 1.47

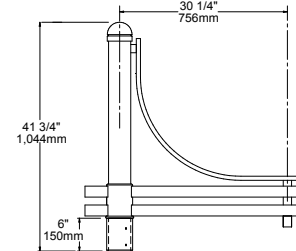


4" POLE

SLA16

WT: 18 LBS

EPA: 2.88

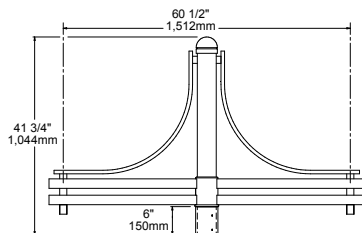


4" POLE

SLA16-2

WT: 28 LBS

EPA: 4.38

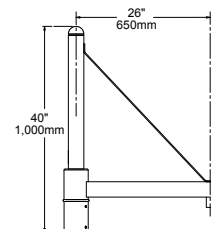


4" POLE

SLA17

WT: 18 LBS

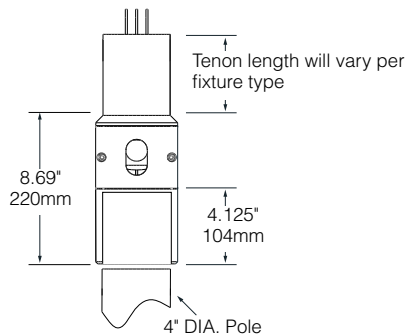
EPA: 1.50



4" POLE

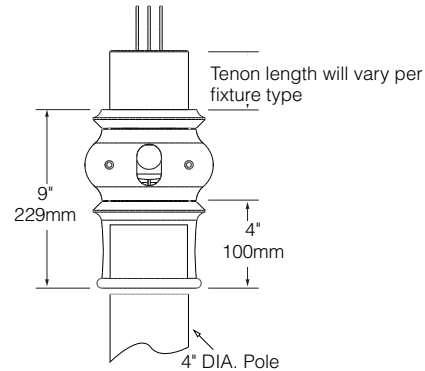
## PHOTOCELL

## PCA-C



Rotatable photocell housing. The photocell can be aimed away from stray light sources for an accurate setting. The photocell is also shielded from light emissions from the fixture. The housing slips over a 4"/100mm O.D. pole. a fixture or arm slips over the 4"/100mm O.D. tenon. Includes an internal twist lock receptacle, and an access cover with integral lens and stainless steel tether. Adds 4.5"/114mm to the overall height of the pole/fixture assembly. Prewired on the load side and line side for easy installation. Photocell by others.

## PCA-T

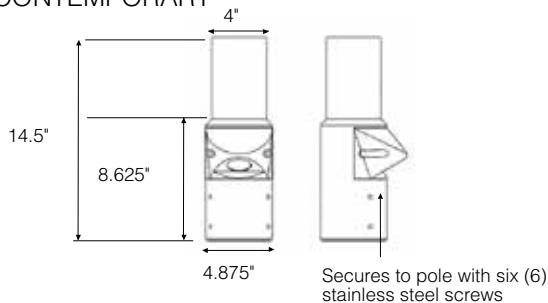


Rotatable photocell housing. The photocell can be aimed away from stray light sources for an accurate setting. The photocell is also shielded from light emissions from the fixture. The housing slips over a 4"/100mm O.D. pole. a fixture slips over the 4"/100mm O.D. tenon. Includes an internal twist lock receptacle, and an access cover with integral lens and stainless steel tether. Adds 5"/125mm to the overall height of the pole/fixture assembly. Prewired on the load side and line side for easy installation. Photocell by others.

## EGRESS

## EPA-C

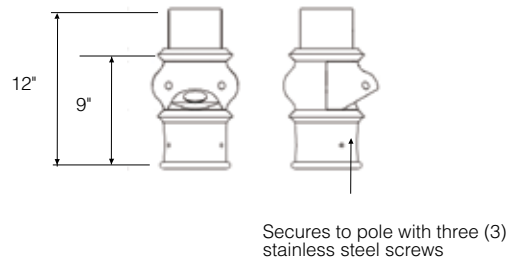
## CONTEMPORARY



The Contemporary Egress Post Top Adapter can be integrated into an existing non-egress-fitted pole application to provide code-required egress illumination. This adapter features 360° rotation for easy field adjustments. It also features an adjustable bracket that can be positioned between 15-45°, so concise, direct illumination can be provided onto the path of egress. The Egress PTA is wired to an auxiliary 120 volt power source that activates the lower-wattage MR16 in the event of an emergency or power interruption. The housing slips over a 4"/100mm O.D. pole. It includes an access cover with an integral lens and a lanyard safety cable. The contemporary model is 14 1/2" tall, but only adds 3 5/8" to the overall height of the pole. Prewired on both the load side and line side for easy installation.

## EPA-T

## TRADITIONAL



The Traditional Egress Post Top Adapter can be integrated into an existing non-egress-fitted pole application to provide code-required egress illumination. This adapter features 360° rotation for easy field adjustments. It also features an adjustable bracket that can be positioned between 15-45 degrees, so concise, direct illumination can be provided onto the path of egress. The Egress PTA is wired to an auxiliary 120 volt power source that activates the lower-wattage MR16 in the event of an emergency or power interruption. The housing slips over a 4"/100mm O.D. pole. It includes an access cover with an integral lens and a lanyard safety cable. The traditional model is 12" tall, but only adds 3 5/8" to the overall height of the pole. Prewired on both the load side and line side for easy installation.

SOLD TO

PO #

JOB NAME

/

/

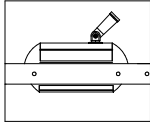
APPROVALS

## Architectural Area Lighting

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 Design patents, Copyright © 2010 Rev 01/2012

**BPC12 - BPC27**

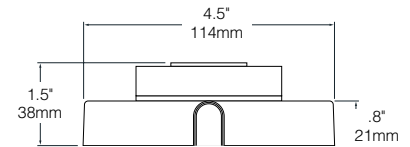
Swivel type photocell with adjustable swivel for aiming. Requires field wiring. Consult factory for specific fixture availability.

**PHC**

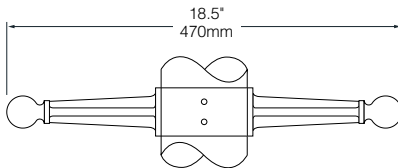
Button type photocell and cast shield. Standard location is 12" down from top of pole. Specify voltage.

**PCR**

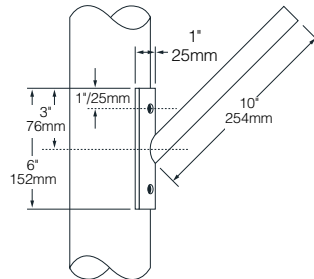
Low profile twist lock photocell receptacle with cast pole cap top. Secures to the top of the pole with three stainless steel set screws. Photocell by others.

**OTHER ACCESSORIES****LR**

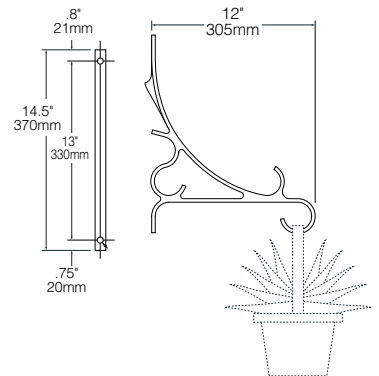
Ladder rest. Slips over a 4"/100mm O.D. pole

**FH**

Flag holder. (Specify location on pole)

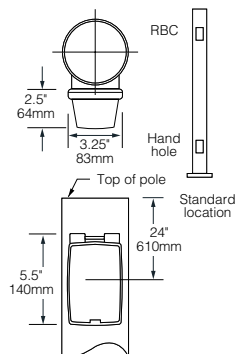
**PLT**

Plant Hanger. For 4"/100mm O.D. poles. (Specify location on pole, holds up to 25 lbs.)

**RBC**

Cast aluminum receptacle housing, integrally welded to the pole. Includes a NEC approved clear weatherproof in-use cover. Does not include a receptacle or internal wiring.

(Standard RBC is 24" below the top of the pole. Consult factory for alternative locations, which may require additional factory reinforcement)

**GFI (with RBC)**

Ground Fault Interrupter. Wet location receptacle. Standard location is 24" down from top of pole.

**FS1**

Single weatherproof fuse holder. Fuse by others.

**FS2**

Double weatherproof fuse holder. Fuse by others.

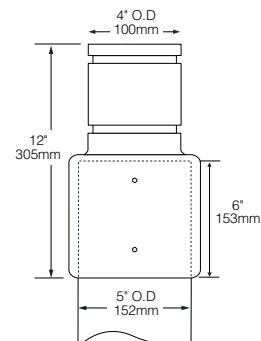
Note: Fuse supplied and installed by others.

**AD4**

This adapter is to be used only with standard AAL arms and post top mount fixtures to slip over a 4"/100mm O.D. pole.

**AD5**

This adapter is to be used only with standard AAL arms and post top mount fixtures that slip over a 4" O.D. pole. The AD5 is a cast aluminum adapter that slips into the arm or (PM option on the UCM) and slips over a 5"/125mm O.D. pole.



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**BANNER ARMS  
BREAKAWAY ARMS**

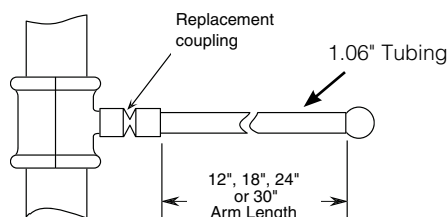
CATALOG NO.  
BANNER ARMS

|         |                                               |
|---------|-----------------------------------------------|
| BBS4-12 | Single assembly for 4" O.D. pole, 12" arm.    |
| BBS4-18 | Single assembly for 4" O.D. pole, 18" arm.    |
| BBS4-24 | Single assembly for 4" O.D. pole, 24" arm.    |
| BBS4-30 | Single assembly for 4" O.D. pole, 30" arm.    |
| BBS5-12 | Single assembly for 5" O.D. pole, 12" arm.    |
| BBS5-18 | Single assembly for 5" O.D. pole, 18" arm.    |
| BBS5-24 | Single assembly for 5" O.D. pole, 24" arm.    |
| BBS5-30 | Single assembly for 5" O.D. pole, 30" arm.    |
| BBD4-12 | Twin assembly for 4" O.D. pole, 12" arms. (2) |
| BBD4-18 | Twin assembly for 4" O.D. pole, 18" arms. (2) |
| BBD4-24 | Twin assembly for 4" O.D. pole, 24" arms. (2) |
| BBD4-30 | Twin assembly for 4" O.D. pole, 30" arms. (2) |
| BBD5-12 | Twin assembly for 5" O.D. pole, 12" arms. (2) |
| BBD5-18 | Twin assembly for 5" O.D. pole, 18" arms. (2) |
| BBD5-24 | Twin assembly for 5" O.D. pole, 24" arms. (2) |
| BBD5-30 | Twin assembly for 5" O.D. pole, 30" arms. (2) |

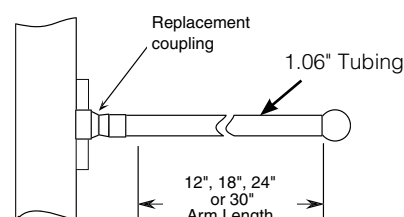
CATALOG NO.  
BANNER ARMS

|         |                                           |
|---------|-------------------------------------------|
| BSQ4-12 | Single assembly for 4" SQ. pole, 12" arm. |
| BSQ4-18 | Single assembly for 4" SQ. pole, 18" arm. |
| BSQ4-24 | Single assembly for 4" SQ. pole, 24" arm. |
| BSQ4-30 | Single assembly for 4" SQ. pole, 30" arm. |

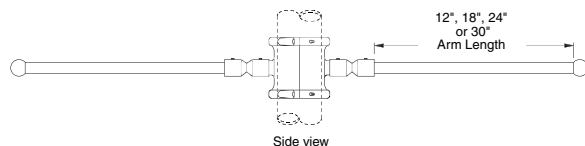
Note: For square poles, Specify banner arms location on pole.



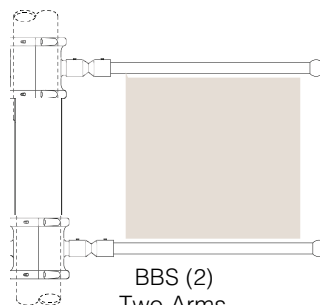
BBS  
Round pole



BSQ  
Square pole



BBD  
Twin Assembly



BBS (2)  
Two Arms

**DESCRIPTION**

Round AAL banner arms are clamshell designs for 4"/100mm or 5"/125mm diameter poles. Banner arm for square pole is secured to the side of the pole with two bolts. The banner arms are easily added or removed from the pole. The breakaway coupling is designed to fail before over-stressing the pole. An internal, stainless steel cable keeps the arm attached to the pole assembly.

The failure point for the coupling is affected by the banner type, pole height and vertical location of the banner on the pole. The loading is also affected by securing the banner at the top only, or the top and bottom. Contact the factory for the maximum banner size recommended for your application.

|         |      |          |
|---------|------|----------|
| SOLD TO | PO # | JOB NAME |
| /       | /    | /        |

|           |
|-----------|
| APPROVALS |
|-----------|

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# SLA17/SLA17(5)/SLA17-2/SLA17(5)-2 – Contemporary Arms

TYPE

A4-HSS &

A-5



SLA17

1. ARM  
**SLA17**

2. COLOR  
**BLT**

## 1. ARM

SLA17 (Slips over 4" pole. Weight: 18 lbs. EPA: 1.50)

SLA17(5) (Slips over 5" pole. Weight: 24 lbs. EPA: 2.20)

SLA17-2 (Twin arms, slips over 4" pole. Weight: 24 lbs.

EPA: 2.05)

SLA17(5)-2 (Twin arms, slips over 5" pole. Weight: 33 lbs.

EPA: 2.09)

## 2. COLOR

WH Arctic White

BL Black

BLT Matte Black

DB Dark Bronze

DGN Dark Green

TT Titanium

WDB Weathered Bronze

MDB Bronze Metallic

VBU Verde Blue

CRT Corten

MAL Matte Aluminum

MG Medium Grey

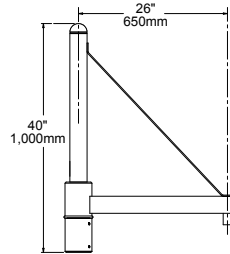
AGN Antique Green

LG Light Grey

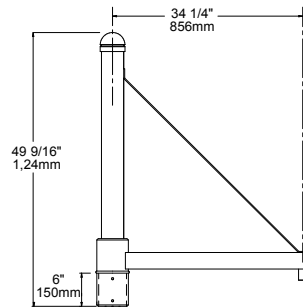
RAL Premium Color

CUSTOM \*\* Contact Factory

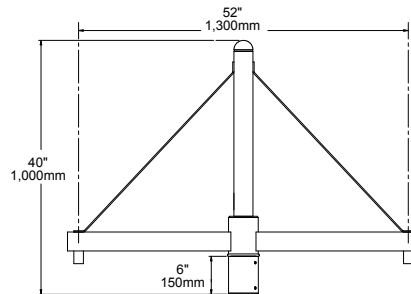
## DIMENSIONS



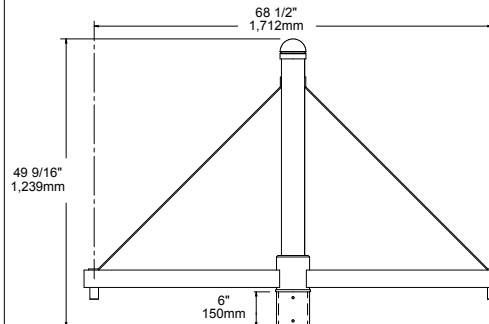
SLA17 (4" pole)



SLA17(5) (5" pole)



SLA17-2 (4" pole)



SLA17(5)-2 (5" pole)

## SPECIFICATIONS

The arm shall be of one piece unitized aluminum construction, fully welded and assembled. The slip fitter shall be cast aluminum with an internal wireway and pole stop. The arm shall be prewired with a quick connector for easy installation.

The arm shall have a cast aluminum fitter welded to the top of the arm(s) for attaching the fixture. The fixture shall be mounted with three stainless steel bolts through the top of the arm fitter into the fixture. The attachment point shall have a silicone pad for sealing the fixture to arm connection.

The arm shall slip over a 4 7/100mm or 5 7/125mm diameter pole or tenon. The cast aluminum slip fitter shall have six stainless steel cup point set screws for securing the arm to the pole or tenon.

JOB \_\_\_\_\_

TYPE \_\_\_\_\_

NOTES \_\_\_\_\_

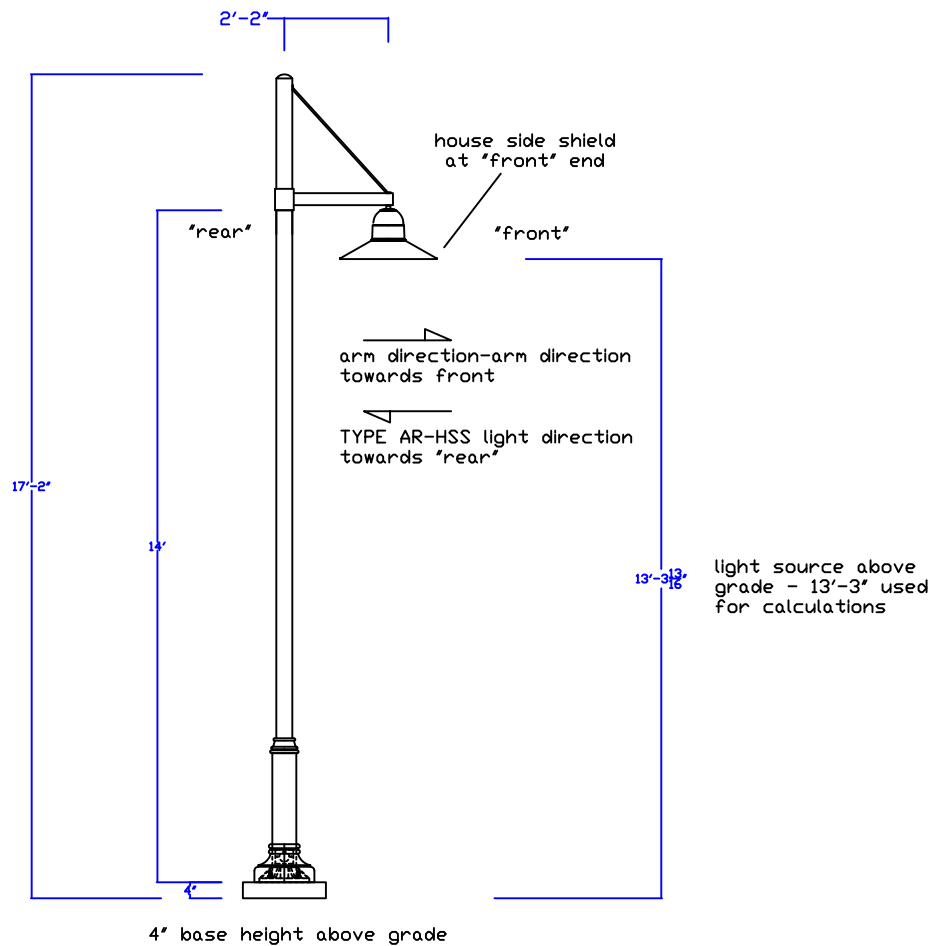


ARCHITECTURAL AREA LIGHTING

16555 East Gale Ave. | City of Industry | CA 91745

P 626.968.5666 | F 626.369.2695 | www.aal.net

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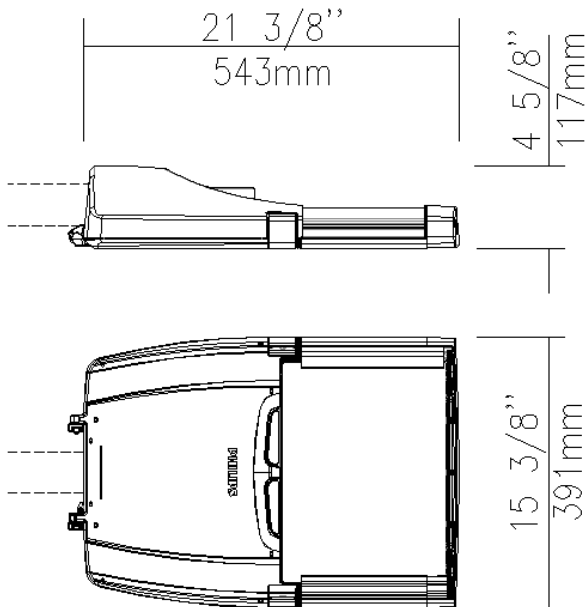
TYPE A-4 HSS, A 5  
 WATERFRONT PARK  
 CITY OF BURLINGTON, VT.

J & M LIGHTING DESIGN, INC.  
 207-967-5223  
 jmlight2@roadrunner.com  
 JAN. 9, 2017  
 scale: 1/4" = 1'-0"



## Specification

TYPE B-4-HS



EPA: 0.60 sq ft / weight: 26 lb (11.8 kg)

Note: 3D image may not represent color or option selected.  
Logos above include link, click to access.

Luminaire **RVS-35W32LED4K-R-LE4-UNIV-HS-GY3**

### Description of Components:

**Housing:** Made of die cast A360 Aluminum alloy 0.090 (2.4mm) minimum thickness. Fits on a 1.66" (42mm) to 2 3/8" (60mm) OD by 6" (152mm) long tenon. Comes with an easy step adjustable reversible zinc plated clamping system with 4 hexagonal bolts 3/8 16 UNC for ease of maintenance and installation. The clamping system is pre-assembled for a 2 3/8" (60mm) diameter tenon. For a 1.66" (42mm) or 1.9" (48mm) diameter tenon the clamping system must be reversed by others. Permits an adjustment of +/- 5°. The housing is complete with a tool-free removable and secured power door avoiding accidental dropping giving access to electronics components and to a terminal block that accepts (#2 max.) wires from the primary circuit. A clearance of 13" (330mm) at the rear is required in order to remove the door.

**Light Engine: LEDgine** composed of 4 main components: **Heat Sink / LED Module / Optical System / Driver**  
Electrical components are RoHS compliant.

**Heat Sink:** Made of 6063-T5 extruded aluminum optimising the LEDs efficiency and life. Product does not use any cooling device with moving parts (only passive cooling device). **Finish of extrusion will be clear anodized not painted.**

**Lens:** Made of soda-lime tempered glass lens, mechanically assembled and sealed onto the lower part of the heat sink.

**LED Module:** LED type Philips Lumileds LUXEON R. Composed of 32 high-performance white LEDs. Color temperature as per ANSI/NEMA bin Neutral White, 4000 Kelvin nominal (3985K +/- 275K or 3710K to 4260K), CRI 70 Min. 75 Typical.

**Optical System:** (LE4), IES type IV (asymmetrical). Composed of high-performance optical grade PMMA acrylic refractor lenses to achieve desired distribution optimized to get maximum spacing, target lumens and a superior lighting uniformity. System is rated IP66. Performance shall be tested per LM-63, LM-79 and TM-15 (IESNA) certifying its photometric performance. **Complete with a (HS) House side shield.** Dark Sky compliant with 0% uplight and U0 per IESNA TM-15.

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## Specification

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**End Cap:** Made of die cast A360.1 Aluminum alloy 0.100 (2.5mm) minimum thickness, mechanically assembled to the heat sink.

**Driver:** High power factor of 90% minimum. Electronic driver, operating range 50/60 Hz. **Auto-adjusting universal voltage input from 120 to 277 VAC rated for both application line to line or line to neutral, Class I**, THD of 20% max. Maximum ambient operating temperature from -40F(-40C) to 130F(55C) degrees.

The current supplying the LEDs will be reduced by the driver if the driver experiences internal overheating as a protection to the LEDs and the electrical components. Output is protected from short circuits, voltage overload and current overload. Automatic recovery after correction. Standard built-in driver surge protection of 2.5kV (min).

**Surge Protector:** Surge protector tested in accordance with ANSI/IEEE C62.45 per ANSI/IEEE C62.41.2 Scenario I Category C High Exposure 10kV/10kA waveforms for Line-Ground, Line-Neutral and Neutral-Ground, and in accordance with U.S. DOE (Department of Energy) MSSLC (Municipal Solid-State Street Lighting Consortium) model specification for LED roadway luminaires electrical immunity requirements for High Test Level 10kV / 10kA.

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## Specification

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|               |
|---------------|
| Miscellaneous |
|---------------|

### Description of Components:

**Wiring:** The connection of the luminaire is done using a terminal block connector 600V, 85A for use with #2-14 AWG. wires from the primary circuit, located inside the housing. Due to the inrush current that occurs with electronic drivers, recommend using a 10Amp time delay fuse to avoid unwanted fuse blowing (false tripping) that can occur with normal or fast acting fuses.

**Hardware:** All exposed screws shall be complete with Ceramic primer-seal basecoat to reduce seizing of the parts and offers a high resistance to corrosion. All seals and sealing devices are made and/or lined with EPDM and/or silicone and/or rubber.

**Finish:** Color to be **medium grey (GY3)** and in accordance with the AAMA 2603 standard. Application of polyester powder coat paint (4 mils/100 microns) with  $\pm 1$  mils/24 microns of tolerance. The Thermosetting resins provides a discoloration resistant finish in accordance with the ASTM D2244 standard, as well as luster retention in keeping with the ASTM D523 standard and humidity proof in accordance with the ASTM D2247 standard.

The surface treatment achieves a minimum of 2000 hours for salt spray resistant finish in accordance with testing performed and per ASTM B117 standard.

**Surface Finish:** *The above mentioned product has been specified in a smooth finish. We wish to inform you that we cannot guarantee a finish without imperfections (e.g. apparent grinding marks and porosity). We strongly recommend the use of a textured finish which provides better uniformity of surface finish. No return of merchandise showing above mentioned imperfection will be granted.*

**LED products manufacturing standard:** The electronic components sensitive to electrostatic discharge (ESD) such as light emitting diodes (LEDs) are assembled in compliance with IEC61340-5-1 and ANSI/ESD S20.20 standards so as to eliminate ESD events that could decrease the useful life of the product.

**Quality Control:** The manufacturer must provide a written confirmation of its ISO 9001-2008 and ISO 14001-2004 International Quality Standards Certification.

**Vibration Resistance:** The RVS meets the **ANSI C136.31**, American National Standard for Roadway Luminaire Vibration specifications for Bridge/overpass applications. (Tested for 3G over 100 000 cycles)

**Web site information details:** / [ISO 9001-2008 Certification](#) / [ISO 14001-2004 Certification](#)



# Specification

HS

| LED light engine technical information for RVS                    |                          |                                         |                             |                             |                             |                             |                             |                             |                  |                             |                                  |            |
|-------------------------------------------------------------------|--------------------------|-----------------------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|------------------|-----------------------------|----------------------------------|------------|
| LED = Philips Lumileds Luxeon R, CRI = 75, CCT = 4000K (+/- 350K) |                          |                                         |                             |                             |                             |                             |                             |                             |                  |                             |                                  |            |
| System (LED + driver) rated life = 100,000 hrs <sup>1</sup>       |                          |                                         |                             |                             |                             |                             |                             |                             |                  |                             |                                  |            |
| Lamp                                                              | Typical delivered lumens | Typical system wattage <sup>2</sup> (W) | Typical current @ 120 V (A) | Typical current @ 208 V (A) | Typical current @ 240 V (A) | Typical current @ 277 V (A) | Typical current @ 347 V (A) | Typical current @ 480 V (A) | LED current (mA) | HID equivalent <sup>3</sup> | Luminaire Efficacy Rating (Lm/W) | BUG rating |
| 35W32LED4K-R-LE2                                                  | 3670                     | 36                                      | 0.29                        | 0.17                        | 0.16                        | 0.15                        | N/A                         | N/A                         | 350              | 70-100W                     | 101.9                            | B1-U0-G1   |
| 35W32LED4K-R-LE3                                                  | 3686                     | 36                                      | 0.29                        | 0.17                        | 0.16                        | 0.15                        | N/A                         | N/A                         | 350              | 70-100W                     | 102.4                            | B1-U0-G1   |
| 35W32LED4K-R-LE4                                                  | 3434                     | 36                                      | 0.29                        | 0.17                        | 0.16                        | 0.15                        | N/A                         | N/A                         | 350              | 70-100W                     | 95.4                             | B1-U0-G1   |
| 35W32LED4K-R-LE5                                                  | 3108                     | 36                                      | 0.29                        | 0.17                        | 0.16                        | 0.15                        | N/A                         | N/A                         | 350              | 70-100W                     | 86.3                             | B2-U0-G1   |
| 55W32LED4K-R-LE2                                                  | 5303                     | 53                                      | 0.40                        | 0.23                        | 0.21                        | 0.19                        | N/A                         | N/A                         | 530              | 100-150W                    | 100.1                            | B1-U0-G1   |
| 55W32LED4K-R-LE3                                                  | 5327                     | 53                                      | 0.40                        | 0.23                        | 0.21                        | 0.19                        | N/A                         | N/A                         | 530              | 100-150W                    | 100.5                            | B1-U0-G1   |
| 55W32LED4K-R-LE4                                                  | 4969                     | 53                                      | 0.40                        | 0.23                        | 0.21                        | 0.19                        | N/A                         | N/A                         | 530              | 100-150W                    | 93.8                             | B1-U0-G1   |
| 55W32LED4K-R-LE5                                                  | 4505                     | 53                                      | 0.40                        | 0.23                        | 0.21                        | 0.19                        | N/A                         | N/A                         | 530              | 100-150W                    | 85.0                             | B3-U0-G1   |
| 72W32LED4K-R-LE2                                                  | 6507                     | 70                                      | 0.57                        | 0.33                        | 0.33                        | 0.25                        | 0.20                        | 0.14                        | 700              | 100-150W                    | 93.0                             | B2-U0-G1   |
| 72W32LED4K-R-LE3                                                  | 6536                     | 70                                      | 0.57                        | 0.33                        | 0.33                        | 0.25                        | 0.20                        | 0.14                        | 700              | 100-150W                    | 93.4                             | B2-U0-G1   |
| 72W32LED4K-R-LE4                                                  | 6092                     | 70                                      | 0.57                        | 0.33                        | 0.33                        | 0.25                        | 0.20                        | 0.14                        | 700              | 100-150W                    | 87.0                             | B2-U0-G2   |
| 72W32LED4K-R-LE5                                                  | 6036                     | 70                                      | 0.57                        | 0.33                        | 0.33                        | 0.25                        | 0.20                        | 0.14                        | 700              | 100-150W                    | 86.2                             | B3-U0-G1   |
| 55W48LED4K-R-LE2                                                  | 5469                     | 55                                      | 0.38                        | 0.22                        | 0.23                        | 0.21                        | 0.17                        | 0.13                        | 350              | 100-150W                    | 99.4                             | B1-U0-G1   |
| 55W48LED4K-R-LE3                                                  | 5397                     | 55                                      | 0.38                        | 0.22                        | 0.23                        | 0.21                        | 0.17                        | 0.13                        | 350              | 100-150W                    | 98.1                             | B1-U0-G1   |
| 55W48LED4K-R-LE4                                                  | 5152                     | 55                                      | 0.38                        | 0.22                        | 0.23                        | 0.21                        | 0.17                        | 0.13                        | 350              | 100-150W                    | 93.7                             | B1-U0-G1   |
| 55W48LED4K-R-LE5                                                  | 4685                     | 55                                      | 0.38                        | 0.22                        | 0.23                        | 0.21                        | 0.17                        | 0.13                        | 350              | 100-150W                    | 85.2                             | B3-U0-G1   |
| 80W48LED4K-R-LE2                                                  | 7903                     | 79                                      | 0.63                        | 0.36                        | 0.34                        | 0.31                        | 0.24                        | 0.18                        | 530              | 150-175W                    | 100.0                            | B2-U0-G1   |
| 80W48LED4K-R-LE3                                                  | 7799                     | 79                                      | 0.63                        | 0.36                        | 0.34                        | 0.31                        | 0.24                        | 0.18                        | 530              | 150-175W                    | 98.7                             | B2-U0-G1   |
| 80W48LED4K-R-LE4                                                  | 7444                     | 79                                      | 0.63                        | 0.36                        | 0.34                        | 0.31                        | 0.24                        | 0.18                        | 530              | 150-175W                    | 94.2                             | B2-U0-G2   |
| 80W48LED4K-R-LE5                                                  | 6757                     | 79                                      | 0.63                        | 0.36                        | 0.34                        | 0.31                        | 0.24                        | 0.18                        | 530              | 150-175W                    | 85.5                             | B3-U0-G1   |
| 108W48LED4K-R-LE2                                                 | 9694                     | 105                                     | 0.86                        | 0.50                        | 0.50                        | 0.43                        | 0.30                        | 0.22                        | 700              | 175-200W                    | 92.3                             | B2-U0-G2   |
| 108W48LED4K-R-LE3                                                 | 9570                     | 105                                     | 0.86                        | 0.50                        | 0.50                        | 0.43                        | 0.30                        | 0.22                        | 700              | 175-200W                    | 91.1                             | B2-U0-G2   |
| 108W48LED4K-R-LE4                                                 | 9134                     | 105                                     | 0.86                        | 0.50                        | 0.50                        | 0.43                        | 0.30                        | 0.22                        | 700              | 175-200W                    | 87.0                             | B2-U0-G2   |
| 108W48LED4K-R-LE5                                                 | 8987                     | 105                                     | 0.86                        | 0.50                        | 0.50                        | 0.43                        | 0.30                        | 0.22                        | 700              | 175-200W                    | 85.6                             | B3-U0-G2   |
| 70W64LED4K-R-LE2                                                  | 6947                     | 71                                      | 0.58                        | 0.34                        | 0.32                        | 0.30                        | 0.24                        | 0.20                        | 350              | 100-150W                    | 97.8                             | B2-U0-G1   |
| 70W64LED4K-R-LE3                                                  | 6970                     | 71                                      | 0.58                        | 0.34                        | 0.32                        | 0.30                        | 0.24                        | 0.20                        | 350              | 100-150W                    | 98.2                             | B2-U0-G1   |
| 70W64LED4K-R-LE4                                                  | 6481                     | 71                                      | 0.58                        | 0.34                        | 0.32                        | 0.30                        | 0.24                        | 0.20                        | 350              | 100-150W                    | 91.3                             | B2-U0-G2   |
| 70W64LED4K-R-LE5                                                  | 6239                     | 71                                      | 0.58                        | 0.34                        | 0.32                        | 0.30                        | 0.24                        | 0.20                        | 350              | 100-150W                    | 87.9                             | B3-U0-G1   |
| 110W64LED4K-R-LE2                                                 | 10039                    | 103                                     | 0.80                        | 0.46                        | 0.42                        | 0.38                        | 0.34                        | 0.28                        | 530              | 200-250W                    | 97.5                             | B2-U0-G2   |
| 110W64LED4K-R-LE3                                                 | 10072                    | 103                                     | 0.80                        | 0.46                        | 0.42                        | 0.38                        | 0.34                        | 0.28                        | 530              | 200-250W                    | 97.8                             | B2-U0-G2   |
| 110W64LED4K-R-LE4                                                 | 9359                     | 103                                     | 0.80                        | 0.46                        | 0.42                        | 0.38                        | 0.34                        | 0.28                        | 530              | 200-250W                    | 90.9                             | B2-U0-G2   |
| 110W64LED4K-R-LE5                                                 | 9010                     | 103                                     | 0.80                        | 0.46                        | 0.42                        | 0.38                        | 0.34                        | 0.28                        | 530              | 200-250W                    | 87.5                             | B3-U0-G2   |
| 90W80LED4K-R-LE2                                                  | 8409                     | 90                                      | 0.78                        | 0.43                        | 0.40                        | 0.34                        | 0.30                        | 0.25                        | 350              | 175-200W                    | 93.4                             | B2-U0-G1   |
| 90W80LED4K-R-LE3                                                  | 8555                     | 90                                      | 0.78                        | 0.43                        | 0.40                        | 0.34                        | 0.30                        | 0.25                        | 350              | 175-200W                    | 95.1                             | B2-U0-G2   |
| 90W80LED4K-R-LE4                                                  | 8096                     | 90                                      | 0.78                        | 0.43                        | 0.40                        | 0.34                        | 0.30                        | 0.25                        | 350              | 175-200W                    | 90.0                             | B2-U0-G2   |
| 90W80LED4K-R-LE5                                                  | 7793                     | 90                                      | 0.78                        | 0.43                        | 0.40                        | 0.34                        | 0.30                        | 0.25                        | 350              | 175-200W                    | 86.6                             | B3-U0-G2   |
| 135W80LED4K-R-LE2                                                 | 12152                    | 128                                     | 1.15                        | 0.61                        | 0.58                        | 0.50                        | 0.43                        | 0.35                        | 530              | 200-250W                    | 94.9                             | B3-U0-G2   |
| 135W80LED4K-R-LE3                                                 | 12363                    | 128                                     | 1.15                        | 0.61                        | 0.58                        | 0.50                        | 0.43                        | 0.35                        | 530              | 200-250W                    | 96.6                             | B3-U0-G2   |
| 135W80LED4K-R-LE4                                                 | 11699                    | 128                                     | 1.15                        | 0.61                        | 0.58                        | 0.50                        | 0.43                        | 0.35                        | 530              | 200-250W                    | 91.4                             | B2-U0-G2   |
| 135W80LED4K-R-LE5                                                 | 11262                    | 128                                     | 1.15                        | 0.61                        | 0.58                        | 0.50                        | 0.43                        | 0.35                        | 530              | 200-250W                    | 88.0                             | B4-U0-G2   |

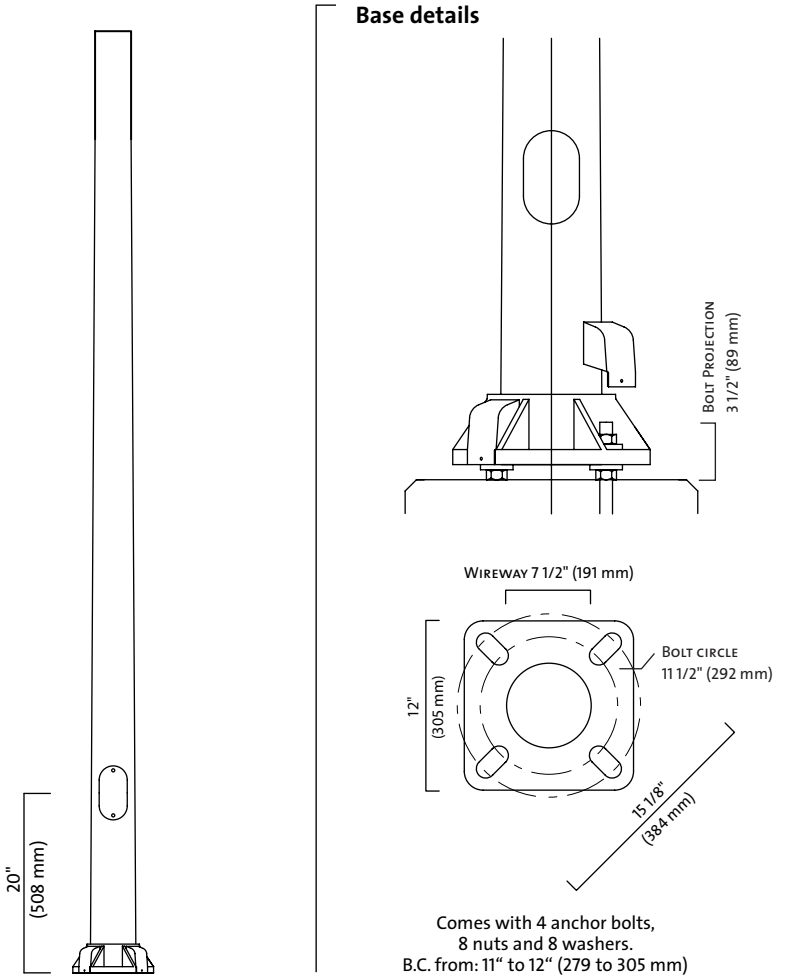
<sup>1</sup> L70 = 100,000 hrs (at ambient temperature = 25°C and forward current = 700 mA)

<sup>2</sup> System wattage includes the lamp and the LED driver.

<sup>3</sup> Equivalence should always be confirmed by a photometric layout

**Note :** Due to rapid and continuous advances in LED technology, LED luminaire data is subject to change without notice and at the discretion of Philips.

ATR85 > ALUMINUM TAPERED POLE



Specifications:

**Pole:** made from tapered 8" to 5" (203 by 127 mm) round aluminum shaft welded top and bottom to a cast-aluminum anchor plate. After tapering and welding, the entire shaft assembly is heat-treated to T6 temper.

A 4" by 8" (102 by 203 mm) maintenance opening is complete with cover and copper ground lug.

**Bolt Cover:** Made of cast aluminum, mechanically fastened to the anchor plate with stainless steel hardware.

**Finish:** See page 142 for Finish details.

Options:

- LS:** Provision for loudspeaker outlet (see page 132)
- PH7:** Button-type photoelectric cell (specify operating voltage)
- DR:** Duplex receptacle (120V line voltage only)
- GFI:** DR with common ground fault interrupter (120V line voltage only)
- BA:** Banner arm (see page 136)
- PS:** Plant support (see page 137)
- MPL:** Mid-pole luminaire

**Note:** The recommended method for calculating EPA (Effective Projected Area) is in accordance with AASHTO 2001 standards: for three seconds, the pole is tested in wind gusts equivalent to the strongest winds on record over the past 50 years, and with a 50 pound load (22.7 kg) placed at 1 foot (305 mm) above its center.

**Important:** Do not obstruct space between anchor plate and concrete base.

| CATALOG<br>NUMBER | NOMINAL<br>HEIGHT |      | TENON<br>SECTION | WALL<br>THICKNESS |     | WEIGHT |    | EPA RATING |         |         |         | ANCHOR BOLTS |        |
|-------------------|-------------------|------|------------------|-------------------|-----|--------|----|------------|---------|---------|---------|--------------|--------|
|                   | ft                | m    |                  | in                | mm  | lbs    | kg | 90 MPH     | 110 MPH | 120 MPH | 150 MPH | in           | mm     |
| ATR85B            | 25                | 7.6  |                  | 0.156             | 4.0 | 100    | 45 | 14.05      | 9.18    | 7.6     | 4.42    | 1-36         | 25-914 |
| ATR85N            | 25                | 7.6  |                  | 0.188             | 4.8 | 117    | 53 | 17.6       | 11.65   | 9.69    | 5.79    | 1-36         | 25-914 |
| ATR85V            | 25                | 7.6  |                  | 0.250             | 6.4 | 152    | 69 | 25.65      | 17.21   | 14.4    | 8.87    | 1-36         | 25-914 |
| ATR85B            | 26                | 7.9  |                  | 0.156             | 4.0 | 104    | 47 | 12.99      | 8.44    | 6.96    | 3.99    | 1-36         | 25-914 |
| ATR85N            | 26                | 7.9  |                  | 0.188             | 4.8 | 122    | 55 | 16.37      | 10.77   | 8.95    | 5.28    | 1-36         | 25-914 |
| ATR85V            | 26                | 7.9  |                  | 0.250             | 6.4 | 157    | 71 | 24.05      | 16.1    | 13.46   | 8.23    | 1-36         | 25-914 |
| ATR85B            | 27                | 8.2  |                  | 0.156             | 4.0 | 107    | 49 | 11.98      | 7.74    | 6.35    | 3.58    | 1-36         | 25-914 |
| ATR85N            | 27                | 8.2  |                  | 0.188             | 4.8 | 126    | 57 | 15.22      | 9.97    | 8.25    | 4.82    | 1-36         | 25-914 |
| ATR85V            | 27                | 8.2  |                  | 0.250             | 6.4 | 153    | 70 | 22.54      | 15.04   | 12.56   | 7.63    | 1-36         | 25-914 |
| ATR85B            | 28                | 8.5  |                  | 0.156             | 4.0 | 111    | 50 | 11.04      | 7.08    | 5.79    | 3.21    | 1-36         | 25-914 |
| ATR85N            | 28                | 8.5  |                  | 0.188             | 4.8 | 130    | 59 | 14.12      | 9.21    | 7.6     | 4.38    | 1-36         | 25-914 |
| ATR85V            | 28                | 8.5  |                  | 0.250             | 6.4 | 168    | 76 | 21.14      | 14.05   | 11.7    | 7.08    | 1-36         | 25-914 |
| ATR85B            | 29                | 8.8  |                  | 0.156             | 4.0 | 114    | 52 | 10.15      | 6.46    | 5.26    | 2.83    | 1-36         | 25-914 |
| ATR85N            | 29                | 8.8  |                  | 0.188             | 4.8 | 134    | 61 | 13.11      | 8.5     | 6.99    | 3.97    | 1-36         | 25-914 |
| ATR85V            | 29                | 8.8  |                  | 0.250             | 3.4 | 174    | 79 | 19.79      | 13.14   | 10.94   | 6.55    | 1-36         | 25-914 |
| ATR85N            | 30                | 9.1  |                  | 0.188             | 4.8 | 139    | 63 | 12.15      | 7.84    | 6.41    | 3.59    | 1-36         | 25-914 |
| ATR85V            | 30                | 9.1  |                  | 0.250             | 6.4 | 170    | 77 | 18.56      | 12.29   | 10.18   | 6.06    | 1-36         | 25-914 |
| ATR85N            | 31                | 9.4  |                  | 0.188             | 4.8 | 143    | 65 | 11.26      | 7.19    | 5.87    | 3.21    | 1-36         | 25-914 |
| ATR85V            | 31                | 9.4  |                  | 0.250             | 6.4 | 185    | 84 | 17.41      | 11.47   | 9.5     | 5.59    | 1-36         | 25-914 |
| ATR85N            | 32                | 9.8  |                  | 0.188             | 4.8 | 147    | 67 | 10.42      | 6.61    | 5.35    | 2.87    | 1-36         | 25-914 |
| ATR85V            | 32                | 9.8  |                  | 0.250             | 6.4 | 191    | 87 | 16.33      | 10.71   | 8.83    | 5.14    | 1-36         | 25-914 |
| ATR85N            | 33                | 10.1 |                  | 0.188             | 4.8 | 152    | 69 | 9.61       | 6.02    | 4.87    | 2.54    | 1-36         | 25-914 |
| ATR85V            | 33                | 10.1 |                  | 0.250             | 6.4 | 197    | 90 | 15.3       | 9.97    | 8.23    | 4.73    | 1-36         | 25-914 |
| ATR85N            | 34                | 10.4 |                  | 0.188             | 4.8 | 156    | 71 | 8.87       | 5.49    | 4.38    | 2.21    | 1-36         | 25-914 |
| ATR85V            | 34                | 10.4 |                  | 0.250             | 6.4 | 202    | 92 | 14.34      | 9.28    | 7.63    | 4.34    | 1-36         | 25-914 |

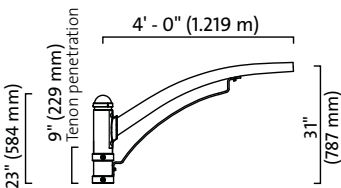
Note: Philips Lumec reserves the right to modify the above details to reflect changes in the cost of materials and/or production and/or design without prior notice.

# TYPE B SERIES

## AC4 / AC6 / AC8 > EXTENDED REACH BRACKETS

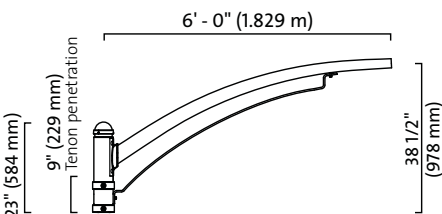
### AC4

EPA: 2.34 sq.ft. Weight: 20.0 lbs. (9.1 kg)



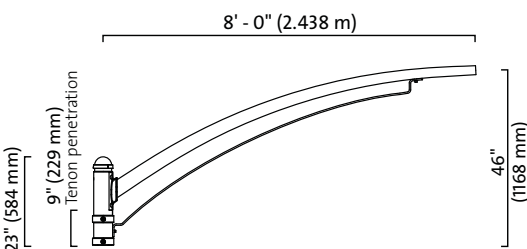
### AC6

EPA: 3.06 sq.ft. Weight: 23.0 lbs. (10.4 kg)



### AC8

EPA: 3.77 sq.ft. Weight: 32.0 lbs. (14.5 kg)



### Specifications:

The **AC4 / AC6 / AC8** mounting arms feature a tapered spun aluminum arm of 4" by 2 7/8" (102 by 73 mm) to 2 3/8" (60 mm) O.D. at the luminaire end, mechanically assembled to the central housing.

The mounting arms include a decorative curved flat piece of aluminum, mechanically assembled to the central pole adaptor and to the arm using stainless steel hardware.

The central pole adaptor is complete with a cast-aluminum cap, slip-fits 9" (229 mm) over a 4" (102 mm), 5" (127 mm) or 5 9/16" (141 mm) O.D. pole or tenon.

### Configurations



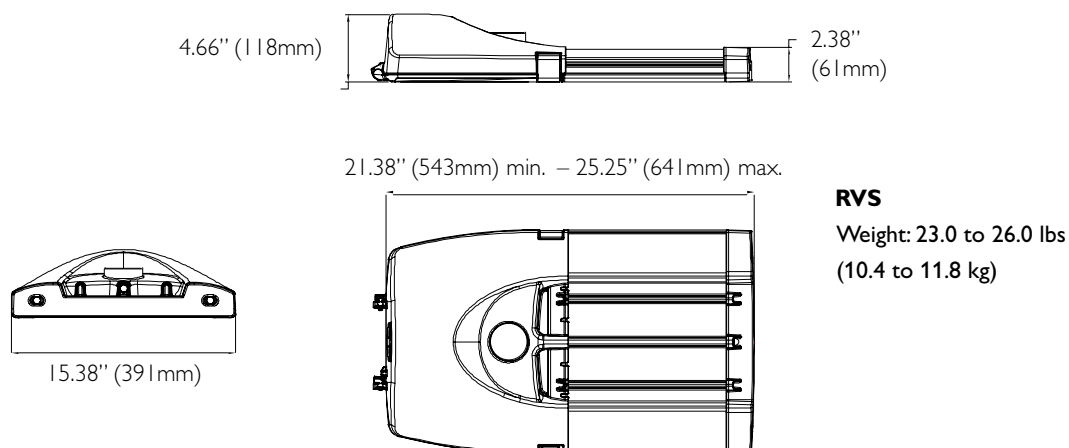


|              |              |             |      |
|--------------|--------------|-------------|------|
| Project name | EAST PARKING | Type        | B-4  |
| Date         | 11-29-2016   | Prepared by | JMLD |

|            |            |                |         |         |           |        |
|------------|------------|----------------|---------|---------|-----------|--------|
| <b>RVS</b> | 35W32LED4K | LE4            | UNIV    |         | CLO-RC    | BKTX   |
| Luminaire  | Lamp       | Optical System | Voltage | Options | Accessory | Finish |

# RoadView LED Series

## RVS



## Lamps

| LUMINAIRE PERFORMANCE DATA (Nominal 4000K CCT) |      |               |                   |              |                            |        |      |        |     |         |        |
|------------------------------------------------|------|---------------|-------------------|--------------|----------------------------|--------|------|--------|-----|---------|--------|
| Lamp                                           | LEDs | Drive Current | Luminaire Lumens* | System Watts | Max. system current (amps) | Weight |      | Length |     | EPA     |        |
|                                                |      |               |                   |              |                            | lb.    | kg.  | in.    | mm. | sq. ft. | sq. m. |
| 35W32LED4K                                     | 32   | 350           | 3686              | 37           | 0.31                       | 23     | 10.4 | 21.38  | 543 | 0.53    | 0.049  |
| 55W32LED4K                                     | 32   | 530           | 5327              | 56           | 0.47                       | 23     | 10.4 | 21.38  | 543 | 0.53    | 0.049  |
| 72W32LED4K                                     | 32   | 700           | 6536              | 73           | 0.61                       | 23     | 10.4 | 21.38  | 543 | 0.53    | 0.049  |
| 55W48LED4K                                     | 48   | 350           | 5397              | 53           | 0.44                       | 23     | 10.4 | 21.38  | 543 | 0.53    | 0.049  |
| 80W48LED4K                                     | 48   | 530           | 7799              | 81           | 0.68                       | 23     | 10.4 | 21.38  | 543 | 0.53    | 0.049  |
| 108W48LED4K                                    | 48   | 700           | 9570              | 105          | 0.88                       | 23     | 10.4 | 21.38  | 543 | 0.53    | 0.049  |
| 70W64LED4K                                     | 64   | 350           | 6970              | 68           | 0.57                       | 26     | 11.8 | 25.25  | 641 | 0.60    | 0.056  |
| 110W64LED4K                                    | 64   | 530           | 10072             | 104          | 0.87                       | 26     | 11.8 | 25.25  | 641 | 0.60    | 0.056  |
| 90W80LED4K                                     | 80   | 350           | 8555              | 85           | 0.71                       | 26     | 11.8 | 25.25  | 641 | 0.60    | 0.056  |
| 135W80LED4K                                    | 80   | 530           | 12363             | 129          | 1.08                       | 26     | 11.8 | 25.25  | 641 | 0.60    | 0.056  |

\*For Type III distribution. See photometric files for other distributions.



**PHILIPS**  
**LUMEC**

## Optical systems / LED

|            |                                      |
|------------|--------------------------------------|
| <b>LE2</b> | TYPE II / Asymmetrical distribution  |
| <b>LE3</b> | TYPE III / Asymmetrical distribution |
| <b>LE4</b> | TYPE IV / Asymmetrical distribution  |

## Voltage

|                                   |            |            |
|-----------------------------------|------------|------------|
| <b>UNIV (120-277)</b>             | <b>347</b> | <b>480</b> |
| (not available for 32 LED models) |            |            |

## Driver options\*\*

|              |                                                                                                                                |
|--------------|--------------------------------------------------------------------------------------------------------------------------------|
| <b>AST</b>   | Driver pre-programmed with progressive lamp starting*                                                                          |
| <b>CDMG</b>  | Dynadimmer standard dimming program*                                                                                           |
| <b>CDMGP</b> | Dynadimmer custom dimming program*                                                                                             |
| <b>CLO</b>   | Constant Light Output, driver pre-programmed to achieve the same light intensity for the duration of the lifespan of the lamp* |
| <b>DALI</b>  | Driver compatible with DALI control systems*                                                                                   |
| <b>DMG</b>   | Dimmable driver 0-10 volt                                                                                                      |
| <b>OTL</b>   | Over The Life, driver pre-programmed to signal the end of lamp life*                                                           |
| <b>OVR</b>   | Dynadimmer override function for use with motion detector or other switching device                                            |

\*Only available with 120 - 277 volts.

\*\* For all programmable options please consult the factory for details

## Luminaire options

|               |                                                                                                      |
|---------------|------------------------------------------------------------------------------------------------------|
| <b>API</b>    | ANSI/NEMA wattage label                                                                              |
| <b>BL</b>     | Bubble level                                                                                         |
| <b>OSL3W</b>  | Motion detector (requires DMG or CDMG)                                                               |
| <b>PH8</b>    | Photoelectric cell, twistlock type includes receptacle                                               |
| <b>PH8XL*</b> | Photoelectric Cell, Twist-lock Type, "Fail ON", extended life 10-year limited warranty from supplier |
| <b>RC</b>     | Receptacle for a twist-lock photocell or shorting cap                                                |
| <b>SR</b>     | Strain relief                                                                                        |

\* Not available with 347 and 480 volt.

## Luminaire accessory

|             |                              |
|-------------|------------------------------|
| <b>SPC*</b> | StarSense Photo-cell Control |
|-------------|------------------------------|

\* Luminaire option RC is required with this accessory

## Finish options

|            |       |           |        |
|------------|-------|-----------|--------|
| <b>GY3</b> | Gray  | <b>BR</b> | Bronze |
| <b>WH</b>  | White | <b>BK</b> | Black  |

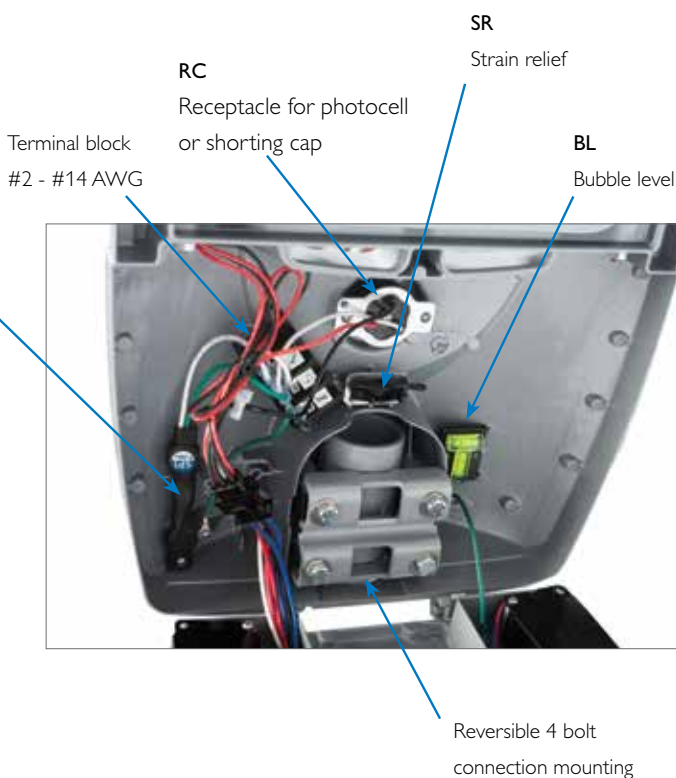
**EXP** Extrusion painted to match cast housing color selected above (standard extrusion color is anodized aluminum).

Additional colors are available. Consult factory for complete specifications.



LEDGINE

**PHILIPS**  
**LUMEC**



Specifications subject to change without notice.

Consult factory for full details.

## Lamp

Composed of high performance white LEDs. ANSI Nominal CCT of 4000K, minimum 70 CRI. Ambient operating temperature range -40C (-40F) to +40C (104F). L70 lumen maintenance projected to be greater than 100,000 hours.

## Optical system

Composed of high performance lenses, protected by a flat tempered glass lens. System is rated IP66. Photometric performance is tested according to IES LM-79.

## Surge protector

Surge protective device provides all phases protection for line-ground, line-neutral, and neutral-ground in accordance with IEEE / ANSI C62.41.2 C High. Surge rating 10 kV, 10 kA and DOE Model Specification for Roadway Luminaires Elevated requirements per Appendix D. Surge protection is standard for all product models 120-480v.

## Driver

Electronic driver, operating range 50-60 Hz. Auto-adjusting to input voltage between 120-277 volt AC, or 347-480 volt AC. Minimum power factor 0.90, max THD 20%. UL recognized component. 100,000 hours expected life. Optional dimming (0-10v) and digital driver features available.

## Housing

The upper and lower parts of the housing are made of die cast A360 aluminum alloy. The 4-bolt mounting system includes a reversible bracket made of zinc plated steel. Fits on a 1.66" to 2.375" OD by 5" long tenon, fixed by 3/8-16 UNC steel zinc plated bolts. An integral part of the housing permits an adjustment of +/- 5° by steps of 2.5°.

## Power door

The housing is complete with a tool-less removable power door including quick disconnects for ease of service. A tool free latch assembly on the power door allows for easy access to the electrical compartment.

## Heat sink

The extruded heat sink is made of A6063 aluminum alloy, and is shaped to draw heat away from the LEDs. Product does not use any cooling device with moving parts (has passive cooling device).

## LED platform

The LEDGINE LED platform consist of two LED boards with 48, 64, or 80 LUXEON Rebel LEDs each, as required to provide total LEDs from 96 - 160. The LED boards are removable and replaceable.

## Wiring

Luminaire wiring is done using a terminal block located inside the housing. Terminal block accepts three wires (#2-14 AWG).

## Hardware and seals

All hardware shall be stainless steel or corrosion resistant. All seals and sealing devices are lined with silicone.

## Finish

Application of a polyester powder coat paint. (4 mils/100 microns). The chemical composition provides a highly durable UV and salt spray resistant finish in accordance with the ASTM-B117 standard and humidity proof in accordance with the ASTM-D2247 standard. The specially formulated Lumital powder coat finish is available in standard gray. Additional colors are available. Consult factory for complete specifications.

## Vibration resistance

Meets the ANSI C136.31-2001 table 2, American National Standard for Roadway Luminaire Vibration specifications for Bridge/overpass applications (3G).

## Certifications and Compliance

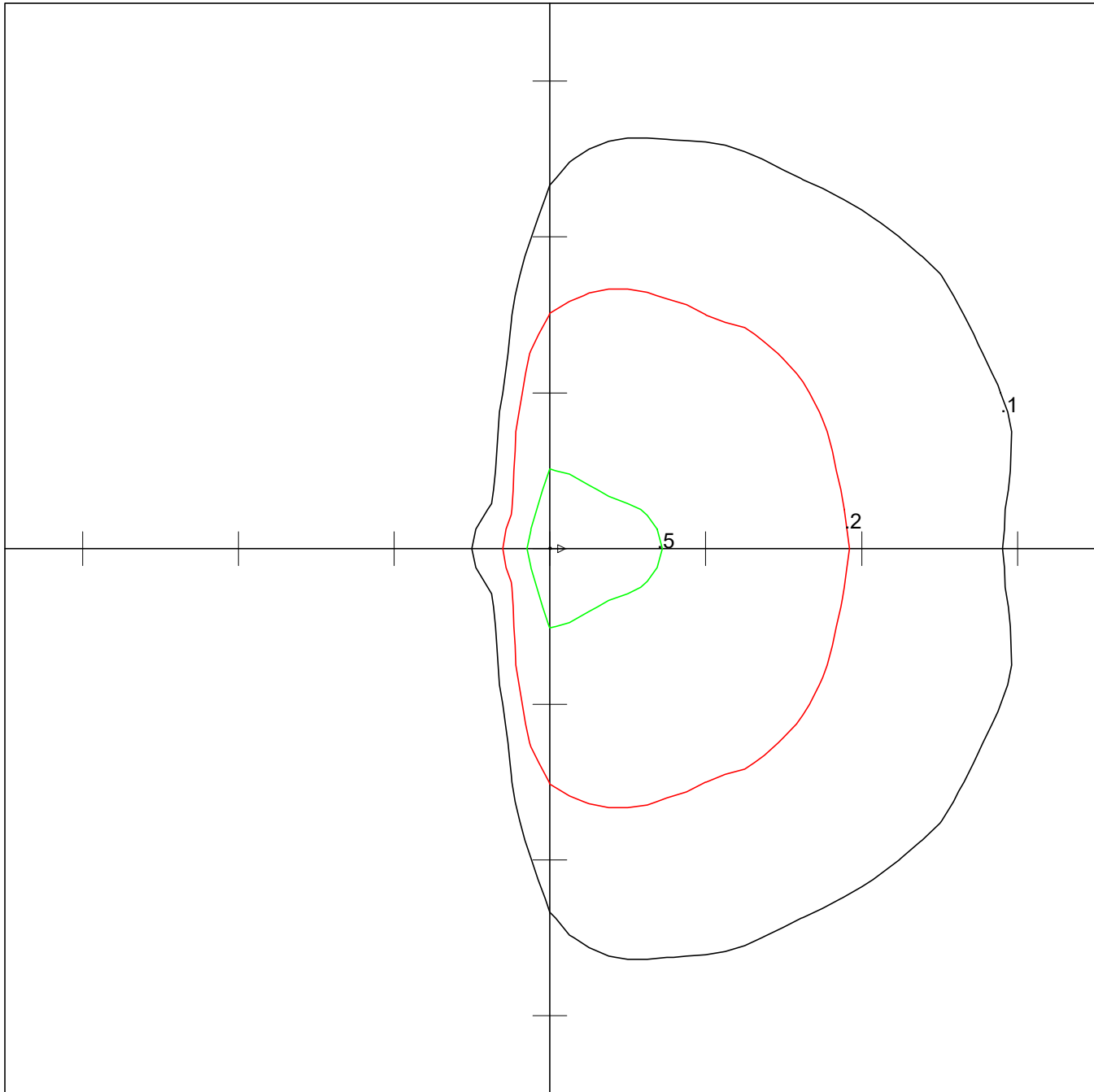
CSA, UL or cUL. ISO 9001-2008. All electrical components are RoHS compliant. Listed on Design Lights Consortium (DLC) Qualified Products List (QPL).







TYPE B4-HS



PHILIPS LUMEC  
RVS-35W32LED4K-R-LE4-HS  
RoadView  
(1 Clusters of 32 LXA7-PW40 LED's) White 35W SSL c/w  
Advance Driver (1)  
XITANIUM LEDINTA03550C425FO 0.35A @ 120.00V

Horizontal Footcandles  
Scale: 1 Inch = 20 Ft.  
Light Loss Factor = 0.80  
Lumens Per Lamp = N.A. (absolute photometry)  
Luminaire Lumens = 2196  
Mounting Height = 25.00 Ft  
Maximum Calculated Value = 0.68 Fc  
Arrangement: Single

**PHOTOMETRIC FILENAME : RVS-35W32LED4K-R-LE4-HS (S1210262).IES**

**DESCRIPTIVE INFORMATION (From Photometric File)**

PHILIPS LUMEC  
RVS-35W32LED4K-R-LE4-HS  
RoadView  
(1 Clusters of 32 LXA7-PW40 LED's) White 35W SSL c/w  
Advance Driver (1)  
XITANIUM LEDINTA03550C425FO 0.35A @ 120.00V

**TEMPLATE SPECIFICATION**

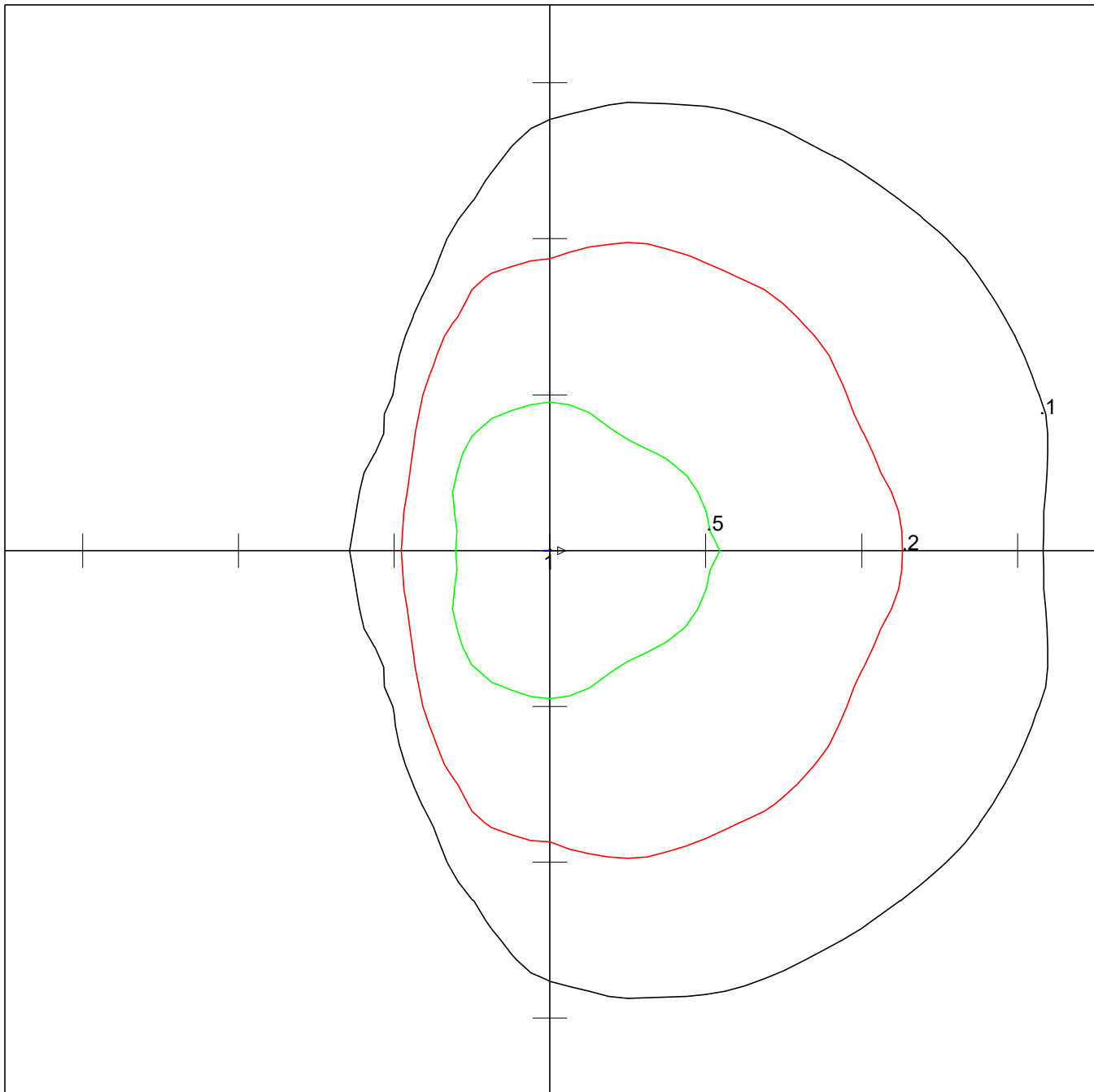
Horizontal Footcandles  
Scale: 1 Inch = 20 Ft.  
Light Loss Factor = 0.80  
Lumens Per Lamp = N.A. (absolute photometry)  
Luminaire Lumens = 2196  
Mounting Height = 25.00 Ft  
Maximum Calculated Value = 0.68 Fc  
Arrangement: Single

**LUMINAIRE LAYOUT INFORMATION**

| <u>#</u> | <u>X</u> | <u>Y</u> | <u>Z</u> | <u>Orient</u> | <u>Tilt</u> | <u>Roll</u> | <u>Spin</u> | <u>Tilt Correction</u> |
|----------|----------|----------|----------|---------------|-------------|-------------|-------------|------------------------|
| 1        | 0.00     | 0.00     | 25.00    | 0.00          | 0.00        | 0.00        | 0.00        | 1.00                   |



TYPE B-4



PHILIPS LUMEC  
RVS-35W32LED4K-R-LE4  
RoadView  
(1 Cluster of 32 LXA7-PW40 LED's) White 35W SSL c/w  
Advance Driver  
XITANIUM LEDINTA03550C425FO 0.35A @ 120.00V

Horizontal Footcandles  
Scale: 1 Inch = 20 Ft.  
Light Loss Factor = 0.80  
Lumens Per Lamp = N.A. (absolute photometry)  
Luminaire Lumens = 3434  
Mounting Height = 25.00 Ft  
Maximum Calculated Value = 1.00 Fc  
Arrangement: Single



**PHOTOMETRIC FILENAME : RVS-35W32LED4K-R-LE4 (S1210243).IES**

**DESCRIPTIVE INFORMATION (From Photometric File)**

PHILIPS LUMEC  
RVS-35W32LED4K-R-LE4  
RoadView  
(1 Cluster of 32 LXA7-PW40 LED's) White 35W SSL c/w  
Advance Driver  
XITANIUM LEDINTA03550C425FO 0.35A @ 120.00V

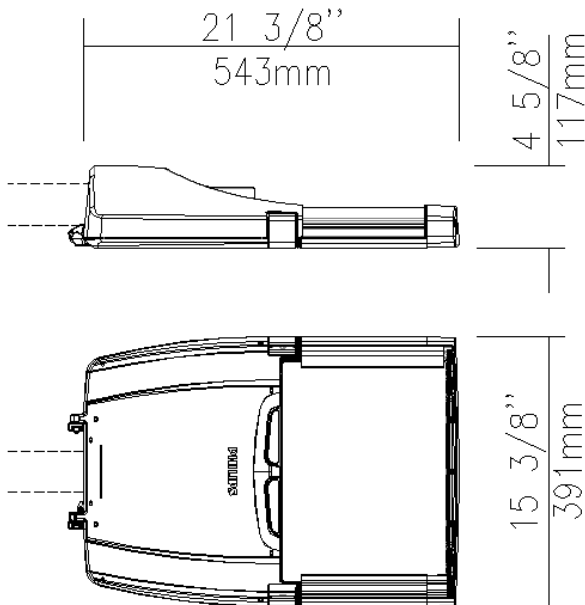
**TEMPLATE SPECIFICATION**

Horizontal Footcandles  
Scale: 1 Inch = 20 Ft.  
Light Loss Factor = 0.80  
Lumens Per Lamp = N.A. (absolute photometry)  
Luminaire Lumens = 3434  
Mounting Height = 25.00 Ft  
Maximum Calculated Value = 1.00 Fc  
Arrangement: Single

**LUMINAIRE LAYOUT INFORMATION**

| <u>#</u> | <u>X</u> | <u>Y</u> | <u>Z</u> | <u>Orient</u> | <u>Tilt</u> | <u>Roll</u> | <u>Spin</u> | <u>Tilt Correction</u> |
|----------|----------|----------|----------|---------------|-------------|-------------|-------------|------------------------|
| 1        | 0.00     | 0.00     | 25.00    | 0.00          | 0.00        | 0.00        | 0.00        | 1.00                   |

## TYPE B-5 (Reference=L37560-2)



EPA: 0.60 sq ft / weight: 26 lb (11.8 kg)  
Note: 3D image may not represent color or option selected.  
Logos above include link, click to access.

Luminaire **RVS-35W32LED4K-R-LE5-VOLT-COL**

### Description of Components:

**Housing:** Made of die cast A360 Aluminum alloy 0.090 (2.4mm) minimum thickness. Fits on a 1.66" (42mm) to 2 3/8" (60mm) OD by 6" (152mm) long tenon. Comes with an easy step adjustable reversible zinc plated clamping system with 4 hexagonal bolts 3/8 16 UNC for ease of maintenance and installation. The clamping system is pre-assembled for a 2 3/8" (60mm) diameter tenon. For a 1.66" (42mm) or 1.9" (48mm) diameter tenon the clamping system must be reversed by others. Permits an adjustment of +/- 5°. The housing is complete with a tool-free removable and secured power door avoiding accidental dropping giving access to electronics components and to a terminal block that accepts (#2 max.) wires from the primary circuit. A clearance of 13"(330mm) at the rear is required in order to remove the door.

**Light Engine: LEDgine** composed of 4 main components: **Heat Sink / LED Module / Optical System / Driver**  
Electrical components are RoHS compliant.

**Heat Sink:** Made of 6063-T5 extruded aluminum optimising the LEDs efficiency and life. Product does not use any cooling device with moving parts (only passive cooling device). **Finish of extrusion will be clear anodized not painted.**

**Lens:** Made of soda-lime tempered glass lens, mechanically assembled and sealed onto the lower part of the heat sink.

**LED Module:** LED type Philips Lumileds LUXEON R. Composed of 32 high-performance white LEDs. Color temperature as per ANSI/NEMA bin Neutral White, 4000 Kelvin nominal (3985K +/- 275K or 3710K to 4260K), CRI 70 Min. 75 Typical.

**Optical System:** (LE5), IES type V (symmetrical). Composed of high-performance optical grade PMMA acrylic refractor lenses to achieve desired distribution optimized to get maximum spacing, target lumens and a superior lighting uniformity. System is rated IP66. Performance shall be tested per LM-63, LM-79 and TM-15 (IESNA) certifying its photometric performance. Dark Sky compliant with 0% uplight and U0 per IESNA TM-15.

**End Cap:** Made of die cast A360.1 Aluminum alloy 0.100 (2.5mm) minimum thickness, mechanically assembled to the heat sink.

**Driver:** High power factor of 90% minimum. Electronic driver, operating range 50/60 Hz. **Auto-adjusting universal voltage input from 120 to 277 VAC rated for both application line to line or line to neutral, Class I**, THD of 20% max. Maximum ambient operating temperature from -40F(-40C) to 130F(55C) degrees.

The current supplying the LEDs will be reduced by the driver if the driver experiences internal overheating as a protection to the LEDs and the electrical components. Output is protected from short circuits, voltage overload and current overload. Automatic recovery after correction. Standard built-in driver surge protection of 2.5kV (min).

**Surge Protector:** Surge protector tested in accordance with ANSI/IEEE C62.45 per ANSI/IEEE C62.41.2 Scenario I Category C High Exposure 10kV/10kA waveforms for Line-Ground, Line-Neutral and Neutral-Ground, and in accordance with U.S. DOE (Department of Energy) MSSLC (Municipal Solid-State Street Lighting Consortium) model specification for LED roadway luminaires electrical immunity requirements for High Test Level 10kV / 10kA.



Miscellaneous

Description of Components:

**Wiring:** The connection of the luminaire is done using a terminal block connector 600V, 85A for use with #2-14 AWG. wires from the primary circuit, located inside the housing. Due to the inrush current that occurs with electronic drivers, recommend using a 10Amp time delay fuse to avoid unwanted fuse blowing (false tripping) that can occur with normal or fast acting fuses.

**Hardware:** All exposed screws shall be complete with Ceramic primer-seal basecoat to reduce seizing of the parts and offers a high resistance to corrosion. All seals and sealing devices are made and/or lined with EPDM and/or silicone and/or rubber.

**Finish: Color to be advised (Standard product Color only):** BKTX (COL) and in accordance with the AAMA 2603 standard. Application of polyester powder coat paint (4 mils/100 microns) with  $\pm 1$  mils/24 microns of tolerance. The Thermosetting resins provides a discoloration resistant finish in accordance with the ASTM D2244 standard, as well as luster retention in keeping with the ASTM D523 standard and humidity proof in accordance with the ASTM D2247 standard.

The surface treatment achieves a minimum of 2000 hours for salt spray resistant finish in accordance with testing performed and per ASTM B117 standard.

**Surface Finish:** *The above mentioned product has been specified in a smooth finish. We wish to inform you that we cannot guarantee a finish without imperfections (e.g. apparent grinding marks and porosity). We strongly recommend the use of a textured finish which provides better uniformity of surface finish. No return of merchandise showing above mentioned imperfection will be granted.*

**Note: IMPORTANT:** All missing details must be clearly specified on the return of these approval drawings. Thank you for your cooperation.

COLOR: BKTX / VOLTAGE: TBD

**LED products manufacturing standard:** The electronic components sensitive to electrostatic discharge (ESD) such as light emitting diodes (LEDs) are assembled in compliance with IEC61340-5-1 and ANSI/ESD S20.20 standards so as to eliminate ESD events that could decrease the useful life of the product.

**Quality Control:** The manufacturer must provide a written confirmation of its ISO 9001-2008 and ISO 14001-2004 International Quality Standards Certification.

**Vibration Resistance:** The RVS meets the **ANSI C136.31**, American National Standard for Roadway Luminaire Vibration specifications for Bridge/overpass applications. (Tested for 3G over 100 000 cycles)

**Web site information details:** / [ISO 9001-2008 Certification](#) / [ISO 14001-2004 Certification](#)

## TYPE B-5 (Reference=L37560-2)

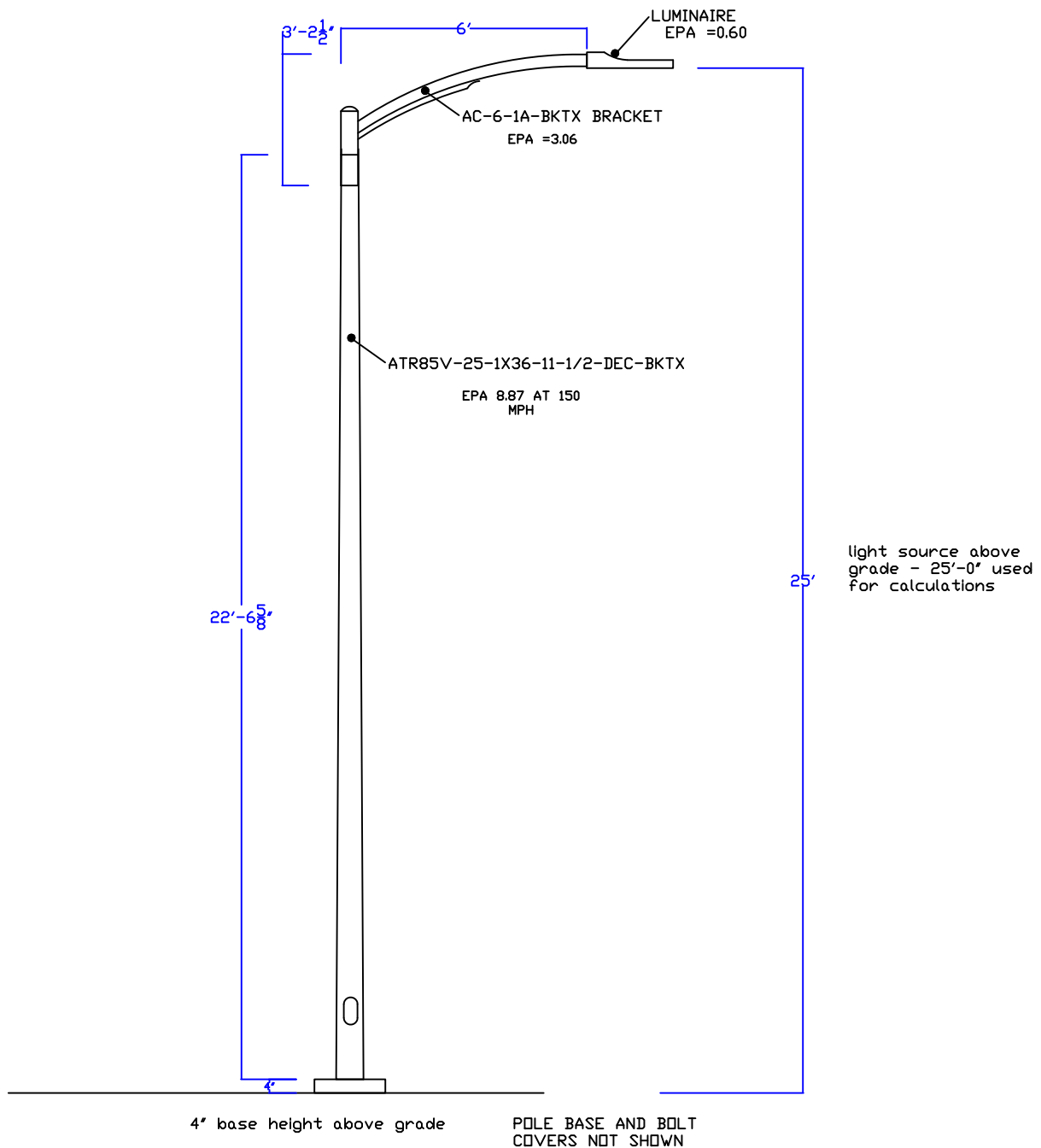
| LED light engine technical information for RVS                    |                          |                                         |                             |                             |                             |                             |                             |                             |                  |                             |                                  |            |
|-------------------------------------------------------------------|--------------------------|-----------------------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|------------------|-----------------------------|----------------------------------|------------|
| LED = Philips Lumileds Luxeon R, CRI = 75, CCT = 4000K (+/- 350K) |                          |                                         |                             |                             |                             |                             |                             |                             |                  |                             |                                  |            |
| System (LED + driver) rated life = 100,000 hrs <sup>1</sup>       |                          |                                         |                             |                             |                             |                             |                             |                             |                  |                             |                                  |            |
| Lamp                                                              | Typical delivered lumens | Typical system wattage <sup>2</sup> (W) | Typical current @ 120 V (A) | Typical current @ 208 V (A) | Typical current @ 240 V (A) | Typical current @ 277 V (A) | Typical current @ 347 V (A) | Typical current @ 480 V (A) | LED current (mA) | HID equivalent <sup>3</sup> | Luminaire Efficacy Rating (Lm/W) | BUG rating |
| 35W32LED4K-R-LE2                                                  | 3670                     | 36                                      | 0.29                        | 0.17                        | 0.16                        | 0.15                        | N/A                         | N/A                         | 350              | 70-100W                     | 101.9                            | B1-U0-G1   |
| 35W32LED4K-R-LE3                                                  | 3686                     | 36                                      | 0.29                        | 0.17                        | 0.16                        | 0.15                        | N/A                         | N/A                         | 350              | 70-100W                     | 102.4                            | B1-U0-G1   |
| 35W32LED4K-R-LE4                                                  | 3434                     | 36                                      | 0.29                        | 0.17                        | 0.16                        | 0.15                        | N/A                         | N/A                         | 350              | 70-100W                     | 95.4                             | B1-U0-G1   |
| 35W32LED4K-R-LE5                                                  | 3108                     | 36                                      | 0.29                        | 0.17                        | 0.16                        | 0.15                        | N/A                         | N/A                         | 350              | 70-100W                     | 86.3                             | B2-U0-G1   |
| 55W32LED4K-R-LE2                                                  | 5303                     | 53                                      | 0.40                        | 0.23                        | 0.21                        | 0.19                        | N/A                         | N/A                         | 530              | 100-150W                    | 100.1                            | B1-U0-G1   |
| 55W32LED4K-R-LE3                                                  | 5327                     | 53                                      | 0.40                        | 0.23                        | 0.21                        | 0.19                        | N/A                         | N/A                         | 530              | 100-150W                    | 100.5                            | B1-U0-G1   |
| 55W32LED4K-R-LE4                                                  | 4969                     | 53                                      | 0.40                        | 0.23                        | 0.21                        | 0.19                        | N/A                         | N/A                         | 530              | 100-150W                    | 93.8                             | B1-U0-G1   |
| 55W32LED4K-R-LE5                                                  | 4505                     | 53                                      | 0.40                        | 0.23                        | 0.21                        | 0.19                        | N/A                         | N/A                         | 530              | 100-150W                    | 85.0                             | B3-U0-G1   |
| 72W32LED4K-R-LE2                                                  | 6507                     | 70                                      | 0.57                        | 0.33                        | 0.33                        | 0.25                        | 0.20                        | 0.14                        | 700              | 100-150W                    | 93.0                             | B2-U0-G1   |
| 72W32LED4K-R-LE3                                                  | 6536                     | 70                                      | 0.57                        | 0.33                        | 0.33                        | 0.25                        | 0.20                        | 0.14                        | 700              | 100-150W                    | 93.4                             | B2-U0-G1   |
| 72W32LED4K-R-LE4                                                  | 6092                     | 70                                      | 0.57                        | 0.33                        | 0.33                        | 0.25                        | 0.20                        | 0.14                        | 700              | 100-150W                    | 87.0                             | B2-U0-G2   |
| 72W32LED4K-R-LE5                                                  | 6036                     | 70                                      | 0.57                        | 0.33                        | 0.33                        | 0.25                        | 0.20                        | 0.14                        | 700              | 100-150W                    | 86.2                             | B3-U0-G1   |
| 55W48LED4K-R-LE2                                                  | 5469                     | 55                                      | 0.38                        | 0.22                        | 0.23                        | 0.21                        | 0.17                        | 0.13                        | 350              | 100-150W                    | 99.4                             | B1-U0-G1   |
| 55W48LED4K-R-LE3                                                  | 5397                     | 55                                      | 0.38                        | 0.22                        | 0.23                        | 0.21                        | 0.17                        | 0.13                        | 350              | 100-150W                    | 98.1                             | B1-U0-G1   |
| 55W48LED4K-R-LE4                                                  | 5152                     | 55                                      | 0.38                        | 0.22                        | 0.23                        | 0.21                        | 0.17                        | 0.13                        | 350              | 100-150W                    | 93.7                             | B1-U0-G1   |
| 55W48LED4K-R-LE5                                                  | 4685                     | 55                                      | 0.38                        | 0.22                        | 0.23                        | 0.21                        | 0.17                        | 0.13                        | 350              | 100-150W                    | 85.2                             | B3-U0-G1   |
| 80W48LED4K-R-LE2                                                  | 7903                     | 79                                      | 0.63                        | 0.36                        | 0.34                        | 0.31                        | 0.24                        | 0.18                        | 530              | 150-175W                    | 100.0                            | B2-U0-G1   |
| 80W48LED4K-R-LE3                                                  | 7799                     | 79                                      | 0.63                        | 0.36                        | 0.34                        | 0.31                        | 0.24                        | 0.18                        | 530              | 150-175W                    | 98.7                             | B2-U0-G1   |
| 80W48LED4K-R-LE4                                                  | 7444                     | 79                                      | 0.63                        | 0.36                        | 0.34                        | 0.31                        | 0.24                        | 0.18                        | 530              | 150-175W                    | 94.2                             | B2-U0-G2   |
| 80W48LED4K-R-LE5                                                  | 6757                     | 79                                      | 0.63                        | 0.36                        | 0.34                        | 0.31                        | 0.24                        | 0.18                        | 530              | 150-175W                    | 85.5                             | B3-U0-G1   |
| 108W48LED4K-R-LE2                                                 | 9694                     | 105                                     | 0.86                        | 0.50                        | 0.50                        | 0.43                        | 0.30                        | 0.22                        | 700              | 175-200W                    | 92.3                             | B2-U0-G2   |
| 108W48LED4K-R-LE3                                                 | 9570                     | 105                                     | 0.86                        | 0.50                        | 0.50                        | 0.43                        | 0.30                        | 0.22                        | 700              | 175-200W                    | 91.1                             | B2-U0-G2   |
| 108W48LED4K-R-LE4                                                 | 9134                     | 105                                     | 0.86                        | 0.50                        | 0.50                        | 0.43                        | 0.30                        | 0.22                        | 700              | 175-200W                    | 87.0                             | B2-U0-G2   |
| 108W48LED4K-R-LE5                                                 | 8987                     | 105                                     | 0.86                        | 0.50                        | 0.50                        | 0.43                        | 0.30                        | 0.22                        | 700              | 175-200W                    | 85.6                             | B3-U0-G2   |
| 70W64LED4K-R-LE2                                                  | 6947                     | 71                                      | 0.58                        | 0.34                        | 0.32                        | 0.30                        | 0.24                        | 0.20                        | 350              | 100-150W                    | 97.8                             | B2-U0-G1   |
| 70W64LED4K-R-LE3                                                  | 6970                     | 71                                      | 0.58                        | 0.34                        | 0.32                        | 0.30                        | 0.24                        | 0.20                        | 350              | 100-150W                    | 98.2                             | B2-U0-G1   |
| 70W64LED4K-R-LE4                                                  | 6481                     | 71                                      | 0.58                        | 0.34                        | 0.32                        | 0.30                        | 0.24                        | 0.20                        | 350              | 100-150W                    | 91.3                             | B2-U0-G2   |
| 70W64LED4K-R-LE5                                                  | 6239                     | 71                                      | 0.58                        | 0.34                        | 0.32                        | 0.30                        | 0.24                        | 0.20                        | 350              | 100-150W                    | 87.9                             | B3-U0-G1   |
| 110W64LED4K-R-LE2                                                 | 10039                    | 103                                     | 0.80                        | 0.46                        | 0.42                        | 0.38                        | 0.34                        | 0.28                        | 530              | 200-250W                    | 97.5                             | B2-U0-G2   |
| 110W64LED4K-R-LE3                                                 | 10072                    | 103                                     | 0.80                        | 0.46                        | 0.42                        | 0.38                        | 0.34                        | 0.28                        | 530              | 200-250W                    | 97.8                             | B2-U0-G2   |
| 110W64LED4K-R-LE4                                                 | 9359                     | 103                                     | 0.80                        | 0.46                        | 0.42                        | 0.38                        | 0.34                        | 0.28                        | 530              | 200-250W                    | 90.9                             | B2-U0-G2   |
| 110W64LED4K-R-LE5                                                 | 9010                     | 103                                     | 0.80                        | 0.46                        | 0.42                        | 0.38                        | 0.34                        | 0.28                        | 530              | 200-250W                    | 87.5                             | B3-U0-G2   |
| 90W80LED4K-R-LE2                                                  | 8409                     | 90                                      | 0.78                        | 0.43                        | 0.40                        | 0.34                        | 0.30                        | 0.25                        | 350              | 175-200W                    | 93.4                             | B2-U0-G1   |
| 90W80LED4K-R-LE3                                                  | 8555                     | 90                                      | 0.78                        | 0.43                        | 0.40                        | 0.34                        | 0.30                        | 0.25                        | 350              | 175-200W                    | 95.1                             | B2-U0-G2   |
| 90W80LED4K-R-LE4                                                  | 8096                     | 90                                      | 0.78                        | 0.43                        | 0.40                        | 0.34                        | 0.30                        | 0.25                        | 350              | 175-200W                    | 90.0                             | B2-U0-G2   |
| 90W80LED4K-R-LE5                                                  | 7793                     | 90                                      | 0.78                        | 0.43                        | 0.40                        | 0.34                        | 0.30                        | 0.25                        | 350              | 175-200W                    | 86.6                             | B3-U0-G2   |
| 135W80LED4K-R-LE2                                                 | 12152                    | 128                                     | 1.15                        | 0.61                        | 0.58                        | 0.50                        | 0.43                        | 0.35                        | 530              | 200-250W                    | 94.9                             | B3-U0-G2   |
| 135W80LED4K-R-LE3                                                 | 12363                    | 128                                     | 1.15                        | 0.61                        | 0.58                        | 0.50                        | 0.43                        | 0.35                        | 530              | 200-250W                    | 96.6                             | B3-U0-G2   |
| 135W80LED4K-R-LE4                                                 | 11699                    | 128                                     | 1.15                        | 0.61                        | 0.58                        | 0.50                        | 0.43                        | 0.35                        | 530              | 200-250W                    | 91.4                             | B2-U0-G2   |
| 135W80LED4K-R-LE5                                                 | 11262                    | 128                                     | 1.15                        | 0.61                        | 0.58                        | 0.50                        | 0.43                        | 0.35                        | 530              | 200-250W                    | 88.0                             | B4-U0-G2   |

<sup>1</sup> L70 = 100,000 hrs (at ambient temperature = 25°C and forward current = 700 mA)

<sup>2</sup> System wattage includes the lamp and the LED driver.

<sup>3</sup> Equivalence should always be confirmed by a photometric layout

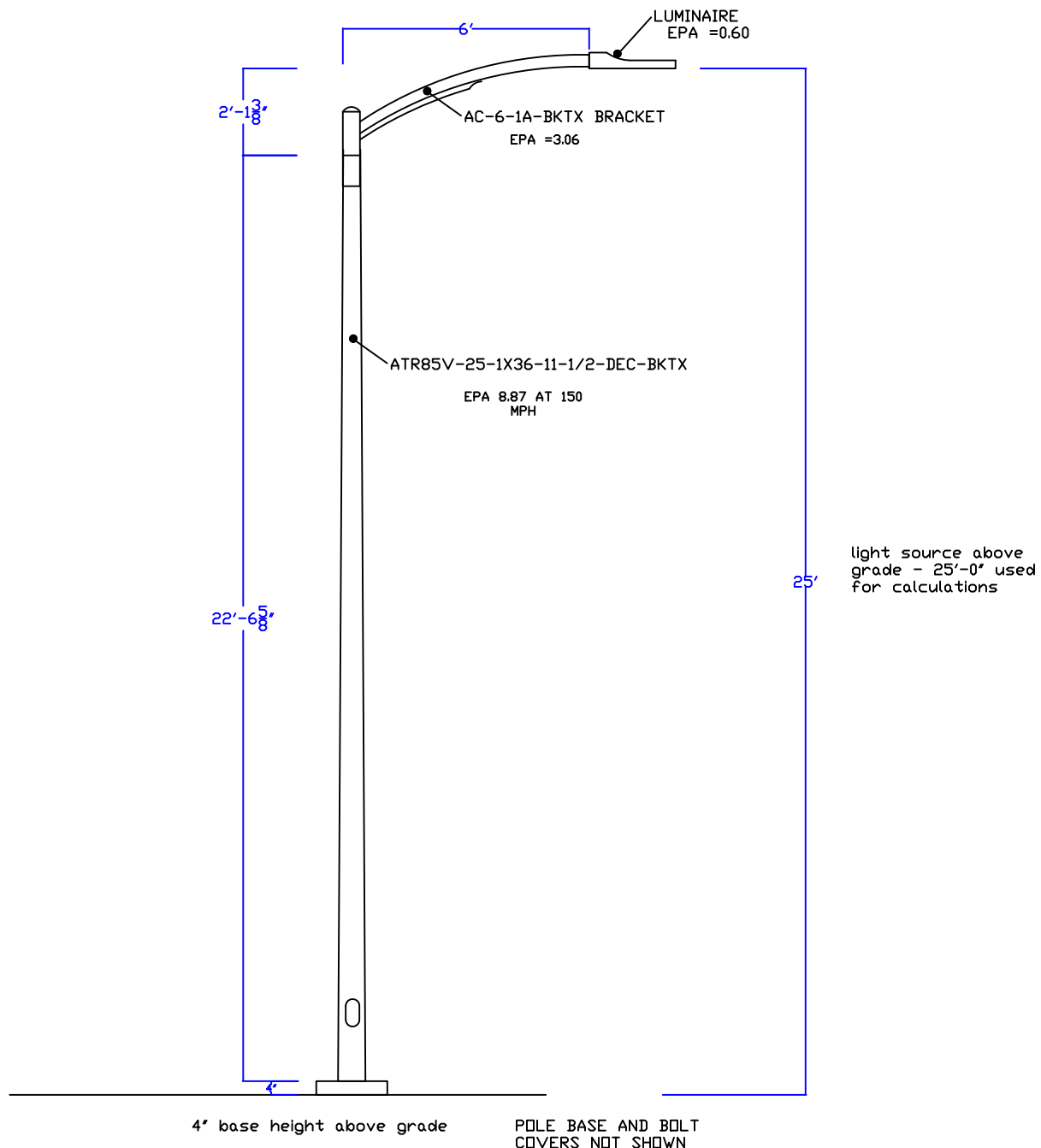
**Note** : Due to rapid and continuous advances in LED technology, LED luminaire data is subject to change without notice and at the discretion of Philips.



TYPE B-4, B-4 HS, B-5  
EAST PARKING LOT  
CITY OF BURLINGTON, VT.

J & M LIGHTING DESIGN, INC.  
207-967-5223  
jmlight2@roadrunner.com  
DEC. 19, 2016  
scale: 1/4" = 1'-0"





TYPE B-4 HSS  
WATERFRONT PARK  
CITY OF BURLINGTON, VT.

J & M LIGHTING DESIGN, INC.  
207-967-5223  
jmlight2@roadrunner.com  
JAN. 9, 2017  
scale: 1/4" = 1'-0"

# UCS – Universe Small Housing Scale

TYPE

C

- LED technology
- Full cutoff option available
- Powder coat finish in 13 standard colors with a polymer primer sealer
- Modular system offers five luminous choices and five hood options for customization to complement site design
- Pole, wall, or pendant mounting options
- Opal glass lens, IES Type 5 distribution for soft, general lighting

| 1. LUMINAIRE | 2. LUMINOUS HOOD | 3. LAMP/BALLAST | 4. COLOR | 5. OPTIONS | 6. OPTIONS (internal) | 7. MOUNTING |
|--------------|------------------|-----------------|----------|------------|-----------------------|-------------|
| UCS          | STR              | 12LED-NW        | BLT      | FCO        |                       |             |



UCS

## 1. LUMINAIRE

UCS Universe small

## 2. LUMINOUS /HOOD

### NO LUMINOUS & HOOD

ANGLED BELL FLARED STRAIGHT SKIRTED  
ANG BEL FLR STR SKB

### LUMINOUS & HOOD

| 4 LUMINOUS WINDOWS | SOLID RINGS | VERTICAL SLOTS | LUMINOUS RINGS |
|--------------------|-------------|----------------|----------------|
| WND-ANG            | SR-ANG      | VSL-ANG        | LUM-ANG        |
| WND-BEL            | SR-BEL      | VSL-BEL        | LUM-BEL        |
| WND-FLR            | SR-FLR      | VSL-FLR        | LUM-FLR        |
| WND-STR            | SR-STR      | VSL-STR        | LUM-STR        |
| WND-SKB            | SR-SKB      | VSL-SKB        | LUM-SKB        |

## 3. LAMP/BALLAST

**LED** (Warm white (3000K), Neutral white (4000K), Bright white (5000K). 32 watts. 120 thru 277 volt)

12LED-WW 12LED-NW 12LED-BW

**COMPACT FLUORESCENT** (120 thru 277 volt ballast. -18°C min start temp. Specify wattage)

CF (4 pin, 26, 32 or 42 watt lamp)

### METAL HALIDE

Medium base, ED-17 lamp. 120/208/240/277 volt ballast

50MH 70MH

G12 base, T-6 ceramic lamp

70MHT6 (120/277/347 volt ballast)

### HIGH PRESSURE SODIUM

Medium base, ED-17 lamp

50HPS (120/277 volt ballast)

70HPS (120/208/240/277 volt ballast)

All ballasts and LED drivers are factory wired for 277 volts, unless specified. Lamps not included (except for LED options). For pole mounted fixtures, the ballast is located in the arm.

## 4. COLOR

|                      |                           |
|----------------------|---------------------------|
| WH Arctic White      | VBU Verde Blue            |
| BL Black             | CRT Corten                |
| BLT Matte Black      | MAL Matte Aluminum        |
| DB Dark Bronze       | MG Medium Grey            |
| DGN Dark Green       | AGN Antique Green         |
| TT Titanium          | LG Light Grey             |
| WDB Weathered Bronze | RAL Premium Color         |
| MDB Bronze Metallic  | CUSTOM ** Contact Factory |

## 5. OPTIONS - HOOD

The natural copper and stainless steel hoods are unfinished to develop a patina over time. All hoods have the under side finished in high reflectance white.

COP (Copper) STS (Stainless steel)

## 6. OPTIONS - INTERNAL

SLC (Internal sleeve to block light when luminous element chosen)

347 (For HID, except 50MH & 50HPS, not available with LED)

FCO (Full cutoff shield. Replaces luminous element)

## 7. MOUNTING – Must choose one

**WALL MOUNT** (Integral ballast. Uses the mounting plate with a prewired ballast)

WCV (Curved arm)

WST (Straight arm)

### POLE MOUNT

Single arm, fits over a 3"/75mm pole

PCVS (Curved arm)

PSTS (Straight arm)

Twin arm, fits over 4"/100mm pole. (The top 6"/150mm of the pole top shall have an open, clear unobstructed area for the ballast assembly)

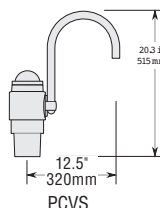
PCVT (Curved arm)

PSTT (Straight arm)

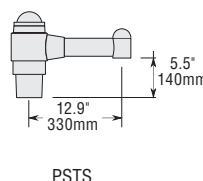
### PENDANT MOUNT (48"/1220mm stem)

PMS (Swivel fits over a standard octagonal j-box. Remote ballast required)

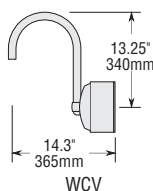
SBE (Surface mounted ballast enclosure)



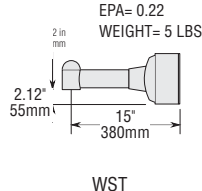
PCVS



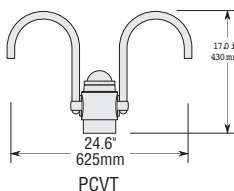
PSTS



WCV



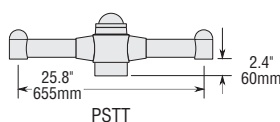
WST



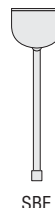
PCVT



PMS



PSTT



SBE

Visit [www.aal.net](http://www.aal.net) for Arms, Poles & Accessories Specification Guide

## SPECIFICATIONS

### HOUSING

The fixture and ballast housing shall be one piece cast aluminum. The luminous rings shall be acrylic with an aluminum spacer and stainless steel rods. The lens shall be tempered, borosilicate opal glass. The lens shall be gasketed and screwed onto the housing for lamp access. The hoods shall be heavy gage spun aluminum with hemmed edges for added rigidity.

All internal and external hardware shall be stainless steel

### FULL CUTOFF

The full cutoff shield is used in place of the luminous element when the FCO option is chosen. It lowers the hood to cover the opal lens, providing IES full cutoff classification meaning there is zero light emitted at 90° horizontal or above. The O.A.H of the UCS fixture with the FCO option is 14.25"/362mm with the bell hood, 14"/356mm with the skirted bell hood, or 13.25"/337mm for others.

### ELECTRICAL

The ballast shall be mounted to a cast plate, prewired with a quick disconnect plug. HID ballasts are high power factor, rated for -30°C starting. Sockets are medium base, pulse rated porcelain. Compact fluorescent socket is for a 26, 32 or 42 watt lamp, 4 pin, GX24q-4, with an electronic ballast, -18°C starting temperature. Ballasts are wired at the factory for 277 volts, unless specified. Standard LED color temperatures are 3000K, 4000K and 5000K. Other color temperatures available. Please contact factory. LED constant current driver operates at 700mA.

See next page

TYPE \_\_\_\_\_  
JOB \_\_\_\_\_  
NOTES \_\_\_\_\_



ARCHITECTURAL AREA LIGHTING  
16555 East Gale Ave. | City of Industry | CA 91745  
P 626.968.5666 | F 626.369.2695 | [www.aal.net](http://www.aal.net)  
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## INSTALLATION & MOUNTING

**Pole mount:** The fixture shall be welded to the arm assembly for both the wall and pole mounting models. The single fixture pole mounted arms PCVS and PSTS shall have an integral ballast compartment, and slip over a 3"/75mm pole. The twin fixture pole mounted arms PCVT and PSTT shall have an integral ballast compartment, and slip over an open top, 4"/100mm pole. The top 6"/150mm of the pole top shall have a clear, unobstructed area for the ballast assembly.

**Wall mount:** The wall mounted ballast housing shall be welded together with the arm and fixture as a unitized assembly. A cast aluminum wall plate shall have the ballast assembly installed and prewired for easy installation. The fixture assembly shall slip over the wall plate and secure with three stainless steel set screws. The mounting system shall allow for horizontal adjustment to level the fixture independent of the mounting plate orientation.

### Pendant mount SBE

The ballast is factory assembled and wired to the mounting plate. A .75"/18mm hole is provided for wiring access to the the J-box. Seal the back plate to the wall surface with an appropriate silicone caulk. Three .375"/10mm holes on 120° centers, on a 5"/125mm circle are provided on the back plate for anchoring. Use appropriate stainless steel fasteners for anchoring.

### FINISH

Fixture finish consists of a five stage pretreatment regimen with a polymer primer sealer, oven dry off and top coated with a thermoset super TGIC polyester powder coat finish. The finish shall meet the AAMA 605.2 performance specification which includes passing a 3000 hour salt spray test for corrosion resistance.

### CERTIFICATION

The fixture shall be listed with ETL and U.L. for outdoor, wet location use, UL1598 and Canadian CSA Std. C22.2 No.250.

### WARRANTY / TERMS AND CONDITIONS OF SALE

Download:

<http://www.hubbellighting.com/resources/warranty/>

## DIMENSIONS

| HOOD                                                                                                       | NO LUMINOUS                                                                                                        | 4 LUMINOUS WINDOW (WIN)                                                                                             | SOLID RINGS (SR)                                                                                                     | VERTICAL SLOTS (VSL)                                                                                                 | LUMINOUS RINGS (LUM)                                                                                                 |
|------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|
| ANG<br><br>DIA: 15"/380mm | <br>HT: 12.75"/325mm<br>EPA: 0.29 | <br>HT: 12.75"/325mm<br>EPA: 0.31 | <br>HT: 13.5"/340mm<br>EPA: 0.32  | <br>HT: 12.75"/325mm<br>EPA: 0.31 | <br>HT: 13.5"/340mm<br>EPA: 0.29  |
| BEL<br><br>DIA: 15"/380mm | <br>HT: 12.75"/325mm<br>EPA: 0.30 | <br>HT: 12.75"/325mm<br>EPA: 0.34 | <br>HT: 13"/330mm<br>EPA: 0.34    | <br>HT: 12.75"/325mm<br>EPA: 0.34 | <br>HT: 13"/330mm<br>EPA: 0.33    |
| FLR<br><br>DIA: 15"/380mm | <br>HT: 12.75"/325mm<br>EPA: 0.28 | <br>HT: 12.75"/325mm<br>EPA: 0.30 | <br>HT: 13"/330mm<br>EPA: 0.30    | <br>HT: 12.75"/325mm<br>EPA: 0.30 | <br>HT: 13"/330mm<br>EPA: 0.28    |
| STR<br><br>DIA: 16"/405mm | <br>HT: 12.75"/325mm<br>EPA: 0.27 | <br>HT: 12.75"/325mm<br>EPA: 0.28 | <br>HT: 12.75"/325mm<br>EPA: 0.28 | <br>HT: 12.75"/325mm<br>EPA: 0.28 | <br>HT: 12.75"/325mm<br>EPA: 0.27 |
| SKB<br><br>DIA: 15"/380mm | <br>HT: 13"/330mm<br>EPA: 0.38    | <br>HT: 16"/405mm<br>EPA: 0.43    | <br>HT: 16"/405mm<br>EPA: 0.43    | <br>HT: 16"/405mm<br>EPA: 0.43    | <br>HT: 15"/380mm<br>EPA: 0.41    |

### UCS 70MH

WATTAGE: 95

LUMEN OUTPUT: 3371

EFFICACY: 58.9

#### B1 U3 G2

##### FORWARD LIGHT LUMEN

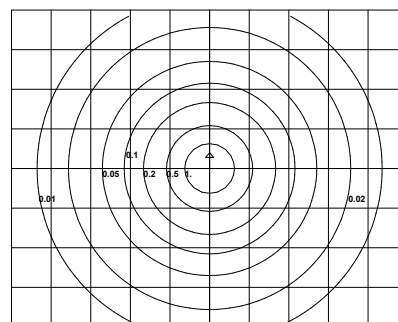
|     |     |       |     |
|-----|-----|-------|-----|
| FL  | 30° | 4.9%  | 276 |
| FM  | 60° | 12.9% | 725 |
| FH  | 80° | 8.4%  | 469 |
| FVH | 90° | 2.2%  | 124 |

##### BACK LIGHT

|     |     |       |     |
|-----|-----|-------|-----|
| BL  | 30° | 4.9%  | 276 |
| BM  | 60° | 12.9% | 725 |
| BH  | 80° | 8.4%  | 469 |
| BVH | 90° | 2.2%  | 124 |

##### UPLIGHT

|    |      |      |     |
|----|------|------|-----|
| UL | 100° | 2.3% | 127 |
| UH | 180° | 1.0% | 54  |



20' MOUNTING HEIGHT

#### Mounting Height

#### Multiplier

|    |       |
|----|-------|
| 10 | 4.000 |
| 15 | 1.778 |
| 20 | 1.000 |
| 25 | 0.640 |
| 30 | 0.444 |
| 35 | 0.327 |
| 40 | 0.250 |
| 45 | 0.198 |
| 50 | 0.160 |

UPLIGHT 94.6%  
DOWNLIGHT 5.4%

### UCS12LED BW

WATTAGE: 32

LUMEN OUTPUT: 1085

EFFICACY: 33.9

#### B1 U2 G1

##### FORWARD LIGHT LUMEN

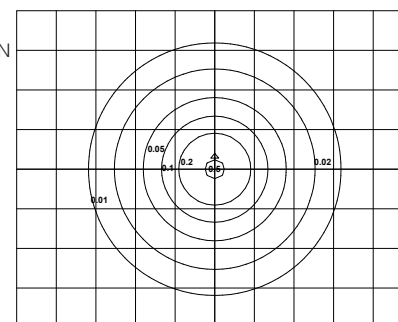
|     |     |       |     |
|-----|-----|-------|-----|
| FL  | 30° | 8.4%  | 91  |
| FM  | 60° | 20.4% | 221 |
| FH  | 80° | 14.5% | 157 |
| FVH | 90° | 4.7%  | 51  |

##### BACK LIGHT

|     |     |       |     |
|-----|-----|-------|-----|
| BL  | 30° | 8.4%  | 91  |
| BM  | 60° | 20.4% | 221 |
| BH  | 80° | 14.5% | 157 |
| BVH | 90° | 4.7%  | 51  |

##### UPLIGHT

|    |      |      |    |
|----|------|------|----|
| UL | 100° | 3.7% | 40 |
| UH | 180° | 0.6% | 6  |



20' MOUNTING HEIGHT

#### Mounting Height

#### Multiplier

|    |       |
|----|-------|
| 10 | 4.000 |
| 15 | 1.778 |
| 20 | 1.000 |
| 25 | 0.640 |
| 30 | 0.444 |
| 35 | 0.327 |
| 40 | 0.250 |
| 45 | 0.198 |
| 50 | 0.160 |

UPLIGHT 95.7%  
DOWNLIGHT 4.3%

AAL reserves the right to change product specifications without notice.



ARCHITECTURAL AREA LIGHTING  
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P 626.968.5666 | F 626.369.2695 | [www.aal.net](http://www.aal.net)  
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[IES files can be found at www.aal.net](http://www.aal.net)





TYPE C

## IES ROAD REPORT

PHOTOMETRIC FILENAME : UCS-ANG-12LED-BW.IES

### DESCRIPTIVE INFORMATION (From Photometric File)

IESNA:LM-63-2002  
 [TEST] KL01878  
 [TESTLAB] KIM LIGHTING  
 [TESTDATE] 01/07/2010  
 [ISSUEDATE] 01/11/2010  
 [MANUFAC] ARCHITECTURAL AREA LIGHTING  
 [LUMCAT] UCS-ANG-12LED-BW 5100K  
 [LUMINAIRE] SMALL SCALE UNIVERSE LUMINAIRE; DIE-CAST  
 [MORE] ALUMINUM BALLAST HOUSING AND LENS FRAME;  
 [MORE] SPUN ALUMINUM ANGLED HOOD; COATED GLASS GLOBE;  
 [MORE] NON CUTOFF  
 [LAMP] 1 2 CONSTANT CURRENT BOARDS  
 [LAMP] 12 LEDS; 5100K; LUMEN RATING=1086  
 [OTHER] DATA SHOWN IS ABSOLUTE FOR THE SAMPLE PROVIDED

### CHARACTERISTICS

|                                                 |                              |
|-------------------------------------------------|------------------------------|
| IES Classification                              | Type V                       |
| Longitudinal Classification                     | Very Short                   |
| Lumens Per Lamp                                 | N.A. (absolute)              |
| Total Lamp Lumens                               | N.A. (absolute)              |
| Luminaire Lumens                                | 1085                         |
| Downward Total Efficiency                       | N.A. (absolute)              |
| Total Luminaire Efficiency                      | N.A. (absolute)              |
| Luminaire Efficacy Rating (LER)                 | 34                           |
| Total Luminaire Watts                           | 32                           |
| Ballast Factor                                  | 1.00                         |
| Upward Waste Light Ratio                        | 0.04                         |
| Maximum Candela                                 | 219                          |
| Maximum Candela Angle                           | 0H 15V                       |
| Maximum Candela (<90 Degrees Vertical)          | 219                          |
| Maximum Candela Angle (<90 Degrees Vertical)    | 0H 15V                       |
| Maximum Candela At 90 Degrees Vertical          | 63 (5.8% Luminaire Lumens)   |
| Maximum Candela from 80 to <90 Degrees Vertical | 120 (11.1% Luminaire Lumens) |
| Cutoff Classification (deprecated)              | N.A. (absolute)              |

**IES ROAD REPORT**  
**PHOTOMETRIC FILENAME : UCS-ANG-12LED-BW.IES**

**LUMINAIRE CLASSIFICATION SYSTEM (LCS)**

|                               | Lumens   | % Lamp | % Luminaire |
|-------------------------------|----------|--------|-------------|
| FL - Front-Low (0-30)         | 90.9     | N.A.   | 8.4         |
| FM - Front-Medium (30-60)     | 221.0    | N.A.   | 20.4        |
| FH - Front-High (60-80)       | 157.0    | N.A.   | 14.5        |
| FVH - Front-Very High (80-90) | 50.8     | N.A.   | 4.7         |
| BL - Back-Low (0-30)          | 90.9     | N.A.   | 8.4         |
| BM - Back-Medium (30-60)      | 221.0    | N.A.   | 20.4        |
| BH - Back-High (60-80)        | 157.0    | N.A.   | 14.5        |
| BVH - Back-Very High (80-90)  | 50.8     | N.A.   | 4.7         |
| UL - Uplight-Low (90-100)     | 40.3     | N.A.   | 3.7         |
| UH - Uplight-High (100-180)   | 5.9      | N.A.   | 0.5         |
| Total                         | 1085.6   | N.A.   | 100.0       |
| BUG Rating                    | B1-U2-G1 |        |             |

**IES ROAD REPORT**  
**PHOTOMETRIC FILENAME : UCS-ANG-12LED-BW.IES**

**CANDELA TABULATION**

**Vert. Horizontal Angles**

|              | <b>0</b> |
|--------------|----------|
| <b>0.0</b>   | 219      |
| <b>2.5</b>   | 219      |
| <b>5.0</b>   | 219      |
| <b>7.5</b>   | 219      |
| <b>10.0</b>  | 219      |
| <b>12.5</b>  | 219      |
| <b>15.0</b>  | 219      |
| <b>17.5</b>  | 218      |
| <b>20.0</b>  | 217      |
| <b>22.5</b>  | 216      |
| <b>25.0</b>  | 214      |
| <b>27.5</b>  | 212      |
| <b>30.0</b>  | 210      |
| <b>32.5</b>  | 208      |
| <b>35.0</b>  | 205      |
| <b>37.5</b>  | 202      |
| <b>40.0</b>  | 200      |
| <b>42.5</b>  | 197      |
| <b>45.0</b>  | 189      |
| <b>47.5</b>  | 190      |
| <b>50.0</b>  | 189      |
| <b>52.5</b>  | 186      |
| <b>55.0</b>  | 184      |
| <b>57.5</b>  | 180      |
| <b>60.0</b>  | 177      |
| <b>62.5</b>  | 173      |
| <b>65.0</b>  | 168      |
| <b>67.5</b>  | 163      |
| <b>70.0</b>  | 156      |
| <b>72.5</b>  | 149      |
| <b>75.0</b>  | 141      |
| <b>77.5</b>  | 131      |
| <b>80.0</b>  | 120      |
| <b>82.5</b>  | 108      |
| <b>85.0</b>  | 94       |
| <b>87.5</b>  | 79       |
| <b>90.0</b>  | 63       |
| <b>92.5</b>  | 48       |
| <b>95.0</b>  | 35       |
| <b>97.5</b>  | 25       |
| <b>100.0</b> | 16       |
| <b>102.5</b> | 9        |
| <b>105.0</b> | 4        |
| <b>107.5</b> | 1        |
| <b>110.0</b> | 0        |
| <b>112.5</b> | 0        |
| <b>115.0</b> | 0        |
| <b>117.5</b> | 0        |
| <b>120.0</b> | 0        |
| <b>122.5</b> | 0        |
| <b>125.0</b> | 0        |
| <b>127.5</b> | 0        |
| <b>130.0</b> | 0        |



**IES ROAD REPORT**  
**PHOTOMETRIC FILENAME : UCS-ANG-12LED-BW.IES**

**CANDELA TABULATION - (Cont.)**

|       |   |
|-------|---|
| 132.5 | 0 |
| 135.0 | 0 |
| 137.5 | 0 |
| 140.0 | 0 |
| 142.5 | 0 |
| 145.0 | 0 |
| 147.5 | 0 |
| 150.0 | 0 |
| 152.5 | 0 |
| 155.0 | 0 |
| 157.5 | 0 |
| 160.0 | 0 |
| 162.5 | 0 |
| 165.0 | 0 |
| 167.5 | 0 |
| 170.0 | 0 |
| 172.5 | 0 |
| 175.0 | 0 |
| 177.5 | 0 |
| 180.0 | 0 |



Dark Sky External Halyard Beacon



Details

NOTE: WILL UPDATE AS YOU SELECT OPTIONS.

|             |                                    |
|-------------|------------------------------------|
| Item Number | ORN-750032D                        |
| US Patent   | 7,275,495                          |
| Material    | Aluminum                           |
| Finish      | Gold                               |
| Fits        | Up to 3 1/2" Top Diameter Flagpole |
| Size        | 8" Diameter Beacon                 |
| Voltage     | 12V                                |
| Made In     | USA                                |

The Dark Sky External Halyard Beacon is the most environmentally correct way for flag illumination on flagpoles during night hours. For the first time, flags can be properly lit during nighttime hours without lighting adjoining property and the night sky! As light pollution and light trespass become increasingly important issues for city and county governments across the country, the Flagpole Beacon already complies with these new regulations. Its patented design lights the flag only and follows the flag as the wind blows it around the flagpole.

The Dark Sky Flagpole Beacon is an IDA Approved Dark Sky Friendly fixture, meeting all the requirements to be certified as a product that does not pollute the night sky. This series of Dark Sky Flagpole Beacon features a shield over the LED lights to minimize glare and reduce light trespass, in accordance with International Dark Sky Association guidelines.

Select finish option, and enter pole height below.

Beacon Features:

- 8 inch Gold Beacon
- 12 volts
- Two 3,000K bulbs (3 Watt)
- Wire kit 10 feet past the height of the pole
- Revolving truck (359°)
- Fits flagpoles with up to 3.5" top diameter
- Solar option and other sizes available, please inquire

This

Options:

Finish

Gold

Flagpole Height ⓘ

For a larger selection, or for custom flags, please visit The Flag Company, Inc.

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# Luminaire Definition(s)

## B-4

RVS-35W32LED4K-R-LE4

|                              |                                     |
|------------------------------|-------------------------------------|
| Filename                     | RVS-35W32LED4K-R-LE4 (S1210243).ies |
| Lumens Per Lamp              | N.A.                                |
| Number of Lamps              | 1                                   |
| Total Lamp Lumens            | N.A.                                |
| Arrangement Lamp Lumens      | N.A.                                |
| Arrangement Luminaire Lumens | 3434                                |
| Luminaire Lumens             | 3434                                |
| Luminaire Efficiency (%)     | N.A.                                |
| Total Light Loss Factor      | 0.800                               |
| Luminaire Watts              | 37                                  |
| Arrangement Watts            | 37                                  |
| Arrangement                  | SINGLE                              |
| Arm Length                   | 0                                   |
| Offset                       | 0                                   |
| Road Classification          | Type IV, Short, N.A. (deprecated)   |
| Upward Waste Light Ratio     | 0.00                                |

| Luminaire Classification System (LCS) | Lumens   | % Lamp | % Luminaire |
|---------------------------------------|----------|--------|-------------|
| LCS-FL                                | 299.2    | N.A.   | 8.7         |
| LCS-FM                                | 1051.3   | N.A.   | 30.6        |
| LCS-FH                                | 1064.5   | N.A.   | 31.0        |
| LCS-FVH                               | 9.9      | N.A.   | 0.3         |
| LCS-BL                                | 290.8    | N.A.   | 8.5         |
| LCS-BM                                | 536.4    | N.A.   | 15.6        |
| LCS-BH                                | 174.3    | N.A.   | 5.1         |
| LCS-BVH                               | 7.9      | N.A.   | 0.2         |
| LCS-UL                                | 0.0      | N.A.   | 0.0         |
| LCS-UH                                | 0.0      | N.A.   | 0.0         |
| Total                                 | 3434.3   | N.A.   | 100.0       |
| BUG Rating                            | B1-U0-G1 |        |             |
| Indoor Classification                 | Direct   |        |             |
| LER                                   | 93       |        |             |

## B-5

RVS-35W32LED4K-R-LE5

|                              |                                     |
|------------------------------|-------------------------------------|
| Filename                     | RVS-35W32LED4K-R-LE5 (S1210301).ies |
| Lumens Per Lamp              | N.A.                                |
| Number of Lamps              | 1                                   |
| Total Lamp Lumens            | N.A.                                |
| Arrangement Lamp Lumens      | N.A.                                |
| Arrangement Luminaire Lumens | 3108                                |
| Luminaire Lumens             | 3108                                |
| Luminaire Efficiency (%)     | N.A.                                |
| Total Light Loss Factor      | 0.800                               |
| Luminaire Watts              | 35                                  |
| Arrangement Watts            | 35                                  |
| Arrangement                  | SINGLE                              |
| Arm Length                   | 0                                   |
| Offset                       | 0                                   |
| Road Classification          | Type VS, Short, N.A. (deprecated)   |
| Upward Waste Light Ratio     | 0.00                                |

| Luminaire Classification System (LCS) | Lumens | % Lamp | % Luminaire |
|---------------------------------------|--------|--------|-------------|
| LCS-FL                                | 138.3  | N.A.   | 4.4         |
| LCS-FM                                | 711.4  | N.A.   | 22.9        |

## Luminaire Definition(s) - Cont.

|                       |          |      |       |
|-----------------------|----------|------|-------|
| LCS-FH                | 743.7    | N.A. | 23.9  |
| LCS-FVH               | 7.8      | N.A. | 0.3   |
| LCS-BL                | 128.7    | N.A. | 4.1   |
| LCS-BM                | 636.0    | N.A. | 20.5  |
| LCS-BH                | 732.0    | N.A. | 23.5  |
| LCS-BVH               | 10.5     | N.A. | 0.3   |
| LCS-UL                | 0.0      | N.A. | 0.0   |
| LCS-UH                | 0.0      | N.A. | 0.0   |
| Total                 | 3108.4   | N.A. | 100.0 |
| BUG Rating            | B2-U0-G1 |      |       |
| Indoor Classification | Direct   |      |       |
| LER                   | 89       |      |       |

### B-4-HS

RVS-35W32LED4K-R-LE4-HS

|                              |                                        |  |  |
|------------------------------|----------------------------------------|--|--|
| Filename                     | RVS-35W32LED4K-R-LE4-HS (S1210262).ies |  |  |
| Lumens Per Lamp              | N.A.                                   |  |  |
| Number of Lamps              | 1                                      |  |  |
| Total Lamp Lumens            | N.A.                                   |  |  |
| Arrangement Lamp Lumens      | N.A.                                   |  |  |
| Arrangement Luminaire Lumens | 2196                                   |  |  |
| Luminaire Lumens             | 2196                                   |  |  |
| Luminaire Efficiency (%)     | N.A.                                   |  |  |
| Total Light Loss Factor      | 0.800                                  |  |  |
| Luminaire Watts              | 35                                     |  |  |
| Arrangement Watts            | 35                                     |  |  |
| Arrangement                  | SINGLE                                 |  |  |
| Arm Length                   | 0                                      |  |  |
| Offset                       | 0                                      |  |  |
| Road Classification          | Type IV, Short, N.A. (deprecated)      |  |  |
| Upward Waste Light Ratio     | 0.00                                   |  |  |

| Luminaire Classification System (LCS) | Lumens   | % Lamp | % Luminaire |
|---------------------------------------|----------|--------|-------------|
| LCS-FL                                | 214.6    | N.A.   | 9.8         |
| LCS-FM                                | 829.6    | N.A.   | 37.8        |
| LCS-FH                                | 857.9    | N.A.   | 39.1        |
| LCS-FVH                               | 7.5      | N.A.   | 0.3         |
| LCS-BL                                | 97.3     | N.A.   | 4.4         |
| LCS-BM                                | 139.1    | N.A.   | 6.3         |
| LCS-BH                                | 46.7     | N.A.   | 2.1         |
| LCS-BVH                               | 2.8      | N.A.   | 0.1         |
| LCS-UL                                | 0.0      | N.A.   | 0.0         |
| LCS-UH                                | 0.0      | N.A.   | 0.0         |
| Total                                 | 2195.5   | N.A.   | 100.0       |
| BUG Rating                            | B0-U0-G1 |        |             |
| Indoor Classification                 | Direct   |        |             |
| LER                                   | 63       |        |             |

# Luminaire Location(s)

## Luminaire Locations

Project Name : Project\_1

Coordinates in Feet

| Lum. |        |            |          |    |         |      |      |      | Aiming Point |          |    | Status |
|------|--------|------------|----------|----|---------|------|------|------|--------------|----------|----|--------|
| No.  | Label  | X          | Y        | Z  | Orient  | Tilt | Roll | Spin | X            | Y        | Z  |        |
| 4    | B-5    | 1450755.59 | 24217.15 | 25 | 291.653 | 0    | 0    | 0    | 1450755.59   | 24217.15 | 25 | On     |
| 3    | B-5    | 1450690.32 | 24194.40 | 25 | 282.821 | 0    | 0    | 0    | 1450690.32   | 24194.40 | 25 | On     |
| 2    | B-4-HS | 1450697.03 | 24141.57 | 25 | 100     | 0    | 0    | 0    | 1450697.03   | 24141.57 | 25 | On     |
| 1    | B-4-HS | 1450780.51 | 24171.57 | 25 | 123.231 | 0    | 0    | 0    | 1450780.51   | 24171.57 | 25 | On     |
| 8    | B-4-HS | 1450861.91 | 24220.21 | 25 | 121.038 | 0    | 0    | 0    | 1450861.91   | 24220.21 | 25 | On     |
| 7    | B-4    | 1450822.24 | 24303.95 | 25 | 270     | 0    | 0    | 0    | 1450822.24   | 24303.95 | 25 | On     |
| 6    | B-4    | 1450768.48 | 24304.03 | 25 | 270     | 0    | 0    | 0    | 1450768.48   | 24304.03 | 25 | On     |
| 5    | B-5    | 1450817.49 | 24253.30 | 25 | 359.344 | 0    | 0    | 0    | 1450817.49   | 24253.30 | 25 | On     |

## Summary By Label

Project Name : Project\_1

| Label  | On | Off | Total |
|--------|----|-----|-------|
| B-4    | 2  | 0   | 2     |
| B-5    | 3  | 0   | 3     |
| B-2    | 0  | 0   | 0     |
| B-4-HS | 3  | 0   | 3     |

---

# Calculation Summary

## SITE

Project: Project\_1  
2 Pt. Grid  
Coordinates in Feet

|                   |            |
|-------------------|------------|
| Point Spacing L-R | 5          |
| Point Spacing T-B | 5          |
| Grid Orient       | 0          |
| Grid Tilt         | 0          |
| Meter Type        | Horizontal |

|                  |      |
|------------------|------|
| Illuminance (Fc) |      |
| Average          | 0.05 |
| Maximum          | 1.19 |
| Minimum          | 0.00 |
| Avg/Min          | N.A. |
| Max/Min          | N.A. |

## EAST PARKING

Project: Project\_1  
Illuminance (Fc)

|           |      |
|-----------|------|
| Average = | 0.57 |
| Maximum = | 1.2  |
| Minimum = | 0.2  |
| Avg/Min = | 2.85 |
| Max/Min = | 6.00 |



PROJECT: BURLINGTON HARBOR WATERFRONT -EAST PARKING  
BURLINGTON, VT.

SECTION 5.5.2 OUTDOOR LIGHTING

SEC. 5.5.2-a Site Plan Review Required

SEC. 5.5.2-b Exemptions  
Project claims no exemptions

SEC. 5.5.2-c Lighting Prohibited  
Project is in compliance, no items on the project are falling within these criteria.

SEC. 5.5.2-d Lighting Plan Submission Requirements

SEC. 5.5.2-1- A site plan showing:

- A. See Attached site plan illustrates area being illuminated.
- B. Point by Point photometric analysis spacing is 2' x 2' grid.
  - Maximum: 1.2 foot-candles
  - Minimum: 0.2 foot-candles
  - Average: 0.58 foot-candles
- C. Calculation of the initial and mean lamps lumens per net acre across the entire site.

NET AREA = 0.7395 acres

TYPE B-4 = 3434 initial lumens X 2 = 6,868 total

TYPE B-4-HS= 2196 initial Lumens X 3 = 6,588 total

TYPE B-3 = 3108 initial Lumens X 3 = 9,324 total

GRAND TOTAL 22,780 INITIAL LUMENS

Mean lumens  $22,780 \times .80 = 18,224$  mean lumens

30,804.6 LUMENS PER ACRE INITIAL

Drawing TYPE B-4, B-4-HS, B-5 are LED using a depreciation factor of .80.

- D. The number, type, location, and mounting height.
  - All luminaires are in compliance with City of Burlington criteria.
  - All luminaires are DLC

Drawing TYPE B-4

Philips RVS-3532LED4K-LE4-UNIV-CLO-RC-BKTX

MOUNTING HEIGHT: 25' FROM FLAT OPTICAL ASSEMBLY TO THE  
GROUND

ARM LENGTH: 6'-0" (AC-6-1A-BKTX)

PHOTOMETRIC FILE: RVS-35W-32LED4K-R-LE4

TEST NO.: S1210243-R1

MOUNTING HEIGHT 25'-0" ABOVE GRADE

QUANTITY: 2

Drawing TYPE B-4-HS

Philips RVS-3532LED4K-LE4-HS-UNIV-CLO-RC-BKTX

MOUNTING HEIGHT: 25' FROM FLAT OPTICAL ASSEMBLY TO THE  
GROUND

ARM LENGTH: 6'-0" (AC-6-1A-BKTX)

PHOTOMETRIC FILE: RVS-35W-32LED4K-R-LE4-HS

TEST NO.: S1210262-R1

MOUNTING HEIGHT 25'-0" ABOVE GRADE

QUANTITY: 3

Drawing TYPE B-5

Philips RVS-3532LED4K-LE5-UNIV-CLO-RC-BKTX

MOUNTING HEIGHT: 25' FROM FLAT OPTICAL ASSEMBLY TO THE  
GROUND

ARM LENGTH: 6'-0" (AC-6-1A-BKTX)

PHOTOMETRIC FILE: RVS-35W-32LED4K-R-LE5

TEST NO.: S1210301-R1

MOUNTING HEIGHT 25'-0" ABOVE GRADE

QUANTITY: 3

SEC. 5.5.2-2

Vertical surfaces are not being illuminated by this proposed design.

SEC. 5.5.2-3

See attached documents Exhibit A

SEC. 5.5.2-4

To be determined by Administrative Officer

SEC. 5.5.2-e General Outdoor Lighting Standards

SEC. 5.5.2-1 Standard used was IES RP-33-2014 Lighting for Exterior Environments

SEC. 5.5.2-2 Standard used was IES RP-20-2014 Lighting for Parking Facilities

SEC. 5.5.2-3 Outdoor Lighting Manual for Vermont Municipalities edition 1996

SEC. 5.5.2-4 Fixtures used on this project comply with current BUG ratings rather than  
deprecated "Full cut-off" "Cut-Off" criteria.

Drawing TYPE B-4 B1-U0-G1

Drawing TYPE B-4-HS B0-U0-G1

Drawing TYPE B-5 B2-U0-G1

Light levels on adjacent property are in compliance with the 0.1 foot-candle 20  
feet beyond the development site.

SEC. 5.5.2-5 All LED luminaires are in compliance with a minimum CRI of 70 (75 CRI typical)  
for the drawing TYPE B series of luminaires.

SEC. 5.5.2-6 Illumination levels are the highest levels measured horizontally at ground level.  
The print-out assumes a flat site. Levels might fluctuate 20% over the life of the  
LED, about 70,000 hours.

SEC. 5.5.2-7 The project is in compliance with no laser light sources.

SEC. 5.5.2-8 There are no flag poles on this project.

SEC. 5.5.2-9 There shall be no neon tubing or banding on this project.

SEC. 5.5.2-f Specific Outdoor Lighting Standards

SEC. 5.5.2-f-1 Parking Lot Lighting

- A. Street lighting pole height complies with the 25'-0" requirement for the parking areas
- B. Project complies with criteria of illumination levels do not exceed 4 initial foot-candles at any point.

"East Parking" Calculated 1.2 foot-candles maximum

- C. Illumination levels are for the functional area of the parking
  - D. Maximum to minimum uniformity ratios are under the 20:1 calculated at 6:00:1.
  - E. Illumination shall be reduced to 50% one hour after the end of public business hours
- Project, as proposed, is not in compliance.

No parking garages are part of this project

SEC. 5.5.2-f-2 Walkway Lighting

Not applicable

SEC. 5.5.2-f-3 Lighting of Gasoline Fueling Pump Islands and Canopies

Not applicable

SEC. 5.5.2-f-4 Other Vehicular Canopies:

Not applicable

SEC. 5.5.2-f-5 Parking Garage Lighting

Not applicable

SEC. 5.5.2-f-6 Lighting of Exterior Sales/Display Areas

Not applicable

SEC. 5.5.2-f-7 Security

Not applicable

SEC. 5.5.2-f-8 Outdoor Recreational Facility Lighting

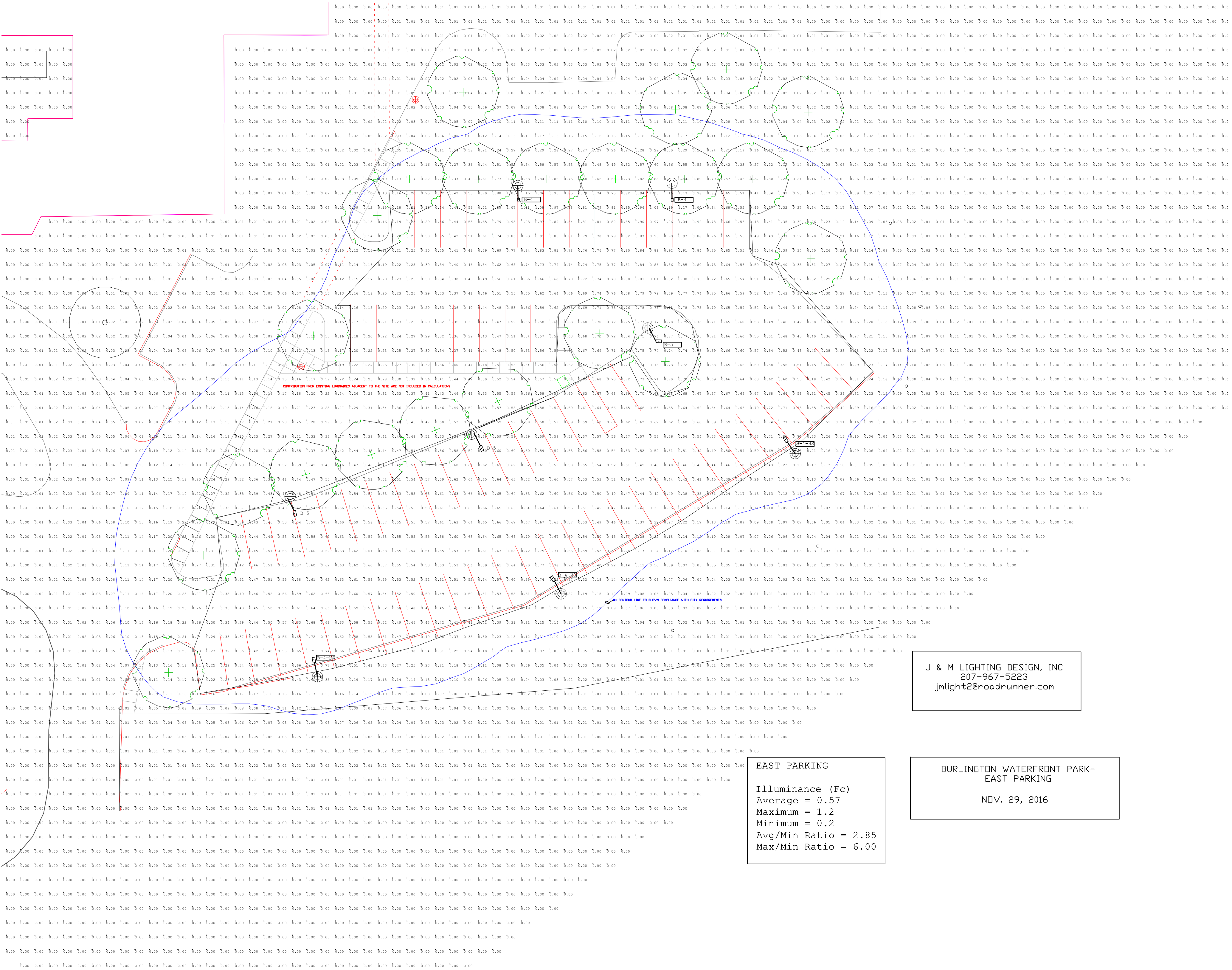
Not applicable

SEC. 5.5.2-f-9 Lighting of Building Facades

Not applicable

SEC. 5.5.2-g Exception

We are only using LED technologies on this project









|   | A       | B            | C                                       | D                                                        | E                           | F        | G                        | H                    | I        | J       | K          | L            | M                        | N                              | O                                                                                                          | P                                                               | Q     | R    | S                           | T           | U       | V      |
|---|---------|--------------|-----------------------------------------|----------------------------------------------------------|-----------------------------|----------|--------------------------|----------------------|----------|---------|------------|--------------|--------------------------|--------------------------------|------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------|-------|------|-----------------------------|-------------|---------|--------|
| 1 |         |              |                                         |                                                          |                             |          |                          |                      |          |         |            |              |                          |                                |                                                                                                            |                                                                 |       |      |                             |             |         |        |
| 2 | DRAWING |              |                                         |                                                          | FIXTURE                     | BUG      |                          |                      | WATTS AT |         | SURGE      |              | FIXTURE +                |                                |                                                                                                            |                                                                 |       |      |                             | PHOTOMETRIC | INITIAL | MEAN   |
| 3 | TYPE    | MANUFACTURER | CATALOG NUMBER                          | FIXTURE ACCESSORIES                                      | ACCESSORIES                 | RATING   | DISTRIBUTION             | FINISH               | 120 VOLT | VOLTS   | PROTECTION | ARM          | BRACKET                  | POLE                           | POLE HEIGHT                                                                                                | POLE ACCESSORIES                                                | COLOR | CRI  | PHOTOMETRIC FILE            | TEST NO.    | LUMENS  | LUMENS |
| 4 | B-4     | PHILIPS      | RVS-3532-LED-4K-R-LE-4-UNIV-CLO-RC-BKTX | RC = RECEPTACLE FOR TWIST-LOCK PHOTOCELL OR SHORTING CAP | CLO = CONSTANT LIGHT OUTPUT | B1-U0-G1 | 4                        | MATTE TEXTURED BLACK | 36       | 120-277 | YES        | AC-6-1A-BKTX | 0.6 + 3.06 + BANNER ARMS | ATR85V-25-1X36-11 1/2-DEC-BKTX | 25'-0" ADJUST POLE HEIGHT TO ACHIEVE LUMINAIRE MOUNTING HEIGHT TO BOTTOM OF FIXTURE 25'-0" ABOVE THE GRADE | 1/2-DEC-BKTX BRACKET ARM FOR BANNERS (2 per pole one side only) | 4,000 | 70 + | RVS-35W32LED4K-R-LE4.IES    | S1210243    | 3434    | 2747.2 |
| 5 | B-4-HS  | PHILIPS      | RVS-3532-LED-4K-R-LE-4-UNIV-CLO-RC-BKTX | RC = RECEPTACLE FOR TWIST-LOCK PHOTOCELL OR SHORTING CAP | CLO = CONSTANT LIGHT OUTPUT | B0-U0-G1 | 4 WITH HOUSE SIDE SHIELD | MATTE TEXTURED BLACK | 36       | 120-277 | YES        | AC-6-1A-BKTX | 0.6 + 3.06 + BANNER ARMS | ATR85V-25-1X36-11 1/2-DEC-BKTX | 25'-0" ADJUST POLE HEIGHT TO ACHIEVE LUMINAIRE MOUNTING HEIGHT TO BOTTOM OF FIXTURE 25'-0" ABOVE THE GRADE | 1/2-DEC-BKTX BRACKET ARM FOR BANNERS (2 per pole one side only) | 4,000 | 70 + | RVS-35W32LED4K-R-LE4-HS.IES | S1210262    | 2196    | 1756.8 |
| 6 | B-5     | PHILIPS      | RVS-3532-LED-4K-R-LE-4-UNIV-CLO-RC-BKTX | RC = RECEPTACLE FOR TWIST-LOCK PHOTOCELL OR SHORTING CAP | CLO = CONSTANT LIGHT OUTPUT | B2-U0-G1 | 5                        | MATTE TEXTURED BLACK | 36       | 120-277 | YES        | AC-6-1A-BKTX | 0.6 + 3.06 + BANNER ARMS | ATR85V-25-1X36-11 1/2-DEC-BKTX | 25'-0" ADJUST POLE HEIGHT TO ACHIEVE LUMINAIRE MOUNTING HEIGHT TO BOTTOM OF FIXTURE 25'-0" ABOVE THE GRADE | 1/2-DEC-BKTX BRACKET ARM FOR BANNERS (2 per pole one side only) | 4,000 | 70 + | RVS-35W32LED4K-R-LE5.IES    | S1210301    | 3108    | 2486.4 |

|   | A       | B              | C                                       | D                                                        | E                           | F        | G                        | H                    | I                 | J       | K          | L      | M                     | N           | O                               | P                                                                                                          | Q                     | R        | S    | T                               | U           | V       | W           |
|---|---------|----------------|-----------------------------------------|----------------------------------------------------------|-----------------------------|----------|--------------------------|----------------------|-------------------|---------|------------|--------|-----------------------|-------------|---------------------------------|------------------------------------------------------------------------------------------------------------|-----------------------|----------|------|---------------------------------|-------------|---------|-------------|
| 1 |         |                |                                         |                                                          |                             |          |                          |                      |                   |         |            |        |                       |             |                                 |                                                                                                            |                       |          |      |                                 |             |         |             |
| 2 | DRAWING |                |                                         |                                                          | FIXTURE                     | BUG      | DISTRIBUTION             |                      |                   |         | SURGE      |        |                       | FIXTURE +   |                                 |                                                                                                            | POLE                  | COLOR    |      |                                 | PHOTOMETRIC | INITIAL |             |
| 3 | TYPE    | MANUFACTURER   | CATALOG NUMBER                          | FIXTURE ACCESSORIES                                      | ACCESSORIES                 | RATING   | TYPE                     | FINISH               | WATTS AT 120 VOLT | VOLTS   | PROTECTION | LUMENS | ARM                   | BRACKET EPA | POLE                            | POLE HEIGHT                                                                                                | ACCESSORIES           | TEMP (k) | CRI  | PHOTOMETRIC FILE                | TEST NO.    | LUMENS  | MEAN LUMENS |
| 4 | A4-HSS  | AAL            | UCM-STR-T4-32LED-4K-450-BLT-120-277     | HSS = HOUSE SIDE SHIELD                                  |                             | B0-U0-G1 | 4 WITH HOUSE SIDE SHIELD | MATTE BLACK          | 48                | 120-277 | YES        | 3,529  | SLA-17                | 2.09        | DB6-4R14-125-14-BLT-RBC-BBS4-24 | 13'-3"FROM BOTTOM OF LUMINAIRE TO GROUND                                                                   | BANNER ARMS           | 4,000    | 73   | UCM-ANG-T4-32LED-4K-450-HSS.IES | NA          | 3529    | 2823.2      |
| 5 | A-5     | AAL            | UCM-STR-T5-32LED-4K-450-BLT-120-277     |                                                          |                             | B3-U0-G1 | 5                        | MATTE BLACK          | 48                | 120-277 | YES        | 4,825  | SLA-17                | 2.09        | DB6-4R14-125-14-BLT-RBC-BBS4-24 | 13'-3"FROM BOTTOM OF LUMINAIRE TO GROUND                                                                   | BANNER ARMS           | 4,000    | 73   | UCM-T5-32LED-4K-450.IES         | NA          | 4825    | 3860        |
| 6 | B-4-HSS | PHILIPS        | RVS-3532-LED-4K-R-LE-4-UNIV-CLO-RC-BKTX | RC = RECEPTACLE FOR TWIST-LOCK PHOTOCELL OR SHORTING CAP | CLO = CONSTANT LIGHT OUTPUT | B0-U0-G1 | 4 WITH HOUSE SIDE SHIELD | MATTE TEXTURED BLACK | 36                | 120-277 | YES        | 3,434  | AC-6-1A-BKTX          | 0.6 + 3.06  | ATR85V-25-1X36-11 1/2-DEC-BKTX  | 25'-0" ADJUST POLE HEIGHT TO ACHIEVE LUMINAIRE MOUNTING HEIGHT TO BOTTOM OF FIXTURE 25'-0" ABOVE THE GRADE | NONE                  | 4,000    | 70 + | RVS-35W32LED4K-R-LE4-HS.IES     | S1210262-R1 | 2196    | 1756.8      |
| 7 | C       | AAL            | UCS-STR--12 LED-NW-BLT-FCO-             |                                                          |                             | B1-U2-G1 |                          | MATTE BLACK          | 32                | 120-277 | YES        | 1,085  | WCV                   | 0.27        | WALL MOUNT                      | NA                                                                                                         | NONE                  | 4,000    | 73   | UCS-ANG-12LED-BW.IES            | KL01878     | 1085    | 868         |
| 8 |         |                |                                         |                                                          |                             |          |                          |                      |                   |         |            |        |                       |             |                                 |                                                                                                            |                       |          |      |                                 |             |         |             |
| 9 | FLAG    | FLAG WAREHOUSE | ORN-750032D                             |                                                          |                             | NA       |                          | GOLD-GREY            | 6                 | 12      | NO         |        | BY FLAG POLE SUPPLIER |             | BY FLAG POLE SUPPLIER           | 35'-0"                                                                                                     | BY FLAG POLE SUPPLIER | 3,000    |      | NA                              | NA          | 0       | 0           |

## Department of Planning and Zoning

149 Church Street  
Burlington, VT 05401  
Telephone: (802) 865-7188  
(802) 865-7195 (FAX)  
(802) 865-7142 (TTY)

David White, AICP, Director  
Meagan Tuttle, AICP, Comprehensive Planner  
Jay Appleton, GIS Manager  
Scott Gustin, AICP, CFM, Principal Planner  
Mary O'Neil, AICP, Principal Planner  
Ryan Morrison, CFM, Associate Planner  
Anita Wade, Zoning Clerk  
vacant, Department Secretary



**TO:** Development Review Board  
**FROM:** Scott Gustin  
**DATE:** March 21, 2017  
**RE:** 17-0776CA/CU; 449 South Prospect Street

=====

**Note: These are staff comments only; decisions on projects are made by the Development Review Board, which may approve, deny, table or modify any project. THE APPLICANT OR REPRESENTATIVE MUST ATTEND THE MEETING.**

Zone: RL      Ward: 6S

Owner/Applicant: Chris C. Khamnei

**Request:** Change of use from single family to duplex and widen driveway.

### **Applicable Regulations:**

Article 3 (Applications and Reviews), Article 4 (Maps & Districts), Article 5 (Citywide General Regulations), Article 6 (Development Criteria & Guidelines), Article 8 (Parking)

### **Background Information:**

The applicant is seeking approval to change the use of an existing single family home to a duplex. The applicant also seeks to widen the existing driveway. No other changes are proposed.

There are no previous zoning actions for this property.

**Recommendation:** Certificate of appropriateness and conditional use approval as per, and subject to, the following findings and conditions:

### **I. Findings**

#### **Article 3: Applications and Reviews**

##### ***Part 5, Conditional Use & Major Impact Review:***

##### **Section 3.5.6 (a) Conditional Use Review Standards**

*Approval shall be granted only if the DRB, after public notice and public hearing, determines that the proposed conditional use and associated development shall not result in an undue adverse effect on each of the following general standards:*

1. *Existing or planned public utilities, facilities or services are capable of supporting the proposed use in addition to the existing uses in the area;*

The property is served by municipal utilities. Sufficient water and sewer service are available. The conversion to a duplex will entail a slight increase in demand. A State of Vermont wastewater permit will be required. A capacity letter issued by the Dept. of Public Works will be required prior to issuance. **(Affirmative finding as conditioned)**



2. *The character of the area affected as defined by the purpose or purposes of the zoning district(s) within which the project is located, and specifically stated policies and standards of the municipal development plan;*

The subject property is located within the Residential Low Density (RL) zone. This district is intended primarily for low-density residential development in the form of single detached dwellings and duplexes. This district is typically characterized by a compact and cohesive residential development pattern reflective of the respective neighborhoods' development history. The conversion to a duplex is consistent with this intent. **(Affirmative finding)**

3. *The proposed use will not have nuisance impacts from noise, odor, dust, heat, and vibrations greater than typically generated by other permitted uses in the same zoning district;*

The proposed duplex is not expected to generate nuisance impacts from noise, odor, dust, or the like that may be more typically associated with industrial uses. **(Affirmative finding)**

4. *The transportation system is capable of supporting the proposed use in addition to the existing uses in the area. Evaluation factors include street designations and capacity; level of service and other performance measures; access to arterial roadways; connectivity; transit availability; parking and access; impacts on pedestrian, bicycle and transit circulation; safety for all modes; and adequate transportation demand management strategies;*

The conversion from single family home to duplex will likely result in minimal additional traffic generation. No traffic study has been provided or is required for a project of this small scale. **(Affirmative finding)**

*and,*

5. *The utilization of renewable energy resources;*

No renewable energy utilization is included in this proposal. Future incorporation is not precluded by the proposed conversion. **(Affirmative finding)**

*and,*

6. *Any standards or factors set forth in existing City bylaws and city and state ordinances;*

Building code, minimum housing standards, and other applicable city bylaws and state ordinances will be administered and enforced separately.

(b) Major Impact Review Standards  
Not applicable.

(c) Conditions of Approval:

*In addition to imposing conditions of approval necessary to satisfy the General Standards specified in (a) or (b) above, the DRB may also impose additional conditions of approval relative to any of the following:*

*1. Mitigation measures, including but not limited to screening, landscaping, where necessary to reduce noise and glare and to maintain the property in a character in keeping with the surrounding area.*

The proposed conversion to a duplex does not require mitigation measures screening, landscaping, and/or the reduction of glare. **(Affirmative finding)**

*2. Time limits for construction.*

No construction timeline or phasing are included in the project plans. The standard 2-year timeframe for zoning permits will apply. **(Affirmative finding)**

*3. Hours of operation and/or construction to reduce the impacts on surrounding properties.*

Hours of operation do not apply to the proposed duplex.

No construction hours are noted. Only minimal exterior construction – associated with the driveway – is proposed. Typical construction hours within or close to residential areas are Monday – Friday from 7:00 AM – 5:00 PM. Saturday construction may be allowed upon request. No work on Sunday. **(Affirmative finding as conditioned)**

*4. That any future enlargement or alteration of the use return for review to the DRB to permit the specifying of new conditions; and,*

Any future enlargement or alteration will be reviewed under the zoning regulations in effect at that time.

*5. Such additional reasonable performance standards, conditions and safeguards, as it may deem necessary to implement the purposes of this chapter and the zoning regulations.*

See the recommended conditions.

#### **Article 4: Maps & Districts**

##### ***Sec. 4.4.5, Residential Districts:***

###### ***(a) Purpose***

###### ***(1) Residential Low Density (RL)***

The subject property is located in the RL zone. This zone is primarily intended for low density residential development in the form of single family homes and duplexes. As noted above, the duplex is consistent with the express intent of the RL zone. **(Affirmative finding)**

###### ***(b) Dimensional Standards & Density***

The property is relatively large at 0.42 acre. It exceeds the 10,000 sf minimum lot size required for a duplex in the RL zone. At an allowable density of 7 units per acre, the proposed 2 units are within density limits.

Lot coverage is limited to 35% (with an additional 10% available for decks, patios, and open porches) of the lot area. As proposed, lot coverage would increase to 19.5%.

Setbacks remain unchanged except that the widened driveway would extend to 5' from the side property line. This setback is acceptable for a driveway.

Building height remains unchanged. **(Affirmative finding)**

***(c) Permitted & Conditional Uses***

The duplex is subject to conditional use review in the RL zone.

***(d) District Specific Regulations***

***1. Setbacks***

No setback encroachments are sought.

***2. Height***

Not applicable in RL.

***3. Lot Coverage***

No lot coverage exceptions are sought.

***4. Accessory Residential Structures and Uses***

No new accessory structures or uses are proposed.

***5. Residential Density***

Both of the residential units are subject an occupancy limit of 4 unrelated adults or a family as defined in the CDO. **(Affirmative finding as conditioned)**

***6. Uses***

Not applicable.

***7. Residential Development Bonuses***

None sought.

**Article 5: Citywide General Regulations**

***Sec. 5.2.3, Lot Coverage Requirements***

See Article 4 above.

***Sec. 5.2.4, Buildable Area Calculation***

Not applicable.

***Sec. 5.2.5, Setbacks***

See Article 4 above.

***Sec. 5.2.6, Building Height Limits***

See Article 4 above.

***Sec. 5.2.7, Density and Intensity of Development Calculations***

See Article 4 above.

***Sec. 5.5.1, Nuisance Regulations***

Nothing in the proposal appears to constitute a nuisance under this criterion. **(Affirmative finding)**

**Article 6: Development Review Standards:**

***Part 1, Land Division Design Standards***

***Sec. 6.1.2, Review Standards***

Not applicable.

## ***Part 2, Site Plan Design Standards***

### ***Sec. 6.2.2, Review Standards***

#### ***(i) Vehicular access***

A single driveway presently serves the property. It is narrow at the curb and widens as it approaches the existing 2-bay garage. The applicant proposes to widen the driveway to 28.' This proposed width exceeds the 18' width limitation on residential driveway widths and cannot be permitted. The proposed driveway widening must be limited to 18' or less. **(Affirmative finding as conditioned)**

## ***Part 3, Architectural Design Standards***

### ***Sec. 6.3.2, Review Standards***

Not applicable.

## **Article 8: Parking**

### ***Sec. 8.1.8, Minimum Off-Street Parking Requirements***

The subject property is within the Neighborhood Parking District. As a result, the proposed duplex requires 4 parking spaces (2 spaces per unit). Existing conditions seemingly afford space for the 4 required parking spots. The proposed driveway widening, even if limited to 18' as required, will provide ample space for the required parking spaces in conjunction with the 2-bay garage.

**(Affirmative finding)**

### ***Sec. 8.2.5, Bicycle Parking Requirements***

Not applicable.

## **II. Conditions of Approval**

1. **Prior to release of the zoning permit**, a revised site plan depicting a driveway of no more than 18' wide shall be submitted, subject to staff review and approval:
2. **Prior to release of the zoning permit**, the applicant shall receive written verification of adequate wastewater capacity from the Department of Public Works.
3. Days and hours of construction are limited to Monday – Friday 7:00 AM – 5:00 PM. No construction activity on Saturday or Sunday.
4. Both of the residential units are subject an occupancy limit of 4 unrelated adults or a family as defined in the CDO.
5. A State of Vermont wastewater permit is required.
6. It is the applicant's responsibility to comply with all applicable ADA requirements.
7. All new construction is required to meet the Guidelines for Energy Efficient Construction pursuant to the requirements of Article VI. Energy Conservation, Section 8 of the City of Burlington Code of Ordinances.
8. Any outdoor signage will require a separate sign permit.
9. Standard Conditions 1-15.



~~BURLINGTON HARBOR MARINA~~

~~LEP Permit Application~~

~~December 22, 2016~~

## TABLE OF CONTENTS



VIEW IN RENDERING

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VIEW OF PARK



DOCK ACCESS POINT

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WATER TREATMENT PLNT AND PAVILION

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SUBJECT MARINA SITE





EXISTING USCG BUILDING AND BREAKWATER ADJACENT TO SITE



USCG BUILDING AND BREAKWATER



ADJACENT FISHING PIER AND SAILING CENTER FACILITIES NORTH OF SITE



ADJACENT FLOATING ATTENUATOR AT COMMUNITY SAILING CENTER





ADJACENT SHORELINE STRUCTURES



DOWNTOWN BURLINGTON WATERFRONT

# Burlington Harbor Marina

January 27, 2017

Mr. Scott Gustin  
Senior Planner  
Burlington Dept. of Planning & Zoning  
149 Church St.  
Burlington, VT 05401

Re: Request for Lot Line Adjustment – 234 Penny Lane

Dear Scott,

Attached is a zoning permit application for construction of a new 160 slip public marina facility on approximately .6 acres of waterfront land to be leased from the City of Burlington. The leased lot will be created through a lot line adjustment described herein. Upland improvements include demolition of the existing pavilion and creation of a marina yard area with (2) gatehouse entrances to the new dock system, (2) modified storage containers for workshop and storage, underground fuel tank, and underground utility connections. A new plaza area for temporary drop off and accessible parking is proposed adjacent to the fishing pier including a new flagpole, landscaping and site lighting. A new waterfront park is proposed in the location of the current parking area adjacent to the Community Sailing Center and fishing pier. Parking for the project will be provided in a 68 space newly constructed lot in the location of the currently permitted 73 space lot under the WFN improvements permit.

The project components are located on 3 separate parcels so an application form is included for all 3. The proposed plat showing the lot line adjustment is included along with a letter requesting same from the City.

The attached fee was calculated as follows:

|                                                    |          |
|----------------------------------------------------|----------|
| \$959,000 of upland site construction/1000 x \$2 = | \$1,918  |
| Permit filing fee                                  | \$ 110   |
| Lot Line Adjustment 2 lots x \$100                 | = \$ 200 |
| Total                                              | \$2,228  |

## Traffic

A traffic study was requested by DPW and is attached.

# Burlington Harbor Marina

## Lighting

A lighting plan and photometric analysis is attached. The chosen fixtures match the fixtures utilized in the roadway and park areas of the WFN project.

## Parking

We are requesting a parking waiver to reduce the required number of spaces from 80 at .5 per berth to 48. The request is based on the following: (i) the maximum number of seasonal slips permitted in the Agreement with the City is 96 (60% of 160), reducing the requirement for parking spaces to 48 (.5 per slip); and (ii) the users of the 64 transient boat slips are less likely to need parking, as they arrive at the Marina by boat. 42 of the 48 spaces are located in the proposed 68 space 'East Lot' with the remaining 26 available for allocation to the Community Sailing Center.

Please let me know if you have any questions on how any of the other Site Plan Review Standards were addressed in the plan.

Signed,

Jack Wallace  
Managing Member  
Burlington Harbor Marina, LLC

Enc

Cc CEDO

RECEIVED  
FEB 10 2017





RECEIVED

FEB 10 2017

DEPARTMENT OF  
PLANNING & ZONING

DEPARTMENT OF  
PLANNING & ZONING

FEB 10 2017



To: Development Review Board

From: Chris Nosh

Re: 449 S. Prospect Street Duplex Application. 17-0776CU

The original deed for this property expressly prohibits any but a single dwelling unit on this property. As you know, accessory apartments are for the benefit of owner-occupiers, not owners not occupying the property. This property should remain a single-family residence.

A copy of the original deed is attached and highlighted. The original deed can be found I book 87, page 547 of Burlington land records.

Thank you.

RECEIVED

MAR 02 2017

DEPARTMENT OF  
PLANNING & ZONING

James M. Munn  
State of Vermont  
Chittenden County, ss.

Personally appeared at Burlington, in said County, Julian B. Clark, the signer and maker of the above written instrument, and acknowledged the same to be his free act and deed this 3rd day of July, A. D. 1925.

Before me,

William N. Edmunds  
Notary Public.

Received for record July 7, 1925 at 5<sup>35</sup> A. M. and recorded.  
Notary,

Edmund B. Loring

City Clerk.

R

Julian B. Clark  
to

(92<sup>50</sup> in Rev Stamps)  
Warranty Deed

Eugene B. & Gertrude H. Jordan

Know All Men By These Presents: That I, Julian B. Clark of Burlington in the County of Chittenden and State of Vermont party of the first part, in consideration of Ten Dollars paid to my satisfaction by Eugene B. Jordan and Gertrude H. Jordan husband and wife, of French in the County of Chittenden and State of Vermont, parties of the second part, and in further consideration of the performance by the parties of the second part, their heirs or assigns, of the conditions, covenants and agreements hereinafter set out to be by them performed, by these presents do hereby give, grant, bargain, sell, alien and convey unto the said Eugene B. and Gertrude H. Jordan and their heirs and assigns forever, subject to said conditions, covenants and agreements, the following described piece or parcel of land situated in the City of Burlington aforesaid and described as follows:

Lot No. 9 as laid down on a plan and detailed description of lot in and comprising a portion of Overlake Park, as called, made by Mc Intosh & Crouse, engineers, and recorded in Vol. 82 at page 569 of the Land Records of the City of Burlington, which plan and description is hereby referred to and made a part of this deed, and said lot is more particularly described as follows:

Beginning at a point in the westerly side line of South Prospect St., seven hundred fifteen (715) feet southerly measured along said side line of said street from the intersection of said line with the southerly side line of Cliff St., which said point is at the intersection of said westerly side line of South Prospect St. with the southerly side line of a proposed street extending from South Prospect Street westerly through Overlake Park; running thence in a northerly direction in said westerly line of said Prospect Street ninety-two (92) feet to a point; thence deflecting to the left eighty-seven degrees and thirty-nine minutes (87-39) and running in a westerly direction one hundred thirty one and forty six hundredths

Inside the side line of a proposed street extending easterly from South Prospect Street through Overlake Park, thence deflecting to the left and running in an easterly direction in a curve to the right, radius six hundred forty seven and forty six hundredths (647.46) feet, a distance of one hundred twenty-five and eighty-two hundredths (125.82) feet to the point or place of beginning.

I, Hase and I, hold the above granted and bargained premises with all the privileges and appurtenances thereto and thereto belonging unto the said Eugene B. Jordan and Loretta H. Jordan, husband and wife, their heirs and assigns, to them and their own proper use, benefit and behoof forever; and I, the said Julian B. Clark do for myself and my heirs, executors and administrators covenant to and with the said parties of the second part, their heirs, executors, administrators and assigns that at and until the unveiling of these presents I am well seized of the premises in fee simple that I have good right and lawful authority to bargain and sell the same in the manner and form as is so written; that they are free and clear of all encumbrances excepting the conditions and limitations hereinafter set forth; and that I will warrant and defend the same against all lawful claims and demands of any person or persons whomsoever excepting one claiming under said conditions and limitations namely:

The parties of the second part hereby covenant with the party of the first part, his heirs and assigns as a part of the consideration for this deed and as a condition of the continued ownership of the property:

1. But one dwelling house shall be erected on said lot and no lot shall be subdivided for sale or otherwise.
2. The premises shall be occupied and used for residence purposes only and not otherwise;
3. That any building excepting a garage which may be erected on said land shall be so erected that the main walls of said building shall not be within twenty feet of the west line of Prospect Street nor within fifteen feet of the north line of a certain proposed street appearing on the plat of The Sutro & Brandall above referred to, nor shall any portion whatever of such building including porches be erected or maintained nearer to any boundary of said land than ten feet; that no garage, unless a part of the dwelling house, shall be erected or kept on said land, wholly or partly, within sixty feet of the front line of said lot; and that no building erected within eighty feet from the front of said lot shall be within ten feet of an adjoining owner's lot.

4. No noisy and dangerous animal shall be kept on said premises and no nuisances of any kind shall be maintained or allowed thereon, nor shall any use of said premises be made or permitted which shall be



5. It is distinctly covenanted and agreed between the parties hereto that all the covenants and agreements above expressed shall run with the land hereby conveyed; provided never-the-less that after January 1, 1950, these restrictions and conditions or any part thereof may be amended, removed, extended or terminated upon the execution of a deed by the owners of a majority of the lots in said Overlake Park duly recorded.

6. It is understood that the placing of the foregoing restrictions and conditions on the land hereby conveyed entails no obligations express or implied upon the party of the first part to place the same restrictions and conditions upon other lots of land in said Park;

7. The party of the first part hereby reserves the right to enter upon the extreme rear part of the land hereby granted, in person or by representatives, or assigns, to erect and maintain thereon or thereunder poles, transmission lines, drains, sewers, conduits, water pipes, heat pipes, and other articles of transmission necessary or beneficial to any of the property contained in Overlake Park; provided that whenever the surface of the ground may be disturbed by the enjoyment of this right the party of the first part shall forthwith repair and restore the surface so disturbed to its former condition as nearly as may be practicable.

In Witness Whereof the party of the first part has hereunto set his hand and seal at Burlington aforesaid this 8th, day of July, 1925.

In the presence of  
C. A. Congdon  
William H. Edmunds  
State of Vermont  
Chittenden County, Vt.

Julian B. Clark Esq.

Personally appeared at Burlington in said County, Julian B. Clark, the signer and reader of the above written instrument, and acknowledged the same to be his free act and deed this 8th, day of July, A. D. 1925.

Before me,

William H. Edmunds  
Notary Public.

Received for record July 8, 1925 at 5 P. M. and recorded.

Attest,

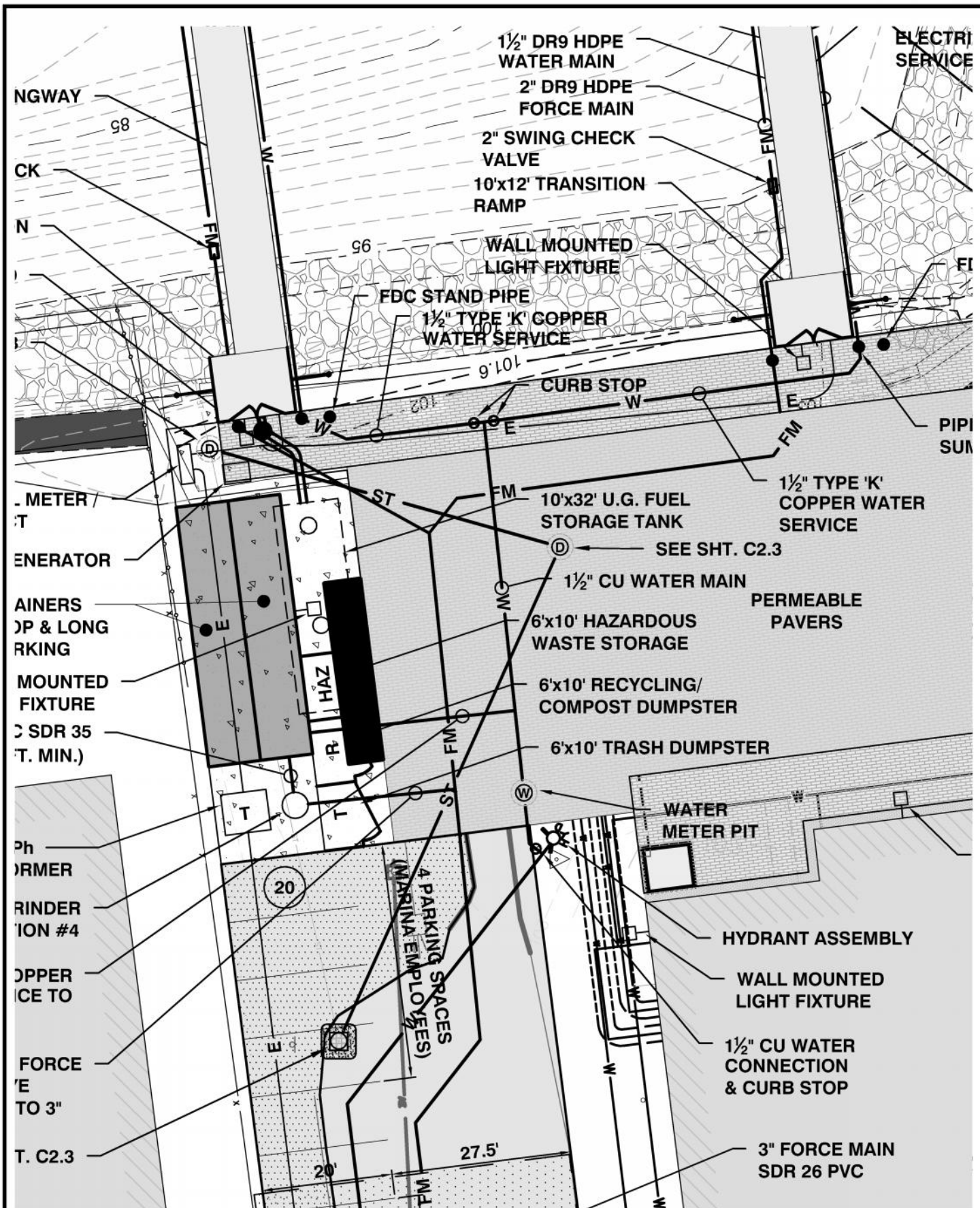
Crawford B. Corby

City Clerk.

Harry & Bidget Leonard  
Burlington Light & Power Co.

© R  
Warranty Deed

Know all Men by these Presents, That, We, Harry Leonard and Bidget Leonard, husband and wife of Burlington in the County of Chittenden and State of Vermont, for and in consideration of Five Hundred (\$500.) Dollars paid to our full satisfaction by Burlington Light & Power Co.



CIVIL ENGINEERING ASSOCIATES, INC.  
 10 MANSFIELD VIEW LN., SO. BURLINGTON, VT 05403  
 802-864-2323 FAX: 802-864-2271



Scale: 1" = 20'  
 Date: 3/14/17

Drawn by: SAL  
 Checked by: DSM

# BURLINGTON HARBOR MARINA

BURLINGTON

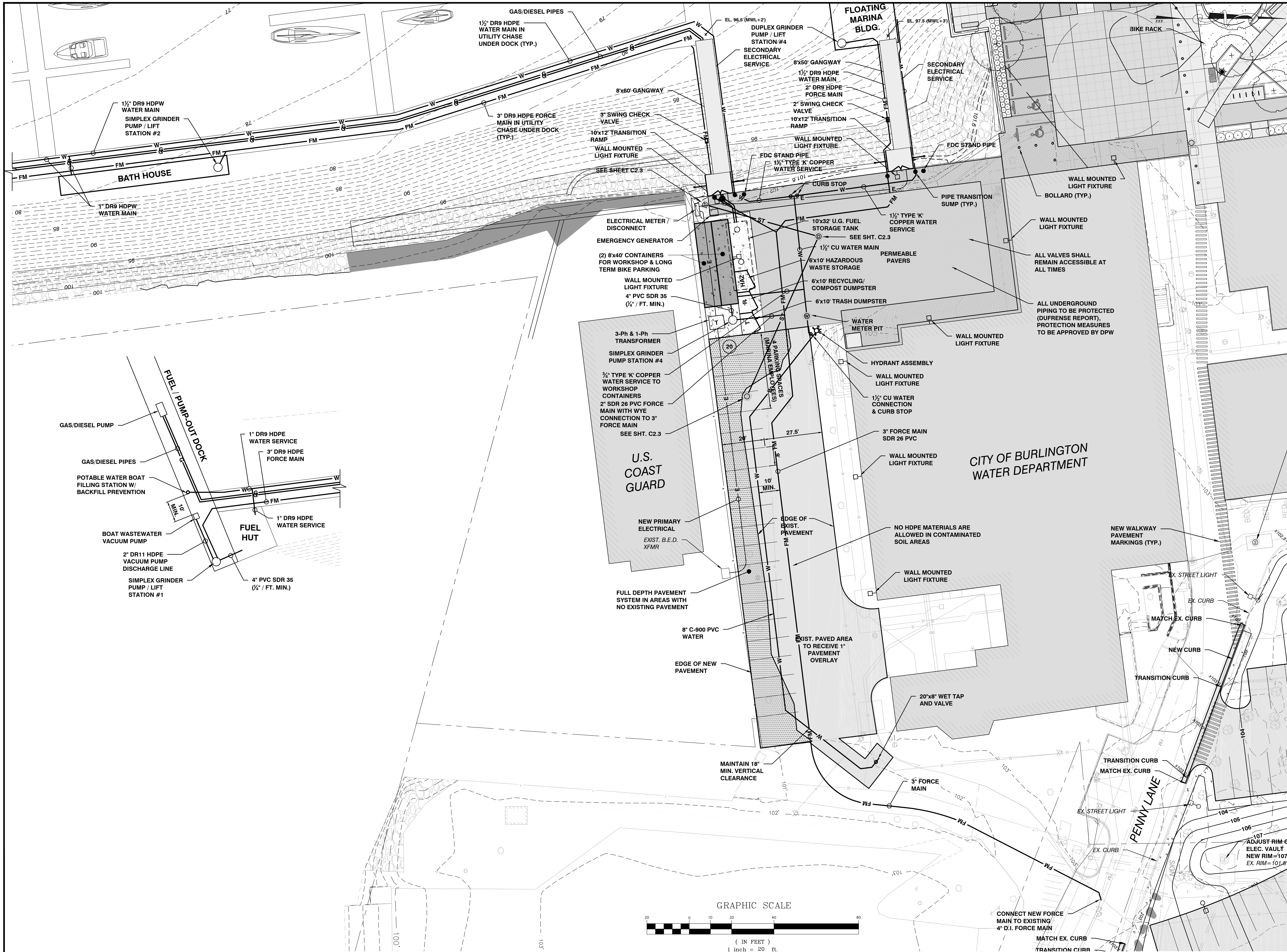
VERMONT

Project No.  
 14115

DRAWING

C2.2A





SITE ENGINEER:



CIVIL ENGINEERING ASSOCIATES, INC.  
10 MANSFIELD VIEW LANE, SOUTH BURLINGTON, VT 05403  
802-864-2323 FAX: 802-864-2271 web: www.cea-vt.com

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DRAWN

SAL

CHECKED

DSM

APPROVED

DSM

OWNER:

**BURLINGTON  
HARBOR MARINA  
LLC**

1 CHURCH STREET  
BURLINGTON VT 05401

PROJECT:

**BURLINGTON  
HARBOR MARINA**

234 PENNY LANE  
BURLINGTON VT 05401



LOCATION MAP

1" = 2000'

| DATE    | CHECKED | REVISION                         |
|---------|---------|----------------------------------|
| 1/24/17 | DSM     | MISC. CHANGES                    |
| 3/14/17 | DSM     | RELOCATE WORK OUTSIDE FLOODPLAIN |
|         |         |                                  |
|         |         |                                  |
|         |         |                                  |
|         |         |                                  |
|         |         |                                  |
|         |         |                                  |

**PROPOSED  
CONDITIONS  
PARTIAL SITE PLAN**

DATE  
JAN. 13, 2017

SCALE  
1" = 20'

PROJ. NO.  
14115

DRAWING NUMBER

**C2.2**

## Department of Planning and Zoning

149 Church Street  
Burlington, VT 05401  
Telephone: (802) 865-7188  
(802) 865-7195 (FAX)  
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David White, AICP, Director  
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Scott Gustin, AICP, CFM, Principal Planner  
Mary O'Neil, AICP, Principal Planner  
Ryan Morrison, CFM, Associate Planner  
Anita Wade, Zoning Clerk  
vacant, Department Secretary



**TO:** Development Review Board  
**FROM:** Scott Gustin  
**DATE:** March 21, 2017  
**RE:** 17-0755CA/CU; 235 Penny Lane  
17-0756CA  
17-0757CA

=====

**Note: These are staff comments only; decisions on projects are made by the Development Review Board, which may approve, deny, table or modify any project. THE APPLICANT OR REPRESENTATIVE MUST ATTEND THE MEETING.**

Zone: DW-PT      Ward: 3C

Owner/Applicant: City of Burlington / Burlington Harbor Marina, LLC

**Request:** Construct marina, parking lot, and related site improvements.

### **Applicable Regulations:**

Article 3 (Applications, Permits, & Project Reviews), Article 4 (Maps & Districts), Article 5 (Citywide General Regulations), Article 6 (Development Criteria & Guidelines), Article 8 (Parking), Article 10 (Subdivision)

### **Background Information:**

The applicant is seeking approval to establish a marina adjacent to the city's fishing pier at the end of Penny Lane. Most of the facility will actually be floating on the lake and is not included in this zoning permit. The zoning permit sought is for onshore improvements only. VT ANR and the US Army Corps of Engineers have permitting jurisdiction over the lake encroachment. Onshore construction includes a new marina yard and drop-off plaza, conversion of the present lakeside parking lot into park space, and construction of a new parking area east of the Burlington Electric Dept. building (where the approved but not constructed Moran parking lot was to be located). The existing pavilion next to the Water Department building will be demolished. The project spans three parcels and, therefore, includes three zoning permit applications – all reviewed concurrently. Lot line adjustments affect two of the parcels.

The Conservation Board reviewed this project February 6, 2017 and unanimously recommended approval of the project as presented.

The marina is a permitted use in the Downtown Waterfront – Public Trust (DW-PT) zone. Following comment from the state floodplain coordinator, the original plans have been revised to move all onshore construction above the 102' elevation (limit of the base flood); however, the proposed gangway necessarily crosses a small sliver of land between the upland and floating marina facilities that lies within the Special Flood Hazard Area (SFHA) – between 95.5' and 102' elevation. This encroachment into the SFHA triggers conditional use review in addition to the



SFHA review criteria under Sec. 4.5.4. The conditional use criteria have nothing to do with the SFHA criteria; however, this conditional use trigger was missed as part of zoning amendment ZA-15-02 that limited conditional use review to only those uses noted as conditional use in *Appendix A – Use Table – All Zoning Districts*. As noted above, the state floodplain coordinator has reviewed and commented on the proposal.

There is no previous zoning activity for this particular address. The public fishing pier (under 0 Lake St) was approved 8/26/99.

**Recommendation:** **Initial review then continue** until such time as the outstanding items in the report below are addressed:

## **I. Findings**

### **Article 3: Applications and Reviews**

#### **Part 5, Conditional Use & Major Impact Review:**

#### **Section 3.5.6 (a) Conditional Use Review Standards**

*Approval shall be granted only if the DRB, after public notice and public hearing, determines that the proposed conditional use and associated development shall not result in an undue adverse effect on each of the following general standards:*

1. *Existing or planned public utilities, facilities or services are capable of supporting the proposed use in addition to the existing uses in the area;*

The proposed development will be served by municipal utilities. Sufficient water and sewer service are available. A State of Vermont wastewater permit will be required. A capacity letter issued by the Dept. of Public Works will be required prior to issuance. Impact fees will be paid to help offset impacts on municipal utilities and facilities. **(Affirmative finding as conditioned)**

2. *The character of the area affected as defined by the purpose or purposes of the zoning district(s) within which the project is located, and specifically stated policies and standards of the municipal development plan;*

The subject property is located in the Downtown Waterfront – Public Trust (DW-PT) District. This district is intended to enhance and diversify commercial and residential development in the downtown waterfront area, and to increase access, utilization, and enjoyment of the lakeshore by the community. Strong emphasis is placed on enhancing public access to the lakeshore. The proposed marina is consistent with this intent. **(Affirmative finding)**

3. *The proposed use will not have nuisance impacts from noise, odor, dust, heat, and vibrations greater than typically generated by other permitted uses in the same zoning district;*

The proposed marina is not expected to generate nuisance impacts from noise, odor, dust, and the like that may be more typically associated with industrial uses. The proposed construction is set far from homes further south along Lake Street. **(Affirmative finding)**

4. *The transportation system is capable of supporting the proposed use in addition to the existing uses in the area. Evaluation factors include street designations and capacity; level of service and other performance measures; access to arterial roadways; connectivity; transit*

*availability; parking and access; impacts on pedestrian, bicycle and transit circulation; safety for all modes; and adequate transportation demand management strategies;*

See Sec. 6.2.2 (i) for traffic analysis.

*and,*

5. *The utilization of renewable energy resources;*

No renewable energy utilization is included in this proposal. Future incorporation is not precluded by the project design. **(Affirmative finding)**

*and,*

6. *Any standards or factors set forth in existing City bylaws and city and state ordinances;*

As noted previously, the project is subject to VT ANR and the US Army Corps of Engineers jurisdiction. City building and energy efficiency codes will also apply.

(b) Major Impact Review Standards  
Not applicable.

(c) Conditions of Approval:

*In addition to imposing conditions of approval necessary to satisfy the General Standards specified in (a) or (b) above, the DRB may also impose additional conditions of approval relative to any of the following:*

1. *Mitigation measures, including but not limited to screening, landscaping, where necessary to reduce noise and glare and to maintain the property in a character in keeping with the surrounding area.*

The proposed development is not expected to produce offsite noise or glare substantial enough to require mitigation. Additional screening of the 68-space parking lot is recommended as further described in Sec. 6.2.2 below. **(Affirmative finding as conditioned)**

2. *Time limits for construction.*

No construction timeline or phasing are included in the project plans. The standard 2-year timeframe for zoning permits will apply. **(Affirmative finding)**

3. *Hours of operation and/or construction to reduce the impacts on surrounding properties.*

The marina will function seasonally between May and October. The marina and fuel dock will be open for business from 7am-6pm Sun-Thurs and 7am-8pm Friday, Saturday, Holidays and the day preceding a holiday. The public restrooms will be open and available to the public from 8am-5pm Sun-Thurs and 8am-7pm Friday and Saturday. The outer perimeter wave attenuating dock will be open to the public from 7am to 10pm.

Construction hours are not noted in the application. Typical construction hours are Monday – Friday from 7:00 AM – 5:00 PM. Saturday construction may be allowed upon request. No work on Sunday. **(Affirmative finding as conditioned)**

4. That any future enlargement or alteration of the use return for review to the DRB to permit the specifying of new conditions; and,  
Any future enlargement or alteration will be reviewed under the zoning regulations in effect at that time.

5. Such additional reasonable performance standards, conditions and safeguards, as it may deem necessary to implement the purposes of this chapter and the zoning regulations.  
See the recommended conditions.

## **Article 4: Maps & Districts**

### **Sec. 4.4.1, Downtown Mixed Use Districts:**

#### **(a) Purpose**

##### **(4) Downtown Waterfront – Public Trust District (DW-PT)**

The subject property is located in the Downtown Waterfront – Public Trust (DW-PT) District. This district is intended to enhance and diversify commercial and residential development in the downtown waterfront area, and to increase access, utilization, and enjoyment of the lakeshore by the community. Strong emphasis is placed on enhancing public access to the lakeshore.

The proposed marina is consistent with this intent. It will be open to the public, including access onto the floating facilities. It will also add a sizable water-dependent business to Burlington's downtown waterfront. **(Affirmative finding)**

#### **(b) Dimensional Standards & Density**

A FAR of 2 is allowed in the DW-PT zone. No new onshore buildings are included in this proposal. Existing FAR will remain unchanged.

There is no lot coverage limit in the DW-PT zone.

No minimum setbacks apply to the project as proposed.

No new onshore buildings are proposed. Existing building height remains unchanged.  
**(Affirmative finding)**

#### **(c) Permitted & Conditional Uses**

See (d) 2 below.

#### **(d) District Specific Regulations**

##### **1. Use Restrictions**

**A. Ground Floor Residential Uses Restricted**  
**(Not applicable)**

##### **2. Public Trust Restrictions**

The subject property is located within that area of the DW-PT north of Main Street. The proposed marina – open to the public on a non-discriminatory basis – is a permitted use. **(Affirmative finding)**

**3. Facades and Setbacks on Side and Rear Property Lines**  
**(Not applicable)**

#### **4. Building Height Setbacks**

**A. Principal View Corridors**  
(Not applicable)

**B. Church Street Buildings**  
(Not applicable)

**C. Side Street Building Height**  
(Not applicable)

#### **5. Lake Champlain Waterfront Setbacks**

No new onshore buildings are included in this proposal. Proposed site work continues to allow public access to the lakeshore. **(Affirmative finding)**

**6. Residential District Setback**  
(Not applicable)

**7. Development Bonuses/Additional Allowances**  
None are sought.

#### **Sec. 4.5.4, Natural Resource Protection Overlay District:**

Minimal encroachment into the SFHA is proposed. It amounts to the gangway connecting the upland marina facilities with the floating marina facilities.

#### **(a) District Specific Regulations: Special Flood Hazard Area**

##### **(7) Special Review Criteria**

##### **A. The danger to life and property...**

The proposed marina will have no impact on flood heights or velocities. **(Affirmative finding)**

##### **B. The danger that material may be swept onto other lands...**

The gangway and related floating marina facilities will be anchored in place. Flood velocities are typically not problematic along the lakeshore. Flood waters rise and then fall. Velocity is a danger within the floodway that follows the river corridor. There is little danger that the marina facilities will be swept away. **(Affirmative finding)**

##### **C. The proposed water supply and sanitation systems...**

Municipal water and sewer will serve the marina. Utility plans and specifications sheets depict the details. Review and approval by the Department of Public Works is required. **(Affirmative finding as conditioned)**

##### **D. The susceptibility of the proposed facility and its contents to flood damage...**

The gangway and related floating facilities will rise and fall with lake levels. They are very unlikely to ever be inundated. **(Affirmative finding)**

##### **E. The importance of the services provided...**



The proposed marina will serve as a significant public amenity affording improved access to the lakeshore. An existing lakeshore parking lot will be transformed to additional public parkland and marina space. **(Affirmative finding)**

**F. The availability of alternative locations...**

The gangway connects the upland marina facilities with the related floating facilities. It is a functionally dependent use necessarily located within the SFHA. **(Affirmative finding)**

**G. The compatibility of the proposed use with existing development...**

As noted elsewhere in these findings, the marina is consistent with the intent of the DW-PT zone. **(Affirmative finding)**

**H. The relationship of the proposed use to the Municipal Development Plan...**

PlanBTV: Downtown and Waterfront specifically calls for additional marina operations to better serve the intense demand for water uses along Burlington's downtown water front. The plan notes the present conditions as inadequate and cites the exiting 8-year wait list for a boat slip (Water Use Expansion)

The proposed marina is accessible by boat, vehicle, bus, bike, and foot. It is consistent with PlanBTV: Downtown and Waterfront's call for transportation options and connectivity (Yield to Pedestrians, Biking, Bikeways, and Transit).

The pervious pavers to be used in construction of the marina facilities are consistent with the provisions of PlanBTV: Downtown and Waterfront (The Green Machine). **(Affirmative finding)**

**I. The safety of access to the property...**

Access to the property will be unaffected by the base flood event. All of the onshore marina facilities are located outside of the SFHA. The gangway and related floating facilities will rise and fall with the lake level. **(Affirmative finding)**

**J. The expected heights, velocity, duration, rate of rise...**

The maximum regulatory flood elevation along the lakeshore is 102' above sea level. The velocity of flood waters along the lakeshore is not problematic. Water is more or less stationary as it rises and falls. The duration of flooding and the rate of its rise depend entirely on spring snowmelt and precipitation events. The lake has risen above 102' just once on record (spring 2011). Sediment transport is insubstantial. Sediment transport is associated with moving waterways such as rivers. The proposed marina will have no impact on flood height, velocity, duration, rate of rise, or sediment transport. **(Affirmative finding)**

**K. Conformance with all other applicable requirements...**

See Articles 4, 5, and 6 of these findings.

**Article 5: Citywide General Regulations**

***Sec. 5.2.3, Lot Coverage Requirements***

See Article 4 above.

***Sec. 5.2.4, Buildable Area Calculation***

Not applicable in the DW-PT zone.

**Sec. 5.2.5, Setbacks**

See Article 4 above.

**Sec. 5.2.6, Building Height Limits**

See Article 4 above.

**Sec. 5.2.7, Density and Intensity of Development Calculations**

See Article 4 above.

**Sec. 5.5.1, Nuisance Regulations**

Nothing in the proposal appears to constitute a nuisance under this criterion. **(Affirmative finding)**

**Sec. 5.5.2, Outdoor Lighting**

A comprehensive outdoor lighting plan has been submitted. Information relative to fixtures, locations, and illumination levels has been provided. There are two distinct lighting environments: 1) the marina site and 2) the parking lot. All of proposed fixtures and related lighting levels are acceptable under the standards of Sec. 5.5.2. The pole lights to be used in the newly converted park area appear to match those at Waterfront Park. The Department of Parks and Recreation has confirmed. The single new flag pole will be illuminated from above. **(Affirmative finding)**

**Sec. 5.5.3, Stormwater and Erosion Control**

The project will actually result in less impervious surface as compared to existing conditions. An existing asphalt parking lot will be converted to park area with substantial lawn. Pervious pavers will be installed at the new marina yard. Stormwater management relies on infiltration and additional green space prior to discharge offsite. As noted previously, the Conservation Board reviewed and recommended approval of this project. Final approval of the proposed stormwater management plan by the city's stormwater program is required. Similarly, final review and approval of the erosion prevention and sediment control plan by the city's stormwater program is required. **(Affirmative finding as conditioned)**

**Article 6: Development Review Standards:**

**Part 1, Land Division Design Standards**

**Sec. 6.1.2, Review Standards**

No land subdivision is proposed. Two of the three lots, however, will be adjusted in size and configuration.

*(a) Protection of important natural features*

See Sec. 6.2.2.

*(b) Block size and arrangement*

Block size and arrangement will remain unchanged. **(Affirmative finding)**

*(c) Arrangement of Lots*

The proposed lot line adjustment serves to place the bulk of the marina facilities on Parcel C with the existing municipal buildings on Parcel B. The proposed lot arrangement is orderly and follows the existing and proposed conditions on the ground. **(Affirmative finding)**

*(d) Connectivity of streets within the city street grid*  
Not applicable.

*(e) Connectivity of sidewalks, trails, and natural systems*  
Not applicable.

## **Part 2, Site Plan Design Standards**

### **Sec. 6.2.2, Review Standards**

#### *(a) Protection of important natural features*

The property does not contain any important natural features as identified in the Open Space Protection Plan or as outlined in Sec. 4.5.4, *Natural Resource Protection Overlay Districts*. The downtown waterfront is specifically excluded from the Riparian & Littoral Conservation zone.  
**(Affirmative finding)**

#### *(b) Topographical alterations*

The existing property is essentially flat and will remain so. Topographic alteration is modest and is largely related to stormwater improvements and construction of the new parking area.  
**(Affirmative finding)**

#### *(c) Protection of important public views*

There are significant public views from the subject property, particularly westward across the lake. These views will be preserved. The proposed construction will not adversely impact any identified public view corridor. **(Affirmative finding)**

#### *(d) Protection of important cultural resources*

The property is a lakeshore fill site of industrial origin. It has no known archaeological significance. It contains no archaeological site points, nor is it located within an archaeologically sensitive area. **(Affirmative finding)**

#### *(e) Supporting the use of alternative energy*

No alternative energies are incorporated into the project design. Construction of the project will have no adverse impact on potential use of alternative energies onsite. **(Affirmative finding)**

#### *(f) Brownfield sites*

The subject property is included on the Vermont DEC Hazardous Site List. Phase I and II environmental site assessments have been done, and a corrective action plan is in place. The applicant will continue to work with VT DEC to address onsite contaminants. **(Affirmative finding)**

#### *(g) Provide for nature's events*

See Sec. 5.5.3 for stormwater management.

There is sufficient room for snow storage around the new parking lot. Within the marina yard and drop-off plaza, there is no dedicated space for snow storage. Given the seasonal operation of the marina, winter time snow storage within these places may be acceptable. **(Affirmative finding)**

#### *(h) Building location and orientation*

No new onshore buildings are included in this proposal. **(Not applicable)**

*(i) Vehicular access*

Two access points will serve the marina. Both exist presently but will be modified as part of this project. Most boats will arrive at the marina by way of the lake. No new ramp or crane are included in this proposal.

A comprehensive traffic analysis has been done as part of this application; however, anticipated traffic generation (up to 20 weekday PM peak hour trips) is well short of the typical 75-trip threshold for a traffic study. Anticipated traffic is also significantly less than that associated with the unbuilt Moran redevelopment (77 PM peak hour trip ends). Traffic associated with the marina will parallel the seasonal use of the marina – most active during the warmer months with very little activity during the off-season colder months. As to be expected, Saturdays are anticipated to generate the most traffic with 309 total trip ends and 26 PM peak hour trip ends. Daily weekday trip ends are expected to total 284 with 20 PM peak hour trip ends. Level of service (LOS) and queue lengths were analyzed at three intersections (Battery & College Streets, College & Main Streets, and Lake Street & Penny Lane) with projections for 2018 and 2023 with build and no-build scenarios. In all scenarios, the anticipated traffic is expected to have little effect on intersection LOS during the PM peak hour (1 second or less increase in delay) and negligible effect on intersection queue lengths. All intersections are expected to continue at acceptable levels of service. No roadway network alterations are proposed. Comment from the Department of Public Works has not yet been received but is anticipated. **(No finding possible)**

*(j) Pedestrian access*

A new sidewalk/walkway will provide a pedestrian connection between the newly reconstructed bike path and the marina. It will also afford a connection to the marina for people parking in the new surface parking lot behind the Electric Dept. building. Given the significance of public accessibility to the marina, this pedestrian connection is particularly important. Where the sidewalk crosses the two entries to the new parking area, it is delineated with striping. It should be continuous concrete. West of the new parking area, the sidewalk becomes a striped walkway across the asphalt, sharing space with vehicles. This section of pedestrian walkway is especially weak and in need of improvement. It should be continuous concrete and elevated above the adjacent asphalt. In the event that this space needs to be shared with vehicles, a mountable curb would be acceptable. **(Affirmative finding as conditioned)**

*(k) Accessibility for the handicapped*

Several handicap parking spaces are included in the marina drop-off area, affording immediate access to the marina and the newly formed park space. Additional handicap spaces are included in the new 68-space parking lot. Insofar as these, or any other handicap accessible features, are required it is the applicant's responsibility to comply. All of the applicable ADA requirements are administered through the city's building code. **(Affirmative finding as conditioned)**

*(l) Parking and circulation*

Space for new parking is limited. The marina is, of course, set close to the lake and relatively far from the road. As a result, space for parking is available between the existing Water Department and Electric Department buildings and the road. The existing parking area will be removed and replaced with the new, larger parking area. As recommended by this criterion, the parking area is split into two sections rather than a singular mass. The location of the new parking lot is the same as that for the approved, but unbuilt, parking associated with the Moran redevelopment. Given the



parking lot's prominent location, enhanced screening in the form of additional landscaping is recommended.

Parking spaces and associated site circulation are laid out such that vehicles will not back out onto Penny Lane. The parking area appears to be curbed at one end (east).

A number of new trees will be planted around the parking lot. In total, 18 new trees will border the parking area. This criterion requires 1 shade tree per every 5 parking spaces (at least 14 trees in this case). The proposed species (maple, elm, and honeylocust) are appropriate to serve as shade trees and meet the minimum caliper requirement at planting (3" – 3.5" caliper). No shade analysis has been provided and is needed. The target is 30% shading of the parking area and must be demonstrated in a shade analysis. **(Affirmative finding as conditioned)**

*(m) Landscaping and fences*

A comprehensive landscaping plan has been submitted and encompasses a diversity of plantings. As noted above, new shade trees will be planted around the new parking area. Most of the additional landscaping is concentrated in the new park space adjacent to the Water Department Pump Station. New plantings help to define the space and provide a buffer from the marina drop-off to the south. Some additional plantings will accent said drop-off area. **(Affirmative finding)**

*(n) Public plazas and open space*

Significant public open space is included in this proposal. The parking lot behind the two existing city buildings will be removed and replaced on one end with new public park space. In addition to new landscaping as noted above, the new park space will include pathways, sitting areas, and access to the lakeshore. Its location will afford ample solar access and unimpeded views across the lake. **(Affirmative finding)**

*(o) Outdoor lighting*

See Sec. 5.5.2.

*(p) Integrate infrastructure into the design*

Site infrastructure including an electrical transformer, emergency generator, trash and recycling facilities will be set to the southwest corner of the marina site. The site plans depict screening around these items. Sheet C4.2 provides acceptable screening details. Any new utility lines must be buried. **(Affirmative finding)**

**Part 3, Architectural Design Standards**

**Sec. 6.3.2, Review Standards**

No new onshore buildings are included in this proposal. Two containers for workshop space and long term bike parking are proposed. No depiction of these containers has been provided and is needed. **(No finding possible)**

**Article 8: Parking**

**Sec. 8.1.8, Minimum Off-Street Parking Requirements**

The proposed marina is located in the Downtown Parking District. As a result, the minimum parking requirement is 0.5 parking space per berth. In this case, 160 berths are proposed with a resultant minimum parking requirement of 80 parking spaces. A new 68-space parking lot is proposed. The marina proposes to use 42 of these 68 spaces along with an additional 4 new spaces

in the separate lot between the Coast Guard and the Water Department building and 2 new handicap spaces at the marina drop-off (48 spaces total for the marina). The 26 remaining parking spaces in the 68-space lot will serve the Community Sailing Center. That facility requires at least 52 parking spaces. A parking waiver is sought. See Sec. 8.1.15 for waiver details. There remain 10 short term spaces at the marina drop-off for users of the marina, fishing pier, and adjacent park land. **(Affirmative finding)**

***Sec. 8.1.9, Maximum Parking Spaces***

This section limits surface parking to 125% of the Neighborhood Parking District minimum parking requirement. As noted above, the minimum standard parking requirement will not be met. A parking waiver is requested. The proposed parking is nowhere near the maximum limitation. **(Affirmative finding)**

***Sec. 8.1.10, Off-Street Loading Requirements***

Loading and un-loading area will be available in the marina yard. **(Affirmative finding)**

***Sec. 8.1.11, Parking Dimensional Requirements***

Proposed parking spaces are dimensionally compliant at 9' X 20.' Back-up space is 20,' whereas 24' is the standard. While less than the standard distance, 20' affords the minimum required 10' dual aisle space within the parking lot. **(Affirmative finding)**

***Sec. 8.1.12, Limitations, Location, Use of Facilities***

*(a) Offsite parking facilities*

**(Not applicable)**

*(b) Downtown street level setback*

The proposed parking lot is set back from Penny Lane to afford space for a new pedestrian sidewalk that will provide access to the marina and adjacent waterfront amenities.

**(Affirmative finding)**

*(c) Front yard parking restricted*

**(Not applicable)**

*(d) Shared parking in the Neighborhood Parking Districts*

**(Not applicable)**

*(e) Single story structures in Shared Use Districts*

**(Not applicable)**

*(f) Joint use of facilities*

Both the marina and the Community Sailing Center will make use of the new 68-space parking lot. The existing parking lot between the Coast Guard and the Water Department building will be modified to result in a net new 4 spaces. This lot will serve both city employees and employees of the marina. **(Affirmative finding)**

*(g) Availability of facilities*

None of the proposed parking will be used for the storage or display of vehicles or materials by offsite users. Parking will be for visitors to onsite uses only. **(Affirmative finding)**

*(h) Compact car parking*  
**(Not applicable)**

***Sec. 8.1.13, Parking for Disabled Persons***

The site plan depicts several handicap parking spaces in the new 68-space parking lot and in close proximity to the marina and the newly established Waterfront Park North. Associated striping is also shown. ADA compliance is administered via the city's building permit process.

**(Affirmative finding as conditioned)**

***Sec. 8.1.14, Stacked and Tandem Parking Restrictions***

**(Not applicable)**

***Sec. 8.1.15, Waivers from Parking Requirements / Parking Management Plans***

The marina requests a 32-space parking waiver. Rather than use 80 parking spaces, 48 spaces are requested (40% waiver). The waiver request is simple and reasonable. Of the 160 boat slips proposed, only 96 will be seasonal. Seasonal users will keep their boats here and will typically arrive onsite by land. The other 64 slips will be transient. Transient users will arrive by boat and will not need car parking. The 48 parking spaces proposed amount to 0.5 space per seasonal boat slip – the minimum parking standard.

The key missing component is a rationale for the Community Sailing Center waiver. A 26-space (50%) parking waiver is requested. These spaces will be provided in the 68-space parking lot. No basis for the requested waiver has yet been provided and is needed.

In the event the parking waiver is granted, in whole or in part, the applicants should be prepared to report back to the Planning & Zoning Department each year for 3 years as to the actual onsite parking demand. **(No finding possible)**

***Sec. 8.2.5, Bicycle Parking Requirements***

The proposed marina will require at least 10 short term bike parking spaces and 1 long term bike parking space. The site plan indicates locations for these facilities but does not provide details as to what they actually are. The short term spaces will be provided with racks at the southeast corner of the new park space, and the long term spaces will be provided at the southwest corner of the site within one of the containers. Details for the bike racks and long term bike parking are needed in order to confirm compliance with the bike parking standards. **(Affirmative finding as conditioned)**

**Article 10: Subdivision**

***Sec. 10.1.15, Lot Line Adjustments***

No subdivision is included in this proposal. Lot lines; however, will be adjusted. Two of the three parcels involved will be modified. As required, a boundary survey by a VT licensed land surveyor has been provided, albeit in draft form. The endorsement block needs to be corrected to indicate the signature of the Zoning Administrator per this criterion. No nonconforming parcels result from the proposed lot line adjustments. There is no minimum lot size requirement in the DW-PT zone.

A mylar of the lot line adjustment, signed by the Zoning Administrator, shall be filed within the city's land records within 180 days of approval. **(Affirmative finding as conditioned)**

***Sec. 10.1.10 Performance Bond and Guarantee of Completion***

As new public improvements (new park space) are included in this project, this criterion call for a performance guarantee. **(Affirmative finding as conditioned)**

**II. Conditions of Approval**

In the event that outstanding items relative to traffic review, the new containers, and the requested parking waiver are addressed, the following conditions are recommended.

1. **Prior to release of the zoning permit**, revised project plans depicting the following shall be submitted, subject to staff review and approval:
  - a. Revised sidewalk constructed of concrete, continuous across parking lot driveways, and with mountable curbing;
  - b. Parking lot shade analysis;
  - c. Details for long and short term bike parking facilities; and,
  - d. Corrected endorsement block (for Zoning Administrator's signature) on the lot line adjustment.
2. **Prior to release of the zoning permit**, the applicant shall receive written verification of adequate wastewater capacity from the Department of Public Works.
3. **Within 180 days of this approval**, a mylar copy of the lot line adjustment, with signature of the Zoning Administrator, shall be filed in the land records. Failure to do so shall render this subdivision approval null and void.
4. Per the requirements of Sec. 10.1.10, *Performance Bond and Guarantee of Completion*, a performance guarantee for all new public improvements shall be provided, subject to review and approval by the City Attorney.
5. For the parking waiver, the applicants shall to report back to the Planning & Zoning Department each year for 3 years from the date of this approval as to the actual onsite parking demand.
6. Final approval of the post-construction stormwater management system and the erosion prevention and sediment control plan by the city's stormwater program staff is required.
7. At least **7 days prior to the issuance of a certificate of occupancy**, the applicant shall pay to the Planning & Zoning Department the impact fee as calculated by staff based on the gross square footage of the proposed development.
8. Days and hours of operation are approved as follows (from May – October):  
The marina and fuel dock will be open for business from 7am-6pm Sun-Thurs and 7am-8pm Friday, Saturday, Holidays and the day preceding a holiday. The public restrooms will be open and available to the public from 8am-5pm Sun-Thurs and 8am-7pm Friday and Saturday. The outer perimeter wave attenuating dock will be open to the public from 7am to 10pm.
9. Days and hours of construction are limited to Monday – Friday 7:00 AM – 5:00 PM. Saturday construction within those hours may be allowed upon request to the DRB. No construction activity on Sunday.
10. Per Sec. 4.5.4, (f) 8, construction within the Special Flood Hazard Area is subject to the following conditions:
  - C. All development:
    - (i) New construction and/or substantial improvements to structures shall be



reasonably safe from flooding and be:

1. Designed and adequately anchored to prevent flotation, collapse, or lateral movement during the occurrence of the base flood;
  2. Constructed of materials resistant to flood damage;
  3. Constructed by methods and practices that minimize flood damage; and
  4. Constructed with electrical, heating, ventilation, plumbing and air conditioning equipment and other service facilities that are designed and/or located so as to prevent water from entering or accumulating within the components during conditions of flooding;
- (ii) All development shall be designed to minimize flood damage to the proposed development and to public facilities and utilities;
- (iii) All development shall be designed to provide adequate surface drainage to reduce exposure to flood hazards;
- (iv) All new construction and substantial improvements that have fully enclosed areas below the lowest floor shall:
1. Be solely used for parking of vehicles, storage, or building access, and such a condition shall clearly be stated on any permits; and,
  2. Be designed to automatically equalize hydrostatic flood forces on exterior walls by allowing for the entry and exit of floodwaters. Such designs must be certified by a registered professional engineer or architect, or meet or exceed the following minimum criteria: A minimum of two openings of two walls having a total net area of not less than one square inch for every square foot of enclosed area subject to flooding shall be provided. The bottom of all openings shall be no higher than one foot above grade. Openings may be equipped with screens, louvers, valves, or other coverings or devices provided that they permit the automatic entry and exit of floodwaters;
- (v) All necessary permits shall be obtained from those governmental agencies from which approval is required by federal or state law.
- D. Residential Development:
- (i) Not applicable.
- E. Non-Residential Development:
- (i) All new construction and substantial improvements for nonresidential purposes shall have the lowest floor, including basement, elevated one foot or more above the base flood elevation. Existing non-residential structures may be flood proofed where designed to be watertight to one foot or more above the base flood elevation, with walls substantially impermeable and with structural components having the capability of resisting hydrostatic and hydrodynamic loads and effects of buoyancy. A permit for a proposed building to be flood proofed shall not be issued until a registered architect or engineer has reviewed the structural design, specifications and plans and has certified that the design and methods of construction are in accordance with meeting the provisions of this subsection.
- F. Water Supply Systems:
- New and replacement water supply and sanitary sewer systems shall be designed so as to prevent the infiltration of floodwaters into the systems and discharge from the systems;
- G. On-Site Waste Disposal Systems:

On-site waste disposal systems shall be located to avoid impairment to them or contamination from them during flooding;

H. Recreational Vehicles:

(i) Not applicable.

11. A State of Vermont wastewater permit is required.
12. All new utility lines shall be buried.
13. It is the applicant's responsibility to comply with all applicable ADA requirements.
14. All new construction is required to meet the Guidelines for Energy Efficient Construction pursuant to the requirements of Article VI. Energy Conservation, Section 8 of the City of Burlington Code of Ordinances.
15. Any outdoor signage will require a separate sign permit.
16. Standard Conditions 1-15.

## Scott Gustin

---

**From:** Pfeiffer, Rebecca <Rebecca.Pfeiffer@vermont.gov>  
**Sent:** Thursday, March 16, 2017 2:26 PM  
**To:** dmarshall@cea-vt.com  
**Cc:** 'Jack Wallace'; Scott Gustin  
**Subject:** RE: Proposed Burlington Harbor Marina Project-Floodplain

Hello all,

In reviewing the updated site plans, it appears that the design will address the question about what development may be located within the SFHA, and therefore under the review of the City.

As I had stated in my earlier email, the buildings that are designed to float would appear to meet the FEMA definition of a functionally dependent use:

A use which cannot perform its intended purpose unless it is located or carried out in close proximity to water. This term includes only docking facilities, port facilities that are necessary for the loading and unloading of cargo or passengers and shipbuilding and ship repair facilities, but does not include long-term storage or related manufacturing facilities.

FEMA regulations do allow for a variance from the non-residential building elevation requirements for functionally dependent uses. If a variance from the City's building elevation requirements is being considered for the floating marina buildings, FEMA's regulations state:

Under limited circumstances, variances may be issued for functionally dependent uses provided that the structure is protected by methods that minimize flood damages during the base flood and there are no additional threats to public safety.

The City's DRB would need to be able to make a finding that the protection methods proposed by the applicants would ensure that there are no additional threats to public safety. As I said in earlier emails, we would typically be looking at the protections measures taken to reduce the potential for fuel or sewage spills. As David had stated below, the flexible sewage line is designed to allow for the rise and fall of the dock. The DRB will need confirm that the line would be able to allow the bathroom building to float at least to the BFE (101.6' NAVD 1988) and be able to withstand anticipated wave action when the Lake is at the BFE, which should be somewhat minimized due to the breakwater. However, I would strongly recommend that the all of the flexible lines and any other systems be designed with the 2011 Lake Champlain flooding water and wave heights in mind.

As for the structures that are located below the BFE, the DRB should confirm that the dock and pier systems will be adequately anchored for water levels at the BFE, and should design the anchoring system to withstand wave forces as well.

Lastly, David had confirmed that the underground fuel storage tank will have a portion of the tank located below the BFE, and has been designed to incorporate tie-down straps. The DRB should confirm that the tank tie-down straps have been designed to withstand buoyancy force for the tank during a base flood.

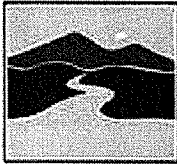
This was a general overview of the redesigned project, but I wanted to provide some comments to the DRB for consideration at their hearing. One of the primary things for the DRB to consider is whether to issue a variance from the non-residential building elevation requirements, and if so, to have findings that demonstrate that the structures are protected by methods that minimize flood damages and that there are no additional threats to public safety. All of the development that is located within the SFHA would need to meet Burlington's standards for all development in 4.5.4(f)8.c(i)-(iii) & (v), and the standards for water supply and on-site disposal systems (4.5.4(f)8.F & G).

Please let me know if there are questions, or if there are any additional changes to the design that would require additional review.

As always, other State, Federal or local permits may be required for this project. The VT DEC Permit Specialist for your region should be able to help identify any other State Environmental Permits that may be necessary. These comments are offered in accordance with 24 VSA §4424.

Please let me know if you have any additional questions or would like to further discuss,

Rebecca



**WATERSHED  
MANAGEMENT DIVISION**  
RIVERS PROGRAM

**Rebecca Pfeiffer, CFM | Floodplain Regulatory Team Lead/Northwest VT Floodplain Manager**  
River Corridor & Floodplain Protection Program  
111 West Street  
Essex Junction, VT 05452  
C 802-490-6157 | F 802-879-3871

**PLEASE NOTE MY NEW EMAIL ADDRESS: [Rebecca.Pfeiffer@vermont.gov](mailto:Rebecca.Pfeiffer@vermont.gov)**

**Flood Ready Vermont:** <http://floodready.vermont.gov/>  
**VT Floodplain Management Blog:** <http://vtfpm.blogspot.com/>  
**VT ANR Natural Resources Atlas:** <http://anrmaps.vermont.gov/websites/anra/>  
**River Corridor & Floodplain Protection Website:** <http://dec.vermont.gov/watershed/rivers/river-corridor-and-floodplain-protection>

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**From:** David Marshall [mailto:[dmarshall@cea-vt.com](mailto:dmarshall@cea-vt.com)]  
**Sent:** Tuesday, March 14, 2017 12:24 PM  
**To:** Pfeiffer, Rebecca <[Rebecca.Pfeiffer@vermont.gov](mailto:Rebecca.Pfeiffer@vermont.gov)>  
**Cc:** 'Jack Wallace' <[jwallace@gmavt.net](mailto:jwallace@gmavt.net)>; Scott Gustin <[SGustin@burlingtonvt.gov](mailto:SGustin@burlingtonvt.gov)>  
**Subject:** RE: Proposed Burlington Harbor Marina Project-Floodplain

Hi Rebecca-

After discussing the City's zoning regulations with Scott Gustin, we have revised the plans to relocate all of the non-floating project components to locations outside of the Flood Plain limits (NAVD 88 101.6) except for the gangway anchors/landings which are considered to be a functionally dependent (recreational) use exempt from the regulation.

Please find attached the revised site plan (and an 8.5x11 enlargement as Sheet C2.2A) which includes a highlight of the 101.6 jurisdictional limits.

The specific changes made to the plan include:

1. The emergency generator and electrical disconnect south of the south gangway were consolidated at a location upgradient of the 101.6 contour.
2. The south gangway landing was moved to the south to tie into the existing grade at a point located above the 101.6 Flood plain elevation.
3. Modify the width of the connecting walkway from the north gangway landing to the south gangway landing so that all work is located above elevation 101.6.

All of the other subsurface work is located in the white (non-floodplain) non-jurisdictional portion of the attached Hazard Map zoning map.

Best Regards



David S. Marshall, P.E.  
Civil Engineering Associates, Inc.  
10 Mansfield View Lane  
South Burlington, VT 05403  
P 802-864-2323 x310 F 864-2271

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**From:** David Marshall [mailto:dmarshall@cea-vt.com]  
**Sent:** Monday, March 13, 2017 5:40 PM  
**To:** 'Rebecca.Pfeiffer@vermont.gov'  
**Cc:** 'Jack Wallace'  
**Subject:** RE: Proposed Burlington Harbor Marina Project-Floodplain

Hi Rebecca-

Jack Wallace from Burlington Harbor Marina asked that I follow up with you with regard to the flood plain limits in the vicinity of the proposed marina project.

Attached is a site plan (Sheet C2,2) which has highlighted the 101.6 contour line. This mapping work is based on the NAVD 88 datum (see plan notes) as depicted on the attached existing conditions bathymetric survey map.

From your narrative below we have inserted our comments in (parenthesis)

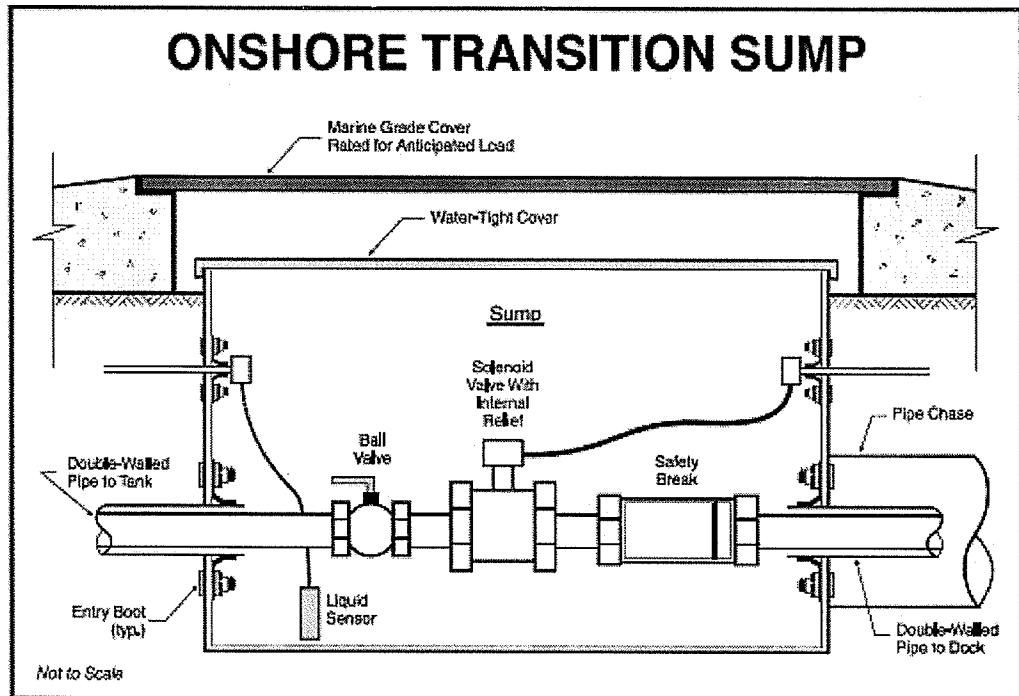
From the plans and the information you provided, it appears that both some parts of the upland improvements and the in-water docking infrastructure including the fuel hut (The structure is placed on the floating dock which will always be above the lake flood level ), bath house (the same as the fuel hut), transformers (actually these are located above the 101.6 elevation), marina support building (This is located above the 101.6 elevation) and the gangways (The landing platforms for the gangways are located below the FEMA Special Flood Hazard Area (SFHA)) , etc. would be part of the local flood hazard area review.

Your narrative goes on to recommend:

I would recommend including the boundary of the FEMA Special Flood Hazard Area (SFHA) on your site plans, including the detailed upland improvement plans (This has been completed) . This would help to clarify if some of the upland infrastructure, like the emergency generator, underground fuel storage tanks (The top of the tanks are located above the FEMA flood limits. The below grade portion of the tanks are located below the 101.6 flood level but have been designed with tie-downs to prevent floatation), etc. are located within the SFHA and therefore be reviewed under Section 4.5.4(f) of the Burlington regulations.

We concur with your observation that the.

With regard to the fueling pipe work, the double wall pipes will terminate at a Transition Surge Tank which will monitor for spill or water infiltration which will automatically shut off the fuel



pumps.

is isolated at the shoreline with curb stops. The sewer force main is constructed of high pressure rated flexible piping with slack on the gangway that can withstand the elevation changes between the floating dock and the land side landing.

With regard to those features that are not considered to be functionally dependent uses, we look forward to your input on the best management practices that would be prudent to employ beyond those already identified.

Best Regards

David S. Marshall, P.E.  
Civil Engineering Associates, Inc.  
10 Mansfield View Lane  
South Burlington, VT 05403  
P 802-864-2323 x310 F 864-2271

**From:** Pfeiffer, Rebecca [mailto:Rebecca.Pfeiffer@vermont.gov]

**Sent:** Tuesday, February 28, 2017 11:48 AM

**To:** Monica Beers <MonicaB@kas-consulting.com>

**Cc:** Jeremy Roberts <JeremyR@kas-consulting.com>; Clare Santos <ClareS@kas-consulting.com>; Scott Gustin <SGustin@burlingtonvt.gov>; Stickney, Michaela <Michaela.Stickney@vermont.gov>

**Subject:** RE: Proposed Burlington Harbor Marina Project-Floodplain

Hi Monica,

Sorry for the delay in getting in touch about the floodplain impacts for the proposed Burlington Marina.

With a project on Lake Champlain, the main concern for floodplain impacts is any of the development that is located below 101.6' (NAVD 1988), and would be part of the City of Burlington's permit review under their Natural Resource Protection Overlay District (Section 4.5.4(f) of the Burlington Comprehensive Development Ordinance). For a project

this, there is no state permit for floodplain considerations, but we provide technical assistance to the municipality responsible for the local flood hazard area permitting.

From the plans and the information you provided, it appears that both some parts of the upland improvements and the in-water docking infrastructure including the fuel hut, bath house, transformers, marina support building and the gangways, etc. would be part of the local flood hazard area review. I would recommend including the boundary of the FEMA Special Flood Hazard Area (SFHA) on your site plans, including the detailed upland improvement plans. This would help to clarify if some of the upland infrastructure, like the emergency generator, underground fuel storage tanks, etc. are located within the SFHA and therefore be reviewed under Section 4.5.4(f) of the Burlington regulations.

For past marina projects, we have typically advised the municipality to consider the docks and other floating support buildings as “functionally dependent uses” which can be allowed in the flood hazard area. FEMA’s definition of a functionally dependent use:

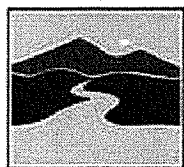
A use which cannot perform its intended purpose unless it is located or carried out in close proximity to water. This term includes only docking facilities, port facilities that are necessary for the loading and unloading of cargo or passengers, and shipbuilding and ship repair facilities, but does not include long-term storage or related manufacturing facilities.

Under limited circumstances, variances may be issued for functionally dependent uses provided that the structure is protected by methods that minimize flood damages during the base flood and there are no additional threats to public safety.

From past reviews of marina infrastructure, the main considerations would be the design of the buildings and infrastructure, which we would recommend to meet Burlington’s standards for all development in 4.5.4(f)8.c(i)-(iii) & and the standards for water supply and on-site disposal systems (4.5.4(f)8.F & G). We would also recommend that the bath house, fuel hut, transformers (presumably located on the transformer pads) and any other floating marina buildings demonstrate that the design would minimize potential threats to public safety. This would most likely include some steps of procedure to ensure that there is no fuel, oil or other hazardous materials in the fuel hut or around the docks during times of flooding, or that potential hazardous material connections be outfitted with shut-off valves or other safety measure. This would be to minimize the risk of a spill if there are waves that damage or overtop the building during flooding (not sure what type of waves the attenuators are designed for). This could be achieved by including a procedure in your comprehensive spill prevention plan.

This review would be a part of the City of Burlington’s permit review, and we provide recommendations and technical assistance to ensure that the minimum FEMA standards for flood hazard development have been met. I would be happy to meet with you and Scott Gustin of Burlington’s Planning & Zoning department if you have any questions or would like to discuss.

Rebecca



**WATERSHED**  
**MANAGEMENT DIVISION**  
**RIVERS PROGRAM**

**Rebecca Pfeiffer, CFM | Floodplain Regulatory Team Lead/Northwest VT Floodplain Manager**  
River Corridor & Floodplain Protection Program  
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**PLEASE NOTE MY NEW EMAIL ADDRESS: [Rebecca.Pfeiffer@vermont.gov](mailto:Rebecca.Pfeiffer@vermont.gov)**

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**VT Floodplain Management Blog:** <http://vtfpm.blogspot.com/>

**VT ANR Natural Resources Atlas:** <http://anrmaps.vermont.gov/websites/anra/>

**River Corridor & Floodplain Protection Website:** <http://dec.vermont.gov/watershed/rivers/river-corridor-and-floodplain-protection>

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**From:** Monica Beers [<mailto:MonicaB@kas-consulting.com>]

**Sent:** Friday, January 27, 2017 9:53 AM

**To:** Pfeiffer, Rebecca <[Rebecca.Pfeiffer@vermont.gov](mailto:Rebecca.Pfeiffer@vermont.gov)>

**Cc:** Jeremy Roberts <[JeremyR@kas-consulting.com](mailto:JeremyR@kas-consulting.com)>; Clare Santos <[ClareS@kas-consulting.com](mailto:ClareS@kas-consulting.com)>

**Subject:** Proposed Burlington Harbor Marina Project-Floodplain

Dear Ms. Pfeiffer:

I am contacting you on behalf of the Burlington Harbor Marina, LLC. who are currently in the planning stages of building a marina at Burlington Harbor. We need to determine if the proposed project will impact the floodplain of Lake Champlain and if any other review is needed. Please let me know if this is something that you could help with. I have attached the site plans for the project for your review.

Please let me know if this something that you would be able to help with and if there is any other information that you need. Thank you for your help.

Best,



**Monica Beers**

Staff Scientist | [monicab@kas-consulting.com](mailto:monicab@kas-consulting.com)

589 Avenue D, Suite 10 | PO Box 787 | Williston, VT 05495

[www.kas-consulting.com](http://www.kas-consulting.com) | 802 383 0486 p | 802 383 0490 f

Please note that this communication and any response to it will be maintained as a public record and may be subject to disclosure under the Vermont Public Records Act.



**Scott Gustin**

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**Subject:** FW: 17-0662CA/MA 75 Cherry Street - Request to Re-Open Hearing

**From:** Michael Long [<mailto:mjlong@burlingtontelecom.net>]  
**Sent:** Sunday, March 12, 2017 2:49 PM  
**To:** Austin Hart  
**Cc:** Scott Gustin; David E. White  
**Subject:** 17-0662CA/MA 75 Cherry Street - Request to Re-Open Hearing

Austin Hart, Chair

Development Review Board

Burlington, VT

3/11/2017

Dear Austin and Members of the Board:

As you may know, land planner and building designer Ben Falk of Moretown – in a letter printed just days ago on March 8 – has identified a PKSB rendering of the proposed Burlington Town Center in a *Seven Days* story as fraudulent. He has also explained that the author of the graphic would have had to override the program or alter the original with another program like Photoshop in order to diminish the tower shadows because all of the other shadows are accurately represented.

Given that the DRB is poised to approve this project on Monday, it is important to address the evidence of fraudulent renderings promptly.

If PKSB has been producing deceptive renderings, then this new information would necessitate reopening the hearing on the BTC application to assess the ramifications of any fraudulent materials and to ascertain the general accuracy of the graphics and testimony in the record.

Please consider this note a request that the hearing be reopened accordingly.

Sincerely,

Michael Long

## Shady Business

Burlington's proposed 14-story high-rise is represented fraudulently by PKSB Architects in ["In Burlington, Upward Growth or 'Vertical Sprawl'?"

February 22]. As a land planner and building designer, I know how 3D representations can mislead or inform the public. The model on page 20 shows about 15 feet of shade cast to the north from the building. However, actual shade cast by this building will cover the entire street to the north and reach into the park while darkening the buildings to the east in the afternoon and stretching over buildings toward the lake in the morning. Fourteen stories casts very long shadows — one of the reasons tall buildings tend to denude public outdoor space. Meanwhile the model shows roughly accurate shade cast for every other building.

This model should be retracted publicly and a new, accurate model produced. It should represent the shadows at various times of day and throughout the year that the proposed building will cast on its neighbors, streets and the adjacent park.

**Ben Falk**

MORETOWN

March 16, 2017

*By Email*

Austin Hart, Chair  
City of Burlington Development Review Board  
City Hall  
Burlington, VT 05401

**Re: DRB Proceedings, Permit Application #17-0662CAIMA**

Dear Mr. Hart,

I write on behalf of BTC Mall Associates, LLC (“BTC”) in reply to an email from Mr. Long concerning permit application #17-0062CA/MA dated March 12, 2017. Mr. Long’s request to re-open the evidentiary hearing in this matter before the Development Review Board (“DRB”) must be denied.

As an initial matter, Mr. Long is not an interested party before the DRB in this matter, and so has no standing to make such a request. Mr. Long signed a petition to seek to become an interested person; however, the petition he signed was not submitted to the DRB until February 28, 2017, after the date on which the evidentiary hearing closed on February 21, 2017. As such, Mr. Long failed to participate in this matter before the DRB. *See* 24 VSA § 4465(b)(4); *Zaremba Group CU - Jericho*, No. 101713, 2014 WL 2134423 (Vt. Super. Ct. Envtl. Div. Apr. 21, 2014) (rejecting interested person status when petition submitted to DRB after evidence closed).<sup>1</sup>

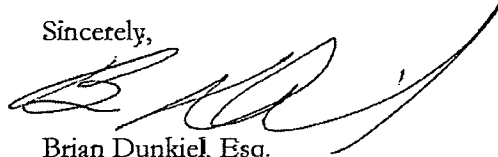
Even if a request to re-open were to be considered, there is no basis to re-open this matter before the DRB. Mr. Long refers to a Letter to the Editor in a local newspaper as “new information.” The letter comments on an image of the project that appears in a previous edition of the publication. It is not known if the letter references any evidence that is before the DRB, or relied on the DRB, and the letter writer seems unaware of the four-season, morning/noon/evening sun studies that were presented in multiple public meetings for the Planning Commission and City Council consideration of the DMUC zoning. In any event, any comments in the letter are irrelevant and are not a basis to reopen the hearing in this matter because the renderings for the project are not “new information.” Indeed, project renderings were part of the application materials submitted in December, and any interested person had three hearings to bring concerns to your attention. However, no interested person made any effort to raise such concerns, and no expert—or any other testimony, for that matter—was submitted during the hearings concerning any of the renderings or other images furnished by the Applicant.

<sup>1</sup> In addition, under the statute, the petitioners “must designate one person to serve as the representative of the petitioners regarding all matters related to the appeal.” 24 V.S.A. § 4465. Mr. Long is neither an interested person, nor a representative of petitioners, and his email should be disregarded by the DRB.

In closing, for the record, BTC categorically rejects Mr. Long's accusations, and represents that all its renderings and all other project materials submitted to the DRB were prepared by professionals following industry standards.

Thank you for your consideration of this matter. Please contact me with any questions.

Sincerely,

A handwritten signature in black ink, appearing to read 'Brian Dunkiel', with a long, sweeping horizontal stroke extending to the right.

Brian Dunkiel, Esq.

DUNKIEL SAUNDERS ELLIOTT RAUBVOGEL & HAND, PLLC

Cc: Noelle MacKay, Director, Burlington Community & Economic Development Office  
Richard W. Haesler, Esq., Assistant City Attorney, City of Burlington  
Kimberlee Sturtevant, Esq., Assistant City Attorney, City of Burlington



## Scott Gustin

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**From:** Michael Long <mjlong@burlingtontelecom.net>  
**Sent:** Monday, March 20, 2017 12:23 PM  
**To:** Scott Gustin  
**Subject:** Reopening the BTC Hearing: Other Business March 21  
**Attachments:** mallblockiness30aug16-3.pdf

Scott,

Since the DRB will be addressing the request to reopen the BTC hearing, please add the following materials to the file on this issue. They include further clarification and/or relevant comments from:

- 1) Ben Falk -- the design professional who wrote the Seven Days letter precipitating my request;
- 2) Diane Gayer -- an architect who has previously raised questions about shadow impacts and the accuracy of materials presented;
- 3) Robert Herenden -- a physicist who has previously drawn attention to the misleading representation of the upper story setback.

My broad concern is with the pattern of deceptive representations, visual and verbal, that form the basis of this project and its application. After the approval last Monday, Mr. Simon claimed the project was still 225 to 250 million. How can that be when all the buildings closest to Church Street are no longer anticipated? How have the funds originally earmarked for those buildings been redirected? And what IS Phase 2 if these buildings have been slashed from the plan?

Any approval from the DRB should rest on solid, not questionable or shifting representations of the project.

Thanks,

Michael

Ben Falk wrote:

Additionally - you can't just mistakenly show shadows for buildings in a 3D model one way and then show an entirely different sun location for the building in question. Software doesn't work that way. This had to be intentional and if they say it's not what's the explanation? At best if that's the case then it is a massive mistake. Ben Falk

On Sat, Mar 18, 2017 at 10:49 AM Ben Falk <[ben@wholesystemsdesign.com](mailto:ben@wholesystemsdesign.com)> wrote:

Hi there, I am not sure I can make the meeting, but I would be happy to write up something describing what I think is happening with these renderings.

If a large and very expensive 3-D model doesn't mean anything, then why produce and publish

I would want to ask, an answer should be given to the public, as to why the shadow is shown in correctly for the one building question but correctly for every other building in this model.

The shade impact of a large building on a public space is significant and is an obvious and major concern of the public, for good reason.

The model shows shade for all buildings in it correctly except the building in question which it actually does show shade for - shadow is not omitted for the building in question, notably, but it is simply shown much less than it truly is.

Why is this?

The public deserve answers.

What shade impact studies have been offered to the public so far?

The whole situation seems very fishy, and at best misrepresents an actual impact. Producing and publishing a model that shows grossly incorrect impacts on public space of a new project violates professional conduct.

Ben Falk

Diane Gayer wrote:

If renderings drawings don't mean anything why do they bother to require drawings at all for a DRB presentation? Of course drawings aren't always "accurate" but they are meant to convey information as correctly as possible. And they are filed as legal documents. These (drawings) are the only means we currently have to define what is being proposed and the (legal and social) expectation is that they are accurate.

Many of us know that we can make drawings reflect what we want, just as words can emphasize different things... in other words drawings are a design tool that can be used to prove your case (you want to make it). In this example, the BTC team has chosen to diminish the actual height and impact of the building mass using shadows that fall differently than the adjacent and existing buildings. One example on the plans shows a set of shadows for all the surrounding buildings to be consistent, yet a very different angle and solar inclination for the proposed development. This has the impact of shortening and diminishing the 14-stories building as against the 4-6 stories of other properties in a way that would not co-exist under our sun. To contrive the impact of shadows in this way is not fair to civic needs nor respectful of design ethics.

I have talked about the height and asked for a proper shadow study from the onset of this project because I know from personal experience how winter shadows can be deadly to retail at the street level, pedestrian sidewalk safety, and winter access to parking garages are impacted. To hear the

no shadow study was done with accuracy and that the DRB approved this project regardless is condemnable.

Urban design is not childplay—it is worth a lot of money, especially if it fails. We can not only end with an unfinished project, we can end up with a new Transit Center permanently in shadow, a Church Street that supports no retail life or street trees, and a desolated "top of" Church Street.

There was never any excuse not to do a proper shadow study. It is a normal requirement and would allow us all to know what the issues are. Even if not desirable, the planning study would prepare us for what to expect, but in this case we are still guessing.... and missing city leadership on this urban concern.

Unfortunately, it follows a pattern on this project. The model that was promised came six months too late and unusable.

Diane Gayer – Architect

On Mar 18, 2017, at 10:22 AM, Michael Long <[mjlong@burlingtontelecom.net](mailto:mjlong@burlingtontelecom.net)> wrote:

Diane,

In response to questions raised about fraudulent renderings in a letter to Seven Days, I requested last week that the BTC hearings before the DRB be reopened. The DRB summarily dismissed that request and went on to approve the project. Nevertheless, on Tuesday the 21st they are taking it up formally as an agenda item. I'm not sure how meaningful this can be post-approval, but if fraud is at play it's important that it be revealed and this could present an opportunity.

I know you have raised questions about the accuracy of materials presented in the past.

Since I have no special expertise on renderings, anything you could provide by way of written or in-person testimony on the matter would be invaluable. I know the local architect's attitude from a brief interaction with him after the deliberation session on Monday is that it was just a rendering and renderings don't mean anything.

Thanks for your interest in this matter.

Best,

Michael

Robert Herenden wrote: (His study attached)

I've thought some more about "blockiness"-the opposite of "peakedness"- based on Burlington  
planning director David White's graphics at the 22 August 2016 City Council working session.  
(Mr. White has kindly given me his files from that presentation.) His graphic shows the least  
possible blockiness as viewed, which requires the most blockiness in the perpendicular direction.  
The difficulty arises from using 3D data on a 2D sheet.

Robert Herenden -



## UNDER-REPRESENTED BLOCKINESS.

Robert Herendeen

[raherendeen@yahoo.com](mailto:raherendeen@yahoo.com)

1 September 2016

I've thought some more about "blockiness"-the opposite of "peakedness"- based on Burlington planning director David White's graphics at the 22 August 2016 City Council working session. (Mr. White has kindly given me his files from that presentation.) His graphic shows the least possible blockiness as viewed, which requires the most blockiness in the perpendicular direction. The difficulty arises from using 3D data on a 2D sheet.

Fig. 1 shows views of two 150 ft x 366 ft footprint buildings. Fig. 1 is schematic but it is to scale. The left building is 105 ft high; the right 160 ft. high. Here I direct attention to the 160 ft image. The problem is that the units of the horizontal and vertical directions are different. The vertical shows height (units = ft) but the horizontal shows area (units = sq ft, but here normalized to % of the base area). Thus floors 1-5 have area = 100, floors 6-8 have area = 80, floors 9-12 have area = 55, and floors 13-14 have area = 27 ( $=100 \cdot 15000 \text{ sq ft} / (150 \cdot 366 \text{ sq ft})$ ).

Because the vertical and horizontal units are different, the images will not necessarily depict the profile one would see. An image to convey the profile should have units of length in both directions. In Fig. 1 the horizontal length is shown proportional to area. A necessary consequence of this choice is that the view from left or right would show no peaking at all. (Another way to say this is that the upper floors' footprint is assumed to have a different shape than the ground floors'). Fig. 2 reveals this. We can see that in Fig. 2 the view from the right would show peaking similar to Fig. 1, while the view from the left shows almost no peaking at all. Fig. 2 may be the final form, in which a best (least blocky) view from one direction requires a worst (most blocky) view from the perpendicular direction. Or it may not be the final form.

In the end the actual shape will determine how blockiness is shared between perpendicular views. In a proportional depiction, in which the higher layers have the same shape as the ground floors, the length would vary as the square root of area for both directions, as shown in Table 1.

The proportional case is indicated by red lines in Fig. 3 It is considerably more blocky than the best case shown in Mr. White's graphic.

And to repeat: the problem is trying to use area to convey length. The 3D model now at the Fletcher Free Library gets around this problem.

|        |                | HORIZONTAL LENGTH          |      |                                                   |      |
|--------|----------------|----------------------------|------|---------------------------------------------------|------|
| Floors | % of base area | As shown/implied in Fig. 1 |      | Proportional: same % reduction in both directions |      |
|        |                | End                        | Side | End                                               | Side |
| 13-14  | 27             | 27                         | 100  | 52                                                | 52   |
| 9-12   | 55             | 55                         | 100  | 74                                                | 74   |
| 6-8    | 80             | 80                         | 100  | 89                                                | 89   |
| 1-5    | 100            | 100                        | 100  | 100                                               | 100  |

Table 1. Width as % of base by floor for Fig. 1 and for proportional case.

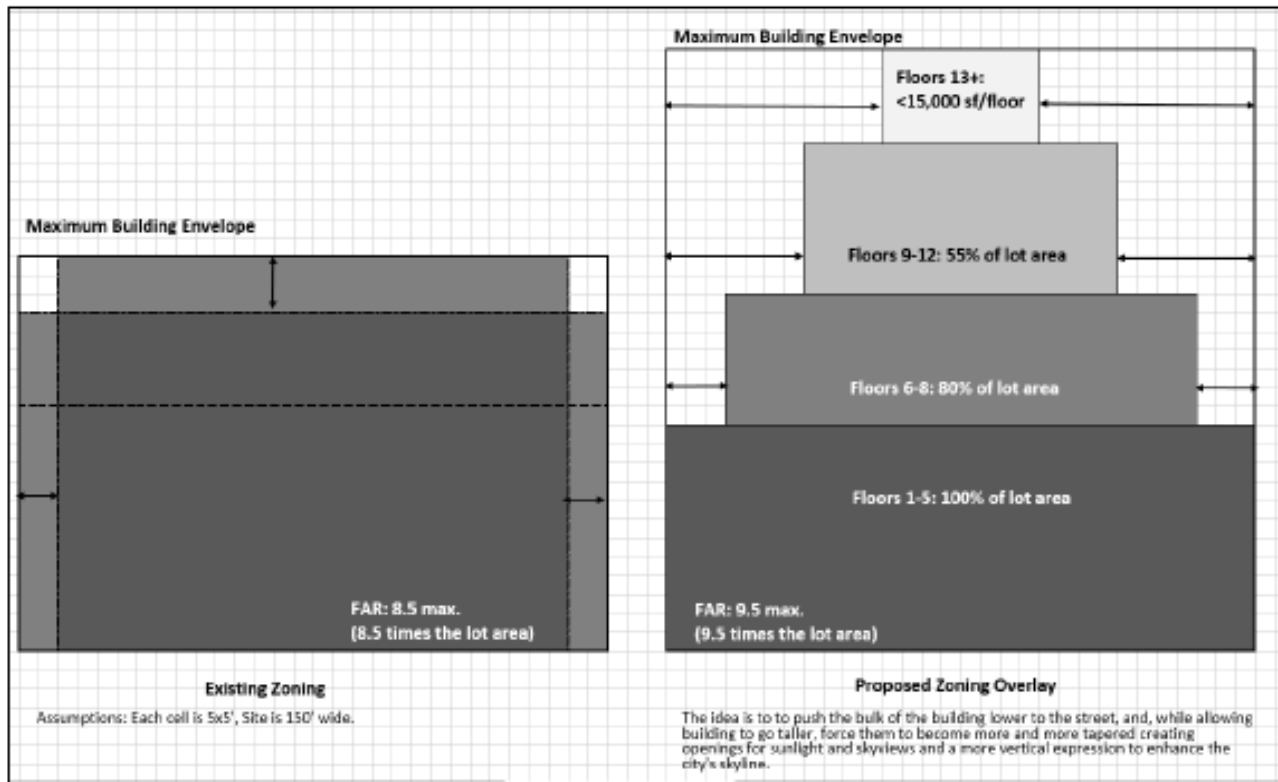
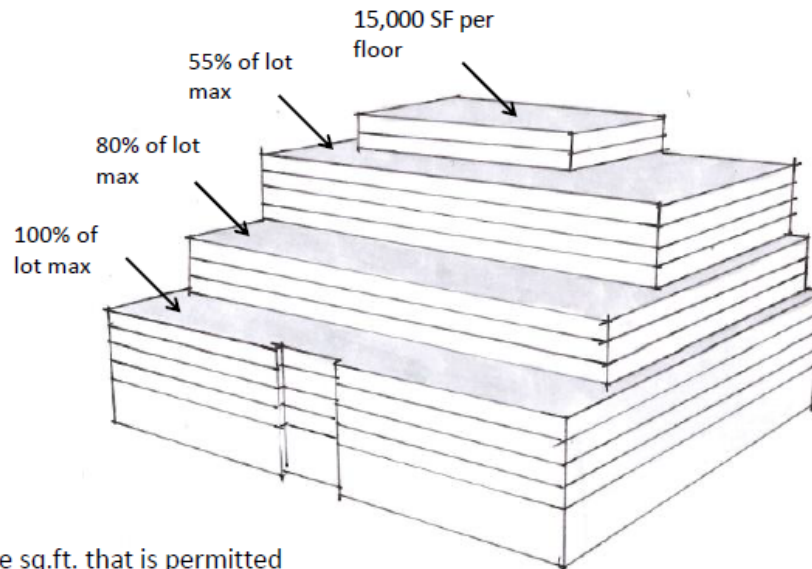


Fig. 1. Source: David White, DMUC Presentation for CC worksession 2.pdf, p. 4.

# Massing-Potential Building Envelope

Maximum FAR per Floor



Regardless of the sq.ft. that is permitted on each floor, **the sum of all floors cannot exceed the maximum Gross Floor Area**, which is calculated by multiplying the site area by the allowable FAR.

Sketch by Julie Campoli

5

Fig. 2. Source: David White, DMUC Presentation for CC worksession 2.pdf, p. 5.



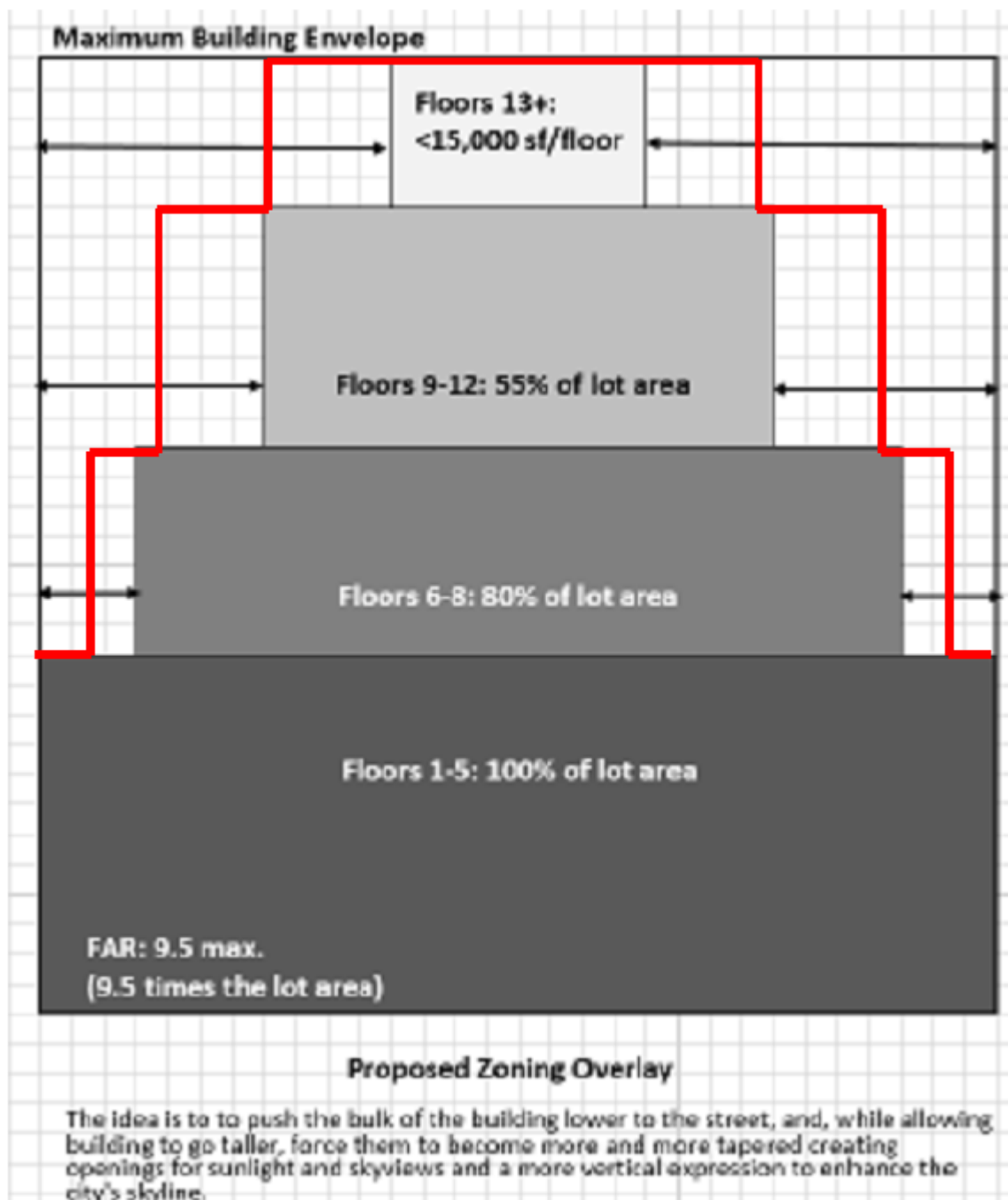


Fig. 3. Same as Fig. 1 but showing the proportional outline in red.

## Department of Planning and Zoning

149 Church Street, City Hall  
Burlington, VT 05401

[www.burlingtonvt.gov/pz](http://www.burlingtonvt.gov/pz)

Phone: (802) 865-7188

Fax: (802) 865-7195

*David White, AICP, Director*  
*Meagan Tuttle, AICP, Comprehensive Planner*  
*Jay Appleton, Senior GIS/IT Programmer/Analyst*  
*Scott Gustin, AICP, CFM, Principal Planner*  
*Mary O'Neil, AICP, Principal Planner*  
*Ryan Morrison, Associate Planner*  
*Anita Wade, Zoning Clerk*



### BURLINGTON DEVELOPMENT REVIEW BOARD

Tuesday, March 21, 2017, 5:00 PM

Conference Room 12, City Hall, 149 Church St, Burlington, VT  
Minutes

**Board Members Present:** Austin Hart, Brad Rabinowitz, AJLaRosa, Israel Smith, Alexandra Zipparo, Wayne Senville, Geoff Hand, Robert Purvee (Alt), Jim Drummond (Alt)

**Staff Members Present:** Scott Gustin, Mary O'Neil, Ryan Morrison, Anita Wade

#### AGENDA

- I. Agenda
- II. Communications  
Board accepts supplementals.
- III. Minutes

#### IV. Public Hearing

##### 1. 17-0762CA/CU; 35 GROVE STREET (RL, Ward 1E) Gina S. Lambdin

Add accessory apartment and mudroom. Convert porch into year-round living space. Reconfigure parking area. (Project Manager, Mary O'Neil)

A.Hart: swears in applicants and asks if they have seen staff recommendations. One issue raised by staff was the parking.

G.Higgins: confirms this. Explains the shared driveway and easement issue. Difficult to turn around in driveway. Need to legally document an easement that satisfies the backup with the cars.

A.Hart: backing out and turn around with an easement that allows this is appropriate.

G.Higgins; property line issue. An easement needs to be documented on what is current situation what are the changes.

B.Rabinowitz: process must note and document lot coverage for both properties.

A.Hart: staff comments on adverse findings is also about landscaping plan for headlight glare, and utility plan/location. Board is looking for supplemental information.

G.Higgins: basic landscaping mostly grass for now with tight space.

A.Hart: look at something to prevent or screen for headlights for this arrangement.

G.Higgins: might need more time to find out what is feasible.

A.Hart: have you looked at the easement to see there's enough space with neighbor for backup.

M.ONeil: shows from google maps.

G.Hand: mentions adverse finding on enclosed porch.  
G.Higgins; hoping to get measurements but need time to get information.  
A.Rowan: neighbor has seen plans and in agreement. Feels it is feasible to do change with a three season light bush or put in evergreen.  
A.Hart: will continue hearing. Asks applicant get information to Board by April 11<sup>th</sup> and have a continuance to April 18th.  
A.Hart: motion to continue hearing.  
B.Rabinowitz: seconds the motion.  
Board Vote: 9-0-0

**2. 17-0763CU; 311 NORTH AVENUE (RM-W, Ward 4N) VLTBTB Parkland LLC**

Allow for a conditional use of the stone house as a community house.  
(Project Manager, Ryan Morrison)

A.Hart: staff recommends this project for consent. No interested persons to speak. Has a question on staff notes and narrative referring to minimum of 13 occupants. What is the maximum.  
J.Bridges: 13 occupants.  
A.Hart: may look at this as more than 13.  
A.Hart: closed public hearing.

**3. 17-0776CU; 449 SOUTH PROSPECT STREET (RL, Ward 6S) Chris Khamnei**

Establish duplex and widen driveway. (Project Manager, Scott Gustin)

A.Hart: mentions supplemental communications and resident letter regarding application.  
C.Khamnei: discusses history of property. Feels he is blamed for using property for more intense use.  
A.Hart; restriction in deed doesn't apply for duplexes.  
C.Khamnei: this is a civil court matter.  
A.Hart: cannot enforce civil covenants.  
C.Khamnei: two original lots and could build more on each lot. Speaking to the issue of duplex. On first lot was brick six bedroom house predating ordinance had an apartment and expands second lot with 3 bedrooms. Felt it was a duplex and trying to bring into compliance. The zoning should reflect two units exist.  
A.Hart: width of driveway?  
C.Khamnei: explained expansion of driveway and provided lot coverage calculation.  
A.Hart: need 4 parking spaces with driveway 18' wide.  
C.Khamnei: meets density requirements. Neighborhood concerns of loud tenants is not true. Generally good neighbors and professionals. Meets duplex standards. No internal renovations, only changes with driveway.  
B.Rabinowitz: questions driveway width.  
C.Khamnei: widest part is against the house near garage and narrows at street to 16 ft.  
B.Rabinowitz: how long have you had the house?  
C.Khamnei; since October.  
A.Hart: opens for public comment.  
K.Dawnly; as resident of South Prospect St, feels project is out of compliance with single family district for no more than 4 unrelated persons. Consistently 6 cars in driveway and if approved as duplex there will be 9 cars. Cars are backing onto sidewalks.

A.Hart: parking on pavement or grass?

K.Dawnly: they park on grass. Gave a letter to the Board.

D.Rue; handout to Board on behalf of Wendy Bombards at 429 So Prospect. This duplex does not comply with CDO and has an undue adverse effect on area. Focus on lots that front on South Prospect and Cliff St, which are all single family built in late 1920's. The purpose of SF district is to re-enforce a historic development pattern and not a duplex pattern. An allowance of more than 4 unrelated persons will have more noise impact. Urges Board to have condition of compliance for single family dwelling. Parking is an issue with residents parking on lawn now. Urge Board to condition for a narrow driveway to control access. Currently exceeds tandem parking requirement. Encourages Board to enforce existing zoning violations and deny application.

W.Senville: any existing zoning violations?

D.Rue: have a list from about Code enforcement actions under investigation. Gives handout to Board.

C.Khamnei: this property rents two units; one with 4 people and one with 3 people, one has three bedrooms and other five bedrooms. Total of seven tenants, not nine residents. They are not parking on the lawn. Usually I am doing repairs and need to park closer due to heavy tools.

G.Hand: drove past property looks like 2 or 3 cars on the lawn when I drove by.

C.Khamnei: application proposes driveway which will be sufficient. The violations are because I registered with zoning department for two units. Always used as a duplex.

G.Hand: do you need to expand driveway to provide adequate parking.

C.Khamnei: yes, if tenants do not park properly, their tires end up on the lawn. The duplex is not going to affect travel on So. Prospect St.

B.Rabinowitz: cannot park in setback.

S.Gustin: can park within setback if in tandem.

C.Khamnei: 6 cars are parked there now. Can get a curb cut on the other side. The two lots are at 19,000 sq ft.

B.Rabinowitz: questions if two lots are combined.

C.Khamnei: yes.

A.Hart: closes public hearing.

#### **4. 17-0755CA/CU; 235 PENNY LANE (DW-PT, Ward 3C) City of Burlington**

Construct marina, parking lot, and related site improvements.

(Project Manager, Scott Gustin)

Board members recused: AJLaRosa, GHand

A.Hart: mentions that the Board has not reviewed the supplemental communications for this project. Swears in applicant and interested persons. A good portion of the marina is off land. The state has jurisdiction on what happens in the lake. Board review is limited to what happens on the land.

J.Wallace and C.Deloia, D.Marshall; provides an overview and bullet points pertaining to staff report. Comments on proposed conditions. Review is on the land improvements. Several components includes the coast guard building, water treatment plant, the Moran, the new lake street extension, and fishing pier. Sailing center will provide information on parking.

Shared parking management plan.

A.Hart: approval for 68 parking spaces?

S.Gustin: approved for 69.

J.Wallace; waiver request from sailing center. Continued vehicular and pedestrian access to drop off plaza, spur of bike path connects waterfront path. The agreement with the City is 160



slips with transient and seasonal slips. Requesting a waiver for transient spaces. Park area – designed the park and recreation areas with Tif funds. Further description of site plans.

A.Hart: access to loading dock?

J.Wallace: water department working to limit of agreements for only employees and restrict of public access. Explains public parking for certain spaces between May 15th to October 15<sup>th</sup>.

M.Nod; spoke of previously approved lot parking spaces for the sailing center. Utilizing parking in the fishing pier lot about 28 spaces. Fifty-two spaces dedicated to storage lot. Have less yard storage space than previously. Asking for a parking waiver with the City. Discussed parking, bus, and bike utilization, and growth in educational programs for youth and public.

B.Rabinowitz: are you submitting as an applicant.

M.Nod: submitted as a co-applicant.

A..Zipparo: question about parking flow. Where does the bus drop off for kids going to sailing center.

M.Nod: explains drop off configuration has a driveway and a hammerhead. Reconfigured flow to handle constraints of site but have sufficient capacity for turn around.

A.Zipparo: expressed concerns about turnaround, drop off, and backing up of bus vehicles, and how it concerns children, pedestrian, and bus access.

B.Rabinowitz: is there a plan of entire project and asks for photos.

S.Gustin: presented two points about parking. Parking management plan addresses the marina and the sailing center.

A.Hart: this is an explanation of why they qualify for waiver. It would be helpful to have CEDO speak on this all fits together.

J.Wallace; spoke about nineteen public parking spaces for weekend and holiday times.

A.Hart: sounds as if this is a component of your application. Would like to know how DPW manage the three uses all at once. It needs to be part of the application.

J.Wallace: mentioned aspects of staff report and proposed conditions. Spoke of additional screening, landscape plans developed with park and recreation, promenade between park and two buildings, extension and turnaround and pedestrian access path, and leaving plan as is with screening and bond condition for public approval. Contaminated soils will find a place on site working with the state landscape berms on site.

B.Rabinowitz: can there be public access on the north side for pedestrians where there is better access?

M.Nod; asking area to be covered and guaranteeing the TIF spending.

N.McKay; sworn in. Gives clarification on TIF.

A.Hart: swears in N.McKay.

Further discussion on vehicular and pedestrian use. Penny Lane access and safety. Flood plain area and questions of bonding or escrow.

S.Gustin: condition is vague, not bond or escrow necessary, and what ordinance says, similar to what has happened to Mall. TIF will pay for it.

A.Hart: allows us to accept a bond or other instrument as stated by the city attorney.

Board opens up to public comment.

S.Goodkind; formerly public works director and familiar with the site. Sees area open to the public with good access. Federal funds should preserve the Penny Lane access and public parking. The development of park is unusual path and should be a public process as to how this public land should be developed as public trust land with some restrictions as to how it can be used. Allocation for the public seems only off hours.

A.Hart: swears in other interested persons.

N.McKay: spearheading through the City Departments. Public process was approved and TIF money was used for infrastructure and public and private investments. Agreement developing all on public property where park and parking lot becomes City owned. The Marina will pay for spaces but may be public arrangement with city for spaces.

A.Hart: are there assigned spaces  
N.McKay: spaces will be allocated as 19 spaces available for public. Penny Lane is City-owned and needed for access this because of its trucks.  
B.Rabinowitz: asks about parking for the fishing pier  
W.Senville: has City looked at effects of fishing pier.  
K.Pigsford: yes, it will be accessible with conditions.  
Resident on Lake St: the access through Lake St. already has too much vehicular traffic.  
Lake Street is fairly noisy.  
M.Long: questions if parking is adequate. Questions other arrangements parked cars and shuttles.  
A.Hart: decision to continue and schedule one more hearing.  
J.Wallace: with property taxes, marina will be accessed a significant amount.  
B.Rabinowitz: the Board needs to look at supplementals.  
A.Hart: move to continue hearing to April 18<sup>th</sup>.  
B.Rabinowitz: seconds the motion.  
Board Vote: 6-0-0

#### **IV. Other Business**

A.Hart: this comes to the Board as a request to reopen the public hearing for 75 Cherry Street.  
Board accepts supplemental communications.  
C.Meyer: assistant city attorney gives criteria and standards by which the Board would reopen the hearing.  
B.Rabinowitz: if information does not generate a positive condition does this alter decision.  
A.Hart: this is to process new information perhaps not available previously.  
M.Long: asked this be reopened.  
A.Hart: we previously closed the public hearing and now reviewing this request.  
M.Long; asks how the Board reviewed the shadow studies.  
A.Hart: working toward an efficiency of process. Made sure all information including shadow studies were available.  
M.Long: felt it was not adequate with what was rendered by computer program.  
B.Rabinowitz: we had elaborate shadow studies.  
M.Long: good if information could be verified.  
B.Dunkiel: pointed out that interested parties are allowed to respond, but there have already been three hearings. Information has been available for years on this project. There should be consequences for someone who wants to reopen the hearing and not take advantage of the time allowed. This is an extraordinary remedy and burden is extremely high on the applicant.  
S.Goodkind; sworn in. Studies may show a different aspect.  
M.Long: the project has been represented and locked in before the public process.  
A.Hart: closed the public hearing.

#### **V. Adjournment**

Austin D. Hart  
Austin D. Hart, Development Review Board  
A. Wade  
A. Wade, Zoning Clerk

June 12, 2017  
Date  
6/5/17  
Date

Plans may be viewed in the Planning and Zoning Office, (City Hall, 149 Church Street, Burlington), between the hours of 8:00 a.m. and 4:30 p.m.  
Participation in the DRB proceeding is a prerequisite to the right to take any subsequent appeal. Please note that ANYTHING submitted to the Planning and Zoning office is considered public and cannot be kept confidential.  
This may not be the final order in which items will be heard. Please view final Agenda, at [www.burlingtonvt.gov/pz/drb/agendas](http://www.burlingtonvt.gov/pz/drb/agendas) or the office notice board, one week