FINAL REPORT

February 9, 2015

planBTV South End | Phase 1 Existing Conditions Report

Burlington

Chittenden County RPC

PREPARED FOR
City of Burlington
Chittenden County Regional Planning Commission

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1 Introduction and Overview

1. Introduction and Overview

1.1 Background

The City of Burlington will be developing a master plan for the south end of the City (planBTV South End) that outlines future development, infrastructure, greenspace, and circulation needs and opportunities for this portion of the City—see **Figure 1-1** for the Study Area on the following page. The overall planning process will place an emphasis on a community conversation to find ways to promote and improve mixed uses, quality urban design, affordable housing, transportation facilities and options, parking management, quality and capacity of public infrastructure while honoring the City's commitment to environmental stewardship and green house gas reduction as noted in the Climate Action Plan.

This Existing Conditions Report represents Phase 1 of this effort and covers a number of tasks completed by the City of Burlington Planning and Zoning Department (P&Z) and the Chittenden County Regional Planning Commission (CCRPC) with assistance from VHB. These tasks include existing conditions inventories and assessments that will help in the development of a meaningful and realistic visioning and planning process in subsequent phases that support the City's larger and overall sustainability mission and vision as articulated in the Burlington Legacy Plan.

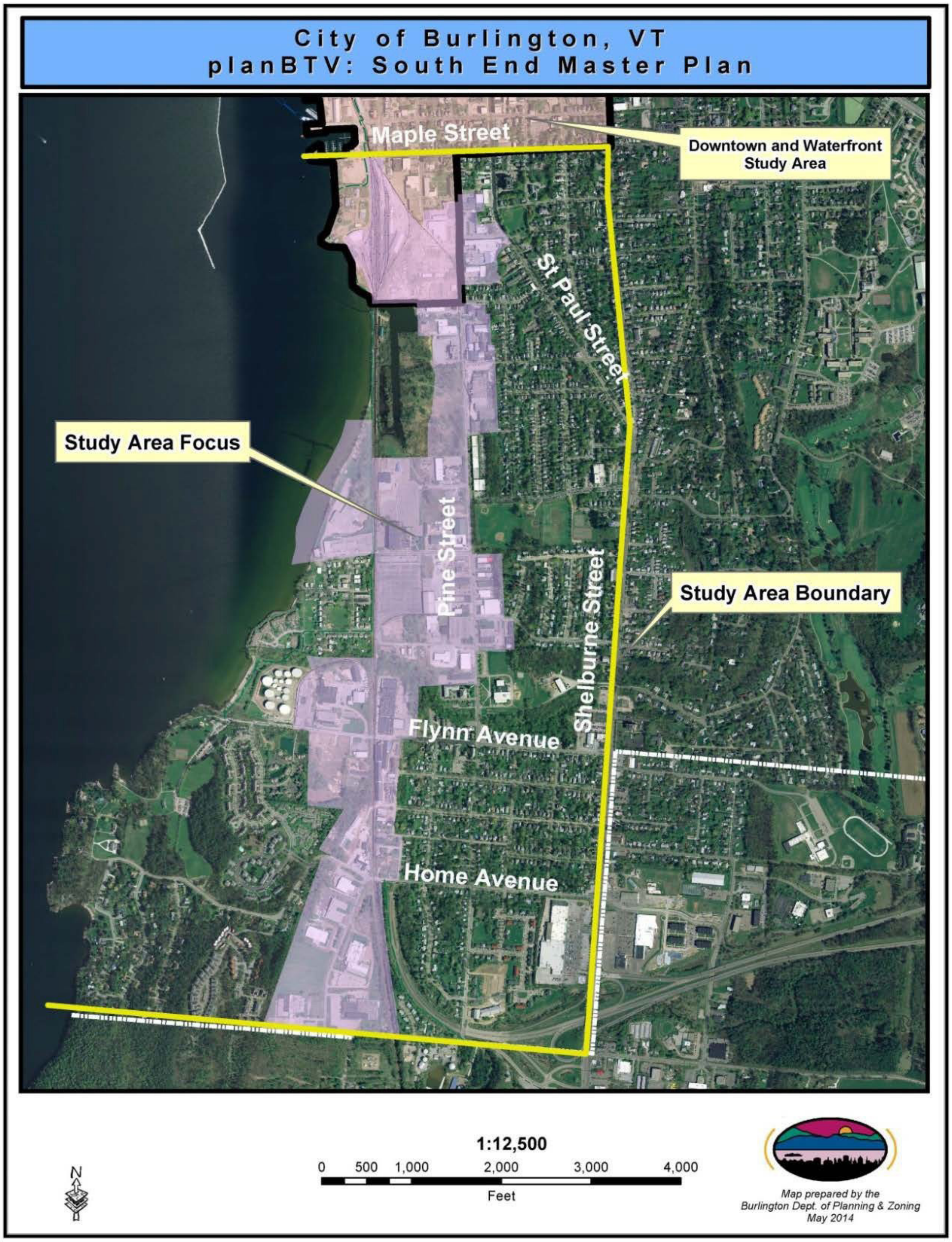
1.2 Study Purpose

The purpose of this Report is to collect, summarize and assess existing conditions within the South End Study Area in four major categories of: Land Use, Transportation and Traffic Operations, Stormwater Infrastructure including Water and Wastewater, and Brownfields Information. This report is organized so each Chapter outlines the findings for each of these categories. Additional technical information for these four categories can be found in Appendices A through D as outlined in the Table of Contents. Data that was collected using GIS technology and much of the information that is presented here has also been provided electronically to the City of Burlington for their use in the ongoing and future projects so that the product of this study is not only a report, but geospatial information that can be applied to other purposes as well.

1.3 Study Area

The planBTV South End Study Project includes the full Study Area for the project as well as a designated Focus Area for which some more detailed data collection and analysis herein is focused. **Figure 1-1** illustrates the location of both of these. The Study Area is bounded on the south by the Burlington/South Burlington town line along Queen City Park Road and on the north by Maple Street. The western boundary of the Study Area is Lake Champlain and the limits extend east to Shelburne Street/ US Route 7 and South Union Street. The Focus Area is bounded to the south also by Queen City Park Road and north by Maple Street with narrower east and west limits that focus on industrial and business land uses rather than recreational and residential. The City will be developing their planBTV South End Master Plan to include the full Study Area whereas some of the Phase 1 efforts focused in part or entirely within the Focus Area as described further in this report.

Figure 1-1: planBTV South End Study Area



1.4 Evaluation of Previous Studies

VHB has reviewed the prior plans and studies and has identified key findings and recommendations of that work. The purpose of this section is to document the key findings and recommendations of the following studies:

» Burlington Transportation Plan (2010)
» Champlain Parkway EIS, Act 250, Etc
» CCTA Transit Development Plan (2010)
» Railyard Enterprise Project
» Chittenden County Park & Ride Plan (2011)
» Global Green Report (CEDO)
» BERA Information
» TMDL for Englesby Brook (DEC, EPA-approved)

Burlington Transportation Plan (2010)

The Burlington Transportation Plan reaffirmed the City's long-term transportation strategies, described intermediate strategies for moving forward and specified a five year plan to be updated annually.

The long term strategy includes a transportation vision which stresses a strong healthy city, transportation choices, and great streets.

» A strong healthy city includes: economic health, physical health, choices for an aging population, safety, and environmental health.

» Alternative transportation choices include: Transportation System Management (TSM), Transportation Demand Management (TDM), Transit, Walking, Biking, Accessibility, and Parking. The goal of the City is to accommodate growth in travel within the existing roadway network and through TSM, non-auto modes, and TDM.

» The Great Streets concept dedicates specific streets within the network as complete streets, transit streets, bicycle streets, slow streets, state truck routes and neighborhood streets to develop an overarching plan for the road network. A Complete Street is a road that is designed to be safe for drivers, bicyclists, transit vehicles and users, and pedestrians of all ages and abilities. The Complete Streets concept focuses not just on individual roads but on changing the decision-making and design process so that all users are routinely considered during the planning, designing, building and operating of all road ways.

The intermediate strategy outlined in the plan requires the City to steer toward the course outlined in the 2001 Municipal Development Plan, monitor what is going on, and chart a new course (five year plan). In order to accomplish this, the plan suggests changes in the way the City delivers transportation programs and services which include:

- Treat streets holistically as prescribed in the Great Streets philosophy
- Develop annual work plans dedicated to meeting the goals of this plan
- Establish mechanisms for the review of these plans
- Develop a project prioritization methodology
- Develop methods to communicate these activities to the public

It was recommended that a set of 14 progress indicators be tracked and reviewed annually.

The Initial Five Year Plan focused on maintenance, funding capital projects (including waterfront improvements, Marketplace District improvements, downtown transit center, south end neighborhood transit center, wayfinding, Champlain Parkway, and Flynn Avenue sidewalk), policy initiatives, parking pricing pilot programs, downtown parking supply, and remote parking.

Champlain Parkway Environmental Impact Statement (EIS)

As the City of Burlington has grown from its late 18th century beginnings, the transportation infrastructure has not kept pace with development. One of the most distinct deficiencies has been the evolution of a city-wide street pattern with few north/south travel routes that are continuous. This deficiency is particularly pronounced in the southern end of the City, on streets that carry traffic between the US Route 7 (Shelburne Street) interchange on I-189 and the downtown area. Shelburne Street is heavily congested as a result of the high traffic volumes, heavily developed commercial properties, and a general lack of access management.

Figure 1-2: The Champlain Parkway abandoned alignment just west of Pine Street near the southern boundary of the Study Area.

Motorists wishing to avoid the traffic impediments on Shelburne Street often times divert from this primary thoroughfare onto the local street network in an attempt to bypass the congestion. As a result, the principal alternate routes into the downtown area from the south are St. Paul Street, which extends from the north end of Shelburne Street; and Pine Street, which parallels St. Paul Street and Shelburne Street.

Pine Street has no direct connection to the two Principal Arterials, I-189 and US Route 7, and is only accessible by traffic migrating to and from Shelburne Street over local, residential streets which include Home Avenue, Lyman Avenue, Ferguson Avenue, Flynn Avenue, Birchcliff Parkway, Locust Street, Howard Street, and Kilburn Street. These local streets are not intended to, nor do they have the capacity to carry the volume of traffic which is diverted from arterial or collector systems. In addition, the existing street pattern encourages use of neighborhood streets by trucks due to the lack of alternative routings. This mix of traffic has created conflict and access concerns in several local neighborhoods.

In July of 1979 the Final Environmental Impact Statement (FEIS) was approved by FHWA which documents the issues involved in the selection of the Selected Alternative. During project development, the EPA began studying the Pine Street Barge Canal area and it was proposed for inclusion on the EPA's first National Priorities List (NPL) of hazardous waste sites in 1981. The construction of the C-1 section (described below) was nearly completed in the late 1980's when a remediation plan began for the Pine Street Barge Canal Superfund Site which delayed the construction of the C-2 section and as a result, section C-1 has never been opened to traffic. During the late 1980's the Vermont Agency of Transportation (VTrans) began studying alternative routes which would bypass the Pine Street Barge Canal and by the 1990's the Burlington City Council began referring to the project as the Champlain Parkway rather than the Southern Connector to separate the project from the Superfund Site.

The purpose of the Champlain Parkway project is to improve circulation, alleviate capacity overburdens, improve safety on local streets and provide traffic relief in the southwestern quadrant of the City of Burlington by providing a connection between the interchange of I-189 with US Route 7 and the downtown waterfront area. Build Alternative 2, which is the preferred alternative, consists of:

- **Section C-1 -** A 0.6 mile section of limited access highway between the Route 7 interchange to Home Avenue (previously constructed but never opened),
- **Section C-2 -** From the northern terminus of C-1 extending northerly approximately 0.7 miles as far as Lakeside Avenue, and
- **Section C-6 -** Commencing at the terminus of C-2 at Lakeside Avenue, and proceeding easterly along Lakeside Avenue to Pine Street this alternative then proceeds northerly along Pine Street.

The EIS provides an overview of the Purpose and Need of the project, Alternatives, Affected Environment, Environmental Consequences, Section 4(f) Impacts and Mitigation, and Scoping, Agency Coordination & Public Participation.

CCTA Transit Development Plan (2010)

The Transit Development Plan (TDP) provides a program for the expansion and enhancement of public transportation service in Chittenden County over a 10-year period and beyond. A lengthy vision statement was developed as part of this plan. A market assessment concluded that "for buses to be competitive with driving, they need to run at a high frequency." The Needs Analysis identifies that 30-minute service is not attractive to choice riders, while 15-minute service in peak periods is a threshold to making transit service competitive with driving and is the central transit recommendation in the TDP. The report identified the replacement of the Cherry Street Station by a new Downtown Transit Center as the most needed facility investment in the CCTA system. Improvements were also recommended for the Pine Street corridor including service upgrades to include 15-minute peak service and a new Sunday service. Based on other case studies throughout Chittenden County this improvement could lead to a 30 percent jump in ridership. Funding for improvements outlined in the plan is not specifically noted although a need for a significant change in the funding structure is recognized.

Railyard Enterprise Project (REP)

This is an ongoing scoping study, to develop a network of multimodal transportation infrastructure improvements in the Pine Street and Battery Street area that would support economic development in the area, improve livability in surrounding neighborhoods, enhance connectivity between Battery Street and Pine Street, and improve intermodal connection to the Burlington Railyard. Currently a Purpose and Needs statement has been developed and the project is evaluating a number of draft alternatives as the first phase of the alternative evaluation process.

Figure 1-3: The Vermont Railways Railyard at the northern boundary of the Study Area where multiple transportation alternatives are being evaluated.

Chittenden County Park & Ride Plan (2011)

This plan presents a prioritized list of new park-and-ride and intercept facilities, and evaluates and recommends upgrades to existing facilities. The plan was designed to be used by regional transportation organizations to guide decisions about the use of federal and state transportation funding for planning, scoping, design and construction of park-and-ride and intercept facility projects. The plan outlines a long-term vision that defines a system of park-and-ride and intercept facilities that are convenient, accessible by multiple modes, located to encourage use, well maintained, safe and clean. In total, the plan develops and prioritizes recommendations for twenty-two new park and ride locations and five new intercept locations as well as existing park-and-ride lots in Chittenden County.

Global Green Report (CEDO)

This report utilizes a sustainable neighborhood assessment tool based on LEED Neighborhood Development (ND) criteria for the Pine Street / South Waterfront area of Burlington. The assessment process enabled the team to identify a series of recommendations to augment and increase the neighborhood's sustainability. A short intensive planning process for this area is recommended by the Global Green team. The report identifies a number of keys to success including shared access to community assets and shared infrastructure; namely, district scale stormwater, but also recreational facilities, pedestrian amenities, district parking, street network, district energy strategy, and demonstration projects. Proposed improvements to Pine Street are also outlined in the report. It is recommended that the City make short term improvements starting in the north in order to carry more of the downtown, pedestrian character into the heart of the Pine Street corridor. Additional short term improvements include more pedestrian crossings, separated multi-modal path, outdoor seating, creative lighting, Calahan Park visibility and an activity hub. Long term improvements include arts and artisan culture, safe routes to school, transit facilities, transit service, and traffic-calming treatments. A sustainability assessment concludes that a LEED Silver score is achievable for LEED ND, and Gold or even Platinum is possible.

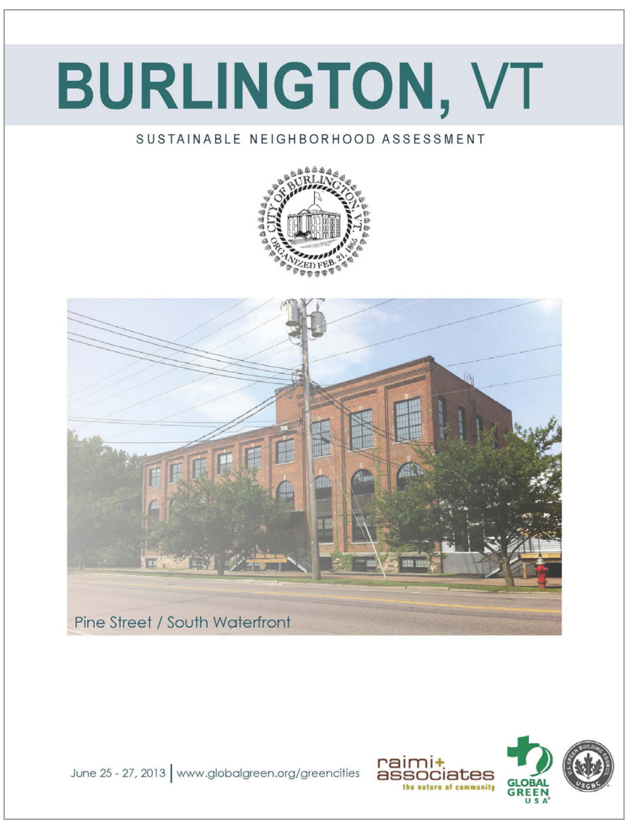


Figure 1-4: The Global Green Sustainable Neighborhood Assessment Report, published in July 2013.

BERA Information

BERA, the Brownfield Economic Revitalization Alliance, is designed to help communities and developers across Vermont redevelop blighted properties in their towns. Under BERA, selected sites will receive priority funding from the state and coordinated and expedited permitting. The Railyard Enterprise Project (REP) area and the 453 Pine Street parcel in Burlington have both been selected as BERA projects. The REP is discussed further in this report and the 453 Pine Street site is a critical property and one of only a few vacant properties in the area for development. Contamination and liability issues need to be addressed before development can occur at this site.

TMDL for Englesby Brook (DEC, EPA-approved)

Englesby Brook watershed is located in the City of Burlington and drains approximately 605 acres. This watershed is predominantly residentially developed along the Shelburne Road corridor and some industrial areas located west of Pine Street in the lower portion of the watershed before it empties into Burlington Bay of Lake Champlain. This Brook is designated as impaired and does not meet water quality standards due to multiple impacts associated with excess stormwater runoff. A Total Maximum Daily Load (TMDL) to address biological impairment has been developed by the Vermont Department of Environmental Conservation (DEC) and approved by the Environmental Protection Agency (EPA). The TMDL demonstrates that Englesby Brook receives excessive stormwater runoff compared to similar but unimpaired streams. The TMDL specifies the high flow reduction (34.4 percent) and base flow increase (11.2 percent) that are required to achieve a flow regime similar to non-stormwater impaired streams. Though the required reductions in Englesby Brook are less than some other impaired streams, the developed nature of the watershed may make meeting these targets very challenging and expensive. In order to implement the TMDL, the Agency of Natural Resources (ANR) has incorporated the flow requirements of the TMDL into the 2012 MS4 Permit. This permit, among other requirements, requires MS4-regulated entities such as Burlington to prepare a flow restoration plan (FRP) to meet the flow targets described in the TMDL. The FRP must detail the suite of best management practices that are required to meet the high flow targets, while prioritizing infiltration practices to meet the low flow targets. Additionally, the FRP must outline a design and construction schedule for the best management practices, a strategy for financing the FRP, and an evaluation of additional regulatory mechanisms required for implementation.

Figure 1-5: Engelsby Brook at Bike Path

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2 Land Use


SEABA
south end arts + business association
SEABA
where art works
Center
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2. Land Use

2.1 Introduction

VHB assisted the city with a comprehensive land use inventory within the Study Area, that consisted of the following:

» An update to the building footprints based on the latest aerial imagery;

» A Land Based Classification Standards (LBCS) inventory for the Study Area Parcels; and

» A Buildout Analysis for the Focus Area

Methodology and results are presented below for each component of the land use inventory.

2.2 Building Footprint Update

Building footprint updates were conducted for the entire South End Study Area based on spring 2013 aerial imagery (15 cm pixel size orthophotos) provided by the Chittenden Country Regional Planning Commission. The City's existing building footprint layer was updated by correcting outdated building footprints, adding new building footprints, and confirming existing building footprints. Through this process the total number of buildings within the Study Area increased from 1,899 in the City based layer to 2,076 based on the update. Building footprints were field verified in August 2014 during the LBCS inventory. The results are shown in the Building Foot-print Update map as the first page of **Appendix A.**

Figure 2-1: VHB staff members worked with CCRPC interns during the field investigations for the LBCS Inventory.

2.3 Land Based Classification Standards Inventory

A Land Based Classification Standards (LBCS) inventory was conducted for the parcels within the South End Study Area during August of 2014. Field staff from VHB led the inventory and were assisted by CCRPC interns. The inventory was conducted using the ArcGIS Collector application on mobile tablet devices. Parcels inventoried were coded in accordance with the following five dimensions of the LBCS (American Planning Association, LBCS Project, April 1, 2001):

1. **Activity** refers to the actual use of land based on its observable characteristics. It describes what actually takes place in physical or observable terms (e.g., farming, shopping, manufacturing, vehicular movement, etc.). An office activity, for example, refers only to the physical activity on the premises, which could apply equally to a law firm, a nonprofit institution, a court house, a corporate office, or any other office use. Similarly, residential uses in single-family dwellings, multi-family structures, manufactured houses, or any other type of building, would all be classified as residential activity.
2. **Function** refers to the economic function or type of establishment using the land. Every land use can be characterized by the type of establishment it serves. Land-use terms, such as agricultural, commercial, and industrial, relate to enterprises. The type of economic function served by the land use gets classified in this dimension; it is independent of actual activity on the land. Establishments can have a variety of activities on their premises, yet serve a single function. For example, two parcels are said to be in the same functional category if they belong to the same establishment, even if one is an office building and the other is a factory.
3. **Structure** refers to the type of structure or building on the land. Land-use terms embody a structural or building characteristic, which suggests the utility of the

space (in a building) or land (when there is no building). Land-use terms, such as single-family house, office building, warehouse, hospital building, or highway, also describe structural characteristic. Although many activities and functions are closely associated with certain structures, it is not always so. Many buildings are often adapted for uses other than its original use. For instance, a single-family residential structure may be used as an office.

4. **Site** development character refers to the overall physical development character of the land. It describes "what is on the land" in general physical terms. For most land uses, it is simply expressed in terms of whether the site is developed or not. But not all sites without observable development can be treated as undeveloped. Land uses, such as parks and open spaces, which often have a complex mix of activities, functions, and structures on them, need categories independent of other dimensions. This dimension uses categories that describe the overall site development characteristics.
5. **Ownership** refers to the relationship between the use and its land rights. Since the function of most land uses is either public or private and not both, distinguishing ownership characteristics seems obvious. However, relying solely on the functional character may obscure such uses as private parks, public theaters, private stadiums, private prisons, and mixed public and private ownership. Moreover, easements and similar legal devices also limit or constrain land-use activities and functions. This dimension allows classifying such ownership characteristics more accurately.

Each of the LBCS dimensions contain "top level" categories which generally define the primary use within the dimension. For example the top level codes for Callahan Park are as follows: Activity - Leisure Activities; Function – Arts, Entertainment, & Recreation; Structure – Institutional or Community Facilities; Site – Developed Site With Parks; and Ownership – Public Restrictions. Furthermore, each dimension was defined for up to six sub categories that further detail each of the uses. Included with this report are maps of the top level code for each of the parcels based on the LBCS inventory. GIS data that include the more detailed uses collected for each of the dimensions has been provided to the City.

Figure 2-2: Champlain Community Garden shown here includes the same top level categories as Callahan Park.

During the field inventory, primary data observed on site was used to populate each of the uses LBCS dimension. In addition the City-provided Assessors data was used to supplement the field inventory for the Ownership dimension to identify some public and nonprofit owned parcels. Residential parcels were field inventoried for the number of structures and units. The City also provided input on parcels that did not easily fit into the LBCS system such as those associated with the Barge Canal or alley parcels within the southeast residential neighborhood within the Study Area. The results of the LBCS inventory are shown in the LBCS Top Code Maps in **Appendix A.**

Methodology

To conduct the inventory, VHB developed a custom mobile data collection application and a web mapping application interface using ArcGIS Online. The mobile data collection application was implemented using ArcGIS Collector, which allowed field staff to complete the land use inventory for each parcel in the field using their mobile phones or mobile tablet devices. This work flow provided direct access to the project GIS data while in the field, and eliminated the need for any manual data entry. Additionally, the web mapping application allowed office staff to track the progress of the inventory without leaving the office. To QA/QC the land use inventory, VHB provided the City with access to the web mapping application, which allowed the City to zoom into each parcel and check the results of the inventory. If City staff found any discrepancies in the data, they were able edit the files directly.

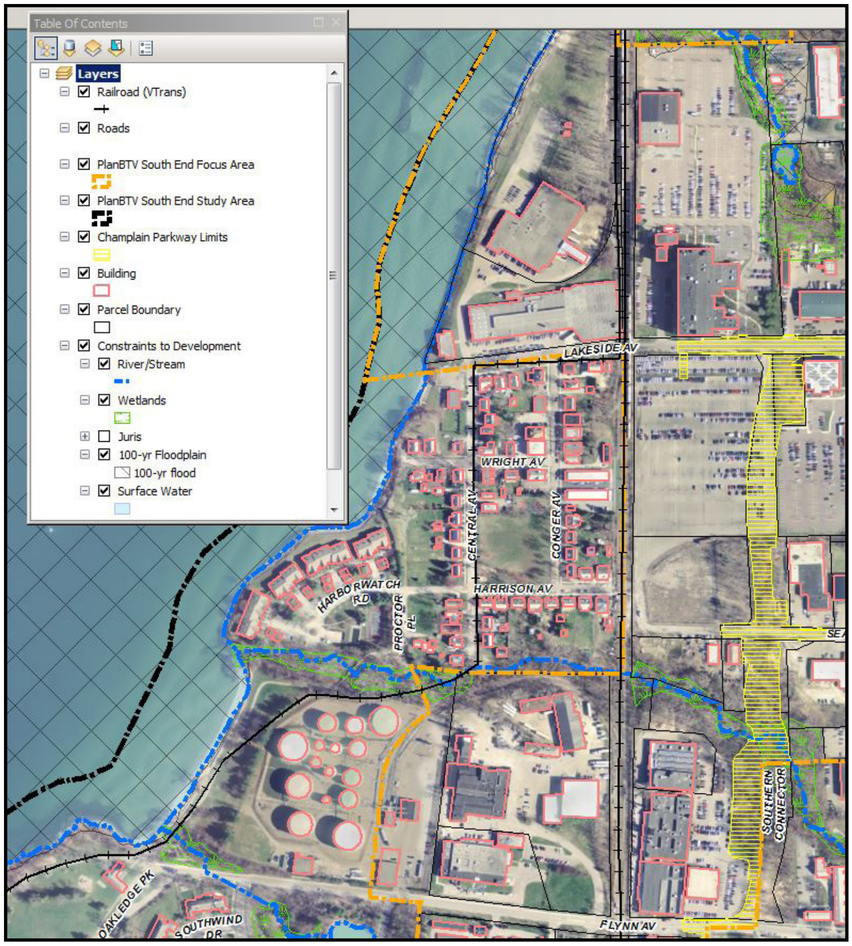
Effective Floor Area Ratio

As part of the existing conditions inventory, an effective Floor Area Ratio (FAR) was calculated for each parcel within the planBTV South End Project Focus Area. Due to discrepancies between the Assessor's data and actual GIS parcel area, all parcels within the Study Area were recalculated using the GIS parcel area for use in the buildout analysis. Building data came from the revised building footprint layer, Assessor's data and field observations as to the number of stories. The mean effective FAR calculation for all parcels within the Project Focus Area is approximately 0.4 in comparison to the zoned FAR, which is 2.0. Furthermore, there are only 5 (five) parcels with an effective FAR over 1.0, with maximum value of 1.6. The results are shown in the Effective Floor Area Ratio Map in **Appendix A.**

2.4 Buildout Analysis

The buildout analysis of the South End Focus Area relied on Assessor's and zoning data, provided by the City Planning Department in May 2014. All of the parcels within the Focus Area are located in the Enterprise Light Manufacturing (E-LM) zoning district. Each parcel was analyzed under a maximum buildout scenario, regardless of existing buildings or vacancy.

Figure 2-3: Example of development constraints in the Study Area.



It is important to remember that the buildout analysis did not factor in parking requirements, or site level analysis. Therefore, the buildout results represent only an approximation of what may be built under the current regulatory scheme. A complete buildout of the South End Focus Area, as presented by this analysis, is neither necessarily possible, nor expected. The results of the buildout analysis are only relevant when existing and maximum buildout is considered relative to one-another, and the purpose of the analysis was for planning purposes only. This approach was discussed and agreed upon with the City on September 9, 2014. The following constraints to development were taken into consideration in the buildout analysis:

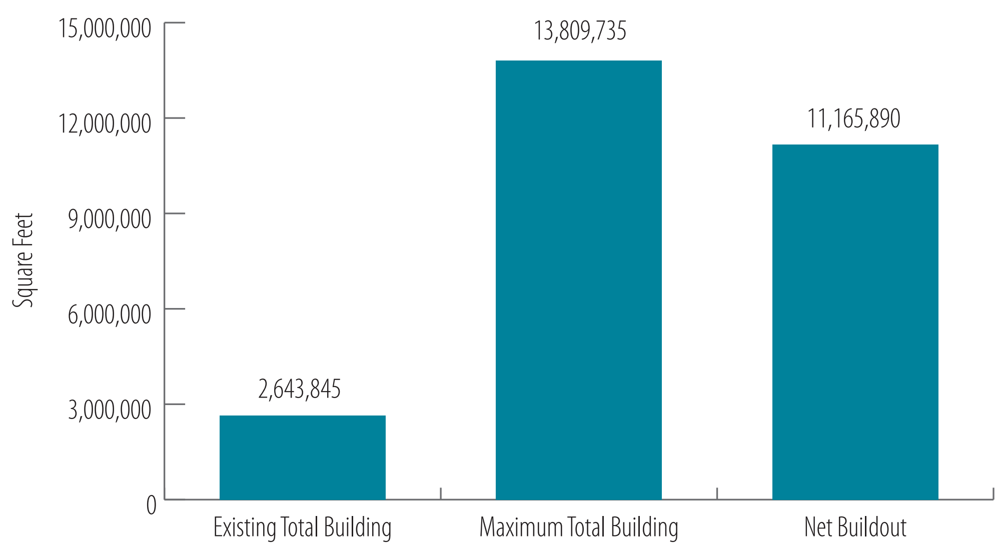
- Wetlands and Surface Waters
- Champlain Valley Parkway project footprint
- 250-foot buffer zone of Lake Champlain
- 100-foot buffer zone from Englesby Brook
- 80 percent maximum lot coverage area

For each parcel, the amount of constrained land is identified and subtracted from the total area of the parcel. The remaining theoretical buildable area (represented in square feet) is multiplied by the currently zoned FAR, yielding the maximum buildout potential for each parcel. To assess the new development potential on each parcel, the existing development is removed from the maximum buildout potential, producing the net development potential.

The results of the buildout analysis, shown in **Table 2-1,** represent light industrial development and are presented in square feet of development. The analysis revealed the potential for an additional 11 million square feet of light industrial development.

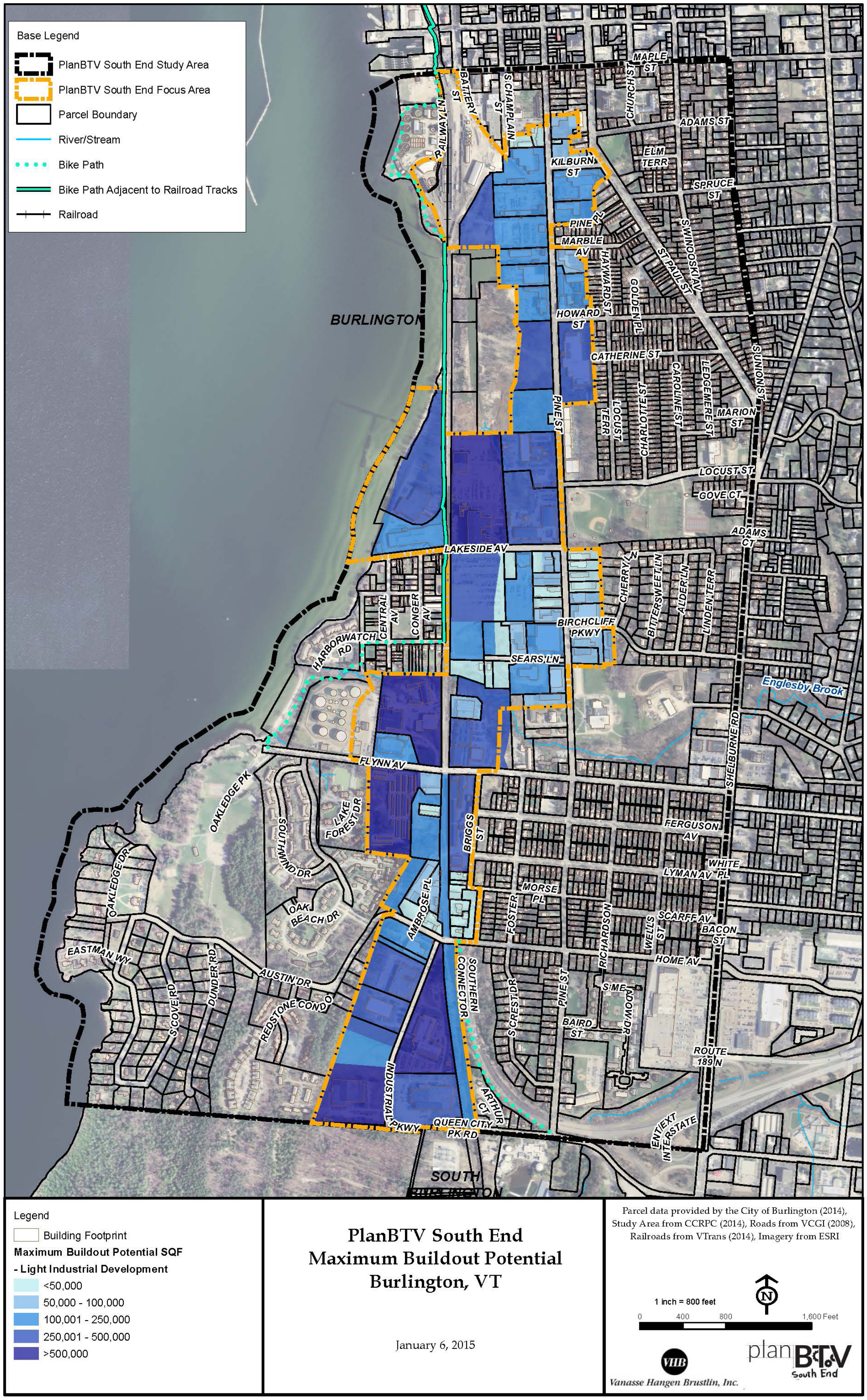
Table 2-1:
Buildout Analysis Summary – Enterprise Light Industrial Zoning District

EXISTING TOTAL BUILDING SQF	MAXIMUM TOTAL BUILDING SQF	NET BUILDOUT SQF
2,643,845	13,809,735	11,165,890



The maximum buildout analysis results are shown on the next page in **Figure 2-4** as well as the full size Maximum Buildout Potential map in Appendix A. The net results of the Buildout compared to existing development are available in the Net Buildout Analysis Map, also in Appendix A. Additionally, the individual parcel results are presented in **Appendix A**.

Figure 2-4: Maximum Buildout Potential Map



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3 Transportation

3. Transportation

3.1 Introduction

VHB collected existing data from the City, CCRPC and VTrans as it relates to the existing transportation system. This data included traffic signal plans, crash data, traffic volumes and turning movement information. Other existing-condition data was gathered in the field through various site visits that included roadway typical sections, bicycle and pedestrian facilities, parking inventory, transit information and other relevant site conditions. Existing conditions are documented here along with descriptions of the current traffic flows and network information.

3.2 Existing Facilities

The existing transportation infrastructure assessment, within the South End Study Area, is primarily focused on the Pine Street corridor and the Focus Area. The infrastructure described includes field inventories and research of roadway and sidewalk characteristics, bicycle facilities, transit and CarShare facilities and networks, and parking facilities. The existing roadway features, character and geometric configuration are depicted within the Roadway section. Transit routes, bus stops and bus shelters are all described in the sections below and a detailed parking inventory is attached as page 2 in **Appendix B.**

The current configuration of transportation facilities vary depending upon the type and location of each street within the South End Study Area.

Roadways

The existing public right-of-way width for the Pine Street Corridor is generally 65-feet. The greenbelt, which is used for trees, streetscape and snow storage, varies throughout Pine Street from zero to eight feet The width and condition of the roadway travel lanes and curbing varies throughout the Study Area. From Maple Street to Locust Street there is generally parallel parking on the east side, a 12- foot northbound travel lane which includes sharrows, and an 11- foot southbound travel lane with a five foot bike lane on the west side. Roadway width from the centerline to curb or edge of pavement range from 18 feet to 20 feet. The two primary typical sections along Pine Street are shown below as **Figure 3-1** and **Figure 3-2.** The current streetscape character of Pine Street feels open and wide which originates from intermittent tree canopy and wide travel lanes and pavement widths. Curb cuts are scattered and on-street parking fills quickly to capacity on the weekdays. Street trees exist in many stages of growth development and vary in spacing on both the east and west sides of the roadway.

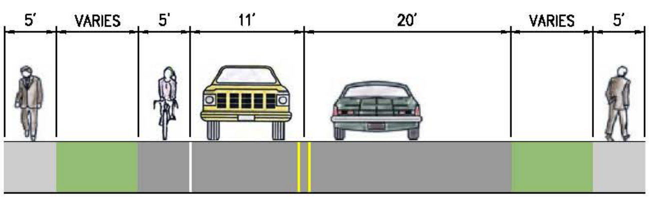


Figure 3-1: Roadway typical section seen along Pine Street from Locust Street to Maple Street.

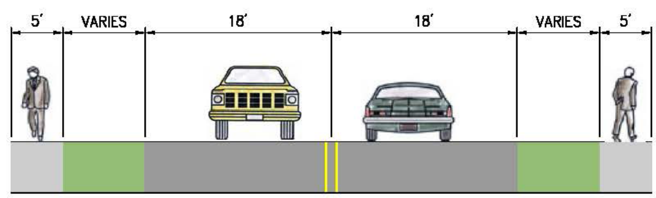


Figure 3-2: Roadway typical section seen along Pine Street from Flynn Avenue to Locust Street.

According to the Burlington Transportation Plan, Pine Street is designated as a Bicycle Street from Queen City Park Road to Lakeside Avenue, then a Complete Street from Lakeside Avenue to Kilburn Street, and is back to a Bicycle Street from Kilburn Street to Maple Street. Shelburne Street, which parallels Pine Street a few blocks east, is also designated as a Complete Street. Kilburn Street and St. Paul Street from Howard Street to Maple are designated Transit Streets.

Bicycle and Pedestrian Facilities

Pine Street currently has "Share the Road" bicycle signage in the northbound direction with painted sharrows in the travel lane and a five foot bike lane from Maple Street to Flynn Avenue southbound. Issues exist with the current configuration including inconsistent southbound bike lanes which do not traverse throughout all of Pine Street and bicyclists contending with parked cars on the east side. For bicyclists traveling southbound through the Lakeside Avenue intersection on Pine Street, the bicycle lane is dropped due to a right-hand turning lane and insufficient curb to curb width to accommodate the bike lane.

Figure 3-3: Rectangular Rapid Flashing Beacons were recently installed along Pine Street at pedestrian crossings and a 5' bike lane is provided along the south bound lane of the road.

Figure 3-4: A CCTA bus heading south bound towards Industrial Avenue where the CCTA headquarters is located.

Other challenges, such as catch basins, poor pavement joints from utility cuts and flooded roadway shoulders, on the west side of Pine Street can be difficult for a bicyclist to navigate in the currently designated bike lane. Bike parking is available at Callahan Park or South Park (near the 5 Sisters neighborhood) for general use which allows CarShare users to arrive to a motor vehicle via alternative modes of transportation.

Within the cross section of Pine Street, five-foot sidewalks are present on both the east and west sides with the exception of one segment from Marble Avenue to just south of the Dealer.com building along the west side. From Marble Avenue to the Burlington Electric Department there are stretches of asphalt sidewalk, concrete sidewalk, and footpaths only. There are four new crosswalks and six new Rectangular Rapid Flashing Beacons (RRFBs) located at the intersections of Pine Street at Locust, Howard, Kilburn Streets, Marble Avenue, the Bobbin Mill Apartments and the Dealer.com headquarters. Crosswalks were already located at the intersections of Pine Street with Howard Street and Kilburn Street. Also, 750-feet of new sidewalk has been added to connect these crosswalks.

Transit, CarShare and CNG Operations & Facilities

Existing Transit

Chittenden County Transportation Authority (CCTA), Campus Area Transportation Management Association (CATMA) and CarShare Vermont networks all provide services in Burlington's South End. Employees, students and residents have these options when traveling to, from or within the South End of Burlington. Downtown businesses have partnered with CATMA to provide transit shuttling for all day employee parking to alleviate the strain from downtown metered parking. Dealer.com shuttles their employees from various satellite lots throughout the corridor on Pine Street. City staff has access to the City Municipal Bike Share Program that houses

15 bicycles at 10 different locations city-wide to be used for transportation within the City. These bicycles can be checked out for use to perform an inspection or attend a meeting without the hassle of driving and parking.

CCTA's Bus Facility and headquarters are located on Industrial Avenue within the City of Burlington's South End. The existing CCTA local routes are Pine Street Route No. 5, Shelburne Road No. 6, City Loop No. 8, Lakeside Commuter Route No. 3 and Sunday Service No.18. The local commuter route is the 116 Commuter Bus Route No. 46. The two regional routes that include stops along Pine Street are the Middlebury LINK Express Route No. 76 and Montpelier LINK Express Route No. 86. See **Figure 3-5** for CCTA's system route map and **Table 3-1** for route service descriptions. Many CCTA buses also utilize Pine Street as a connection to access the main CCTA building on Industrial Parkway when they are "Out of Service". The CCTA TDP identified the replacement of the Cherry Street Station by a new Downtown Transit Center as the most needed facility investment in the CCTA system. Improvements were also recommended for the Pine Street corridor including service upgrades to include 15-minute peak service and a new Sunday service. Based on other case studies throughout Chittenden County this improvement could lead to a 30percent jump in ridership.

More detail on all route schedules and maps can be found in **Table 3-1** on the following pages and at: **http://cctaride.org/bus-routes-schedules/**

Figure 3-5: CCTA Transit Map

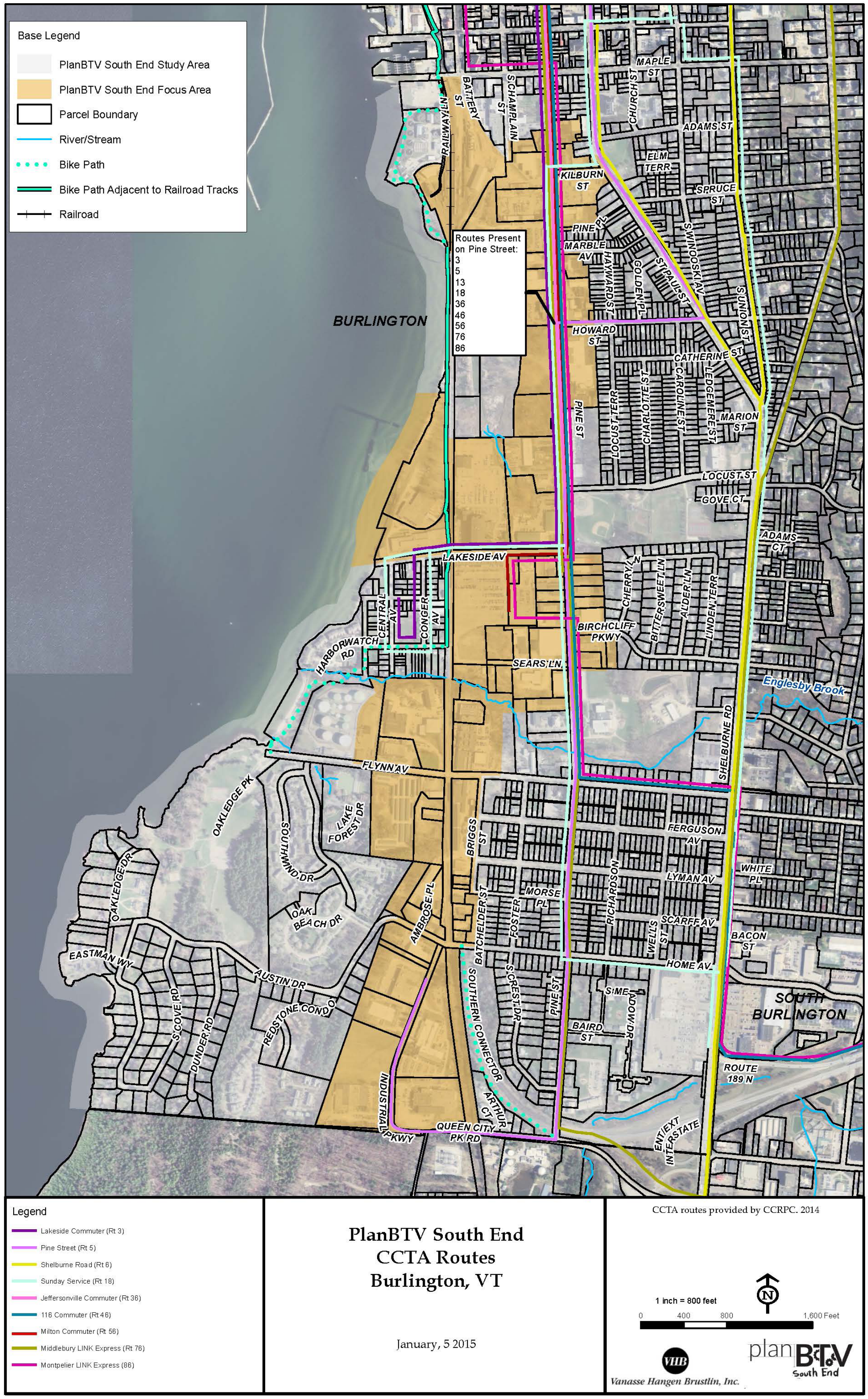


Table 3-1: CCTA Route Descriptions

ROUTE NAME/NUMBER	OPERATING TIMES	OPERATING INTERVALS	BOARDING
Pine Street (No.5)	Monday - Saturday 6:15 AM - 6:15 PM	15 minute peak hour weekday service 30 minute weekday base and Saturday service	478 average weekday boardings in FY13 (whole route, not just Study Area)
Shelburne Road (No.6)	Monday - Friday 6:10 AM - 10:40 PM Saturday 6:15 AM - 8:15 PM	30 minute base service Hourly weekday evening and Saturday morning and evening service	982 average weekday boardings in FY13 (whole route, not just Study Area)
City Loop (No.8)	Monday - Friday 6:45 AM - 9:40 PM Saturday 6:45 AM - 6:15 PM	15 minute weekday AM peak hour service 30 minute weekday and Saturday base service	323 average weekday boardings in FY13 (whole route, not just Study Area)
Lakeside Commuter (No.3)	Monday - Friday 6:05 • 6:35 • 7:05 AM From the Lakeside Avenue neighborhood to Cherry Street	Three morning trips	
Sunday Service (No.18)	Sunday 8:25 AM - 5:20 PM Service within the City of Burlington	Roughly hourly service	120 average Sunday Boardings in FY13 (whole route, not just Study Area)
The 116 Commuter (No.46) *(Jointly operated with ACTR)*	Monday - Friday Commuter route from downtown Burlington to Middlebury via Rt.116	Two morning and two afternoon trips	
Middlebury LINK (No.76)	Monday - Saturday Between downtown Burlington and Middlebury via Rt.7	Two weekday morning and afternoon trips Saturday service operated by ACTR	
Montpelier LINK (No.86)	Monday - Friday Commuter route traveling between downtown Burlington and Montpelier	10 daily peak hour roundtrips 1 midday roundtrip	

There are currently 70 designated bus stops and 7 bus shelters within the Study Area. **Table 3-2,** identifies the route and location of the existing bus stops and shelters:

Table 3-2: Bus Stops and Locations with Shelter

Lakeside Commuter (No.3)

- Lakeside Ave @ DPW
- Wright Ave. @ Central Ave.
- Harrison Ave. @ Central Ave.
- Conger Ave. @ Central Ave.
- Conger Ave. @ Lakeside

Pine Street (No.5)

- St. Paul St. @ Maple St.
- St. Paul St. @ opp. 230 St. Paul
- St. Paul St. @ Kilburn St.
- Kilburn St. @ Pine St.
- Pine St. @ Old Greyhound
- Pine St. @ Opp. Howard St.
- Pine St. @ Burlington Electric Dept.
- Pine St @ Cumberland Farms
- Pine St. @ Opp. Birchcliff Pkwy.
- Pine St. @ Champlain Apts.
- Pine St. @ Howard Center (S)
- Pine St. @ Ferguson Ave.
- Pine St. @ Lyman Ave.
- Pine St. @ Home Ave.
- Industrial Pkwy. @ CCTA Offices (S)
- Industrial Pkwy. @ Rhino Foods
- Queen City Pkwy. @ Central Ave.
- Queen City Pkwy. @ Pine St.
- Pine St. @ McClure Gymnasium (S)
- Pine St. @ Baird St.
- Pine St. @ Home Ave.
- Pine St. @ Lyman Ave.
- Pine St. @ Ferguson Ave.
- Pine St. @ Opp. Howard Center (S)
- Pine St. @ Champlain School
- Pine St. @ Birchcliff Pkwy
- Pine St. @ Locust St.
- Pine St. @ Howard St.
- Howard St. @ Caroline St.
- St. Paul St. @ S.Winnoski Ave
- St. Paul St. @ #390
- St. Paul St. @ Spruce St.
- St. Paul St. @ 230 St. Paul (S)
- St. Paul St. @ Maple St.

Shelburne Road (No.6)

- S. Winooski Ave @ Maple St
- Maple St @ S. Union St
- S.Union St. @ Adams St.
- S. Union St. @ Spruce St.
- S. Union St. @ Opp. Bayview Rd.
- S. Union St. @ Howard St.
- S. Union St. @ St. Paul St.
- Shelburne Rd. @ Gove Ct.
- Shelburne Rd. @ Champlain Inn
- Shelburne Rd. @ Birchcliff Pkwy.
- Shelburne Rd. @ Opp. Prospect Pkwy
- Shelburne Rd. @ Flynn Ave.
- Shelburne Rd. @ Ferguson Ave.
- Shelburne Rd. @ Lyman Ave.
- Shelburne Rd. @ Scarff Ave.
- Shelburne Rd. @ Price Chopper Ctr. (S)
- Shelburne Rd. @ Queen City Pkwy.
- Shelburne Rd @ Shaws (S)
- Shelburne Rd. @ Hadley Rd.
- Shelburne Rd. @ White Place
- Shelburne Rd. @ Proctor Ave. (S)
- Shelburne Rd. @ Kinney Drugs
- Shelburne Rd. @ Clymer St.
- Shelburne Rd @ Alfred St
- Shelburne Rd. @ Hoover St.
- Shelburne Rd. @ Adams Ct.
- Shelburne Rd. @ Opp. Marian Ct.
- S. Union St. @ Howard St.
- S. Union St. @ Bayview St.
- S. Union St. @ Cliff St.
- S. Union St. @ Spruce St.
- S. Union St. @ Maple St.

City Loop (No.8)

- Maple St. @ S. Union St.
- Maple St. @ S. Winooski Ave.
- Maple St. @ Church St.
- Maple St. @ St. Paul St.
- Maple St. @ Pine St.
- Maple St. @ Battery St.

(S) *Shelter*

Figure 3-6: Tammy the Toyota Tacoma located at Curtis Lumber on Pine Street is one of the four CarShare pod locations within the South End.

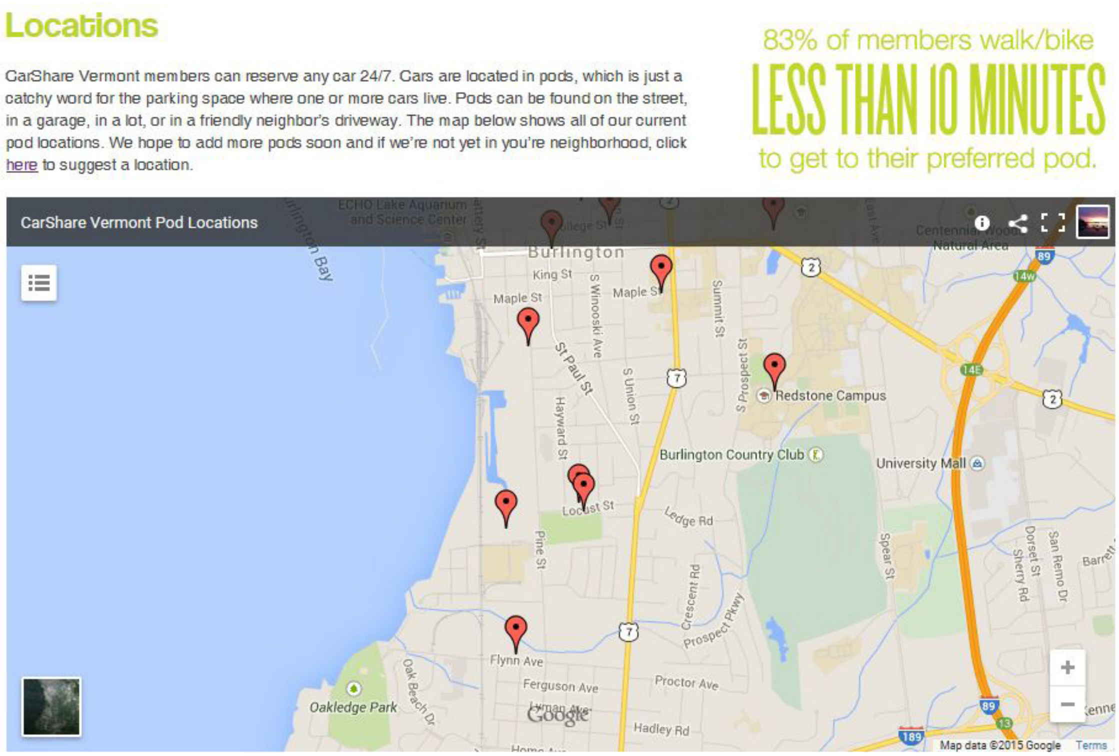
CarShare Vermont

CarShare Vermont is a nonprofit organization established in 2008 with a mission to provide an affordable, convenient, and reliable alternative to private car ownership that enhances the environmental, economic, and social wellbeing of the region. Their vision is a region in which individuals, businesses, and other organizations meet their transportation needs while owning fewer vehicles, and as a result improve the environment, enhance community health, and save money. More information about CarShare and their mission can be found here: **http://www.carsharevt.org**/

Conveniently located "pods" (vehicle storage locations) are positioned throughout Burlington within walking distance of many residential areas and also include bike parking. CarShare operates five pods within the Study Area as shown in **Figure 3-7** on the following page. These pods are located at:

1. 35 Charlotte Street in the 5 Sisters neighborhood is the location of a silver Toyota Prius C Hybrid, also known among the CarShare community as Calvin.
2. Calahan Park on Locust Street at Charlotte Street is the location of a black Dodge Caravan Minivan, also known as Gerry.
3. 128 Lakeside Avenue in the Innovation Center complex is the location of a grey Toyota Prius Hybrid, also known as Einstein.
4. The first parking space on your left as you enter Flynn Avenue Co-op parking lot at 288 Flynn Avenue is in the location of another Toyota Prius Hybrid, known as Penny.
5. Curtis Lumber parking lot on Pine Street is the location of a dark blue Toyota Tacoma pickup truck, also known as Tammy.

Figure 3-7: CarShare Locations in the South End



Compressed Natural Gas (CNG) & Electric Vehicle Charging Stations

The City of Burlington Department of Public Works (DPW), which is located at 645 Pine Street, operates a compressed natural gas vehicle (CNG) fueling station at the back of the building. City of Burlington fleet vehicles and the University of Vermont Buses currently utilize the fueling station, as well as public and private fleets.

Figure 3-8: The Burlington DPW and Parks, Recreation & Waterfront are located at 645 Pine Street and behind the building is the CNG fueling station.

There are currently six public electric vehicle charging locations in Burlington. Of those within the City limits, two are located in the project area within the South End. Vermont Energy Investment Corporation (VEIC) on Lakeside Avenue hosts four Level 2 electric vehicle charging stations capable of charging a range of 10 to 20 miles per hour charged. Burlington Electric Department located at 585 Pine Street hosts two Level 2 chargers and a DC Fast Charger which supplies an 80percent charge in 20 to 30 minutes. Additional details about electric vehicle charging stations available for public use can be found on the following website: **http://driveelectricvt.com/charging-stations/public-charging-map**

Parking

A detailed parking inventory was collected through field observation for both on and off-street parking within the Study Focus Area. The inventory documents on-street parking capacity and restrictions and surface lot parking capacity, restrictions, and other special designations. On-street parking is most prominent along the main roads including Flynn Avenue, Home Avenue, Pine Street and the streets closer to the residential areas. The total capacity for on-street parking within the Focus Area of the South End is 269 vehicles which includes primarily unrestricted parking spaces. Other on-street space restrictions vary from 15-minute, one-hour, two-hour and private spaces as shown on **Figure 3-10** on the next page.

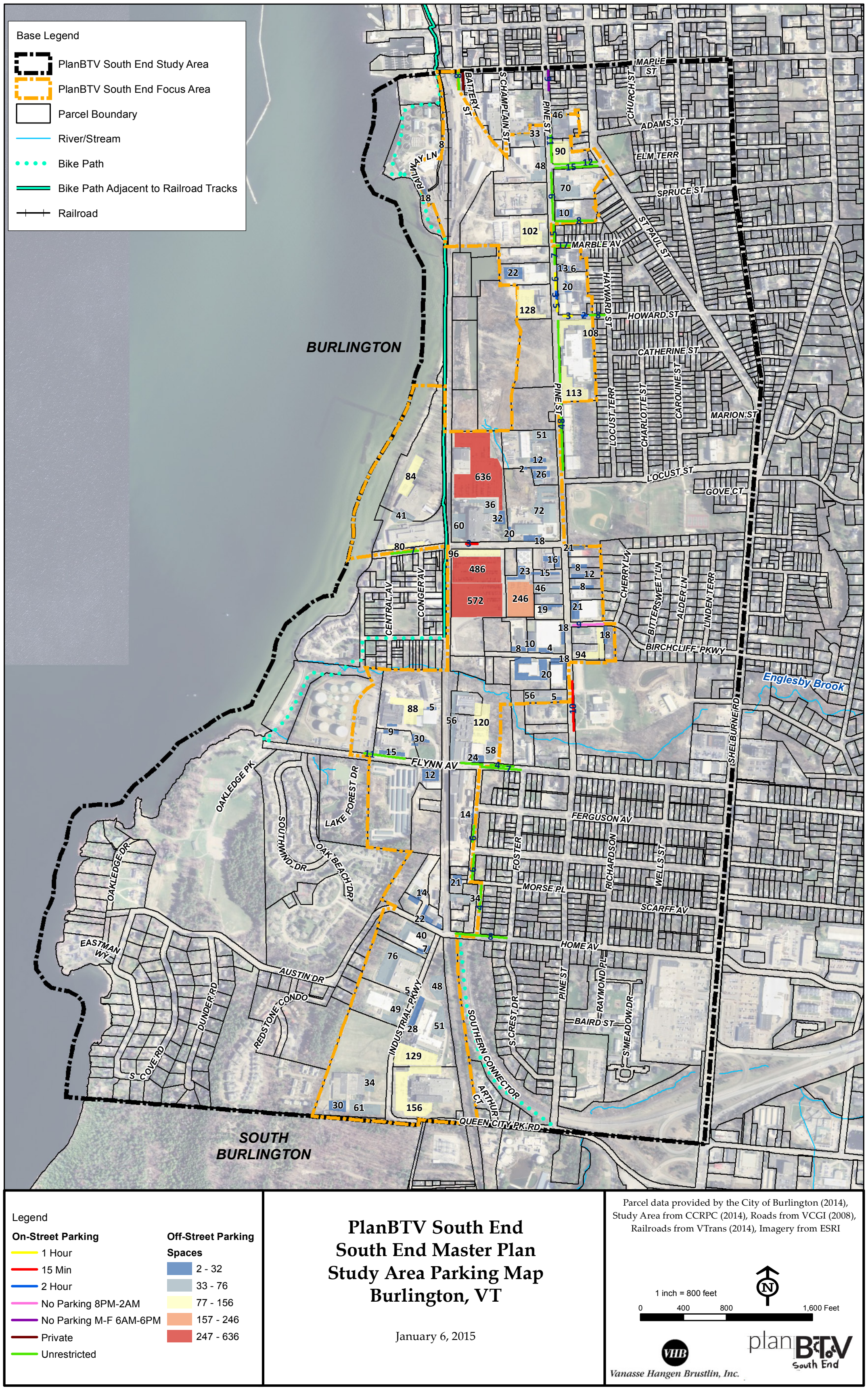
Figure 3-9: Example of on-street parking restrictions along Pine Street.

Surface lots were also inventoried for existing capacity and restrictions, and while most lots were unsigned and unrestricted, it is clear that the lots are used by local businesses for employees and customer parking. Handicapped spaces, carshare spaces, carpool spaces, and other special designated spaces were all noted within the GIS layer that was developed to be a deliverable to the City. Other attributes that were considered were whether the surface lot was gravel, or paved, which business the lot is designated for (if it was clear) and any restrictions. The total capacity for off-street parking within the Focus Area of the South End is 5,108 vehicles. The largest surface lots are located off of Lakeside Avenue which are dedicated for Champlain College and private car dealerships on the south side of Lakeside Avenue and a variety of other businesses including University of Vermont Medical Center (UVMMC), Vermont Energy Investment Corporation (VEIC), Dealer.com, and others on the north side of Lakeside Avenue.

Parking challenges, as the South End continues to grow, include management of surface lots (private and public) as well as on-street parking capacity which is currently at a high demand due to growing local businesses. Dealer.com continues to need additional parking for their company as parking is at a premium on the Pine Street corridor, and their surface lot is consistently full. Employees do their best to park in the lot and on the street nearby, but there is often spill over into neighborhood residential side streets, at the old bus station on Pine Street, and behind the Innovation Center. The parking needs of Dealer.com will continue to increase as their business is expanding quickly.

A map of parking capacity and on-street parking restrictions is on the next page as **Figure 3-10** as well as attached as apge 2 in **Appendix B**.

Figure 3-10: Parking Inventory Map



3.3 Traffic Operations

Transportation System

Pine Street is a two lane roadway (one travel lane in each direction) that provides a north-south connection between Downtown and Queen City Park Road along the South End of Burlington. Sidewalks are provided along both sides of Pine Street within the Study Corridor with the exception of one segment from Marble Avenue to just south of the Dealer.com building along the west side. Pine Street accommodates cyclists within the Study Corridor with "bike route" and "share the road" signage along the northbound travel lane and a bike lane adjacent to the southbound travel lane for most of the study corridor with the exception of south of Flynn Avenue. Land use along Pine Street is a mix of commercial and residential.

East of Pine Street, Shelburne Street (US Route 7) provides the primary north-south connection between I-189 and Shelburne to the south and connections to downtown Burlington area via St. Paul Street, Union Street, and Willard Street. In the vicinity of the project area Shelburne Street is a four-lane highway (two travel lanes in each direction) and turn lanes at major intersections. Sidewalk is provided on both sides of Shelburne Road.

Within the project Study Area, numerous local streets provide east-west connections between Pine Street and St. Paul/Shelburne Street to the east. The majority of these east-west local streets are two-lane roadways with one travel lane in each direction (Maple Street, Kilburn Street, Howard Street, Locust Street, Lakeside Avenue, Flynn Avenue, and Home Avenue) while Marble Avenue is a one-way westbound roadway. Land uses along these local streets are primarily residential with mixed commercial properties.

Several bus stops are located along the corridor with regularly scheduled service provided by Chittenden County Transit Authority (CCTA). Specifically, CCTA's Route No. 3 (Lakeside Commuter), Route No. 5 (Pine Street), Route No. 46 (The 116 Commuter), Route No. 76 (Middlebury Link Express), and Route No. 86 (Montpelier Link Express) all provide service along Pine Street.

Traffic Control

Traffic control of intersections within the Study Area vary from signalized to stop-controlled. Within the Focus Area, there are three major Pine Street intersections with Flynn Avenue, Lakeside Avenue and Maple Street which are described in detail below. Most other intersections with Pine Street are stop-controlled on the minor approach that allows for uninterrupted flow on Pine Street.

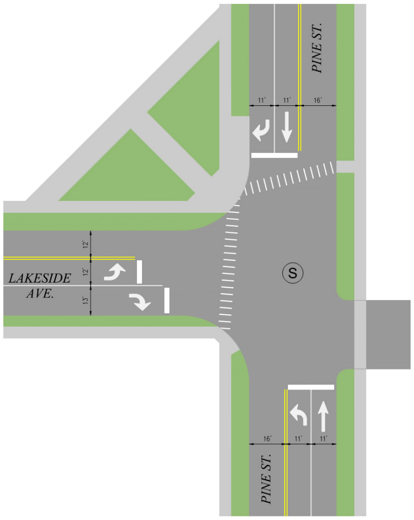


Figure 3-11: The intersection of Pine Street and Lakeside Avenue includes signalized control and limited pedestrian facilities.

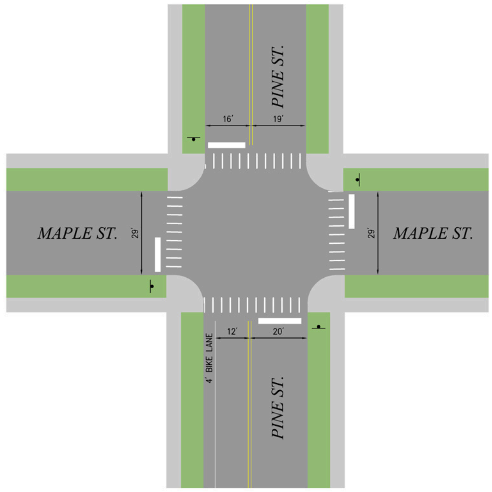


Figure 3-12: The intersection of Pine Street and Maple Street includes four-way vehicle stop control and crosswalks across all four approach legs.

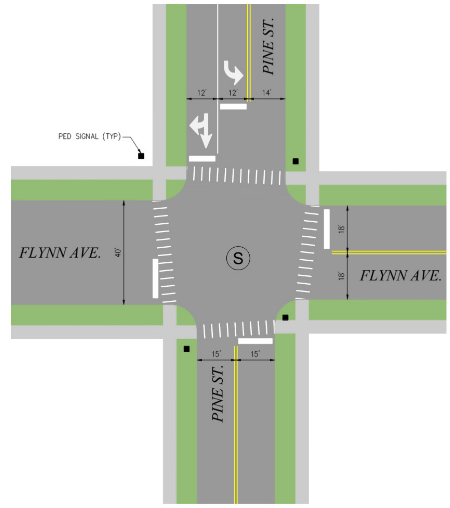


Figure 3-13: The intersection of Pine Street and Flynn Avenue includes signalized control for vehicles and pedestrian signal across all four approach legs.

Pine Street and Lakeside Avenue is a 3-way signalized intersection as shown above in **Figure 3-11.** There are no pedestrian signals for the two crosswalks which are on the north side of the intersection of crossing Pine Street and the west side of the intersection crossing Lakeside Avenue. There is a driveway curb cut on the east side of Pine Street from Feldman's Bagels. The northbound left turn traffic from Pine Street currently does not have a protected turning phase. Traffic entering Pine Street from Lakeside Avenue has a phase to turn left or right.

The intersection at Pine Street and Maple Street is 4-way stop controlled as shown above in **Figure 3-12**. There are pedestrian crosswalks on each approach. The predominant flow of traffic moving northbound on Pine Street makes a left turn onto Maple Street moving west which is where most of the queuing occurs.

The intersection of Pine Street and Flynn Avenue is traffic signal controlled as shown above in **Figure 3-13.** A left turning lane and protected left turn signal phase is provided for motorists traveling southbound on Pine Street to Flynn Avenue. The southbound left turning lane stop bar is staggered back from the intersection to allow for turning movements of trucks and buses. Motorists traveling westbound on Flynn Avenue, approaching Pine Street, will see a no turn on red arrow displayed on a separated LED blank out sign. Pedestrian signals are located on all four corners with full crosswalks painted in place.

Traffic Volume Network Development

Traffic Data

Traffic count data collected by VTrans and CCRPC over the last few years (2011 – 2014) were compiled. Specifically, turning movement counts (TMC) conducted at eight study corridor intersections along Pine Street during the weekday morning and weekday evening peak periods were compiled, reviewed, and used for this evaluation. Additionally, TMCs at six intersections along the adjacent streets of Shelburne Street, St. Paul Street, and South Winooski Avenue were also compiled for the purpose of traffic model forecasting, if needed under the subsequent phases of this Master Plan effort.

Design Hour Volume

Since it is impractical to design for the highest volume encountered during the year, VTrans guidelines recommend a compromise between capacity and cost. Design Hourly Volume (DHV) criteria allow roads to be designed for the 30th highest hourly volume of the year. Historical data from the three closest VTrans permanent traffic count stations (P6D001 - VT Route 127 in Burlington, P6D040 - US Route 7 in Colchester, and P6D061 - US Route 2 in Williston) were reviewed to establish an appropriate DHV condition. Listings of the 200 highest hours at these three permanent counts stations were reviewed to identify what peak periods are reflective of a DHV condition (30th highest hour). Both Weekday morning and weekday evening peak hours were consistently identified within the highest 60 hours at the Burlington count station and weekday evening peak hours were identified within the highest 60 hours at the Colchester and Williston count stations; indicating that both the weekday morning and a weekday evening peak hours are reflective of a DHV condition. Therefore, the average adjustment factor calculated from the three stations was used to estimate the DHV conditions. The following DHV adjustments were applied to the raw turning movement counts:

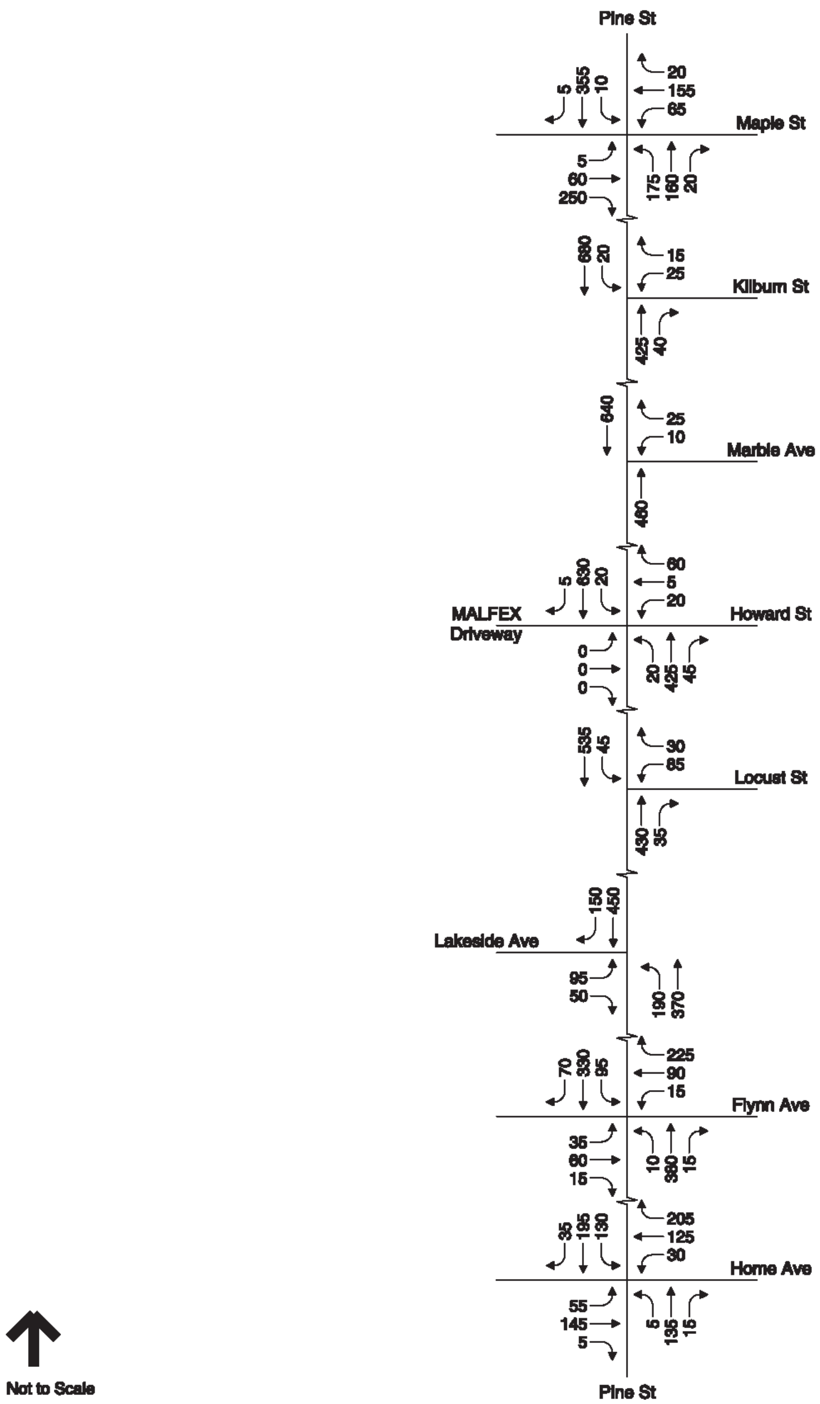
- A 1.03 DHV adjustment was applied to the June weekday morning and weekday evening data; and
- A 1.06 DHV adjustment was applied to the August weekday morning and weekday evening data.

Detailed calculations for the Design Hour Volume adjustments are provided in the Appendix B.

Traffic Volume Network Development

The 2014 weekday morning and weekday evening peak hour traffic volume networks for this evaluation were developed by applying the DHV adjustments to the 2013 and 2014 raw traffic volumes and applying an average annual growth rate of 1 percent per year, which was based on regression analysis for the urban highway group conducted by VTrans. Northbound and southbound volumes along the corridor were compared at adjacent intersections and balancing adjustments were made where appropriate. The 2014 weekday morning and weekday evening peak hour traffic volumes, which were used in both the intersection and multimodal operational analyses, are shown in **Figures 3-14** and **3-15** and are included as pages 7 and 8 of **Appendix B.**

Figure 3-14: 2014 Weekday AM Network Diagram

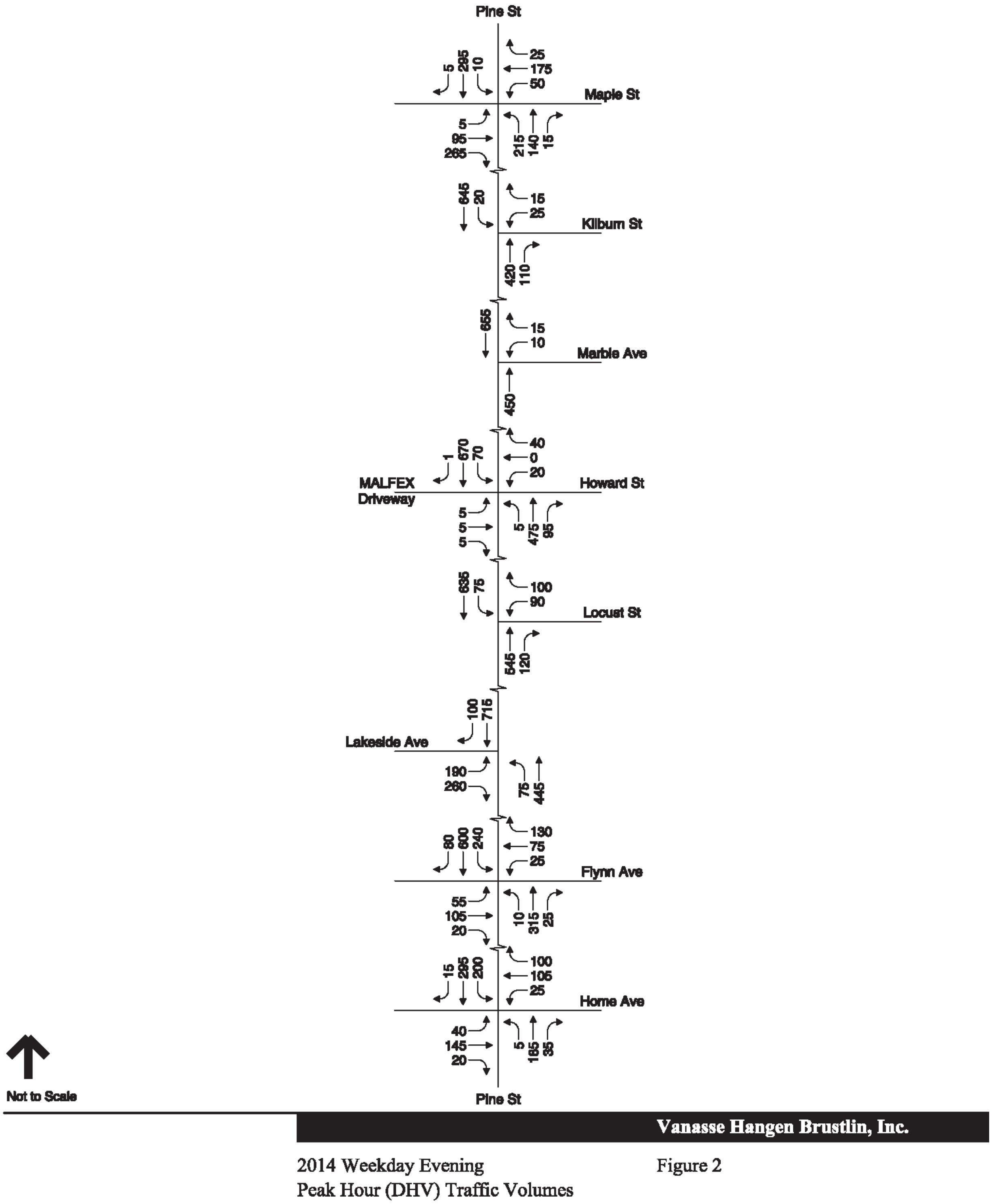


Vanasse Hangen Brustlin, Inc.

2014 Weekday Morning
Peak Hour Traffic Volumes

Figure 1

Figure 3-15: 2014 Weekday PM Network Diagram



Intersection Operational Analysis

Intersection capacity analyses were performed for the Study Area intersections along Pine Street. Intersection levels of service (LOS) were calculated based on the criteria published in the 2000 Highway Capacity Manual (footnote-1 in **Table 3-5**). Level of service is a qualitative measure describing the operating conditions of a facility as perceived by the user, which in the case of an intersection analysis would be the motorists. Intersection LOS is calculated based on numerous factors including, but not limited to: traffic volumes, percent heavy vehicles, bus stops, conflicting pedestrian, traffic control, and roadway geometrics.

Intersection levels of service range from A to F, which are based on varying levels of delay. LOS A describes operations with very little delay and a low volume-to-capacity ratio (v/c), while LOS F describes operations with long control delays and/or a v/c greater than 1.0. In urban environments, overall intersection LOS E or better is generally considered satisfactory during peak hours of travel. LOS F could also be accepted in locations where facility upgrades could severely impact the environment and/or other resources or negatively affect other modes of transportation (e.g., increase pedestrian crossing time due to wider roadway). **Table 3-3** and **Table 3-4** summarizes the LOS criteria for the signalized and unsignalized intersection analyses, as well as the multimodal analyses described in the following section. The volume-to-capacity ratio quantifies the degree to which the intersection as a whole or a particular movement is utilized. For example, v/c of 0.90 is at operating at 90 percent capacity or with 10 percent of the capacity available. A v/c above 1.0 is over capacity (no available capacity).

The signalized intersections along Pine Street currently operate well. Specifically the intersection of Lakeside Avenue at Pine Street currently operates at LOS A during the weekday morning and weekday evening peak hours. The intersection of Flynn Avenue at Pine Street currently operates at LOS B during the weekday morning and weekday evening peak hours. **Table 3-3** summarizes the signalized intersection capacity analysis.

The intersection capacity analysis results indicate that the majority of the unsignalized intersections will operate at an acceptable LOS D or better in both the weekday morning and weekday evening peak hours. The minor street approaches of the Maltex driveway and Howard Street at Pine Street operate at a LOS E during the weekday evening, but with a volume of only 15 and 60 vehicles, respectively. The minor street approach of Locust Street at Pine Street currently operates at LOS F during the weekday evening peak hour with a volume of 190 vehicles. The unsignalized intersection capacity analysis is summarized in **Table 3-4.**

Traffic Flow Tables

Table 3-3: Signalized Intersection Capacity Analysis Summary (2014 Existing Conditions)

LOCATION / MOVEMENT	PEAK PERIOD	V/C*	DELAY**	LOS***	50%Q	95%Q	STORAGE~
Pine St at Lakeside Avenue							
EB left-turn from Lakeside Ave	AM	0.27	15	B	18	56	-
EB right-turn from Lakeside Ave		0.03	14	B	0	20	100
NB left-turn from Pine St		0.37	5	A	21	81	125
NB through from Pine St		0.34	5	A	41	119	-
SB through from Pine St		0.44	5	A	53	157	-
SB right-turn from Pine St		0.11	4	A	0	20	150
Overall		0.40	6	A			
EB left-turn from Lakeside Ave	PM	0.39	16	B	45	110	-
EB right-turn from Lakeside Ave		0.24	15	B	10	63	100
NB left-turn from Pine St		0.29	6	A	10	38	125
NB through from Pine St		0.44	7	A	63	147	-
SB through from Pine St		0.69	10	A	126	288	-
SB right-turn from Pine St		0.07	5	A	0	16	150
Overall		0.59	10	A			
Pine St at Flynn Avenue							
EB movements from Flynn Ave	AM	0.31	15	B	22	62	-
WB movements from Flynn Ave		0.54	17	B	40	120	-
NB movements from Pine St		0.59	14	B	94	189	-
SB left-turn from Pine St		0.21	7	A	11	33	125
SB through/right from Pine St		0.43	7	A	58	132	-
Overall		0.60	12	B			
EB movements from Flynn Ave	PM	0.50	17	B	43	106	-
WB movements from Flynn Ave		0.47	17	B	33	102	-
NB movements from Pine St		0.57	15	B	83	155	-
SB left-turn from Pine St		0.43	7	A	31	64	125
SB through/right from Pine St		0.65	9	A	120	229	-
Overall		0.70	12	B			

** Volume to capacity ratio.*

*** Delay expressed in seconds per vehicle.*

**** Level of service.*

50%Q – 50th percentile queue expressed in feet.

95%Q – 95th percentile queue expressed in feet.

Storage~ - Available storage in feet.

Table 3-4: Unsignalized Intersection Capacity Analysis Summary (2014 Existing Conditions)

LOCATION / MOVEMENT	PEAK PERIOD	DEMAND*	DELAY^	LOS+	95%Q
Pine St at Maple St					
All EB movements from Maple St	AM	315	19	C	95
All WB movements from Maple St		240	18	C	68
All NB movements from Pine St		355	26	D	138
All SB movements from Pine St		370	26	D	145
All EB movements from Maple St	PM	365	23	C	128
All WB movements from Maple St		250	18	C	73
All NB movements from Pine St		370	27	D	150
All SB movements from Pine St		310	21	C	105
Pine St at Kilburn St					
All WB movements from Kilburn St	AM	40	26	D	17
SB left/through from Pine St		700	1	A	2
All WB movements from Kilburn St	PM	40	27	D	18
SB left/through from Pine St		665	1	A	2
Pine St at Marble Avnue					
WB left-turn from Marble Ave	AM	10	26	D	4
WB right-turn from Marble Ave		25	13	B	4
WB left-turn from Marble Ave	PM	10	26	D	4
WB right-turn from Marble Ave		15	13	B	2
Pine St at Howard St					
All EB movements from Maltex	AM	<5	26	D	1
All WB movements from Howard St		85	24	C	32
NB left/through from Pine St		475	1	A	1
SB left/through from Pine St		655	1	A	2
All EB movements from Maltex	PM	15	39	E	10
All WB movements from Howard St		60	39	E	39
NB left/through from Pine St		575	1	A	1
SB left/through from Pine St		740	2	A	6

LOCATION / MOVEMENT	PEAK PERIOD	DEMAND*	DELAY^	LOS+	95%Q
Pine St at Locust St					
All WB movements from Locust St	AM	115	29	D	52
SB left/through from Pine St		580	1	A	3
All WB movements from Locust St	PM	190	91	F	187
SB left/through from Pine St		710	2	A	7
Pine St at Home Ave^					
All EB movements from Home St	AM	205	13	B	40
All WB movements from Home St		360	16	C	85
All NB movements from Pine St		155	12	B	28
All SB movements from Pine St		360	17	C	98
All EB movements from Home St	PM	205	14	B	45
All WB movements from Home St		230	14	B	50
All NB movements from Pine St		225	14	B	48
All SB movements from Pine St		510	32	D	223

** Demand in vehicles per hour.*

^ Delay in seconds per vehicle.

+ Level of service.

95%Q – 95th percentile queue expressed in feet.

^ Results for All Way Stop Control (AWSC) intersections are based on the HCM 2010 methodology, as the HCM 2000 methodology does not calculate queue lengths for AWSC intersections. However, based on field observations it is apparent that the AWSC analysis at Pine Street and Maple Street underestimates the queues. All other results based on the HCM 2000.

Multimodal Operational Analysis

Planning level multimodal analyses were performed for the Pine Street corridor within the Study Area between Maple Street and Home Avenue. Levels of service (LOS) were calculated based on the criteria published in the 2010 Highway Capacity Manual (footnote-2 in **Table 3-5**). Multimodal level of service describes the quality of service from the perspective of the user by letter grade levels. Multimodal users of the corridor include pedestrians, bicyclists, transit riders, and motorists.

The automobile LOS criteria is based on the through vehicle travel speed, where LOS A represents primarily free-flow operation and LOS F is characterized by congested flow at extremely low speeds. The criteria for the pedestrian and bicycle modes are based on scores reflecting the users perception of service quality. The criteria for the transit mode are based on measured changes in transit patronage due to changes in service quality. The automobile travel speed and the pedestrian, bicycle, and transit perception link scores, which determine the LOS, are calculated according to the methodology provided in the HCM 2010 using numerous factors including, but not limited to: traffic volume, lane configuration, travel speed, on-street parking, shoulder/bike lane, pavement condition, sidewalks, sidewalk-roadway separation, and bus frequency. All of these factors play a role in the LOS in each the north and south bound directions and as conditions vary on each side of the road, LOS for automobiles, bicyclists, pedestrians, and transit users may also vary based on the direction of flow. **Table 3-5** summarizes the LOS criteria for the multimodal analyses as well as the intersection analysis described in the previous section.

Automobile, bicycle, pedestrian, and bus operational analyses were conducted for three segments along Pine Street: Maple Street to/from Lakeside Avenue, Lakeside Avenue to/from Flynn Avenue, and Flynn Avenue to/from Home Avenue. The results of the multimodal analysis are provided in **Table 3-5** and summarized as follows.

The automobile operations along the Pine Street roadway segments ranged from LOS B to D with the overall arterial length operating at LOS C southbound and LOS B northbound for both AM and PM peaks. The bicycle operations along the Pine Street roadway segments ranged from LOS B to E with the overall arterial length operating at LOS C southbound and LOS D northbound. The southbound segment of Flynn Avenue to Home Avenue and the northbound segments of Flynn Avenue to Lakeside Avenue and Lakeside Avenue to Maple Street, which lack bike lanes or striped shoulders, operate at a LOS E during the weekday morning peak hour. The pedestrian operations along the Pine Street roadway segments ranged from LOS B to D with better overall arterial length operations along the northbound segments where there is consistent sidewalk. The bus operations along the Pine Street roadway segments operate at LOS B or better with the overall arterial length operating at LOS A southbound and northbound.

Table 3-5: Multimodal Analysis Summary

2014 WEEKDAY MORNING PEAK HOUR EXISTING CONDITIONS								
ROADWAY - DIRECTION	AUTOMOBILE OPERATIONS		BICYCLE OPERATIONS		PEDESTRIAN OPERATIONS		BUS OPERATIONS	
Segment	Speed	LOS	Score	LOS	Score	LOS	Score	LOS
Pine St - Southbound								
Home Ave to Flynn Ave	16	D	4.6	E	3.5	D	4.8	B
Flynn Ave to Lakeside Ave	24	B	3.0	C	2.7	B	8.4	A
Lakeside Ave to Maple St	24	B	3.2	C	3.6	D	10.8	A
Arterial Length	22	C	3.5	C	3.4	C	9.0	A
Pine St – Northbound								
Home Ave to Flynn Ave	22	B	3.7	D	2.3	B	6.3	A
Flynn Ave to Lakeside Ave	25	B	4.6	E	3.0	C	8.4	A
Lakeside Ave to Maple St	20	C	4.7	E	2.8	C	9.0	A
Arterial Length	22	B	4.2	D	2.6	B	7.4	A

2014 WEEKDAY EVENING PEAK HOUR EXISTING CONDITIONS								
ROADWAY – DIRECTION	AUTOMOBILE OPERATIONS		BICYCLE OPERATIONS		PEDESTRIAN OPERATIONS		BUS OPERATIONS	
Segment	Speed	LOS	Score	LOS	Score	LOS	Score	LOS
Pine St – Southbound								
Home Ave to Flynn Ave	19	C	3.9	D	3.8	D	4.8	B
Flynn Ave to Lakeside Ave	22	B	2.6	B	3.7	D	8.4	A
Lakeside Ave to Maple St	23	B	2.5	B	3.8	D	9.6	A
Arterial Length	22	C	2.9	C	3.7	D	8.3	A
Pine St – Northbound								
Home Ave to Flynn Ave	22	B	3.0	C	2.1	B	6.3	A
Flynn Ave to Lakeside Ave	24	B	3.9	D	2.8	C	8.0	A
Lakeside Ave to Maple St	21	C	4.2	D	3.1	C	8.4	A
Arterial Length	22	B	3.6	D	2.6	B	7.1	A

Note: Operational analysis calculated with HCS 2010 Version 6.60 - ARTPLAN 2012 - Multimodal Arterial Level of Service Analysis for Conceptual Planning and Preliminary Engineering.

Speed - Expressed in miles per hour.

LOS - level of service: - Automobile LOS is based on segment speed and
- Bicycle, Pedestrian, and Bus LOS are based on segment score.

Score – Calculated based on the methodology in the HCM 2010. The bicycle and pedestrian LOS is determined utilizing HCM Exhibit 17-4 while the bus LOS is determined by utilizing an ARTPLAN scale prepared by FDOT.

The Arterial Length LOS represents the average LOS across all segments.

Field Observations

In addition to conducting technical operational analyses along the study corridor, field observations consisted of driving and walking the corridor were made in an effort to gain a better understanding of how the corridor functions and any existing deficiencies. The following are some of the noted observations.

» Pedestrian crosswalks at some intersections such as the Pine Street/Home Street intersection are not perpendicular to the approaching lane resulting in a longer pedestrian crossing distance.

» The cross section along Pine Street varies throughout its length with on-street parking provided in some areas and not in others, and a designated bicycle lane provided on the southbound side for part of the roadway and not on the northbound side. These types of inconsistencies can be confusing to users of the corridor.

» Although there are pedestrian crosswalks provided at the traffic signal controlled Pine Street/Lakeside Avenue intersection, there is no pedestrian actuated signal phase. As a result, pedestrians crossing Pine Street must contend with left-turning vehicles from Lakeside Avenue once the Pine Street approach is stopped on the red phase. Additionally, the Pine Street crosswalk is not perpendicular to the travel way resulting in a longer than necessary crossing. It should also be noted that the pedestrian crossing distance for the crosswalk that extends across Lakeside Avenue is long (over 55 feet).

» Traffic operations at the Pine Street/Lakeside Avenue intersection are also adversely impacted by the absence of an exclusive signal phase to accommodate motorists turning left onto Lakeside Avenue from Pine Street. Additionally, motorists enter the intersection from the Feldman's Bagel driveway (which is located opposite but slightly off-set from Lakeside Avenue) without being controlled by the traffic signal.

» Numerous uncontrolled curb-cuts and driveways are located throughout the corridor.

» In addition to morning and evening peak hour delay and vehicle queues at the 4-way stop controlled Pine Street/Maple Street intersection that were identified in the operational analysis section, long queues, particularly on the Pine Street northbound approach were observed during the mid-day and throughout most of the day.

Note that the Pine Street/Lakeside Avenue intersection will be improved in 2015. These improvements include new traffic signals, pedestrian crossing signals, and updated signalization.

Crash Evaluation

Crash data was compiled from VTrans for the years 2009-2013. Current data for 2014 was collected as of October 22, 2014 and only includes those crashes that have information within the state crash system and it is understood that data may still be subject to change. Within the years that this crash data represents, varying City ordinances and state laws have been put into effect with the intent of creating safer roads and resulting in fewer crashes. The City-wide speed limit ordinance of 25 mph was put in place on October 19, 2011; **Table 3-6,** on the following page, includes pre and post speed ordinance data. Vermont's "Texting Law" was put into effect on June 10, 2010 and the statewide no handheld devices law has been in effect since October 1, 2014. On the following page, in **Table 3-6,** is a summary of the crash data collected from VTrans.

The VTrans High Crash Location (HCL) Report for 2008-2012 includes reference to three High Crash Sections along Pine Street. The first of these is from mile marker 0.0 to 0.3, the second is from 0.8 to 1.1, and the last section extends from mile marker 1.1-1.4. See **Figure 3-19** for the HCL location Map and **Figure 3-20** for a Crash Summary Map or pages 3 and 4 in **Appendix B** for larger maps.

Table 3-6: Crash Data Summary

CRASH DATA SUMMARY (INTERSECTIONS & CORRIDORS)								
	PINE STREET AT FLYNN AVENUE		PINE STREET CORRIDOR EXCLUDING FLYNN AVENUE.		ST. PAUL STREET CORRIDOR		TOTAL	
YEAR								
2009	9	32%	37	14%	10	22%	56	17%
2010	7	25%	43	16%	12	27%	62	19%
2011	4	14%	45	17%	4	9%	53	16%
2012	2	7%	42	16%	6	13%	50	15%
2013	6	21%	52	20%	6	13%	64	19%
2014 (Jan - October 22, 2014)	0	0%	43	16%	7	16%	50	15%
Total	28	100%	262	100%	45	100%	335	100%
TYPE								
Right Angle	8	29%	49	19%	4	9%	61	18%
Rear End	8	29%	91	35%	13	29%	112	33%
Sideswipe	4	14%	32	12%	12	27%	48	14%
Turning Movement	4	14%	31	12%	4	9%	39	12%
Other	4	14%	59	23%	12	27%	75	22%
Total	28	100%	262	100%	45	100%	335	100%
SEVERITY								
Property Damage	23	82%	211	81%	37	82%	271	81%
Personal Injury	5	18%	51	19%	8	18%	64	19%
Total	28	100%	262	100%	45	100%	335	100%
DAY OF THE WEEK								
Mon-Fri	26	93%	224	85%	34	76%	284	85%
Sat-Sun	2	7%	38	15%	11	24%	51	15%
Total	28	100%	262	100%	45	100%	335	100%
WEATHER								
Clear/Cloudy	25	89%	237	90%	31	69%	293	87%
Rain	3	11%	14	5%	9	20%	26	8%
Snow/Slush	0	0%	11	4%	5	11%	16	5%
Total	28	100%	262	100%	45	100%	335	100%

Source: VTrans

Crash evaluations provided for the most recent 5-year periods from January 1, 2009 to October 22, 2014

2009-2014 Crash Data

Although this summary does not reveal any fatal crashes, as shown on the following page, in **Figure 3-16,** there may be a discrepancy in the data as in July of 2011 there was a pedestrian fatality which is not reflected in the VTrans database, but is included in police records. Vehicle conflicts with bicyclist and pedestrians have been prominent along Pine St. in recent years as shown by data collected from the Burlington Police Department (BPD). Dubois & King, Inc. provided VHB with a summary of the Pine Street Crash Reports they collected from BPD and a summary and analysis are included in the memorandum as **Appendix B-5 - B-6**. The BPD crash reports, shown in **Figure 3-17,** revealed 21 crashes involving bicycles or pedestrians from 2011-2014 including 1 fatality at the intersection of Pine Street and Flynn Avenue. Of the 21 crashes, 10 were involving bicyclists with a motor vehicle and 11 invovled conflicts with a pedestrian. **Figure 3-18**, on page 45, shows additional statistics about the location of the bicyclist or pedestrian when they were involved in the crash.

Figure 3-16: Crashes by Severity

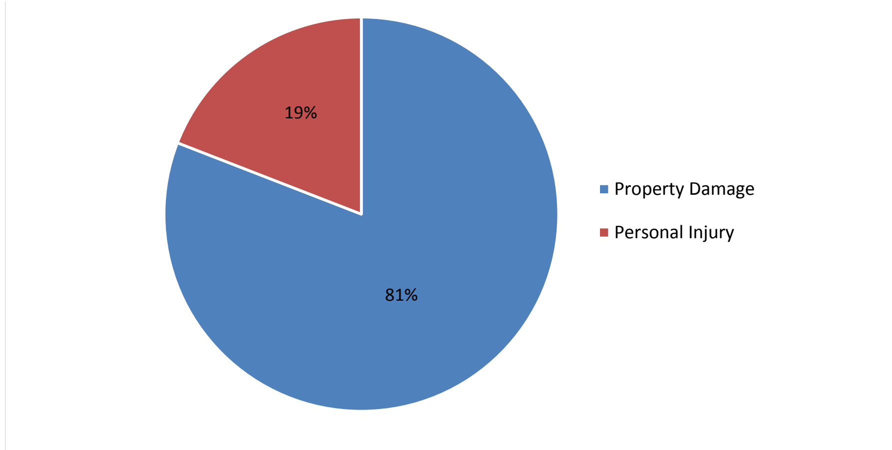


Figure 3-17: Crashes by Type

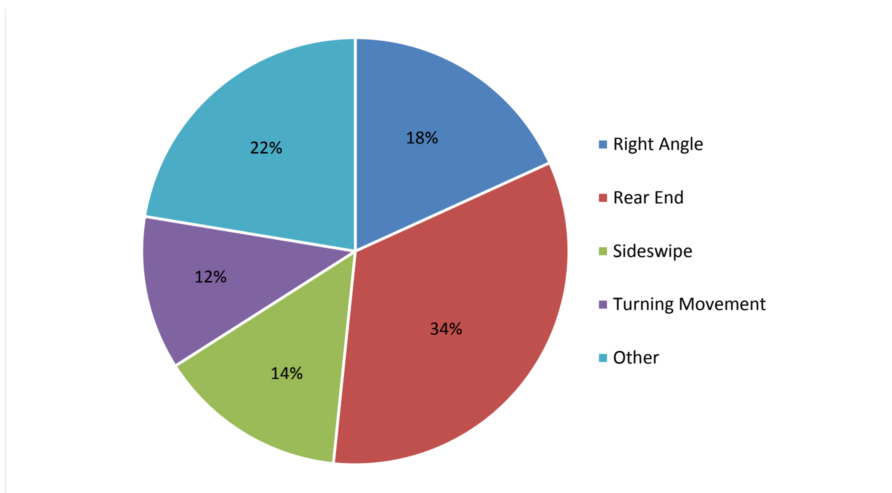


Figure 3-18: Bicycle/Pedestrian Crashes by Location

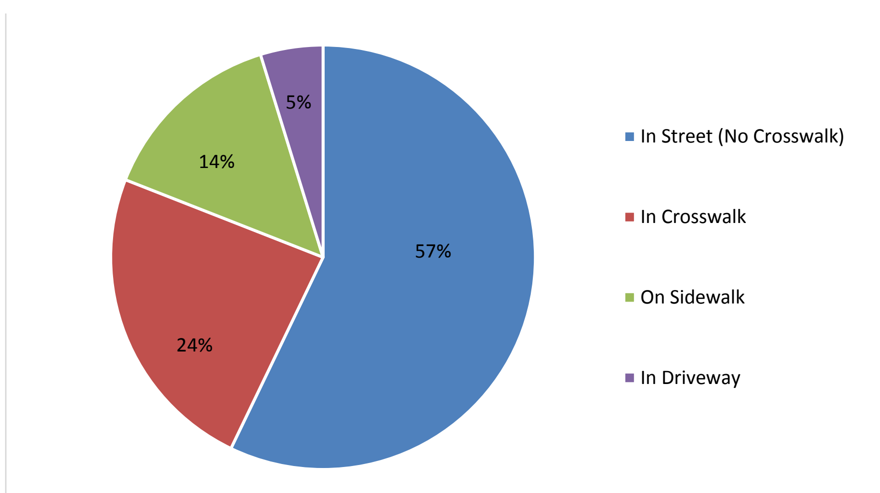


Figure 3-19: High Crash Location Map

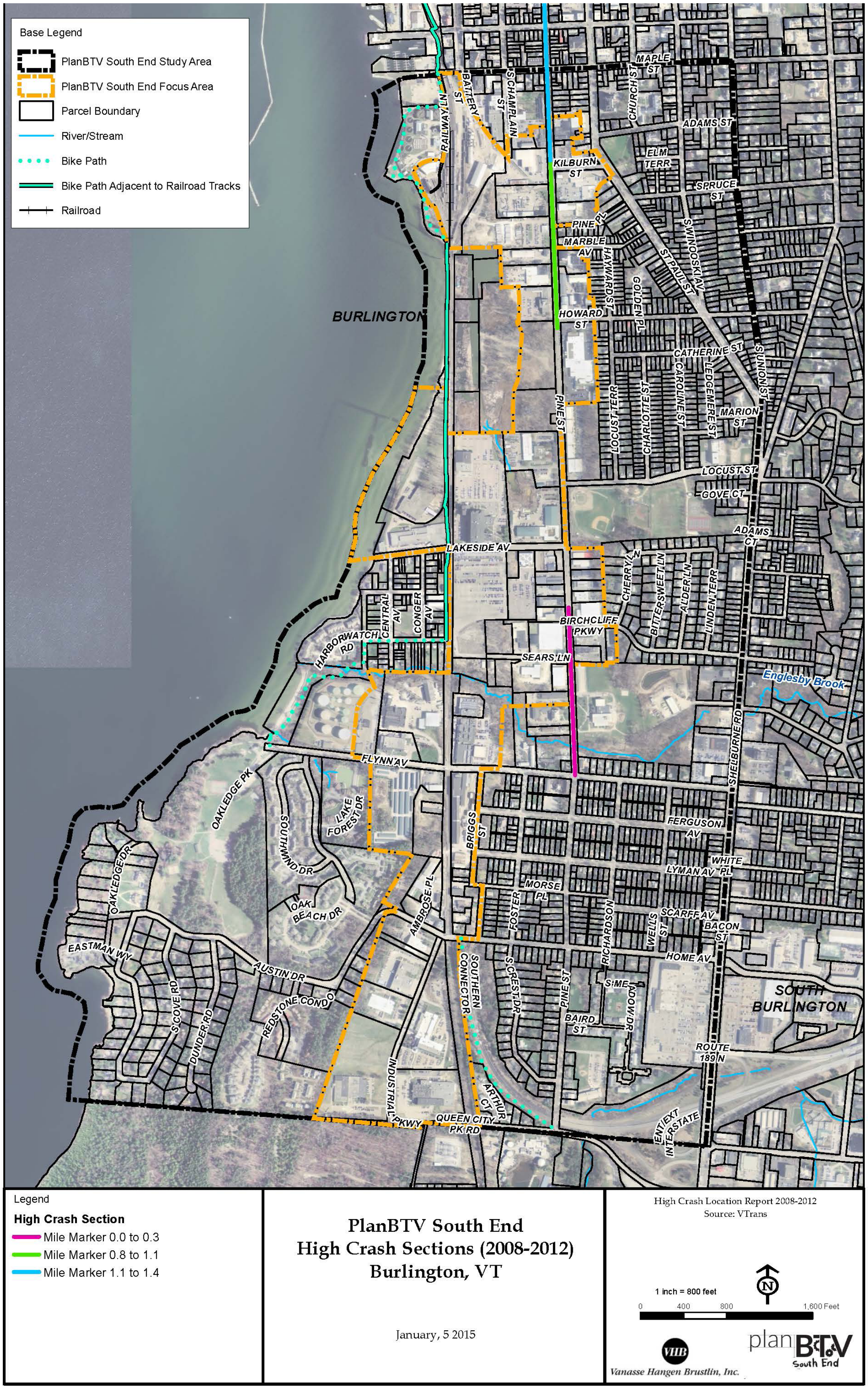
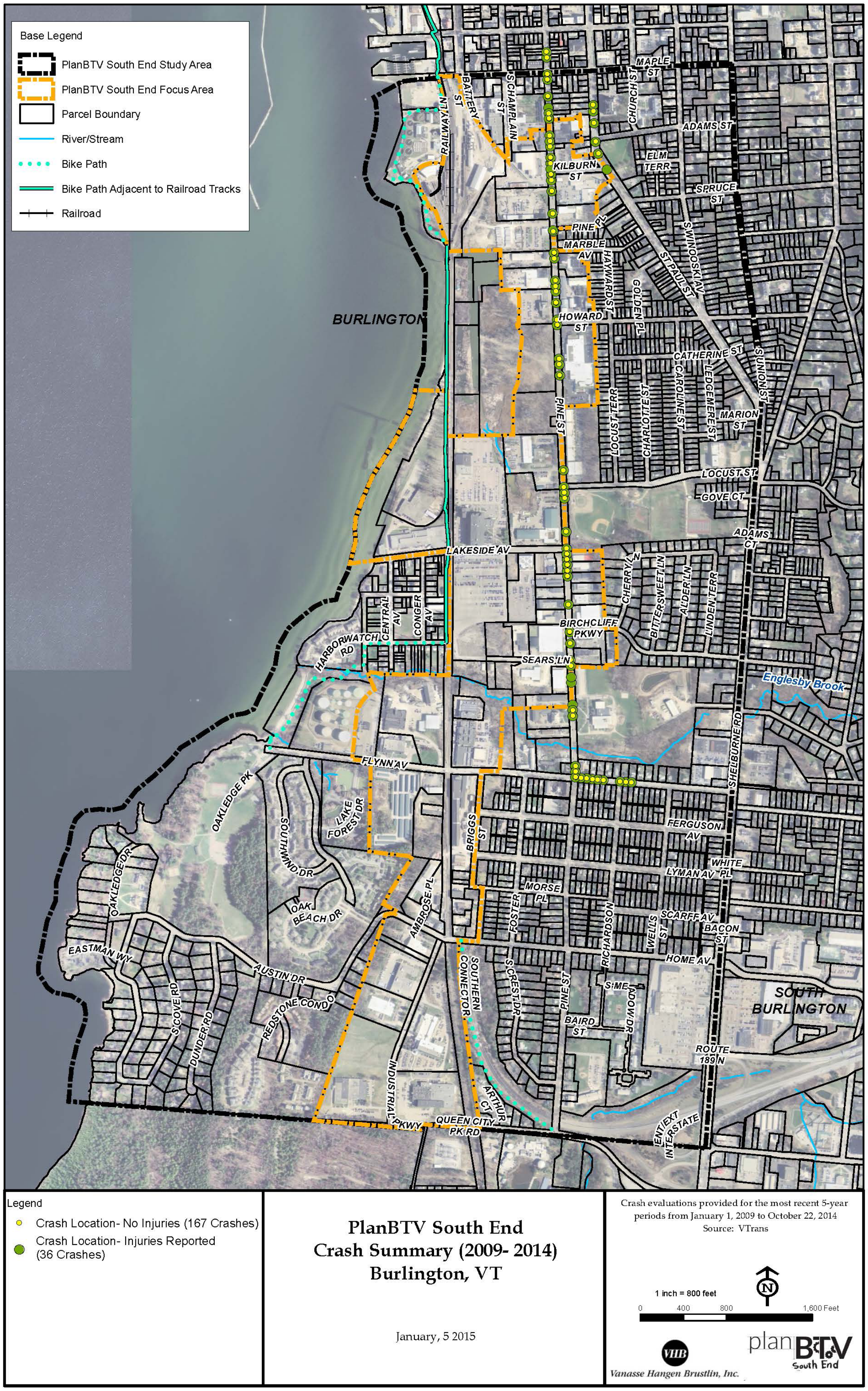


Figure 3-20: Crash Summary Map



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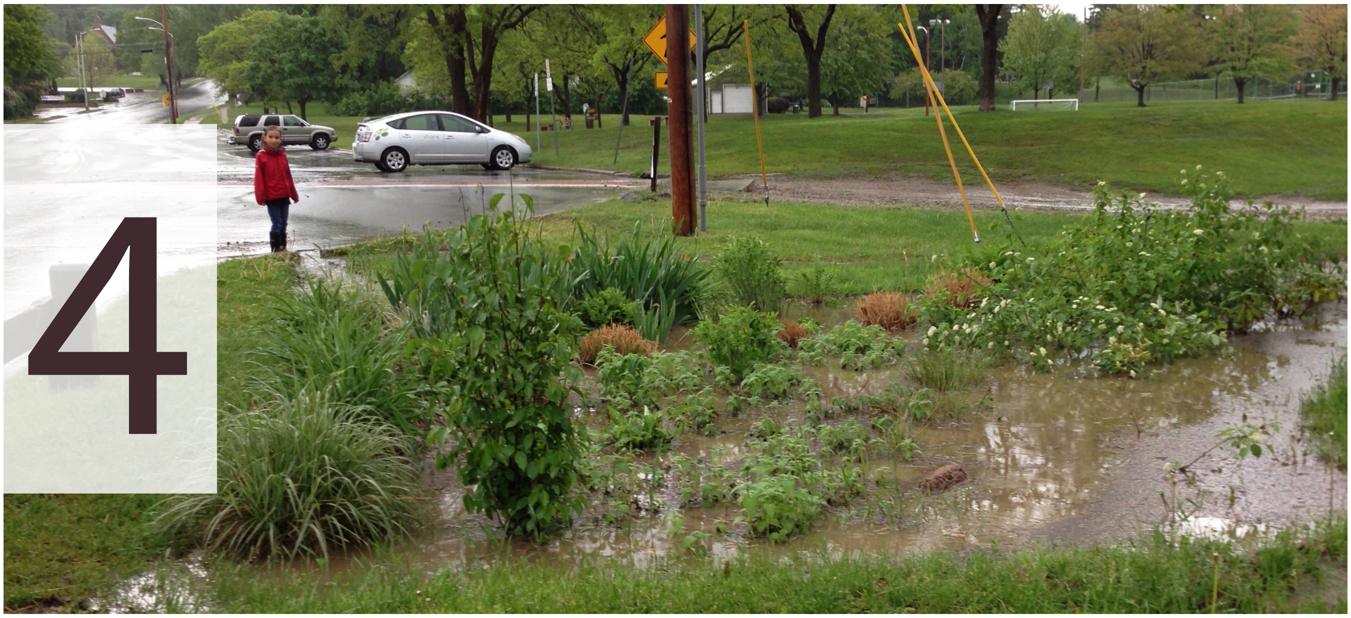
4 Stormwater



4. Stormwater

4.1 Introduction

VHB performed a stormwater assessment of the Study Area to identify capacity and limitations of existing infrastructure. This section describes the findings of the stormwater assessment, including observations at outfalls recommended for future monitoring, locations for dye or flow testing to clarify indeterminate pipe connections, and locations requiring maintenance or rehabilitation.

4.2 Stormwater Assessment Assumptions

Since the City is currently working on an update of the calibrated hydrologic/ hydraulic (H/H) model for the Main Wastewater Treatment Plant (Main WWTP) collection system that serves a portion of the Study Area, VHB did not include those portions of the Study Area served by the Main WWTP in this stormwater assessment. As is typical of older cities, much of the Main WWTP collection system is combined, meaning that wastewater and stormwater are collected in the same pipe and travel as a combined waste stream to the Main WWTP. During large storm events, the capacity of the treatment plant can be exceeded resulting in a portion of the excess combined sewer (wastewater and stormwater) flow not receiving the full complement of treatment provided by the plant under normal conditions before being discharged to Lake Champlain. This excess flow receives physical separation of solids and disinfection for bacteria, but does not receive nutrient removal. Therefore, the goal of stormwater management for both new development and redevelopment in portions of Study Area served by the Main WWTP combined sewer should be to reduce the quantity (both volume and peak discharge rates) of stormwater reaching the Main WWTP collection system in order to reduce the frequency of bypass events.

Further, as there is currently a flow restoration plan being developed for Englesby Brook, VHB did not concentrate on refining watershed boundaries within the Englesby Brook watershed, though approximate delineations were completed within the project's Focus Area. The Englesby Brook watershed accounts for an appreciable portion of the southeast corner of the Study Area. Lastly, VHB did not perform a detailed evaluation of portions of the Study Area that are south of Flynn Street and east of the project's Focus Area, as this location is largely residential and offers relatively limited options for stormwater improvements due to the lack of redevelopment opportunities. Areas outside the Focus Area may be subject to retrofit projects beyond those implied by redevelopment depending on the final direction of the Lake Champlain TMDL. The Lake Champlain TMDL, anticipated for final release in 2015, is a significant stormwater driver in the area. Based on preliminary TMDL allocations released in November 2014, the City will be required to reduce phosphorous loading by 25percent to Burlington Bay. This would likely require retrofit of more than 25percent of the impervious that drains to Burlington Bay, which includes the Study Area and may also include managing runoff which currently flows to the combined sewer.

4.3 Methodology

VHB used the City's stormwater network information available in GIS as the base for this assessment. Upon review, it became apparent that a significant portion of the network within the Focus Area was missing invert elevations or depths, far more than could be collected within the number of field days prescribed in the project scope of work. VHB reviewed this deficiency with the City's Stormwater Program Manager Megan Moir and collaboratively refined the scope of the field effort to meet the goals of the assessment within the available budget. Accordingly, VHB focused the data collection efforts on stormwater discharging to the Barge Canal, specifically the outfalls behind the DPW building at Pine Street and Lakeside Avenue and behind BED, off Pine Street between Lakeside Avenue and Howard Street.

The City also maintains a GIS layer of stormwater watersheds, delineated roughly by receiving water. These watersheds are shown in Appendix C: Watershed Delineation by Receiving Water. VHB received this layer from the City and reviewed it as part of this assessment, using it to inform the study but not relying on it because the focus of this assessment was to delineate watersheds to individual outfalls instead of to receiving waters, and because the City indicated that the watershed delineations in this layer are approximate.

4.4 Results

Drainage Network

Within the Focus Area, VHB identified approximately 38 drainage structure and 17 pipes for which connectivity data were missing in the City's database and whose inspection would help refine the tributary areas to the outfalls of interest. VHB's field technician, and Greg Johnson, the City's Stormwater/GIS Technician, met in the field to refine unknown connections in Pine Street. In most locations, the team also measured geometry to take advantage of opened catch basin and manhole structures.

After field work was complete, Greg Johnson incorporated the observations into the City database and shared the updated data with VHB. Subsequently, VHB conducted a "windshield survey" to refine overland drainage patterns, particularly in locations where surface conditions, curbing, or roof drainage could not be identified from aerial imagery. During the windshield survey, VHB also confirmed the assumption that, in the outlying residential neighborhoods tributary to the Focus Area, drainage patterns generally follow typical urban patterns where front yards drain to the adjacent street and rear yards conform to underlying topography.

Using the updated database, the ANR map of existing stormwater permits, 2-foot contours available from the Vermont Center for Geographic Information (VCGI), and the observations made during the windshield survey, VHB delineated seven watersheds within the Focus Area with permitted controlled stormwater discharges; 19 discrete stormwater outfalls with associated watersheds; two watersheds discharging to catch basins with unknown outfall locations; and 24 watersheds where stormwater appears to infiltrate within the watershed. VHB delineated watersheds outside of Focus Area (and in one case outside the project's Study Area) where they were tributary to outfalls contained within Focus Area.

Appendix C: Watershed Delineation by Receiving Water, attached, shows a graphical representation of the delineated watersheds, color coded by receiving water. Shaded watersheds have no obvious drainage infrastructure and are likely to predominantly drain by infiltration. Areas discharging to the two outfalls of interest at the Barge Canal are bounded in yellow.

4.5 Summary of Existing Stormwater Management Network

In general, excess stormwater not infiltrated on pervious surfaces within the Focus Area flows to a closed drainage system which discharges either to the Main WWTP or to an open waterbody. There are no large, contiguous areas of pervious surface within the Focus Area, therefore the majority of rainfall is discharged. Appendix C: Overall Watersheds Impervious Cover shows an overlay of impervious cover on the delineated watersheds. There are a handful of properties that have current DEC stormwater permits. For properties that have a permit, stormwater runoff relating to the permitted portion of the property is controlled on-site to meet the DEC stormwater management criteria prior to discharge and as such could potentially have a reduce impact on stormwater capacity or quality issued when compared to uncontrolled runoff. The properties that have stormwater permits are indicated on the GIS layer that is the product of this assessment.

4.6 Recommendations

Stormwater issues affecting the Focus Area are related to runoff quantity, runoff quality, or both. The City has identified the primary goals for each receiving water as described in **Table 4-1.**

Table 4-1: Primary Stormwater Issues by Receiving Water

RECEIVING WATER	PRIMARY STORMWATER MANAGEMENT GOAL
Barge Canal	Water Quality Treatment, Peak Rate Control
Main WWTP	Runoff Reduction, Peak Rate Control
Englesby Brook	Water Quality Treatment, Runoff Reduction, Peak Rate Control
Lake Champlain *(Includes Blanchard Beach)*	Water Quality Treatment

In order to address both quantity and quality issues affecting the Focus Area, planning efforts should include an emphasis on how stormwater management can be included in a distributed fashion through a project. Developers will need to make a significant effort and investment towards managing stormwater on their sites. Stormwater from new impervious will need to be mitigated fully in accordance with the goals outlined in **Table 4.1.** Stormwater from existing or redeveloped impervious will need to be mitigated to the maximum extent feasible, beyond that required by existing state stormwater management rules, in order to meet goals of the Lake Champlain and Englesby Brook TMDLs. Planning efforts should include very early consideration for how stormwater from both new and redeveloped impervious surfaces will be managed. Given the high premium on space in the Focus Area, stormwater should ideally be managed through the use of distributed green infrastructure type practices which can also provide co-benefits which align with other Study Area or city wide goals (e.g. bio-retention in traffic calming bumpouts, urban tree canopy enhancements and stormwater tree-box filters, pedestrian bump-outs with pervious pavement and/or bio-retention capture etc.) **Table 4-2** on the following page expands on the City's stormwater management measures to address each primary goal.

Table 4-2: Primary Stormwater Management Goals

STORMWATER MANAGEMENT GOAL	TYPICAL STORMWATER MANAGEMENT MEASURES TO ADDRESS GOAL
Water Quality Treatment	Flow through practices like sand filters; bioretention or tree system filters with un-restricted underdrain; permeable pavements with unrestricted underdrain; downspout disconnection to vegetated area
Runoff Reduction	Infiltration type practices including subsurface infiltration, bioretention, tree system filters or permeable pavements without underdrain, increasing urban tree canopy coverage over impervious surface, residential downspout disconnection, removal of impervious surface, stormwater capture for reuse; green roofs
Peak Rate Control	Any of the runoff reduction methods, as well as, subsurface storage in tanks or pipes with slow release; bioretention or permeable pavement systems with restricted underdrain; green roofs or blue roofs.

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5 Brownfields

5. Brownfields

5.1 Introduction

This section describes the findings of VHB's review of documented oil and hazardous materials ("OHM") sites located within the City Community and Economic Development Office's ("CEDO's") proposed brownfields area-wide plan ("AWP") redevelopment area ("AWP Project Area") and the planBTV South End Study Area. The AWP Project Area generally occupies the northeastern most corner of the planBTV South End Study Area. See the Brownfields Overview Map and Series Maps included on pages 1 to 9 of Appendix D for the locations and extents of the AWP Project Area and the planBTV South End Study Area.

The EPA brownfields AWP program is an EPA grant program which provides funding to conduct research to aid in the eventual cleanup and reuse of key brownfields sites. Through the brownfields AWP approach, the community identifies a specific project area that is affected by a single large or multiple brownfields, then works to develop a reuse plan for the project area. The AWP Project Area is located primarily within the Burlington rail yard and also includes several southerly contiguous properties located to the east of Pine Street and extending as far south as the BED Property. This area was chosen for an area-wide brownfield redevelopment plan due to long-term industrial use and documented environmental impacts (EPA Grant ID #BFVT005). The AWP

Project is managed by Burlington's CEDO. See the Brownfields Series Maps included on pages 1 to 9 of Appendix D for the locations and extents of the AWP Project Area and the planBTV South End Study Area.

The purpose of the brownfield assessment is to document the Existing Environmental Conditions within the planBTV South End Study Area (including the AWP Project Area) as of January 10, 2015. This assessment is intended to inform the City and CCRPC of cleanup needs and the potential for subsequent redevelopment and reuse within these areas. The expectation is that the redevelopment of these areas will create a positive environmental outcome related to public health, air and water quality.

VHB geospatially located oil and hazardous materials ("OHM") sites within the AWP Project Area and planBTV South End Study Area and reviewed information from the following DEC and EPA Databases:

- DEC designated hazardous waste sites ("HWSs")
  - "Active" HWSs are currently undergoing environmental management activities under the jurisdiction of the DEC Sites Management Section ("SMS").
  - "Closed" HWSs are sites where investigation and/or remediation activities have been completed to the satisfaction of the SMS and the SMS has determined that any potential residual contamination no longer poses a threat to sensitive receptors.
- EPA Comprehensive Environmental Response, Compensation, and Liability Information System ("CERCLIS"), which provides data regarding Superfund ("CERCLA") Sites
- DEC registered underground storage tanks ("USTs")
- DEC and EPA Brownfield sites ("Brownfields")
- DEC and EPA registered hazardous waste generation facilities ("RCRA Generators")

VHB conducted detailed research on OHM sites mapped within these areas including freedom of information act ("FOIA") requests from the DEC and file reviews of the available information. A reference section summarizing the reviewed reports is included on pages 27 to 32 of Appendix D. Using the available information, VHB assigned risk levels (high, medium or low) to each site based on the potential for site conditions to pose challenges to redevelopment within the Study Area. These risk levels are based on the E1527-13 ASTM Standards for Phase I Environmental Site Assessments. Detailed descriptions of these risk categories are included below:

- **High Risk:** Those sites where there is a documented presence or likely presence of any hazardous substance or petroleum product which poses a threat of a future release to the environment. This risk category includes sites with on-going investigations, sites with data gaps identified by VHB, and sites with regulatory restrictions on land use or on-site activities.

» **Medium Risk:** Those sites where a past release of hazardous substances or petroleum products has occurred, but the release and resulting contamination has been addressed to the satisfaction of the applicable regulatory authority. This risk category includes sites where hazardous substances have been allowed to remain in-place and may be subject to the implementation of required controls, such as deed restrictions, land use restrictions, activity use restrictions, or engineering controls.

» **Low Risk:** Those sites where a past release of hazardous substances or petroleum products has occurred but the release and resulting contamination has been addressed to the satisfaction of the applicable regulatory authority by meeting the unrestricted use criteria as established by the regulatory authority and without subjecting the site to any restrictions or required controls.

The risk determination is based on a review of existing information and not based upon any sampling or analysis performed by VHB specifically for this Brownfield Assessment. In addition, unknown, undocumented, and/or not-fully-characterized contamination likely exists throughout the Study Area based on its industrial history and use. VHB cannot characterize Project-wide risk related to the historic uses unless an area has been previously investigated. VHB has used professional judgment to assign risk levels to sites where contamination is not documented, but a material threat of a release exists (e.g. an active UST site) or where current site practices are indicative of generating contamination (e.g. an active railroad yard).

Using the most recently available data from investigation reports, VHB mapped the approximate extent of documented existing contamination at active hazardous sites within the Study Area. Brownfields Maps showing the Study Area and the extent of documented contamination are included on pages 1 to 9 of **Appendix D.** A summary matrix for HWS and Brownfields sites located within the planBTV Study Area is included on pages 10 to 12 of Appendix D. Summary tables of the HWSs, USTs, and EPA facilities located within the map extents are provided in the tables on pages 13 to 26 of **Appendix D.**

The following sections of the report detail site specific information for sites (HWSs, CERCLA sites, UST sites, Brownfield sites, and RCRA sites) located within the AWP Project Area and planBTV Study Area. After the summary for each site, VHB offered an opinion as to the overall risk level of that site with regard to the previously discussed ranking system.

5.2 Hazardous Waste Sites ("HWSs") and EPA Superfund ("CERCLA") Sites within the AWP Project Area

Three active HWSs and five closed HWSs are located within the AWP Project Area (pages 13 and 14 of **Appendix D**). Two Superfund sites are also located within the AWP Project Area (page 24 of **Appendix D**). VHB reviewed all available files associated with these sites since they are located within the AWP Project Area. A summary for each of these sites is included below:

1. Pine Street Barge Canal (Active HWS #770042; Superfund ID#9259809)

The Pine Street Barge Canal site is an active HWS and Superfund site due to historic releases of coal tar, fuel oil, cyanide, contaminated wood chips, iron oxide, cinders and metals into and around the canal from the former Burlington Light & Power Manufactured Gas Plant (1908 to 1966) and other industries in the area. Currently, primary groundwater contaminants include polycyclic aromatic hydrocarbons ("PAHs"), volatile organic compounds ("VOCs"), metals, and coal tar non-aqueous phase liquid ("NAPL"). The extent of coal tar NAPL is generally consistent with the limits of the canal. Corrective action included the installation and maintenance of a sand cap cover over the contaminated soils within the canal, reclassification of the groundwater to Class IV, and a deeded easement for the State of Vermont to help maintain land use restrictions. According to the document titled "Findings of Fact and Reclassification Order for the Proposed Boundaries of the Class IV Groundwater at the Pine Street Barge Canal Superfund Site," deed restrictions include the following:

- prevention of residential development;
- prevention of use of the properties as daycares or schools;
- prevention of groundwater use;
- requirement to minimize excavation into contaminated soils;
- a mandate that no activities that will change hydrogeologic conditions that would cause migrations of contaminated groundwater to Lake Champlain will be allowed; and
- a mandate to inform workers who may contact soils to develop protective measures prior to construction.

The following table details the properties which are subjected to the Pine Street Barge Canal deed restrictions, as described above.

Table 5-1: Deed Restriction Properties

PROPERTIES SUBJECT TO PINE STREET BARGE CANAL DEED RESTRICTION			
SITE NAME	SITE ADDRESS	DEED (BK/PG)	PARCEL ID
VT Railway	1 Railway Lane or 0 Maple Street	877/141	053-1-009-00
na	44 Lakeside Avenue	880/635	053-2-012-00
General Electric	128 Lakeside Av-enue	877/89	053-2-010-00
na	0 Pine Street	877/64	NA
Public Works Garage/ Former Street Sweeping Building	339 Pine Street	877/29	049-2-019-00
Ultramar Harvey Property	345 Pine Street 351 Pine Street	880/647	053-1-017-00
Citizens Oil Co.	377 Pine Street	879/74	053-1-006-00
na	405 Pine Street	877/127	053-1-005-00
Maltex	431 Pine Street	877/113, 877/78 & 877/102	053-1-004-00
453 Pine Street	453 Pine Street	877/16 & 877/2	053-1-003-00
na	501 Pine Street	880/635	053-1-012-00 053-1-002-00
na	501 Pine Street (Gate House)	880/623	053-1-001-00
na	585 Pine Street	877/41	053-2-005-00
na	645 Pine Street	877/52	053-2-004-00

*The Deed references are from the Burlington City Land Records, a formal title search was not performed under this assessment.

Recent reports indicate that coal tar NAPL is starting to migrate through the sand cap and into the canal. On-going remediation and monitoring efforts continue at this site.

Impacts to soil and groundwater exist on-site and extend to the south and east within the AWP Project Area. Activity use restrictions are in place at this site and surrounding sites. In addition, coal tar NAPL has been identified as migrating through the existing sand cap and into the surface water of the canal. VHB considers this site to pose a high risk of contamination to the Project Area. Any redevelopment activities are subject to the current land use restrictions and institutional controls unless further cleanup is undertaken to lift those restrictions.

2. Maltex Pond (Closed HWS #870035)

The Maltex Pond site is located on the easterly adjoining property to the Pine Street Barge Canal site. This site was closed by the DEC but is continued to be studied via the Pine Street Barge Canal site. As indicated by the table above, this site is subject to the land use restrictions to limit site uses that could damage the soil cap on the Pine Street Barge Canal site.

Although this site is closed, it is continued to be studied in conjunction with the Pine Street Barge Canal site where on-going monitoring and remediation of documented contamination is occurring. Therefore, the hazards associated with the Barge Canal site (as described above) also apply to this site. In addition land use restrictions and institutional controls associated with the Pine Street Barge Canal site are applicable to this site. Therefore, VHB considers this site to pose a high risk of contamination to the Project Area. Any redevelopment activities are subject to the current land use restrictions and institutional controls unless further cleanup is undertaken to lift those restrictions.

3. Vermont Railway (Closed HWS #770179)

The Vermont Railway site includes an active railroad switching yard and roundhouse. This site is listed as a closed HWS due to the discovery of petroleum impacts to soil and groundwater during the closure of a 2,000-gallon fuel oil UST in 2010. The UST was partially located under a concrete slab foundation of a shed-like structure; therefore, the UST was closed in place as to not compromise this structure. All excavated materials were backfilled into the excavated area. An initial site investigation included the installation of four soil borings and monitoring wells around the UST. In 2001, groundwater samples from these wells indicated that 1,3,5-trimethylbenzene, 1,2,4-trimethylbenzene and naphthalene exceeded regulatory standards in three of the four wells. The initial site investigation also included an assessment of environmental conditions associated with a 700-gallon gasoline UST that was removed from the site in 1984. A fifth boring advanced in the area of the 700-gallon tank showed no evidence of petroleum impacts. This site was granted a SMAC designation on August 29, 2008. The DEC SMAC summary letter indicates that groundwater contaminants in all four monitoring wells were below the respective regulatory standards, and that the monitoring wells were abandoned in May 2008. The facility currently has a registered 2,000-gallon fuel oil UST on-site which was installed in 1984. In addition, a portion of this site is subject to the land use restrictions to limit site uses that could damage the soil cap on the Pine Street Barge Canal site.

According to available information, contamination related to the on-site UST release was addressed to the satisfaction of the DEC. However an active 2,000-gallon fuel oil UST is located on the site. Although no documented releases are associated with the active fuel oil tank, the presence and age of this tank presents a potential threat of a release to the Project Area. A portion of this site is subject to land use restrictions and institutional controls associated with the Pine Street Barge Canal site. In addition based on historic and current use (railroad) other contaminants may be present in surficial soils and *groundwater. Therefore, VHB considers this site to pose a high risk of contamination to the Project Area.*

4. 266 Champlain Street (Active HWS #20002827)

The 266 South Champlain Street site is listed as an active HWS due to the discovery of petroleum impacts to soil and groundwater associated with a former 1,000-gallon gasoline UST located on the southwestern site area. This UST was presumed to have been removed in 1990, however, it was identified during on-site construction activities and removed in May 2012. The limit of gross contamination around the tank was not determined because further excavation would undermine nearby building foundations. Petroleum contaminated soils were backfilled into the UST excavation area. According to prior reports, a second UST was formerly located on the northeastern corner of the site. Although there is no record of removal for this tank, it was not physically encountered during the advancement of soil borings and groundwater just downgradient of the alleged UST location did not show signs of petroleum impacts. Currently, remedial techniques include natural attenuation with biennial groundwater monitoring to track the concentrations of petroleum related VOCs in groundwater. In 2013, groundwater results (June 2013) indicate that several on-site wells exceeded regulatory standards for methyl-tert butyl ether ("MTBE"), benzene, ethylbenzene, naphthalene, 1,3,5-trimethylbenzene and 1,2,4-trimethylbenzene.

Impacts to soil and groundwater exist on-site and extend to the south and west onto the Gregory Supply property and to the railroad ROW. In addition, the degree and extent of contamination under the nearby site buildings have not been delineated and air quality within the buildings has not been tested. Due to the presence of on-site contamination, VHB considers this site to pose a high risk of contamination to the Project Area. As this is an active HWS, redevelopment activities would be subject to DEC regulations.

5. 453 Pine Street (Active HWS #20043192)

The 453 Pine Street site is located on a westerly adjoining property to the Pine Street Barge Canal site. Lumber mill lay down areas and structures were erected on the property around the time of the railroad and barge canal construction (early 1900's). This HWS was originally investigated in conjunction with the Pine Street Barge Canal and Maltex Pond until 1998. PAHs, manufactured gas plant wastes, and coal tar NAPL exist in on-site soils (primarily along the southern and southwestern site areas). Metals and certain semi-volatile organic compounds ("SVOCs") exist in groundwater throughout the site. As indicated by the table above, this site is subject to the land use restrictions to limit site uses that could damage the soil cap on the Pine Street Barge Canal site. This site is also studied under the BERA program

Impacts to soil and groundwater exist on-site and extend to the east onto the Pine Street Barge Canal site. In addition, land use restrictions and institutional controls have been placed on the property. Since this site is actively managed and subject to regulatory controls and land use restrictions due to documented on-site contamination, *VHB considers this site to pose a high risk of contamination to the Project Area. Any redevelopment activities are subject to the current land use restrictions and institutional controls unless further cleanup is undertaken to lift those restrictions. As this is an active HWS, redevelopment activities would also be subject to DEC regulations.*

6. Ultramar (Closed HWS # 870097)

The Ultramar site was formerly used as a petroleum bulk storage facility and is located on the northerly adjoining property to the Pine Street Barge Canal site. In 1986 a 4,200-gallon spill of fuel oil occurred from an on-site tank. The spill reportedly traveled off-site and into the surface water of the Barge Canal. Approximately 110,000 gallons of impacted surface water was recovered from the canal and approximately 400 tons of contaminated soil were removed from the site and properly disposed of. In addition, sorbent materials were deployed in the canal to prevent the spreading of contamination. Monitoring wells were installed and no petroleum product was noted in these wells in 1998. The DEC issued a NFAP designation for this release as they determined the release to no longer affect soil**,** groundwater or surface water beyond contaminant levels associated with the Pine Street Barge Canal site. As indicated by Table 5-1 on page 58, above, this site is subject to the land use restrictions to limit site uses that could damage the soil cap on the Pine Street Barge Canal site. Any lingering off-site contamination associated with this site (e.g. potential impacts to water and sediments within the Barge Canal) would be managed in conjunction with the Pine Street Barge Canal site.

Impacts to on-site soil and groundwater and off-site surface water have been remediated to the satisfaction of the DEC as subject to regulatory controls. Land use restrictions and institutional controls associated with the Pine Street Barge Canal are applicable to this site. Therefore, VHB considers this site to pose a medium risk of contamination to the Project Area. Any redevelopment activities are subject to the current land use restrictions and institutional controls unless further cleanup is undertaken to lift those restrictions.

7. Bell Aircraft Dump (Superfund ID #9346957) and General Electric Lakeside Avenue (Closed HWS #770041)

Although the GE Lakeside Avenue HWS is located on the southerly adjoining property to the AWP Project Area, it is discussed in this section because the site was merged with the Bell Aircraft Dump (partially located within the AWP Project Area). This facility is also listed as a RCRA CORRACTS site (ID #VTD002083434). Process wastes from the Former Bell Aircraft facility, such as paint and plating sludges, oils, halogenated degreasing solvents, cyanide, and magnesium were allegedly dumped into unlined pits and swamps. Site investigations were completed at the property under State and EPA oversight. Investigations identified impacts to on-site soil and groundwater were remediated to the satisfaction of the DEC and determined that groundwater contamination was not migrating off-site. The DEC SMAC letter states that "soil contamination remaining on site will not pose a threat to human health or the environment as long as there is no long term contact with contaminated soils." On-going corrective action and monitoring associated with the Pine Street Barge Canal site is still occurring on-site. As indicated by the table above, this site is subject to the land use restrictions to limit site uses that could damage the soil cap on the Pine Street Barge Canal site.

Although this HWS is closed, impacts to soil and groundwater exist on-site and extend to the north and east onto the Barge Canal site. Contamination related to this site was addressed to the satisfaction of the DEC, but on-going studies of this area are completed in conjunction with the Barge Canal site. However, land use restrictions and institutional controls have been placed on the property. Therefore, VHB considers this site to pose a medium risk of contamination to the Project Area. Any redevelopment activities are subject to the current land use restrictions and institutional control unless further cleanup is undertaken to lift those restrictions.

8. Burlington Public Works Garage/Former Street Sweeping Building (Closed HWS #992592 and Active HWS #20144476)

The Burlington Public Works Garage is listed as a closed HWS, an active HWS, and brownfields site. The site was initially designated a HWS in 1999 (#992592) due to soil contamination from an on-site leaking waste-oil AST and the discovery of contaminated groundwater associated with an on-site UST. Contaminated soil from the AST release was excavated and stockpiled on-site in 1998. In 1999, four USTs were removed from the property; a 1,000-gallon gasoline UST, a 3,000-gallon gasoline UST, a 2,000-gallon fuel oil UST, and a 10,000-gallon diesel UST (leaking tank). The soil pile was removed from the site and properly disposed of in 2007. Periodic groundwater sampling took place until 2008. This site was granted a SMAC designation on February 2, 2011 with a notice to the land records indicating that residual soil and groundwater petroleum contamination remain on-site; specifically, under the western portion of the building and immediately south of the building approximately 1.0 to 1.5 feet below grade. According to the notice to the land records, prior to conducting any subsurface work, excavation or groundwater extraction in the vicinity of this contamination, the DEC must be notified. Although historic groundwater and soil samples were taken, samples were only analyzed for petroleum contaminants. The site was re-opened under the Brownfields program to understand what further environmental investigation or remediation may be required prior to possible future redevelopment (e.g possible residual impacts to soil, groundwater and soil gas). Further site characterization work is on-going. As indicated by the table above, this site is also subject to land use restrictions to limit site uses that could damage the soil cap on the Pine Street Barge Canal site.

Given the historic uses of this property (reportedly a street sweepings storage, asphalt batch plant and industrial usage with interior floor drains) and other adjoining sites (Barge Canal, etc.) contaminants within soil and groundwater have yet to be fully characterized, but include petroleum constituents at a minimum. In addition, the degree and extent of contamination under the site building has not been delineated, and air quality within the *building has not been tested. Activity use restrictions are in place at this site. VHB considers this site to pose a medium risk of contamination to the Project Area. Any redevelopment activities would be subject to the current activity use restrictions unless further cleanup is undertaken to lift those restrictions. As this is an active HWS, redevelopment activities would also be subject to DEC regulations.*

5.2 Hazardous Waste Sites ("HWSs") and EPA Superfund ("CERCLA") Sites Outside the AWP Project Area but within the planBTV South End Study Area

Nine active HWSs and 29 closed HWSs are located outside the AWP Project Area but within the remaining portion of the planBTV South End Study Area (pages 15 to 19 of Appendix D). Of the total 38 HWSs, VHB determined that 17 HWSs may contribute to contamination within the Study Area. Summaries for all sites are included on pages 15 to 19 of **Appendix D**.

1. Exxon Oil Terminal (Active HWS #870002)

This HWS is a former petroleum bulk storage facility. Petroleum impacts to soils and groundwater were discovered on-site during a subsurface investigation. On-site groundwater is impacted and the contaminant plume extends off-site to the north and west. A groundwater interceptor trench was installed along the northern and western property boundaries. Groundwater which collects in this trench is continually dewatered, treated and discharged to the municipal sanitary sewer system. Remediation includes extraction and treatment of groundwater via the trench system. Groundwater monitoring is on-going.

Impacts to soil and groundwater above regulatory standards remain on-site and are currently being remediated and monitored. Due to the persistent presence of on-site contamination, VHB considers this site to pose a high risk of contamination to the planBTV South End Study Area, and redevelopment activities would be subject to DEC regulations.

2. Mobil Terminal (Active HWS #870175)

This HWS is currently used as a petroleum bulk storage facility. Petroleum impacts to soil and groundwater were discovered, and were identified as being related to a leaking on-site AST and other historic releases within the on-site sump collection system. Although concentrations have decreased over time, groundwater is still impacted across the site. Downgradient areas (north and west) have not yet been studied to determine if impacts exist. On-site groundwater monitoring is on-going.

Impacts to soil and groundwater above regulatory standards remain on-site and may extend off-site to the north and west. The groundwater contaminant plume is currently being monitored and remediated through natural attenuation, and potential new releases would be mitigated through the use of spill collection systems. Due to the persistent presence of on-site contamination and current use as a petroleum bulk storage facility, *VHB considers this site to pose a high risk of contamination to the planBTV South End Study Area, and redevelopment activities would be subject to DEC regulations.*

3. Former Don Cobb's Quality Used Cars (Active HWS #900491)

Petroleum impacts to soil and groundwater were discovered during the removal of on-site USTs. Groundwater monitoring results from 2006 indicate that low levels of select petroleum constituents exceeded regulatory standards in one well. Groundwater monitoring is on-going, and results suggest that contamination is not likely migrating off-site.

Impacts to groundwater remain on-site, and are continually monitored. Due to the persistent presence of on-site contamination above regulatory standards, VHB considers this site to pose a high risk of contamination to the planBTV South End Study Area, and redevelopment activities would be subject to DEC regulations.

4. Leo Duncan Auto Service (Active HWS #900594)

Petroleum impacts were identified in soil and groundwater associated with an on-site gasoline UST. The UST and the majority of the contaminated soils were removed from the site and properly disposed of. The groundwater contaminant plume is well defined, limited in extent, but extends off-site to the south.

Impacts to groundwater are limited in extent and are continually monitored. Due to the persistent presence of on-site contamination above regulatory standards, VHB considers this site to pose a high risk of contamination to the planBTV South End Study Area, and redevelopment activities would be subject to DEC regulations.

5. Tamarack Automotive (Active HWS #941740)

Petroleum impacts to soil and groundwater were discovered during the removal of a 500-gallon waste oil UST and a 1,000-gallon fuel oil UST. Approximately 300 gallons of petroleum-impacted groundwater was evacuated during tank removal, and impacted soils were backfilled on-site. Groundwater monitoring results from 2012 indicate that naphthalene concentrations exceeded regulatory standards in one on-site well, and that contaminants were not migrating off-site. Groundwater monitoring is on-going.

Impacts to groundwater remain on-site, and are continually monitored. Due to the persistent presence of on-site contamination above regulatory standards, VHB considers this site to pose a high risk of contamination to the planBTV South End Study Area and redevelopment activities would be subject to DEC regulations.

6. Cannon Residence (Active HWS #20063617)

Petroleum impacts to soil and groundwater were discovered during the removal of a 550-gallon heating oil UST. This site was formerly used as a dry cleaning facility although no dry cleaning-related contamination, such as chlorinated solvents, has been identified. Groundwater is not impacted over the regulatory standards. The HWS status remains active due to the DEC's concerns about potential presence of PAHs from coal ash on the property.

Impacts to surface soils potentially remain. Due to the potential presence of on-site PAH contamination, and its status as an active HWS, VHB considers this site to pose a high risk of contamination to the planBTV South End Study Area, and redevelopment activities would be subject to DEC regulations.

7. General Electric Co. Armament Systems Department (Closed HWS #770040)

This HWS is a former metal machine shop where coolant oils and cutting oils were used during metals processing. Chlorinated solvent contamination was discovered under the southern end of an on-site building and was attributed to the improper storage of these products and waste cutting materials. Impacted soils were removed from the site and properly disposed of with the exception of soils under the building that could not be removed without compromising the integrity of the building. Sub-slab soil gas was below the regulatory standards and the contamination was determined not to affect sensitive receptors. Arsenic was also detected in surficial soils over the regulatory standards but concentrations were determined to be typical of urban conditions. The site was administratively closed in on January 31, 2001.

Impacts to soils located under the on-site building remain on-site but have been remediated to the satisfaction of the DEC. However, due to the persistent presence of on-site contamination, VHB considers this site to pose a medium risk of contamination to the planBTV South End Study Area, and redevelopment activities may be subject to DEC regulations.

8. Former Vermont Structural Steel (Closed HWS #770109)

This HWS is a former on-site petroleum bulk storage facility, construction staging area and steel foundry. Petroleum and chlorinated solvent contamination was identified during a subsurface investigation. Solid waste in the form of coal slag and construction debris was also identified during subsurface investigations. According to available files, remediation was achieved through natural attenuation. No excavation of contamination was reported in the available DEC files. A notice to the land records was filed in 1991 detailing the limited nature of on-site contamination and that contamination is not migrating off-site. The site was administratively closed by the DEC with a NFAP on August 7, 1991. Groundwater levels were reportedly above regulatory standards upon closure.

Impacts to soil and groundwater remain on-site but have been remediated to the satisfaction of the DEC. However, due to the persistent presence of on-site contamination, VHB considers this site to pose a medium risk of contamination to the planBTV South End Study Area, and redevelopment activities would be subject to land use restrictions and may be subject to DEC regulations.

9. Former Weissner Property (Closed HWS #770124)

Petroleum and PAH impacts were discovered in surficial soils during an investigation prior to roadway construction. Impacts were limited in extent but partially extended into the ROW. No further information was available for remedial measures.

Impacts to soil and groundwater potentially remain on-site but have been remediated to the satisfaction of the DEC. However, due to the potential presence of on-site contamination, VHB considers this site to pose a medium risk of contamination to the planBTV South End Study Area, and redevelopment activities may be subject to DEC regulations.

10. Edlund Industries (Closed HWS #880269)

Edlund Industries is a kitchen equipment manufacturing company. Petroleum impacts to soil and groundwater were discovered during the removal of a 6,500-gallon diesel UST and a 1,000-gallon gasoline UST. This site is underlain by hard-packed clay which acts as a confining layer. Free-phase petroleum was reported on groundwater during the tank removal, and no remediation was performed. This site was administratively closed with a NFAP designation although petroleum contamination remained on-site.

Impacts to soil and groundwater remain on-site but have been remediated to the satisfaction of the DEC. However, due to the persistent presence of on-site contamination, VHB considers this site to pose a medium risk of contamination to the planBTV South End Study Area and redevelopment activities may be subject to DEC regulations.

11. Independent Foods (Closed HWS #890455)

Petroleum impacts were identified in soil and groundwater associated with an on-site fuel oil UST. The UST was closed in place and the majority of the contaminated soils were removed from the site. The site was granted a SMAC designation with a notice to the land records indicating that residual soil and groundwater petroleum contamination remain on-site and extend off site to the southeast. The downgradient limits of the plume are not defined.

Impacts to soil and groundwater remain on-site and extend off-site to the southeast but have been remediated to the satisfaction of the DEC. However, due to the persistent presence of contamination, VHB considers this site to pose a medium risk of contamination to the planBTV South End Study Area, and redevelopment activities may be subject to DEC regulations.

12. Englesby Brook (Active HWS #931505)

Petroleum concentrations above regulatory standards in the Englesby Brook were reported in 1993. No source of contamination was identified. No further investigations or remedial actions are documented in the available DEC files.

Impacts to surface water potentially remain. Due to the potential presence of on-site contamination, VHB considers this site to pose a medium risk of contamination to the planBTV South End Study Area and redevelopment activities involving Englesby Brook may be subject to DEC regulations.

13. Sears Roebuck & Co. (Closed HWS #972173)

This HWS is a former auto repair facility with a battery recycling operation and petroleum UST and AST. Low levels of petroleum and chlorinated solvents, were detected beneath the eastern portion of the on-site building. Levels of lead in groundwater exceeded regulatory standards, at one location beneath the battery recycling room in the building. No significant contamination was detected in exterior areas and contamination is not migrating off-site. This site was administratively closed with a SMAC designation on September 8, 1998 with contaminants remaining on-site.

Impacts to soil and groundwater remain on-site but have been remediated to the satisfaction of the DEC. However, due to the presence of contamination, VHB considers this site to pose a medium risk of contamination to the planBTV South End Study Area, and redevelopment activities may be subject to DEC regulations.

14. Cumberland Farms #4018. (Closed HWS #982418)

This HWS is a gasoline filling station with two former gasoline USTs and three current USTs. Petroleum impacts were identified in soil and groundwater during the replacing of piping of the two former USTs in 1998. Approximately 35 tons of impacted soils were removed from the site and properly disposed of. Three groundwater monitoring wells were installed and a relic well was identified on-site. Annual groundwater monitoring was completed to track the natural attenuation of the contaminant plume. In 2003 the former USTs, retail store and monitoring network were replaced during the redevelopment of the site. This site was administratively closed with a SMAC designation on August 27, 2012 with petroleum contaminants remaining on-site, primarily on the eastern side of the site in soil and groundwater as detailed by a notice to the land records.

Impacts to soil and groundwater remain on-site but have been remediated to the satisfaction of the DEC. However, due to the presence of contamination as documented in a land use restriction, VHB considers this site to pose a medium risk of contamination to the planBTV South End Study Area. Redevelopment activities would be subject to the land use restriction and may be subject to DEC regulations.

15. Former St. Johnsbury Trucking (Closed HWS #992591)

Soil on-site was impacted by petroleum due to two on-site 8,000-gallon USTs. Subsurface investigations in 1999 and 2005 confirmed the petroleum impacts to shallow soil and found no impacts to groundwater. A notice to the land records was filed in 2010 documenting the soils impacts. This site was administratively closed with a SMAC designation on February 2, 2011 by the DEC with residual soils contamination remaining on-site. Contaminants do not extend beyond the property boundary.

Impacts to soil and groundwater remain on-site but have been remediated to the satisfaction of the DEC. However, due to the presence of contamination as documented in a land use restriction, VHB considers this site to pose a medium risk of contamination to the planBTV South End Study Area. Redevelopment activities would be subject to the land use restriction and may be subject to DEC regulations.

16. P,W,Q,Y,C Law Offices (Closed HWS #20073748)

Petroleum impacts to soil were discovered during the removal of a fuel oil UST which was determined to be in poor condition upon removal. All soils were back-filled on-site. No impacts to groundwater or indoor air of the on-site building were reported. Residual soils contamination remains on-site but is not likely migrating off-site. This site was administratively closed by the DEC with a SMAC designation on February 8, 2008 although residual contamination remains on-site.

Impacts to soil and groundwater remain on-site but have been remediated to the satisfaction of the DEC. However, due to the persistent presence of contamination, VHB considers this site to pose a medium risk of contamination to the planBTV South End Study Area, and redevelopment activities may be subject to DEC regulations.

17. Bobbin Mill Apartments (Active HWS #20134377)

This HWS was formerly used as a manufacturing facility and coal/stone storage facility. Contaminant impacts including the presence of PAHs and arsenic are limited to surficial soils, and are typical of urban fill. A soil management plan documenting materials handling practices has been completed for this site. A notice to the land records was filed in 2013 detailing institutional controls such as a soil cap and limits of on-site contaminated areas. Upon completion of redevelopment, this site would be eligible for a SMAC designation.

Contamination remains on-site but has been addressed to the satisfaction of the DEC. Once site redevelopment is complete, this site would be eligible for a SMAC designation. However, due to the persistent presence of contamination as documented by a land use restriction, VHB considers this site to pose a medium risk of contamination to the planBTV South End Study Area. As this is currently and active site, redevelopment activities would be subject to DEC regulations.

Based on a review of available documentation, the remaining 22 HWSs located within the planBTV South End Study Area are not considered likely to pose an environmental risk to the Study Area, as described in the respective summary tables in the Appendix D.

5.4 Brownfields Facilities

One DEC-listed facility and three EPA-listed facilities were identified within the AWP Project Area (pages 20 to 21 of **Appendix D**). A summary for each of these sites is included below:

1. The **351 Pine Street** site is listed as a Brownfield site. A Phase II Environmental Site Assessment was recently completed, and identifies naphthalene, coal tar NAPL, PAHs and metals (arsenic and lead) as contaminants in on-site soil and groundwater. Soil gas has not yet been tested. Characterization is on-going. In addition, this site is subject to the land use restrictions to limit site uses that could damage the soil cap on the Pine Street Barge Canal site.
   Impacts to soil and groundwater exist on-site. Land use restrictions associated with the Barge Canal site have been placed on the property. Based on available information, VHB considers this site to pose a high risk of contamination to the Project Area. Any redevelopment activities are subject to the current land use restrictions unless further cleanup is undertaken to lift those restrictions. As this is an active site, redevelopment activities would also be subject to DEC regulations.

2. The **453 Pine Street** site is also listed as HWS #20043192 (see discussion above). This site is subject to the land use restrictions to limit site uses that could damage the soil cap on the Pine Street Barge Canal site and is also studied under the BERA program. Further detail regarding this site is included in the HWS section of this report.
   Impacts to soil and groundwater exist on-site and extend to the east onto the Pine Street Barge Canal site. In addition, land use restrictions and institutional controls have been placed on the property. Since this site is actively managed and subject to regulatory controls and land use restrictions due to documented on-site contamination, VHB considers this site to pose a high risk of contamination to the Project Area. Any redevelopment activities are subject to the current land use restrictions and institutional controls unless further cleanup is undertaken to lift those restrictions. As this is an active HWS, redevelopment activities would also be subject to DEC regulations.

3. The **Vermont Transit Passenger Terminal** at 345 Pine Street is listed on the EPA database and no files regarding site environmental information were available for review. According to the EPA database cleanup of hazardous materials was required for this property and redevelopment is 'in progress.' This site was formerly used as part of the Ultramar petroleum bulk storage facility (HWS #870097). This

site is subject to the land use restrictions to limit site uses that could damage the soil cap on the Pine Street Barge Canal site.
On-site impacts are unknown but reportedly exist. Given the vicinity to the Ultramar site (HWS #870097) contaminants of concern likely include petroleum at a minimum. In addition, land use restrictions and institutional controls associated with the Barge Canal site have been placed on the property. Based on available information, VHB considers this site to pose a high risk of contamination to the Project Area. Any redevelopment activities are subject to the current land use restrictions and institutional controls unless further cleanup is undertaken to lift those restrictions. As this is an active HWS, redevelopment activities would also be subject to DEC regulations.

4. The **Burlington Public Works Garage/Former Street Sweeping Building** at 339 Pine Street is also listed as HWS #992592 and HWS #20144476 (see discussion above). The site was re-opened in 2014 under the Brownfields program to understand what further environmental investigation or remediation may be required prior to possible future redevelopment (e.g. possible residual impacts to soil, groundwater and soil gas). Further site characterization work is on-going. This site is subject to the land use restrictions to limit site uses that could damage the soil cap on the Pine Street Barge Canal site. Further detail regarding this site is included in the HWS section of this report.

   Given the historic uses of this property (reportedly a street sweepings storage, asphalt batch plant and industrial usage with interior floor drains) and other adjoining sites (Barge Canal, etc.) contaminants within soil and groundwater have yet to be fully characterized, but include petroleum constituents at a minimum. In addition, the degree and extent of contamination under the site building has not been delineated, and air quality within the building has not been tested. Activity use restrictions are in place at this site. VHB considers this site to pose a medium risk of contamination to the Project Area. Any redevelopment activities would be subject to the current activity use restrictions unless further cleanup is undertaken to lift those restrictions. As this is an active HWS, redevelopment activities would also be subject to DEC regulations.

Four EPA-listed Brownfield facilities were identified outside of the AWP Project Area but within the planBTV South End Study Area (pages 20 to 21 of Appendix D). No DEC-listed Brownfields facilities were identified within this area. Two of the four EPA Brownfield facilities are associated with HWS and therefore, concerns associated with these listings were previously addressed in the HWS section and in tables on pages 15 to 19 of **Appendix D**. The remaining two facilities do not appear on any other environmental database and contain historic buildings. Brownfield sites can be listed solely based on building construction (e.g. asbestos in interior building materials) rather than based on known on-site contamination.

Based on available information, the Brownfield facilities located outside of the AWP Project Area but within the planBTV South End Study Area are not considered likely to pose an additional risk of contamination to the Study Area.

5.5 Underground Storage Tank ("UST") Sites

One active and three closed (or "pulled") UST sites are located within the AWP Project Area (page 22 of **Appendix D**) and are also listed as HWSs. A summary for each of these sites is included below:

1. The **Vermont Railway, Inc. (ID #6582550)** is an active UST site with one registered 2,000-gallon fuel oil tank which was installed in 1984. In addition, a 2,000-gallon fuel oil tank was removed from this site in 2010 and a 700-gallon gasoline tank was removed in 1985. Contamination was discovered during the 2010 tank removal, as discussed previously under HWS #770179.
2. The **Burlington Public Work Garage (ID #822)** is listed as a closed UST site. A 275-gallon used oil tank and a 1,000-gallon used oil tank were removed in 2000. A 1,000-gallon gasoline tank, a 3,000-gallon gasoline tank, a 2,000-gallon fuel oil tank and a 10,000-gallon diesel tank were removed in 1999. Contamination was discovered in 1999 following tank removal, as previously discussed under HWS #992592.
3. The **266 South Champlain Street (ID #5551723)** is listed as a closed UST site. A 1,000-gallon used gasoline UST were removed in 2012. Contamination was discovered during tank removal, as previously discussed under HWS #20002827.
4. The **General Dynamics Armament Systems (ID #192)** is listed as a closed UST site. Two tanks were removed in 1988 (a 5,000-galllon fuel oil UST and a 1,000-gallon fuel oil UST), four tanks were removed in 1989 (two 12,500-gallon fuel oil USTs, a 5,000-gallon fuel oil UST and a 4,000-gallon gasoline UST), three tanks were removed in 1991 (two 2,000-gallon waste oil USTs and one 2,000-gallon gasoline UST) and one tank was removed in 2001 (12,000-gallon fuel oil UST). The 1,000-gallon fuel oil tank removed in 1988 reportedly leaked. Further discussion regarding this facility is included under HWS #770041 above.

There are 20 UST sites are located outside of the AWP Project Area but within the planBTV South End Study Area. Fourteen of the 20 UST facilities are 'pulled' facilities and associated with HWSs; therefore, concerns associated with these listings are addressed in the above HWS section. Four of the 19 facilities are listed as closed or 'pulled' facilities with no associated HWS listing, indicating that no contamination was identified or reported during the tank removals on these properties. Therefore no environmental risk to the Study Area is associated with these three UST facilities. The remaining UST facilities are described below:

1. The **Cumberland Farms #4018 (ID #518)** is an active UST site. Two 6,000-gallon gasoline USTs were installed in 1982 and removed in 2003. The piping associated with these tanks leaked and resulted in a listing as a HWS (HWS #982418). Currently this site has two 12,000-gallon gasoline USTs and one 8,000-gallon

gasoline UST on-site which were all installed in 2003. The HWS listing associated with this site was closed with petroleum contaminants allowed to remain on-site. Further detail regarding this site is included in the HWS section of this report.

2. The **Montstream Residence (ID #1414)** is active with one 2,000-gallon fuel oil tank and no associated spills or environmental releases reported, indicating that no contamination was identified or reported for this property.
3. The **Mobil Terminal (ID #6584140)** is listed as a 'pulled' UST site and active HWS (HWS #870175). This property is now occupied by **Global Partners, LP**, and used as a petroleum bulk storage facility. No specifics regarding the current sizing of tanks on the property was available through the DEC records. According to available maps of the area there are at least 15 bulk petroleum above ground tanks located on the property.

5.6 RCRA Generator Facilities

Six DEC-listed RCRA generator facilities and two EPA-listed RCRA generator facilities were identified within the AWP Project Area. Twenty-five DEC-listed RCRA generator facilities and 57 EPA-listed RCRA generator facilities were identified outside of the AWP Project Area but within the planBTV South End Study Area. DEC-listed facilities are summarized on page 23 of **Appendix D** and EPA-listed facilities are summarized on pages 24 to 26 of **Appendix D**.

RCRA designation indicates sites that have registered as generators of hazardous wastes, which typically are manifested off-site by certified haulers. RCRA status does not necessarily indicate that a facility has released contamination to the environment; however, improper handling practices at a RCRA facility could result in a release.

Based on the available information, these RCRA facilities are not considered likely to pose any additional risk of contamination to the planBTV South End Study Area.

5.7 Other EPA Databases

Several facilities listed in other EPA environmental databases, such as Integrated Compliance Information Systems ("ICIS"), National Compliance Database ("NCDB") and Air Facility Systems ("AIRS/AFS") are located on the AWP Project Area (page 24 of **Appendix D).**

Facilities on other EPA environmental databases, such as AIRS/AFS, Biennial Reporter ("BR"), ICIS, NCDB, bulk storage facilities ("OIL") and Toxic Release Inventory Sites ("TRIS") were identified within the planBTV Study Area (pages 24 to 26 of **Appendix D).**

Based on the available information, these facilities are not considered likely to pose any additional risk of contamination to the planBTV South End Study Area.

5.8 Surficial Spills Databases

VHB did not search the spills database in association with this assessment. VHB understands that any spill site where soil or groundwater were impacted and which required remediation would have been listed by the DEC as a hazardous waste site and remedial efforts would have been documented accordingly and reviewed under that section. Many of the spill sites listed on the DEC database are minor in nature and would not affect the overall conclusions of this assessment. In addition, searching the DEC spills database is not expected to provide helpful information because the database is not spatially searchable and small spills are a typical part of "urban background" conditions.

5.9 Building Materials

Lead, asbestos, and PCB containing building material surveys are outside of the scope of work at this time. This assessment only included an evaluation of documented environmental contamination and issues identified by the DEC; therefore, no building material surveys were conducted. Given the age of buildings throughout the planBTV South End Study Area, VHB recommends that building material surveys should be performed at a later stage of site-specific design, and prior to any demolition.

5.10 Summary of Future Use

In general, future conditions at the Brownfields and Hazardous Sites in the Study Area would involve removal of contaminant sources along with remediation and/or stabilization of the existing soil and groundwater contamination, to the extent necessary for redevelopment of these properties to occur. Remediation would be targeted to reduce exposure of the public to contamination to acceptable levels, and to reduce risk of contamination to Lake Champlain, but may not necessarily eliminate all remaining contaminants due to practical limitations on the feasibility of remediation. Where deed restrictions prohibit the use of properties (e.g. Barge Canal and associated sites) for residential development, daycares, schools, etc. and require minimal excavation, the goal of remediation efforts would be to reduce and contain contaminants to a degree necessary to lift the restrictions.

Additional investigation and development of site-specific remediation plans would be needed as described in Chapter 6.4 to achieve the desired future conditions.

6 Conclusions

6. Conclusions

6.1 Introduction

The purpose of this Existing Conditions Report is to inventory and document the existing site conditions for the planBTV South End Project as the City prepares to develop a full Master Plan for the area. Land Use, Transportation, Stormwater, and Brownfields have all been investigated and documented within the dedicated chapters and appendices of this report. Conclusions and general recommendations for the City for each sub-practice are here to help inform the planBTV South End Master Plan Project and future City efforts.

6.2 Land Use and Buildout Analysis

A maximum buildout analysis was completed for the parcels located within the planBTV South End Project Focus Area. The analysis revealed that there is a potential for an additional 11 million square feet of development. However, it is highly unlikely and it is not anticipated that a maximum buildout will occur within the Project Focus Area. The results of the buildout analysis are only relevant when existing and maximum buildout is considered relative to one-another, and the purpose of the analysis was for planning purposes only.

A component of the buildout analysis was the calculation of the effective floor area ratio (FAR), which provides another way of comparing current density to what is allowed under current zoning regulations. The effective FAR calculations indicate that the current development density on the parcels located with the Project Focus Area, are under developed when comparing what currently exists and what is currently allowed under zoning. The effective FAR for all of the parcels within the Project Focus Area is substantially lower (mean effective FAR is 0.40) than the zoned FAR, which is 2.0.

To better understand the buildout potential within the Project Focus Area, it would be beneficial to work with City Planning Staff and local developers to identify and prioritize potential redevelopment sites, and conduct a more detailed buildout analysis with additional site constraints from the current zoning regulations for the identified sites.

The purpose of the LBCS inventory and building footprint update was to collect current information from the field and recent aerial photography and provide it to the City in GIS format. VHB digitized over 1,880 building footprints and collected LBCS data on 1,552 properties in the South End Study Area. The building footprints and LBCS information are stored in an ESRI GIS format that has been provided to the City.

A brief summary of the LBCS Function dimension top level code indicates that the South End is approximately 87 percent residential use and six percent general sales and services by count of properties. Remaining functions, which include manufacturing, transportation, education, arts, entertainment and recreation, make up the remaining seven percent of the properties.

6.3 Transportation System

The South End transportation system serves neighborhoods, schools, businesses, colleges and commercial uses. Not only is this area a waypoint, but it is a thriving destination. This existing diverse range of transportation users in the South End need a robust multimodal transportation network which will service all users (pedestrians, bicyclists,, transit riders, and motorists). With just over 100 miles of roadways in the City of Burlington's street network there is an immense opportunity to harness this ROW and public space to improve the network of streets, sidewalks and bike lanes. More specifically, within the City's vibrant South End district there is already an existing need and desire for solutions to better accommodate pedestrians, bicyclists, transit and motor vehicles.

As presented in the City's Transportation Plan, the City envisions a plan which stresses transportation choices and livability. The City recognizes that some levels of traffic congestion are inevitable and is not seeking to continually expand roadway capacity to accommodate growth. The City's goal is to accommodate growth in travel within the existing roadway system and through the implementation of Transportation Systems Management (TSM), supporting non-auto modes of travel, and Transportation Demand Management.

With this vision in mind and as the City prepares to engage the public in the development of the South End Master Plan, the City should consider the following:

- **Public Transit:** Improvements to the existing public transit opertions on Pine Street were recommended through the CCTA Transit Development Plan for the Pine Street corridor including service upgrades to include 15-minute peak service and a new Sunday service. The multimodal analysis shows a current LOS of B or better along Pine Street. Based on other case studies throughout Chittenden County this improvement could lead to a 30percent jump in ridership. Additionally, CarShare Vermont provides a network of vehicles parked in convenient spots in and around Burlington, including the South End, that can be used on an hourly or daily basis as needed in an effort to get people around with fewer vehicles.
- **Bicyclists:** On Pine Street, bicycle accommodations are currently inconsistent as designated bike lanes are provided along some segments of the corridor while other segments operate under "Share the Road". Specifically, the southbound bike lane is not carried through the intersection of Lakeside Avenue with the introduction of a southbound right-turn lane on Pine Street. In the northbound direction, Pine Street provides "Share the Road" signage and painted sharrows in the travel lane. The multimodal analysis reported the least desirable operations for cyclists (LOS D and E) where bike lanes are not provided. On Pine Street, bicyclists could be better accommodated with continuous bike lanes in each direction, improved pavement condition and reduced curb-cuts where possible.
- **Pedestrians:** Sidewalk is present along both sides of Pine Street except from Marble Avenue to the Burlington Electric Department where there are stretches of asphalt sidewalk, concrete sidewalk, and footpaths only. The multimodal analysis reported levels of service D for segments adjacent to the southbound travel way (west side), while the segments adjacent to the northbound travel way (east side), which provide continuous sidewalk, provide LOS C or better. Crosswalks accommodate pedestrians crossing Pine Street at Maple Street, Kilburn Street, Howard Street, Lakeside Avenue, the Champlain School, Flynn Avenue, and Home Avenue. Although there are pedestrian crosswalks provided at the traffic signal controlled Pine Street/Lakeside Avenue intersection, there is currently no pedestrian actuated signal phase. Pedestrian mobility can be improved by filling in the existing gaps in sidewalk along the west side of Pine Street.
- **Motorists:** The intersection operational analysis along Pine Street revealed both signalized intersections operate at good levels of service (LOS B or better). However, traffic operations at the Pine Street/Lakeside Avenue intersection are adversely impacted by the absence of an exclusive traffic signal phase to accommodate motorists turning left onto Lakeside Avenue. Additionally, motorists currently enter the intersection from the slightly offset Feldman's Bagel driveway without being controlled by the traffic signal. Several approaches at unsignalized intersections experience LOS D or E, which is not uncommon in urban environments. Only the minor street approach of Locust Street at Pine Street operates at LOS F during the

weekday evening peak hour. Providing a separate right-turn lane on the Locust Street approach would improve the operations allowing right-turns to bypass left-turns. Intersection analysis and field observations indicated that northbound traffic on Pine Street currently experiences long queues and delays during peak hours and mid-day at the 4-way stop-controlled intersection at Maple Street.

» **Parking:** Parking along the corridor, both on-street and surface lots (private and public), is currently in high demand and accommodations will need to be considered as the future build-out of the corridor continues.

» **Access Management:** Numerous uncontrolled curb-cuts and driveways are located throughout the corridor. The Master Plan should consider and incorporate access management guidelines.

» **Champlain Parkway:** The planned Champlain Parkway is expected to reduce traffic volumes along Pine Street south of Lakeside Avenue serving to better protect the residential neighborhoods located in the south end of the corridor. At the same time this would add limited overall capacity to the corridor of Pine Street while expanding the capacity of key intersections including Lakeside Avenue and Maple Street.

6.4 Stormwater

As part of this assessment, VHB made note of key areas to improve the City's understanding of the stormwater network in the Focus Area and thus understand where opportunities for enhanced stormwater management practices can be carried out. These are listed below, and the relevance of each recommendation is noted.

General Recommendations

» **Soil Hydraulic Properties:** In order to determine opportunities for runoff reduction and water quality treatment, the City should undertake soil testing at locations considered as having potential for stormwater management via infiltration. As City ROW may represent the most advantageous location for infiltration practices, the evaluation of these opportunities should proceed in close coordination with transportation planning efforts, especially roadway, parking, and sidewalk improvements. Some transportation uses may not be compatible with subsurface infiltration measures. Stormwater practices should be located in areas with soils suitable for infiltration, requiring site-specific soil exploration prior to site selection. NRCS and City staff should be consulted to select likely locations to test for favorable soils.

» **Missing Invert Data:** Though this assessment resolved the majority of missing connectivity data within the Focus Area, as described in Chapter 4, the majority of stormwater infrastructure within the Focus Area is missing invert data, and some pipe size data is also missing. In order to construct a stormwater system model of the entire system, all invert data will need to be collected. However, collection of invert data can be scaled back depending on the goals of the modeling effort. For instance, if the City only wishes to evaluate inlet capacity, no invert data is needed. If pipe capacity at the outfalls is the primary concern, inverts of manholes are of more importance than inverts of catch basins.

» **Rail Drainage:** Rail drainage patterns were only observed in some locations. Conditions observed indicate no subsurface drain infrastructure. Runoff flows to a ditch along rail. VHB recommends escort and inspection along the entire rail corridor.

» **Roof Drains:** Roof drains were not observed on several large buildings within the Focus Area. VHB made assumptions about connectivity and in most cases, whether roof runoff is routed internally to a closed drainage system or is disconnected to overland flow, the eventual discharge location of roof runoff will remain unchanged from what is indicated. VHB describes in the following section (Location-Specific Recommendations) where roof connectivity may result in a different discharge location.

» **Conditions Assessment:** The City indicates that they have not had adequate resources in recent years with which to pursue a condition assessment. The City is pursing more formal asset management but until that time, the condition of stormwater infrastructure is largely unknown. As an interim measure, VHB recommends the City consider whether condition assessment could be included as part of catch basin and pipe cleaning efforts and as part of outfall monitoring.

Location-Specific Recommendations

» **BED Outfall:** The City indicated that the lower portion of the drainage system tributary to the outfall behind BED, outfall BC1.0, floods during larger storm events. When the field investigation took place on September 19, 2014, the outfall was observed to be more than half submerged **(see Figure 6-1).**

Figure 6-1. Outfall BC1.0. Photo taken by VHB on September 22, 2014, with approximate stage in Lake Champlain at 24.6 feet NGVD29.

The 2008 Final NAPL[1] Investigation Report for the Barge Canal, reviewed as part of the Brownfields assessment (Chapter 5), indicates that the weir, installed presumably to prevent erosion of the soils cap within the canal, is set at elevation of 96.5 feet. Water levels in the impounded area behind the weir only become lower than that elevation due to evapotranspiration; no supplemental outlets exist. Water levels very closely track lake elevations above 96.5 feet. There are no required water levels recorded in the easement, but the invert of the weir dictates a minimum water level in the Barge Canal.

As this pertains to the outfall behind BED, using judgment based on two-foot contours and our photos of the location from September 19, 2014, VHB estimates the outfall invert is approximately 97.5 feet. It does not appear that the water surface at the BED outfall is directly correlated to the water surface at the weir due to its distance from that structure and potential obstructions and resulting backwater through the narrow channel joining the outfall to the canal.

1 NAPL: Non-Aqueous Phase Liquid

Greg Johnson also indicated that when the water level is high in Lake Champlain, the outfall is completely submerged and cannot be observed. Though pipes leading to this outfall appear large and may have been sized to accommodate some tailwater, the presence of backwater in this system reduces capacity to capture and convey stormwater flows for a large portion of Pine Street. The capacity issue is further exacerbated by the approximately 30 acres of Pine Street and the Five Sisters neighborhood east of Pine Street which flow to this outfall. Further, this outfall may see increased flows if sewer separation projects between Lakeside Avenue and Howard Street are constructed in the future. This outfall is located in a relatively flat area, therefore raising the outfall above the anticipated tailwater elevation is unlikely to be feasible. The recommended long-term solution would be to significantly reduce the tributary area to this outfall and install a new outfall above the anticipated tailwater, though topography may not be favorable to this solution. To partially mitigate tailwater influence, VHB recommends that the City consider installing a flexible tide gate on the outfall, such as a Tideflex® valve in order to prevent tailwater from flowing into the system and reducing available system storage. Traditional flap-type tide gates are not as durable as flexible tide gates, and require installation on a headwall, which is not available in this location.

» **444 and 500 Pine Street:** Roof drains at 444 and 500 Pine Street were not observed. VHB assumed that roof drainage from these two large residential buildings discharges to the separate stormwater system in Pine Street, but due to the presence of combined sewer lines in Pine Street, this assumption should be verified either by dye testing of the roof leaders or smoke testing of the connecting manholes.

» **BED Front Parking Lot:** VHB was unable to conclusively determine drainage tributary to Manhole BC102.01, located in the front parking lot of BED. Observation of adjacent manholes and catch basins indicate that this manhole may be abandoned. VHB recommends inspection of this manhole during a rain event or using a dye test or stick camera to verify the status of this manhole.

» **128 Lakeside Avenue:** During inspections, the field team spoke to the building manager at 128 Lakeside Avenue. He provided the team with a plan showing stormwater connections on that property. The property has been configured such that it discharges stormwater to the abandoned water intake now identified on the City database as outfall LC33.0. VHB recommends that the City review the permit/legal status of using the abandoned intake pipe as a stormwater outfall for untreated discharges.

» **Behind Independent Block:** VHB identified connectivity data missing from the parking lot behind Independent Block along Battery Street. However, VHB understands that connections in this area are under review by others due to high concentrations of hazardous materials. Therefore, at the direction of the City, connections in this location were not inspected.

» **Pine Street from Lakeside Avenue to BED:** Catch basins on west side of Pine Street, from Lakeside Avenue to where pipes traverse the BED parking lot, appear to have T-connections without manhole structures to an alleged pipe located along the west curb line. The pipe was observed at the location where it changes direction to traverse the BED parking lot, but not before. VHB recommends a dye test or stick camera to verify catch basin connections to the pipe.

6.5 Brownfields

VHB has identified the following eight HWSs located within the AWP Project Area that pose a medium to high risk of subsurface contamination to the AWP Project Area:

» Pine Street Barge Canal (HWS #770042, CERCLIS ID#9259809)

» 453 Pine Street (HWS #20043192, Brownfield)

» Ultramar (HWS #870035)

» Maltex Pond (HWS #870035)

» Former Bell Aircraft Dump/General Electric Lakeside Avenue (HWS#770041, CERCLIS ID #9346957)

» 266 Champlain Street (HWS #20002827)

» Vermont Railway (HWS #770179, UST #6582550)

» Burlington Public Works Garage (HWS #992592, HWS #20144476, Brownfields, UST #822)

VHB has identified the following 16 HWSs located outside of the AWP Project Area but within the planBTV South End Study Area that pose a medium to high risk of subsurface contamination to the Study Area:

» General Electric Co. Armament Systems Department (HWS #770040)

» Former Vermont Structural Steel (HWS #770109, UST #1700)

» Former Weissner Property (HWS #770124)

» Exxon Oil Terminal (HWS #870002)

» Mobil Terminal (HWS 870175, UST #6584140)

» Edlund Industries (HWS #880269)

» Independent Foods (HWS #890455)

» Former Don Cobb's Quality Used Cars (HWS #900491, UST #1427)

» Leo Duncan Auto Service (HWS #900594, UST #8649477)

» Englesby Brook (HWS #931505)

» Tamarack Automotive (HWS #941740)

» Sears Roebuck & Co. (HWS #972173)

» Former St. Johnsbury Trucking (HWS #992591, UST #1904)

» Cannon Residence (HWS #20063617)

- P,W,Q,Y,C Law Offices (HWS #20073748)
- Bobbin Mill Apartments (HWS #20134377, Brownfields)

In addition, the historic industrial use of the planBTV South End Study Area, and in particular of the AWP Project Area, suggests that "pockets" of undocumented subsurface contamination may be encountered anywhere within these areas, based on the presence of historic fuel storage facilities, industry sites, lumber yards, and railroads.

Based on the available information, including deed restrictions, activity use restrictions, engineering controls, and known locations of contaminated soil and groundwater, redeveloping significant portions of these areas for recreational, residential, commercial and mixed-use purposes will be challenging in certain locations, given the nature of the contamination and/or costs of further study and remediation activities. Additional unknown and not-fully-characterized contamination likely exists within these areas. In coordination with the DEC, further site investigation should be performed to fill-in the data gaps, determine what types of redevelopment would be acceptable in various locations within the Study Area, and to guide remediation of the contamination that would impede earthwork and development. The DEC may prefer that contaminated soils be left in place or removed depending on the nature, degree, and extent of contamination at the various locations.

For the purposes of improving stormwater, development in the Study Area should include an emphasis on high density with distributed open spaces as opposed to traditional horizontal development, in order to minimize impervious surfaces and potentially reclaim existing impervious areas for implementation of green stormwater infrastructure practices. Structured parking, multi-unit housing, and mixed-use development are examples of uses that meet this goal.

A Land Use

Contents:

A-1: Buildout Analysis Building Footprint Map

A-2: Activity Dimension - Top Level Inventory and Buildout Analysis Map

A-3: Function Dimension - Top Level Inventory and Buildout Analysis Map

A-4: Ownership Dimension - Top Level Inventory and Buildout Analysis Map

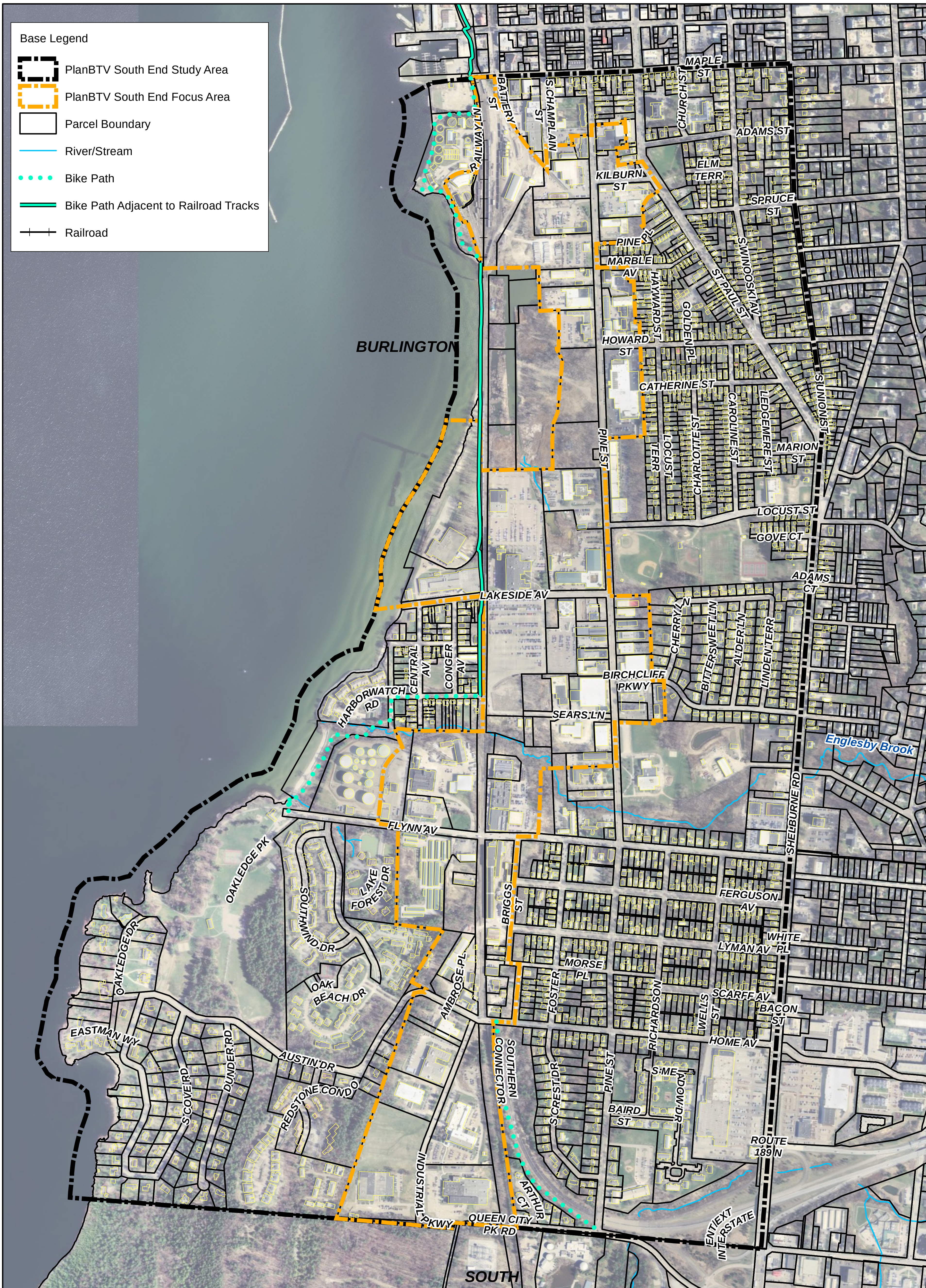
A-5: Site Dimension - Top Level Inventory and Buildout Analysis Map

A-6: Structure Dimension - Top Level Inventory and Buildout Analysis Map

A-7: Effective Floor Area Ratio Map

A-8: Net Buildout Analysis Map

A-9: Maximum Buildout Potential Map



Legend

Building Footprint

PlanBTV South End Buildout Analysis Building Footprint Map Burlington, VT

January 6, 2015

Parcel data provided by the City of Burlington (2014), Study Area from CCRPC (2014), Roads from VCGI (2008), Railroads from VTrans (2014), Imagery from ESRI

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1 inch = 800 feet

0 400 800 1,600 Feet

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planBTV South End

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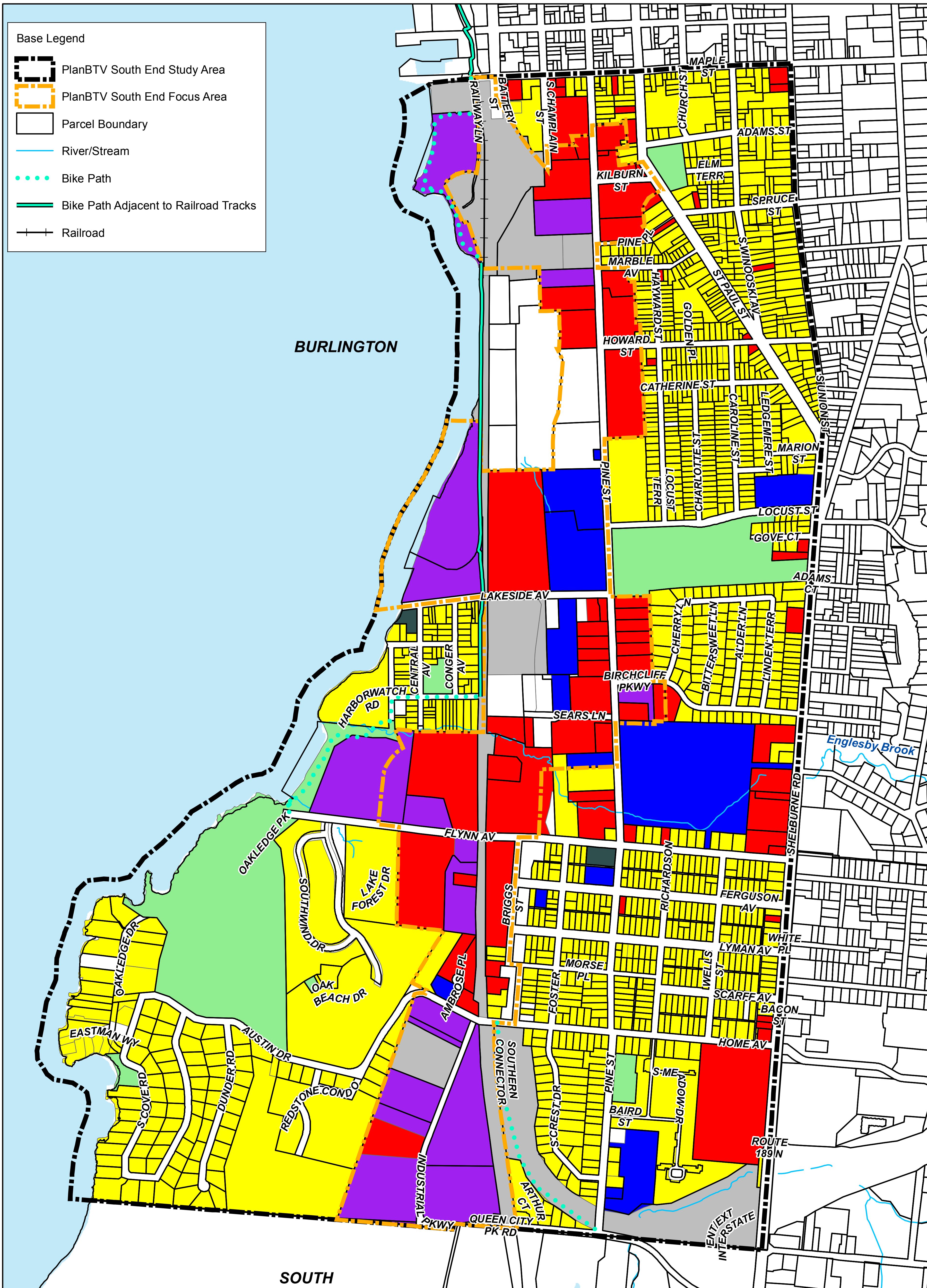

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LBCS Code	LBCS Activity Description
1000	Residential activities
2000	Shopping, business, or trade activities
3000	Industrial, manufacturing, and waste-related activities
4000	Social, institutional, or infrastructure-related activities
5000	Travel or movement activities
6000	Mass assembly of people
7000	Leisure activities
8000	Natural resources-related activities
9000	No human activity or unclassifiable activity

PlanBTV South End Activity Dimension - Top Level Inventory and Buildout Analysis, Burlington, VT

January 6, 2014

Parcel data provided by the City of Burlington (2014), Study Area from CCRPC (2014), Roads from VCGI (2008), Railroads from VTrans (2014), LBCS data from VHB (2014) Imagery from ESRI

1 inch = 800 feet

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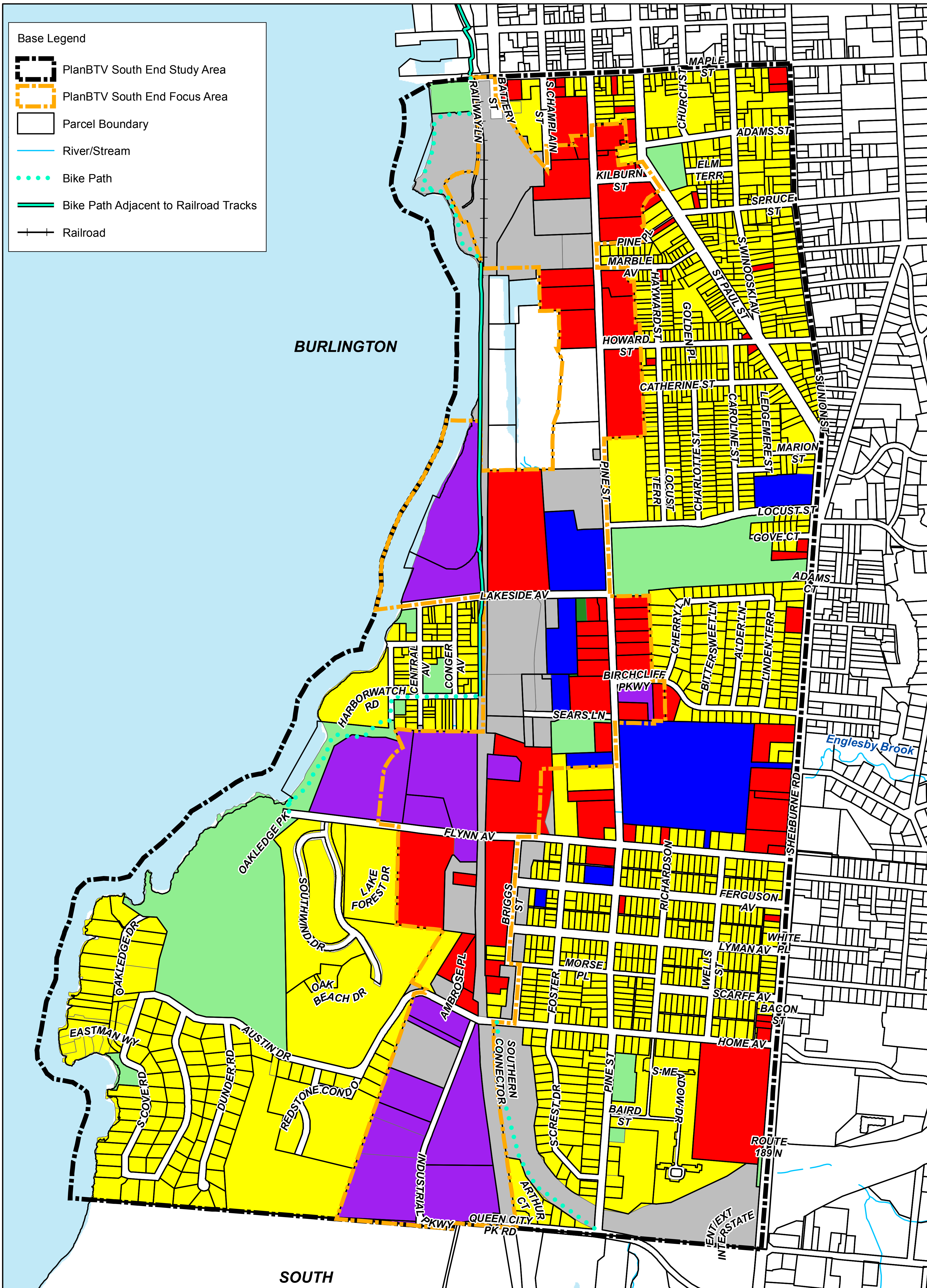

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LBCS Code	LBCS Activity Description
1000	Residence or accomodation functions
2000	General sales or services
3000	Manufacturing and wholesale trade
4000	Transportation, communication, information, and utlities
5000	Arts, entertainment, and recreation
6000	Education, public admin, health care, and other inst.
7000	Construction-related business
8000	Mining and extraction establishment
9000	Agriculture, forestry, fishing and hunting
9900	Unclassifiable

PlanBTV South End
Function Dimension - Top Level
Inventory and Buildout Analysis
Burlington, VT

January 6, 2015

Parcel data provided by the City of Burlington (2014), Study Area from CCRPC (2014), Roads from VCGI (2008), Railroads from VTrans (2014), LBCS data from VHB (2014) Imagery from ESRI

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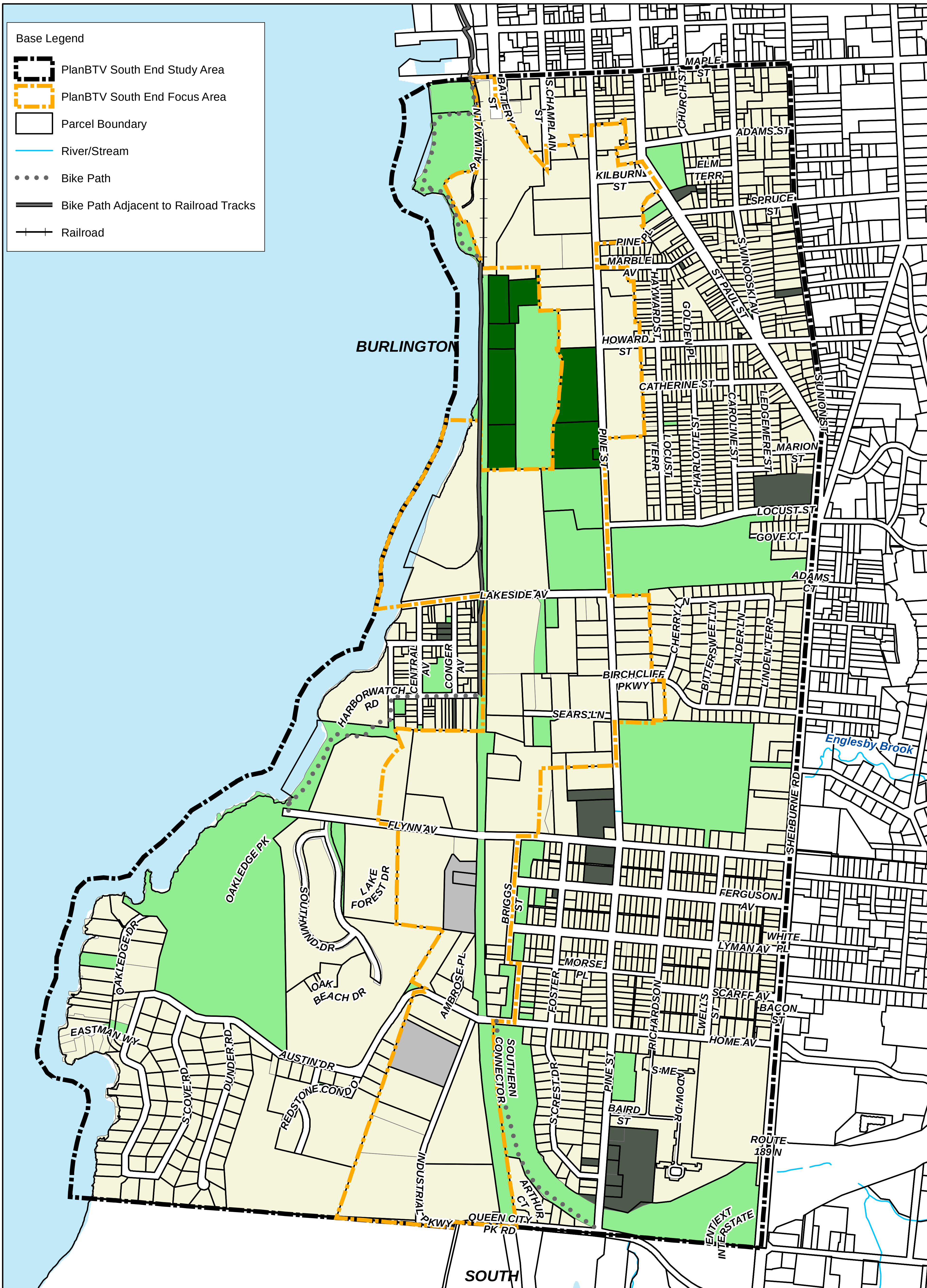

LBCS Code	LBCS Activity Description
1000	No constraints -- private ownership
4000	Public restrictions -- local, state, and federal
5000	Other public use restrictions -- regional, special
6000	Nonprofit ownership restrictions
7000	Joint ownership character -- public entities
9000	Unclassifiable site development character

PlanBTV South End
Ownership Dimension - Top Level
Inventory and Buildout Analysis
Burlington, VT

January 6, 2015

Parcel data provided by the City of Burlington (2014), Study Area from CCRPC (2014), Roads from VCGI (2008), Railroads from VTrans (2014), LBCS data from VHB (2014) Imagery from ESRI

1 inch = 800 feet

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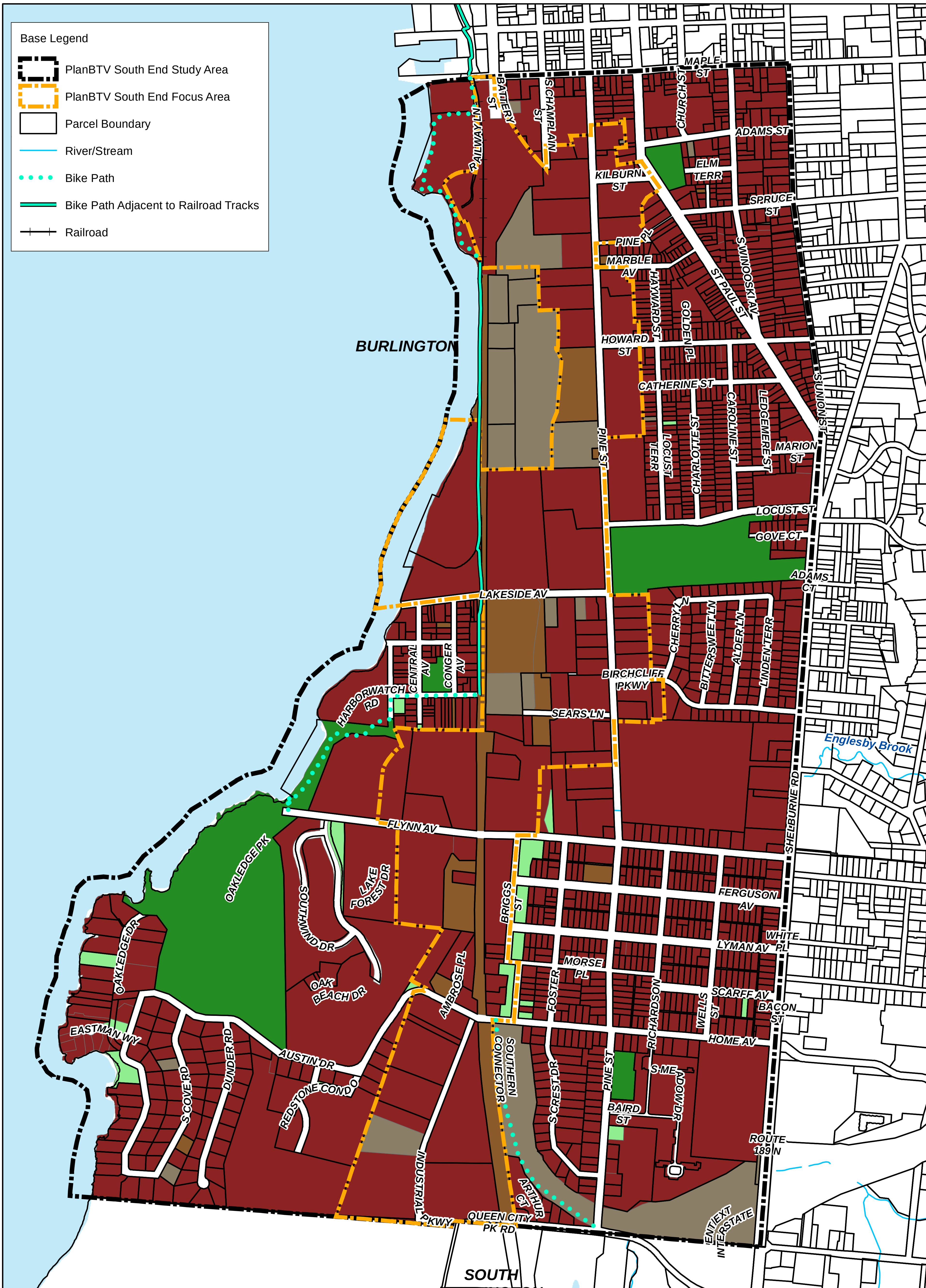
planBTV South End



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LBCS Code	LBCS Activity Description
1000	Site in natural state
2000	Developing site
3000	Developed site -- crops, grazing, forestry, etc.
4000	Developed site -- no buildings and no structures
5000	Developed site -- nonbuilding structures
6000	Developed site -- with buildings
7000	Developed site -- with parks
8000	Not applicable to this dimension
9000	Unclassifiable site development character

PlanBTV South End
Site Dimension - Top Level
Inventory and Buildout Analysis
Burlington, VT

January 6, 2015

Parcel data provided by the City of Burlington (2014), Study Area from CCRPC (2014), Roads from VCGI (2008), Railroads from VTrans (2014), LBCS data from VHB (2014) Imagery from ESRI

1 inch = 800 feet

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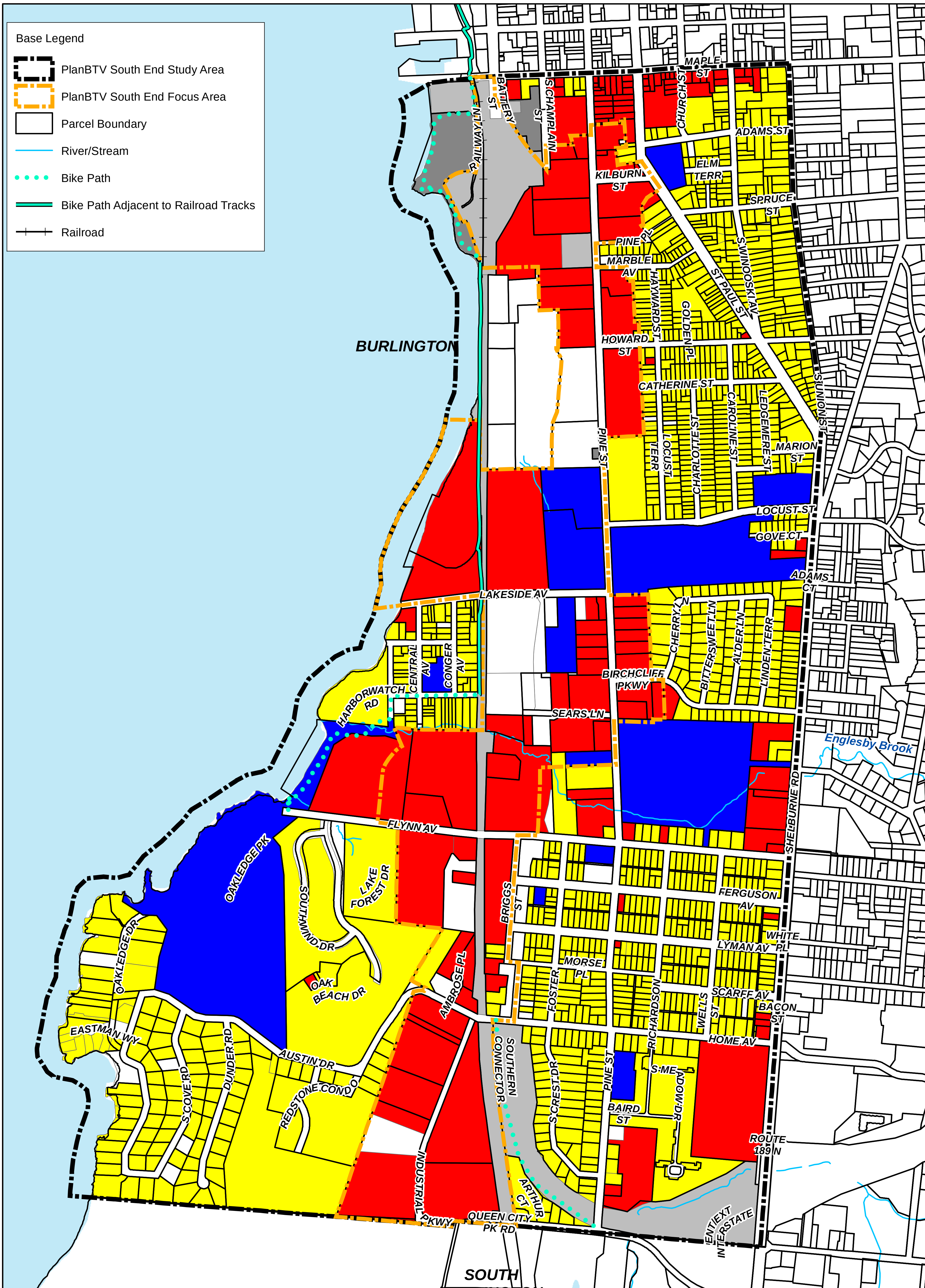
Vanasse Hangen Brustlin, Inc.

planBTV South End



LBCS Code	LBCS Activity Description
1000	Residential Buildings
2000	Commercial Buildings and other specialized structures
3000	Public Assembly Structures
4000	Institutional or community facilities
5000	Transportation – related facilities
6000	Utility and other nonbuilding structures
7000	Specialized military structures
8000	Sheds, farm buildings, or agricultural facilities
9000	No Structure

PlanBTV South End
Structure Dimension - Top Level Inventory and Buildout Analysis
Burlington, VT

January 6, 2015

Parcel data provided by the City of Burlington (2014), Study Area from CCRPC (2014), Roads from VCGI (2008), Railroads from VTrans (2014), LBCS data from VHB (2014) Imagery from ESRI

1 inch = 800 feet

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VHB Vanasse Hangen Brustlin, Inc.

planBTV South End

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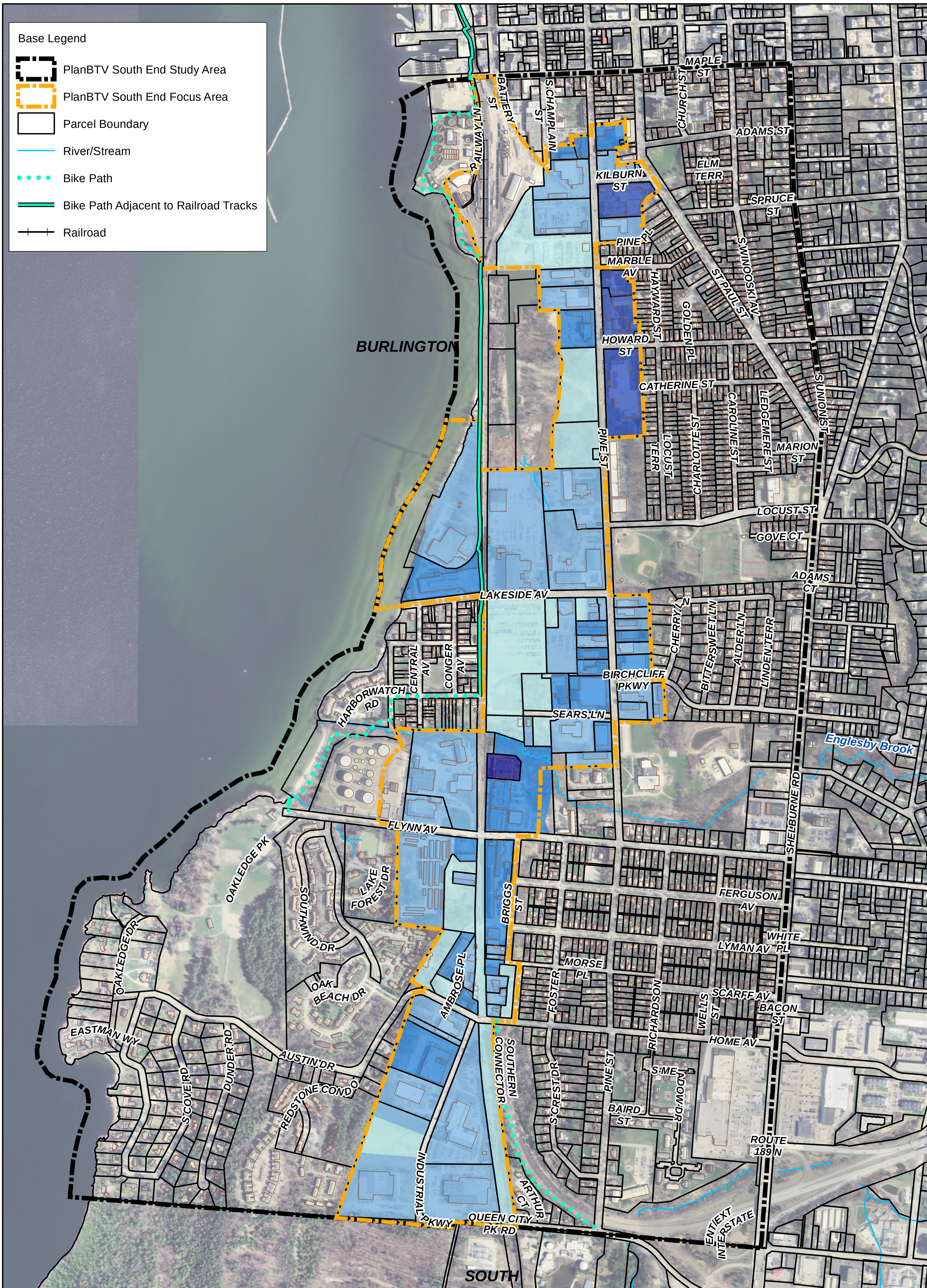

Legend

Building Footprint

Effective Floor Area Ratio

- 0.0 - 0.15
- 0.16 - 0.50
- 0.51 - 1.0
- 1.1 - 1.5
- >1.5

PlanBTV South End
Effective Floor Area Ratio
Burlington, VT

January 6, 2015

Parcel data provided by the City of Burlington (2014), Study Area from CCRPC (2014), Roads from VCGI (2008), Railroads from VTrans (2014), LBCS data from VHB (2014) Imagery from ESRI

1 inch = 800 feet

0 400 800 1,600 Feet

N

VHB

Vanasse Hangen Brustlin, Inc.

planBTV South End

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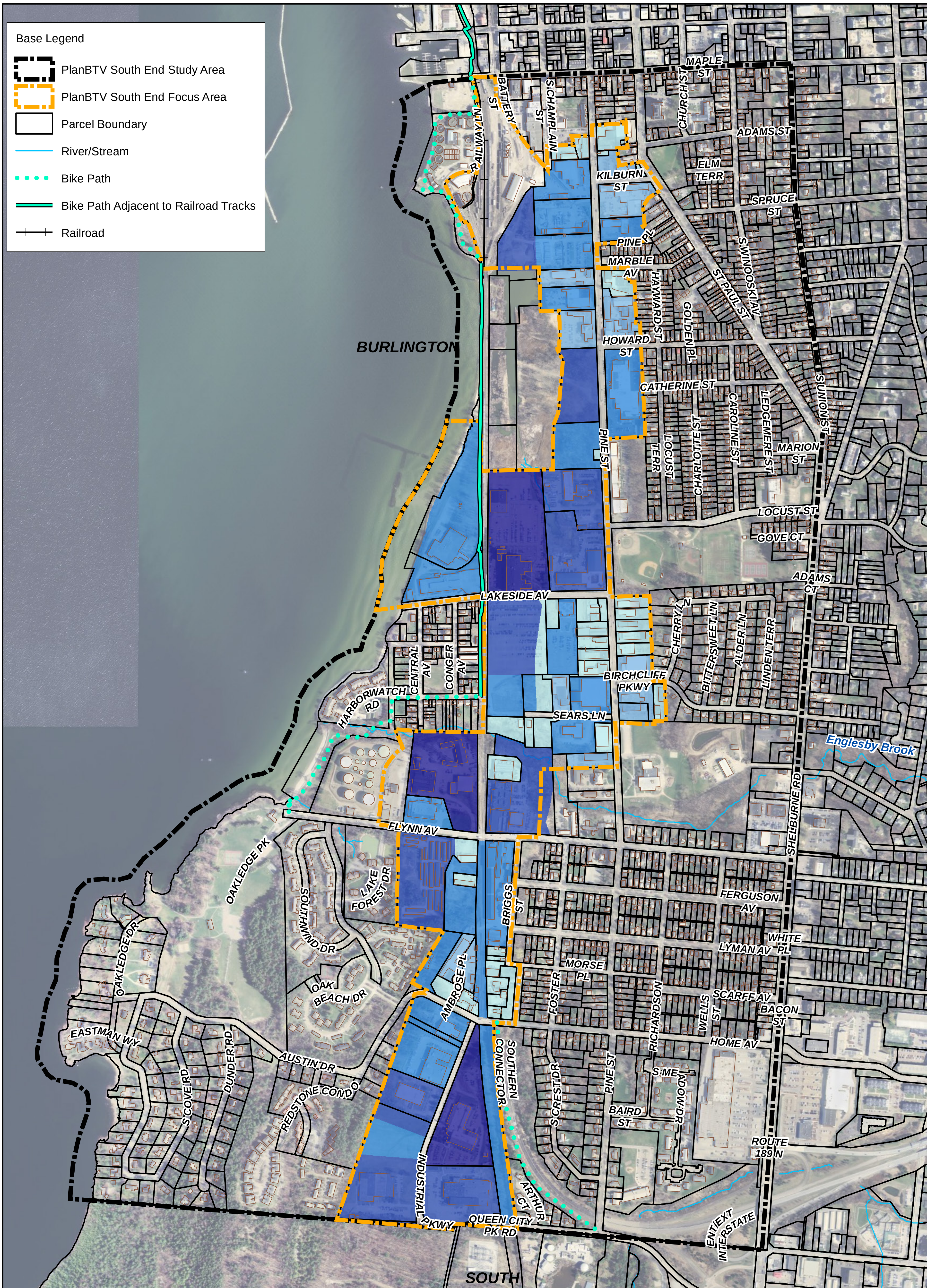


Legend

Building Footprint

Net Buildout Potential SQF

- Light Industrial Development

- <50,000
- 50,001 - 100,000
- 100,001 - 250,000
- 250,001 - 500,000
- 500,001 - 906,069

PlanBTV South End
Net Buildout Analysis
Burlington, VT

January 6, 2015

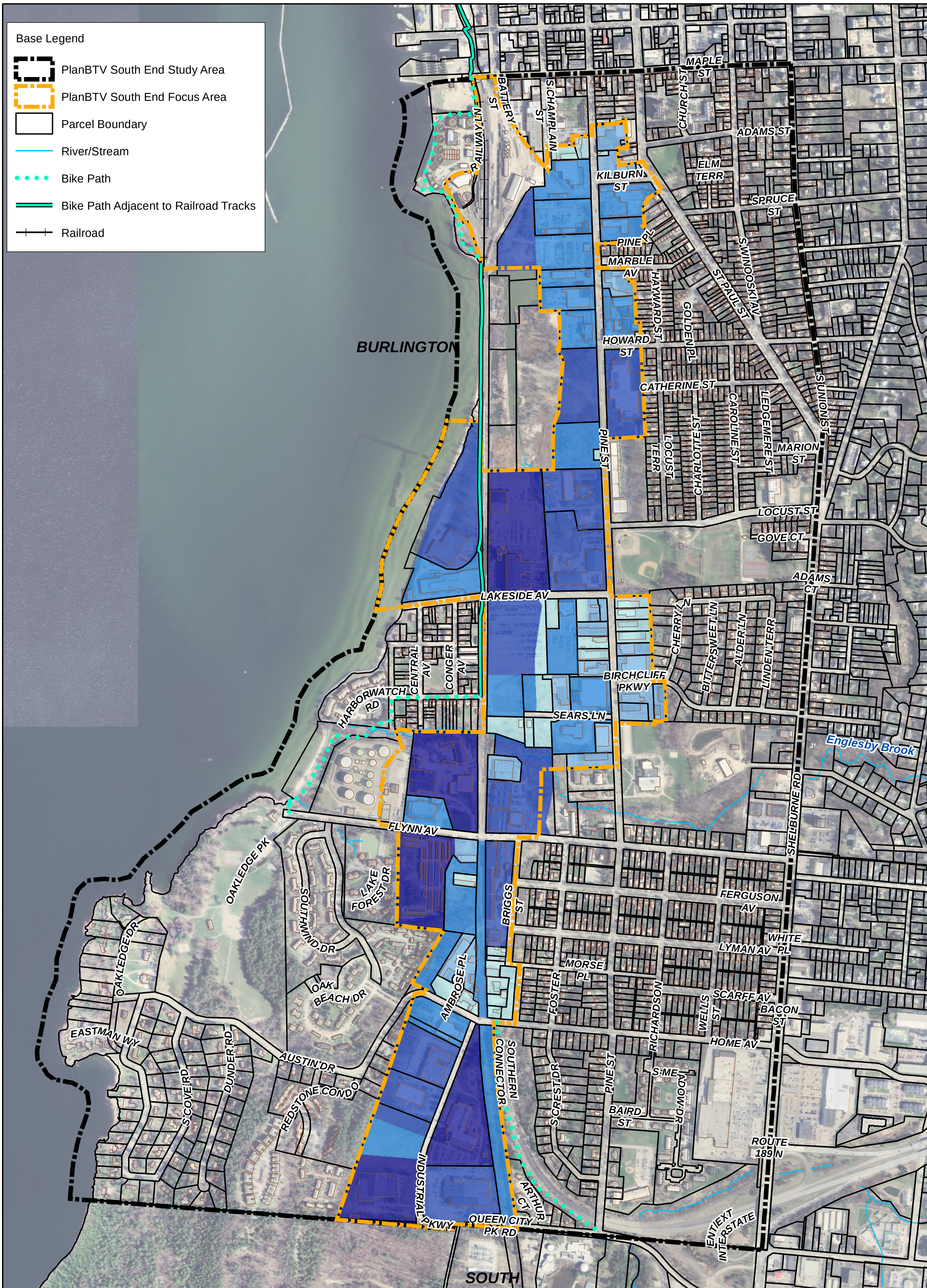
Parcel data provided by the City of Burlington (2014), Study Area from CCRPC (2014), Roads from VCGI (2008), Railroads from VTrans (2014), Imagery from ESRI

1 inch = 800 feet

0 400 800 1,600 Feet

Vanasse Hangen Brustlin, Inc.

planBTV South End



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Legend

Building Footprint

Maximum Buildout Potential SQF - Light Industrial Development

- <50,000
- 50,000 - 100,000
- 100,001 - 250,000
- 250,001 - 500,000
- >500,000

PlanBTV South End Maximum Buildout Potential Burlington, VT

January 6, 2015

Parcel data provided by the City of Burlington (2014), Study Area from CCRPC (2014), Roads from VCGI (2008), Railroads from VTrans (2014), Imagery from ESRI

1 inch = 800 feet

0 400 800 1,600 Feet

N

VHB Vanasse Hangen Brustlin, Inc.

planBTV South End

B Transportation

Contents:

B-1: CCTA Routes Map

B-2: South End Master Plan Study Area Parking Map

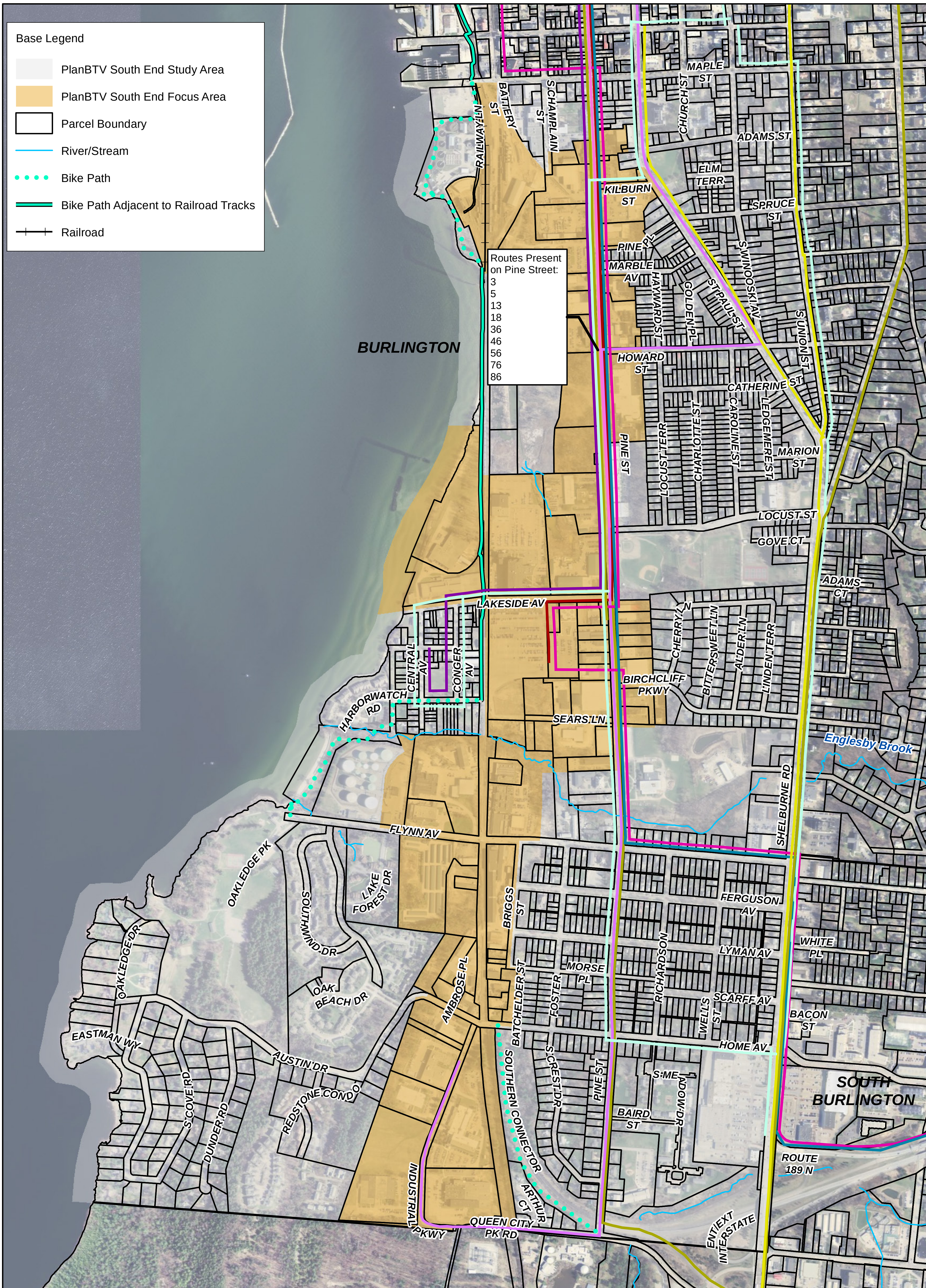
B-3: High Crash Sections (2008-2012) Map

B-4: Crash Summary (2009-2014) Map

B-5 - B-6: Pine Street Crash Report Summary Memorandum

B-7 - B-8: 2014 Weekday Network Diagrams

B-9 - B-60: Supplemental Traffic Information



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Legend

- Lakeside Commuter (Rt 3)
- Pine Street (Rt 5)
- Shelburne Road (Rt 6)
- Sunday Service (Rt 18)
- Jeffersonville Commuter (Rt 36)
- 116 Commuter (Rt 46)
- Milton Commuter (Rt 56)
- Middlebury LINK Express (Rt 76)
- Montpelier LINK Express (86)

PlanBTV South End
CCTA Routes
Burlington, VT

January, 5 2015

CCTA routes provided by CCRPC. 2014

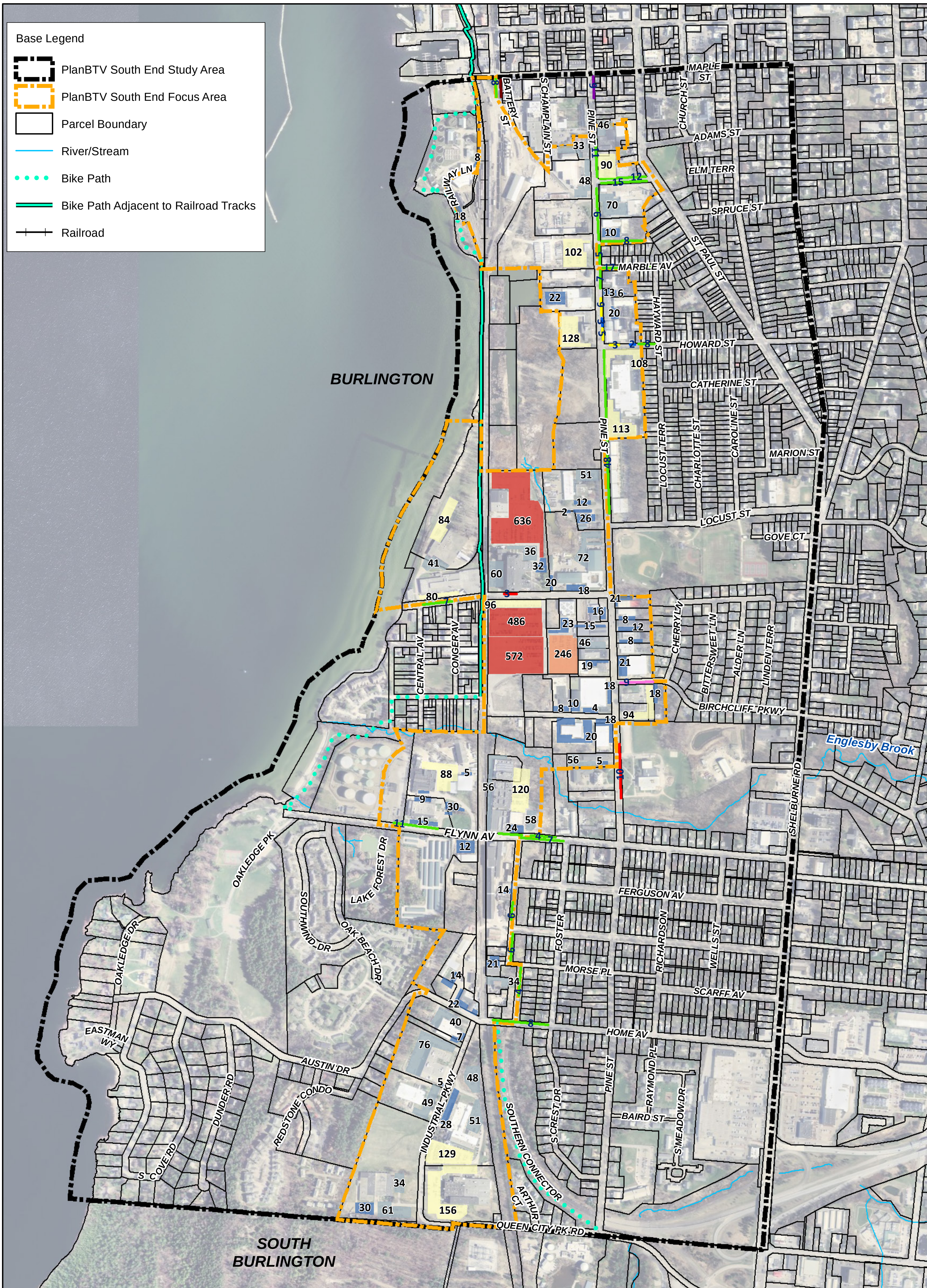
1 inch = 800 feet

0 400 800 1,600 Feet

N

VHB Vanasse Hangen Brustlin, Inc.

planBTV South End



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Legend

On-Street Parking	Off-Street Parking Spaces
1 Hour	2 - 32
15 Min	33 - 76
2 Hour	77 - 156
No Parking 8PM-2AM	157 - 246
No Parking M-F 6AM-6PM	247 - 636
Private	
Unrestricted	

PlanBTV South End
South End Master Plan
Study Area Parking Map
Burlington, VT

January 6, 2015

Parcel data provided by the City of Burlington (2014), Study Area from CCRPC (2014), Roads from VCGI (2008), Railroads from VTrans (2014), Imagery from ESRI

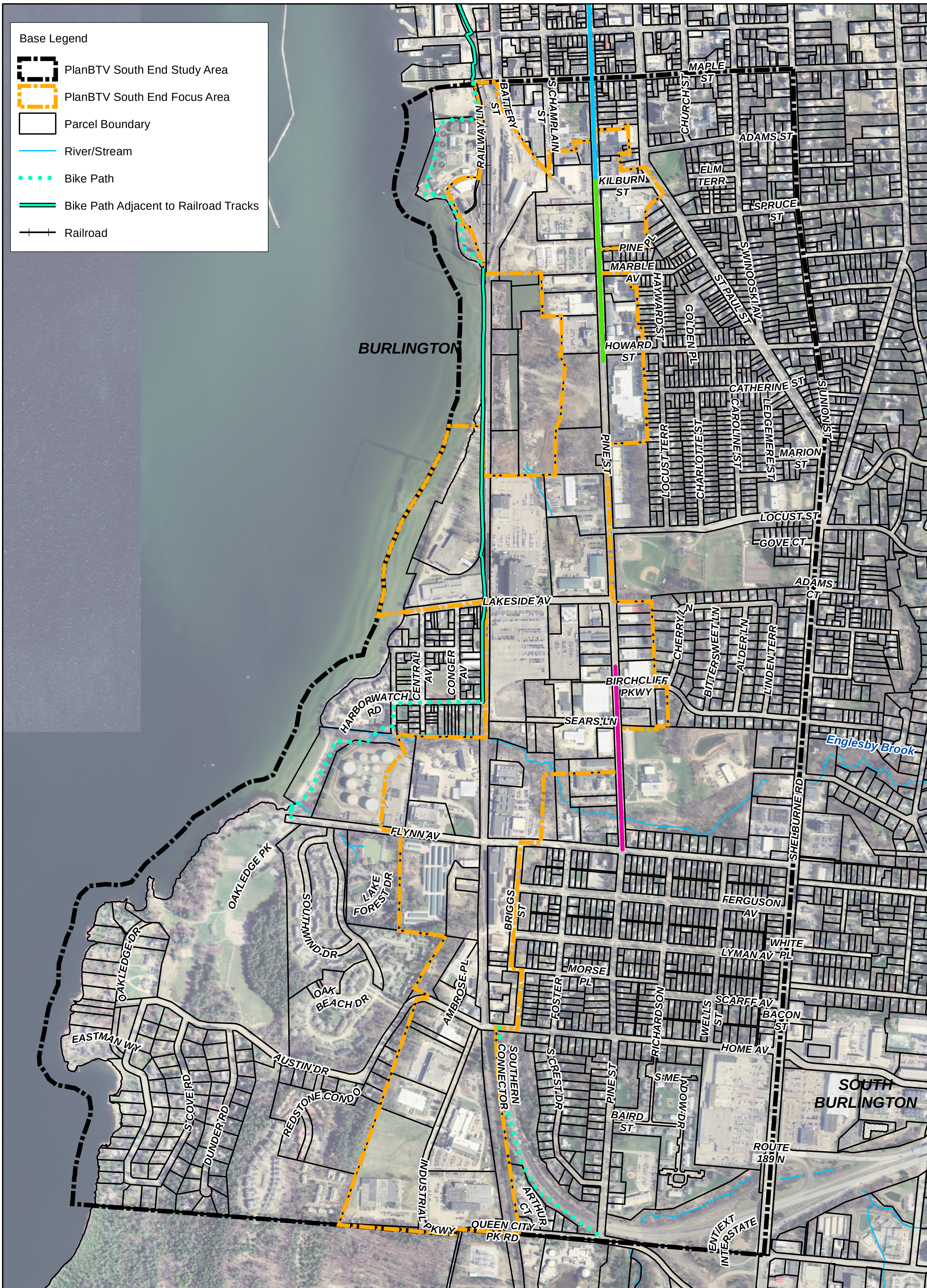
1 inch = 800 feet

0 400 800 1,600 Feet

N

Vanasse Hangen Brustlin, Inc.

plan BTV South End



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Legend

High Crash Section

- Mile Marker 0.0 to 0.3
- Mile Marker 0.8 to 1.1
- Mile Marker 1.1 to 1.4

PlanBTV South End
High Crash Sections (2008-2012)
Burlington, VT

January, 5 2015

High Crash Location Report 2008-2012
Source: VTrans

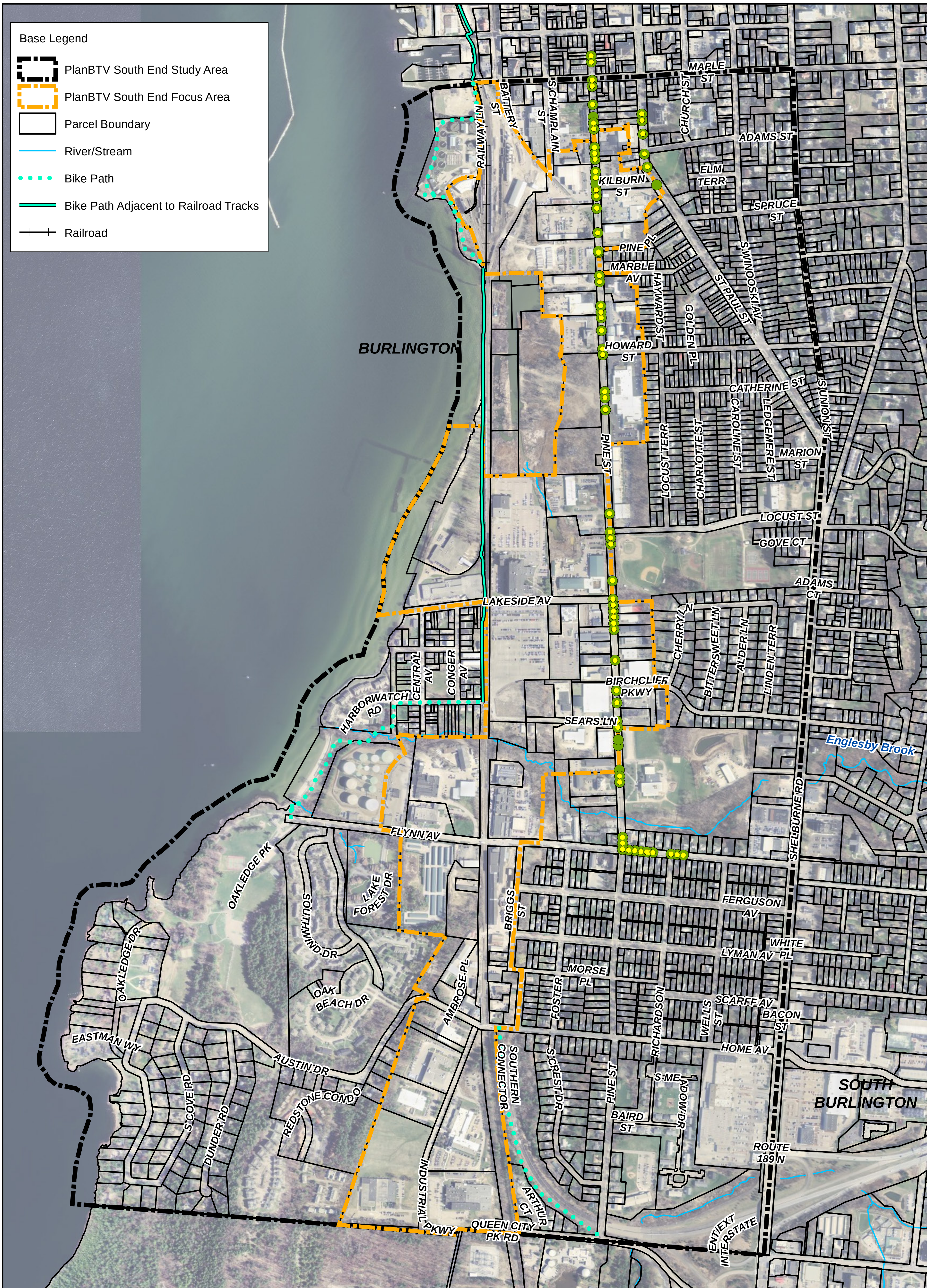
1 inch = 800 feet

0 400 800 1,600 Feet

N

Vanasse Hangen Brustlin, Inc.

plan BTV South End



Legend

- Crash Location- No Injuries (167 Crashes)
- Crash Location- Injuries Reported (36 Crashes)

PlanBTV South End
Crash Summary (2009- 2014)
Burlington, VT

January, 5 2015

Crash evaluations provided for the most recent 5-year periods from January 1, 2009 to October 22, 2014
Source: VTrans

1 inch = 800 feet

0 400 800 1,600 Feet

N

VHB
Vanasse Hangen Brustlin, Inc.

planBTV South End

Memorandum

To: Erin Parizo, P.E.
From: Lucy Gibson, P.E.
Date: January 13, 2015
Re: Pine Street Crash Report Summary

Introduction

Dubois & King obtained detailed crash reports from the Burlington Police Department for the Pine Street corridor between Main Street and Home Ave and surrounding study area. The crash reports detail the time and date of each crash, type of crash, its location, crash diagrams, and narratives from responding officers and those involved in each crash. The crash reports include four years of incidents: 2011, 2012, 2013, and 2014.

Analysis

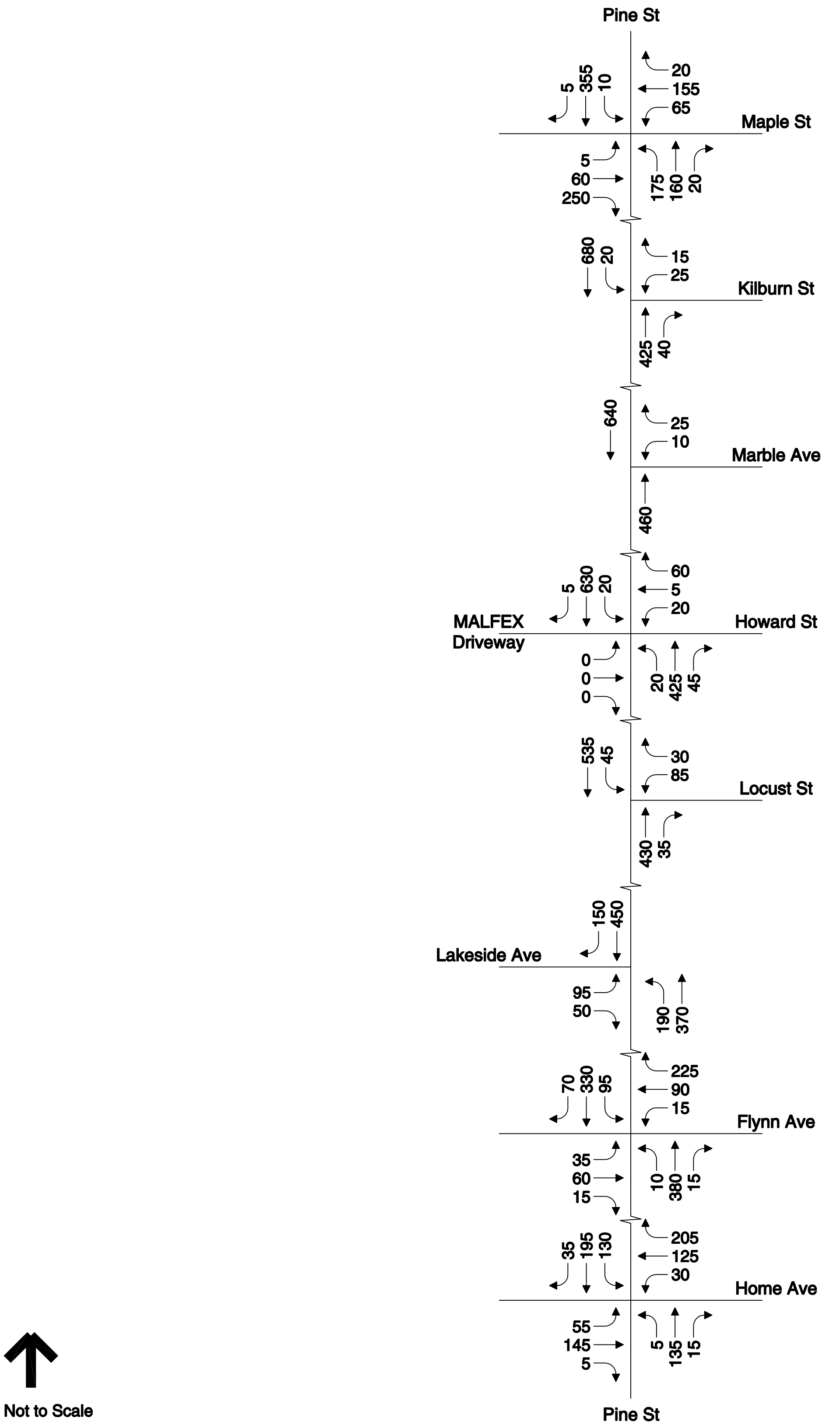
Analysis of the crash reports indicate that a total of 21 crashes involving bicycles and pedestrians occurred on the Pine Street corridor between Main and Home and surrounding study area from 2011-2014, 19 of which occurred on Pine Street, including 1 fatality. 10 crashes involved bicycles and 11 involved pedestrians. 5 of the 11 pedestrian crashes occurred as a result of vehicles striking pedestrians while in a crosswalk. 3 of the 10 bicycle crashes occurred when cyclists were traveling on the sidewalk. The area of Pine and Kilburn Streets had a total of 4 bike and pedestrian crashes, while Pine Street/Howard Street and Pine Street/Maple Street each had 3 crashes. The fatality occurred at the intersection of Pine Street and Flynn Avenue.

Conclusion

The traffic analysis conducted Champlain Parkway indicated that during 2006 through 2010, there were only 3 crashes on the entire Pine Street corridor that involved bicyclists or pedestrians. The recent increase in bicycle and pedestrian crash frequency over the past 4 years highlights the importance of addressing bicycle and pedestrian safety in the design of the Champlain Parkway. The Pine Street corridor has seen rapid redevelopment as it emerges as a hub of activity in the form of new shops, art studios, and work spaces. The redevelopment of Burlington's South End has coincided with increases in multi modal transportation, as walking and biking have become viable alternatives to driving in order to reach the area's many destinations. The table on the following page provides a summary of the crashes reviewed as part of this analysis.

Table 1: Pine Street Bicycle and Pedestrian Crashes from 2011 - 2014

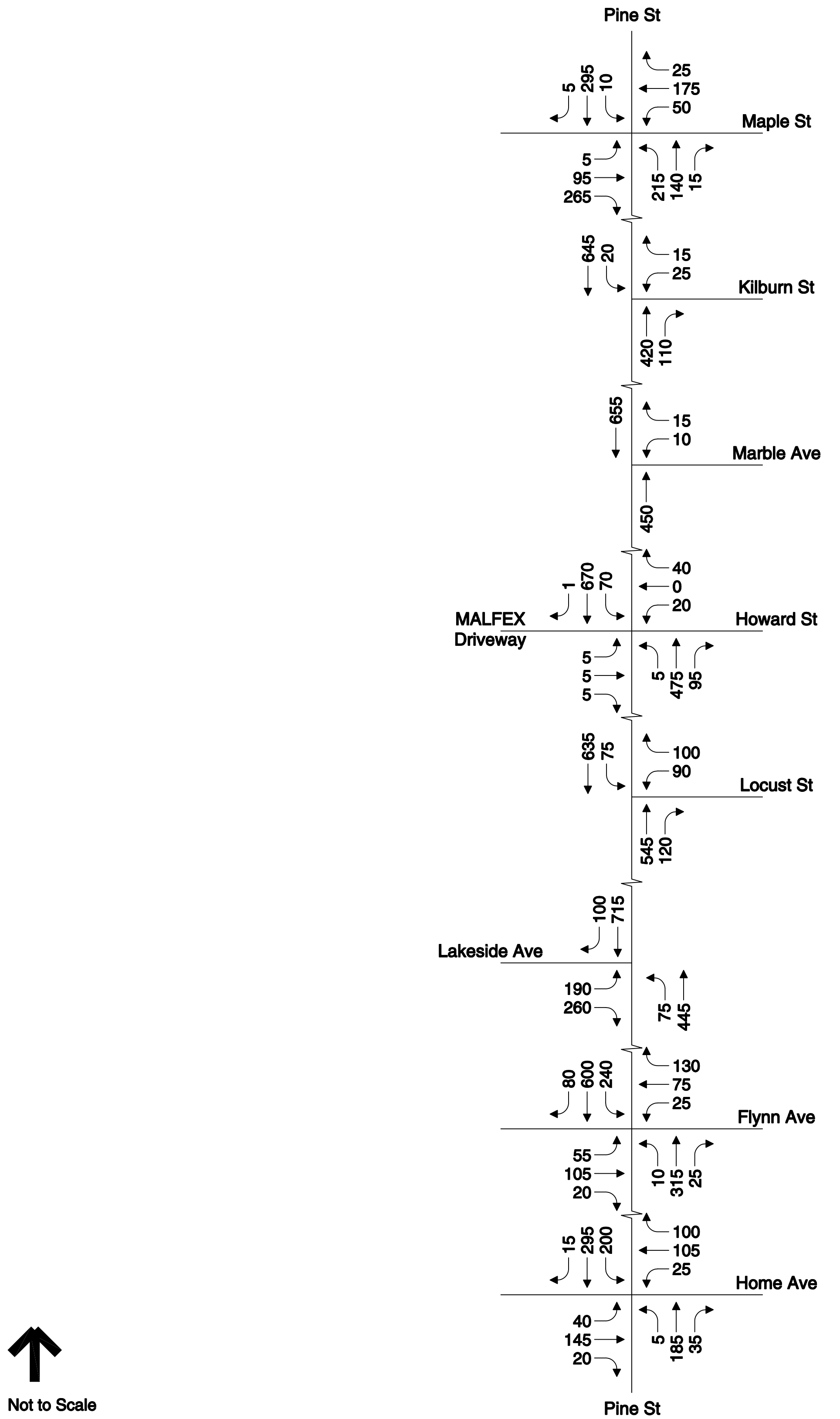
Date	Time	Incident #	Street Address	Officer	Bike	Ped	Car	Bus	In Street	In Crosswalk	Sidewalk	Driveway	Fatality
6/17/2012	16:49	12BU014680	Flynn Ave/Oakledge	Olofson		x	x		x				
12/30/2011	11:09	11BU30323	Home/Southcrest Dr	Matt White		x	x		x				
7/13/2012	9:47	12BU017226	Pine St/Birchcliff Pky	312:Wilkinson	x		x		x				
5/22/2012	18:09	12BU012192	Pine St/Flynn Ave	289:Badeau	x		x		x				
7/9/2011	18:37	03BU15220	Pine St/Flynn Ave	163: Glynn		x	x		x	x			x
7/12/2013	9:50	13BU017499	Pine St/Howard St	333:Weinisch	x		x		x				
12/20/2013	14:10	13BU033464	Pine St/Howard St	335:Spaulding		x	x		x	x			
9/25/2014	14:41	14BU027106	Pine St/Howard St	229:Hemond		x	x		x	x			
5/29/2012	11:39	12BU012831	Pine St/Kilburn St	147:Petralia	x		x					x	
5/23/2013	10:43	13BU012380	Pine St/Kilburn St	263:Wilson	x		x				x		
9/29/2014	18:57	14BU027612	Pine St/Kilburn St	226:Labrecque	x		x				x		
12/11/2012	13:22	12BU031330	Pine St/Kilburn St	228:Brodeur		x	x		x	x			
2/27/2014	18:09	14BU005092	Pine St/King St	319:Seller		x	x		x	x			
5/22/2013	16:41	13BU012288	Pine St/Lakeside Ave	313:Kahlig	x		x		x				
4/1/2014	17:45	14BU007836	Pine St/Lakeside Ave	263:Wilson		x	x		x				
6/10/2012	0:30	12BU013989	Pine St/Locust St	289:Badeau		x	x		x				
12/11/2013	8:07	13BU032738	Pine St/Locust St	1001:Online	x		x		x				
2/25/2014	18:15	14BU004610	Pine St/Maple St	319:Seller		x	x		x				
7/19/2012	13:13	12BU017842	Pine St/Maple St	254:Morris	x		x				x		
12/14/2012	14:39	12BU031589	Pine St/Maple St	262:White	x		x		x				
12/27/2011	18:27	11BU030130	Pine St/Pearl St	312:Wilkinson		x		x	x				



Vanasse Hangen Brustlin, Inc.

2014 Weekday Morning
Peak Hour Traffic Volumes

Figure 1



Vanasse Hangen Brustlin, Inc.

2014 Weekday Evening
Peak Hour (DHV) Traffic Volumes

Figure 2

ARTPLAN 2012 Conceptual Planning Analysis

Project Information

Analyst	VHB	**Arterial Name**	Pine Street	**Study Period**	**Dir Hr Demand Vol**
Date Prepared	10/15/2014 8:18:22 AM	**From**	Maple St	**Modal Analysis**	Multimodal
Agency	VHB	**To**	Home Ave	**Program**	ARTPLAN 2012
Area Type	Transitioning/Urban	**Peak Direction**	Southbound	**Version Date**	12/12/2012
Arterial Class	2				

File Name	\\vhb\proj\Vermont\57685.00 CCRPC\tech\Multi Modal LOS - HCS\Pine St 2014 AM.xap
User Notes	2014 AM Existing Conditions Pine Street Burlington, VT (South End)

Arterial Data

K	0.09	**PHF**	1	**Control Type**	Pretimed
D	0.57	**% Heavy Vehicles**	6	**Base Sat. Flow Rate**	1950

Automobile Intersection Data

Cross Street	Cycle Length	Thru g/C	Arr. Type	INT # Dir.Lanes	% Left Turns	% Right Turns	Left Turn Lanes	Left Turn Phasing	# Left Turn Lanes	LT Storage Length	Left g/C	Right Turn Lanes
Lakeside Ave	66	0.61	3	1	1	25	No	None	N/A	N/A	N/A	Yes
Flynn Ave	66	0.56	3	1	19	14	Yes	ProtPerm	1	150	0.25	No
Home Ave	60	0.4	3	1	36	10	No	None	N/A	N/A	N/A	No

Automobile Segment Data

Segment #	Length	AADT	Hourly Vol.	SEG # Dir.Lanes	Posted Speed	Free Flow Speed	Median Type	On-Street Parking	Parking Activity
1 (to Lakeside Ave)	4400	12000	650	1	25	30	None	No	N/A
2 (to Flynn Ave)	2150	9000	500	1	25	30	None	No	N/A
3 (to Home Ave)	1600	6000	350	1	25	30	None	No	N/A

Automobile LOS

Segment #	Thru Mvmt Flow Rate	Adj. Sat. Flow Rate	v/c	Control Delay	Int. Approach LOS	Queue Ratio	Speed (mph)	Segment LOS
1 (to Lakeside Ave)	488	851	0.939	20.97	C	0.00	23.59	B
2 (to Flynn Ave)	405	1317	0.549	9.91	A	0.23	23.86	B
3 (to Home Ave)	350	1052	0.832	30.73	C	0.00	15.95	D

Arterial Length	**1.5640**	**Weighted g/C**	**0.49**	**FFS Delay**	**75.44**	**Threshold Delay**	**0.00**	**Auto Speed**	**21.60**	**Auto LOS**	**C**

Automobile Service Volumes

Note: The maximum normally acceptable directional service volume for LOS E in Florida for this facility type and area type is 1000 veh/h/ln.

	A	B	C	D	E
Lanes	**Hourly Volume In Peak Direction**				
1					
2					
3					
4					
*					
Lanes	**Hourly Volume In Both Directions**				
2					
4					
6					
8					
*					
Lanes	**Annual Average Daily Traffic**				
2					
4					
6					
8					
*					

Multimodal Segment Data

Segment #	Outside Lane Width	Pave Cond	Pave Shldr /Bike Lane	Side Path	Side Path Separation	Side walk	Sidewalk Roadway Separation	Sidewalk Roadway Protective Barrier	Bus Freq	Passenger Load Factor	Amenities	Bus Stop Type
1 (to Lakeside Ave)	Typical	Typical	Yes	No	N/A	Yes	Typical	No	9	0.4	Fair	Typical
2 (to Flynn Ave)	Typical	Typical	Yes	No	N/A	Yes	Typical	No	8	0.4	Fair	Typical
3 (to Home Ave)	Typical	Typical	No	No	N/A	Yes	Wide	No	5	0.4	Fair	Typical

Pedestrian SubSegment Data

	% of Segment			Sidewalk			Separation			Barrier		
Segment #	1	2	3	1	2	3	1	2	3	1	2	3
1 (to Lakeside Ave)	32	45	23	Yes	No	Yes	Typical	N/A	Typical	No	No	No
2 (to Flynn Ave)	100			Yes			Typical			No		
3 (to Home Ave)	50	50		Yes	No		Wide	N/A		No	No	

Multimodal LOS

	Bicycle Street		Bicycle Sidepath		Pedestrian					Bus	
Link #	Score	LOS	Score	LOS	1	2	3	Score	LOS	Adj. Buses	LOS
1 (to Lakeside Ave)	3.16	C	N/A	N/A				3.64	D	10.80	A
2 (to Flynn Ave)	3.04	C	N/A	N/A				2.67	B	8.36	A
3 (to Home Ave)	4.56	E	N/A	N/A				3.51	D	4.75	B

Bicycle LOS	3.50	C	Pedestrian LOS	3.41	C	Bus LOS	8.96	A

MultiModal Service Volume Tables

Bicycle

	A	B	C	D	E
Lanes	**Hourly Volume In Peak Direction**				
1	0	0	0	0	0
2	0	0	0	0	0
3	0	0	0	0	0
4	0	0	0	0	0
*	0	0	0	0	0
Lanes	**Hourly Volume In Both Directions**				
2	N/A	N/A	N/A	N/A	N/A
4	N/A	N/A	N/A	N/A	N/A
6	N/A	N/A	N/A	N/A	N/A
8	N/A	N/A	N/A	N/A	N/A
*	N/A	N/A	N/A	N/A	N/A
Lanes	**Annual Average Daily Traffic**				
2	N/A	N/A	N/A	N/A	N/A
4	N/A	N/A	N/A	N/A	N/A
6	N/A	N/A	N/A	N/A	N/A
8	N/A	N/A	N/A	N/A	N/A
*	N/A	N/A	N/A	N/A	N/A

Pedestrian

	A	B	C	D	E
Lanes	**Hourly Volume In Peak Direction**				
1	0	0	0	0	0
2	0	0	0	0	0
3	0	0	0	0	0
4	0	0	0	0	0
*	0	0	0	0	0
Lanes	**Hourly Volume In Both Directions**				
2	N/A	N/A	N/A	N/A	N/A
4	N/A	N/A	N/A	N/A	N/A
6	N/A	N/A	N/A	N/A	N/A
8	N/A	N/A	N/A	N/A	N/A
*	N/A	N/A	N/A	N/A	N/A
Lanes	**Annual Average Daily Traffic**				
2	N/A	N/A	N/A	N/A	N/A
4	N/A	N/A	N/A	N/A	N/A
6	N/A	N/A	N/A	N/A	N/A
8	N/A	N/A	N/A	N/A	N/A
*	N/A	N/A	N/A	N/A	N/A

Bus

A	B	C	D	E
Buses Per Hour In Peak Direction				
Buses in Study Hour in Peak Direction (Daily)				

* Service Volumes for the specific facility being analyzed, based on # of lanes from the intersection and segment data screens.
** Cannot be achieved based on input data provided.
*** Not applicable for that level of service letter grade. See generalized tables notes for more details.
# Under the given conditions, left turn lane storage is highly likely to overflow. The number of directional thru lanes should be reduced accordingly.
Facility weighted g/C exceeds normally acceptable upper range (0.5); verify that g/C inputs are correct.
Intersection capacity (ies) are exceeded for the full hour; an operational level analysis tool is more appropriate for this situation.

ARTPLAN 2012 Conceptual Planning Analysis

Project Information

Analyst	VHB	**Arterial Name**	Pine Street	**Study Period**	**Dir Hr Demand Vol**
Date Prepared	10/15/2014 8:18:22 AM	**From**	Maple St	**Modal Analysis**	Multimodal
Agency	VHB	**To**	Home Ave	**Program**	ARTPLAN 2012
Area Type	Transitioning/Urban	**Peak Direction**	Southbound	**Version Date**	12/12/2012
Arterial Class	2				

File Name	\\vhb\proj\Vermont\57685.00 CCRPC\tech\Multi Modal LOS - HCS\Pine St 2014 PM.xap
User Notes	2014 PM Existing Conditions Pine Street Burlington, VT (South End)

Arterial Data

K	0.09	**PHF**	1	**Control Type**	CoordinatedActuated
D	0.57	**% Heavy Vehicles**	2	**Base Sat. Flow Rate**	1950

Automobile Intersection Data

Cross Street	Cycle Length	Thru g/C	Arr. Type	INT # Dir.Lanes	% Left Turns	% Right Turns	Left Turn Lanes	Left Turn Phasing	# Left Turn Lanes	LT Storage Length	Left g/C	Right Turn Lanes
Lakeside Ave	66	0.57	3	1	1	12	No	None	N/A	N/A	N/A	Yes
Flynn Ave	66	0.58	3	1	26	9	Yes	ProtPerm	1	150	0.25	No
Home Ave	60	0.4	3	1	39	3	No	None	N/A	N/A	N/A	No

Automobile Segment Data

Segment #	Length	AADT	Hourly Vol.	SEG # Dir.Lanes	Posted Speed	Free Flow Speed	Median Type	On-Street Parking	Parking Activity
1 (to Lakeside Ave)	4400	12000	700	1	25	30	None	No	N/A
2 (to Flynn Ave)	2150	9000	950	1	25	30	None	No	N/A
3 (to Home Ave)	1600	6000	550	1	25	30	None	No	N/A

Automobile LOS

Segment #	Thru Mvmt Flow Rate	Adj. Sat. Flow Rate	v/c	Control Delay	Int. Approach LOS	Queue Ratio	Speed (mph)	Segment LOS
1 (to Lakeside Ave)	616	1081	1.000	25.02	C	0.00	22.75	B
2 (to Flynn Ave)	703	1409	0.801	11.67	B	0.66	22.14	B
3 (to Home Ave)	550	1107	0.661	18.54	B	0.00	19.13	C

Arterial Length	**1.5640**	**Weighted g/C**	**0.49**	**FFS Delay**	**73.32**	**Threshold Delay**	**0.00**	**Auto Speed**	**21.78**	**Auto LOS**	**C**

Automobile Service Volumes

Note: The maximum normally acceptable directional service volume for LOS E in Florida for this facility type and area type is 900 veh/h/ln.

	A	B	C	D	E
Lanes	**Hourly Volume In Peak Direction**				
1	**	390	440	***	***
2	**	860	900	***	***
3	**	1330	***	***	***
4	**	1800	***	***	***
*	**	390	440	***	***
Lanes	**Hourly Volume In Both Directions**				
2	N/A	N/A	N/A	N/A	N/A
4	N/A	N/A	N/A	N/A	N/A
6	N/A	N/A	N/A	N/A	N/A
8	N/A	N/A	N/A	N/A	N/A
*	N/A	N/A	N/A	N/A	N/A
Lanes	**Annual Average Daily Traffic**				
2	N/A	N/A	N/A	N/A	N/A
4	N/A	N/A	N/A	N/A	N/A
6	N/A	N/A	N/A	N/A	N/A
8	N/A	N/A	N/A	N/A	N/A
*	N/A	N/A	N/A	N/A	N/A

Multimodal Segment Data

Segment #	Outside Lane Width	Pave Cond	Pave Shldr /Bike Lane	Side Path	Side Path Separation	Side walk	Sidewalk Roadway Separation	Sidewalk Roadway Protective Barrier	Bus Freq	Passenger Load Factor	Amenities	Bus Stop Type
1 (to Lakeside Ave)	Typical	Typical	Yes	No	N/A	Yes	Typical	No	8	0.4	Fair	Typical
2 (to Flynn Ave)	Typical	Typical	Yes	No	N/A	Yes	Typical	No	8	0.4	Fair	Typical
3 (to Home Ave)	Typical	Typical	No	No	N/A	Yes	Wide	No	5	0.4	Fair	Typical

Pedestrian SubSegment Data

	% of Segment			Sidewalk			Separation			Barrier		
Segment #	1	2	3	1	2	3	1	2	3	1	2	3
1 (to Lakeside Ave)	32	45	23	Yes	No	Yes	Typical	N/A	Typical	No	No	No
2 (to Flynn Ave)	100			Yes			Typical			No		
3 (to Home Ave)	50	50		Yes	No		Wide	N/A		No	No	

Multimodal LOS

	Bicycle Street		Bicycle Sidepath		Pedestrian					Bus	
Link #	Score	LOS	Score	LOS	1	2	3	Score	LOS	Adj. Buses	LOS
1 (to Lakeside Ave)	2.45	B	N/A	N/A				3.75	D	9.60	A
2 (to Flynn Ave)	2.55	B	N/A	N/A				3.66	D	8.40	A
3 (to Home Ave)	3.93	D	N/A	N/A				3.83	D	4.75	B
	Bicycle LOS	2.88	C		Pedestrian LOS			3.74	D	Bus LOS 8.32	A

MultiModal Service Volume Tables

Bicycle

	A	B	C	D	E
Lanes	**Hourly Volume In Peak Direction**				
1	160	360	1000	> 1000	***
2	230	710	2000	> 2000	***
3	350	1060	3000	> 3000	***
4	460	1420	4000	> 4000	***
*	160	360	1000	> 1000	***
Lanes	**Hourly Volume In Both Directions**				
2	N/A	N/A	N/A	N/A	N/A
4	N/A	N/A	N/A	N/A	N/A
6	N/A	N/A	N/A	N/A	N/A
8	N/A	N/A	N/A	N/A	N/A
*	N/A	N/A	N/A	N/A	N/A
Lanes	**Annual Average Daily Traffic**				
2	N/A	N/A	N/A	N/A	N/A
4	N/A	N/A	N/A	N/A	N/A
6	N/A	N/A	N/A	N/A	N/A
8	N/A	N/A	N/A	N/A	N/A
*	N/A	N/A	N/A	N/A	N/A

Pedestrian

	A	B	C	D	E
Lanes	**Hourly Volume In Peak Direction**				
1	70	240	600	940	1000
2	**	480	1200	1900	2000
3	**	720	1790	2850	3000
4	**	960	2390	3790	4000
*	70	240	600	940	1000
Lanes	**Hourly Volume In Both Directions**				
2	N/A	N/A	N/A	N/A	N/A
4	N/A	N/A	N/A	N/A	N/A
6	N/A	N/A	N/A	N/A	N/A
8	N/A	N/A	N/A	N/A	N/A
*	N/A	N/A	N/A	N/A	N/A
Lanes	**Annual Average Daily Traffic**				
2	N/A	N/A	N/A	N/A	N/A
4	N/A	N/A	N/A	N/A	N/A
6	N/A	N/A	N/A	N/A	N/A
8	N/A	N/A	N/A	N/A	N/A
*	N/A	N/A	N/A	N/A	N/A

Bus

A	B	C	D	E
Buses Per Hour In Peak Direction				
>= 5	>= 4	>= 3	>= 2	>= 1
Buses in Study Hour in Peak Direction (Daily)				

>= 4.78	>= 3.19	>= 2.39	>= 1.59	>= 0.80

*** Service Volumes for the specific facility being analyzed, based on # of lanes from the intersection and segment data screens.**
**** Cannot be achieved based on input data provided.**
***** Not applicable for that level of service letter grade. See generalized tables notes for more details.**
 # Under the given conditions, left turn lane storage is highly likely to overflow. The number of directional thru lanes should be reduced accordingly.
Facility weighted g/C exceeds normally acceptable upper range (0.5); verify that g/C inputs are correct.
Intersection capacity (ies) are exceeded for the full hour; an operational level analysis tool is more appropriate for this situation.

ARTPLAN 2012 Conceptual Planning Analysis

Project Information

Analyst	VHB	**Arterial Name**	Pine Street	**Study Period**	**Dir Hr Demand Vol**
Date Prepared	10/15/2014 8:18:22 AM	**From**	Home Ave	**Modal Analysis**	Multimodal
Agency	VHB	**To**	Maple St	**Program**	ARTPLAN 2012
Area Type	Transitioning/Urban	**Peak Direction**	Northbound	**Version Date**	12/12/2012
Arterial Class	2				

File Name	\\vhb\proj\Vermont\57685.00 CCRPC\tech\Multi Modal LOS - HCS\Pine St 2014 AM - NB.xap
User Notes	2014 AM Existing Conditions Pine Street - NORTHBOUND Burlington, VT (South End)

Arterial Data

K	0.09	**PHF**	1	**Control Type**	Pretimed
D	0.57	**% Heavy Vehicles**	6	**Base Sat. Flow Rate**	1950

Automobile Intersection Data

Cross Street	Cycle Length	Thru g/C	Arr. Type	INT # Dir.Lanes	% Left Turns	% Right Turns	Left Turn Lanes	Left Turn Phasing	# Left Turn Lanes	LT Storage Length	Left g/C	Right Turn Lanes
Flynn Ave	66	0.38	3	1	2	4	No	None	N/A	N/A	N/A	No
Lakeside Ave	66	0.61	3	1	34	1	Yes	Protected	1	125	0.25	No
Maple St	60	0.4	3	1	45	6	No	None	N/A	N/A	N/A	No

Automobile Segment Data

Segment #	Length	AADT	Hourly Vol.	SEG # Dir.Lanes	Posted Speed	Free Flow Speed	Median Type	On-Street Parking	Parking Activity
1 (to Flynn Ave)	4400	6000	400	1	25	30	None	Yes	Low
2 (to Lakeside Ave)	2150	7000	600	1	25	30	None	No	N/A
3 (to Maple St)	1600	9000	475	1	25	30	None	No	N/A

Automobile LOS

Segment #	Thru Mvmt Flow Rate	Adj. Sat. Flow Rate	v/c	Control Delay	Int. Approach LOS	Queue Ratio	Speed (mph)	Segment LOS
1 (to Flynn Ave)	400	1132	0.930	30.10	C	0.00	22.13	B
2 (to Lakeside Ave)	396	1417	0.458	7.41	A	0.69	24.63	B
3 (to Maple St)	475	1046	0.439	16.06	B	0.00	20.02	C

Arterial Length	**1.5640**	**Weighted g/C**	**0.44**	**FFS Delay**	**67.66**	**Threshold Delay**	**0.00**	**Auto Speed**	**22.26**	**Auto LOS**	**B**

Automobile Service Volumes

Note: The maximum normally acceptable directional service volume for LOS E in Florida for this facility type and area type is 1000 veh/h/ln.

	A	B	C	D	E
Lanes	**Hourly Volume In Peak Direction**				
1	**	320	420	***	***
2	**	750	840	***	***
3	**	1190	1260	***	***
4	**	1620	1680	***	***
*	**	320	420	***	***
Lanes	**Hourly Volume In Both Directions**				
2	N/A	N/A	N/A	N/A	N/A
4	N/A	N/A	N/A	N/A	N/A
6	N/A	N/A	N/A	N/A	N/A
8	N/A	N/A	N/A	N/A	N/A
*	N/A	N/A	N/A	N/A	N/A
Lanes	**Annual Average Daily Traffic**				
2	N/A	N/A	N/A	N/A	N/A
4	N/A	N/A	N/A	N/A	N/A
6	N/A	N/A	N/A	N/A	N/A
8	N/A	N/A	N/A	N/A	N/A
*	N/A	N/A	N/A	N/A	N/A

Multimodal Segment Data

Segment #	Outside Lane Width	Pave Cond	Pave Shldr /Bike Lane	Side Path	Side Path Separation	Side walk	Sidewalk Roadway Separation	Sidewalk Roadway Protective Barrier	Bus Freq	Passenger Load Factor	Amenities	Bus Stop Type
1 (to Flynn Ave)	Wide	Typical	No	No	N/A	Yes	Wide	No	5	0.4	Fair	Typical
2 (to Lakeside Ave)	Wide	Typical	No	No	N/A	Yes	Typical	No	8	0.4	Fair	Typical
3 (to Maple St)	Typical	Typical	No	No	N/A	Yes	Typical	No	9	0.4	Fair	Typical

Pedestrian SubSegment Data

	% of Segment			Sidewalk			Separation			Barrier		
Segment #	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**
1 (to Flynn Ave)	100			Yes			Wide			No		
2 (to Lakeside Ave)	100			Yes			Typical			No		
3 (to Maple St)	100			Yes			Typical			No		

Multimodal LOS

	Bicycle Street		Bicycle Sidepath		Pedestrian					Bus	
Link #	**Score**	**LOS**	**Score**	**LOS**	**1**	**2**	**3**	**Score**	**LOS**	**Adj. Buses**	**LOS**
1 (to Flynn Ave)	3.72	D	N/A	N/A				2.25	B	6.27	A
2 (to Lakeside Ave)	4.55	E	N/A	N/A				3.03	C	8.40	A
3 (to Maple St)	4.69	E	N/A	N/A				2.80	C	8.98	A
	Bicycle LOS	**4.18**	**D**				**Pedestrian LOS**	**2.61**	**B**	**Bus LOS**	**7.37** **A**

MultiModal Service Volume Tables

Bicycle

	A	B	C	D	E
Lanes	**Hourly Volume In Peak Direction**				
1	120	150	170	550	1000
2	150	180	340	1100	2000
3	160	260	500	1620	3000
4	**	350	660	2160	4000
*	120	150	170	550	1000
Lanes	**Hourly Volume In Both Directions**				
2	N/A	N/A	N/A	N/A	N/A
4	N/A	N/A	N/A	N/A	N/A
6	N/A	N/A	N/A	N/A	N/A
8	N/A	N/A	N/A	N/A	N/A
*	N/A	N/A	N/A	N/A	N/A
Lanes	**Annual Average Daily Traffic**				
2	N/A	N/A	N/A	N/A	N/A
4	N/A	N/A	N/A	N/A	N/A
6	N/A	N/A	N/A	N/A	N/A
8	N/A	N/A	N/A	N/A	N/A
*	N/A	N/A	N/A	N/A	N/A

Pedestrian

	A	B	C	D	E
Lanes	**Hourly Volume In Peak Direction**				
1	210	550	890	1000	> 1000
2	410	1090	1780	2000	> 2000
3	620	1640	2660	3000	> 3000
4	820	2180	3540	4000	> 4000
*	210	550	890	1000	> 1000
Lanes	**Hourly Volume In Both Directions**				
2	N/A	N/A	N/A	N/A	N/A
4	N/A	N/A	N/A	N/A	N/A
6	N/A	N/A	N/A	N/A	N/A
8	N/A	N/A	N/A	N/A	N/A
*	N/A	N/A	N/A	N/A	N/A
Lanes	**Annual Average Daily Traffic**				
2	N/A	N/A	N/A	N/A	N/A
4	N/A	N/A	N/A	N/A	N/A
6	N/A	N/A	N/A	N/A	N/A
8	N/A	N/A	N/A	N/A	N/A
*	N/A	N/A	N/A	N/A	N/A

Bus

A	B	C	D	E
Buses Per Hour In Peak Direction				
>= 6	>= 4	>= 3	>= 2	>= 1
Buses in Study Hour in Peak Direction (Daily)				

>= 5.66	>= 3.77	>= 2.83	>= 1.89	>= 0.95

*** Service Volumes for the specific facility being analyzed, based on # of lanes from the intersection and segment data screens.**
**** Cannot be achieved based on input data provided.**
***** Not applicable for that level of service letter grade. See generalized tables notes for more details.**
 # Under the given conditions, left turn lane storage is highly likely to overflow. The number of directional thru lanes should be reduced accordingly.
Facility weighted g/C exceeds normally acceptable upper range (0.5); verify that g/C inputs are correct.
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ARTPLAN 2012 Conceptual Planning Analysis

Project Information

Analyst	VHB	**Arterial Name**	Pine Street	**Study Period**	**Dir Hr Demand Vol**
Date Prepared	10/15/2014 8:18:22 AM	**From**	Home Ave	**Modal Analysis**	Multimodal
Agency	VHB	**To**	Maple St	**Program**	ARTPLAN 2012
Area Type	Transitioning/Urban	**Peak Direction**	Northbound	**Version Date**	12/12/2012
Arterial Class	2				

File Name	\\vhb\proj\Vermont\57685.00 CCRPC\tech\Multi Modal LOS - HCS\Pine St 2014 PM - NB.xap
User Notes	2014 PM Existing Conditions Pine Street - NORTHBOUND Burlington, VT (South End)

Arterial Data

K	0.09	**PHF**	1	**Control Type**	Pretimed
D	0.57	**% Heavy Vehicles**	3	**Base Sat. Flow Rate**	1950

Automobile Intersection Data

Cross Street	Cycle Length	Thru g/C	Arr. Type	INT # Dir.Lanes	% Left Turns	% Right Turns	Left Turn Lanes	Left Turn Phasing	# Left Turn Lanes	LT Storage Length	Left g/C	Right Turn Lanes
Flynn Ave	66	0.34	3	1	3	7	No	None	N/A	N/A	N/A	No
Lakeside Ave	66	0.57	3	1	14	1	Yes	Protected	1	125	0.25	No
Maple St	60	0.4	3	1	45	4	No	None	N/A	N/A	N/A	No

Automobile Segment Data

Segment #	Length	AADT	Hourly Vol.	SEG # Dir.Lanes	Posted Speed	Free Flow Speed	Median Type	On-Street Parking	Parking Activity
1 (to Flynn Ave)	4400	6000	350	1	25	30	None	Yes	Low
2 (to Lakeside Ave)	2150	7000	500	1	25	30	None	No	N/A
3 (to Maple St)	1600	9000	600	1	25	30	None	No	N/A

Automobile LOS

Segment #	Thru Mvmt Flow Rate	Adj. Sat. Flow Rate	v/c	Control Delay	Int. Approach LOS	Queue Ratio	Speed (mph)	Segment LOS
1 (to Flynn Ave)	350	1168	0.881	30.48	C	0.00	22.15	B
2 (to Lakeside Ave)	430	1473	0.512	9.41	A	0.21	24.05	B
3 (to Maple St)	600	1084	0.317	14.00	B	0.00	20.59	C

Arterial Length	**1.5640**	**Weighted g/C**	**0.41**	**FFS Delay**	**67.48**	**Threshold Delay**	**0.00**	**Auto Speed**	**22.28**	**Auto LOS**	**B**

Automobile Service Volumes

Note: The maximum normally acceptable directional service volume for LOS E in Florida for this facility type and area type is 1000 veh/h/ln.

	A	B	C	D	E
Lanes	**Hourly Volume In Peak Direction**				
1	**	320	420	***	***
2	**	750	840	***	***
3	**	1190	1260	***	***
4	**	1620	1680	***	***
*	**	320	420	***	***
Lanes	**Hourly Volume In Both Directions**				
2	N/A	N/A	N/A	N/A	N/A
4	N/A	N/A	N/A	N/A	N/A
6	N/A	N/A	N/A	N/A	N/A
8	N/A	N/A	N/A	N/A	N/A
*	N/A	N/A	N/A	N/A	N/A
Lanes	**Annual Average Daily Traffic**				
2	N/A	N/A	N/A	N/A	N/A
4	N/A	N/A	N/A	N/A	N/A
6	N/A	N/A	N/A	N/A	N/A
8	N/A	N/A	N/A	N/A	N/A
*	N/A	N/A	N/A	N/A	N/A

Multimodal Segment Data

Segment #	Outside Lane Width	Pave Cond	Pave Shldr /Bike Lane	Side Path	Side Path Separation	Side walk	Sidewalk Roadway Separation	Sidewalk Roadway Protective Barrier	Bus Freq	Passenger Load Factor	Amenities	Bus Stop Type
1 (to Flynn Ave)	Wide	Typical	No	No	N/A	Yes	Wide	No	5	0.4	Fair	Typical
2 (to Lakeside Ave)	Wide	Typical	No	No	N/A	Yes	Typical	No	8	0.4	Fair	Typical
3 (to Maple St)	Typical	Typical	No	No	N/A	Yes	Typical	No	8	0.4	Fair	Typical

Pedestrian SubSegment Data

	% of Segment			Sidewalk			Separation			Barrier		
Segment #	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**
1 (to Flynn Ave)	100			Yes			Wide			No		
2 (to Lakeside Ave)	100			Yes			Typical			No		
3 (to Maple St)	100			Yes			Typical			No		

Multimodal LOS

	Bicycle Street		Bicycle Sidepath		Pedestrian					Bus	
Link #	**Score**	**LOS**	**Score**	**LOS**	**1**	**2**	**3**	**Score**	**LOS**	**Adj. Buses**	**LOS**
1 (to Flynn Ave)	3.02	C	N/A	N/A				2.14	B	6.27	A
2 (to Lakeside Ave)	3.90	D	N/A	N/A				2.81	C	7.98	A
3 (to Maple St)	4.22	D	N/A	N/A				3.07	C	8.40	A

Bicycle LOS		Pedestrian LOS		Bus LOS	
3.56	D	2.56	B	7.14	A

MultiModal Service Volume Tables

Bicycle

	A	B	C	D	E
Lanes	**Hourly Volume In Peak Direction**				
1	120	150	170	550	1000
2	150	180	340	1100	2000
3	160	260	500	1620	3000
4	**	350	660	2160	4000
*	120	150	170	550	1000
Lanes	**Hourly Volume In Both Directions**				
2	N/A	N/A	N/A	N/A	N/A
4	N/A	N/A	N/A	N/A	N/A
6	N/A	N/A	N/A	N/A	N/A
8	N/A	N/A	N/A	N/A	N/A
*	N/A	N/A	N/A	N/A	N/A
Lanes	**Annual Average Daily Traffic**				
2	N/A	N/A	N/A	N/A	N/A
4	N/A	N/A	N/A	N/A	N/A
6	N/A	N/A	N/A	N/A	N/A
8	N/A	N/A	N/A	N/A	N/A
*	N/A	N/A	N/A	N/A	N/A

Pedestrian

	A	B	C	D	E
Lanes	**Hourly Volume In Peak Direction**				
1	210	550	890	1000	> 1000
2	410	1090	1780	2000	> 2000
3	620	1640	2660	3000	> 3000
4	820	2180	3540	4000	> 4000
*	210	550	890	1000	> 1000
Lanes	**Hourly Volume In Both Directions**				
2	N/A	N/A	N/A	N/A	N/A
4	N/A	N/A	N/A	N/A	N/A
6	N/A	N/A	N/A	N/A	N/A
8	N/A	N/A	N/A	N/A	N/A
*	N/A	N/A	N/A	N/A	N/A
Lanes	**Annual Average Daily Traffic**				
2	N/A	N/A	N/A	N/A	N/A
4	N/A	N/A	N/A	N/A	N/A
6	N/A	N/A	N/A	N/A	N/A
8	N/A	N/A	N/A	N/A	N/A
*	N/A	N/A	N/A	N/A	N/A

Bus

A	B	C	D	E
Buses Per Hour In Peak Direction				
>= 6	>= 4	>= 3	>= 2	>= 1
Buses in Study Hour in Peak Direction (Daily)				

>= 5.66	>= 3.77	>= 2.83	>= 1.89	>= 0.95

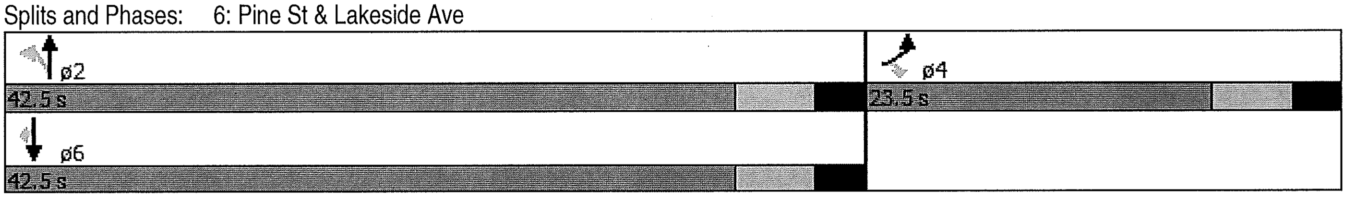
*** Service Volumes for the specific facility being analyzed, based on # of lanes from the intersection and segment data screens.**
**** Cannot be achieved based on input data provided.**
***** Not applicable for that level of service letter grade. See generalized tables notes for more details.**
 # Under the given conditions, left turn lane storage is highly likely to overflow. The number of directional thru lanes should be reduced accordingly.
Facility weighted g/C exceeds normally acceptable upper range (0.5); verify that g/C inputs are correct.
Intersection capacity (ies) are exceeded for the full hour; an operational level analysis tool is more appropriate for this situation.

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↰	↱	↰	↑	↑	↱
Volume (vph)	95	50	190	370	450	150
Lane Group Flow (vph)	95	50	190	370	450	150
Turn Type	Prot	Perm	Perm	NA	NA	Perm
Protected Phases	4			2	6	
Permitted Phases		4	2			6
Detector Phase	4	4	2	2	6	6
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	23.5	23.5	23.5	23.5	32.5	32.5
Total Split (s)	23.5	23.5	42.5	42.5	42.5	42.5
Total Split (%)	35.6%	35.6%	64.4%	64.4%	64.4%	64.4%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.5	2.5	2.5	2.5	2.5	2.5
Lost Time Adjust (s)	-2.5	-2.5	-2.5	-2.5	-2.5	-2.5
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	None	None	Min	Min	Min	Min
v/c Ratio	0.22	0.12	0.35	0.32	0.41	0.16
Control Delay	15.4	5.8	8.7	6.6	7.6	1.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	15.4	5.8	8.7	6.6	7.6	1.9
Queue Length 50th (ft)	18	0	21	41	53	0
Queue Length 95th (ft)	56	20	81	119	157	20
Internal Link Dist (ft)	985			2066	512	
Turn Bay Length (ft)	75		150			150
Base Capacity (vph)	771	721	709	1518	1421	1188
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.12	0.07	0.27	0.24	0.32	0.13

Intersection Summary

Cycle Length: 66
Actuated Cycle Length: 44.5
Natural Cycle: 60
Control Type: Actuated-Uncoordinated

Splits and Phases: 6: Pine St & Lakeside Ave



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↰	↱	↰	↑	↑	↱
Volume (vph)	95	50	190	370	450	150
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	12	13	11	11	11	11
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	0.98	1.00	1.00	1.00	0.97
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1656	1494	1692	1783	1670	1376
Flt Permitted	0.95	1.00	0.47	1.00	1.00	1.00
Satd. Flow (perm)	1656	1494	833	1783	1670	1376
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	95	50	190	370	450	150
RTOR Reduction (vph)	0	39	0	0	0	58
Lane Group Flow (vph)	95	11	190	370	450	92
Confl. Peds. (#/hr)	12	3	3			12
Heavy Vehicles (%)	9%	9%	3%	3%	10%	10%
Turn Type	Prot	Perm	Perm	NA	NA	Perm
Protected Phases	4			2	6	
Permitted Phases		4	2			6
Actuated Green, G (s)	7.3	7.3	25.4	25.4	25.4	25.4
Effective Green, g (s)	9.8	9.8	27.9	27.9	27.9	27.9
Actuated g/C Ratio	0.21	0.21	0.61	0.61	0.61	0.61
Clearance Time (s)	6.5	6.5	6.5	6.5	6.5	6.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	355	320	508	1088	1019	840
v/s Ratio Prot	c0.06			0.21	c0.27	
v/s Ratio Perm		0.01	0.23			0.07
v/c Ratio	0.27	0.03	0.37	0.34	0.44	0.11
Uniform Delay, d1	15.0	14.2	4.5	4.4	4.7	3.7
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.4	0.0	0.5	0.2	0.3	0.1
Delay (s)	15.4	14.2	5.0	4.6	5.1	3.8
Level of Service	B	B	A	A	A	A
Approach Delay (s)	15.0			4.7	4.7	
Approach LOS	B			A	A	

Intersection Summary			
HCM 2000 Control Delay	5.9	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.40		
Actuated Cycle Length (s)	45.7	Sum of lost time (s)	8.0
Intersection Capacity Utilization	50.3%	ICU Level of Service	A
Analysis Period (min)	15		

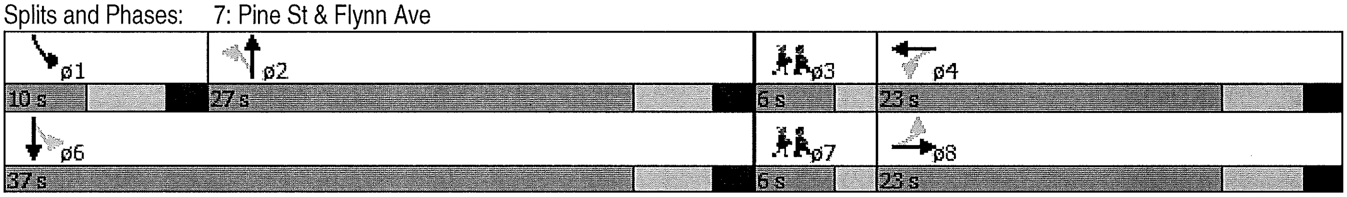
c Critical Lane Group

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	ø3	ø7
Lane Configurations										
Volume (vph)	35	60	15	90	10	380	95	330		
Lane Group Flow (vph)	0	110	0	330	0	405	95	420		
Turn Type	Perm	NA	Perm	NA	Perm	NA	pm+pt	NA		
Protected Phases		8		4		2	1	6	3	7
Permitted Phases	8		4		2		6			
Detector Phase	8	8	4	4	2	2	1	6		
Switch Phase										
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	2.0	2.0
Minimum Split (s)	18.0	18.0	18.0	18.0	23.0	23.0	10.0	23.0	6.0	6.0
Total Split (s)	23.0	23.0	23.0	23.0	27.0	27.0	10.0	37.0	6.0	6.0
Total Split (%)	34.8%	34.8%	34.8%	34.8%	40.9%	40.9%	15.2%	56.1%	9%	9%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	2.0	2.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	0.0	0.0
Lost Time Adjust (s)		-2.0		-2.0		-2.0	-2.0	-2.0		
Total Lost Time (s)		4.0		4.0		4.0	4.0	4.0		
Lead/Lag	Lag	Lag	Lag	Lag	Lag	Lag	Lead		Lead	Lead
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes	Yes
Recall Mode	None	None	None	None	Min	Min	None	Min	None	None
v/c Ratio		0.32		0.64		0.58	0.20	0.46		
Control Delay		16.9		15.2		17.3	7.0	8.6		
Queue Delay		0.0		0.0		0.0	0.0	0.0		
Total Delay		16.9		15.2		17.3	7.0	8.6		
Queue Length 50th (ft)		22		40		94	11	58		
Queue Length 95th (ft)		62		120		189	33	132		
Internal Link Dist (ft)		1097		1411		1562		2066		
Turn Bay Length (ft)							150			
Base Capacity (vph)		502		685		942	478	1192		
Starvation Cap Reductn		0		0		0	0	0		
Spillback Cap Reductn		0		0		0	0	0		
Storage Cap Reductn		0		0		0	0	0		
Reduced v/c Ratio		0.22		0.48		0.43	0.20	0.35		

Intersection Summary

Cycle Length: 66
Actuated Cycle Length: 48.3
Natural Cycle: 60
Control Type: Actuated-Uncoordinated

Splits and Phases: 7: Pine St & Flynn Ave



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	35	60	15	15	90	225	10	380	15	95	330	90
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0		4.0	4.0	
Lane Util. Factor		1.00			1.00			1.00		1.00	1.00	
Frpb, ped/bikes		1.00			0.97			1.00		1.00	0.99	
Flpb, ped/bikes		1.00			1.00			1.00		1.00	1.00	
Frt		0.98			0.91			0.99		1.00	0.97	
Flt Protected		0.98			1.00			1.00		0.95	1.00	
Satd. Flow (prot)		1412			1415			1849		1665	1687	
Flt Permitted		0.81			0.98			0.99		0.36	1.00	
Satd. Flow (perm)		1164			1396			1825		632	1687	
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)	35	60	15	15	90	225	10	380	15	95	330	90
RTOR Reduction (vph)	0	9	0	0	118	0	0	2	0	0	13	0
Lane Group Flow (vph)	0	101	0	0	212	0	0	403	0	95	407	0
Confl. Peds. (#/hr)	10		5	7		12	5		7	12		10
Heavy Vehicles (%)	13%	13%	13%	3%	3%	3%	2%	2%	2%	6%	6%	6%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	5	5	5
Parking (#/hr)	5	5	5	5	5	5						
Turn Type	Perm	NA		Perm	NA		Perm	NA		pm+pt	NA	
Protected Phases		8			4			2		1	6	
Permitted Phases	8			4			2			6		
Actuated Green, G (s)		11.6			11.6			16.3		25.2	25.2	
Effective Green, g (s)		13.6			13.6			18.3		27.2	27.2	
Actuated g/C Ratio		0.28			0.28			0.38		0.56	0.56	
Clearance Time (s)		6.0			6.0			6.0		6.0	6.0	
Vehicle Extension (s)		3.0			3.0			3.0		3.0	3.0	
Lane Grp Cap (vph)		324			389			684		455	940	
v/s Ratio Prot										0.02	c0.24	
v/s Ratio Perm		0.09			c0.15			c0.22		0.10		
v/c Ratio		0.31			0.54			0.59		0.21	0.43	
Uniform Delay, d1		13.9			15.0			12.2		6.4	6.3	
Progression Factor		1.00			1.00			1.00		1.00	1.00	
Incremental Delay, d2		0.6			1.6			1.3		0.2	0.3	
Delay (s)		14.5			16.5			13.5		6.6	6.6	
Level of Service		B			B			B		A	A	
Approach Delay (s)		14.5			16.5			13.5			6.6	
Approach LOS		B			B			B			A	

Intersection Summary			
HCM 2000 Control Delay	11.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	48.8	Sum of lost time (s)	14.0
Intersection Capacity Utilization	75.2%	ICU Level of Service	D
Analysis Period (min)	15		

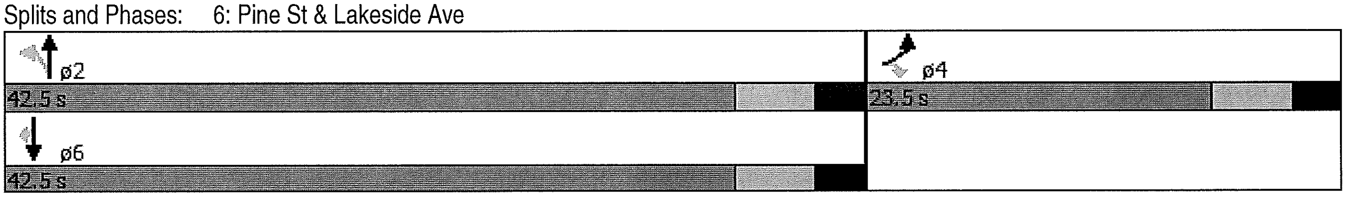
c Critical Lane Group

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↰	↱	↰	↑	↑	↱
Volume (vph)	190	260	75	445	715	100
Lane Group Flow (vph)	190	260	75	445	715	100
Turn Type	Prot	Perm	Perm	NA	NA	Perm
Protected Phases	4			2	6	
Permitted Phases		4	2			6
Detector Phase	4	4	2	2	6	6
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	23.5	23.5	23.5	23.5	32.5	32.5
Total Split (s)	23.5	23.5	42.5	42.5	42.5	42.5
Total Split (%)	35.6%	35.6%	64.4%	64.4%	64.4%	64.4%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.5	2.5	2.5	2.5	2.5	2.5
Lost Time Adjust (s)	-2.5	-2.5	-2.5	-2.5	-2.5	-2.5
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	None	None	Min	Min	Min	Min
v/c Ratio	0.40	0.44	0.30	0.45	0.70	0.11
Control Delay	19.6	7.6	10.1	8.4	12.6	1.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	19.6	7.6	10.1	8.4	12.6	1.9
Queue Length 50th (ft)	45	10	10	63	126	0
Queue Length 95th (ft)	110	63	38	147	288	16
Internal Link Dist (ft)	985			2066	512	
Turn Bay Length (ft)	75		150			150
Base Capacity (vph)	717	774	349	1384	1424	1199
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.26	0.34	0.21	0.32	0.50	0.08

Intersection Summary

Cycle Length: 66
Actuated Cycle Length: 50.9
Natural Cycle: 60
Control Type: Actuated-Uncoordinated

Splits and Phases: 6: Pine St & Lakeside Ave



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↰	↱	↰	↑	↑	↱
Volume (vph)	190	260	75	445	715	100
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	12	13	11	11	11	11
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	0.98	1.00	1.00	1.00	0.97
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1787	1612	1676	1766	1818	1506
Flt Permitted	0.95	1.00	0.25	1.00	1.00	1.00
Satd. Flow (perm)	1787	1612	447	1766	1818	1506
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	190	260	75	445	715	100
RTOR Reduction (vph)	0	155	0	0	0	43
Lane Group Flow (vph)	190	105	75	445	715	57
Confl. Peds. (#/hr)	6	3	3			6
Heavy Vehicles (%)	1%	1%	4%	4%	1%	1%
Turn Type	Prot	Perm	Perm	NA	NA	Perm
Protected Phases	4			2	6	
Permitted Phases		4	2			6
Actuated Green, G (s)	11.1	11.1	26.2	26.2	26.2	26.2
Effective Green, g (s)	13.6	13.6	28.7	28.7	28.7	28.7
Actuated g/C Ratio	0.27	0.27	0.57	0.57	0.57	0.57
Clearance Time (s)	6.5	6.5	6.5	6.5	6.5	6.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	483	435	255	1007	1037	859
v/s Ratio Prot	c0.11			0.25	c0.39	
v/s Ratio Perm		0.06	0.17			0.04
v/c Ratio	0.39	0.24	0.29	0.44	0.69	0.07
Uniform Delay, d1	15.0	14.3	5.6	6.2	7.6	4.8
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.5	0.3	0.6	0.3	1.9	0.0
Delay (s)	15.5	14.6	6.2	6.5	9.6	4.9
Level of Service	B	B	A	A	A	A
Approach Delay (s)	15.0			6.5	9.0	
Approach LOS	B			A	A	

Intersection Summary			
HCM 2000 Control Delay	9.8	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.59		
Actuated Cycle Length (s)	50.3	Sum of lost time (s)	8.0
Intersection Capacity Utilization	62.7%	ICU Level of Service	B
Analysis Period (min)	15		

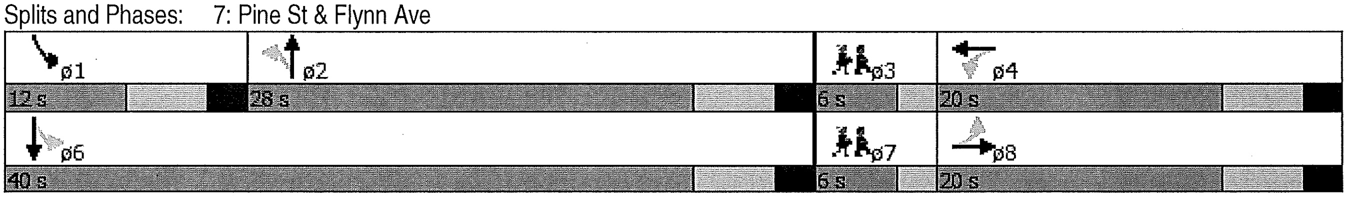
c Critical Lane Group

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	ø3	ø7
Lane Configurations										
Volume (vph)	55	105	25	75	10	315	240	600		
Lane Group Flow (vph)	0	180	0	230	0	350	240	680		
Turn Type	Perm	NA	Perm	NA	Perm	NA	pm+pt	NA		
Protected Phases		8		4		2	1	6	3	7
Permitted Phases	8		4		2		6			
Detector Phase	8	8	4	4	2	2	1	6		
Switch Phase										
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	2.0	4.0
Minimum Split (s)	18.0	18.0	18.0	18.0	23.0	23.0	10.0	23.0	6.0	6.0
Total Split (s)	20.0	20.0	20.0	20.0	28.0	28.0	12.0	40.0	6.0	6.0
Total Split (%)	30.3%	30.3%	30.3%	30.3%	42.4%	42.4%	18.2%	60.6%	9%	9%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	2.0	2.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	0.0	0.0
Lost Time Adjust (s)		-2.0		-2.0		-2.0	-2.0	-2.0		
Total Lost Time (s)		4.0		4.0		4.0	4.0	4.0		
Lead/Lag	Lag	Lag	Lag	Lag	Lag	Lag	Lead		Lead	Lead
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes	Yes
Recall Mode	None	None	None	None	Min	Min	None	Min	None	None
v/c Ratio		0.51		0.57		0.58	0.43	0.66		
Control Delay		22.1		16.9		18.2	8.1	11.2		
Queue Delay		0.0		0.0		0.0	0.0	0.0		
Total Delay		22.1		16.9		18.2	8.1	11.2		
Queue Length 50th (ft)		43		33		83	31	120		
Queue Length 95th (ft)		106		102		155	64	229		
Internal Link Dist (ft)		1097		1411		1562		2066		
Turn Bay Length (ft)							150			
Base Capacity (vph)		433		481		860	558	1292		
Starvation Cap Reductn		0		0		0	0	0		
Spillback Cap Reductn		0		0		0	0	0		
Storage Cap Reductn		0		0		0	0	0		
Reduced v/c Ratio		0.42		0.48		0.41	0.43	0.53		

Intersection Summary

Cycle Length: 66
Actuated Cycle Length: 50.7
Natural Cycle: 60
Control Type: Actuated-Uncoordinated

Splits and Phases: 7: Pine St & Flynn Ave



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣		↰	↱	
Volume (vph)	55	105	20	25	75	130	10	315	25	240	600	80
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0		4.0	4.0	
Lane Util. Factor		1.00			1.00			1.00		1.00	1.00	
Frpb, ped/bikes		0.99			0.96			1.00		1.00	0.99	
Flpb, ped/bikes		0.99			1.00			1.00		0.99	1.00	
Frt		0.98			0.92			0.99		1.00	0.98	
Flt Protected		0.98			0.99			1.00		0.95	1.00	
Satd. Flow (prot)		1557			1367			1819		1725	1779	
Flt Permitted		0.84			0.95			0.97		0.37	1.00	
Satd. Flow (perm)		1328			1306			1774		679	1779	
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)	55	105	20	25	75	130	10	315	25	240	600	80
RTOR Reduction (vph)	0	7	0	0	69	0	0	5	0	0	7	0
Lane Group Flow (vph)	0	173	0	0	161	0	0	345	0	240	673	0
Confl. Peds. (#/hr)	26		14	11		23	14		11	23		26
Heavy Vehicles (%)	2%	2%	2%	7%	7%	7%	3%	3%	3%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	5	5	5
Parking (#/hr)	5	5	5	5	5	5						
Turn Type	Perm	NA		Perm	NA		Perm	NA		pm+pt	NA	
Protected Phases		8			4			2		1	6	
Permitted Phases	8			4			2			6		
Actuated Green, G (s)		11.2			11.2			15.2		27.3	27.3	
Effective Green, g (s)		13.2			13.2			17.2		29.3	29.3	
Actuated g/C Ratio		0.26			0.26			0.34		0.58	0.58	
Clearance Time (s)		6.0			6.0			6.0		6.0	6.0	
Vehicle Extension (s)		3.0			3.0			3.0		3.0	3.0	
Lane Grp Cap (vph)		347			341			604		561	1032	
v/s Ratio Prot										0.07	c0.38	
v/s Ratio Perm		c0.13			0.12			0.19		0.18		
v/c Ratio		0.50			0.47			0.57		0.43	0.65	
Uniform Delay, d1		15.8			15.7			13.6		6.5	7.2	
Progression Factor		1.00			1.00			1.00		1.00	1.00	
Incremental Delay, d2		1.1			1.0			1.3		0.5	1.5	
Delay (s)		17.0			16.7			14.9		7.1	8.7	
Level of Service		B			B			B		A	A	
Approach Delay (s)		17.0			16.7			14.9			8.2	
Approach LOS		B			B			B			A	

Intersection Summary			
HCM 2000 Control Delay	11.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	50.5	Sum of lost time (s)	14.0
Intersection Capacity Utilization	86.5%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
1: Pine St & Maple St

9/24/2014

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			✥	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	5	60	250	65	155	20	175	160	20	10	355	5
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	5	60	250	65	155	20	175	160	20	10	355	5

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	315	240	355	370
Volume Left (vph)	5	65	175	10
Volume Right (vph)	250	20	20	5
Hadj (s)	-0.44	0.04	0.22	0.10
Departure Headway (s)	6.8	7.5	7.2	7.0
Degree Utilization, x	0.60	0.50	0.71	0.72
Capacity (veh/h)	472	416	464	479
Control Delay (s)	19.5	17.8	25.8	26.4
Approach Delay (s)	19.5	17.8	25.8	26.4
Approach LOS	C	C	D	D

Intersection Summary			
Delay	22.9		
Level of Service	C		
Intersection Capacity Utilization	86.3%	ICU Level of Service	E
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	25	15	425	40	20	680
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	25	15	425	40	20	680
Pedestrians	52		52			46
Lane Width (ft)	12.0		12.0			12.0
Walking Speed (ft/s)	4.0		4.0			4.0
Percent Blockage	4		4			4
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1269	543			517	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1269	543			517	
tC, single (s)	6.5	6.4			4.2	
tC, 2 stage (s)						
tF (s)	3.6	3.4			2.3	
p0 queue free %	84	97			98	
cM capacity (veh/h)	157	474			984	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	40	465	700
Volume Left	25	0	20
Volume Right	15	40	0
cSH	209	1700	984
Volume to Capacity	0.19	0.27	0.02
Queue Length 95th (ft)	17	0	2
Control Delay (s)	26.3	0.0	0.5
Lane LOS	D		A
Approach Delay (s)	26.3	0.0	0.5
Approach LOS	D		

Intersection Summary			
Average Delay	1.2		
Intersection Capacity Utilization	69.8%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	10	25	460	0	0	640
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	10	25	460	0	0	640
Pedestrians	45		45			45
Lane Width (ft)	12.0		12.0			11.0
Walking Speed (ft/s)	4.0		4.0			4.0
Percent Blockage	4		4			3
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1190	550			505	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1190	550			505	
tC, single (s)	6.5	6.3			4.2	
tC, 2 stage (s)						
tF (s)	3.6	3.4			2.3	
p0 queue free %	95	95			100	
cM capacity (veh/h)	184	481			996	

Direction, Lane #	WB 1	WB 2	NB 1	SB 1
Volume Total	10	25	460	640
Volume Left	10	0	0	0
Volume Right	0	25	0	0
cSH	184	481	1700	1700
Volume to Capacity	0.05	0.05	0.27	0.38
Queue Length 95th (ft)	4	4	0	0
Control Delay (s)	25.7	12.9	0.0	0.0
Lane LOS	D	B		
Approach Delay (s)	16.5		0.0	0.0
Approach LOS	C			

Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	51.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Volume (veh/h)	1	1	1	20	5	60	5	425	45	20	630	5
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	1	1	1	20	5	60	5	425	45	20	630	5
Pedestrians		17			54			54			42	
Lane Width (ft)		12.0			10.0			12.0			11.0	
Walking Speed (ft/s)		4.0			4.0			4.0			4.0	
Percent Blockage		1			4			4			3	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1252	1224	704	1240	1204	544	652			524		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1252	1224	704	1240	1204	544	652			524		
tC, single (s)	7.1	6.5	6.2	7.2	6.6	6.3	4.2			4.2		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.6	4.1	3.4	2.3			2.3		
p0 queue free %	99	99	100	84	97	88	99			98		
cM capacity (veh/h)	116	167	415	127	166	492	889			984		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	3	85	475	655
Volume Left	1	20	5	20
Volume Right	1	60	45	5
cSH	176	275	889	984
Volume to Capacity	0.02	0.31	0.01	0.02
Queue Length 95th (ft)	1	32	0	2
Control Delay (s)	25.8	23.9	0.2	0.5
Lane LOS	D	C	A	A
Approach Delay (s)	25.8	23.9	0.2	0.5
Approach LOS	D	C		

Intersection Summary			
Average Delay	2.1		
Intersection Capacity Utilization	64.6%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	85	30	430	35	45	535
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	85	30	430	35	45	535
Pedestrians	2		2			1
Lane Width (ft)	12.0		12.0			12.0
Walking Speed (ft/s)	4.0		4.0			4.0
Percent Blockage	0		0			0
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)			592			
pX, platoon unblocked	0.95	0.95			0.95	
vC, conflicting volume	1076	450			467	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1056	399			416	
tC, single (s)	6.5	6.3			4.2	
tC, 2 stage (s)						
tF (s)	3.6	3.4			2.3	
p0 queue free %	61	95			96	
cM capacity (veh/h)	219	603			1067	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	115	465	580
Volume Left	85	0	45
Volume Right	30	35	0
cSH	263	1700	1067
Volume to Capacity	0.44	0.27	0.04
Queue Length 95th (ft)	52	0	3
Control Delay (s)	28.9	0.0	1.1
Lane LOS	D		A
Approach Delay (s)	28.9	0.0	1.1
Approach LOS	D		

Intersection Summary			
Average Delay	3.4		
Intersection Capacity Utilization	72.2%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	55	145	5	30	125	205	5	135	15	130	195	35
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	55	145	5	30	125	205	5	135	15	130	195	35

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	205	360	155	360
Volume Left (vph)	55	30	5	130
Volume Right (vph)	5	205	15	35
Hadj (s)	0.09	-0.29	0.00	0.08
Departure Headway (s)	6.4	5.7	6.4	6.0
Degree Utilization, x	0.36	0.57	0.28	0.60
Capacity (veh/h)	498	591	482	561
Control Delay (s)	12.9	15.9	11.9	17.8
Approach Delay (s)	12.9	15.9	11.9	17.8
Approach LOS	B	C	B	C

Intersection Summary			
Delay	15.4		
Level of Service	C		
Intersection Capacity Utilization	63.7%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	5	95	265	50	175	25	215	140	15	10	295	5
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	5	95	265	50	175	25	215	140	15	10	295	5

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	365	250	370	310
Volume Left (vph)	5	50	215	10
Volume Right (vph)	265	25	15	5
Hadj (s)	-0.42	0.01	0.13	0.05
Departure Headway (s)	6.8	7.5	7.2	7.3
Degree Utilization, x	0.68	0.52	0.74	0.63
Capacity (veh/h)	491	418	469	448
Control Delay (s)	23.1	18.4	27.6	21.7
Approach Delay (s)	23.1	18.4	27.6	21.7
Approach LOS	C	C	D	C

Intersection Summary			
Delay	23.2		
Level of Service	C		
Intersection Capacity Utilization	87.0%	ICU Level of Service	E
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	25	15	420	110	20	645
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	25	15	420	110	20	645
Pedestrians	59		59			49
Lane Width (ft)	12.0		12.0			12.0
Walking Speed (ft/s)	4.0		4.0			4.0
Percent Blockage	5		5			4
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1278	583			589	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1278	583			589	
tC, single (s)	6.5	6.3			4.1	
tC, 2 stage (s)						
tF (s)	3.6	3.4			2.2	
p0 queue free %	84	97			98	
cM capacity (veh/h)	154	449			933	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	40	530	665
Volume Left	25	0	20
Volume Right	15	110	0
cSH	204	1700	933
Volume to Capacity	0.20	0.31	0.02
Queue Length 95th (ft)	18	0	2
Control Delay (s)	26.9	0.0	0.6
Lane LOS	D		A
Approach Delay (s)	26.9	0.0	0.6
Approach LOS	D		

Intersection Summary			
Average Delay	1.2		
Intersection Capacity Utilization	68.2%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↰	↱	↑			↑
Volume (veh/h)	10	15	450	0	0	655
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	10	15	450	0	0	655
Pedestrians	55		55			55
Lane Width (ft)	12.0		12.0			11.0
Walking Speed (ft/s)	4.0		4.0			4.0
Percent Blockage	5		5			4
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1215	560			505	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1215	560			505	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	94	97			100	
cM capacity (veh/h)	181	481			1001	

Direction, Lane #	WB 1	WB 2	NB 1	SB 1
Volume Total	10	15	450	655
Volume Left	10	0	0	0
Volume Right	0	15	0	0
cSH	181	481	1700	1700
Volume to Capacity	0.06	0.03	0.26	0.39
Queue Length 95th (ft)	4	2	0	0
Control Delay (s)	26.0	12.7	0.0	0.0
Lane LOS	D	B		
Approach Delay (s)	18.0		0.0	0.0
Approach LOS	C			

Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	52.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Volume (veh/h)	5	5	5	20	1	40	5	475	95	70	670	1
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	5	5	5	20	1	40	5	475	95	70	670	1
Pedestrians		17			70			70			57	
Lane Width (ft)		12.0			10.0			12.0			11.0	
Walking Speed (ft/s)		4.0			4.0			4.0			4.0	
Percent Blockage		1			5			6			4	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1458	1478	758	1490	1430	650	688			640		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1458	1478	758	1490	1430	650	688			640		
tC, single (s)	7.2	6.6	6.3	7.2	6.6	6.3	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.6	4.1	3.4	3.6	4.1	3.4	2.2			2.2		
p0 queue free %	94	95	99	74	99	90	99			92		
cM capacity (veh/h)	79	106	371	76	113	419	884			898		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	15	61	575	741
Volume Left	5	20	5	70
Volume Right	5	40	95	1
cSH	121	165	884	898
Volume to Capacity	0.12	0.37	0.01	0.08
Queue Length 95th (ft)	10	39	0	6
Control Delay (s)	38.9	39.0	0.2	2.0
Lane LOS	E	E	A	A
Approach Delay (s)	38.9	39.0	0.2	2.0
Approach LOS	E	E		

Intersection Summary			
Average Delay	3.2		
Intersection Capacity Utilization	93.5%	ICU Level of Service	F
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	Y		↑→			←↑
Volume (veh/h)	90	100	545	120	75	635
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	90	100	545	120	75	635
Pedestrians	6		6			4
Lane Width (ft)	12.0		12.0			12.0
Walking Speed (ft/s)	4.0		4.0			4.0
Percent Blockage	1		1			0
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)			592			
pX, platoon unblocked	0.88	0.88			0.88	
vC, conflicting volume	1402	615			671	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1388	491			555	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	28	80			91	
cM capacity (veh/h)	125	502			882	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	190	665	710
Volume Left	90	0	75
Volume Right	100	120	0
cSH	207	1700	882
Volume to Capacity	0.92	0.39	0.09
Queue Length 95th (ft)	187	0	7
Control Delay (s)	91.1	0.0	2.1
Lane LOS	F		A
Approach Delay (s)	91.1	0.0	2.1
Approach LOS	F		

Intersection Summary			
Average Delay	12.0		
Intersection Capacity Utilization	95.3%	ICU Level of Service	F
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			✥	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	40	145	20	25	105	100	5	185	35	200	295	15
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	40	145	20	25	105	100	5	185	35	200	295	15

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	205	230	225	510
Volume Left (vph)	40	25	5	200
Volume Right (vph)	20	100	35	15
Hadj (s)	0.00	-0.21	-0.05	0.08
Departure Headway (s)	6.8	6.5	6.4	5.9
Degree Utilization, x	0.39	0.42	0.40	0.84
Capacity (veh/h)	482	503	508	510
Control Delay (s)	13.9	14.1	13.6	32.7
Approach Delay (s)	13.9	14.1	13.6	32.7
Approach LOS	B	B	B	D

Intersection Summary			
Delay	22.1		
Level of Service	C		
Intersection Capacity Utilization	68.2%	ICU Level of Service	C
Analysis Period (min)	15		

Intersection	
Intersection Delay, s/veh	22.7
Intersection LOS	C

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBU	NBL	NBT	NBR
Vol, veh/h	0	5	60	250	0	65	155	20	0	175	160	20
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	9	9	9
Mvmt Flow	0	5	60	250	0	65	155	20	0	175	160	20
Number of Lanes	0	0	1	0	0	0	1	0	0	0	1	0

Approach	EB	WB	NB
Opposing Approach	WB	EB	SB
Opposing Lanes	1	1	1
Conflicting Approach Left	SB	NB	EB
Conflicting Lanes Left	1	1	1
Conflicting Approach Right	NB	SB	WB
Conflicting Lanes Right	1	1	1
HCM Control Delay	19.3	17.7	25.5
HCM LOS	C	C	D

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	49%	2%	27%	3%
Vol Thru, %	45%	19%	65%	96%
Vol Right, %	6%	79%	8%	1%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	355	315	240	370
LT Vol	160	60	155	355
Through Vol	20	250	20	5
RT Vol	175	5	65	10
Lane Flow Rate	355	315	240	370
Geometry Grp	1	1	1	1
Degree of Util (X)	0.703	0.593	0.497	0.718
Departure Headway (Hd)	7.131	6.777	7.45	6.987
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	504	529	482	514
Service Time	5.199	4.846	5.524	5.053
HCM Lane V/C Ratio	0.704	0.595	0.498	0.72
HCM Control Delay	25.5	19.3	17.7	26
HCM Lane LOS	D	C	C	D
HCM 95th-tile Q	5.5	3.8	2.7	5.8

Intersection				
Intersection Delay, s/veh				
Intersection LOS				

Movement	SBU	SBL	SBT	SBR
Vol, veh/h	0	10	355	5
Peak Hour Factor	1.00	1.00	1.00	1.00
Heavy Vehicles, %	2	6	6	6
Mvmt Flow	0	10	355	5
Number of Lanes	0	0	1	0

Approach	SB
Opposing Approach	NB
Opposing Lanes	1
Conflicting Approach Left	WB
Conflicting Lanes Left	1
Conflicting Approach Right	EB
Conflicting Lanes Right	1
HCM Control Delay	26
HCM LOS	D

Lane

Intersection	
Intersection Delay, s/veh	15.1
Intersection LOS	C

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBU	NBL	NBT	NBR
Vol, veh/h	0	55	145	5	0	30	125	205	0	5	135	15
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles, %	2	3	3	3	2	2	2	2	2	3	3	3
Mvmt Flow	0	55	145	5	0	30	125	205	0	5	135	15
Number of Lanes	0	0	1	0	0	0	1	0	0	0	1	0

Approach	EB	WB	NB
Opposing Approach	WB	EB	SB
Opposing Lanes	1	1	1
Conflicting Approach Left	SB	NB	EB
Conflicting Lanes Left	1	1	1
Conflicting Approach Right	NB	SB	WB
Conflicting Lanes Right	1	1	1
HCM Control Delay	12.9	15.6	11.8
HCM LOS	B	C	B

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	3%	27%	8%	36%
Vol Thru, %	87%	71%	35%	54%
Vol Right, %	10%	2%	57%	10%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	155	205	360	360
LT Vol	135	145	125	195
Through Vol	15	5	205	35
RT Vol	5	55	30	130
Lane Flow Rate	155	205	360	360
Geometry Grp	1	1	1	1
Degree of Util (X)	0.275	0.36	0.557	0.592
Departure Headway (Hd)	6.389	6.33	5.682	6.034
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	564	570	637	601
Service Time	4.402	4.34	3.682	4.034
HCM Lane V/C Ratio	0.275	0.36	0.565	0.599
HCM Control Delay	11.8	12.9	15.6	17.4
HCM Lane LOS	B	B	C	C
HCM 95th-tile Q	1.1	1.6	3.4	3.9

Intersection				
Intersection Delay, s/veh				
Intersection LOS				

Movement	SBU	SBL	SBT	SBR
Vol, veh/h	0	130	195	35
Peak Hour Factor	1.00	1.00	1.00	1.00
Heavy Vehicles, %	2	4	4	4
Mvmt Flow	0	130	195	35
Number of Lanes	0	0	1	0

Approach	SB
Opposing Approach	NB
Opposing Lanes	1
Conflicting Approach Left	WB
Conflicting Lanes Left	1
Conflicting Approach Right	EB
Conflicting Lanes Right	1
HCM Control Delay	17.4
HCM LOS	C

Lane

Intersection	
Intersection Delay, s/veh	22.8
Intersection LOS	C

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBU	NBL	NBT	NBR
Vol, veh/h	0	5	95	265	0	50	175	25	0	215	140	15
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles, %	2	1	1	1	2	2	2	2	2	2	2	2
Mvmt Flow	0	5	95	265	0	50	175	25	0	215	140	15
Number of Lanes	0	0	1	0	0	0	1	0	0	0	1	0

Approach	EB	WB	NB
Opposing Approach	WB	EB	SB
Opposing Lanes	1	1	1
Conflicting Approach Left	SB	NB	EB
Conflicting Lanes Left	1	1	1
Conflicting Approach Right	NB	SB	WB
Conflicting Lanes Right	1	1	1
HCM Control Delay	22.8	18.2	27.2
HCM LOS	C	C	D

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	58%	1%	20%	3%
Vol Thru, %	38%	26%	70%	95%
Vol Right, %	4%	73%	10%	2%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	370	365	250	310
LT Vol	140	95	175	295
Through Vol	15	265	25	5
RT Vol	215	5	50	10
Lane Flow Rate	370	365	250	310
Geometry Grp	1	1	1	1
Degree of Util (X)	0.73	0.678	0.516	0.62
Departure Headway (Hd)	7.103	6.689	7.424	7.203
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	507	537	483	499
Service Time	5.175	4.762	5.506	5.281
HCM Lane V/C Ratio	0.73	0.68	0.518	0.621
HCM Control Delay	27.2	22.8	18.2	21.4
HCM Lane LOS	D	C	C	C
HCM 95th-tile Q	6	5.1	2.9	4.2

Intersection				
Intersection Delay, s/veh				
Intersection LOS				

Movement	SBU	SBL	SBT	SBR
Vol, veh/h	0	10	295	5
Peak Hour Factor	1.00	1.00	1.00	1.00
Heavy Vehicles, %	2	3	3	3
Mvmt Flow	0	10	295	5
Number of Lanes	0	0	1	0

Approach	SB
Opposing Approach	NB
Opposing Lanes	1
Conflicting Approach Left	WB
Conflicting Lanes Left	1
Conflicting Approach Right	EB
Conflicting Lanes Right	1
HCM Control Delay	21.4
HCM LOS	C

Lane

Intersection	
Intersection Delay, s/veh	21.8
Intersection LOS	C

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBU	NBL	NBT	NBR
Vol, veh/h	0	40	145	20	0	25	105	100	0	5	185	35
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles, %	2	1	1	1	2	2	2	2	2	2	2	2
Mvmt Flow	0	40	145	20	0	25	105	100	0	5	185	35
Number of Lanes	0	0	1	0	0	0	1	0	0	0	1	0

Approach	EB	WB	NB
Opposing Approach	WB	EB	SB
Opposing Lanes	1	1	1
Conflicting Approach Left	SB	NB	EB
Conflicting Lanes Left	1	1	1
Conflicting Approach Right	NB	SB	WB
Conflicting Lanes Right	1	1	1
HCM Control Delay	13.9	14	13.5
HCM LOS	B	B	B

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	2%	20%	11%	39%
Vol Thru, %	82%	71%	46%	58%
Vol Right, %	16%	10%	43%	3%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	225	205	230	510
LT Vol	185	145	105	295
Through Vol	35	20	100	15
RT Vol	5	40	25	200
Lane Flow Rate	225	205	230	510
Geometry Grp	1	1	1	1
Degree of Util (X)	0.396	0.382	0.413	0.837
Departure Headway (Hd)	6.343	6.716	6.46	5.907
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	565	533	554	612
Service Time	4.407	4.783	4.522	3.956
HCM Lane V/C Ratio	0.398	0.385	0.415	0.833
HCM Control Delay	13.5	13.9	14	32.2
HCM Lane LOS	B	B	B	D
HCM 95th-tile Q	1.9	1.8	2	8.9

Intersection				
Intersection Delay, s/veh				
Intersection LOS				

Movement	SBU	SBL	SBT	SBR
Vol, veh/h	0	200	295	15
Peak Hour Factor	1.00	1.00	1.00	1.00
Heavy Vehicles, %	2	1	1	1
Mvmt Flow	0	200	295	15
Number of Lanes	0	0	1	0

Approach	SB
Opposing Approach	NB
Opposing Lanes	1
Conflicting Approach Left	WB
Conflicting Lanes Left	1
Conflicting Approach Right	EB
Conflicting Lanes Right	1
HCM Control Delay	32.2
HCM LOS	D

Lane

Vermont Agency of Transportation
Permanent Count Station P6D001
Burlington: VT127 0.40 mi North of Manhatten Dr

2013 Average	Weekday 7:00 AM	Weekday 5:00 PM
January	1,311	1,301
February	1,328	1,317
March	1,377	1,364
April	1,420	1,417
May	1,433	1,432
June	1,342	1,435
July	1,147	1,412
August	1,206	1,457
September	1,426	1,460
October	1,432	1,459
November	1,262	1,306
December	1,157	1,172
Year Average	1,320	1,378
Peak Month	*1,433*	*1,460*

2013 DHV (30th Highest Hour) = 1,536

33/60 of the 60 highest hours are @ 5:00 PM and 27/60 are @7AM.
Therefore, the DHV represents both an AM & PM condition at this station.

Calculate AM DHV based on average ratio of PM to AM peak volumes.

Seasonally & Design Hour Volume Adjustment Factors

Counts Dates:		*2013 Raw Data Weekday 7:00 AM*	*2013 Raw Data Weekday 5:00 PM*	**Adjustment Factors** Weekday *7:00 AM AM**	**Adjustment Factors** Weekday 5:00 PM **DHV****
June	*Average AM/PM Ratio*	*1,342*	*1,435*		**1.07**
	Peak Month Adjustment				
July	*Average AM/PM Ratio*	*1,147*	*1,412*		1.09
	Peak Month Adjustment				
August	*Average AM/PM Ratio*	*1,206*	*1,457*		**1.05**
	Peak Month Adjustment				

**DHV Adjustment Factors are calculated by dividing the 2013 DHV (30th Highest Hour) by the average month count.

Average (3 Stations)	
June	**1.03**
July	1.09
August	**1.06**

\\vtnfdata\projects\57685.00 CCRPC\ssheets\Seasonal DHV Factors 09-03-14.xls

Vermont Agency of Transportation
Permanent Count Station P6D040
Colchester: US7 0.6 mi South of Blakely Rd

2013 Average	Weekday 7:00 AM	Weekday 5:00 PM	
January	1,118	1,481	
February	1,159	1,523	
March	1,187	1,569	
April	1,236	1,550	** @4:00*
May	1,272	1,682	
June	1,242	1,743	
July	1,130	1,641	** @4:00*
August	1,182	1,680	
September	1,309	1,704	
October	1,309	1,714	
November	1,144	1,486	
December	1,072	1,404	
Year Average	1,197	1,598	
Peak Month	*1,309*	*1,743*	

2013 DHV (30th Highest Hour) = 1,785

43/60 of the 60 highest hours are @ 5:00 PM and 14/60 are @4PM.
Therefore, the DHV represents a PM condition at this station.

Calculate AM DHV based on average ratio of PM to AM peak volumes.

Seasonally & Design Hour Volume Adjustment Factors

Counts Dates:		2013 Raw Data Weekday 7:00 AM	2013 Raw Data Weekday 5:00 PM	Adjustment Factors Weekday 7:00 AM AM*	Adjustment Factors Weekday 5:00 PM DHV**
June	*Average AM/PM Ratio*	*1,242*	*1,743*		**1.02**
	Peak Month Adjustment				
July	*Average AM/PM Ratio*	*1,130*	*1,641*		1.09
	Peak Month Adjustment				
August	*Average AM/PM Ratio*	*1,182*	*1,680*		**1.06**
	Peak Month Adjustment				

**DHV Adjustment Factors are calculated by dividing the 2013 DHV (30th Highest Hour) by the average month count.

\\vtnfdata\projects\57685.00 CCRPC\ssheets\Seasonal DHV Factors 09-03-14.xls

Vermont Agency of Transportation
Permanent Count Station P6D061
Williston: US2 0.2 mi East of Industrial Ave

2013 Average	Weekday 8:00 AM	Weekday 4:00 PM	
January	665	1,011	
February	663	1,006	
March	687	1,070	
April	702	1,104	** @ 3PM*
May	714	1,114	** @ 3PM*
June	761	1,180	** @ 3PM*
July	729	1,092	** @ 3PM*
August	717	1,118	
September	710	1,090	
October	725	1,069	
November	660	980	
December	641	1,008	
Year Average	698	1,070	
Peak Month	*761*	*1,180*	

2013 DHV (30th Highest Hour) = 1,185

41/60 of the 60 highest hours are late afternoon (3/4/5PM), 13/60 are midday (12/1PM), and 5/60 are morning (10/11AM).
Therefore, the DHV represents a midday/afternoon condition at this station.

Calculate AM DHV based on average ratio of PM to AM peak volumes.

Seasonally & Design Hour Volume Adjustment Factors

Counts Dates:		*2013 Raw Data Weekday 7:00 AM*	*2013 Raw Data Weekday 5:00 PM*	**Adjustment Factors** Weekday 4:00 PM **DHV****
June	*Average AM/PM Ratio* *Peak Month Adjustment*	*761*	*1,180*	**1.00**
July	*Average AM/PM Ratio* *Peak Month Adjustment*	*729*	*1,092*	1.09
August	*Average AM/PM Ratio* *Peak Month Adjustment*	*717*	*1,118*	**1.06**

**DHV Adjustment Factors are calculated by dividing the 2013 DHV (30th Highest Hour) by the average month count.

2013 Growth Factors by Regression Analysis Group

A: Interstate Highways

Site ID	Route No	Town	Regression Analysis Year	20 Year GF 2013 to 2033	Short term GF 2008 to 2013
P6C002	I91	Sheffield	1994	1.12	1.06
P6C015	I93	Waterford	1994	1.35	1.05
P6D091	I89	South Burlington	1994	1.20	1.06
P6D092	I89	Colchester	1994	1.21	1.03
P6D099	I189	South Burlington	1994	1.04	1.04
P6F096	I89	Swanton	1994	1.17	1.07
P6N002	I91	Bradford	1994	1.15	0.95
P6P082	I91	Derby	1994	0.87	1.01
P6R001	US4	Fair Haven	1994	1.08	0.93
P6W002	I89	Berlin	1994	1.15	0.98
P6W089	I89	Waterbury	1994	1.17	1.03
P6X071	I91	Vernon	1994	0.92	0.96
P6X072	I91	Brattleboro	1994	0.97	0.91
P6X073	I91	Putney	1994	0.94	0.90
P6X074	I91	Rockingham	1994	1.03	0.97
P6Y001	I89	Bethel	1994	1.17	1.00
P6Y002	I91	Norwich	1994	1.15	0.97
			GROUP AVG	1.10	1.00

B: Urban

Site ID	Route No	Town	Regression Analysis Year	20 Year GF 2013 to 2033	Short term GF 2008 to 2013	
P6D001	VT127	Burlington	1994	0.72	0.96	Neg
P6D040	US7	Colchester	1994	1.16	1.01	0.20% Annual
P6D129	VT2A	Williston	1994	0.93	1.04	0.75% Annual
P6R022	US7	Rutland Town	1994	0.89	0.96	
P6W004	VT62	Barre City	1994	1.04	0.81	
P6W006	US302	Berlin	1994	0.88	1.10	
P6W024	US2	Montpelier	1994	0.99	1.10	
P6X011	US5	Brattleboro	1994	0.89	0.99	
			GROUP AVG	0.94	1.00	

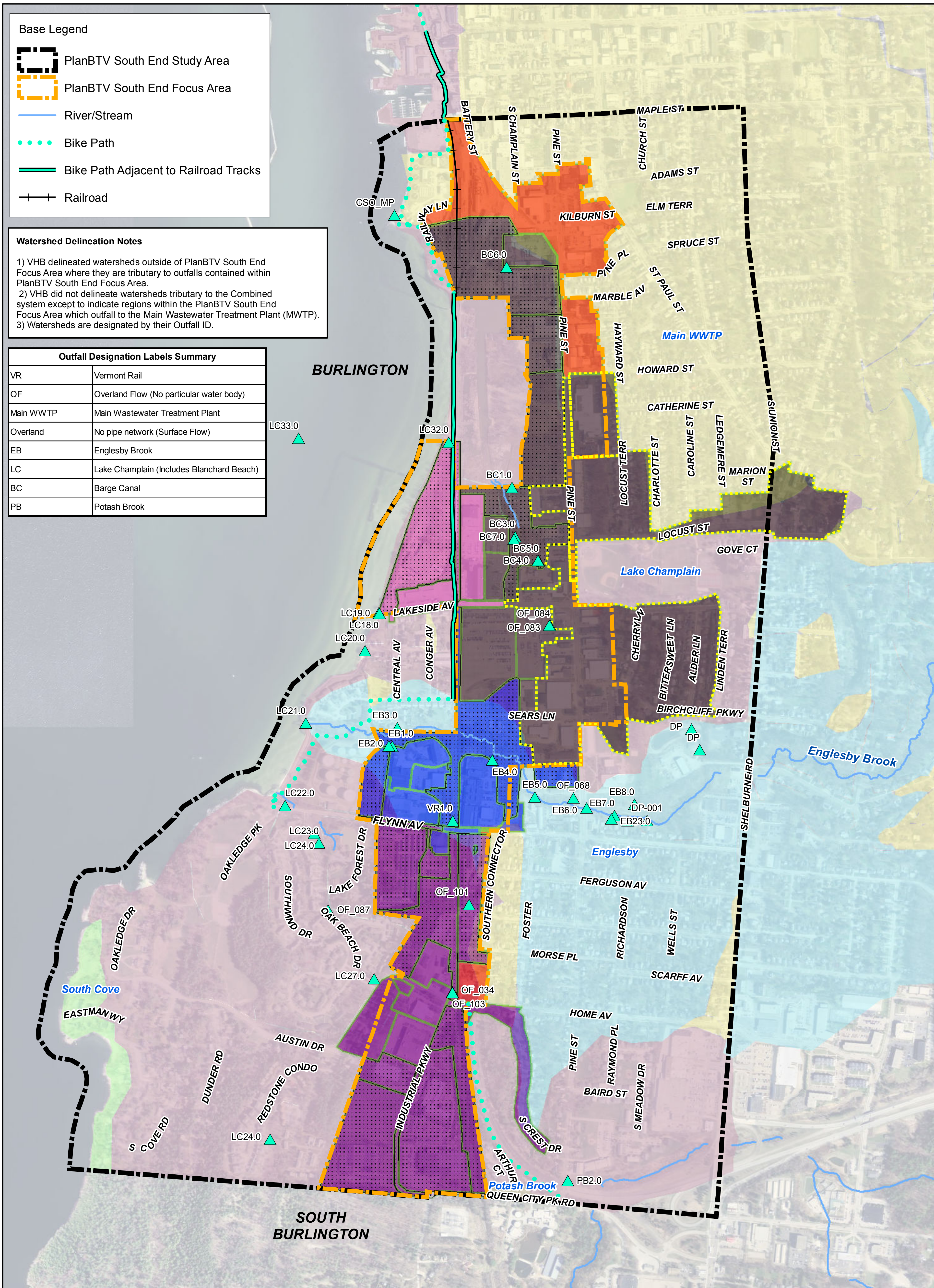
Continued on Next Page...

C Stormwater

Contents:

C-1: Watershed Delineation by Receiving Water Map

C-2: Overall Watersheds Impervious Cover Map



Watershed Delineation Notes

1) VHB delineated watersheds outside of PlanBTV South End Focus Area where they are tributary to outfalls contained within PlanBTV South End Focus Area.
2) VHB did not delineate watersheds tributary to the Combined system except to indicate regions within the PlanBTV South End Focus Area which outfall to the Main Wastewater Treatment Plant (MWTP).
3) Watersheds are designated by their Outfall ID.

Outfall Designation Labels Summary

VR	Vermont Rail
OF	Overland Flow (No particular water body)
Main WWTP	Main Wastewater Treatment Plant
Overland	No pipe network (Surface Flow)
EB	Englesby Brook
LC	Lake Champlain (Includes Blanchard Beach)
BC	Barge Canal
PB	Potash Brook

Legend

City Delineated Watersheds by Receiving Water
- Lake Champlain
- South Cove
- Englesby
- Potash Brook
- Main WWTP

VHB Watersheds by Receiving Water
- Barge Canal
- Blanchard Beach
- Combined (MWTP)
- Englesby Brook
- Lake Champlain

- Outfalls/Discharge Points
- Watershed of Interest
- Overland Watersheds

PlanBTV South End Watershed Delineation by Receiving Water Burlington, VT

February 10, 2015

Study Area from CCRPC (2014), Roads from VCGI (2013), Railroads from VTrans (2014), Outfalls Provided by City of Burlington GIS, Imagery from ESRI.

1 inch = 862 feet

0 400 800 1,600 Feet

N

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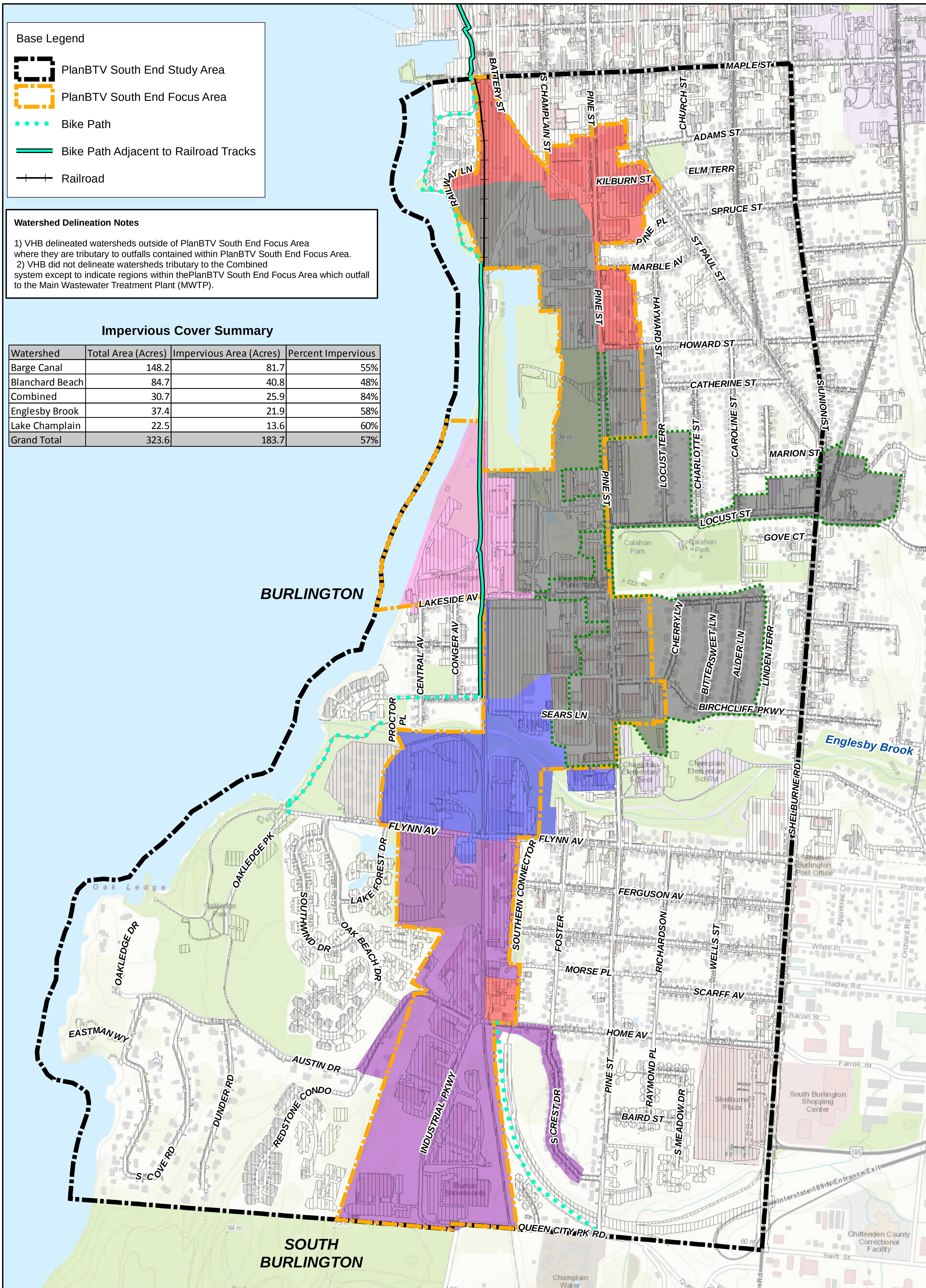
planBTV South End



Watershed Delineation Notes

1) VHB delineated watersheds outside of PlanBTV South End Focus Area where they are tributary to outfalls contained within PlanBTV South End Focus Area.
2) VHB did not delineate watersheds tributary to the Combined system except to indicate regions within thePlanBTV South End Focus Area which outfall to the Main Wastewater Treatment Plant (MWTP).

Impervious Cover Summary

Watershed	Total Area (Acres)	Impervious Area (Acres)	Percent Impervious
Barge Canal	148.2	81.7	55%
Blanchard Beach	84.7	40.8	48%
Combined	30.7	25.9	84%
Englesby Brook	37.4	21.9	58%
Lake Champlain	22.5	13.6	60%
Grand Total	323.6	183.7	57%

Legend
- Impervious Cover
- Watershed of Interest

Watersheds by Receiving Water
- Barge Canal
- Blanchard Beach
- Combined (MWTP)
- Englesby Brook
- Lake Champlain

PlanBTV South End Overall Watersheds Impervious Cover Burlington, VT

January 6, 2015

Study Area from CCRPC (2014), Roads from VCGI (2008), Railroads from VTrans (2014), Base map from ESRI

1 inch = 800 feet

0 400 800 1,600 Feet

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D Brownfields

Contents:

D-1: Brownfields Overview Map

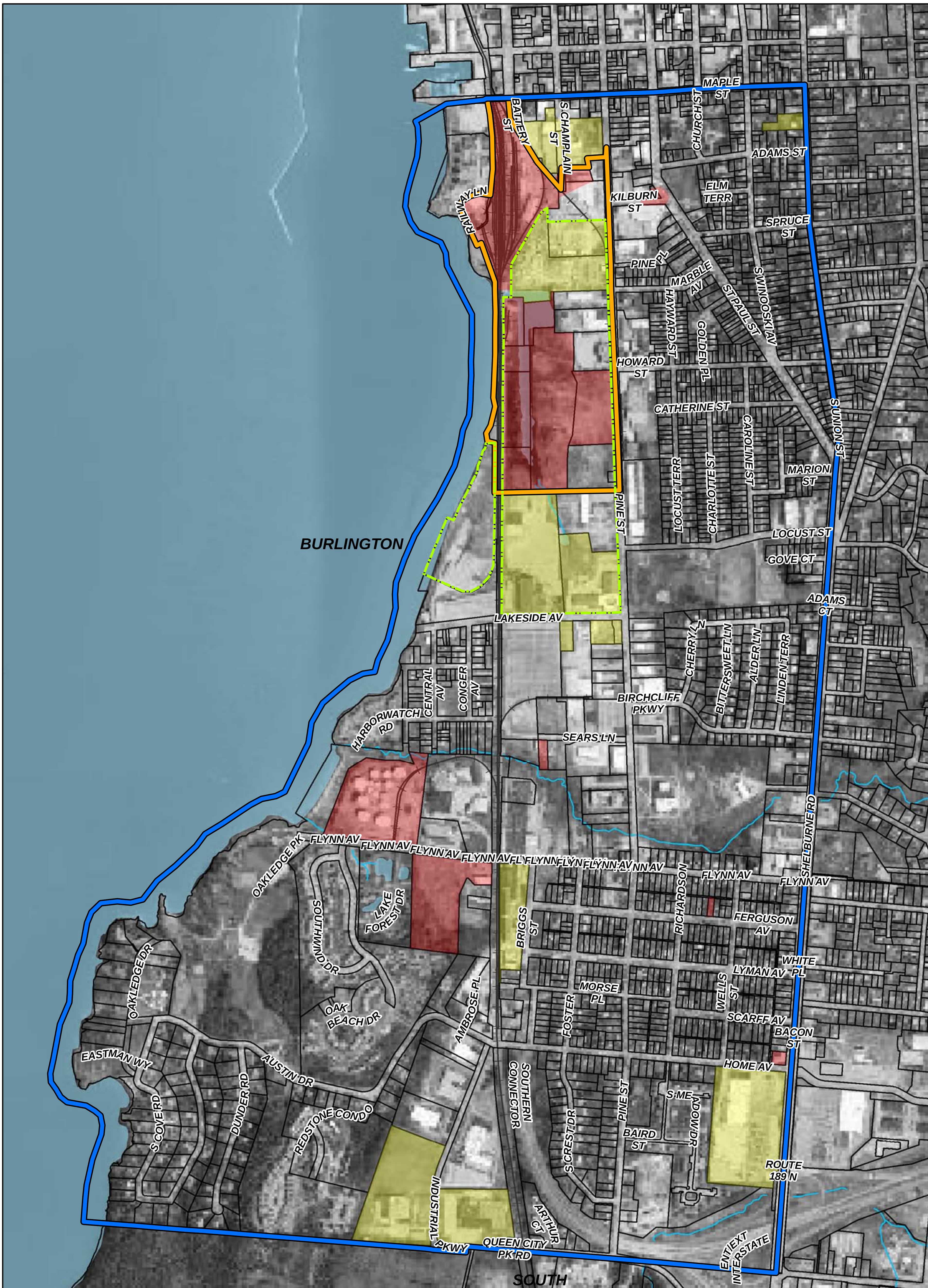
D-2: Brownfields Reference Map

D-3 - D-9: Brownfields Map Series

D-10 - D-12: Brownfields Matrix

D-13 - D-26: VT DEC/EPA Site Matrices

D-27 - D-32: References



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Legend

- PlanBTV South End Study Area
- AWP Project Area
- Barge Canal Deed Restriction Area
- High Risk Sites
- Medium Risk Sites
- Parcel Boundary
- Roads
- River/Stream
- Railroad Tracks
- Waterbody (VHD)

PlanBTV South End Brownfields Overview Map Burlington, VT

December 31, 2014

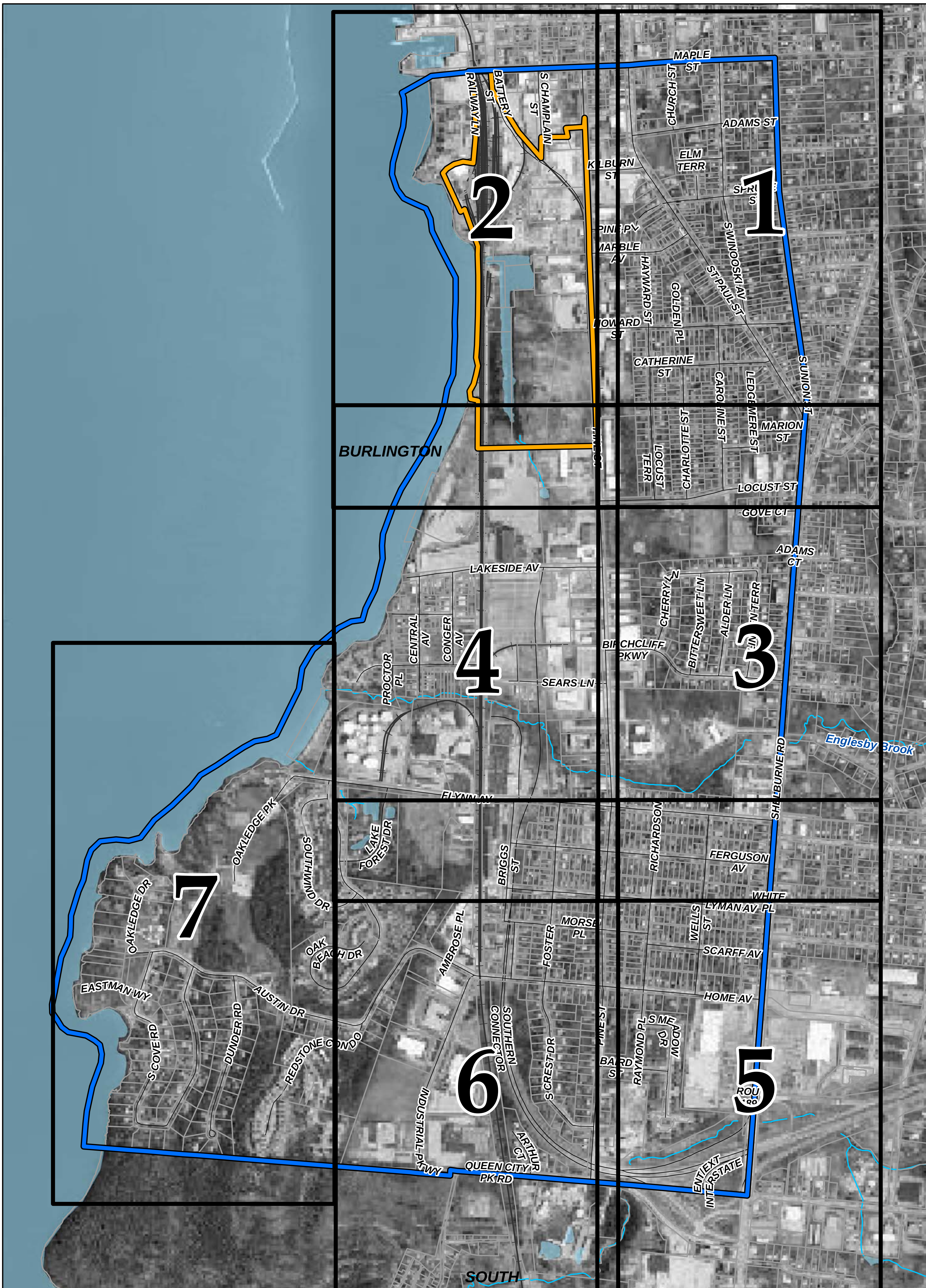
0 400 800 1,600 Feet

Parcel data provided by the City of Burlington (2014), Study Area, Focus Area and AWP Project Area from CCRPC (2014), High Risk and Medium Risk Sites by VHB (2014), Roads from VCGI (2008), Railroads from VTrans (2014), Streams from VT Hydrography Dataset (2008), Imagery from ESRI, Deed restriction area from various sources georeferenced by VHB (2014).

1 inch = 800 feet

Vanasse Hangen Brustlin, Inc.

planBTV South End



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Legend

- PlanBTV South End Study Area
- AWP Project Area
- 1 Grid/Page Reference for Brownsfields Map Series
- Parcel Boundary
- Roads
- River/Stream
- Railroad Tracks
- Waterbody (VHD)

PlanBTV South End Brownsfield Reference Map Brownsfield Map Series Burlington, VT

December 31, 2014

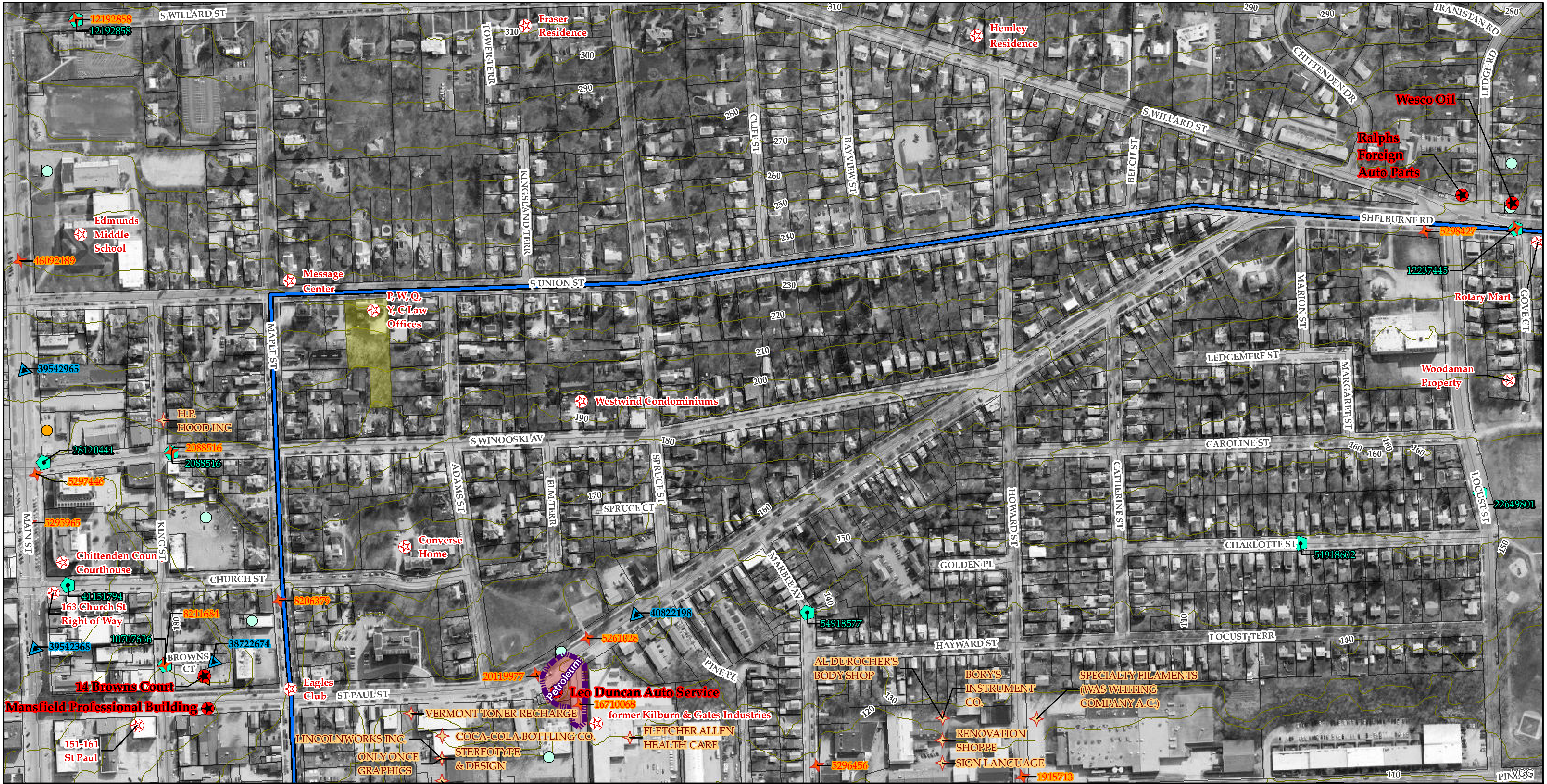
0 400 800 1,600 Feet

Parcel data provided by the City of Burlington (2014), Study Area, Focus Area and AWP Project Area from CCRPC (2014), Roads from VCGI (2008), Railroads from VTrans (2014), Streams from VT Hydrography Dataset (2008), Imagery from ESRI.

1 inch = 833 feet

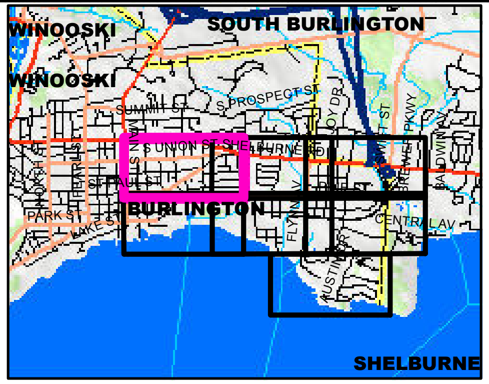
VHB Vanasse Hangen Brustlin, Inc.

planBTV South End



Sources: Background by VMP (2012); Landfills, Brownfields, and Hazardous Waste Sites from VT DEC (2014); UST Site data provided by VT DEC (2010); Surface water data from VCGI (2014); Streams from VT Hydrography Dataset (2008); Roads by VTrans and from VCGI (2014); Contour layer from VCGI (2014). The EPA facilities from US EPA (2014). "EPA Other" databases include: AIRS,BR, ICIS-NPDES, ans TRIS. Contaminant Plumes and deed restriction area from various sources digitized by VHB (2013).

D-3



Legend

- PlanBTV Study Area
- AWP Project Area
- High Risk Sites
- Medium Risk Sites
- Parcel Boundary
- Railroad (VTrans)
- 10 ft Elevation Contour
- Streams
- Waterbody (VHD)
- VSWI Wetland

EPA Facilities

- EPA Brownfield
- CERCLIS
- RCRAINFO
- EPA Other

USTs

- Active
- Removed

VT DEC Facilities

- Active HWS
- Closed HWS
- VT Brownfield
- PSI (1980)
- Landfill
- VT RCRA

Contaminant Plume

- Arsenic
- Chlorinated VOCs
- PAHs
- Petroleum
- Petroleum, PCBs
- Barge Canal Deed Restriction Area

N

300 150 0 300 Feet

City of Burlington/CCRPC Plan BTV South End Burlington, Vermont Brownfields Map Series

January 02, 2015

Page 1 of 7

VHB Vanasse Hangen Brustlin, Inc.

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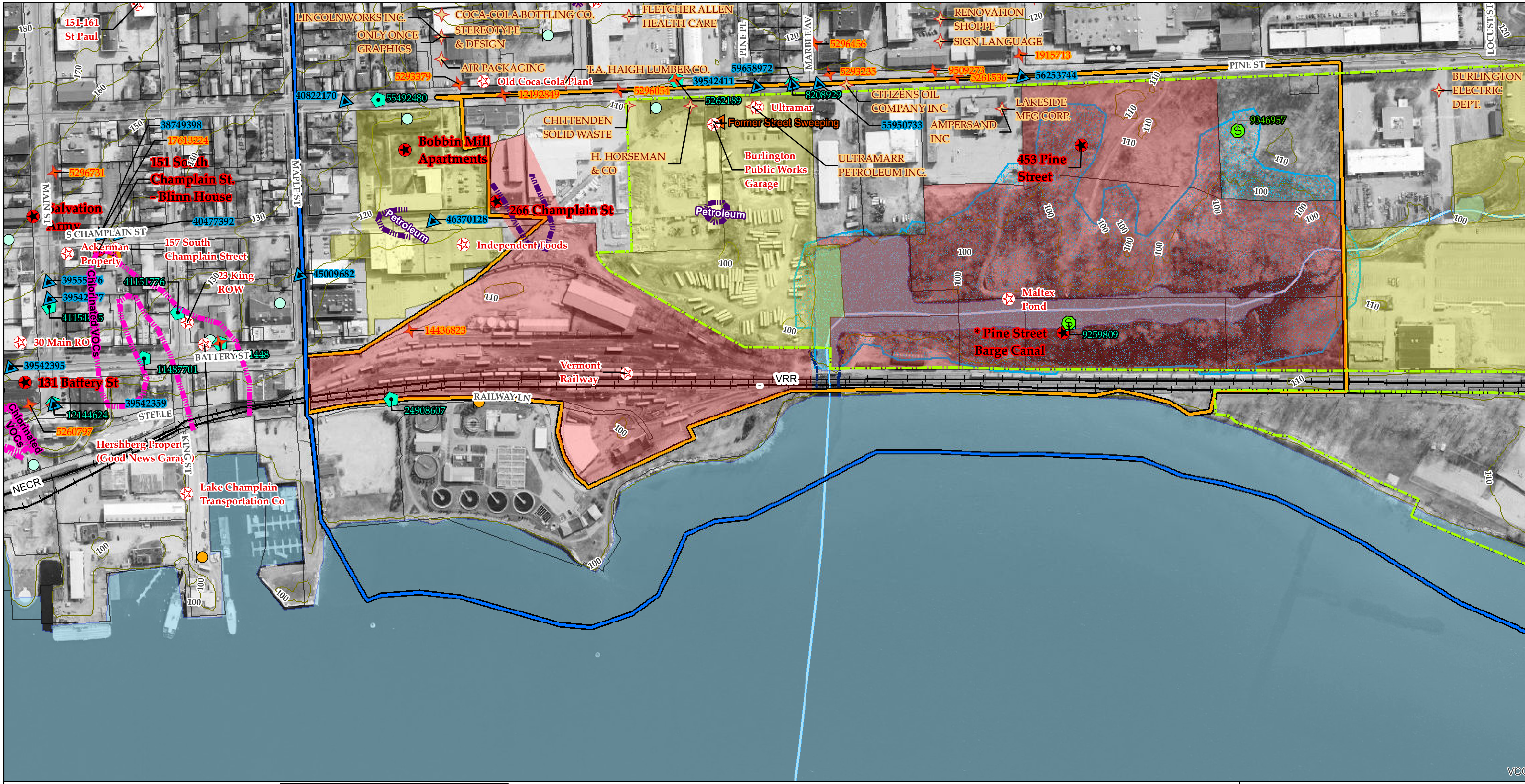
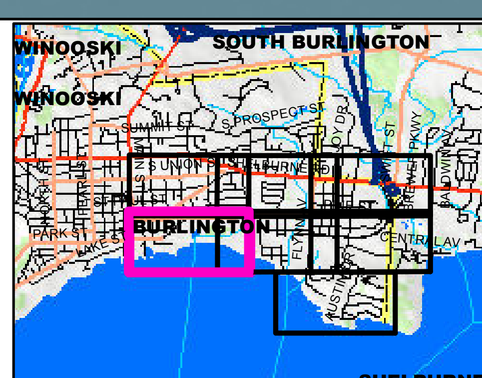


Sources: Background by VMP (2012); Landfills, Brownfields, and Hazardous Waste Sites from VT DEC (2014); UST Site data provided by VT DEC (2010); Surface water data from VCGI (2014); Streams from VT Hydrography Dataset (2008); Roads by VTrans and from VCGI (2014); Contour layer from VCGI (2014). The EPA facilities from US EPA (2014). "EPA Other" databases include: AIRS,BR, ICIS-NPDES, ans TRIS. Contaminant Plumes and deed restriction area from various sources digitized by VHB (2013).

D-4



Legend

- PlanBTV Study Area
- AWP Project Area
- High Risk Sites
- Medium Risk Sites
- Parcel Boundary
- Railroad (VTrans)
- 10 ft Elevation Contour
- Streams
- Waterbody (VHD)
- VSWI Wetland

EPA Facilities

- EPA Brownfield
- CERCLIS
- RCRAINFO
- EPA Other

USTs

- Active
- Removed

VT DEC Facilities

- Active HWS
- Closed HWS
- VT Brownfield
- PSI (1980)
- Landfill
- VT RCRA

Contaminant Plume

- Arsenic
- Chlorinated VOCs
- PAHs
- Petroleum
- Petroleum, PCBs
- Barge Canal Deed Restriction Area

300 150 0 300 Feet

City of Burlington/CCRPC
Plan BTV South End
Burlington, Vermont
Brownfields Map Series

January 02, 2015

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VHB *Vanasse Hangen Brustlin, Inc.*

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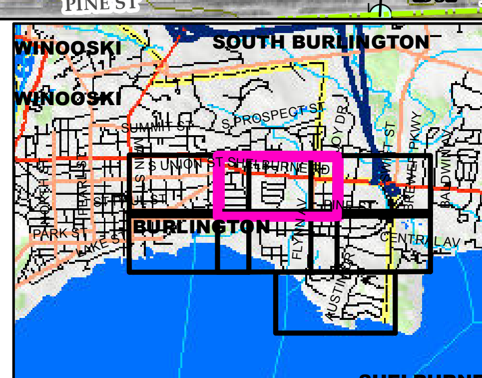
Sources: Background by VMP (2012); Landfills, Brownfields, and Hazardous Waste Sites from VT DEC (2014); UST Site data provided by VT DEC (2010); Surface water data from VCGI (2014); Streams from VT Hydrography Dataset (2008); Roads by VTrans and from VCGI (2014); Contour layer from VCGI (2014). The EPA facilities from US EPA (2014). "EPA Other" databases include: AIRS,BR, ICIS-NPDES, ans TRIS. Contaminant Plumes and deed restriction area from various sources digitized by VHB (2013).

D-5



Legend

- PlanBTV Study Area
- AWP Project Area
- High Risk Sites
- Medium Risk Sites
- Parcel Boundary
- Railroad (VTrans)
- 10 ft Elevation Contour
- Streams
- Waterbody (VHD)
- VSWI Wetland

EPA Facilities

- EPA Brownfield
- CERCLIS
- RCRAINFO
- EPA Other

USTs

- Active
- Removed

VT DEC Facilities

- Active HWS
- Closed HWS
- VT Brownfield
- PSI (1980)
- Landfill
- VT RCRA

Contaminant Plume

- Arsenic
- Chlorinated VOCs
- PAHs
- Petroleum
- Petroleum, PCBs
- Barge Canal Deed Restriction Area

N

300 150 0 300 Feet

City of Burlington/CCRPC Plan BTV South End Burlington, Vermont Brownfields Map Series

January 02, 2015

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Vanasse Hangen Brustlin, Inc.

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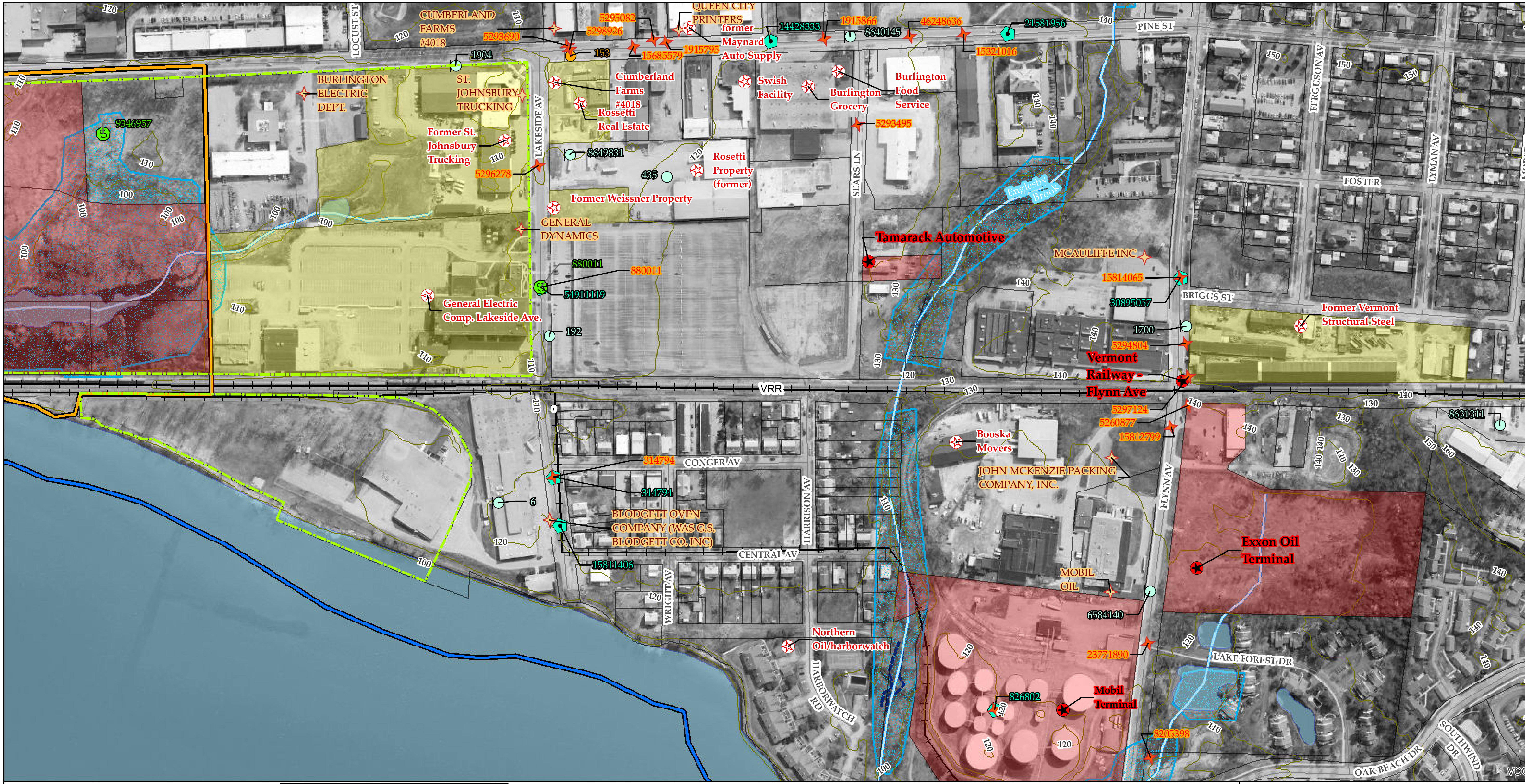

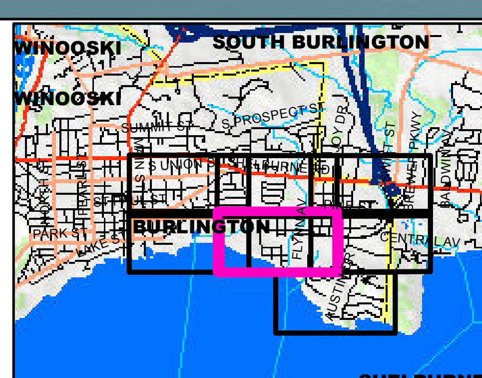

Sources: Background by VMP (2012); Landfills, Brownfields, and Hazardous Waste Sites from VT DEC (2014); UST Site data provided by VT DEC (2010); Surface water data from VCGI (2014); Streams from VT Hydrography Dataset (2008); Roads by VTrans and from VCGI (2014); Contour layer from VCGI (2014). The EPA facilities from US EPA (2014). "EPA Other" databases include: AIRS,BR, ICIS-NPDES, ans TRIS. Contaminant Plumes and deed restriction area from various sources digitized by VHB (2013).

D-6

Legend

- PlanBTV Study Area
- AWP Project Area
- High Risk Sites
- Medium Risk Sites
- Parcel Boundary
- Railroad (VTrans)
- 10 ft Elevation Contour
- Streams
- Waterbody (VHD)
- VSWI Wetland

EPA Facilities

- EPA Brownfield
- CERCLIS
- RCRAINFO
- EPA Other

USTs

- Active
- Removed

VT DEC Facilities

- Active HWS
- Closed HWS
- VT Brownfield
- PSI (1980)
- Landfill
- VT RCRA

Contaminant Plume

- Arsenic
- Chlorinated VOCs
- PAHs
- Petroleum
- Petroleum, PCBs
- Barge Canal Deed Restriction Area

N

300 150 0 300 Feet

City of Burlington/CCRPC Plan BTV South End Burlington, Vermont Brownfields Map Series

January 02, 2015

Vanasse Hangen Brustlin, Inc.

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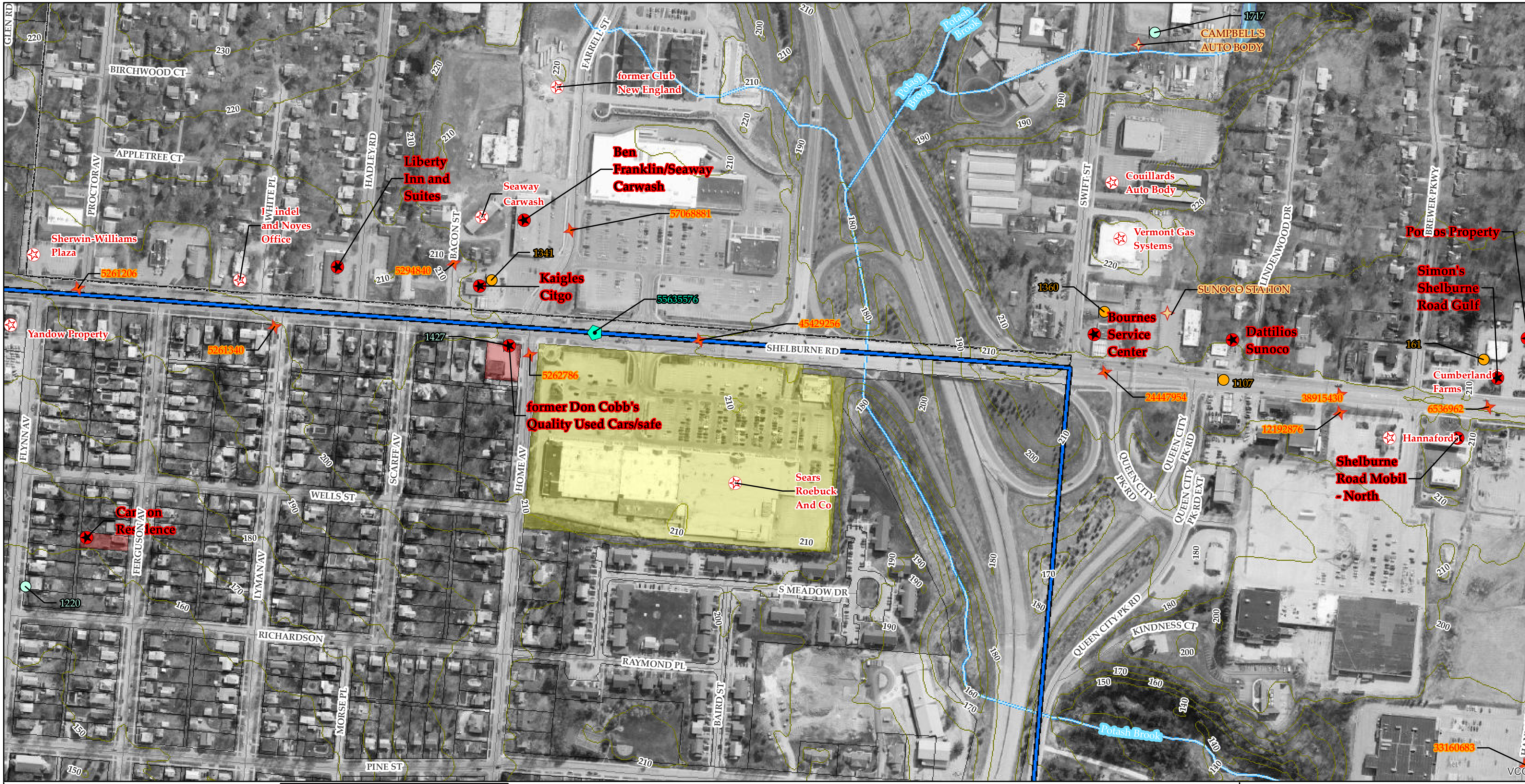

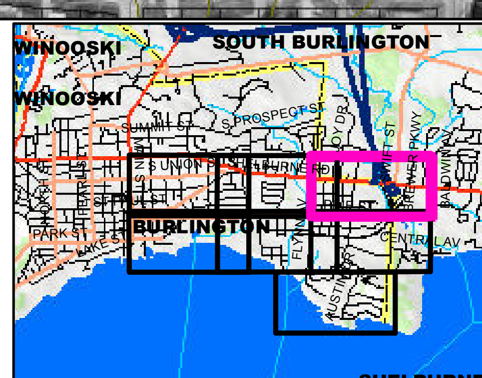

Sources: Background by VMP (2012); Landfills, Brownfields, and Hazardous Waste Sites from VT DEC (2014); UST Site data provided by VT DEC (2010); Surface water data from VCGI (2014); Streams from VT Hydrography Dataset (2008); Roads by VTrans and from VCGI (2014); Contour layer from VCGI (2014). The EPA facilities from US EPA (2014). "EPA Other" databases include: AIRS,BR, ICIS-NPDES, ans TRIS. Contaminant Plumes and deed restriction area from various sources digitized by VHB (2013).

D-7

Legend

- PlanBTV Study Area
- AWP Project Area
- High Risk Sites
- Medium Risk Sites
- Parcel Boundary
- Railroad (VTrans)
- 10 ft Elevation Contour
- Streams
- Waterbody (VHD)
- VSWI Wetland

EPA Facilities

- EPA Brownfield
- CERCLIS
- RCRAINFO
- EPA Other

USTs

- Active
- Removed

VT DEC Facilities

- Active HWS
- Closed HWS
- VT Brownfield
- PSI (1980)
- Landfill
- VT RCRA

Contaminant Plume

- Arsenic
- Chlorinated VOCs
- PAHs
- Petroleum
- Petroleum, PCBs
- Barge Canal Deed Restriction Area

N

300 150 0 300 Feet

City of Burlington/CCRPC
Plan BTV South End
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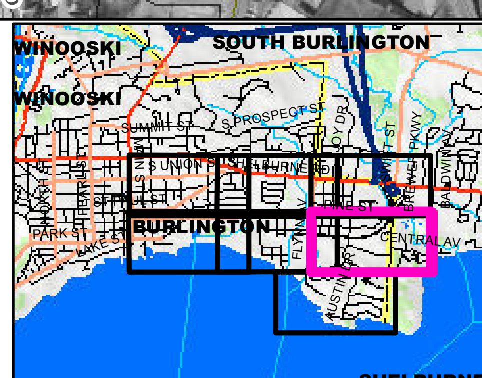
VHB Vanasse Hangen Brustlin, Inc.



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D-8

Legend

- PlanBTV Study Area
- AWP Project Area
- High Risk Sites
- Medium Risk Sites
- Parcel Boundary
- Railroad (VTrans)
- 10 ft Elevation Contour
- Streams
- Waterbody (VHD)
- VSWI Wetland

EPA Facilities

- EPA Brownfield
- CERCLIS
- RCRAINFO
- EPA Other

USTs

- Active
- Removed

VT DEC Facilities

- Active HWS
- Closed HWS
- VT Brownfield
- PSI (1980)
- Landfill
- VT RCRA

Contaminant Plume

- Arsenic
- Chlorinated VOCs
- PAHs
- Petroleum
- Petroleum, PCBs

Barge Canal Deed Restriction Area

300 150 0 300 Feet

City of Burlington/CCRPC
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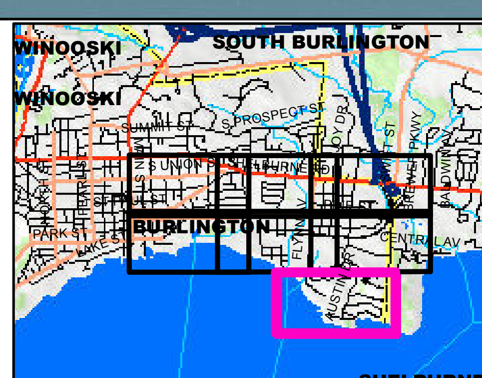

Sources: Background by VMP (2012); Landfills, Brownfields, and Hazardous Waste Sites from VT DEC (2014); UST Site data provided by VT DEC (2010); Surface water data from VCGI (2014); Streams from VT Hydrography Dataset (2008); Roads by VTrans and from VCGI (2014); Contour layer from VCGI (2014). The EPA facilities from US EPA (2014). "EPA Other" databases include: AIRS,BR, ICIS-NPDES, ans TRIS. Contaminant Plumes and deed restriction area from various sources digitized by VHB (2013).

D-9

Legend

- PlanBTV Study Area
- AWP Project Area
- High Risk Sites
- Medium Risk Sites
- Parcel Boundary
- Railroad (VTrans)
- 10 ft Elevation Contour
- Streams
- Waterbody (VHD)
- VSWI Wetland

EPA Facilities

- EPA Brownfield
- CERCLIS
- RCRAINFO
- EPA Other

USTs

- Active
- Removed

VT DEC Facilities

- Active HWS
- Closed HWS
- VT Brownfield
- PSI (1980)
- Landfill
- VT RCRA

Contaminant Plume

- Arsenic
- Chlorinated VOCs
- PAHs
- Petroleum
- Petroleum, PCBs

Barge Canal Deed Restriction Area

N

300 150 0 300 Feet

City of Burlington/CCRPC Plan BTV South End Burlington, Vermont Brownfields Map Series

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Brownfield Matrix
Plan BTV South End - Phase I
Burlington, Vermont

DEC Site Number	Site Name	Site Address	DEC Priority	Current Use	Historic Use	Documented COCs	On-Site Spills	RCRA Generator	Active/ Pulled UST(s)	Deed Restriction	Engineering Control	Persisting On-Site Contamination	Known/Suspected Impact to a Neighboring Property	Known/Suspected Impact from a Neighboring Property	Data Gaps	Remediation Expense Associated with Redevelopment	VHB Priority
[1]	[1]	[1]	[1]	[1]	[1, 3]	[1]	[1]	[1, 2]	[1]	[1]	[1]	[1]			[4]	[5]	[6]
770042	* Pine Street Barge Canal	King Street	HIGH	Vacant Superfund site	Industrial, Burlington Light & Power Manufactured Gas Plant	Coal tar NAPL, fuel oil, cyanide, wood chips, iron oxide, cinders, metals	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	HIGH
870035	Maltex Pond	n/a	NFAP	Vacant site	Unknown	Coal tar NAPL	Yes	No	No	Yes	No	Yes	Yes	Yes	Yes	Yes	HIGH
770179	Vermont Railway	1 Railway Lane	SMAC	Railroad yard	Railroad yard	Petroleum VOCs	Yes	No	Yes	Yes	No	Yes	No	Yes	Yes	Yes	HIGH
20002827	266 Champlain Street	266 Champlain Street	LOW	Artist studios	Unknown Industrial	Petroleum VOCs	No	No	Yes	No	No	Yes	Yes	No	Yes	Yes	HIGH
20043192	453 Pine Street	453 Pine Street	LOW	Vacant site	Lumber mill, other industrial	Coal tar NAPL, PAH, metals, SVOCs	No	No	No	Yes	No	Yes	Yes	Yes	Yes	Yes	HIGH
870002	Exxon Oil Terminal	199 Flynn Ave	LOW	Self storage facility	Petroleum bulk storage facility (above-ground)	Petroleum VOCs	Yes	Yes	No	No	Yes	Yes	Yes	No	Yes	Yes	HIGH
870175	Mobil Terminal	Flynn Ave	LOW	Petroleum bulk storage facility	Petroleum bulk storage facility	Petroleum VOCs	Yes	Yes	Yes	No	No	Yes	Yes	No	Yes	Yes	HIGH
900491	Former Don Cobb's Quality Used Cars/safe	521 Shelburne Rd.	MED	Commercial property (hair salon)	Car dealership	Petroleum VOCs	No	No	Yes	No	No	Yes	No	No	Yes	Yes	HIGH
900594	Leo Duncan Auto Service	291 St. Paul Street	LOW	Auto repair garage	Unknown	Petroleum VOCs	No	Yes	Yes	No	No	Yes	Yes	No	Yes	Yes	HIGH
941740	Tamarack Automotive	53 Sears Lane	LOW	Auto repair garage	Unknown	Petroleum VOCs	No	No	Yes (not registered)	No	No	Yes	No	No	Yes	Yes	HIGH
20063617	Cannon Residence	134 Ferguson Ave	MED	Residence	Dry-cleaning facility, on-site fill	Petroleum VOCs, PAH, coal ash (no chlorinated VOCs detected)	No	No	Yes (not registered)	No	No	Yes	No	No	Yes	Yes	HIGH
20124348	351 Pine Street	351 Pine Street	LOW	Harvey Parcel, truck parking area	Petroleum bulk storage facility (above ground), lumber/coal storage and scrap yard	Petroleum VOCs, coal tar NAPL, PAH, metals	No	Yes	No	Yes	No	Yes	No	Yes	Yes	Yes	HIGH
110039542411*	VT Transit Passenger Terminal	345 Pine Street		Closed VT Transit terminal	Petroleum bulk storage facility (above-ground)	Not documented	No	Yes	No	Yes	No	Yes	No	Yes	Yes	Yes	HIGH
770040	General Electric Comp. A&esd	Industrial Avenue	SMAC	Burton Snowboards facility	Metal machine shop	Chlorinated VOCs, metal cutting oils, metals	Yes	Yes	No	No	No	Yes	No	No	Yes	Yes	MED
770041	General Electric Comp.	Lakeside Ave	SMAC	Commercial office space	General Electric facility, Bell aircraft dump, other industrial	Coal tar NAPL, petroleum, plating sludge, oils, halogenated solvents, cyanide, metals	Yes	Yes	Yes	Yes	No	Yes	No	Yes	Yes	Yes	MED
770109	Former Vermont Structural Steel	Briggs & Flynn Streets	NFAP	Antique shop, warehouses	Steel foundry, materials storage and petroleum bulk storage facility	Petroleum VOCs, chlorinated VOCs, coal slag	No	No	Yes	Yes	No	Yes	No	No	Yes	Yes	MED
770124	Former Weissner Property	Lakeside Ave	SMAC	Grassy lot	Unknown	Petroleum VOCs, PAH	No	No	No	No	No	Yes	Yes	No	Yes	Yes	MED
870097	Ultramar	n/a	NFAP	Closed VT transit terminal, Harvey Property truck storage area.	Petroleum bulk storage facility (above-ground)	Petroleum VOCs	Yes	Yes	No	Yes	No	Yes	No	Yes	Yes	Yes	MED
880269	Edlund Industries	n/a	NFAP	Kitchen equipment manufacturing company	Unknown	Petroleum VOCs	Yes	Yes	Yes (not registered)	No	No	Yes	No	No	Yes	Yes	MED

Brownfield Matrix
Plan BTV South End - Phase I
Burlington, Vermont

DEC Site Number	Site Name	Site Address	DEC Priority	Current Use	Historic Use	Documented COCs	On-Site Spills	RCRA Generator	Active/ Pulled UST(s)	Deed Restriction	Engineering Control	Persisting On-Site Contamination	Known/Suspected Impact to a Neighboring Property	Known/Suspected Impact from a Neighboring Property	Data Gaps	Remediation Expense Associated with Redevelopment	VHB Priority
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890455	Independent Foods	S. Champlain St.	SMAC	Commercial business spaces	Unknown	Petroleum VOCs	No	No	Yes (not registered)	Yes	No	Yes	Yes	Yes	Yes	Yes	MED
931505	Englesby Brook	Rt 7	MED	Surface water	Surface water	none detected	Yes	No	No	No	No	No	No	Yes	No	??	MED
972173	Sears Roebuck And Co	Shelburne Rd	SMAC	Commercial business spaces	Auto repair garage and battery recycling facility	Petroleum VOCs, chlorinated VOCs, lead	No	No	Yes (not registered)	No	No	Yes	No	No	Yes	Yes	MED
982418	Cumberland Farms #4018	661 Pine St	SMAC	Gasoline station	Unknown	Petroleum VOCs	Yes	Yes	Yes	Yes	No	Yes	No	No	Yes	Yes	MED
992591	Former St. Johnsbury Trucking	Pine St.	SMAC	Burlington DPW offices	St. Johnsbury trucking facility	Petroleum VOCs	Yes	Yes	Yes	Yes	No	Yes	No	No	Yes	Yes	MED
992592 20144476	Burlington Public Works Garage	Pine Street	SMAC	RESOURCE, CSWD transfer station and artist spaces	Public works garage, street sweeping facility and asphalt batch plant	Petroleum VOCs	Yes	Yes	Yes	Yes	No	Yes	No	Yes	Yes	Yes	MED
20073748	P, W, Q, Y, C Law Offices	253 South Union St	SMAC	Commercial office building	Unknown	Petroleum VOCs	No	No	Yes (not registered)	No	No	Yes	No	No	Yes	Yes	MED
20134377	Bobbin Mill Apartments	235 Pine Street	MED	Residential apartments	Manufacturing and coal/stone storage	PAH, arsenic	No	No	No	Yes	Yes	Yes	No	No	No	Yes	MED
870001	Northern Oil/harborwatch	Harrison Ave	NFAP	Residential apartments	Petroleum bulk storage facility (above-ground)	Petroleum VOCs	No	No	No	No	No	No	No	No	No	No	LOW
890383	Burlington Food Service	Pine St.	NFAP	Burlington Food Service	Unknown	Petroleum VOCs	No	No	Yes (not registered)	No	No	No	No	No	Yes	Yes	LOW
911069	Rosetti Property (former)	175 Lakeside Avenue	SMAC	Miller Center	Recycling facility, other unknown	Petroleum VOCs	Yes	No	Yes	No	No	No	No	No	Yes	Yes	LOW
921232	Barrett's Trucking	16 Austin Drive	NFAP	Barrett Trucking Co., Inc.	Unknown	Petroleum VOCs	No	No	Yes	No	No	No	No	No	Yes	No	LOW
921264	Burlington School District	287 Shelburne Rd	NFAP	School bus garage	Unknown	Petroleum VOCs	No	No	Yes	No	No	No	No	No	Yes	Yes	LOW
921309	Old Coca Cola Plant	226 Pine St	SMAC	RESTORE, Metal & Light, artist studios	Coca Cola Plant	Petroleum VOCs	Yes	Yes	Yes	No	No	No	No	No	Yes	Yes	LOW
931521	Vermont Railway - Flynn Ave	207 Flynn Ave	MED	Railroad depot	Unknown	Petroleum VOCs	No	No	Yes (not registered)	No	No	No	No	No	Yes	Yes	LOW
941679	Rossetti Real Estate	175 Lakeside Ave	SMAC	Miller Center	Recycling facility, other unknown	Petroleum VOCs	Yes	No	Yes	No	No	No	No	No	Yes	Yes	LOW
951791	C C T A Garage	1 Industrial Parkway	SMAC	CCTA garage	Unknown	Petroleum VOCs	Yes	Yes	Yes	No	No	No	No	No	Yes	Yes	LOW
982379	Yandow Property	351Shelburne St and Flynn Ave	SMAC	Auto dealership	Commercial property, auto repair facility	Petroleum VOCs, hydraulic oil	No	Yes	No	No	No	No	No	No	No	No	LOW
982527	Rotary Mart	103 Shelburne Rd	SMAC	Gasoline station	Unknown	Petroleum VOCs	Yes	Yes	No	No	No	No	No	No	Yes	Yes	LOW
992638	Eagles Club	194 St Paul St	SMAC	Residential	Unknown	Petroleum VOCs	Yes	No	Yes	No	No	No	No	No	Yes	No	LOW
20002774	Maynard Auto	696 Pine St	SMAC	Restaurant, Commercial space	Auto repair and supply facility	Petroleum VOCs	No	Yes	Yes	No	No	No	No	No	No	No	LOW
20033138	Former Kilburn & Gates Industries	20 Kilburn St	SMAC	Commercial property (yoga, physical therapy) and artist studios	Unknown	Petroleum VOCs	No	No	Yes	No	No	Yes	No	Yes	Yes	Yes	LOW
20033161	Westwind Condominiums	308 S Winooski Ave	SMAC	Residential apartments	Unknown	Petroleum VOCs	Yes	No	Yes (not registered)	No	No	No	No	No	Yes	No	LOW
20053376	Booska Movers	180 Flynn Ave	SMAC	Booska Movers	Unknown	Petroleum VOCs	Yes	Yes	No	No	No	No	No	No	Yes	No	LOW

Brownfield Matrix
Plan BTV South End - Phase I
Burlington, Vermont

DEC Site Number	Site Name	Site Address	DEC Priority	Current Use	Historic Use	Documented COCs	On-Site Spills	RCRA Generator	Active/ Pulled UST(s)	Deed Restriction	Engineering Control	Persisting On-Site Contamination	Known/Suspected Impact to a Neighboring Property	Known/Suspected Impact from a Neighboring Property	Data Gaps	Remediation Expense Associated with Redevelopment	VHB Priority
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20053387	Converse Home	272 Church St	SMAC	Converse Home assisted living community	Unknown	Petroleum VOCs	No	No	Yes (not registered)	No	No	No	No	No	Yes	No	LOW
20073730	Swish Facility	703 Pine St	SMAC	Dry cleaning facility	Unknown	Petroleum VOCs	Yes	No	No	No	No	Yes	No	No	Yes	Yes	LOW
20083804	Burlington Grocery	747 Pine Street	SMAC	Burlington Food Service	Unknown	Petroleum VOCs	No	No	Yes (not registered)	No	No	No	No	No	Yes	Yes	LOW
20083862	Former Maynard Auto Supply	696 Pine St	SMAC	Restaurant, Commercial space	Auto repair and supply facility	Petroleum VOCs	No	Yes	Yes	No	No	No	No	No	No	No	LOW
20104056	Woodaman Property	8 Gove Court	SMAC	Residence	Home auto repair facility, other unknown	Petroleum VOCs, arsenic, lead	No	No	No	No	No	No	No	No	No	No	LOW
20104100	Wharf Lane Apartments	57 Maple Street	SMAC	Residential apartments	Unknown	Petroleum VOCs (heating oil)	No	No	Yes	No	No	No	No	No	Yes	Yes	LOW
110040822170*	221 Pine Street	221 Pine Street		Residential apartments	Unknown	Asbestos, PCB building materials	No	No	No	No	No	No	No	No	Yes	No	LOW
110040822198*	322 St. Paul Street	322 St. Paul Street		Residential group home	Unknown	Not documented	No	No	No	No	No	No	No	No	Yes	No	LOW

Sites listed in order of following tables for consistency
[1] Information from the VT DEC database or derived from files made available form the VT DEC.
[2] Information from the EPA database.
[3] Review of historical sources such as Sanborn maps was not performed under this assessment. Historic use information was derived from DEC records and consultants reports where available.
[4] Data Gap indicates lack of information related to one or more of the following categories: historic use, suspected undocumented contamination based on location/current use/historic use, or incomplete environmental assessments
[5] "Remediation Expense Associated with Redevelopment": properties likely need further investigation, characterization, monitoring, and/or remediation prior to or during redevelopment activities
[6] The VHB priority determination is based on a review of existing information and not based upon any sampling or analysis performed by VHB.
* = Refers to an EPA Site Number for a EPA listed Brownfields site.
COC = Contaminant of Concern
UST = Underground Storage Tank
VOC = Volatile organic Compounds
NAPL = Non-aqueous Phase Liquid
PAH = Polycyclic Aromatic Hydrocarbons

VT DEC Hazardous Waste Sites
Plan BTV South End - Phase I
Burlington, Vermont

SITES WITHIN THE AWP PROJECT AREA

Site Number	Site Name	Address	Town	DEC Priority	DEC Staff	Discovery Date	Closure Date	DEC Project Status	Associated Facilities	Opinion	Map Page
770042	* Pine Street Barge Canal	King Street	Burlington	HIGH	Michael Smith	1/1/1981		ROD has been finalized. Consent Decree signed 9/30/99. Remedial design commences fall 99. Cleanup will commence in spring 2001.	HWS #770041 CERCLA #9259809	Coal tar NAPL, cyanide, iron oxide, cinders and metals in on-sight soil and groundwater. A sand cap was placed over the contaminants (located primarily within the canal). Recent reports indicated that coal tar NAPL is migrating through the sand cap and into the canal surface water. Land use restrictions apply to this site. Monitoring and remedial efforts are on-going.	2
870035	Maltex Pond	n/a	Burlington	NFAP	Unassigned	<Null>		Site Closed		Combined with the Pine Street Barge Canal site. Land use restrictions apply to this site.	2
770179	Vermont Railway	1 Railway Lane	Burlington	SMAC	Richard Spiese	1/1/1991	8/29/2008	Epa Removal Pa Completed 7/89. Fuel oil UST removal and GW investigation showed limited soils and GW contamination. GW monitoring GW met GWESs.	UST #6582550	Petroleum impacts to soil and groundwater from on-site UST.The UST was closed in place. Groundwater impacts were remediated via natural attenuation and the site was administratively closed. This site is no longer considered likely to affect soil or groundwater but a UST is still located on the premisis. Land use restrictions apply to this site.	2
20002827	266 Champlain Street	266 Champlain Street	Burlington	LOW	Gerold Noyes	10/4/2000		Contam found from former UST. Site invest complete, biennial monitor	UST #5551723	Petroleum impacts to soil and groundwater from an on-site UST. The UST was removed in 2012. A second UST was located on-site with no identified impacts. Groundwater impacts are being remediated via natural attenuation and biennial groundwater monitoring. Contamination extends from the UST site to the south and west onto the Gregory Supply property. Air quality has not yet been assessed for nearby buildings.	2
20043192	453 Pine Street	453 Pine Street	Burlington	LOW	Michael Smith	<Null>		Brownfields Project, Stone Env. and Dakota have conducted TarGOST survey to delineate the extent of NAPL. GeoDeign has conducted geotechnical survey of site. These data will be used to allow design of a building that will not affect Pine St remedy.	Brownfield	PAH, manufarcuted gas plant wastes, metals and coal tar NAPL exst in on-site soils and groundwater primarily along the southern and southwestern site areas. Groundwater comtamination on this property is now managed with the adjoining Pine Street Barge Canal site. Land use restriction apply to this site.	2
870097	Ultramar	n/a	Burlington	NFAP	Unassigned	<Null>		Site Closed		Petroleum impacts to soil, groundwater and surface water due to a 4,200-gallon fuel oil spill. On-going monitoring of groundwater is combined with the Pine Street Barge Canal site. Land use restrictions apply to this site.	2
770041	General Electric Comp.	Lakeside Ave	Burlington	SMAC	Michael Smith	6/1/1981	5/1/2006	Rcra Corrective Action Permit Pending RCRA correctiuve action permit granted. All work required by permit was completed and the site received a SMAC designation in May 2006	CERCLA #9346957 UST #192 RCRA CORRACTS	Impacts to soil and groundwater due to historic manufacturing uses. Groundwater contamination originating from on-site is reportedly not migrating off-site. However, groundwater comtamination on-site is now managed with the Pine Street Barge Canal site. Land use restrictions apply to this site.	4

VT DEC Hazardous Waste Sites
Plan BTV South End - Phase I
Burlington, Vermont

SITES WITHIN THE AWP PROJECT AREA

Site Number	Site Name	Address	Town	DEC Priority	DEC Staff	Discovery Date	Closure Date	DEC Project Status	Associated Facilities	Opinion	Map Page
992592 20144476	Burlington Public Works Garage	Pine Street	Burlington	SMAC	Michael Smith	8/18/1998	2/2/2011	site SMAC 2 Feb 2011	UST #822 Brownfield	Impacts to soil and groundwater due to an on-site UST and AST. The tanks were removed from the site. petroleum impacts associated with the UST were remediated via natural attenuation. Petroleum impacts associated with the AST were documented with a notice to the land record. The site was re-opened under the Brownfields program to understand what further investigation or remdiation may be required prior to future redevelopment. Land use restrictions apply to this site.	2

Hazardous Waste Sites Data Georeferenced from VT DEC (March 2014)

The following risk designations were assigned by VHB based on review of applicable reports and VHBs assessment of risk that the Project will encounter contamination associated with the above listed facilities.

high risk
medium risk
low risk

VT DEC Hazardous Waste Sites
Plan BTV South End - Phase I
Burlington, Vermont

SITES WITHIN THE PLAN BTV SOUTH END STUDY AREA - Sorted by Risk Level than Alphabetical by Site Name

Site Number	Site Name	Address	Town	DEC Priority	DEC Staff	Discovery Date	Closure Date	DEC Project Status	Associated Facilities	Opinion	Map Page
870002	Exxon Oil Terminal	199 Flynn Ave	Burlington	LOW	Richard Spiese	1/1/1987		Contamination Limited On Site. Monitoring Ongoing. Trench Installed. Site entered RCPP. Site monitoring requirement continues.		Former on-site petroleum bulk storage facility. Petroleum impacts to soils and groundwater were discovered on-site during a subsurface investigation. On-site groundwater is impacted and the contaminant plume extends off-site to the north and west. An interceptor trench was installed along the northern and western property boundaries. Groundwater which collects in this trench is continually dewatered, treated and discharged to the municipal sanitary sewer system. Remediation includes extraction and treatment of groundwater via the trench system. Groundwater monitoring is on-going.	4,6
870175	Mobil Terminal	Flynn Ave	Burlington	LOW	Richard Spiese	11/1/1987		Corrective Action Complete. Contaminated soils require treatment and disposal. Ongoing monitoring of low level contaminated groundwater ongoing.	UST #6584140	Currently used as a petroleum bulk storage facility. Petroleum impacts to soil and groundwater discovered related to a leaking on-site AST and other historic releases identified within the on-site sump collection system. Although concentrations have decreased over time, groundwater is still impacted across the site and may extend off-site to the north and west. Groundwater monitoring is on-going.	4
900491	Former Don Cobb's Quality Used Cars/safe	521 Shelburne Rd.	Burlington	MED	Lynda Provencher	NA		Contamination Discovered During Ust Removal.	US #1427	Petroleum impacts to soil and groundwater discovered during the removal of on-site USTs. Groundwater results from 2006 indicate that low levels of select petroleum constituents exceeded regulatory standards in one well. Groundwater monitoring is on-going although contamination is not likely migrating off-site.	5
900594	Leo Duncan Auto Service	291 St. Paul Street	Burlington	LOW	Gerold Noyes	7/21/2005		Site reopened due to off-site migration, see also #2003-3138, occasional FP. former gas station. 1/2010 6 of 9, 11/2010 4 of 8 MWs 11/2012 3 of 7 MWs above VGES. annual sample	UST #8649477	Petroleum impacts were identified in soil and groundwater associated with an on-site gasoline UST. The UST and the majority of the contaminated soils were removed from the site and properly disposed of. The groundwater contaminant plume is well defined, limited in extent, and extends off-site to the south	1
941740	Tamarack Automotive	53 Sears Lane	Burlington	LOW	Linda Elliott	1/1/1995		Petroleum contamination from two underground storage tanks. Ongoing monitoring reveals declining contaminant plume. Annual site monitoring with next round June 2014.		Petroleum impacts to soil and groundwater discovered during the removal of two USTs. Only naphthlene is currently above regulatory standards in one well. Contaminants are not migrating off-site. Groundwater monitoring is on-going.	4
20063617	Cannon Residence	134 Ferguson Ave	Burlington	MED	Matt Moran	11/13/2006		Former dry cleaner had triad SI performed with no signficant findings aside from surficial PAHs related to fill. UST closure complete with soil or GW contamination at tank grave. Monitoring results 8/08 showed no VGES violations for MW-1, MW-2 and MW-UST		Petroleum impacts to soil and groundwater discovered during the removal of a UST. This site was formerly used as a dry cleaning facility although no contamination associated with that facility has been identified. Groundwater is not impacted over the regulatory standards. The HWS status remains active due to the questionable presence of PAHs from coal ash on the property.	3, 5

VT DEC Hazardous Waste Sites
Plan BTV South End - Phase I
Burlington, Vermont

SITES WITHIN THE PLAN BTV SOUTH END STUDY AREA - Sorted by Risk Level than Alphabetical by Site Name

Site Number	Site Name	Address	Town	DEC Priority	DEC Staff	Discovery Date	Closure Date	DEC Project Status	Associated Facilities	Opinion	Map Page
770040	General Electric Comp. A&esd	Industrial Avenue	Burlington	SMAC	Stan Corneille	6/1/1981	8/7/1998	Landfarming of soils completed. Groundwater monitoring completed.		Chlorinated contamination was discovered under the southern end of an on-site building and was attributed to the improper storage of cutting lubricants and waste cutting materials. Impacted soils were removed from the site and properly disposed of with the exception of soils under the building. Sub-slab soil gas was below the regulatory standards and the contamination was determined to not effect sensitive receptors. The site was administratively closed in 2001.	6
770109	Former Vermont Structural Steel	Briggs & Flynn Streets	Burlington	NFAP	Unassigned	NA	8/7/1991	Monitoring Completed. Site Closed.	UST #1700	Former petroleum bulk storage facility, construction staging area and steel foundry. Petroleum and solvent wastes identified during a subsurface investigation. A notice to the land records was filed in 1991 detailing the limited nature of on-site contamination and that contamination is not migrating off-site. The site was closed with a NFAP in 1991. Groundwater levels were reportedly above regulatory standards upon closure.	4, 6
770124	Former Weissner Property	Lakeside Ave	Burlington	SMAC	Stan Corneille	NA		Inactive		Petroleum and PAH discovered in surficial soils during an investigation prior to roadway construction. Impacts were limited in extent but partially extend into the ROW. No further information available.	4
880269	Edlund Industries	n/a	Burlington	NFAP	Unassigned	NA		Site Closed		Petroleum impacts to soil and groundwater discovered during the removal of two USTs. Site underlain by hard packed clay. Free product reported on groundwater. No further results available. Site closed with contamination remaining on-site.	6
890455	Independent Foods	S. Champlain St.	Burlington	SMAC	Richard Spiese	1/1/1989	5/24/2010	Notice to land record put on deed. Site SMACed.		Petroleum impacts to soil and groundwater from on-site UST. The UST was closed in place and a notice to the land records was filed. Groundwater impacts extend off-site to the southeast. The downgradient limits of the plume are not defined. Site was closed with a SMAC designation.	
931505	Englesby Brook	Rt 7	Burlington	MED	Unassigned	12/1/1993		Petroleum Impact In Storm Drain. An investigation indentified several possible sources, but Further Investigation is Needed.		Petroleum impacts to the Englesby Brook above regulatory standards in 1993. No defined source of contamination and no further data is available.	3, 6
972173	Sears Roebuck And Co	Shelburne Rd	South Burlington	SMAC	Linda Elliott	6/1/1997	8/1/1998	Investigation complete		Former auto repair facility with a battery recycling room and associated petroleum UST and AST. Low levels of petroleum, chlorinated solvents and lead were detected beneath the eastern portion of the on-site building. Contamination is not migrating off-site. This site was closed with a SMAC in 1998 with contaminants remaining on-site.	5
982418	Cumberland Farms #4018	661 Pine St	Burlington	SMAC	Gerold Noyes	4/21/1998	8/27/2012	UST removed. Contamn found. Investigation completed. Semi-annual GW monitoring required, 5/7, 9/13/99, 3/22, 9/20/00, 4/24/01, 4 of 8; 6/2011 3 of 8 wells over VGES in the vicinity of the USTs and pump island. No off site impact.	UST #153 Surficial Spills	Petroleum impacts to soil and groundwater due to two on-site USTs. Site redeveloped and new gas station installed. Impacts do not extend off-site. Site closed with a notice to theland record.	4

VT DEC Hazardous Waste Sites
Plan BTV South End - Phase I
Burlington, Vermont

SITES WITHIN THE PLAN BTV SOUTH END STUDY AREA - Sorted by Risk Level than Alphabetical by Site Name

Site Number	Site Name	Address	Town	DEC Priority	DEC Staff	Discovery Date	Closure Date	DEC Project Status	Associated Facilities	Opinion	Map Page
992591	Former St. Johnsbury Trucking	Pine St.	Burlington	SMAC	Michael Smith	7/29/1998	2/2/2011	Site SMAC 2 Feb 2011	UST #1904	Petroleum impacts to soil due to two on-site USTs. Groundwater was determined to not have been affected. A notice to the land records was filed for soils at this property. Site closed with residual soils contamination. Contaminants do not extend beyond the property boundary.	4
20073748	P, W, Q, Y, C Law Offices	253 South Union St	Burlington	SMAC	Ashley Desmond	11/12/2007	2/15/2008	Contamination discovered during the removal of a heating oil UST. . The tank had over 700 gallons of product in it at the time of removal (1,000 gallon tank). Contamination was focused around a small hole in the bottom of the tank. PID readings declined		Petroleum impacts to soil discovered during the removal of a UST. All soils were backfilled. No impacts to groundwater or indoor air were reported. Residual soils contamination remains on-site but is not likely migrating off-site. Site closed with a SMAC although residual contamination remains on-site.	1
20134377	Bobbin Mill Apartments	235 Pine Street	Burlington	MED	Hugo Martínez Cazón	5/3/2013		Phase II focused on surface soil characterization	Brownfield	Contamination limited to surficial soils and is typical of urban fill waste profile (PAH and arsenic). Soil management plan and notice to the land records have been filed documenting materials handling practices and institutional controls (soils cap). Eligible for a SMAC once redevelopment is complete.	2
921232	Barretts Trucking	16 Austin Drive	Burlington	NFAP	Linda Elliott	<Null>	1/1/1994	Ust Removal. Stockpiled Soils. NFAP	UST #8631311	Petroleum impacts to soil discovered during a UST removal. Approximately 35 yards of contaminated soil removed and properly disposed of. No further contamination evident. Site was closed with a NFAP in 1994.	6
20053376	Booska Movers	180 Flynn Ave	Burlington	SMAC	Richard Spiese	4/25/2005	1/24/2008	Dispenser leak to gravel parking lot. Some migration to Inglesby Brook. Booms and pads in stream swept away in heavy rainfall. EP&S re-deployed boom and collected used material. GW investigation showed low levels of VOC contamination. GWESs met. MWs aban		Diesel ASTs dispenser pump malfunction and release to gravel parking lot. Groundwater results were below regulatory standards. Sorbents and booms deployed in Englsby Brook and groundwater monitoring wells installed. Surface water cleaned up and groundwater results below regulatory standards. Site closed with a SMAC in 2008.	4
890383	Burlington Food Service	Pine St.	Burlington	NFAP	Unassigned	NA		Site Closed		Petroleum impacts to soil discovered during a UST removal. Approximately 25 yards of contaminated soil removed and properly disposed of. No further contamination evident. Site was closed with a NFAP in 1990.	4
20083804	Burlington Grocery	747 Pine Street	Burlington	SMAC	Sarah A. Bartlett	1/8/2008	7/29/2009	One fuel oil UST closed July 2008. ISI conducted January 2009, two MWs contained TPH in excess of 1,000 mg/kg. No sensitive receptors effected. Additional groundwater monitoring conducted May 2009. No petroleum VOCs in excess of VGES, no TPH in excess of		Petroleum impacts to soil and groundwater discovered during a UST removal. Remediation through natural attenuation. Groundwater results decreased below the regulatory standards. Site was closed with a SMAC designation in 2009.	4
921264	Burlington School District	287 Shelburne Rd	Burlington	NFAP	Unassigned	<Null>	10/22/1992	Site Assessment Complete. No Impact To Gw Above Standards	UST 776	Petroleum impacts to soil discovered during the removal of five USTs. Groundwater was not impacted over regulatory standards. Site was closed with a NFAP in 1992.	
951791	C C T A Garage	1 Industrial Parkway	Burlington	SMAC	John Schmeltzer	12/1/1996	4/1/1997	Hydraulic Oil Recovery Complete, Limited To On-site.	UST #1525	150 gallon release from a hydraulic lift system. Contaminated soils were removed from the site and properly disposed of. A groundwater recovery and treatment system was operated on-site. Groundwater results decreased below regulatory standards. Site closed with a SMAC designation in 1997.	6

VT DEC Hazardous Waste Sites
Plan BTV South End - Phase I
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SITES WITHIN THE PLAN BTV SOUTH END STUDY AREA - Sorted by Risk Level than Alphabetical by Site Name

Site Number	Site Name	Address	Town	DEC Priority	DEC Staff	Discovery Date	Closure Date	DEC Project Status	Associated Facilities	Opinion	Map Page
20053387	Converse Home	272 Church St	Burlington	SMAC	Ashley Desmond	6/8/2005	7/24/2006	Underground storage tank removed. Contamination found. Investigation needed. First letter sent in July 05. ISI found limited groundwater contamination at site. Second groundwater monitoring event found no contaminants exceeding the minimum lab detection		Petroleum impacts to soil and groundwater due to an on-site UST. The UST was removed. Impacts were reportedly minor in nature and limited in extent and not migrating off-site. No residual groundwater contamination is present on-site. Site closed with a SMAC designation.	1
992638	Eagles Club	194 St Paul St	Burlington	SMAC	Sarah A. Bartlett	6/8/1999	7/2/2009	UST removed May 1999. 4 MWs installed, two contained multiple petroleum VOCs in excess of VGES through October 2002. Additional sampling April 2009, no VOCs in excess of MDLs. Indoor air monitoring in on-site and surrounding buildings, no impacts.	UST #1438	Petroleum impacts to soil and groundwater due to an on-site UST. Groundwater contamination is no longer above regulatory standards and is not migrating off-site. Site closed with a SMAC designation.	1
20033138	Former Kilburn & Gates Industries	20 Kilburn St	Burlington	SMAC	Gerold Noyes	6/9/2003	5/3/2010	fuel oil UST removed. Contam found. Site investigation showed that majority of site contamination was gasoline related migration onto site from #90-0594 Duncan Auto. MWs left open for Duncan Auto investigation to be closed with Duncan Auto closure	HWS #900594 UST#1456	On-site contamination was determined to be migrating on-site from an adjoining site (Leo Duncan Auto ID #900594). Site closed with a SMAC designation.	1, 2
20083862	Former Maynard Auto Supply	696 Pine St	Burlington	SMAC	Gerold Noyes	10/7/2008	4/29/2010	2 abandoned UST's removed. Former gas station, closed Site 20002774. Expressway. Confirmatory sample shows minimal impact to GW. SMAC	HWS #20002774 UST #5559796	Petroleum impacts to soil and groundwater discovered during the removal of a UST in 2000. Impacts associated with this tank were resolved in 2000. In 2008 two additional USTs were identified on-site and this site was re-opened. Remediation through natural attenuation. Groundwater results decreased below the regulatory standards. Site was closed with a SMAC designation in 2010.	3, 4
20002774	Maynard Auto	696 Pine St	Burlington	SMAC	Gerold Noyes	4/13/2000	10/4/2000	UST removed. Contam found. Investigation completed. Minor impact to GW. VGES exceeded in tank pit moitor well. SMAC . Re-opened 10/2008 as 2008-3862 following removal of 2 abandoned USTs	HWS #20083862 UST #5559796	See HWS #20083862	3, 4
870001	Northern Oil/harborwatch	Harrison Ave	Burlington	NFAP	Richard Spiese	NA	7/22/1991	Long Term Monitering Completed. Site Closed.		Former petroleum bulk storage facility. Low-levels of petroleum constituents were identified in soils and groundwater. Later groundwater monitoring indicated no exceedance of regulatory standards. This site was closed with an NFAP in 1991.	4
921309	Old Coca Cola Plant	226 Pine St	Burlington	SMAC	Matt Moran	10/1/1992	8/1/1994	Investigation Of Gasoline Underground Storage Tank Complete, Site Closed.	UST #9990335	Petroleum impacts to soil and groundwater from and on-site UST. Impacted soils were removed from the tank grave and groundwater was shown to be below regulatory standards. Site was closed with a SMAC designation.	2
911069	Rosetti Property (former)	175 Lakeside Avenue	Burlington	SMAC	Linda Elliott	11/1/1994	4/20/2012	Property underwent long term ground water monitoring to track petroleum plume. Redevelopment in summer 2011 for Champlain College - Miller Center. Ongoing site work reveals no apparent impact to identified receptors. Site eligible for SMAC. Letter issued	HWS #941679	See HWS #941679	4
941679	Rossetti Real Estate	175 Lakeside Ave	Burlington	SMAC	Matt Moran	12/1/1994	9/1/1995	Site Invest Complete, No Impact To Soils Or Gw From Ust's	HWS #911069	Petroleum impacts to soil from an on-site UST. Groundwater was shown to not have been affected. During redevelopment petroleum impacted soils were identified but were below screening values. These soils were burried beneath approximately two feet of clean fill on-site. This site was also used as a recycling facility but no contaminants were analyzed regarding that particular site use. Site closed with a SMAC designation.	4

VT DEC Hazardous Waste Sites
Plan BTV South End - Phase I
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SITES WITHIN THE PLAN BTV SOUTH END STUDY AREA - Sorted by Risk Level than Alphabetical by Site Name

Site Number	Site Name	Address	Town	DEC Priority	DEC Staff	Discovery Date	Closure Date	DEC Project Status	Associated Facilities	Opinion	Map Page
982527	Rotary Mart	103 Shelburne Rd	Burlington	SMAC	Richard Spiese	10/6/1998	9/12/2005	Limited GW contamination discovered. Site in Natural Attenuation monitoring. GWESs met on site. MWs closed.		Petroleum impacts to soil and groundwater during the replacement of UST piping. Site remediated through natural attenuation until groundwater results decreased below regulatory standards. This site was closed with a SMAC in 2005.	1, 3
20073730	Swish Facility	703 Pine St	Burlington	SMAC	Ashley Desmond	9/25/2007	5/6/2008	Contamination discovered during the closure of a heating oil UST. It was originally speculated that there had been a gasoline release in the vicinity of the UST due to high PID readings, but the VOC analysis indicated a profile similar to heating oil. In		Petroleum impacts to soil and groundwater discovered during the closure of a UST. Remediation through natural attenuation. Only naphthalene above regulatory standards in one well. Site was closed with a SMAC designation in 2008.	4
931521	Vermont Railway - Flynn Ave	207 Flynn Ave	Burlington	MED	Unassigned	12/1/1993		SMAC status pending notification from Vermont Railway that contaminated soils have been spread or backfilled onsite.		Petroleum impacts to soil and groundwater discovered during the removal of three USTs and potentially from a former (1976/1977) fuel oil leak. Contaminated soils were removed in 1993 and stockpiled on-site for treatment. No impacts to groundwater were evident. SMAC available pending notification of the spreading or backfill of stockpiled soils.	4
20033161	Westwind Condominiums	308 S Winooski Ave	Burlington	SMAC	Tim Cropley	9/30/2003	8/14/2013	Underground storage tank removed. Contamination found. Groundwater investigation performed and three rounds of MW samples collected in 2004. Final 2 rounds had no detectable VOCs. Mws properly abandonned.		Impacts to soil and groundwater from on-site UST. The UST was removed. Groundwater impacts were remediated with natural attenuation and analytical results decreased below regulatory standards. Site closed with a SMAC designation.	1
20104056	Woodaman Property	8 Gove Court	Burlington	SMAC	Ashley Desmond	3/22/2010	9/7/2010	Surface contamination encountered during a limited site investigation, which appears to be associated with occasional automobile maintenance at the property. Two oil stained areas were excavated and soils were drummed for disposal. Groundwater monitoring		Petroleum impacts to soil and groundwater associated with a former on-site auto repair facility. Approximately five drums of impacted soils were removed from the site. Groundwater decreased below regulatory standards. Site closed with a SMAC designation in 2010.	1, 3
20104100	Wharf Lane Apartments	57 Maple Street	Burlington	SMAC	Lynda Provencher		11/12/2010	2 6,000 gallon abandoned heating oil underground storage tanks closed in place. Contamination found in the soils found inside the tanks. 115 tons of soil excavated and transported to ESMI. No groundwater encountered.	Brownfield	Petroleum impacts discovered during the removal of two USTs. Approximately 115 tons of impacted soil was removed and properly disposed of. Groundwater showed no impacts but PAHs were ideentified in soils. The site was closed with a SMAC designation in 2010.	2
982379	Yandow Property	351Shelburne St and Flynn Ave	Burlington	SMAC	Hugo Martínez Cazón	5/18/1998	2/1/2007	Phase 2 Environmental Site Assessment Complete. Groundwater And Soil Impacts By Gasoline Compounds. Requesting Follow-up Investigation. SMAC obtainied 2/1/07 October 2006: demolition work coordinated with soil management plan results in stockpile of cont		Impacts to soil discovered during the removal of three hydraulic lifts. Impacted soils were excavated and properly disposed of. Groundwater was not impacted. This site was closed with a SMAC in 2007.	3

Hazardous Waste Sites Data Georeferenced from VT DEC (March 2014)
The following risk designations were assigned by VHB based on review of applicable reports and VHBs assessment of risk that the Project will encounter contamination associated with the above listed facilities.

high risk
medium risk
low risk

VT DEC Brownfields Sites
Plan BTV South End - Phase I
Burlington, Vermont

SITES WITHIN THE AWP PROJECT AREA					
Site Name	**Address**	**Town**	**DEC Priority**	**DEC Staff**	**Associate Facilities**
Former Street Sweeping Building	339 Pine Street	Burlington	MED	Sarah A. Bartlett	HWS #992592 HWS #20144476
351 Pine Street	351 Pine Street	Burlington	LOW	Michael Smith	
453 Pine Street	453 Pine Street	Burlington	LOW	Michael Smith	HWS #20043192

SITES WITHIN THE PLAN BTV SOUTH END STUDY AREA					
Site Name	**Address**	**Town**	**DEC Priority**	**DEC Staff**	**Associate Facilities**
None					

EPA Brownfields Sites
Plan BTV South End - Phase I
Burlington, Vermont

SITES WITHIN THE AWP PROJECT AREA						
Registry ID	**Program Acronym**	**Program ID**	**Name**	**Address**	**Town**	**Associated Facilities**
39542411	ACRES	12970	VERMONT TRANSIT PASSENGER TERMINAL	345 PINE STREET	BURLINGTON	
55950733	ACRES	164821	351 PINE STREET	351 PINE STREET	BURLINGTON	
56253744	ACRES	164801	453 PINE STREET	453 PINE STREET	BURLINGTON	HWS #20043192

SITES WITHIN THE PLAN BTV SOUTH END STUDY AREA						
Registry ID	**Program Acronym**	**Program ID**	**Name**	**Address**	**Town**	**Associated Facilities**
40822198	ACRES	111515	322 ST. PAUL STREET	322 ST. PAUL STREET	BURLINGTON	
46370128	ACRES	133142	BOBBIN APARTMENTS	234 SOUTH CHAMPLAIN STREET	BURLINGTON	HWS #20134377
45009682	ACRES	133141	WHARF LANE APARTMENTS	57 MAPLE STREET	BURLINGTON	HWS #20104100
40822170	ACRES	111513	221 PINE STREET	221 PINE STREET	BURLINGTON	

VT DEC Underground Storage Tank Sites
Plan BTV South End - Phase I
Burlington, Vermont

SITES WITHIN THE AWP PROJECT AREA					
Site Number	**SOURCE**	**Site Name**	**Address**	**Associated Facilities**	**Status**
822	Q	Burlington Public Works Department	339 Pine Street	HWS #992592	PULLED
6582550	M	Vermont Railway Inc	1 Railway Lane	HWS #770179	ACTIVE
5551723		266 Champlain Street	266 Champlain Street	HWS #20002827	PULLED
192		General Electric Comp.	Lakeside Ave	HWS #770041	PULLED

SITES WITHIN THE PLAN BTV SOUTH END STUDY AREA					
Site Number	**SOURCE**	**Site Name**	**Address**	**Associated Facilities**	**Status**
1700	Q	Perry Enterprises	207 Flynn Avenue	HWS #770109	PULLED
1414	Q	Montstream Residence	20 South Cove Road		ACTIVE
6586235	Q	Pool World, Inc.	16 Austin Drive		PULLED
1525	Q	Chittenden County Trans Authority	1 Industrial Parkway	HWS #951791	PULLED
1220	Q	Residence	361 Flynn Avenue		PULLED
1427	M	Don Cobb's Quality Used Cars	521 Shelburne Road	HWS #900491	PULLED
6584140	M	Mobil Oil Corp. VT Terminal	2 Flynn Avenue	HWS #870175	PULLED
153		Cumberland Farms #4018	661 Pine Street	HWS #982418	ACTIVE
8631311	M	Barrett Trucking Co., Inc.	16 Austin Drive	HWS #921232	PULLED
6	Q	G.S. Blodgett Co., Inc.	50 Lakeside Avenue		PULLED
8649477		Duncan's Auto Services	291 St. Paul Street	HWS #900594	PULLED
1904		Former St. Johnsbury Trucking	645 Pine Street	HWS #992591	PULLED
435		Rosetti Brothers/Casella Waste Management	175 Lakeside Aveenue	HWS #911069	PULLED
8649831		Blodgett Supply Company	44 Lakeside Avenue		PULLED
776		Maintenance Building Physical Plant	287 Shelburne Road	HWS #921264	PULLED
1438		Eagle's Club	194 St Paul Street	HWS #992638	PULLED
1456			Kilburne and Gates Industries	HWS #20033138	PULLED
5559796		Maynard Auto Supply	696 Pine Street	HWS #20002774 HWS #20083862	PULLED
9990335		Old Coca Cola Plant	266 Pine Street	HWS #921309	PULLED
5557882		Wharf Lane Apartments	57 Maple Street	HWS #20104100	PULLED

VT DEC RCRA Sites
Plan BTV South End - Phase I
Burlington, Vermont

SITES WITHIN THE AWP PROJECT AREA					
EPA ID	**Facility Name**	**Status**	**Address**	**Town**	**Associated Facilities**
VT5000000190	CITIZENS OIL COMPANY INC	C	377 PINE STREET	BURLINGTON	
	H. HORSEMAN & CO	C	431 PINE STREET	BURLINGTON	
VTD988375408	CHITTENDEN SOLID WASTE	G	339 PINE STREET	BURLINGTON	HWS #992592 HWS #20144476 Brownfield
VTD052502929	LAKESIDE MFG CORP.	S	431 PINE STREET	BURLINGTON	
	ULTRAMARR PETROLEUM INC.	OB	345 PINE STREET	BURLINGTON	HWS #870097
	AMPERSAND INC	S	431 PINE STREET	BURLINGTON	

SITES WITHIN THE PLAN BTV SOUTH END STUDY AREA					
EPA ID	**Facility Name**	**Status**	**Address**	**Town**	**Associated Facilities**
VTD000649780	GENERAL DYNAMICS (WAS MARTIN MARIETTA G.E.)	G	INDUSTRIAL PARKWAY	BURLINGTON	
VTD020663183	BURTON SNOW BOARDS	G	80 INDUSTRIAL ROAD	BURLINGTON	
VTD981215734	CHITTENDEN COUNTY TRANSP. AUTHORITY	G	1 INDUSTRIAL PARKWAY	BURLINGTON	HWS #951791 UST #1525
VTD981886880	MCAULIFFE INC	NG	208 FLYNN AVENUE	BURLINGTON	
	JOHN MCKENZIE PACKING COMPANY, INC.	S	160 FLYNN AVENUE	BURLINGTON	
VTD000791871	MOBIL OIL	G	FLYNN AVENUE	BURLINGTON	HWS #870175 UST #6584140
VTD002063741	GEORGE LITTLE PRESS	C	750 PINE STREET	BURLINGTON	
VTD002074896	QUEEN CITY PRINTERS	G	701 PINE STREET	BURLINGTON	
VT5000001594	CUMBERLAND FARMS #4018	G	661 PINE STREET	BURLINGTON	HWS #982418
VTD002067254	BLODGETT OVEN COMPANY (WAS G.S. BLODGETT CO. INC)	G	50 LAKESIDE AVENUE	BURLINGTON	
VTD982190001	ST. JOHNSBURY TRUCKING	OB	PINE STREET	BURLINGTON	HWS #992596
VTD002083434	GENERAL DYNAMICS	G	LAKESIDE AVENUE	BURLINGTON	
VTD020654430	BURLINGTON ELECTRIC DEPT.	G	585 PINE STREET	BURLINGTON	
VTD002068500	SPECIALTY FILAMENTS (WAS WHITING COMPANY A.C.)	G	1 HOWARD STREET	BURLINGTON	
	AL DUROCHER'S BODY SHOP	S	420 PINE STREET	BURLINGTON	
	BORY'S INSTRUMENT CO.	S	420 PINE STREET	BURLINGTON	
	RENOVATION SHOPPE	S	424 PINE STREET	BURLINGTON	
	SIGN LANGUAGE	S	416 PINE STREET	BURLINGTON	
	FLETCHER ALLEN HEALTH CARE	C	310 PINE STREET, LANE PRESS BUILDING	BURLINGTON	
	T.A. HAIGH LUMBER CO.	NG	315 PINE STREET	BURLINGTON	
	COCA-COLA BOTTLING CO.	NG	266 PINE STREET	BURLINGTON	HWS# 921309 UST #9990335
VT5000000521	STEREOTYPE & DESIGN	C	266 PINE STREET	BURLINGTON	
	LINCOLNWORKS INC.	S	266 PINE STREET	BURLINGTON	
	ONLY ONCE GRAPHICS	S	266 PINE STREET	BURLINGTON	
	AIR PACKAGING	S	266 PINE STREET	BURLINGTON	

EPA Sites
Plan BTV South End - Phase I
Burlington, Vermont

SITES WITHIN THE AWP PROJECT AREA						
Registry ID	**Program Acronym**	**Program ID**	**Interest Type**	**Name**	**Address**	**Town**
8208929	AIRS/AFS	50007CFC10	AIR MINOR	ENVIRONMENTAL DEPOT	339 PINE STREET	BURLINGTON
9259809	CERCLIS	VTD980523062	SUPERFUND NPL	PINE STREET CANAL	PINE ST	BURLINGTON
9346957	CERCLIS	VTD981215775	SUPERFUND (NON-NPL)	BELL AIRCRAFT DUMP (FORMER)	LAKESIDE AVENUE	BURLINGTON
8208929	ICIS	17500	FORMAL ENFORCEMENT ACTION	ENVIRONMENTAL DEPOT	339 PINE STREET	BURLINGTON
9259809	ICIS	38916	FORMAL ENFORCEMENT ACTION	PINE STREET CANAL	PINE ST	BURLINGTON
9259809	ICIS	38918	FORMAL ENFORCEMENT ACTION	PINE STREET CANAL	PINE ST	BURLINGTON
8208929	NCDB	I01#19940510NI005 2	COMPLIANCE ACTIVITY	ENVIRONMENTAL DEPOT	339 PINE STREET	BURLINGTON
8208929	RCRAINFO	VTD988367553	UNSPECIFIED UNIVERSE	ENVIRONMENTAL DEPOT	339 PINE STREET	BURLINGTON
14436823	RCRAINFO	VTR000506014	CESQG	TRACKSIDE TERMINAL OIL CO LLC	267 BATTERY ST	BURLINGTON

SITES WITHIN THE PLAN BTV SOUTH END STUDY AREA						
Registry ID	**Program Acronym**	**Program ID**	**Interest Type**	**Name**	**Address**	**Town**
314794	AIRS/AFS	5000700013	AIR MINOR	BLODGETT OVEN	50 LAKESIDE AVE.	BURLINGTON
826802	AIRS/AFS	5000700027	AIR SYNTHETIC MINOR	GLOBAL PETROLEUM TERMINAL	2 FLYNN AVENUE	BURLINGTON
880011	AIRS/AFS	5000700011	AIR MINOR	GENERAL DYNAMICS TECHNICAL CENTER	128 LAKESIDE AVENUE	BURLINGTON
1915615	AIRS/AFS	5000700010	AIR SYNTHETIC MINOR	BURTON SNOWBOARDS	80 INDUSTRIAL PARKWAY	BURLINGTON
1916080	AIRS/AFS	50007CFC07	AIR MINOR	CHITTENDEN COUNTY TRANS AUTHORITY	1 INDUSTRIAL AVE	BURLINGTON
1915795	AIRS/AFS	5000700029	AIR MINOR	QUEEN CITY PRINTERS	701 PINE STREET	BURLINGTON
1916106	AIRS/AFS	50007CFC09	AIR MINOR	D P W	645 PINE ST	BURLINGTON
1915713	AIRS/AFS	5000700002	AIR MINOR	SPECIALTY FILAMENTS INC	1 HOWARD STREET	BURLINGTON
7329596	AIRS/AFS	5000700005	AIR MINOR	GENERAL DYNAMICS INDUSTRIAL PARKWAY	HOME AVE.	BURLINGTON
12626319	AIRS/AFS	5000700042	AIR MINOR	GP BURLINGTON NORTH	128 LAKESIDE AVENUE	BURLINGTON
41948122	AIRS/AFS	5000700018	AIR MINOR	EDLUND COMPANY	159 INDUSTRIAL PARKWAY	BURLINGTON
826802	BR	VTD000791871	HAZARDOUS WASTE BIENNIAL REPORTER	GLOBAL PETROLEUM TERMINAL	2 FLYNN AVENUE	BURLINGTON
880011	BR	VTD002083434	HAZARDOUS WASTE BIENNIAL REPORTER	GENERAL DYNAMICS TECHNICAL CENTER	128 LAKESIDE AVENUE	BURLINGTON
5261448	BR	VTD043783992	HAZARDOUS WASTE BIENNIAL REPORTER	VERMONT RAILWAY INC	1 RAILWAY LN	BURLINGTON
5262189	BR	VTD988375408	HAZARDOUS WASTE BIENNIAL REPORTER	CHITTENDEN SOLID WASTE DISTRICT	339A PINE ST	BURLINGTON
44931250	BR	VTD000649780	HAZARDOUS WASTE BIENNIAL REPORTER	GENERAL DYNAMICS ARMAMENT & TECH PRODUCTS	152 INDUSTRIAL PKWY BLDG 41	BURLINGTON
880011	CERCLIS	VTD002083434	SUPERFUND (NON-NPL)	GENERAL DYNAMICS TECHNICAL CENTER	128 LAKESIDE AVENUE	BURLINGTON
826802	EIS	7726011	CRITERIA AND HAZARDOUS AIR POLLUTANT INVENTORY	GLOBAL PETROLEUM TERMINAL	2 FLYNN AVENUE	BURLINGTON
1915615	EIS	7725811	CRITERIA AND HAZARDOUS AIR POLLUTANT INVENTORY	BURTON SNOWBOARDS	80 INDUSTRIAL PARKWAY	BURLINGTON
41169552	EIS	7966111	CRITERIA AND HAZARDOUS AIR POLLUTANT INVENTORY	EDLUND CO INC (BURLINGTON)	BOX 929	BURLINGTON
826802	ICIS	7378531	ENFORCEMENT/COMPLIANCE ACTIVITY	GLOBAL PETROLEUM TERMINAL	2 FLYNN AVENUE	BURLINGTON
826802	ICIS	600034476	ENFORCEMENT/COMPLIANCE ACTIVITY	GLOBAL PETROLEUM TERMINAL	2 FLYNN AVENUE	BURLINGTON
5298365	ICIS	600032736	ENFORCEMENT/COMPLIANCE ACTIVITY	HERITAGE ENVIRONMENTAL PROJECTS INC	35 BATCHELDER ST	BURLINGTON
12237445	ICIS	7825168	ENFORCEMENT/COMPLIANCE ACTIVITY	ROTARY GULF	82 SHELBURNE ROAD	BURLINGTON
14428333	ICIS	2659631	FORMAL ENFORCEMENT ACTION	SWISH MAINTENANCE LIMITED	703 PINE ST	BURLINGTON
14428333	ICIS	2659631	ENFORCEMENT/COMPLIANCE ACTIVITY	SWISH MAINTENANCE LIMITED	703 PINE ST	BURLINGTON
22649801	ICIS	600044786	ENFORCEMENT/COMPLIANCE ACTIVITY	CHRIST THE KING ELEMENTARY SCHOOL	136 LOCUST STREET	BURLINGTON
30895057	ICIS	600025075	ENFORCEMENT/COMPLIANCE ACTIVITY	HOWARD CENTER / THE BAIRD SCHOOL	208 FLYNN AVENUE SUITE 3J	BURLINGTON
41948122	ICIS	1800056129	ENFORCEMENT/COMPLIANCE ACTIVITY	EDLUND COMPANY	159 INDUSTRIAL PARKWAY	BURLINGTON
41948122	ICIS	1800056128	ENFORCEMENT/COMPLIANCE ACTIVITY	EDLUND COMPANY	159 INDUSTRIAL PARKWAY	BURLINGTON
54918602	ICIS	3000039285	ENFORCEMENT/COMPLIANCE ACTIVITY	TARGET HOUSING	85-87 CHARLOTTE STREET	BURLINGTON
54918577	ICIS	3000039272	ENFORCEMENT/COMPLIANCE ACTIVITY	CHAMPLAIN HOUSING TRUST PROPERTY	57 MARBLE AVENUE	BURLINGTON
55492480	ICIS	3400042953	ENFORCEMENT/COMPLIANCE ACTIVITY	MULTI-FAMILY HOUSE	230 PINE STREET	BURLINGTON
14428333	NCDB	C01#SSURO01-2003001	COMPLIANCE ACTIVITY	SWISH MAINTENANCE LIMITED	703 PINE ST	BURLINGTON
21581956	NCDB	I01#19900126HE162 1	COMPLIANCE ACTIVITY	CHAMPLAIN SCHOOL	800 PINE STREET	BURLINGTON
22649801	NCDB	I01#19940217NI003 1	COMPLIANCE ACTIVITY	CHRIST THE KING ELEMENTARY SCHOOL	136 LOCUST STREET	BURLINGTON

EPA Sites
Plan BTV South End - Phase I
Burlington, Vermont

SITES WITHIN THE PLAN BTV SOUTH END STUDY AREA						
Registry ID	**Program Acronym**	**Program ID**	**Interest Type**	**Name**	**Address**	**Town**
826802	NPDES	VT0000353	ICIS-NPDES NON-MAJOR	GLOBAL PETROLEUM TERMINAL	2 FLYNN AVENUE	BURLINGTON
880011	NPDES	VTP000004	ICIS-NPDES UNPERMITTED	GENERAL DYNAMICS TECHNICAL CENTER	128 LAKESIDE AVENUE	BURLINGTON
5298105	NPDES	VT0020729	ICIS-NPDES NON-MAJOR	CHAMPLAIN WATER DISTRICT	403 QUEEN CITY PARK RD	SOUTH BURLINGTON
15811406	NPDES	VT0000337	ICIS-NPDES NON-MAJOR	G. S. BLODGETT CO.	32 LAKESIDE AVE	BURLINGTON
24908607	NPDES	VT0100153	ICIS-NPDES MAJOR	BURLINGTON MAIN WASTEWATER TREATMENT PLANT	53 LAVALLEY LANE	BURLINGTON
41948122	NPDES	VTU000041	ICIS-NPDES UNPERMITTED	EDLUND COMPANY	159 INDUSTRIAL PARKWAY	BURLINGTON
54911119	NPDES	VT0000558	ICIS-NPDES NON-MAJOR	FORTIETH BURLINGTON LLC	128 LAKESIDE AVE	BURLINGTON
826802	OIL	R1-VT-00007	FRP	GLOBAL PETROLEUM TERMINAL	2 FLYNN AVENUE	BURLINGTON
314794	RCRAINFO	VTD002067254	CESQG	BLODGETT OVEN	50 LAKESIDE AVE.	BURLINGTON
826802	RCRAINFO	VTD000791871	SQG	GLOBAL PETROLEUM TERMINAL	2 FLYNN AVENUE	BURLINGTON
880011	RCRAINFO	VTD002083434	CESQG	GENERAL DYNAMICS TECHNICAL CENTER	128 LAKESIDE AVENUE	BURLINGTON
880011	RCRAINFO	VTR000510560	CESQG	GENERAL DYNAMICS TECHNICAL CENTER	128 LAKESIDE AVENUE	BURLINGTON
1915615	RCRAINFO	VTD020663183	CESQG	BURTON SNOWBOARDS	80 INDUSTRIAL PARKWAY	BURLINGTON
1915866	RCRAINFO	VTD002063741	UNSPECIFIED UNIVERSE	GEORGE LITTLE PRESS	750 PINE ST	BURLINGTON
1915795	RCRAINFO	VTD002074896	SQG	QUEEN CITY PRINTERS	701 PINE STREET	BURLINGTON
1915713	RCRAINFO	VTD002068500	CESQG	SPECIALTY FILAMENTS INC	1 HOWARD STREET	BURLINGTON
5261340	RCRAINFO	VTD037366671	UNSPECIFIED UNIVERSE	JASONS DRY CLEANING INC	430 SHELBURNE RD	SOUTH BURLINGTON
5260877	RCRAINFO	VTD000791392	UNSPECIFIED UNIVERSE	EXXON CO USA BURLINGTON TERM	199 FLYNN AVE	BURLINGTON
5261028	RCRAINFO	VTD002070811	UNSPECIFIED UNIVERSE	LANE PRESS INC	305 ST PAUL ST	N BURLINGTON
5261448	RCRAINFO	VTD004859088	UNSPECIFIED UNIVERSE	VERMONT RAILWAY INC	1 RAILWAY LN	BURLINGTON
5261448	RCRAINFO	VTD043783992	LQG	VERMONT RAILWAY INC	1 RAILWAY LN	BURLINGTON
5261536	RCRAINFO	VTD052502929	UNSPECIFIED UNIVERSE	LAKESIDE DIV OF VERMONT	431 PINE ST	BURLINGTON
5262189	RCRAINFO	VTD988375408	CESQG	CHITTENDEN SOLID WASTE DISTRICT	339A PINE ST	BURLINGTON
5262189	RCRAINFO	VTD988375408	TRANSPORTER	CHITTENDEN SOLID WASTE DISTRICT	339A PINE ST	BURLINGTON
5262786	RCRAINFO	VTR000007740	CESQG	KAIGLES CITGO	510 SHELBURNE RD	SOUTH BURLINGTON
5262786	RCRAINFO	VTR000504597	CESQG	KAIGLES CITGO	510 SHELBURNE RD	SOUTH BURLINGTON
5262722	RCRAINFO	VTR000007641	CESQG	KAIGLE R INC	210 SHELBURNE RD	BURLINGTON
5262544	RCRAINFO	VTR000002980	CESQG	VT DEPT OF BGS COSTELLO COURT MAINT SHOP	32 CHERRY ST	BURLINGTON
5293495	RCRAINFO	VT5000000927	SQG	GREERS DRY CLEANING	27 SEARS LN	BURLINGTON
5293235	RCRAINFO	VT5000000190	CESQG	CITIZENS OIL CO INC	377 PINE ST	BURLINGTON
5293379	RCRAINFO	VT5000000521	CESQG	RESOURCE - A NON-PROFIT COMMUNITY ENTERPRISE	266 PINE ST	BURLINGTON
5294109	RCRAINFO	VTD077194629	UNSPECIFIED UNIVERSE	BEAUDOINS RADIATOR SERVICE	8 HOME AVENUE	BURLINGTON
5293690	RCRAINFO	VT5000001594	CESQG	CUMBERLAND FARMS #4018	661 PINE ST	BURLINGTON
5294760	RCRAINFO	VTD981215734	CESQG	CHITTENDEN COUNTY TRANS AUTHORITY	15 INDUSTRIAL PKWY	BURLINGTON
5294804	RCRAINFO	VTD981886880	UNSPECIFIED UNIVERSE	MCAULIFFE INC	208 FLYNN AVE	BURLINGTON
5295082	RCRAINFO	VTD982545428	UNSPECIFIED UNIVERSE	VT ENGINE SERVICE INC	696 PINE ST	BURLINGTON
5296278	RCRAINFO	VTR000005116	UNSPECIFIED UNIVERSE	CASELLA WASTE MANAGEMENT INC	175 LAKESIDE AVE	BURLINGTON
5296456	RCRAINFO	VTR000005512	CESQG	LIGHT WORKS INC	19 MARBLE AVE	BURLINGTON
5296054	RCRAINFO	VTR000004671	UNSPECIFIED UNIVERSE	FLETCHER ALLEN HEALTH CARE-GIVEN HEALTH CARE	310 PINE ST	BURLINGTON
5297124	RCRAINFO	VTR000007997	CESQG	SKITUNER MFG	208 FLYNN AVE	BURLINGTON
5297455	RCRAINFO	VTR000008623	CESQG	WESCO INC CHAMPLAIN FARMS	315 SHELBURNE RD	BURLINGTON
5297482	RCRAINFO	VTR000008656	CESQG	WESCO ROTARY MART	103 SHELBURNE RD	BURLINGTON
5298105	RCRAINFO	VTR000011619	CESQG	CHAMPLAIN WATER DISTRICT	403 QUEEN CITY PARK RD	SOUTH BURLINGTON
5298365	RCRAINFO	VTR000012179	CESQG	HERITAGE ENVIRONMENTAL PROJECTS INC	35 BATCHELDER ST	BURLINGTON
5298427	RCRAINFO	VTR000012328	UNSPECIFIED UNIVERSE	S B COLLINS RALPHS FOREIGN AUTO	616 SOUTH WILLARD ST	BURLINGTON
5298926	RCRAINFO	VTR000013383	CESQG	POMERLEAU FORMER A BROWN AUTO SITE	660 PINE ST	BURLINGTON
8205398	RCRAINFO	VTD019104017	UNSPECIFIED UNIVERSE	YANDOW MOTOR CO	FLYNN AVE	BURLINGTON
9509273	RCRAINFO	VT5000000497	CESQG	HORSMAN H	431 PINE ST	BURLINGTON
12192849	RCRAINFO	VTR000502815	CESQG	CONANT METAL & LIGHT	270 PINE ST	BURLINGTON

EPA Sites
Plan BTV South End - Phase I
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SITES WITHIN THE PLAN BTV SOUTH END STUDY AREA						
Registry ID	**Program Acronym**	**Program ID**	**Interest Type**	**Name**	**Address**	**Town**
12237445	RCRAINFO	VTR000008649	CESQG	ROTARY GULF	82 SHELBURNE ROAD	BURLINGTON
12237445	RCRAINFO	VTR000501817	CESQG	ROTARY GULF	82 SHELBURNE ROAD	BURLINGTON
15321016	RCRAINFO	VTR000507376	CESQG	1ST ADVANTAGE DENTAL	789 PINE ST	BURLINGTON
15685579	RCRAINFO	VTR000508747	CESQG	NORTHERN TOYOTALIFT INC	683 PINE ST	BURLINGTON
15812799	RCRAINFO	VTR000509059	UNSPECIFIED UNIVERSE	BOOSKA MOVERS	180 FLYNN AVE	BURLINGTON
15812744	RCRAINFO	VTR000509042	CESQG	THERRIENS BOILER & MECHANICAL SVC INC	41 BIRCHCLIFF PKWY	BURLINGTON
15814065	RCRAINFO	VTR000508853	CESQG	SELECT DESIGN	208 FLYNN AVE	BURLINGTON
16710068	RCRAINFO	VTR000509497	CESQG	FOX PRINTING	39 KILBURN ST	BURLINGTON
20119977	RCRAINFO	VTR000511774	CESQG	DUNCANS AUTO	291 ST PAUL ST	BURLINGTON
22524767	RCRAINFO	VTD000649848	UNSPECIFIED UNIVERSE	GENERAL ELECTRIC COMPANY A&ESD	INDUSTRIAL PARKWAY	BURLINGTON
23771890	RCRAINFO	VTR000500090	UNSPECIFIED UNIVERSE	ENVIRONMENTAL PRODUCTS & SERVICES OF VERMONT INC	2 FLYNN AVE	BURLINGTON
41948122	RCRAINFO	VTD002070050	SQG	EDLUND COMPANY	159 INDUSTRIAL PARKWAY	BURLINGTON
44924696	RCRAINFO	VTR000521252	CESQG	BURTON SNOWBOARDS - CRAIGS PROTOSHOP	152 INDUSTRIAL PKWY	BURLINGTON
44931250	RCRAINFO	VTD000649780	UNSPECIFIED UNIVERSE	GENERAL DYNAMICS ARMAMENT & TECH PRODUCTS	152 INDUSTRIAL PKWY BLDG 41	BURLINGTON
45429256	RCRAINFO	VTR000521427	CESQG	SHAWS #7517	570 SHELBURNE RD	BURLINGTON
46248636	RCRAINFO	VTR000521823	CESQG	NOYES AUTOMOTIVE AND TIRE	777 PINE STREET	BURLINGTON
314794	TRIS	05402GSBLD50LAK	TRI REPORTER	BLODGETT OVEN	50 LAKESIDE AVE.	BURLINGTON
826802	TRIS	05401GLBLP2FLYN	TRI REPORTER	GLOBAL PETROLEUM TERMINAL	2 FLYNN AVENUE	BURLINGTON
880011	TRIS	05401GNRLLLAKES	TRI REPORTER	GENERAL DYNAMICS TECHNICAL CENTER	128 LAKESIDE AVENUE	BURLINGTON
22524767	TRIS	05401GNRLLINDUS	TRI REPORTER	GENERAL ELECTRIC COMPANY A&ESD	INDUSTRIAL PARKWAY	BURLINGTON
41948122	TRIS	05402DLNDC159IN	TRI REPORTER	EDLUND COMPANY	159 INDUSTRIAL PARKWAY	BURLINGTON

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