

Siting Study and Conceptual Master Plan

# North Beach Campground Amenity Siting Study & Conceptual Master Plan

Burlington, Vermont

AUGUST 2017



PREPARED FOR

City of Burlington Parks,  
Recreation & Waterfront  
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Burlington, VT 05401



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PARKS  
RECREATION  
WATERFRONT  
VERMONT

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## Attachments

Attachment A:	OHM Existing Conditions Memo
Attachment B:	Cultural Resources ARA



## Acknowledgements

The design and master planning process for North Beach Campground was made possible through time and energy dedicated by members of the City of Burlington's Parks, Recreation & Waterfront staff. Their contributions provided valuable input in developing a vision for the master plan and the future legacy of North Beach Campground. The following individuals participated in various meetings, and charrettes throughout the planning process.

### City of Burlington Parks, Recreation & Waterfront

#### Director:

- › Jesse Bridges – Former Parks Director and Harbormaster

#### Planning Division:

- › Jon Adams-Kollitz – Parks Project Coordinator
- › Max Madilinski – Associate Parks Project Coordinator (Project Manager)
- › Nina Safavi – Parks Comprehensive Planner
- › Diana Wood – Marketing & Outreach Manager

#### Waterfront Division:

- › Alec Kaeding – Facilities Operations Director
- › Erin Moreau – Waterfront Manager

#### Parks Division:

- › Todd Greenough – Facility Maintenance Manager
- › Marty Hornick – Grounds Foreman
- › Deryk Roach – Parks Maintenance and Operations Superintendent
- › Warren Spinner – City Arborist
- › Mattie Wolfer – Arborist Technician

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# 1

## Introduction

North Beach Campground comprises approximately 45 acres located adjacent to the Burlington High School, Burlington Bike Path and Lake Champlain's North Beach. The campground offers approximately 140 seasonal camp sites nestled in an urban environment, while offering wonderful rural character with a mixture of wooded sites, a sandy beach and picnic areas. The campground entrance also serves as the gateway to one of Burlington's most popular beaches, North Beach. This campground is truly a gem located in the heart of the city.

The park has outgrown its original design when camping needs were much simpler. Things have changed with the size of today's RVs and travel trailers, along with anticipated amenities and services to support the modern camping experience. Sometimes these needs can create conflicting uses within and adjacent to the campground. This master plan tries to balance the needs of campers, BPRW maintenance operations, pedestrian, bicycle and vehicular circulation, ecological health/restoration/preservation and preservation of cultural resources.

This planning process included exploring ideas to improve the overall park experience and direct the long-term vision for the campground. The focus of this work looked at developing a comprehensive siting study and conceptual master plan for the campground, which addresses siting current and future amenities at North Beach Campground. The outcome of this evaluation includes suggested renovations, relocation and additional needed facilities and amenities.

# 2

## Site Analysis and Observations

### Vehicular/Pedestrian Circulation

- › The North Beach Campground lacks a sense of arrival:
  - Limited wayfinding and signage along North Avenue and Institute Road.
  - The arrival has limited queuing space for campers checking in.
- › Upon arrival at the Main Office there is a conflict with camper check-in and vehicles paying for parking to gain access to North Beach.
- › Beach traffic travels through the campground to gain access to North Beach.
- › The sidewalk along Institute Road ends at the entrance to North Beach Campground. There is no sidewalk or designated pedestrian path to North Beach. Currently pedestrian traffic walks in the access roads.
- › From within the campground there is limited access to the Burlington Bike Path, only one gated maintenance access exists.

### Facilities

- › The existing camp store is undersized and not centrally located for campground users.
- › The combined maintenance building and laundry facility is in poor condition. The building is in a non-desirable location for highest and best use of space. The location creates inefficient land use for the campground.
- › The existing bath houses and shower facilities are very dated and need modernization.
- › There is not a designated children's play area within the campground.
- › There isn't a good community gathering space for programmed events.

### Campsites

- › There are approximately 140 campsites within North Beach Campground:
  - Full Hook-up Sites: 27
  - Small/Medium Sites: 39
  - Tent Sites: 74

- › In general, all the campsites are very small and undersized for modern camping.
- › There aren't any pull through sites to accommodate larger motorhomes.
- › There are a limited number of campsites that meet ADA standards as required by the United States Access Board.

## Storm Water Management

- › Standing water was identified on the north side of the maintenance facility, with additional standing water along the curved section of Institute Road on the south side of the maintenance facility. Poor drainage and shallow ledge seem to be contributing factors.
- › The area near tent sites 49A-C tends to hold water during rain events.
- › There is erosion along the gravel roads around the campground.
- › Poor drainage and stormwater management is causing focused run-off to tent sites 32-36 which is causing significant erosion and standing water.

## Environmental

- › The North Beach Maintenance Building (HWS ID #20002788) is listed as an active hazardous waste site with the Vermont Department of Environmental Conservation due to petroleum impacts related to a former 4,000 gallon underground storage tank which was removed in 2000 (UST ID #8640123). The hazardous waste site is currently enrolled in the Petroleum Cleanup Fund where costs associated with on-going monitoring is currently off-set with state funds.
- › The North Beach Maintenance Building has an internal floor drain with possible connection to a drywell. Dry wells and floor drains linked to buildings where 'high risk' activities occur (such as the former material storage, and vehicle maintenance in the Maintenance Building) are no longer allowable under the Underground Injection Control Rule (ANR, 2014), and this feature should be formally abandoned. Testing of soil and groundwater associated with this feature is recommended.

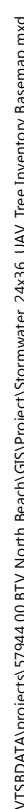
## Cultural

- › An Archaeological Resources Assessment was conducted by the University of Vermont (2001) for work associated with the Burlington Bike Path. The report identifies a portion of the campground that has potential to be an archaeological sensitive area. The report identifies "Area 9".

## Vegetation Restoration

- › There are several large mature canopy trees in the campground that provide nice character and shade. Many of the larger trees are showing signs of decline. There is a lack of succession planting to help replace the larger trees over time.





Sources:

City of Burlington (2016-2017)

Vermont Center for Geographic Information (2017)

University of Vermont Consulting Archeology Program (2017)

VHB (2016 -2017)

Waite-Heindel Plan (2015)

University of Vermont Spatial Analysis Lab Aerial Photo (UVMASL, 2017)

Gravity Mains (City of Burlington)	Pressurized Mains (City of Burlington)
Abandoned	Monitoring Well (WH)
Combined	Soil Boring (WH)
Sewage	Manhole (City of Burlington)
Storm	Culverts (City of Burlington)
Tree	Overhead Electric Line (City of Burlington)
Stump Removal	Underground Electric Line (City of Burlington)
Planting Site	Archaeological Sensitive Areas (UVM CAP) (Approx.)
Removed - not to be replanted	
Tree Defects	



# 3

## Planning and Design Considerations

### Vehicular Circulation

- › A two-way main access drive is created that shifts vehicular traffic to the south of the park headquarters. This main access drive provides a separation of day use North Beach traffic from interior campsite circulation.
- › Two protected stacking lanes are created for camper check-in to separate campers from North beach day use arrivals. It is recommended that North Beach parking fees are collected in a separate booth adjacent to the North Beach parking lots. This reduces vehicular conflict, confusion and congestion at the existing Park headquarters.
- › Seven short term parking spaces are added beyond the existing garage structure at the headquarters.
- › Park camping pods are separated from through traffic and have their own internal circulation networks. The main access drive and campsite loop roads are paved, internal campsite drives are gravel.
- › Park Identity Signage is added along North Avenue.

### Bicycle Circulation

- › A contiguous bicycle lane is created along the main access drive to connect North Avenue with the North Beach Campground and North Beach day use area.
- › Bike path connections are created from the campground to the Burlington Bike Path.
- › Bicycle racks are provided at all facilities.

### Facilities

- › The headquarters buildings are retained with a larger storage area added to the garage structure.
- › Two structures are proposed for the central Community Open Space area: a combination general store, laundry, bath house facility and a community room with fireplace. Bathroom/changing rooms will be accessed from the outside with individual entries versus an internal circulation system.

- › A large storage/maintenance facility is added in the existing storage area adjacent to the cemetery. A wood screen fence separates this area from the campsites.
- › A combination pump out station/garbage/recycling station is located near the intersection of the main access drive and the internal circulation drive for the small/medium campsites. This provides easy vehicular access for all campers as they leave the campground.
- › A parking booth is added adjacent to the North Beach parking area.
- › The existing large maintenance/laundry building will be removed.

## Campsite Organization

- › Campsites are organized into specific zones relative to camper size, function requirements, amenities provided and impact on the natural resource.
- › Campsite zones include: Full hook up sites, small/medium camp sites, tent sites and cabins/lean-tos.
- › Most of the full hook up sites are located along the northern border of the campground in a generally open area and in the open area near the existing large maintenance building. These campsites can be accessed from the main access drive or from the existing drive which passes between the two headquarters buildings. All of these sites are handicap accessible.
- › Small/Medium campsites are located in the center of the campground under the canopies of the existing large trees. These sites have water and electric but are not full hookup. Four handicap sites are provided close to the Community Open Space near bathrooms, laundry, open air pavilion and general store.
- › Tent sites are provided along the perimeter of the park adjacent to the ravine and the bike path. Water is available. Two handicap campsites are provided.
- › Lean-tos/cabins are created at the existing group camping area adjacent to the bike path/railroad tunnel and in the isolated area across the ravine adjacent to the cemetery.
- › Camping pads are provided and fire pits are fixed in place to reduce environmental damage.
- › Internal access drives to the campsites have been designed to run parallel to the lake taking advantage of natural clearings between the existing trees. This provides visual access to the water from individual campsites as the camper vehicles are parked perpendicular to the water versus parallel to it.

## Storm Water Management

- › The orientation of the small/medium campsite access drives parallel to the lake which reduces the flow of storm water rushing downhill along the drives, thus reducing the potential of erosion. This is similar to the agricultural practice of not aligning planting rows downhill.
- › This alignment also provides the opportunity to add shallow infiltration swales along campsite internal boundaries to further interrupt the surface flow of water heading towards the lake.
- › Two larger storm water bio retention areas are created in the full hookup campsite area.

## Vegetation Restoration

- › All existing tree locations and their associated health conditions have been provided by the City Arborist/Parks with GPS coordinates and care has been taken to save all significant, healthy individual specimens.
- › To ensure a new generation of shade trees, additional plantings are designed along campsite boundaries in locations that will increase their chances of survival and create privacy for the campsites.
- › Street tree plantings are proposed along the main access drive to enhance the existing street trees.
- › The existing woods/ledge area near the headquarters and the wooded ravine have been preserved and are unaffected by the campground improvements.
- › Dead, diseased and invasive species are to be removed.





Cabins / Leantos



Tent Site - Pads / Platforms



Community Fire Pit



Small / Medium Campsite



Pull Through Campsite

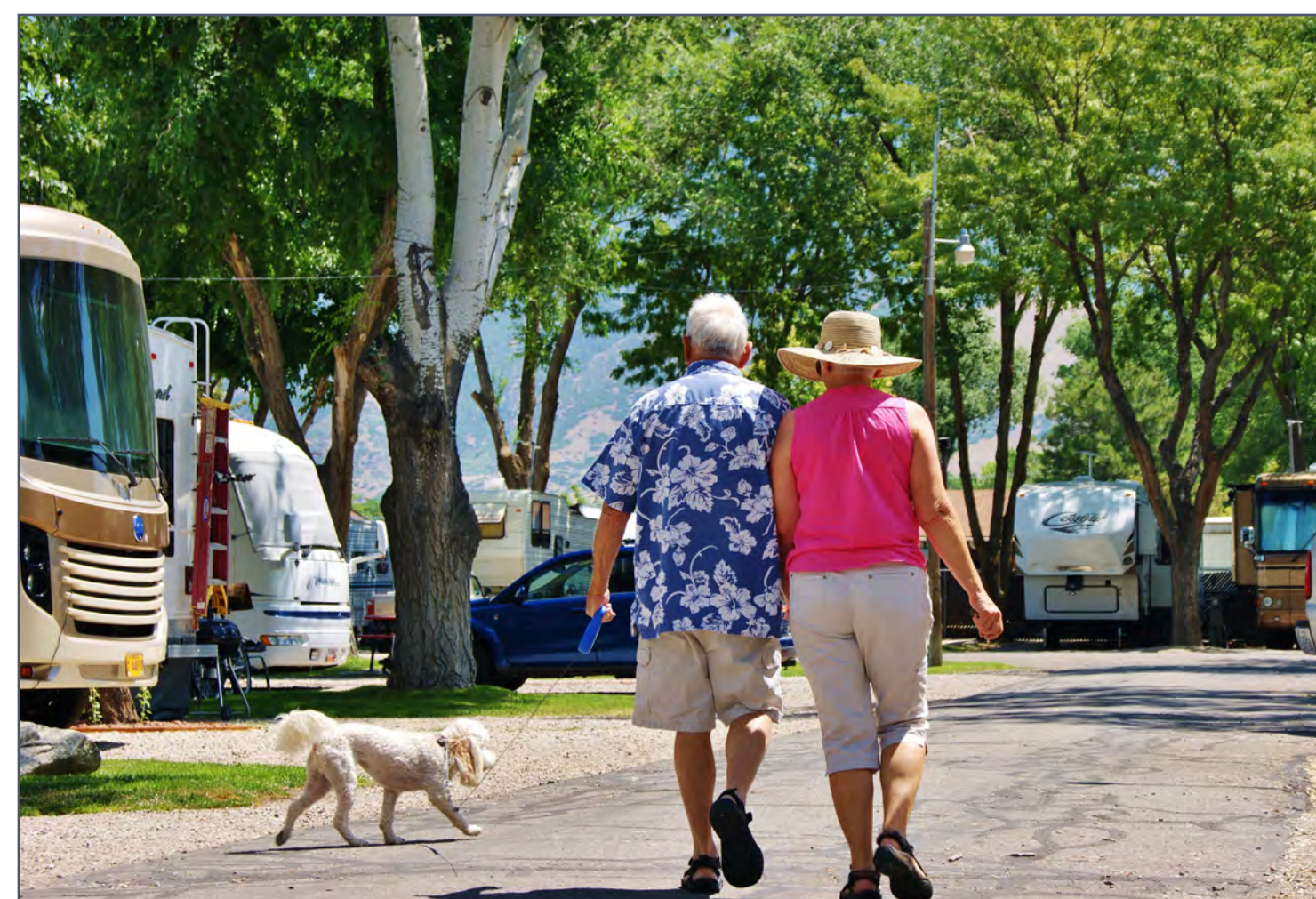




Children's Natural Play Area



Stormwater / Bioretention



Biking / Walking - Sidewalk Access to Beach



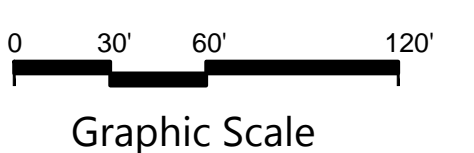
Pavilion / Shelter



# 4

## Concept Master Plan







# 5

## Phasing Notes

### Short Term Goals (1-3 years)

#### ST-1. Main Office Renovations

- › Remove existing canopy between main office and wood storage building (completed spring 2017)
- › Landscaping
- › Signage

#### ST-2. Demolish Existing Maintenance Facility / Adjust Layout for Sites 1-23 (Full Hook-up) / Create Pull Through Sites 14-23 (Full Hook-up) / Relocate Dump Station

- › Environmental remediation for known soil contaminants; Approved Corrective Action Plan (CAP)
- › Demolish existing maintenance facility
- › New utilities: Water, Sewer and Power
- › Asphalt roads
- › Gravel pads
- › Relocated existing dumping station to new location
- › Landscaping
- › Stormwater management

#### Notes:

1. During construction of the expanded pull through campsites, access to the campground can be maintained by utilizing the existing road network and current circulation patterns.
2. Remediation for known existing soil contaminants from the former 4,000 gallon underground storage tank will require an approved Corrective Action Plan (CAP) by Vermont Department of Environmental Conservation. Coordination with the Vermont DEC Petroleum Clean-Up Fund is recommended.

3. Potential concerns for soil contamination from the floor drain in the existing Maintenance Facility. Refer to VHB memo dated 4/4/2017 North Beach Campground Mater Plan-Existing Conditions Evaluation for Contaminated Soils; Conclusions & Recommendations; item #5.

### **ST-3. Build New Storage/Maintenance Facility**

- › Boundary/property line discussion with Burlington School District
- › Possible access from Cemetery property
- › New Building
- › Screen fencing
- › New utilities: Water, Sewer and Power

### **ST-4. Adjust Layout for Sites 24-27 (Full Hook-up)**

- › New utilities: Water, Sewer and Power
- › Asphalt roads
- › Gravel pads
- › Landscaping

### **ST-5. Parking Attendant Booth for Beach Parking**

- › Install new parking attendant booth
- › New utilities: Power and Wi-Fi
- › Signage

### **ST-6. Entry Road Alignment and Pedestrian Access to Beach**

- › Boundary/property line discussion with Burlington School District
- › Discussion with Rock Point School
- › New camper entry sequence with median and queuing lanes
- › New main road
- › New pedestrian walk
- › New access spur to and from the bike path just before the bike path bridge over the road
- › Signage

#### **Notes:**

1. During construction of the expanded new road, access to the campground can be maintained by utilizing the existing road network and adjusted circulation patterns.

## Long Term Goals (4-6 years)

### LT-1. Community Center/General Store/Bath House/Laundry Facility

- › New buildings (2)
- › New utilities: Water, Sewer and Power
- › Parking spaces
- › Outdoor spaces – patios
- › Landscaping
- › Signage

### LT-2. Cabins Site 110-121

- › Boundary/property line discussion with Burlington School District
- › New Cabins
- › New utilities: Water and Power
- › Parking spaces

#### Notes:

1. Lean-tos could also be utilized in these locations.
2. Power is provided to each cabin.
3. Water service is strategically located in 2-3 locations

### LT-3. Cabins Site 122-128

- › New Cabins
- › New utilities: Water and Power
- › Parking spaces
- › Fire pit

#### Notes:

1. Lean-tos could also be utilized in these locations.
2. Power is provided to each cabin.
3. Water service is strategically located in 2-3 locations

### LT-4. Adjust Layout of Small/Medium Camp Sites

- › Orientation and re-sizing of campsites
- › Selective tree removal
- › Stormwater management

- › Gravel roads
- › Handicap gravel campsite pads
- › Demolish existing bath house (see note #1)
- › Permanent fire pit locations

**Notes:**

1. Demolishing the existing bath house would only occur once the new bath house was constructed with the general store and laundry facility. The existing bath house could remain in place until that time.
2. Camp site size is 30'x40' min; 40'x40' is ideal.

**LT-5. Adjust Layout of Tent Sites**

- › Stormwater management
- › Re-size the campsites
- › Handicap gravel campsite pads
- › Permanent fire pit locations
- › Simple adjustment of tent site sizes and layout

**LT-6. Bath House (Near sites 24-27)**

- › New building or Addition/Renovation to existing building
- › New utilities: Water, Sewer and Power
- › Parking spaces
- › Signage

**LT-7. Children's Natural Play Area**

- › Boulders
- › Stepping logs
- › Climbing logs
- › Play structure

# 6

## Phasing Plan







## 7

## Conceptual Cost Estimate

### CONCEPTUAL COST ESTIMATE NORTH BEACH CAMPGROUND AMENITY SITING STUDY & CONCEPTUAL MASTER PLAN

DATE: 8/2017

MASTER PLAN ITEMS DESCRIPTION – SHORT TERM (1-3years)		QUANTITY	UNITS	UNIT PRICE	COST
<b>ST-1 MAIN OFFICE RENNOVATIONS</b>					
Low Stone Wall - Dry stack		60	LF	\$ 180.00	\$ 10,800.00
Trees		3	EA	\$ 650.00	\$ 1,950.00
Concrete Terrace - 5"		3.5	CY	\$ 300.00	\$ 1,050.00
Concrete Terrace - 8" Stone Sub-base		13	CY	\$ 36.00	\$ 468.00
Landscaping		1	LS	\$ 5,000.00	\$ 5,000.00
Subtotal					\$ 19,268.00
25% Contingency					\$ 4,817.00
Design Costs (Approximately 25% of Subtotal + Contingency)					\$ 6,021.25
<b>Total</b>					<b>\$ 30,106.25</b>

**CONCEPTUAL COST ESTIMATE (CONTINUED)**  
**NORTH BEACH CAMPGROUND AMENITY SITING STUDY &**  
**CONCEPTUAL MASTER PLAN**

DATE: 8/2017

MASTER PLAN ITEMS DESCRIPTION – SHORT TERM (1-3years)		QUANTITY	UNITS	UNIT PRICE	COST
ST-2	DEMOLISH EXISTING MAINTENENACE BUILDING CREATE PULL THROUGH SITES 14-23 (Full Hook-up) RELOCATE DUMP STATION				
	Demolish Existing Maintenance Buildings	1	LS	\$ 6,000.00	\$ 6,000.00
	Tree and Stump Removal	12	EA	\$ 450.00	\$ 5,400.00
	Asphalt Road -4"	826	TN	\$ 130.00	\$ 107,380.00
	Asphalt Road - 18" Stone Sub-base	1831	CY	\$ 36.00	\$ 65,916.00
	Gravel Pads - 8"	577	CY	\$ 36.00	\$ 20,772.00
	Sewer - 4" PVC - Lines to each site	1456	LF	\$ 30.00	\$ 43,680.00
	Water - 2" PVC – Lines to each site	690	LF	\$ 20.00	\$ 13,800.00
	Electric 1.5" PVC Wired - Lines to each site	690	LF	\$ 15.00	\$ 10,350.00
	Common Excavation - Utility lines to each site	863	CY	1.50	\$ 9,924.50
	Utility Pedestals - Water and Electric each site	23	EA	\$ 300.00	\$ 6,900.00
	Sewer - 4" PVC – Dump Station	50	LF	\$ 30.00	\$ 1,500.00
	Water - 2" PVC – Dump Station	50	LF	\$ 20.00	\$ 1,000.00
	Stormwater Improvements	1	LS	\$50,000.00	\$ 50,000.00
	6" Topsoil	702	CY	\$ 45.00	\$ 31,590.0
	Seeding	52500	SF	\$ 0.10	\$ 5,250.00
	Subtotal				\$ 379,462.50
	25% Contingency				\$ 94865.63
	Design Costs (Approximately 25% of Subtotal + Contingency)				\$ 118,582.03
	<b>Total</b>				<b>\$592,910.16</b>

## Notes:

1. Additional costs would be associated with any necessary Vermont DEC Corrective Action Plan (CAP) for the known soil contamination related to the former 4,000 gallon underground storage tank.
2. Additional costs would be associated with any potential environmental clean-up from the floor drain in the Existing Maintenance Building
3. Camp site size targeted at 40'x50'min, 50'x50' ideal.

**CONCEPTUAL COST ESTIMATE (CONTINUED)**  
**NORTH BEACH CAMPGROUND AMENITY SITING STUDY &**  
**CONCEPTUAL MASTER PLAN**

DATE: 8/2017

MASTER PLAN ITEMS DESCRIPTION – SHORT TERM (1-3years)		QUANTITY	UNITS	UNIT PRICE	COST
<b>ST-3 BUILD NEW STORAGE/MAINTENANCE FACILITY</b>					
Building		2800	SF	\$ 20.00	\$ 56,000.00
Screen Fencing		300	LF	\$ 18.00	\$ 5,400.00
Sewer - 4" PVC		360	LF	\$ 30.00	\$ 10,800.00
Water - 2" PVC		60	LF	\$ 20.00	\$ 1,200.00
Electric 1.5" PVC Wired		60	LF	\$ 15.00	\$ 900.00
Common Excavation - Utility Lines		213	CY	\$ 11.50	\$ 2,449.50
Subtotal					\$ 76,749.50
25% Contingency					\$ 19,187.38
Design Costs (Approximately 25% of Subtotal + Contingency)					\$ 19,187.38
<b>Total</b>					<b>\$115,125.25</b>

Notes:

1. Potential land acquisition required for building maintenance facility on Burlington School District property

MASTER PLAN ITEMS DESCRIPTION – SHORT TERM (1-3years)		QUANTITY	UNITS	UNIT PRICE	COST
<b>ST-4 ADJUSTED LAYOUT FOR SITES 24-27 (Full Hook-up)</b>					
Gravel Pads		75	CY	\$ 36.00	\$ 2,700.00
Sewer - 4" PVC - Lines to each site		255	LF	\$ 30.00	\$ 7,650.00
Water - 2" PVC – Lines to each site		120	LF	\$ 20.00	\$ 2,400.00
Electric 1.5" PVC Wired - Lines to each site		255	LF	\$ 15.00	\$ 3,825.00
Common Excavation - Utility Lines to each site		151	CY	\$ 11.50	\$ 1,736.50
Utility Pedestals - Water and Electric each site		4	EA	\$ 300.00	\$ 1,200.00
Trees		5	EA	\$ 650.00	\$ 3,250.00
6" Topsoil		172	CY	\$ 45.00	\$ 7,740.00
Seeding		9316	SF	\$ 0.10	\$ 931.60
Subtotal					\$ 31,433.10
25% Contingency					\$ 7,858.28
Design Costs (Approximately 25% of Subtotal + Contingency)					\$ 9,822.84
<b>Total</b>					<b>\$ 49,114.22</b>

Notes:

1. Camp site size targeted at 40'x50'min, 50'x50' ideal.

**CONCEPTUAL COST ESTIMATE (CONTINUED)**  
**NORTH BEACH CAMPGROUND AMENITY SITING STUDY &**  
**CONCEPTUAL MASTER PLAN**

DATE: 8/2017

MASTER PLAN ITEMS DESCRIPTION – SHORT TERM (1-3years)		QUANTITY	UNITS	UNIT PRICE	COST
<b>ST-5</b>	<b>PARKING ATTENDANT BOOTH</b>				
Small Attendant Booth		1	EA	\$ 1,500.00	\$ 1,500.00
Electric 1.5" PVC Wired - Lines to each site		125	LF	\$ 15.00	\$ 1,875.00
Wi-Fi Equipment		1	EA	\$ 300.00	\$ 300.00
Subtotal					\$ 3,675.00
25% Contingency					\$ 918.75
Design Costs (Approximately 25% of Subtotal + Contingency)					\$ 1,148.44
<b>Total</b>					<b>\$ 5,742.19</b>

MASTER PLAN ITEMS DESCRIPTION – SHORT TERM (1-3years)		QUANTITY	UNITS	UNIT PRICE	COST
<b>ST-6</b>	<b>ENTRY ROAD ALIGNMENT AND PEDESTRIAN ACCESS TO BEACH</b>				
Tree and Stump Removal		18	EA	\$ 450.00	\$ 8,100.00
Asphalt Road -4"		1316	TN	\$ 130.00	\$171,080.00
Asphalt Road - 18" Stone Sub-base		2825	CY	\$ 36.00	\$101,700.00
Concrete Walk - 5"		159	CY	\$ 300.00	\$ 47,700.00
Concrete Walk - 8" Stone Sub-base		255	CY	\$ 36.00	\$ 9,180.00
Trees		43	EA	\$ 650.00	\$ 27,950.00
6" Topsoil		130	YD	\$ 45.00	\$ 5,850.00
Seeding		7060	SF	\$ 0.10	\$ 706.00
Subtotal					\$372,266.00
25% Contingency					\$ 93,066.50
Design Costs (Approximately 25% of Subtotal + Contingency)					\$116,333.13
<b>Total</b>					<b>\$581,665.63</b>

**CONCEPTUAL COST ESTIMATE (CONTINUED)**  
**NORTH BEACH CAMPGROUND AMENITY SITING STUDY &**  
**CONCEPTUAL MASTER PLAN**

DATE: 8/2017

MASTER PLAN ITEMS DESCRIPTION – LONG TERM (4-6 years)		QUANTITY	UNITS	UNIT PRICE	COST
LT-1	COMMUNITY CENTER/GENERAL STORE/ BATH HOUSE/LAUNDRY				
Tree and Stump Removal	6	EA	\$ 450.00	\$ 2,700.00	
Community Center	1600	SF	\$ 100.00	\$ 160,000.00	
General Store / Bath House / Laundry Facility	2400	SF	\$ 120.00	\$ 288,000.00	
Asphalt Road - 4"	1316	TN	\$ 130.00	\$ 171,080.00	
Asphalt Road - 18" Stone Sub-base	2825	CY	\$ 36.00	\$ 101,700.00	
Concrete Terrace - 5"	13	CY	\$ 300.00	\$ 3,900.00	
Concrete Terrace - 8" Stone Sub-base	20	CY	\$ 36.00	\$ 720.00	
Concrete Walk - 5"	159	CY	\$ 300.00	\$ 47,700.00	
Concrete Walk - 8" Stone Sub-base	255	CY	\$ 36.00	\$ 9,180.00	
Sewer - 4" PVC	126	LF	\$ 30.00	\$ 3,780.00	
Water - 2" PVC	126	LF	\$ 20.00	\$ 2,520.00	
Electric - 1.5" PVC Wired	126	LF	\$ 15.00	\$ 1,890.00	
Common Excavation - Utility Lines	75	CY	\$ 11.50	\$ 862.50	
Tree	2	EA	\$ 650.00	\$ 1,300.00	
Landscaping	1	LS	\$20,000.00	\$ 20,000.00	
Subtotal				\$ 815,332.50	
25% Contingency				\$ 203,833.13	
Design Costs (Approximately 25% of Subtotal + Contingency)				\$ 254,791.41	
Total				\$1,273,957.03	

MASTER PLAN ITEMS DESCRIPTION – LONG TERM (4-6 years)		QUANTITY	UNITS	UNIT PRICE	COST
LT-2	CABIN / LEAN-TO SITES 110-124				
Cabin / Lean-To		15	EA	\$ 4,500.00	\$ 67,500.00
Asphalt Road - 4"		207	TN	\$ 130.00	\$ 26,910.00
Asphalt Road - 18" Stone Sub-base		460	CY	\$ 36.00	\$ 16,560.00
Water - 2" PVC		585	LF	\$ 20.00	\$ 11,700.00
Electric - 1.5" PVC Wired		840	LF	\$ 15.00	\$ 12,600.00
Common Excavation - Utility Lines		497	CY	\$ 11.50	\$ 5,715.50
Tree		2	EA	\$ 650.00	\$ 1,300.00
Subtotal					\$142,285.50
25% Contingency					\$ 35,571.38
Design Costs (Approximately 25% of Subtotal + Contingency)					\$ 44,464.22
Total					\$222,321.09



**CONCEPTUAL COST ESTIMATE (CONTINUED)**  
**NORTH BEACH CAMPGROUND AMENITY SITING STUDY &**  
**CONCEPTUAL MASTER PLAN**

DATE: 8/2017

MASTER PLAN ITEMS DESCRIPTION – LONG TERM (4-6 years)		QUANTITY	UNITS	UNIT PRICE	COST
<b>LT-3 CABIN / LEAN-TO SITES 125-131</b>					
Cabin / Lean-To	7	EA	\$ 4,500.00	\$ 31,500.00	
Asphalt Road/Parking	103	TN	\$ 130.00	\$ 13,390.00	
Asphalt Road - Stone Sub-base	230	CY	\$ 36.00	\$ 8,280.00	
Asphalt Walk - 2"	14	TN	\$ 130.00	\$ 1,820.00	
Asphalt Walk - 8" Stone Sub-base	27	CY	\$ 36.00	\$ 972.00	
Water - 2" PVC	430	LF	\$ 20.00	\$ 8,600.00	
Electric - 1.5" PVC Wired	300	LF	\$ 15.00	\$ 4,500.00	
Common Excavation - Utility Lines	255	CY	\$ 11.50	\$ 2,932.50	
Stone Fire Pit	1	LS	\$ 500.00	\$ 500.00	
Tree	10	EA	\$ 650.00	\$ 6,500.00	
Subtotal					\$ 78,994.50
25% Contingency					\$ 19,748.63
Design Costs (Approximately 25% of Subtotal + Contingency)					\$ 24,685.78
<b>Total</b>					<b>\$123,428.91</b>

Notes:

1. Potential land acquisition required for building cabins on cemetery property

MASTER PLAN ITEMS DESCRIPTION – LONG TERM (4-6 years)		QUANTITY	UNITS	UNIT PRICE	COST
<b>LT-4 ADJUST LAYOUT OF SMALL/MEDIUM CAMP SITES</b>					
Tree and Stump Removal	6	EA	\$ 450.00	\$ 2,700.00	
Gravel Pads	555	CY	\$ 36.00	\$ 19,980.00	
Asphalt Road/Parking - 4"	646	TN	\$ 130.00	\$ 83,980.00	
Asphalt Road - 18" Stone Sub-base	1438	CY	\$ 36.00	\$ 51,768.00	
Water - 2" PVC	3940	LF	\$ 20.00	\$ 78,800.00	
Electric - 1.5" PVC Wired	3940	LF	\$ 15.00	\$ 59,100.00	
Common Excavation - Utility Lines	2334	CY	\$ 11.50	\$ 26,841.00	
Utility Pedestals - Water and Electric each site	53	EA	\$ 300.00	\$ 15,900.00	
Stormwater Improvements	1	LS	\$50,000.00	\$ 50,000.00	
Tree	39	EA	\$ 650.00	\$ 25,350.00	
6" Topsoil	835	CY	\$ 45.00	\$ 37,575.00	
Seeding	45000	SF	\$ 0.10	\$ 4,500.00	
Subtotal					\$ 456,494.00
25% Contingency					\$ 114,123.50
Design Costs (Approximately 25% of Subtotal + Contingency)					\$ 142,654.38
<b>Total</b>					<b>\$ 713,271.88</b>



**CONCEPTUAL COST ESTIMATE (CONTINUED)**  
**NORTH BEACH CAMPGROUND AMENITY SITING STUDY &**  
**CONCEPTUAL MASTER PLAN**

DATE: 8/2017

MASTER PLAN ITEMS DESCRIPTION – LONG TERM (4-6 years)		QUANTITY	UNITS	UNIT PRICE	COST
LT-5	ADJUST LAYOUT OF TENT SITES				
Tree and Stump Removal		4	EA	\$ 450.00	\$ 1,800.00
Gravel Pads for ADA		25	CY	\$ 36.00	\$ 900.00
Stormwater Improvements		1	LS	\$15,000.00	\$ 15,000.00
Subtotal					\$ 17,700.00
25% Contingency					\$ 4,425.00
Design Costs (Approximately 25% of Subtotal + Contingency)					\$ 5,531.25
Total					\$ 27,656.25

Notes:

- Existing water locations remain where they are.

MASTER PLAN ITEMS DESCRIPTION – LONG TERM (4-6 years)		QUANTITY	UNITS	UNIT PRICE	COST
LT-6	BATH HOUSE (Near sites 24-27)				
Bath house		1475	SF	\$ 100.00	\$ 147,500.00
Asphalt - 4"Parking		17	TN	\$ 130.00	\$ 2,210.00
Asphalt Parking - 18"Stone Sub-base		37	CY	\$ 36.00	\$ 1,332.00
Concrete Walk 5"		159	CY	\$ 300.00	\$ 47,700.00
Concrete Walk - Stone Sub-base		255	CY	\$ 36.00	\$ 9,180.00
Sewer - 4" PVC		90	LF	\$ 30.00	\$ 2,700.00
Water - 2" PVC		90	LF	\$ 20.00	\$ 1,800.00
Electric - 1.5" PVC Wired		90	LF	\$ 15.00	\$ 1,350.00
Common Excavation - Utility Lines		53	CY	\$ 11.50	\$ 609.50
Landscaping		1	LS	\$ 2,000.00	\$ 2,000.00
Subtotal					\$ 216,381.50
25% Contingency					\$ 54,095.38
Design Costs (Approximately 25% of Subtotal + Contingency)					\$ 67,619.22
Total					\$338,096.09

MASTER PLAN ITEMS DESCRIPTION – LONG TERM (4-6 years)		QUANTITY	UNITS	UNIT PRICE	COST
LT-7	CHILDREN'S NATURAL PLAY AREA				
Boulders, Steeping Logs, Climbing Logs, Play Structure		1	LS	\$ 5,000.00	\$ 5,000.00
Subtotal					\$ 5,000.00
25% Contingency					\$ 1,250.00
Design Costs (Approximately 25% of Subtotal + Contingency)					\$ 1,562.50
Total					\$ 7,812.50



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## Attachment A: OHM Existing Conditions Memo





## Memorandum

To: City of Burlington  
Parks, Recreation & Waterfront

Date: April 4, 2017

Project #: 57944.00

From: Rachel Lomonaco

Re: North Beach Campground Master Plan  
Existing Conditions Evaluation for Contaminated Materials

---

### **INTRODUCTION**

On behalf of the City of Burlington Parks, Recreation & Waterfront ("BPRW"), VHB has prepared this Existing Conditions Assessment for Contaminated Materials for the North Beach Campground property ("the Site"). The goal of the overall project will be to develop a conceptual master plan for the campground, which will include an evaluation of current and future amenities at the Site. The purpose of this memorandum is to summarize what is currently known regarding existing contaminant conditions at the Site, what is required to further evaluate those conditions, and to provide information and recommendations which can be evaluated by BPRW and the Project Team during the master plan development.

### **PROJECT AREA**

The Site is located at 60 Institute Road in Burlington Vermont, near the shore of Lake Champlain and to the east of the Burlington Bike Path and North Beach. The Site is approximately 44-acres in size, and contains access roadways, a Main Office, Maintenance Building, picnic grounds, vegetated areas, and approximately 137 seasonal camp sites. The primary access drives for the Site are shared with one of Burlington's most popular beaches, North Beach. A Site Location Map is included on page 1 of the Attachment.

According to the Bedrock Geologic Map of Vermont (Ratcliffe, et al, 2011), bedrock within the Site is mapped as Dunham Dolostone consisting of dolostone and dolomitic quartzite. According to the Natural Resource Conservation Service ("NRCS"), Site soils are mapped as Adams and Windsor loamy sands, Farmington extremely rocky loam, Munson and Raynham silt loams and filled lands. Results from soil borings collected on-site indicate that fine to coarse sands exists from about 0-4 feet below ground surface ("bgs"), and tighter soils consisting of sandy silts and silty clay exist from about 4-16 feet below ground surface. Bedrock was not encountered during the on-site soil boring assessment to a maximum exploratory depth of 32 feet below ground surface.

The buildings on the Site are serviced by municipal water and sewer (see the Existing Conditions Map included on page 2 of the Attachment).

### **PROJECT AREA HISTORY**

Around 1918 the North Beach property was purchased by the City (UVM, 2012), but many of the initial improvement projects focused on the beach facilities, with the only on-site improvement being the construction of a roadway to access the beach. By the mid-1960s the Main Office, a storage shed and 30 tent sites were constructed at the Site (UVM, 2012). By the mid-1980s the campground expanded to include 50 tent sites and 45 trailer sites, new underground utilities and bathroom facilities (see the 1986 Site Plan included on page 3 of the Attachment).

The on-site Maintenance Building was constructed sometime prior to the mid-1970s, and was reportedly historically used as a maintenance shop (H&N, 2007; H&N, 2010). More recently the property has been used to store machinery, vehicles, and supplies used by the BPRW staff. Reportedly, a dry well was observed in the floor of the Maintenance Building, but this feature has not been



fully inspected previously (H&N, 2007). Contaminants of concern associated with historic maintenance practices include petroleum compounds, degreasers, antifreeze, and chlorinated compounds at a minimum.

Historic adjoining site uses included a railroad corridor, public beach, cemetery, and school. Contaminants of concern associated with the historic adjoining railroad corridor include metals (specifically lead and arsenic), polycyclic aromatic hydrocarbons ("PAHs") and petroleum compounds associated with undocumented, historic releases. Additionally, nuisance vegetation within railroad corridors may have been controlled through the use of herbicides, pesticides, and/or PCBs.

### **ENVIRONMENTAL RECORDS REVIEW**

The North Beach Maintenance Building (HWS ID #20002788) is listed as an active hazardous waste site with the Vermont Department of Environmental Conservation ("VT DEC") due to petroleum impacts related to a former underground storage tank ("UST") which was removed in 2000 (UST ID #8640123). The hazardous waste site is currently enrolled in the Petroleum Cleanup Fund ("PCF") where costs associated with on-going monitoring is currently off-set with state funds.

VHB completed a desktop review of environmental records associated with the hazardous waste site listing. Below is a summary of available reports from the VT DEC database.

#### **UST System Closure Inspection, Griffin International Inc., May 24, 2000**

A 4,000-gallon gasoline UST was formerly located on-site approximately 20 feet south of the Maintenance Building. This tank was owned by the BPRW, and was reportedly used to store gasoline for use in the department's vehicles.

The UST was removed from the Site on May 18, 2000. Upon excavation, the UST appeared to be in good condition with no visible rust, pitting or holes. Approximately 190 gallons of waste were pumped from the tank prior to removing the tank from the ground, and these waste liquids were transported and disposed of off-site by Environmental Products and Services. Photoionization detector ("PID") field screening of soils within the tank grave indicated that gross volatile organic compounds ("VOCs") ranged from 80-230 ppm from the ground surface to approximately 9 feet below ground surface. Groundwater was encountered in the tank grave excavation area, and a petroleum sheen was observed on the groundwater surface. All soils excavated during the UST removal, including contaminated soils, were backfilled into the tank grave.

#### **Phase II Environmental Site Assessment, Heindel & Noyes, Inc., May 3, 2007**

In February 2007, nine soil borings (B-1 through B-9) were advance in the area surrounding the former UST location. Soil samples were scanned with a PID at 2-foot intervals in every boring. Based on field screening, evidence of contamination was identified in each boring, but the highest readings were generated from borings B-1, B-2, B-4, and B-9, at levels greater than 100 ppm. Soil borings logs are presented on pages 5-14 of the Attachment.

A soil sample was collected from SB-9 at 8 feet below ground surface (PID field screening reading of 160 ppm), and was submitted to a laboratory for analysis of petroleum volatile organic compounds ("VOCs") by EPA method 8021B, and total petroleum hydrocarbons diesel range organics ("TPH-DRO") by EPA method 8015. Benzene, ethylbenzene and naphthalene exceeded their respective residential soil screening values ("SSVs"), but were below the industrial SSVs. A summary of soil analytical results is presented on page 15 of the Attachment.



Four of the nine soils borings were finished as 1-inch diameter PVC monitoring wells (B-1/MW-1, B-3/MW-2, B-5/MW-3, and B-6/MW-4). Wells were installed to 15 feet below ground surface, with 10 feet of factory slotted screen, fitted with solid riser and bentonite seal to ground surface. In March 2007, groundwater sampling was completed in MW-1, MW-3 and MW-4, but MW-2 could not be sampled due to inadequate water volume. Groundwater sampling results indicated that groundwater concentrations of benzene, toluene, methyl-tert-butyl ether ("MTBE"), naphthalene and trimethylbenzene exceeded their respective Vermont Groundwater Enforcement Standards ("VGES").

*Periodic Groundwater Monitoring Reports 2008-2016, Heindel & Noyes and Waite Heindel Environmental Management*

Groundwater monitoring was completed on a semi-annual basis in 2007, 2008, 2009, on an annual basis in 2011 and 2012, and on a bi-ennial basis between 2014 and 2016. MW-1 was replaced in September 2008 by MW-1R, but well re-installation details were not included through the available monitoring reports (H&N, 2010). Additionally, MW-2 was replaced in January 2010 by MW-2R and was deepened to 27 feet bgs (see boring log on page 14 of the Attachment). MW-4 was destroyed between 2012 and 2014 and was not reinstalled as this well was located hydrologically upgradient to the former UST area and never showed evidence of contamination (WHEM, 2014).

The groundwater elevation data from this period suggests that groundwater is located approximately 3.5-17.5 feet below ground surface and flows consistently to the southwest towards Lake Champlain (see page 16 of the Attachment for groundwater elevation data). Groundwater analytical results indicate that groundwater has consistently exceeded the VGES for various petroleum constituents in MW-1R and MW-2R (see page 17 of the Attachment for groundwater analytical data). MW-2R is the only groundwater well located directly downgradient of the former UST location, and the 2016 results indicate that groundwater in MW-2R exceeded the VGES for benzene, toluene, ethylbenzene, trimethylbenzene, naphthalene and MTBE (WHEM, 2016). Given the presence of high concentrations in the furthest downgradient monitoring well, the extent of the groundwater contaminant plume has not been defined.

**CONCLUSIONS & RECOMMENDATIONS**

In summary, the existing dataset has provided limited information relating to the release of gasoline contamination from the former UST. However, the extent of this contamination and the potential impact to sensitive receptors has not been defined. Additionally, other potential source(s) of contamination at the Site have not been assessed, which are further discussed below. Therefore, additional data collection is required to further define existing contaminant conditions at the Site and to determine how those conditions may affect the redevelopment and sensitive receptors.

VHB's conclusions and recommendations included below are limited by the information available at the time of the assessment:

1. VHB wants to acknowledge that a Corrective Action Plan would likely be required for construction on this Site. As this Site is listed as an active VT DEC hazardous waste site, construction of the Project would likely be required to be completed in accordance with a site-specific Corrective Action Plan. The Petroleum Cleanup Fund may cover costs associated with management of contaminated soils and/or groundwater to accommodate the construction project should these actions assist with overall cleanup of the Site with final determination by VT DEC.



2. VHB recommends the pre-characterization of soils that are anticipated to be disturbed during construction, to understand the soil re-use and/or disposal options, as the condition of soil across the Site is currently unknown. Because the Site is located near a former railroad corridor, and within a general downtown area, it is anticipated that typical "urban" contaminants of concern (metals and PAHs) would be identified in shallow soils across the Site. Additionally, the presence of petroleum constituents has been confirmed in soils near the former gasoline UST, but the extent of these impacts (laterally and with depth) is not currently known. Lastly, the potential impacts associated with other potential on-site sources of contamination (dry well in the Maintenance Building) have not yet been assessed.
3. VHB recommends the installation of soil borings and monitoring wells to the southwest of the current well array to delineate the extent of groundwater contamination, as the extent of groundwater contamination across the Site is currently unknown. Groundwater at the Site is confirmed to be impacted with petroleum constituents at concentrations in excess of the VGES, and based on the historic groundwater monitoring results, the downgradient extent of petroleum contamination has not yet been defined by the current monitoring well array. Additionally, the potential impacts associated with other potential on-site sources of contamination (dry well in the Maintenance Building) have not yet been assessed.
4. VHB recommends that the off-site shipment of soil be minimized, to reduce construction costs. BPRW is well aware of the costs associated with the disposal of soils from experience with other projects located in downtown Burlington. In order to reduce construction costs, it is advantageous to use engineering strategies to 'balance' soils on-site, where possible. Current precedent for 'capping' contaminated soil includes covering soil with an indicator fabric and 6-inches of clean fill, or covering with impervious surfaces. Currently a draft VT DEC rule on this topic is out for public comment, which prescribes more stringent 'capping' requirements, but this draft rule is not yet in effect. VHB will continue to evaluate these emerging regulations, while developing the master plan.
5. VHB recommends the inspection and potential closure of the dry well located in the floor of the Maintenance Building. It should be noted that dry wells and floor drains linked to buildings where 'high risk' activities occur (such as the former material storage, and vehicle maintenance in the Maintenance Building) are no longer allowable under the Underground Injection Control ("UIC") Rule (ANR, 2014), and this feature should be formally abandoned. Testing of soil and groundwater associated with this feature are recommendation provided under #2 and #3, above.
6. VHB recommends that any stormwater improvements proposed for the project be evaluated regarding their potential effect on the current groundwater contaminant plume. Stormwater infiltration systems in particular, may alter the hydrogeologic nature of an area, which could have an effect on the current state of a groundwater contaminant plume. Since the extent of the groundwater contaminant plume is currently unknown, stormwater design for this project may be difficult until the extent is defined.
7. VHB recommends that the current monitoring wells be preserved during construction, if possible. If the current monitoring wells (MW-1R, MW-2R and MW-3) are destroyed due to development, then the VT DEC would require the reinstallation of these wells, at the expense of the project.



## **ATTACHMENTS**

Page 1:	Location Map
Page 2:	Existing Conditions Map
Page 3:	1986 Historic Site Plan
Page 3:	WHEM Groundwater Contour and Total VOC Concentration Map for 11/18/2016
Page 4-14:	Soil Boring Logs
Page 15:	Soil Data
Page 16:	Groundwater Elevation Data
Page 17:	Groundwater Concentration Data

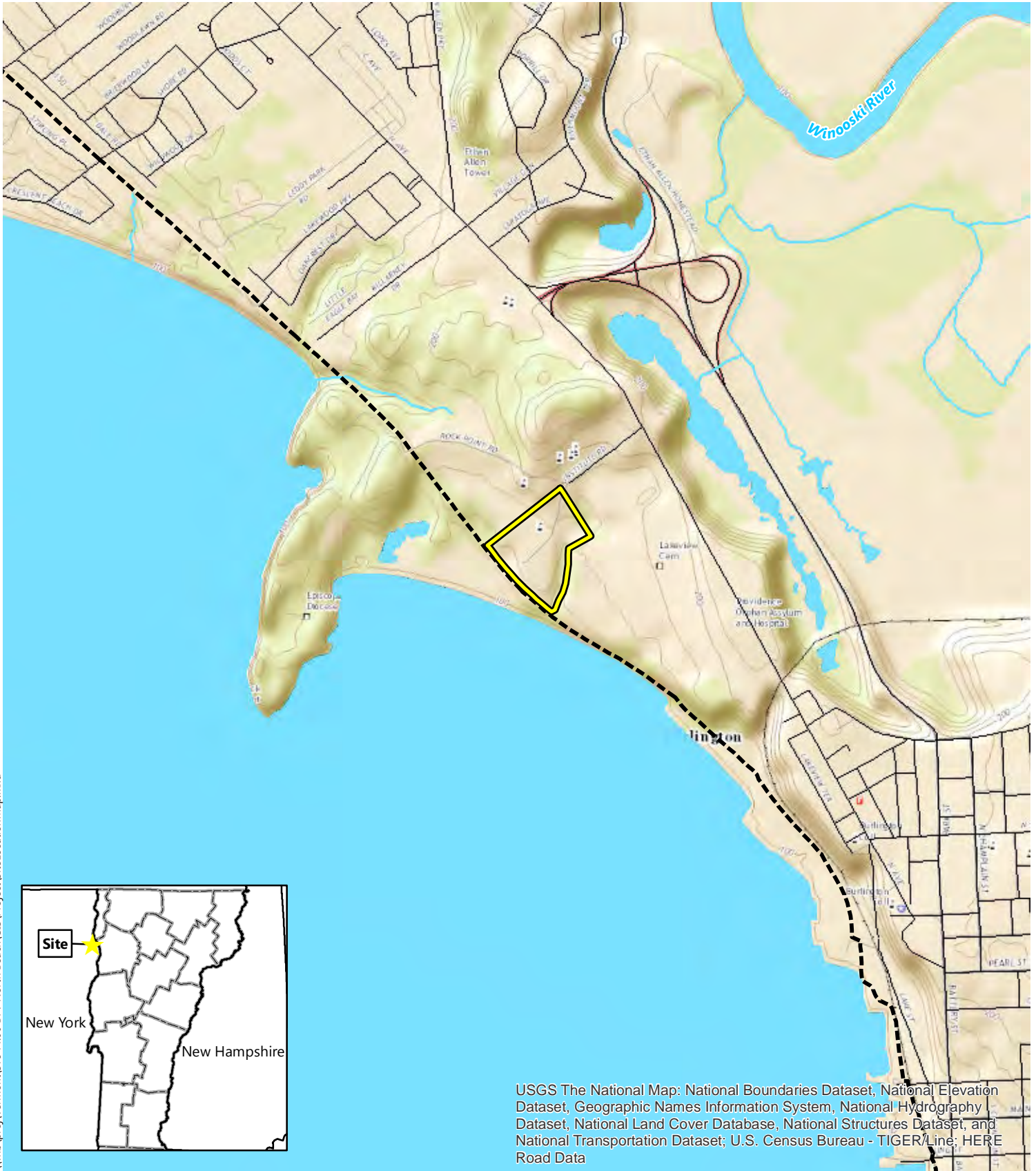
## **REFERENCES**

- Agency of Natural Resources, "Environmental Protection Rules Chapter 11, Underground Injection Control Regulations." Effective October 29, 2014.
- Griffin International, Inc., "Burlington Parks Recreation, North Beach Maintenance Facility UST System Closure Inspection, Facility ID #8640123." May 24, 2000.
- Heindel & Noyes, Inc., "North Beach Maintenance Facility, Burlington, Vermont Phase II Environmental Site Assessment." May 3, 2007.
- Heindel & Noyes, Inc., "North Beach Maintenance Facility, SMS Site #20002788, Groundwater Monitoring Report – November 2010." January 12, 2011.
- Heindel & Noyes, Inc., "North Beach Maintenance Facility, SMS Site #20002788, Groundwater Monitoring Report – November 2011." December 22, 2011.
- University of Vermont ("UVM"), Historic Preservation Program, "HP 206 Researching Historic Structures and Sites - North Beach." 2012. Available on-line at: <http://www.uvm.edu/~hp206/2012/leckie/webfinal/northbeach.html>
- Waite-Heindel Environmental Management, "North Beach Maintenance Facility, SMS Site #20002788, Groundwater Monitoring Report – November 2012." February 19, 2013.
- Waite-Heindel Environmental Management, "North Beach Maintenance Facility, SMS Site #20002788, 2014 Biennial Site Status Report." March 30, 2015.
- Waite-Heindel Environmental Management, "North Beach Maintenance Facility, SMS Site #20002788, 2016 Biennial Site Status Report." January 12, 2016.



# **ATTACHMENT**





## North Beach Campground Master Plan | Burlington, Vermont

- Site Boundary (VCGI)
- Burlington Bike Path (VHB)
- VHD Waterbody (VCGI)
- VHD Stream (VCGI)
- Interstate
- US Highway
- State Highway
- Town Road

### Site Location Map

Sources:  
 USGS Topo Background (2015)  
 VCGI - Vermont Center for Geographic Information  
 VTrans - Vermont Agency of Transportation  
 VHB - Various Years



## Existing Conditions

Sources:  
City of Burlington (2016-2017)  
Vermont Center for Geographic Information (2017)  
University of Vermont Consulting Archeology Program (2017)  
VHB (2016 -2017)  
Waite-Heindel Plan (2015)  
Background Color Orthophoto (VCGI, 2013)

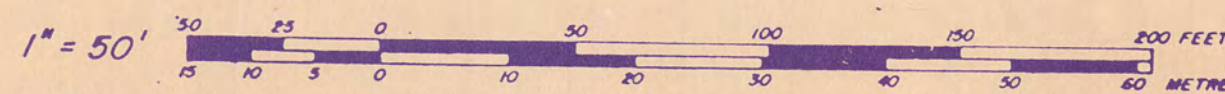
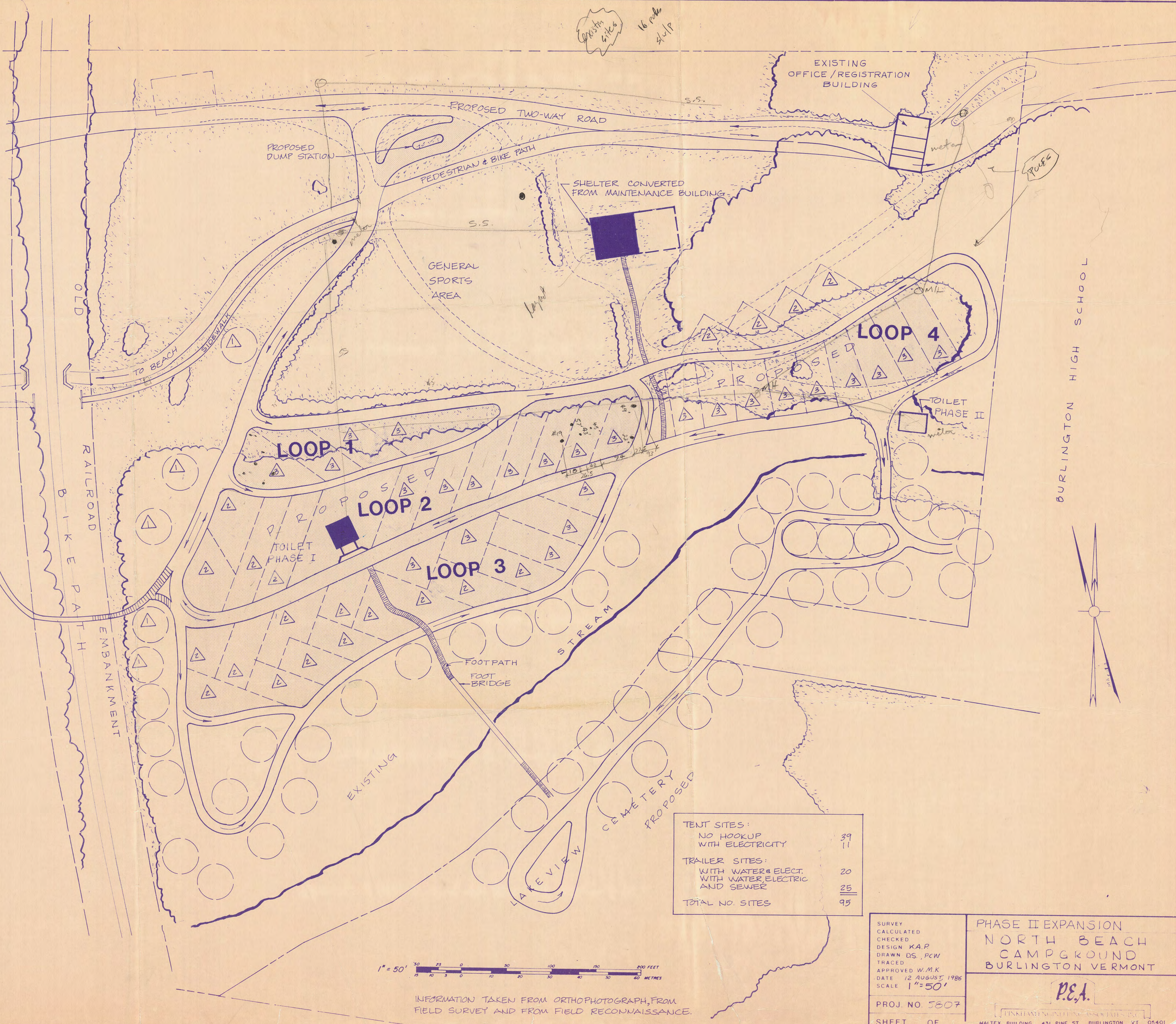


# LEGEND

- ① ELECTRIC HOOKUP
- ② WATER AND ELECTRIC HOOKUPS
- ③ SEWER, WATER AND ELECTRIC HOOKUPS
- TRAILER SITES
- TENT SITES
- EXISTING ROADS TO BE REMOVED IN FUTURE
- ROADS-EXISTING TO REMAIN & PROPOSED
- PHASE II



VICINITY MAP



INFORMATION TAKEN FROM ORTHOPHOTOGRAPH, FROM FIELD SURVEY AND FROM FIELD RECONNAISSANCE.

TENT SITES:	
NO HOOKUP	39
WITH ELECTRICITY	11
TRAILER SITES:	
WITH WATER & ELECT.	20
WITH WATER, ELECTRIC AND SEWER	25
TOTAL NO. SITES	95

SURVEY CALCULATED  
CHECKED  
DESIGN K.A.P.  
DRAWN D.S., P.C.W.  
TRACED  
APPROVED W.M.K.  
DATE 12 AUGUST 1986  
SCALE 1"=50'

PROJ. NO. 5807

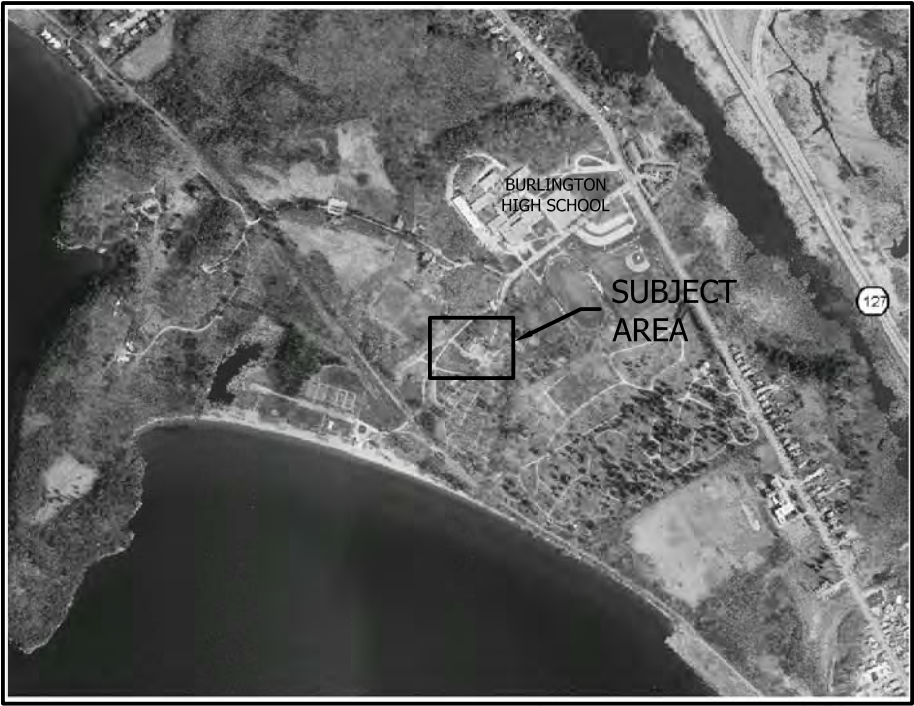
SHEET OF

PHASE II EXPANSION  
NORTH BEACH  
CAMPGROUND  
BURLINGTON VERMONT

P.E.A.

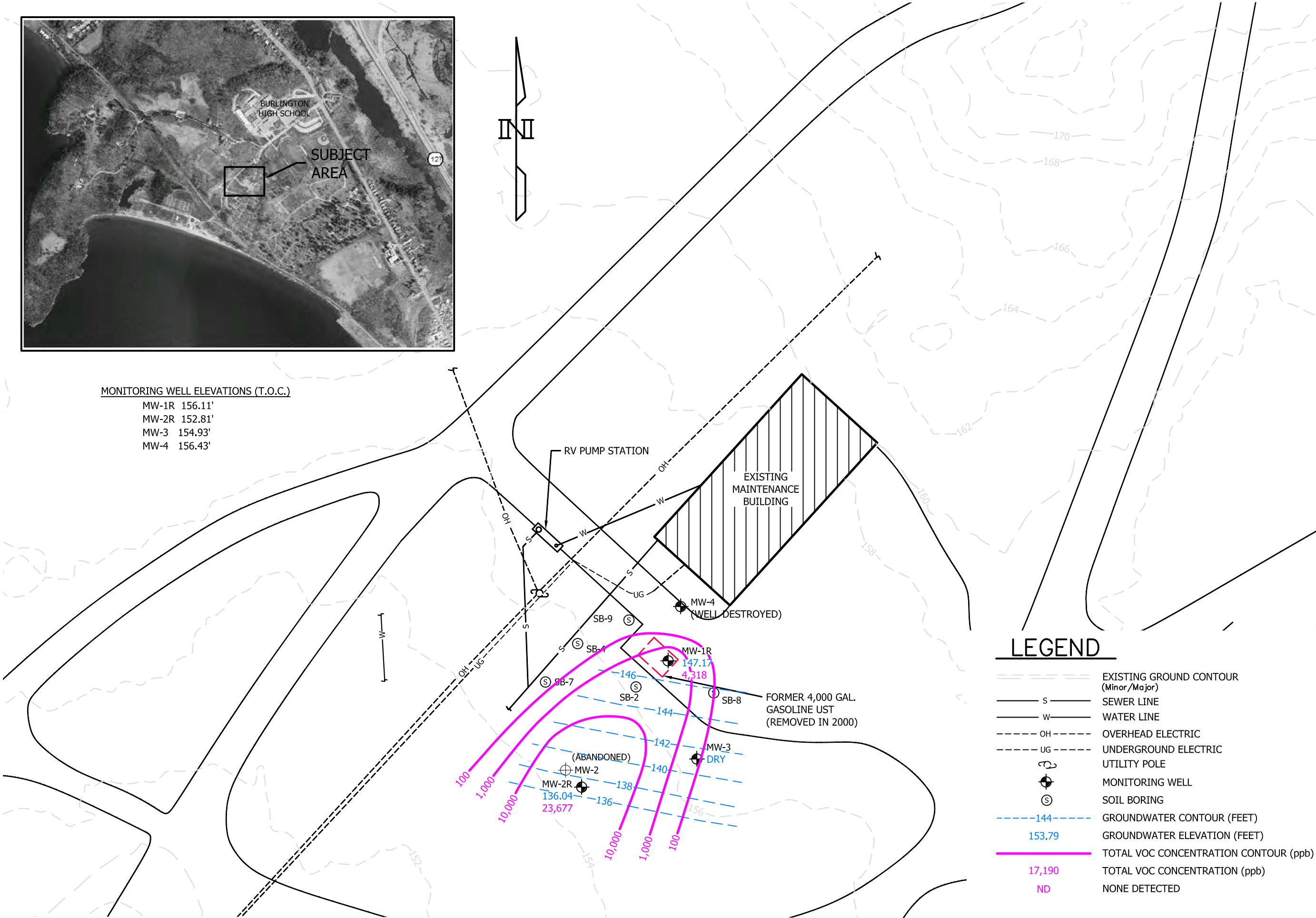
HALTEX BUILDING 431 PINE ST. BURLINGTON, VT 05401





MONITORING WELL ELEVATIONS (T.O.C.)

MW-1R 156.11'  
MW-2R 152.81'  
MW-3 154.93'  
MW-4 156.43'

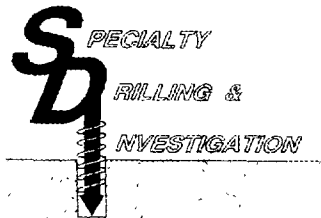


LEGEND

- EXISTING GROUND CONTOUR (Minor/Major)
- S SEWER LINE
- W WATER LINE
- OH OVERHEAD ELECTRIC
- UG UNDERGROUND ELECTRIC
- UTILITY POLE
- MONITORING WELL
- SOIL BORING
- 144 GROUNDWATER CONTOUR (FEET)
- 153.79 GROUNDWATER ELEVATION (FEET)
- 17,190 TOTAL VOC CONCENTRATION CONTOUR (ppb)
- 17,190 TOTAL VOC CONCENTRATION (ppb)
- ND NONE DETECTED

CITY OF BURLINGTON  NORTH BEACH MAINTENANCE FACILITY BURLINGTON, VERMONT   GROUNDWATER CONTOUR AND  TOTAL VOC CONCENTRATION MAP FOR 11/18/2016   SCALE: 1"=40'		DATE:	12/8/2016	<div>W H Waite - Heindel E M</div> <div>• Hydrogeology • Environmental Services • • Water and Wastewater Design • Burlington, Vermont • (802) 860-9400</div>	
		PROJECT NO.	07008.1		
		DRAWN BY:	D.W.F.		
		PROJ. MGR:	C.P.		
		APPROVED:			
FILE:  PROJECTS\North Beach\CADD\dwg\NB Siteplan.dwg		<input type="checkbox"/> DRAFT	<input checked="" type="checkbox"/> FINAL	SHEET:	





P.O. BOX 4503  
BURLINGTON, VT  
05406-4503  
T: 802-658-0820  
F: 802-860-1014

PROJECT NAME: S/BURLINGTON, NORTH BEACH  
SDI PROJECT NO: \_\_\_\_\_  
PROJECT LOCATION: BURLINGTON, VT  
LATITUDE: \_\_\_\_\_ LONGITUDE: \_\_\_\_\_  
SHEET 1 OF 1

BORING NO. MW-1

## SOIL BORING LOG

BORING LOCATION			
DATE AND TIME STARTED	2/22/07 AT 8 AM	RIG HOURS METER START	5292.8
FOREMAN	CHRIS ALDRICH	H & N STAFF	CHRIS ALDRICH & CHRIS RIEPE
DATE AND TIME COMPLETED	2/22/07 AT 9:30 AM	RIG HOURS METER END	5294

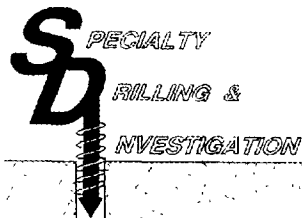
SAMPLING METHOD	SPLIT SPOON	<u>DIRECT PUSH</u>	CUTTINGS
SIZE 24"	HAMMER 140 LB	FALL 30"	

NO	REC (FT)	DEPTH (FT)	BLOWS	SAMPLE DESCRIPTION	STRATA CHANGE	PID
	3.9	0-4		0'-2' GRAVEL FILL MATERIAL 2'-4' OLIVE LAYERED VERY FINE SAND, ODOR		200+ AT 2', STRONG ODOR
	4	4-8		AS ABOVE; ODOR, WET LENSES AT 5' AND 6' AND 7'		52.4 AT 6'
	4	8-12		AS ABOVE, STRONG ODOR 11'-12' SILTY CLAY, FINE SANDS		12.9 AT 9' 62 AT 10.5'
	4	12-16		WET, AS ABOVE, AT 15.5', GRAY SILTY CLAY		100 AT 13' ND AT 15'
				SET 1" PVC WELL TO 15'		

### WELL CONSTRUCTION DETAILS

PVC Screen:	1" diameter	0.01" slot	10' Sections	Set from	15' to 5'
PVC Riser	1" diameter	4.5' Sections		Set from	5' to 5'
Filter Sock					-4" Stick Up
Sand Pack	15' to 2.5'	1 bag			
Bentonite Seal	2.5' to 2'		Cap		
Grout Seal	' to '		1 Plug		
Well Finish	x flush	Guard	1 Gripper	Native Backfill	
			1 BTW		





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PROJECT NAME S/BURLINGTON, NORTH BEACH  
SDI PROJECT NO  
PROJECT LOCATION BURLINGTON, VT  
LATITUDE LONGITUDE:  
SHEET 1 OF 1

BORING NO SB-2

## SOIL BORING LOG

BORING LOCATION	SEE MAP		
DATE AND TIME STARTED	2/22/07	RIG HOURS METER START	5294
FOREMAN	CHRIS ALDRICH	H & N STAFF	CHRIS ALDRICH & CHRIS RIEPE
DATE AND TIME COMPLETED	2/22/07 AT 10:30 AM	RIG HOURS METER END	5295

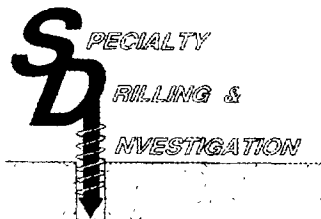
SAMPLING METHOD	SPLIT SPOON	DIRECT PUSH	CUTTINGS
SIZE 24"	HAMMER 140 LB	FALL 30"	

NO	REC (FT)	DEPTH (FT)	BLOWS	SAMPLE DESCRIPTION	STRATA CHANGE	PID
1	4.0	0-4		0-4' SILTY SAND, MOIST-WET AT 3.4'		0.2
2	2.5	4-8		AS ABOVE TO 7' 10' 7' 10'-8.0' GR. FINE SAND; ODOR		1.3 AT 6' 200 AT 7' 10'
3	4.0	7-12		8' 0"-8' 2" AS ABOVE 8.2'-9' 0' BROWN SANDY SILT, MOIST 9.0'-12' 0' BROWN SILTY CLAY; MOIST-WET		200+ AT 9' 0' 71.4 AT 11' 5'
4	4.0	12-16		12'-16' AS ABOVE, P.O.W. AT 13' AND 16'; WET; ODOR		85.8 AT 13' 31.8 AT 15'
5	7.0	16-20		16'-20' BROWN-GREY SILTY CLAY, STRRONG ODOR		200* AT 20'
6	4.0	20-23		20'-23' GRAY SILTY CLAY, WET		13.1 AT 20' 5' 3.1 AT 23'

### WELL CONSTRUCTION DETAILS

PVC Screen	_____ " diameter	_____ " slot	_____ ' Sections	Set from	_____
PVC Riser	_____ " diameter	_____ ' Sections		Set from	_____
Filter Sock	_____			_____ " Stick Up	
Sand Pack	_____				
Bentonite Seal	_____		Cap		
Grout Seal	_____ ' to _____ '		Plug		
Well Finish	_____ flush	Guard _____	Gripper	Native Backfill	_____
			BTW		





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BORING NO MW-2/SB-3

PROJECT NAME S/BURLINGTON, NORTH BEACH

SDI PROJECT NO

PROJECT LOCATION BURLINGTON, VT

LATITUDE LONGITUDE

SHEET 1 OF 1

## SOIL BORING LOG

BORING LOCATION	SEE MAP		
DATE AND TIME STARTED	2/22/07 AT 10.30 AM	RIG HOURS METER START:	5295
FOREMAN	CHRIS ALDRICH	H & N STAFF	CHRIS ALDRICH & CHRIS RIEPE
DATE AND TIME COMPLETED	2/22/07 AT 11 25 AM	RIG HOURS METER END:	5295 9

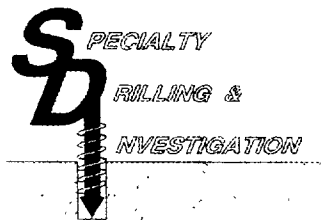
SAMPLING METHOD	SPLIT SPOON	DIRECT PUSH	CUTTINGS
SIZE. 24"	HAMMER 140 LB	FALL. 30"	

NO	REC (FT)	DEPTH (FT)	BLOWS	SAMPLE DESCRIPTION	STRATA CHANGE	PID
1	3.6	0-4		0.5' BROWN ORGANIC 0.5'-3.6' BROWN FINE SANDS, SILT		0 2
2	4 0	4-8		4'-5 7' AS ABOVE 5 7'-8 0' BROWN FINE SAND, SOME SILT, WET AT 6'		0 3-0.5
3	3 5	8-12		8'-12' AS ABOVE, FINE SAND LENSES AT 10 5', NO ODOR		0 2-0 4 4 AT 10'
4	3 5	12-16		12'-16' BROWN SILT, TRACE FINE SAND, SOME CLAY, MORE CLAY TOWARDS BOTTOM; WET		11 AT 13' 11.5 AT 16'

### WELL CONSTRUCTION DETAILS

PVC Screen.	1 " diameter	0 01 " slot	10 ' Sections	Set from	15' to 5'
PVC Riser	1 " diameter	4.5 ' Sections		Set from	5' to 5'
Filter Sock					-4 " Stick Up
Sand Pack	15' to 4'	1 bag			
Bentonite Seal	4' to 2'		Cap		
Grout Seal	' to '		1 Plug		
Well Finish	x flush	Guard	1 Gripper	Native Backfill	
			1 BTW		





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SDI PROJECT NO. \_\_\_\_\_  
PROJECT LOCATION BURLINGTON, VT  
LATITUDE \_\_\_\_\_ LONGITUDE \_\_\_\_\_  
SHEET 1 OF 1

BORING NO. SB-4

## SOIL BORING LOG

BORING LOCATION		SEE MAP	
DATE AND TIME STARTED	2/22/07 AT 11 30 AM	RIG HOURS METER START	5295.9
FOREMAN	CHRIS ALDRICH	H & N STAFF	CHRIS ALDRICH & CHRIS RIEPE
DATE AND TIME COMPLETED	2/22/07 AT 12 PM	RIG HOURS METER END.	5296.5

SAMPLING METHOD	SPLIT SPOON	<u>DIRECT PUSH</u>	CUTTINGS
SIZE 24"	HAMMER 140 LB	FALL 30"	

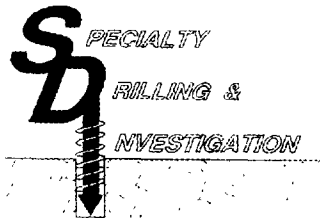
NO	REC (FT)	DEPTH (FT)	BLOWS	SAMPLE DESCRIPTION	STRATA CHANGE	PID
1	1.0	0-4		0- 5' GRASS, SOIL 0.5'-4' BROWN GRAY FINE SAND WITH SOME SILT, NO ODOR		26.2 AT 4'
2	3.5	4-8		4'-8' AS ABOVE, MOIST AT 6', SAND HORIZON AT 6.2'; ODOR		200 AT 8'
3	2.3	8-12		8'-12' BROWN SILT, SOME CLAY, P O W AT 9', ODOR, WET		73.3 AT 12'
4	3.5	12-16		12'-16' AS ABOVE 16' SAND HORIZON, GRAY CLAY		16.6 AT 16'
5	4.0	16-20		16'-20' GRAY CLAY, SOME SILT, P O W AT 19.5'		7.7 AT 20'

### WELL CONSTRUCTION DETAILS

PVC Screen. _____ " diameter	_____ " slot	_____ ' Sections	Set from _____
PVC Riser _____ " diameter:	_____ ' Sections		Set from _____
Filter Sock _____			_____ " Stick Up
Sand Pack _____			
Bentonite Seal _____		Cap	
Grout Seal _____ ' to _____ '		Plug	
Well Finish _____ flush	Guard _____	Gripper	Native Backfill _____
		BTW	

S:\Burlington North Beach\Soil Boring Logs 022207.xls\SB-9





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SDI PROJECT NO \_\_\_\_\_  
PROJECT LOCATION BURLINGTON, VT  
LATITUDE \_\_\_\_\_ LONGITUDE \_\_\_\_\_  
SHEET 1 OF 1

BORING NO MW-3; SB-5

## SOIL BORING LOG

BORING LOCATION	<u>SEE MAP</u>		
DATE AND TIME STARTED	<u>2/22/07 AT 12.15 PM</u>	RIG HOURS METER START	<u>5296.5</u>
FOREMAN	<u>CHRIS ALDRICH</u>	H & N STAFF	<u>CHRIS ALDRICH &amp; CHRIS RIEPE</u>
DATE AND TIME COMPLETED	<u>2/22/07 AT 1:15 PM</u>	RIG HOURS METER END	<u>5298.1</u>

SAMPLING METHOD	<u>SPLIT SPOON</u>	<u>DIRECT PUSH</u>	<u>CUTTINGS</u>
SIZE. 24"	<u>HAMMER 140 LB</u>	<u>FALL 30"</u>	

NO	REC (FT)	DEPTH (FT)	BLOWS	SAMPLE DESCRIPTION	STRATA CHANGE	PID
1	4	0-4		0-4' BROWN FINE SAND, TRACE SILT, P.O.W. AT 3.9'		1 1 AT 1' 12 5 AT 4'
2	4	4-8		4'-4' 7" AS ABOVE 4' 7"-8' BROWN SILT, TRACE FINE SAND, SAND HORIZON AT 7' 4', MOIST AT 6' 5', NO ODOR		1 4 AT 4' 5' 14 6 AT 6' 5'
3	2 8	8-12		8'-10' AS ABOVE 10'-10.5' FINE BROWN SAND 8' 5"-12' BROWN SILT, SOME CLAY, SOME SAND, NO ODOR		10 5 AT 8' 5' 6 9 AT 12'
4	4	12-16		12'-16' AS ABOVE, SAND HORIZON AT 15.5', WET, NO ODOR		2 2 AT 13' 1 6 AT 15' 5'
				SET 1" PVC WELL TO 15'		

### WELL CONSTRUCTION DETAILS

PVC Screen	<u>1</u> " diameter	<u>0.01</u> " slot	<u>10</u> ' Sections	Set from	<u>15' to 5'</u>
PVC Riser	<u>1</u> " diameter	<u>4.5</u> ' Sections		Set from	<u>5' to 5'</u>
Filter Sock					<u>-4</u> " Stick Up
Sand Pack	<u>15' to 4'</u>	<u>1 bag</u>			
Bentonite Seal	<u>4' to 2'</u>		Cap		
Grout Seal	<u>' to '</u>		<u>1</u> Plug		
Well Finish	<u>x</u> flush	Guard. _____	<u>1</u> Gripper	Native Backfill.	_____
			<u>1</u> BTW		





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PROJECT NAME S/BURLINGTON, NORTH BEACH  
SDI PROJECT NO \_\_\_\_\_  
PROJECT LOCATION BURLINGTON, VT  
LATITUDE \_\_\_\_\_ LONGITUDE \_\_\_\_\_  
SHEET 1 OF 1

BORING NO SB-6

## SOIL BORING LOG

BORING LOCATION	<u>SEE MAP</u>		
DATE AND TIME STARTED	<u>2/22/07 AT 3 20 PM</u>	RIG HOURS METER START	<u>5298 1</u>
FOREMAN	<u>CHRIS ALDRICH</u>	H & N STAFF	<u>CHRIS ALDRICH &amp; CHRIS RIEPE</u>
DATE AND TIME COMPLETED	<u>2/22/07</u>	RIG HOURS METER END	<u>5299 7</u>

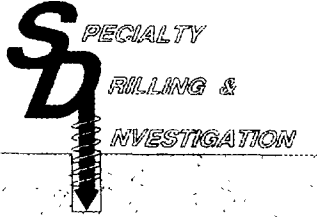
SAMPLING METHOD.	<u>SPLIT SPOON</u>	<u>DIRECT PUSH</u>	<u>CUTTINGS</u>
SIZE. 24"	<u>HAMMER 140 LB</u>	<u>FALL. 30"</u>	

NO	REC (FT)	DEPTH (FT)	BLOWS	SAMPLE DESCRIPTION	STRATA CHANGE	PID
1	3.5	0-4		0'-2' BROWN-BLACK COARSE SAND AND GRAVEL 2'-3' BROWN-GRAY SAND 3'-4' GRAY SILT AND SAND		0 8
2	2.0	4-8		4'-8' GRAY-BROWN SANDY SILT		1 2 AT 5' 1 3 AT 7 5'
3	3 4	8-12		8'-12' AS ABOVE, NO ODOR, MOIST-WET		0 3 AT 9' 1 6 AT 11 0'
4	1 8	12-16		12'-16' AS ABOVE, MORE CLAY AT BOTTOM, WET, NO ODOR		2 6 AT 16'
				SET 1" PVC WELL TO 15'		

### WELL CONSTRUCTION DETAILS

PVC Screen	<u>1</u> " diameter.	<u>0.01</u> " slot	<u>10</u> ' Sections	Set from	<u>15' to 5'</u>
PVC Riser	<u>1</u> " diameter	<u>4 5</u> ' Sections		Set from:	<u>5' to 5'</u>
Filter Sock					<u>-4</u> " Stick Up
Sand Pack	<u>15' to 4'</u>	<u>1 bag</u>			
Bentonite Seal	<u>4' to 2'</u>		<u>Cap</u>		
Grout Seal	<u>' to '</u>		<u>1 Plug</u>		
Well Finish	<u>x</u> flush	<u>Guard</u>	<u>1 Gripper</u>	Native Backfill	
			<u>1 BTW</u>		





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PROJECT NAME S/BURLINGTON, NORTH BEACH  
SDI PROJECT NO \_\_\_\_\_  
PROJECT LOCATION BURLINGTON, VT  
LATITUDE \_\_\_\_\_ LONGITUDE \_\_\_\_\_  
SHEET 1 OF 1

BORING NO SB-7

### SOIL BORING LOG

BORING LOCATION	<u>SEE MAP</u>		
DATE AND TIME STARTED	<u>2/22/07 AT 12 PM</u>	RIG HOURS METER START	<u>5299 7</u>
FOREMAN	<u>CHRIS ALDRICH</u>	H & N STAFF	<u>CHRIS ALDRICH &amp; CHRIS RIEPE</u>
DATE AND TIME COMPLETED	<u>2/22/07 AT 4 30 PM</u>	RIG HOURS METER END	<u>5300</u>

SAMPLING METHOD	<u>SPLIT SPOON</u>	<u>DIRECT PUSH</u>	<u>CUTTINGS</u>
SIZE: 24"	<u>HAMMER 140 LB</u>	<u>FALL 30"</u>	

NO	REC (FT)	DEPTH (FT)	BLOWS	SAMPLE DESCRIPTION	STRATA CHANGE	PID
1	4	0-4		0'-4' BROWN SILT WITH FINE SAND		0-1
2	4	4-8		4'-8' AS ABOVE, MORE CLAY TOWARDS BOTTOM, MOIST AT 7'		0-2 AT 7'
3	2 3	8-12		8'-12' BROWN SILT, SOME FINE SAND, P.O W AT 9', MOIST		0-1 AT 8'-11' 12 AT 12'
4	3 5	12-16		12'-14' AS ABOVE 14'-16' FINE BROWN SAND, SOME SILT, WET AT 14', ODOR		20 AT 13' 18 AT 15'
5	4.0	16-20		16'-17' AS ABOVE 17'-20' GRAY SILT, SOME CLAY, WET		2 AT 17'-18' 1 AT 19'-20'

#### WELL CONSTRUCTION DETAILS

PVC Screen	_____ " diameter	_____ " slot	_____ ' Sections	Set from	_____
PVC Riser	_____ " diameter	_____ ' Sections		Set from	_____
Filter Sock	_____				_____ " Stick Up
Sand Pack	_____				
Bentonite Seal	_____		Cap		
Grout Seal	_____ ' to _____		Plug		
Well Finish	_____ flush	Guard _____	Gripper	Native Backfill:	_____
			BTW		









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PROJECT NAME S/BURLINGTON, NORTH BEACH

SDI PROJECT NO

PROJECT LOCATION BURLINGTON, VT

LATITUDE  LONGITUDE

SHEET 1 OF 1

BORING NO SB-9

## SOIL BORING LOG

BORING LOCATION	<u>SEE MAP</u>		
DATE AND TIME STARTED	<u>2/22/2007 AT 4:50 PM</u>	RIG HOURS METER START	<u>5300 7</u>
FOREMAN	CHRIS ALDRICH	H & N STAFF	CHRIS ALDRICH & <u>CHRIS RIEPE</u>
DATE AND TIME COMPLETED	<u>2/22/07 AT 5 45 PM</u>	RIG HOURS METER END	<u>5301 5</u>

SAMPLING METHOD	SPLIT SPOON	<u>DIRECT PUSH</u>	CUTTINGS
SIZE: 24"	HAMMER 140 LB	FALL 30"	

[illegible]

**WELL CONSTRUCTION DETAILS**

PVC Screen \_\_\_\_\_ " diameter. \_\_\_\_\_ " slot \_\_\_\_\_ ' Sections      Set from \_\_\_\_\_

PVC Riser \_\_\_\_\_ " diameter. \_\_\_\_\_ ' Sections      Set from \_\_\_\_\_

Filter Sock \_\_\_\_\_ " Stick Up

Sand Pack \_\_\_\_\_

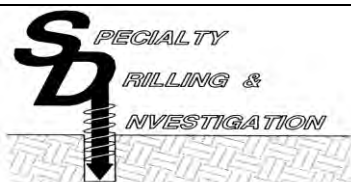
Bentonite Seal \_\_\_\_\_ Cap

Grout Seal \_\_\_\_\_ ' to \_\_\_\_\_ ' Plug

Well Finish \_\_\_\_\_ flush      Guard \_\_\_\_\_ Gripper      Native Backfill \_\_\_\_\_

BTW





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BORING NUMBER: MW-2R

Sheet 1 of 1

PROJECT NAME: S/H&N NORTH BEACH

PROJECT LOCATION: BURLINGTON, VERMONT

### SOIL BORING LOG

BORING LOCATION:

DATE AND TIME STARTED: ONSITE 1/7/10 @ 0800 RIG HOURS METER START: 7495.5

FOREMAN: CHRIS ALDRICH H & N STAFF: CHRIS ALDRICH & MATTHEW MILLER

DATE AND TIME COMPLETED: RIG HOURS METER END:

BORING METHOD: 4 1/4 HOLLOW STEM AUGER 2 1/4 H S A 6 1/4 H S A WASH/SPIN and DRIVE AIR HAMMER  
SAMPLING METHOD: SPLIT SPOON **DIRECT PUSH** CUTTINGS BACKHOE HAND AUGER  
SIZE: 24" HAMMER: 140 LB. FALL: 30"

NO.	REC. (IN.)	DEPTH (FT.)	BLOWS	SAMPLE DESCRIPTION	STRATA CHANGE	PID
1	39"	0-4'	DIRECT PUSH	BROWN FINE SAND, TRACE SILT, FROZEN TO SLIGHT MOISTURE, TRACE MOTTLING.		0.1
2	34"	4-8'	DIRECT PUSH	AS ABOVE, MOIST TO WET, NO ODOR, NO SHEEN.		0.2
3	32"	8-12'	DIRECT PUSH	BROWN FINE TO VERY FINE SAND, TRACE SILT, SATURATED 4-11", SANDY SILT LAYERS @ 11-12", 21-23", 29-32", LITTLE MOTTLING, MOIST BELOW 11", NO ODOR, NO SHEEN.		0.4 0.2 0.3
4	37"	12-16'	DIRECT PUSH	BROWN SANDY SILT, WET, LITTLE MOTTLING, NO ODOR, NO SHEEN.		0.3
5	44"	16-20'	DIRECT PUSH	0-36" WET BROWN SANDY SILT, TRACE FINE SAND SEAMS, NO ODOR, NO SHEEN. 36-44" GRAY SILTY CLAY, IRON STAINED FINE SAND SEAMS @ 39.5" AND 41", NO ODOR, NO SHEEN, WET.		1.3 0.6
6	44"	20-24'	DIRECT PUSH	0-7" SATURATED GRAY SILTY CLAY. 7-44" BROWN TO OLIVE BROWN SANDY SILT, LITTLE MOTTLING, FINE TO VERY FINE SAND LENSES, SATURATED/MOTTLED GRAY SILTY CLAY LENS @ 26-28'.		3.5 7.2
7	43"	24-28'	DIRECT PUSH	0-29" BROWN/OLIVE BROWN SANDY WET SILT WITH FINE SAND LENSES @ 4-6", 14-16", 20-21", SATURATED ODOR NEAR TOP SAND LENSES. 29-43" SATURATED GRAY SILTY CLAY, TRACE FINE SAND.		5.8 10.0
8	47"	28-32"	DIRECT PUSH	GRAY SILTY CLAY, TRACE FINE SAND, SATURATED ODOR @ TOP.		3.2 0.1
				SET 1" PVC WELL TO 27'.		
				PID = HNU #12		

### WELL CONSTRUCTION DETAILS

PVC Screen: 1 in. diameter	Slot: 0.010	Sections: 10'	Set from: 27 to 17
PVC Riser: 1 in. diameter		Sections: 17'	Set from: 17 to -0.5
Filter Sock:			Stick up: -0.5
Sand Pack: to bags	Cap		
Bentonite Seal: to bags	Plug		
Grout seal: to bags	Gripper		
Well Finish: X Flush Guard	BTW	Native Backfill: to	



**North Beach Campground Master Plan**  
**Detected Soil Constituents**



	Residential SSV	Industrial SSV	Residential VDH	<b>SB-9</b>
Depth of Sample (ft. bgs)				8.0
PID Field Measurement (ppm)				160
TPH-DRO**	200	1000		43.9
Benzene	1.2	5.1	0.442	<b><u>5.00</u></b>
Toluene	4900	47000	464	36.7
Ethylbenzene	5.8	25	2.21	<b><u>8.92</u></b>
Xylenes	580	2500	57.5	54.9
Methyl-tert-butyl ether (MTBE)	47	210	69.8	ND < 4.42
Naphthalene	3.8	17	1.42	<b><u>ND &lt; 4.42</u></b>
1,2,4-Trimethylbenzene	58	240	26.4	19.5
1,3,5-Trimethylbenzene	780	12000		6.02

Data sourced from Heindel & Noyes 2007 Phase II Environmental Site Assessment Report

All values in mg/kg unless otherwise noted

SSV - VT DEC Soil Screening Value, based on the EPA Regional Screening Levels from May 2016

VDH - Vermont Department of Health risk based residential soil screening level

ND - Not detected below the indicated value

Blank - No data available

Bold - Exceeds the Residential SSV

Shaded - Exceeds the Industrial SSV

Underlined - Exceeds the Residential VDH

ft. bgs - feet below ground surface

ppm - parts per million

\*\*The EPA 8015 procedure checks for volatility and does not differentiate between aromatic or aliphatic compounds.

Due to the lack of sensitivity a general standard for all TPH compounds reported in analytical results.





**TABLE 1: GROUNDWATER ELEVATION DATA**  
North Beach Maintenance Garage  
Burlington, Vermont  
SMS Site #2000-2788

**Groudwater Depths (ft below Top of Casing)**

Monitoring Well	Top of Casing Elevation (ft)	4/11/08	9/21/08	4/15/09	9/10/09	7/23/10	11/15/10	11/10/11	11/30/12	11/13/14	11/18/16
MW-1/MW-1R	156.11	DESTROYED	7.20	4.31	7.51	3.94	3.6	4.43	4.55	6.38	8.94
MW-2/MW-2R	153.49	5.11	DRY	11.58	DRY	10.08	9.53	11.2	11.95	12.97	17.45
MW-3	154.93	4.15	11.96	7.31	11.97	7.16	9.15	9.28	9.32	11.54	DRY
MW-4	156.35	0.39	4.13	4.21	4.2	2.47	0.5	2.56	2.35	Well Destroyed	Well abandoned

**Groundwater Elevations (ft)**

Monitoring Well	Top of Casing Elevation (ft)	4/11/08	9/21/08	4/15/09	9/10/09	7/23/10	11/15/10	11/10/11	11/30/12	11/13/14	11/18/16
MW-1/MW-1R	156.11	Destroyed	148.91	151.80	148.60	152.17	152.51	151.68	151.56	149.73	147.17
MW-2/MW-2R	153.49	148.38	DRY	141.91	DRY	143.41	143.96	142.29	141.54	140.52	136.04
MW-3	154.93	150.78	142.97	147.62	142.96	147.77	145.78	145.65	145.61	143.39	DRY
MW-4	156.35	155.96	152.22	152.14	152.15	153.88	155.85	153.79	154.00	Well Destroyed	Well abandoned





**Waite-Heindel**  
Environmental Management

**TABLE 2: GROUNDWATER QUALITY DATA: VOCs**  
North Beach Maintenance Garage  
Burlington, Vermont  
SMS Site #2000-2788

Parameter			Benzene	Ethyl- Benzene	MTBE	Toluene	1,3,5-TMB	1,2,4-TMB	1,2,4-TMB and 1,3,5-TMB	Total Xylenes	Naphthalene	Total Petrol. VOCs	Unidentified Peaks
VT Enforcement Standard			5.0	700.0	40.0	1000.0			350.0	10,000.0	20.0	---	---
VT Preventive Action Limit			0.5	350.0	20.0	500.0			none	5,000.0	10.0	---	---
VT Health Advisory			1.0	none	40.0	none			none	none	20.0	---	---
Federal MCL			5.0	700.0	none	1000.0			none	10,000.0	none	---	---
UNITS			ug/l	ug/l	ug/l	ug/l			ug/l	ug/l	ug/l	---	---
Sample ID	Date	Method											
MW-1/MW-1R*	3/7/2007	8021B	596	673	2,000	1,660			1,943	6,020	200	13,092	> 10
	9/7/2007	8021B	1540	814	3,420	ND / < 100			1,869	353	215	< 8,311	>10
	4/11/2008	8021B	NS	NS	NS	NS			NS	NS	NS	NS	NS
	9/21/2008	8021B	3,040	438	4,250	2,020			1165	2,670	261	13,844	> 10
	4/15/2009	8021B	5,670	1,150	1,860	7,060			<932	5,680	ND / < 400	21,820	>10
	9/10/2009	8021B	3,730	583	1,320	3,680			<313	2,940	ND / < 200	12,453	>10
	7/23/2010	8021B	7,350	1,970	1,390	9,490			2,621	13,100	363	36,284	>10
	11/15/2010	8021B	6,600	1,800	1,010	6,830			2,630	10,500	420	29,790	>10
	11/10/2011	8021B	4,360	1,250	608	4,420			1,766	7,160	243	19,807	>10
	11/30/2012	8021B	3,580	1,540	479	3,570	507	1,520	2,027	8,270	353	21,846	>10
	11/13/2014	8021B	778	380	104	790	200	578	778	2,930	ND / < 100	6,638	>10
	11/18/2016	8021B	1,170	417	300	131	109	421	530	1,140	ND / < 100	4,318	>10
MW-2/MW-2R**	3/7/2007	8021B	NS	NS	NS	NS			NS	NS	NS	NS	NS
	9/7/2007	8021B	NS	NS	NS	NS			NS	NS	NS	NS	NS
	4/11/2008	8021B	ND < 1	ND < 1	ND < 2	ND < 1			ND < 2	ND < 2	ND < 2	ND < 11	0
	9/21/2008	8021B	NS	NS	NS	NS			NS	NS	NS	NS	NS
	4/15/2009	8021B	NS	NS	NS	NS			NS	NS	NS	NS	NS
	9/10/2009	8021B	NS	NS	NS	NS			NS	NS	NS	NS	NS
	7/23/2010	8021B	2,800	1,040	2,670	2,960			747	3,290	ND / < 200	< 13,707	NS
	11/22/2010	8021B	2,080	691	1,540	1,460			753	1,910	ND / < 200	< 8,634	> 10
	11/10/2011	8021B	4,900	1,730	4,660	5,780			1308	6,660	243	25,281	> 10
	11/30/2012	8021B	1,450	771	1,430	880	210	475	685	2,040	181	8,122	> 10
	11/13/2014	8021B	4,930	1,750	8,620	3,280	235	1,240	1,475	6,890	306	28,726	> 10
	11/18/2016	8021B	4,550	1,840	8,030	1,840	358	973	1,331	4,510	245	23,677	>10
MW-3	3/7/2007	8021B	2.8	ND / < 1	ND / < 2	1.2			ND / < 2	2.1	ND / < 2	< 13.1	> 10
	9/7/2007	8021B	ND / < 1	ND / < 1	ND / < 2	ND / < 1			ND / < 2	ND / < 2	ND / < 2	ND / < 11	3
	4/11/2008	8021B	ND < 1.0	ND < 1.0	ND < 2.0	ND < 1.0			ND < 2.0	ND < 2.0	ND < 2.0	ND / < 11	0
	9/21/2008	8021B	ND < 1.0	ND < 1.0	ND < 2.0	ND < 1.0			ND < 2.0	ND < 2.0	ND < 2.0	ND / < 11	0
	4/15/2009	8021B	NS	NS	NS	NS			NS	NS	NS	NS	NS
	9/10/2009	8021B	ND < 1.0	ND < 1.0	ND < 2.0	ND < 1.0			ND < 2.0	ND < 2.0	ND < 2.0	ND / < 11	0
	7/23/2010	NS	NS	NS	NS	NS			NS	NS	NS	NS	NS
	11/15/2010	NS	NS	NS	NS	NS			NS	NS	NS	NS	NS
	11/10/2011	8021B	2.6	ND < 1.0	ND < 2.0	3.4			ND < 2.0	3.8	ND < 2.0	< 16.8	0
	11/30/2012	8021B	1.3	ND < 1.0	ND < 2.0	2.2			ND < 2.0	3.5	ND < 2.0	< 14.0	0
	11/13/2014	8021B	ND < 1.0	ND < 1.0	ND < 2.0	ND < 1.0			ND < 2.0	ND < 2.0	ND < 2.0	ND / < 11	0
	11/18/2016		No Sample										
MW-4	3/7/2007	8021B	< 1	< 1	2.4	< 1			< 2	< 2	< 2	< 11.4	0
	9/7/2007	8021B	< 1	< 1	2.0	< 1			< 2	< 2	< 2	ND < 11	0
	4/11/2008	8021B	ND < 1.0	ND < 1.0	ND < 2.0	ND < 1.0			ND < 2.0	ND < 2.0	ND < 2.0	ND < 11	0
	9/21/2008	8021B	ND < 1.0	ND < 1.0	ND < 2.0	ND < 1.0			ND < 2.0	ND < 2.0	ND < 2.0	ND < 11	0
	4/15/2009	8021B	NS	NS	NS	NS			NS	NS	NS	NS	NS
	9/10/2009	8021B	ND < 1.0	ND < 1.0	ND < 2.0	ND < 1.0			ND < 2.0	ND < 2.0	ND < 2.0	ND < 11	> 10
	7/23/2010	NS	NS	NS	NS	NS			NS	NS	NS	NS	NS
	11/15/2010	NS	NS	NS	NS	NS			NS	NS	NS	NS	NS
	11/10/2011	8021B	ND < 1.0	ND < 1.0	ND < 2.0	ND < 1.0			ND < 2.0	ND < 2.0	ND < 2.0	ND < 11	0
	11/30/2012	8021B	ND < 1.0	ND < 1.0	ND < 2.0	ND < 1.0			ND < 2.0	ND < 2.0	ND < 2.0	ND < 11	0
	11/13/2014		Well Destroyed										
	11/18/2016		Well Abandoned										

**Note:**

NS = "not sampled" because well was dry during sampling event

ND = "not detected"

Bold values detected above reporting limits; shaded box indicates concentration above Vermont Groundwater Enforcement Standards (VGES)

\* = reinstalled 9/11/08 by Specialty Drilling and Investigation

\*\* = reinstalled 1/7/2010 by Specialty Drilling and Investigation



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## **Attachment B: Cultural Resources ARA**





*The*  
**UNIVERSITY**  
*of* **VERMONT**

CONSULTING ARCHAEOLOGY PROGRAM

November 1, 2001

Carol Duncan  
Burlington Public Works  
645 Pine Street  
Burlington, VT 05401

Dear Carol,

Attached, please find an Archaeological Resources Assessment (ARA) for the proposed Waterfront Bike Path Evaluation, Burlington, Chittenden County, Vermont. Sixteen archaeologically sensitive areas were identified throughout the project's Area of Potential Effects (APE). We have recommended a Phase I site identification survey be conducted in these sensitive areas prior to project construction to determine the presence/absence of significant prehistoric Native American sites.

We would be happy to prepare a cost estimate for the Phase I study in the event that the sensitive areas cannot be avoided. Please feel free to contact me if you have any questions.

Sincerely,

Charles Knight, Ph.D.  
Assistant Director

cc: Scott Dillon, VDHP



**Archaeological Resources Assessment for the  
Waterfront Bike Path Evaluation, Burlington, Chittenden County, Vermont**

Submitted to:

Carol Duncan  
Burlington Public Works  
645 Pine Street  
Burlington, VT 05401

Submitted by:

Charles Knight, Ph.D.

University of Vermont  
Consulting Archaeology Program  
112 University Heights  
Burlington, VT 05405

Report No. 324

November 1, 2001



## **Archaeological Resources Assessment for the Waterfront Bike Path Evaluation, Burlington, Chittenden County, Vermont**

### **Project Description**

The University of Vermont's Consulting Archaeology Program (UVM CAP) conducted an Archaeological Resources Assessment (ARA), as part of the Section 106 cultural resources review for the proposed Waterfront Bike Path Rehabilitation Project for the City of Burlington, Chittenden County, Vermont. This review is required by the National Historic Preservation Act of 1966, as amended, given that the project is supported by federal funds through the Vermont Agency of Transportation (VAOT). Proposed project elements include the widening of the path and shoulders, the addition of signage, fencing along sloped areas, enhanced drainage and other improvements. The project area encompasses a 7.6 mile corridor along the eastern shore of Lake Champlain, from Oakledge Park in the south, to the mouth of the Winooski River in the north (Figure 1).

### **Study Goal**

The goal of an archaeological resources assessment (or "review") is to identify portions of a specific project's Area of Potential Effects (APE) that have the potential for containing prehistoric and/or historic sites. An ARA is to be accomplished through a "background search" and a "field inspection" of the project area. For this study, reference materials were reviewed following established guidelines. Resources examined included the National Register of Historic Places (NRHP) files; the Historic Sites and Structures Survey; and the USGS master archaeological maps that accompany the Vermont archaeological inventory. Relevant town histories and nineteenth-century maps also were consulted. Based on the background research, general contexts were derived for prehistoric and historic resources in the vicinity of the study area.

### **Prehistoric Archaeological Site Potential**

Several prehistoric sites are known within the proposed project's APE (Figure 2). Field Site 76 (FS-CH-76) represents an isolated projectile point, recovered from the rocky outcrop next to the beach at the end of Flynn Avenue in Oakledge Park. Site VT-CH-081 dates to the Late Archaic period (4000 – 900 B.C.) and the Late Woodland Period (A.D. 1050 – 1600), and covers the beachfront from Oakledge Park to the barge canal, based on the recovery of numerous artifacts in the early and middle part of the 20<sup>th</sup> century. Several sites may be represented here. Site VT-CH-161 is located behind and around the renovated Holloway Block Buildings that front on Battery Street along the Burlington Waterfront. In addition to numerous historic artifacts, several prehistoric quartzite flakes were recovered from these sites, reflecting a prehistoric component. Field Site 173 (FS-CH-173) represents a water-worn Late Archaic period (4000 –



900 B.C.) projectile point recovered from North Beach. Site VT-CH-264 is located just north of this area and consists of two artifact areas that produced a combined total of over 50 lithic flakes. Site VT-CH-119 consists of lithic flakes and a stemmed projectile point, which were recovered at the end of Lone Rock Point, at the northern extreme of North Beach. Finally, site VT-CH-847 was identified approximately 200 m east of Station 253+00 of the bike path. This site includes materials that date to the Late Archaic period (4000 – 900 B.C.). More, as yet unidentified sites undoubtedly exist in the general area as well.

### **Historic Archaeological Site Potential**

A review of historic maps of Chittenden County indicates that there are no existing significant historic archaeological sites within the proposed project's APE. There are no properties identified on the historic 1857 Walling's map, the historic 1869 Beers' map (Figure 3), or the 1906 USGS map (Figure 4). One property, that of J. A. Arthur on the 1869 Beers Map, is the only one that is near the railway line from downtown Burlington to the mouth of the Winooski River, but was not affected by it. A significant amount of historic disturbances related to waterfront industry, including large areas of landfill associated with the development of the lumber and rail industries, makes it unlikely that significant historic sites exist intact within the study corridor. As a result of the pre-existing railway corridor, a general lack of historic settlement along this corridor, and historic disturbance related to waterfront industry, no historic sites are likely to be impacted by the proposed project.

### **Field Inspection**

A field inspection of the project area was undertaken on September 27, 2001, by Dr. Charles Knight, Assistant Director of the UVM CAP. The project area received a high sensitivity score of 44 based on the variables in the "Draft Environmental Model for Locating [Prehistoric] Archaeological Sites," since it parallels the eastern shore of Lake Champlain, crossing several streams, intermittent streams, and ending near the Winooski River. Sixteen areas sensitive for prehistoric archaeological sites were identified during the inspection. These sensitive areas were characterized by linear sections on either side of the bike path, often near drainages (Figures 5-7).

#### **Areas 1 and 2**

Areas 1 and 2 are located in Oak Ledge Park, south of Station 0+00. Area 1 is a linear swath, parallel to the east side of the existing Bike Path, from the tennis courts to the washroom facilities building (Figure 5). Area 2 is located on the west side of the existing bike path, parallel to Area 1. The southern end of Area 2 is just north of the tennis courts, and extends from the bike path to the shore of Lake Champlain. It continues north and east along the bike path, ending where the washroom facilities' building is located (Figure 5). Bike Path widening and turn-around construction will affect these sensitive areas, which lie within or near known field site FS-CH-76.



### Area 3

Area 3 is located in the northern tip of Oak Ledge Park, on the northern edge of a drainage, which itself is located at the end of Flynn Ave, just north of the park entrance, at, or near, Station 0+00 (Figure 5). The sensitive area parallels the bike path on its east side, but also includes the northern edge of the drainage. Bike path widening, turn-around construction, and drainage rehabilitation will affect this sensitive area, which lies within or near known site VT-CH-81.

### Areas 4 and 5

Area 4 is located along the southern edge of the existing bike path, in-between the bike path and the northern limit of a compound with large oil tanks at Station 10+00, just before the bike path crosses a wood bridge over a drainage onto Harrison Avenue (Figure 5). Area 5 is located on the northern edge of the bike path from Area 4, and includes the wooded section between the bike path and the drainage, also at Station 10+00. Bike path widening, turn-around construction, and drainage rehabilitation will affect these sensitive areas, which lie within or near known site VT-CH-81.

### Area 6

Area 6 is located on the north edge of the drainage which borders Areas 4 and 5, parallel to the southern edge of the existing bike path, just before the bike path turns onto Proctor Avenue at Station 15+20, and eventually Harrison Ave (Figure 5). Bike path widening and turn-around construction will affect this sensitive area, which lies within or near known site VT-CH-81.

### Area 7

This area is located along the stretch between Stations 31+00 and 58+00, at the point where the landform to the west of the bike path converges with the bike path. This sensitive area is a small triangular shaped piece of land (Figure 5). Bike path widening or turn-around construction will affect this sensitive area, which lies within or near known site VT-CH-81.

### Area 8

Area 8 is a wedge-shaped linear section on the west side of the existing bike path, south of where the bike path crosses a driveway to the parking facilities at North Beach, and just south of Station 169+00 (Figure 6). Bike path widening or turn-around construction will affect this sensitive area.

### Area 9

Area 9 is located north of North Beach, on the eastern edge of the existing Bike Path, approximately at Station 169+00 (Figure 6). It is a linear area parallel to the existing bike path. Bike path widening and turn-around construction will effect this sensitive area, which lies in



close proximity to known site VT-CH-264.

#### Areas 10 and 11

Area 10 is located on the west side of the existing bike path in an undeveloped area south of the western terminus of Killarney Drive, approximately at Station 208+00 (Figure 6). It is a linear area, parallel to the bike path and will be impacted by bike path widening and turn-around construction. Area 11 is located across the bike path from Area 10, parallel to the eastern edge of the path.

#### Area 12

Area 12 is located on the northeast corner of the area of the bike path that is crossed by a small road just north of the western terminus of Killarney Drive, north of Station 208+00 (Figure 6). It is located next to a ravine and just south of a house. It is a triangular shaped area that will be impacted by bike path widening, turn-around construction and drainage rehabilitation.

#### Area 13

Located approximately two blocks north of Area 12, Area 13 is a linear area parallel to the eastern edge of the existing bike path, on the western edge of the back lawns of the three northern-most houses on the west side Beachcrest Road, between Stations 208+00 and 225+00 (Figure 6). Bike path widening and turn-around construction will affect this sensitive area.

#### Area 14

Area 14 is a 100 m long linear area parallel to the western edge of the existing bike path, extending south from the bike path stop sign at Shore Road, north of Leddy Park, approximately at Station 238+00 (Figure 7).

#### Area 15 and 16

Area 15 is located on the western edge of the bike path at the southern terminus of the development on Northshore Drive, where a small rest stop for Bike Path users is located, just north of Station 277+00 (Figure 7). It is triangular shaped in its southern extreme, narrowing to a linear area paralleling the western edge of the bike path. Area 16 is located on the eastern edge of the bike path, just across from Area 15. Both areas will be impacted by bike path widening, and turn-around construction.



## **Conclusions and Recommendations**

The City of Burlington proposes the Waterfront Bike Path Rehabilitation Project, which includes the widening of the path and shoulders, the addition of signage, fencing along sloped areas, enhanced drainage and other amenities (Figure 1). The UVM CAP conducted an ARA of the proposed project area as part of the Section 106 cultural resources review, and a total of 16 archaeological sensitive areas were identified. A Phase I Site Identification Survey is recommended to determine the presence/absence of sites within the areas designated Areas 1-16, if they cannot be avoided by proposed path widening, turn-around construction, or drainage rehabilitation.

Charles Knight, Ph.D.  
Assistant Director



## Bibliography

Beers, F. W.

1869 *Atlas of Chittenden Co. Vermont*. New York. (Republished 1969 by The Book Cellar).

U.S. Geological Survey

1906 SW/4 South Burlington 15" quadrangle. United States Geological Survey, Washington D.C.

Walling, H.F.

1857 *Map of Chittenden County, Vermont*. Baker and Tilden Co., New York.



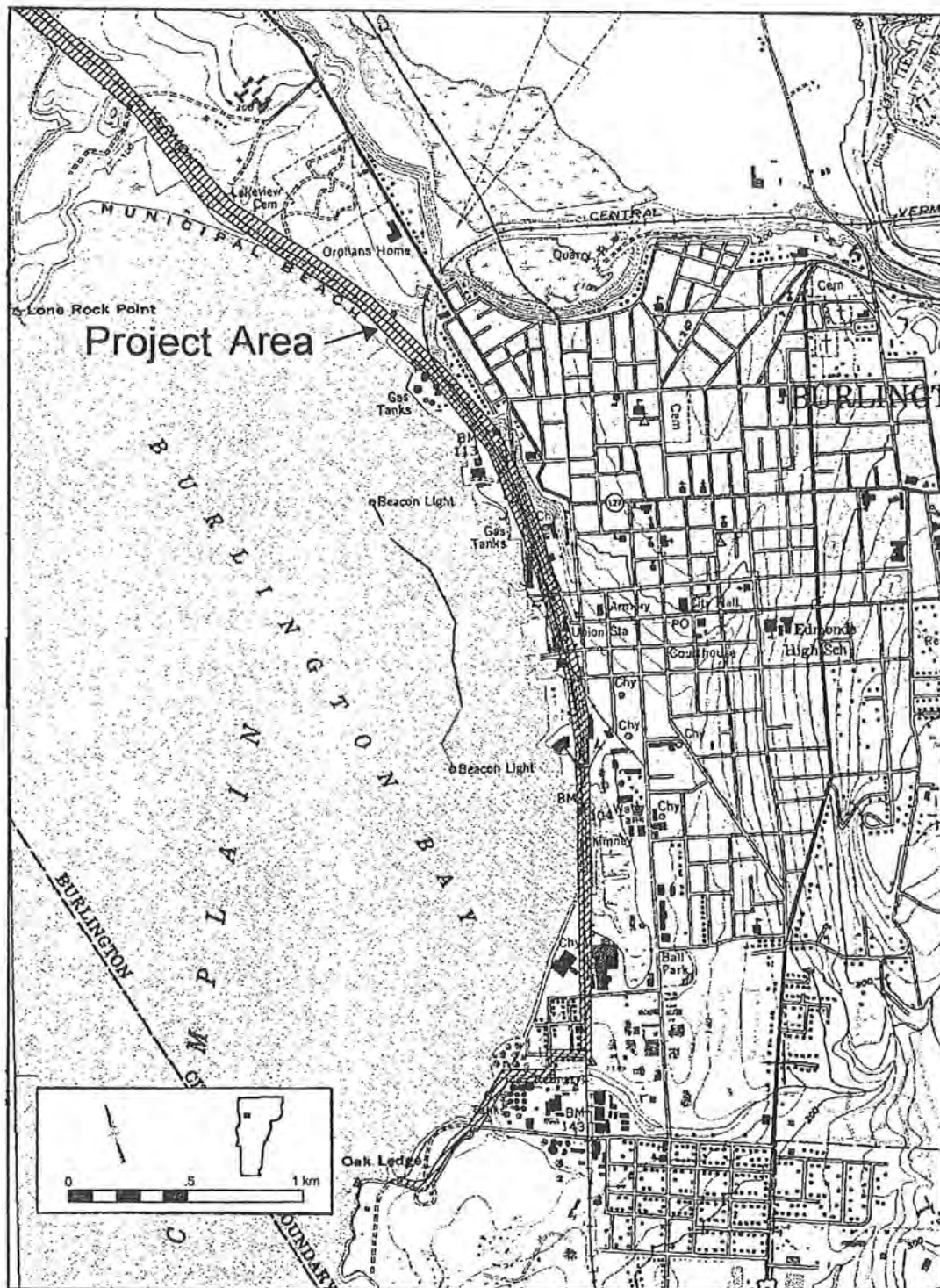


Figure 1. Location of the proposed Waterfront Bike Path Rehabilitation Project, Burlington, Chittenden County, Vermont.



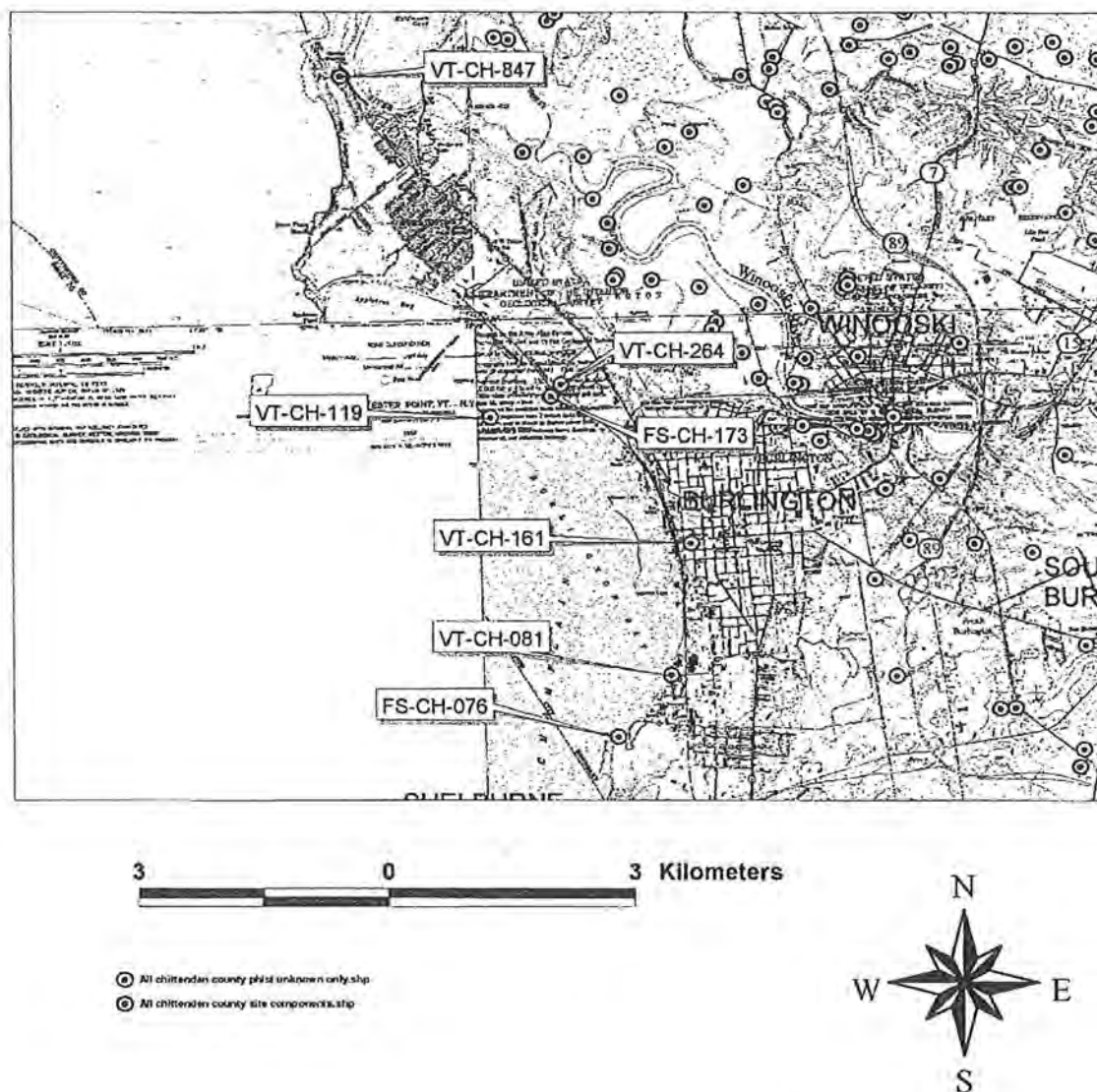


Figure 2. Location of prehistoric archaeological sites near the proposed Waterfront Bike Path Rehabilitation Project, Burlington, Chittenden County, Vermont.

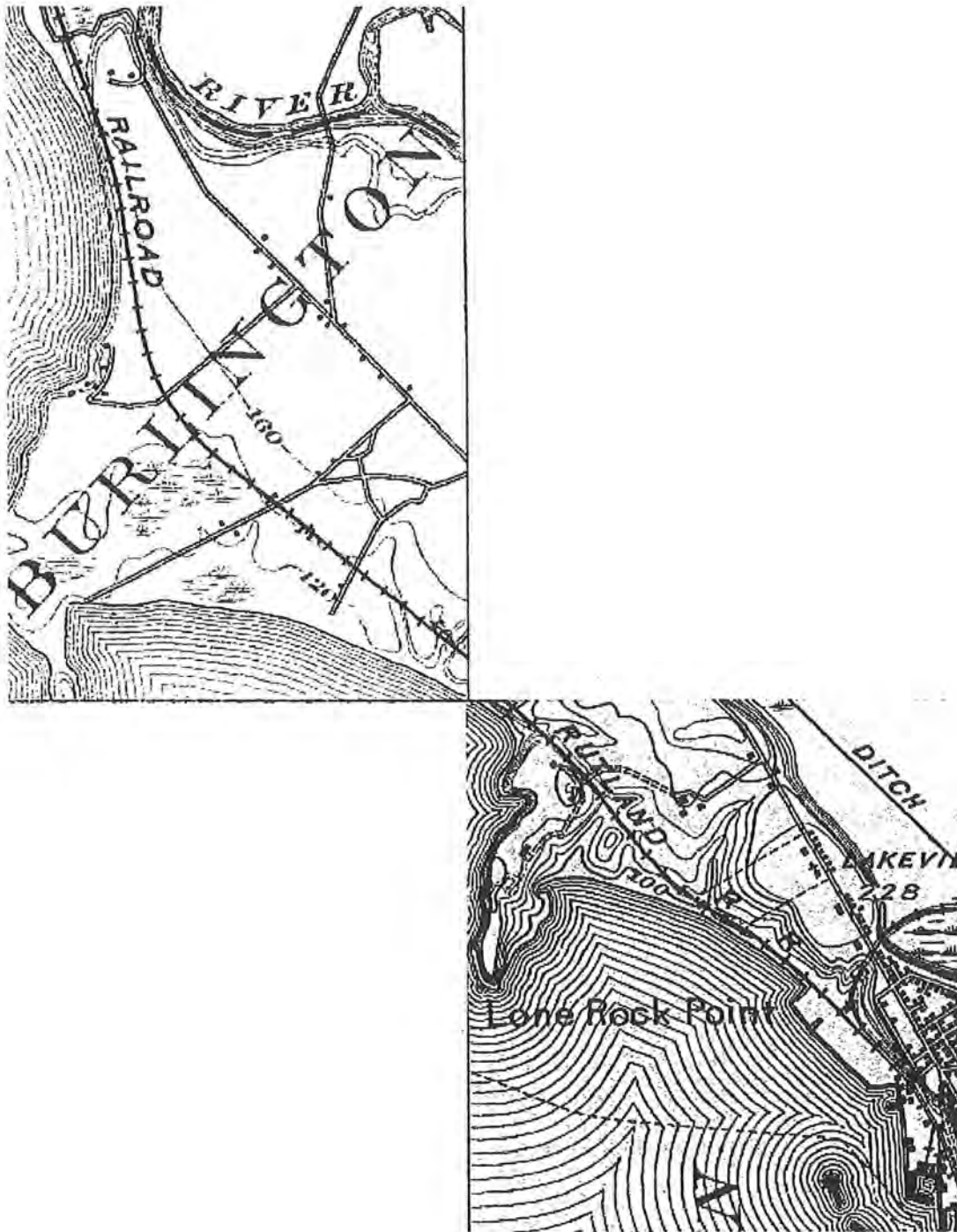




Beers 1869

Figure 3. 1869 Beers map showing the location of the area affected by the proposed Waterfront Bike Path Rehabilitation Project, Burlington, Chittenden County, Vermont.





1906 USGS

Figure 4. 1906 USGS map showing the location of the area affected by the proposed Waterfront Bike Path Rehabilitation Project, Burlington, Chittenden County, Vermont.



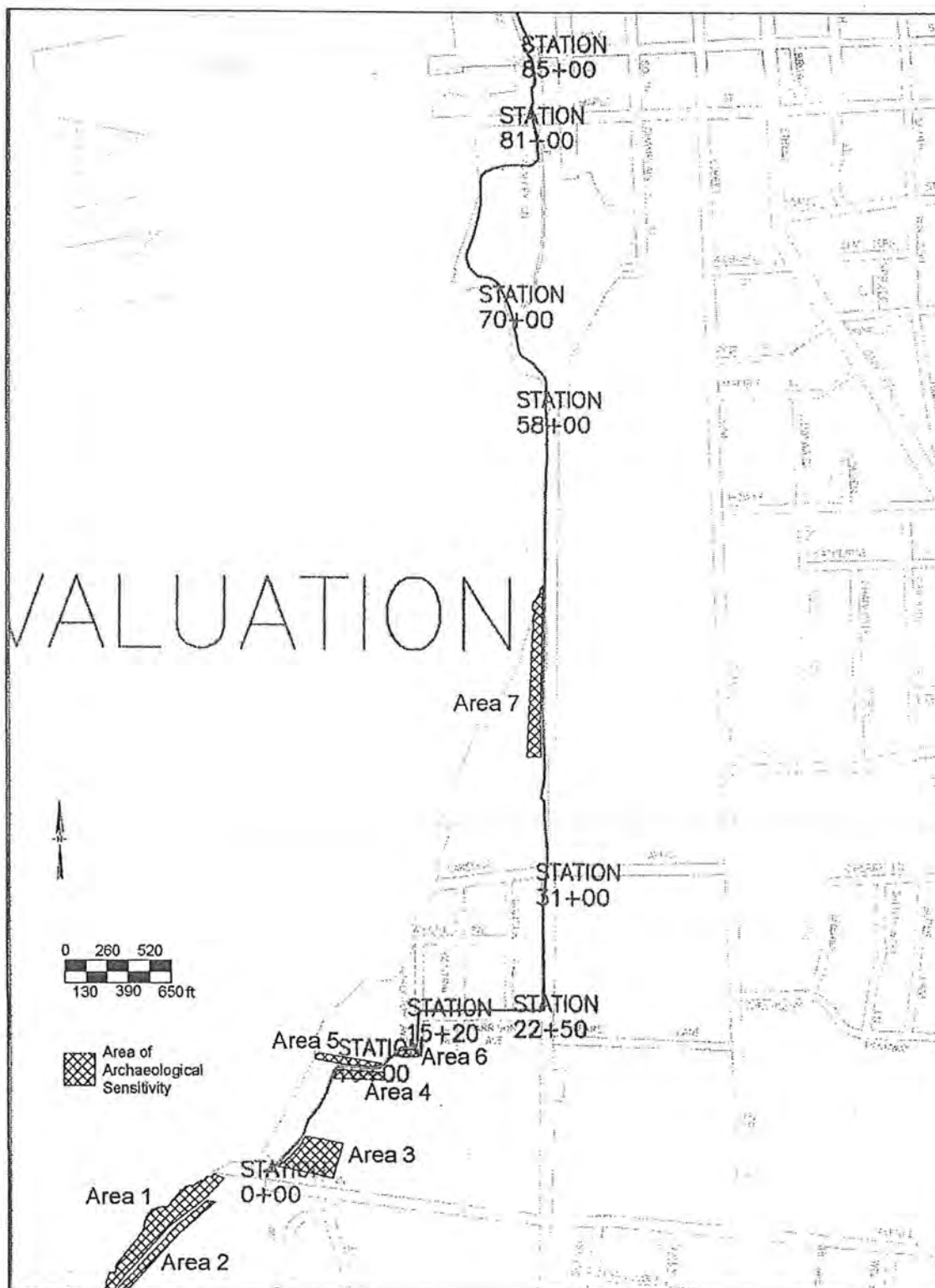


Figure 5. Location of Archaeological Sensitive Areas 1 - 7, along the Waterfront Bike Path, Burlington, Vermont.



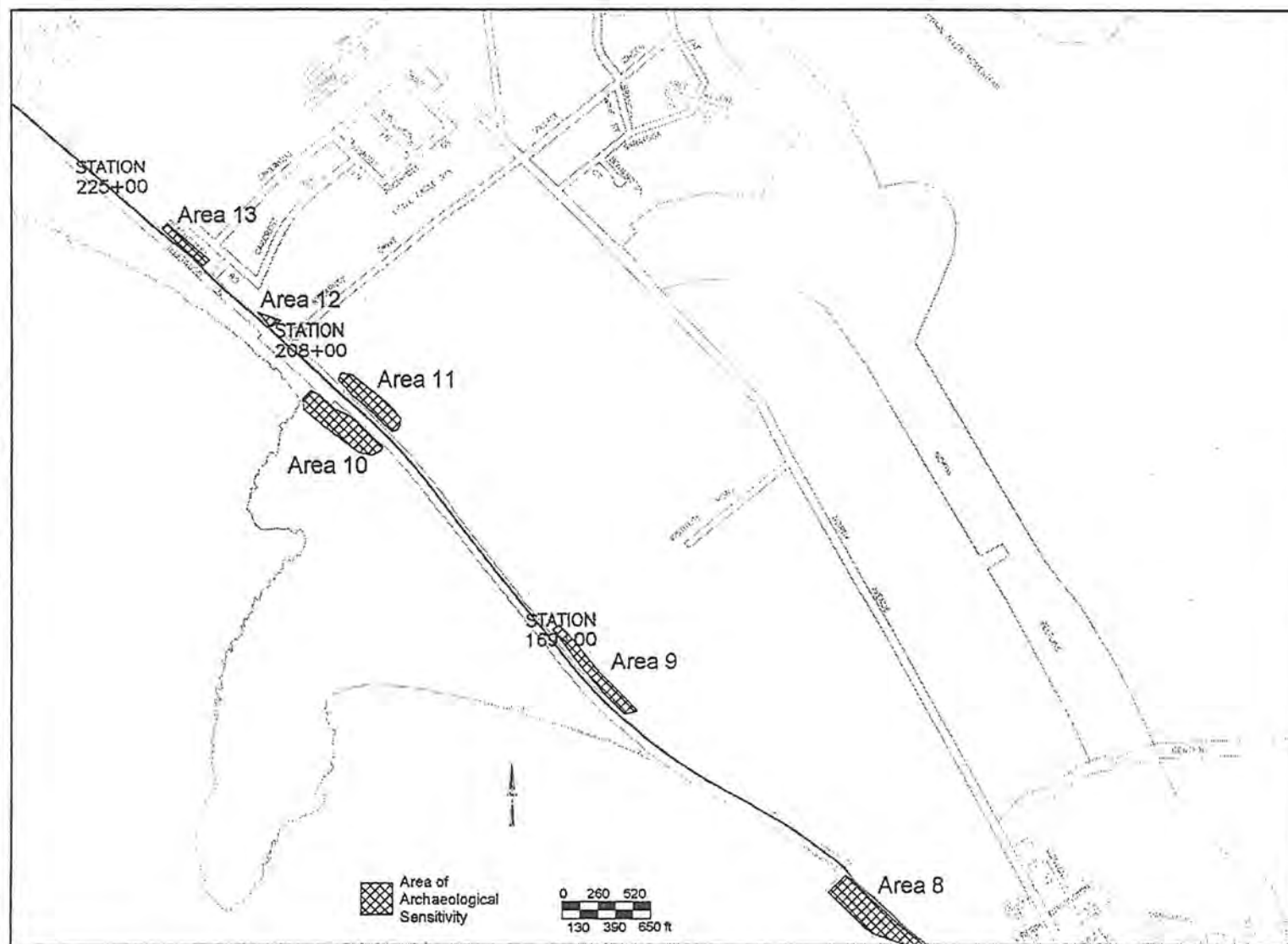


Figure 6. Location of Archaeological Sensitive Areas 8 - 13, along the Waterfront Bike Path, Burlington, Vermont.



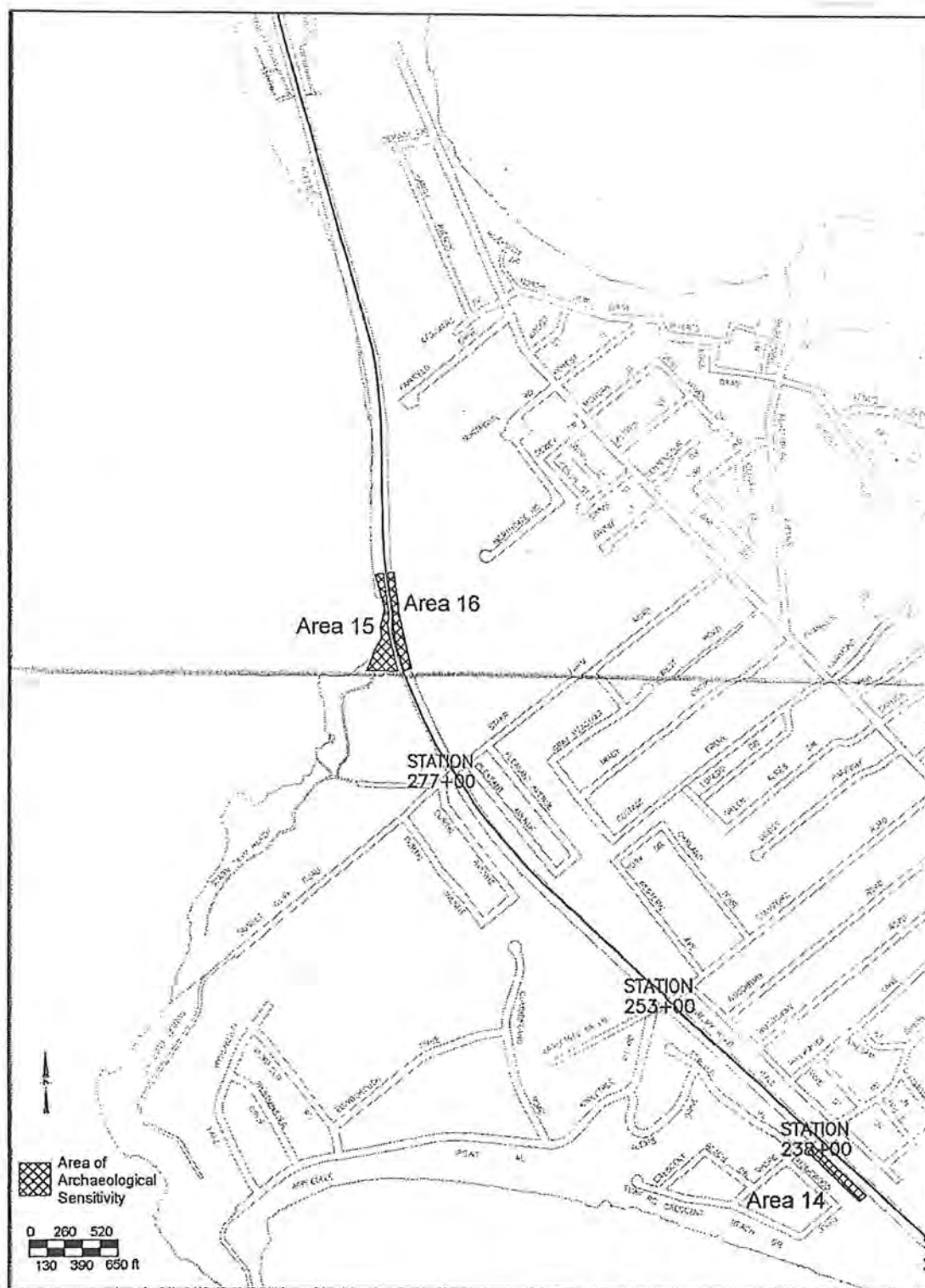


Figure 7. Location of Archaeological Sensitive Areas 14 - 16, along the Waterfront Bike Path, Burlington, Vermont.



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