BURLINGTON WATERFRONT INFRASTRUCTURE STUDY

Final
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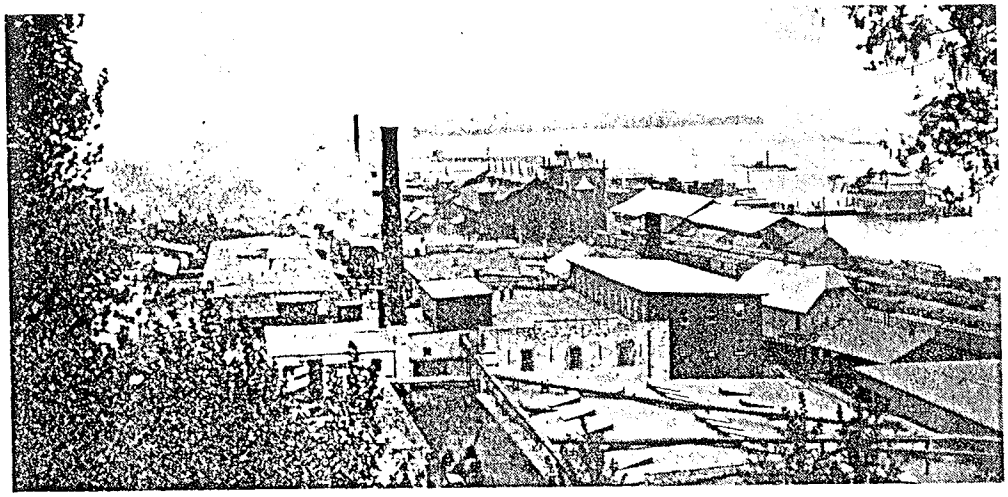

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EXECUTIVE SUMMARY

This study is prepared to provide technical supporting data for conceptual infrastructure improvements (i.e., water sewer, storm drainage, roadways, utilities, parking) for the downtown Burlington Waterfront. This study supercedes the infrastructure study prepared in 1988[1].

This study has evaluated the existing infrastructure and determined what improvements are necessary to meet the needs of the project. A phasing plan is proposed that will utilize the city planned infrastructure upgrades and a public/private partnership to help apportion costs for the proposed developments.

The conceptual site plan contains the following elements.

- Construction of 151 new residential units (1-2 bedrooms)
- Renovation of the Moran Power Plant into a museum and theater complex
- Construction of recreational center including a pool and athletic courts.
- Construction of approximately 200,000 square feet of new office and retail space
- Retain various businesses (i.e., auto parts store, gas station, and restaurants) throughout the development
- Proposed expanded restaurant at Lake Champlain Transportation Company
- Open space provided as 11.2 acre Waterfront Park
- Construction of a theater and museum at the existing Pease Grain site and a museum at the Naval Reserve Site.
- Retain existing public boat landing, U.S. Coast Guard Station & Water Treatment Plant.

The conceptual site plan presented is approximately a 50 percent reduction of the plan previously submitted in 1988.

Burlington Waterfront Infrastructure Study Boehm Associates, T.Y. LIN International August 1988.

This technical study is provided to support the design presented on the conceptual infrastructure plans. The analysis includes the impacts associated with utilities, sewer, water, stormwater and traffic as well as the measures necessary to mitigate the existing infrastructure inadequacies.

Each of these is discussed below.

SEWER

The waterfront currently discharges its wastewater to the wastewater treatment plant at Roundhouse Point. New sewer mains and lateral construction will be required to provide sewer service to the proposed development. The lift station at the water treatment plant and the pump station at the end of College Street will be upgraded to handle the additional sewage generated by the waterfront development. The treatment plant has recently undergone extensive improvements and has adequate capacity for the development.

STORMWATER

Stormwater runoff will be provided by new collection systems for all impervious areas (i.e., roads & buildings). The collection system will be designed to minimize the peak rate of runoff to existing predevelopment conditions. Catch basins with oil traps and debris sumps will be provided to help prevent pollutants and sediment from entering Lake Champlain. The level of new development will require a stormwater collection system for the heavier developed areas and a method of treating the runoff prior to discharging it into Lake Champlain. A collection and recharge system with indirect discharge to the lake are proposed.

WATER

The existing water distribution system has adequate pressure and flow to serve the needs of the project. The system will require additional connections to provide reliable water service to waterfront development. Depending on individual developments, water main loops could be installed to provide potable water and fire protection to new development.

TRANSPORTATION

The existing Lake Street cross-section and alignment can adequately handle the proposed traffic levels (based on a capacity basis only). Improvements to Lake Street and College Street are recommended to

improve the safety conditions, parking, and aesthetics. These improvements will include new full depth pavement and widening along with lighting, sidewalks and a green belt area. College Street will be reconstructed from Battery Street to the railroad crossing in the same cross section.

UTILITIES

Adequate power for the project as proposed will be provided by Burlington Electric Department (BED).

The BED overhead service lines and Green Mountain Power's (GMP) transmission lines currently run through the site and detract from the Waterfront. It is recommended that these lines be relocated underground to improve the waterfronts aesthetics. This option should be considered as part of the Phase I development plan.

Vermont Gas Company mains exist around the perimeter of the development. It is recommended that a new high pressure gas main be installed in Lake Street to provide service to the major portion of the development. Other gas services will be extended or added for various buildings elsewhere in the development.

New England Telephone provides telephone service to the Waterfront. Telephone service is considered adequate for the proposed Waterfront development All existing and proposed telephone services are recommended to be underground.

SANITARY SEWER

EXISTING CONDITIONS

The Burlington sanitary sewer collection system is a combined sewer overflow (CSO) system. Both sewer and stormwater are collected and treated at the city's wastewater treatment plant. The main treatment plant is located at the southern end of the waterfront project near Roundhouse Point. During high intensity storms (which create peak stormwater flows) the combined sewer and stormwater that cannot be treated drains into overflow pipes and discharges directly to Lake Champlain. This system inadequacy has created a pollution problem in Lake Champlain. The city of Burlington is currently completing a $52 million improvement to the wastewater treatment plant (WWTP) and CSO system in downtown Burlington to decrease the amount of discharge and improve the quality of wastewater discharge into the lake.

Currently, the waterfront has an inadequate sewer collection system. In the 1988 study[2] it was determined that the existing collection system provided minimal service and was at capacity. This refers to the existing pump station at the foot of College Street.

The waterfront development area served with sewer is listed below.

- Moran Station, U.S. Coast Guard Station and water treatment plant currently discharge their wastewater into a lift station adjacent to the water treatment plant. This wastewater is pumped through a 4 inch force main to Lake Street to the existing 8 inch gravity main near the Haigh Building.

- The existing Atkinson apartment building pumps its wastewater to the previously mentioned force main from the Water Treatment Plant.

- The 8 inch gravity sewer main in Lake Street discharges into the College Street pump station.

- The remainder of the development areas sewage is collected in 8 and 10 inch sewers that gravity feed to the College Street pump station.

- The College Street pump station pumps the wastewater up to a 30 inch by 42 inch brick sewer main in Battery Street via a 6 inch

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Ibid.

ductile iron force main. This sewer main was recently installed and discharges directly to the WWTP.

Based on discussions with the Burlington Department of Public Works (DPW), the estimated average daily flow of the WWTP after the current improvements are completed will be 5.3 mgd. The peak daily flow will be approximately 13 mgd. Currently the WWTP treats approximately 4.3 mgd (average daily flow) under a dry weather condition. The WWTP (with improvements) has an additional capacity of 1.0 mgd.

The existing wastewater flows from the Waterfront project area are estimated to be 0.03 mgd. These existing wastewater flows are presented in Table 1. These flows were based on design criteria published by the Vermont Department of Environmental Health and discussions with the city of Burlington Department of Public Works.

FUTURE IMPACTS

Based on the same design criteria used to develop the existing wastewater flows, the additional average daily wastewater flow generated from the project is estimated to be 0.08 mgd. The additional peak daily wastewater flow is expected to be 0.19 mgd. The proposed Waterfront Development wastewater flows are presented in Table 2.

The total average daily wastewater flow generated from the waterfront project is 0.10 mgd and the peak daily flow is 0.26 mgd. The 1988 study had proposed approximately 0.45 mgd and 1.124 mgd for average daily and peak daily flow, respectively. The waterfront development as currently proposed is approximately 50 percent smaller. The wastewater rate assumptions used in 1988 were extremely conservative. Historical wastewater generation rates were discussed with Tom Moreau at the Burlington Department of Public Works (DPW) and the residential, retail, and office flows in this study are based on the rates discussed. Other wastewater flow rates used were based on Vermont design criteria.

The total average daily wastewater flow associated with the waterfront will be approximately 0.1 mgd. The WWTP has adequate capacity to treat the project's wastewater flows.

Based on the above flows, it is recommended that the project be separated into three areas, north, middle and south. These are presented in Figure 1. The north area will collect all development north of the Haigh Building and discharge it into the existing lift station at the water treatment plant. The lift station will pump the wastewater to the existing 8-inch gravity sewer main in Lake Street. This lift station may need to be upgraded to handle the additional flows.

The middle area will discharge by gravity into the 8-inch main in Lake Street eventually terminating at the College Street pump station. Burlington DPW has stated that this pump station is currently at capacity and will need to be upgraded or replaced.

The southern area will continue to drain as it presently does. Any new buildings will be required to connect to the existing gravity sewer systems that discharge into the sewer main in Battery Street.

Existing sanitary sewer lines are assumed to be vitrified clay pipe or asbestos cement pipe laid at a minimum slope of 0.005 feet per feet with a roughness coefficient "N" of 0.013. The capacity of a 8-inch line at this slope is approximately 0.85 mgd (1.3 cubic feet per second). Vermont State regulations recommend that all sewers be designed using a peak hour design factor of approximately 3.8. Therefore, the proposed Waterfront will ultimately generate peak hour wastewater flows of approximately 0.39 mgd (0.6 cfs). Based on these capacities and estimated flows, the existing sewer system should adequately serve the needs of the project.

MITIGATION

Mitigation measures recommended to minimize the impact of the Waterfront Development will include the following:

- Installation of water saving fixtures in existing and proposed development. This could lessen the impact on the average daily wastewater flow by approximately 10 percent.

- Upgrade the water treatment plant lift station to handle the development in the north area. New pumps, motors, and impellers could be installed to handle the additional wastewater flow. Emergency power and/or underground storage could be included to eliminate any power outage overflows.

- Upgrade the College Street pump station to handle the additional wastewater flow. Construct an emergency generator and/or storage tank to eliminate power outage overflows.

- Analyze the existing stormwater collection system in the Waterfront area to determine whether or not the stormwater runoff is entering the sanitary sewer systems and make appropriate modifications.

All new sanitary sewer mains (including force mains) and laterals will be in a collection system separate from the stormwater collection system. Any sewer services found to be connected to the storm drain system will be disconnected and relocated to the appropriate sewer main.

TABLE 1

EXISTING WASTEWATER GENERATION CALCULATIONS

Prepared by: VHB Inc.

BURLINGTON WATERFRONT INFRASTRUCTURE STUDY
Burlington, Vermont

NO.	USE	TYPE OF USE	SIZE (note 1)		GENERATION RATE (note 1)	SEWAGE (gpd)	PEAKING FACTOR	PEAK DAY SEWAGE (gpd)
	EXISTING							
3	WATER PLANT	public	27,000	sf	0.075	2,025	2.5	5,063
		office	17,864	sf	0.075	1,340	2.5	3,350
4	US COAST GUARD	public	5,000	sf	0.075	375	2.5	938
5	BOAT LAUNCH	public	-					
7	ATKINSON BUILDING	residential	15	units	163.8	2,457	2.5	6,143
10	HAIGH BUILDING	restaurant (inside)	75	seats	15	1,125	2.5	2,813
		restaurant (outside)	45	seats	15	675	2.5	1,688
		office	11,100	sf	0.075	833	2.5	2,081
11	McKENSIE BUILDING	office	13,000	sf	0.075	975	2.5	2,438
14	WATERFRONT PARK	recreational	11.2	acres		500	2.5	1,250
15	COMMUNITY BOATHOUSE	public	4,750	sf	0.075	356	2.5	891
		marina	32	slips	5	160	2.5	400
17	AUTO PARTS STORE	commercial	10,800	sf	0.150	1,620	2.5	4,050
18	GAS STATION	commercial	4	islands	300	1,200	2.5	3,000
20	ICE HOUSE	restaurant	225	seats	15	3,375	2.5	8,438
		florist	1,164	sf	0.075	87	2.5	218
21	SHANTY - ON - THE - SHORE	restaurant	87	seats	15	1,305	2.5	3,263
22	SAILWORKS BUILDING	office	13,575	sf	0.075	1,018	2.5	2,545
		retail	4,524	sf	0.075	339	2.5	848
23	BRICK BUILDING	office	21,210	sf	0.075	1,591	2.5	3,977
24	DOCKSIDE CAFE	restaurant	150	seats	15	2,250	2.5	5,625
	BUILDING	ofice	6,300	sf	0.075	473	2.5	1,181
25	VERMONT RAILWAY	office	4,800	sf	0.075	360	2.5	900
		warehouse	1,600	sf	0.050	80	2.5	200
		roundhouse	14,000	sf	-	300	2.5	750
26	WASTEWATER FACILITY	public	3,200	sf	0.075	240	2.5	600
27	PERKINS PIER	office	1,632	sf	0.050	82	2.5	204
		marina	80	slips	5	400	2.5	1,000
28	LAKE CHAMPLAIN	restaurant	40	seats	15	600	2.5	1,500
	TRANSPORTATION	warehouse	4,725	sf	0.050	236	2.5	591
	INFILTRATION	-	2,415	lf	0.085	205	2.5	513
					SUBTOTAL	26,582 gpd 0.03 mgd		66,454 gpd 0.07 mgd

NOTES:

1 Sewage generation rates are based on rates supplied by the City of Burlington Department of Public Works. They are as follows:

Residential -	63 gpd per person and 2.6 people per home =	163.8	gpd/home
Commercial -	15 gpd per 100 sf =	0.150	gpd/sf
Retail/ Public -	15 gpd and 200 sf per person =	0.075	gpd/sf
Office -	15 gpd and 200 sf per person =	0.075	gpd/sf
Restaurant -	15 gpd per seat		
Marina -	5 gpd per slip		
Warehouse -	5 gpd per 100 sf =	0.050	gpd/sf

2 The numbers in the left hand column refer to the Existing and Proposed Condition plans

3 Infiltration is based on Vermont regulations. Assume 300gpd/diameter inch/mile

9/3/93

TABLE 2

PROPOSED WASTEWATER GENERATION CALCULATIONS

Prepared by: VHB Inc.

BURLINGTON WATERFRONT INFRASTRUCTURE STUDY
Burlington, Vermont

NO.	USE	TYPE OF USE	SIZE (note 1)		GENERATION RATE (note 1)	SEWAGE (gpd)	PEAKING FACTOR	PEAK DAY SEWAGE (gpd)
	PROPOSED							
1	RECREATION CENTER	recreational	58,000	sf	0.150	8,700	2.5	21,750
2	MORAN POWER PLANT	museum gift shop theater restaurant	70,000	sf	0.150	10,500	2.5	26,250
6	VON TURKEVICH	residential	35	homes	163.8	5,733	2.5	14,333
8	MAIN STREET LANDING	residential	77	homes	163.8	12,613	2.5	31,532
	102 LAKE STREET	retail	27,000	sf	0.075	2,025	2.5	5,063
		office	22,100	sf	0.075	1,658	2.5	4,144
9	BARRY MOSSMAN'S HOUSING	residential	19	homes	163.8	3,112	2.5	7,781
12	BARRY MOSSMAN'S PROJECT	office	36,000	sf	0.075	2,700	2.5	6,750
		retail	9,000	sf	0.075	675	2.5	1,688
13	PEASE GRAIN SITE	theater, museum	50,200	sf	0.150	7,530	2.5	18,825
16	NAVAL RESERVE SITE	research center	12,000	sf	0.150	1,800	2.5	4,500
		museum	23,000	sf	0.150	3,450	2.5	8,625
		retail	2,000	sf	0.075	150	2.5	375
		restaurant	100	seats	15	1,500	2.5	3,750
		marina	28	slips	5	140	2.5	350
19	UNION STATION	residential	20	homes	163.8	3,276	2.5	8,190
		retail	45,000	sf	0.075	3,375	2.5	8,438
		office	59,500	sf	0.075	4,463	2.5	11,156
29	TRANSPORTATION CENTER	parking	400	spaces	-	-		-
		retail	30,000	sf	0.075	2,250	2.5	5,625
		office	15,000	sf	0.075	1,125	2.5	2,813
		public	8,000	sf	0.075	600	2.5	1,500
					PROPOSED FLOWS	77,374 gpd		193,435 gpd
					EXISTING FLOWS	26,581 gpd		66,453 gpd
					TOTAL	103,955 gpd		259,888 gpd
						0.10 mgd		0.26 mgd

NOTES:

1 Sewage generation rates are based on rates supplied by the City of Burlington Department of Public Works. They are as follows:

Residential -	63 gpd per person and 2.6 people per home =	163.8	gpd/home
Commercial -	15 gpd per 100 sf =	0.150	gpd/sf
Retail/ Public -	15 gpd and 200 sf per person =	0.075	gpd/sf
Office -	15 gpd and 200 sf per person =	0.075	gpd/sf
Restaurant -	15 gpd per seat		
Marina -	5 gpd per slip		
Warehouse -	5 gpd per 100 sf =	0.050	gpd/sf

2 The numbers in the left hand column refer to the Existing and Proposed Condition plans

STORMWATER COLLECTION SYSTEM

EXISTING CONDITIONS

A minimal stormwater collection system exists in the waterfront area. There are four drainage areas in the proposed development area. The area to the north, (Depot Street and Lake Street) sheet drains and flows in ditches eventually discharging into Lake Champlain. The area between the Coast Guard station and the southern end of the existing Waterfront Park also sheet flows into a ditch adjacent to the railroad tracks and flows to the north, over Lake Street and discharges into the lake.

The area east of the railroad tracks and Lake Street sheet flows over the grassed area and is collected in a series of catch basins and pipes that discharge into Lake Champlain. Currently, the waterfront park north of College Street is experiencing drainage problems related to topography, etc. Lake Street is a part of this area and is a paved public street where water collects in puddles and evaporates.

The area including College Street and the south end of Lake Street collects stormwater runoff in catch basins and drains to the west and discharges via a 30 inch pipe directly into Lake Champlain at the foot of College Street.

The drainage area to the south including the foot of King and Maple Streets west of Battery Street sheet flows into Lake Champlain.

FUTURE IMPACTS

The proposed waterfront plan includes construction of residential, commercial, retail and recreational facility as well as roads, driveways and parking lots. The proposed construction will create additional impervious surface throughout the site, increasing peak rates of runoff. In addition, the size and configuration of the drainage areas will be altered due to the proposed construction.

MITIGATION

The proposed stormwater collection system for the waterfront was preliminarily analyzed using the rational method and due to the proposed construction it is recommended that a stormwater collection system with water quality features be constructed.

Proposed drainage basins and collection system(s) are presented on Plan 2 - Stormwater Collection System and Sanitary Sewer Plan. They are designed to sheet flow and collect stormwater in catch basins and discharge into Lake Champlain via several culverts. It is recommended that each of these systems have water quality features included in the design and construction.

The stormwater collection system(s) should be designed to maintain the existing runoff from the waterfront area and reduce sediment and pollutants from entering the lake. Catch basins with debris sumps and oil/water hoods would be used as well as oil/water separators on each of the culverts prior to any stormwater discharge into Lake Champlain.

To reduce the proposed peak rate of runoff to predevelopment conditions, three options are presented. They are:

- Storage pipes
- Detention ponds
- Subsurface recharge system

Storage Pipes

Proposed runoff can be reduced to predevelopment conditions by collecting the stormwater into a system that temporarily stores the water in subsurface pipes designed with a constrained outlet orifice. The purpose of this orifice is to allow a base rate of flow into the lake under any condition. As the storm event increases and the orifice can not allow more water through it, the pipe will begin to fill up. Storms larger than the 10 year event will then overflow through a pipe and a oil/water separator before discharging into the Lake.

This is an easy system to design and has been proven to work effectively.

Detention Ponds

These could be designed as part of individual developments but due to the topography and other site constraints is not practical.

Recharge System

A subsurface recharge system utilizing perforated pipes and recharge trenches that discharge runoff into the groundwater is another option. This option functions in two ways; it reduces the peak rate of runoff into the lake and recharges filtered stormwater into the groundwater. The

system works by collecting stormwater into a standard drainage system which allows smaller storm events and the first flush of larger storm events into the recharge system. This is accomplished using a weir or orifice structure in conjunction with an oil/water separator. The recharge system includes perforated pipes designed to percolate the stormwater into the groundwater via a crushed stone layer (recharge trench). Stormwater runoff from less frequent and larger storm events (i.e., storms with return frequencies of greater than two years) would enter the oil/water separators and bypass the recharge areas as soon as the sustems have reached their capacity. The stormwater overflow would then be allowed to discharge directly into Lake Champlain. During the spring thaw, Lake Champlain can rise dramatically above its summertime level. During this period, the recharge system would be surcharged and all runoff would drain directly into Lake Champlain. This option is recommended for the project stormwater collection system and will require further evaluation prior to final design.

All of these stormwater collection options for minimizing the post development rate of runoff would include water quality features prior to any point discharge into the Lake Champlain.

All new development (i.e., recreational center, proposed housing) should have collection systems designed to handle the 10 year storm and be connected into the larger system(s) mentioned above that would ultimately discharge into Lake Champlain.

WATER

EXISTING CONDITIONS

The city of Burlington is provided water by the Francis J. O'Brien Water Treatment Plant located along the lake shore at the north end of the Waterfront development. The water is pumped from the lake via two-24 inch pipes and one 30-inch pipe. The raw water is treated through a rapid sand filter process and chemicals are added prior to being transmitted to the City via a 20-inch main.

A 20-inch water main transmits the treated potable water to the city. A 16-inch main runs southerly in Lake Street with 10- and 12-inch mains along Battery Street. Recently, a 12-inch water main was constructed to the Community Boathouse. All existing water mains are presented on the Water Distribution/Roadway Improvement Plan. Individual water services to existing buildings within the waterfront area are not shown but are assumed to exist and to be of adequate size to serve existing demands. Current average daily water demand for the City of Burlington is approximately 5.0 million gallons per day (mgd). The existing Waterfront uses approximately 0.03 mgd under the average day condition.

The approximate existing water usage for the Waterfront Development is shown in Table 3.

PROJECT IMPACTS

Using standards developed by the Vermont Department of Environmental Health Guidelines for Wastewater Usage and adding 10 percent to account for water loss (i.e., irrigation), the estimated average day demands are outlined in Table 4. The proposed average daily demand on existing infrastructure for the waterfront project is estimated to be 0.11 mgd. The peak daily flow was determined using a peaking factor of 1.8 and is approximately 0.22 mgd.

The proposed waterfront development will generate an increase of approximately 2 percent of the existing average daily flow at the City of Burlington's Water Treatment Plant. Existing pressures and flows are adequate to serve the needs of the proposed development.

MITIGATION

No mitigation is necessary based on the projected water needs of the project.

TABLE 3

EXISTING WATER USAGE CALCULATIONS

Prepared by: VHB Inc.

BURLINGTON WATERFRONT INFRASTRUCTURE STUDY
Burlington, Vermont

NO.	USE	TYPE OF USE	SIZE (note 1)		GENERATION RATE (note 1)	WATER (gpd)	PEAKING FACTOR	PEAK DAY WATER USE (gpd)
	EXISTING							
3	WATER PLANT	public	27,000	sf	0.083	2,241	1.8	4,034
		office	17,864	sf	0.083	1,483	1.8	2,669
4	US COAST GUARD	public	5,000	sf	0.083	415	1.8	747
5	BOAT LAUNCH	public	-					
7	ATKINSON BUILDING	residential	15	units	180.0	2,700	1.8	4,860
10	HAIGH BUILDING	restaurant (inside)	75	seats	15	1,125	1.8	2,025
		restaurant (outside)	45	seats	15	675	1.8	1,215
		office	11,100	sf	0.083	921	1.8	1,658
11	McKENSIE BUILDING	office	13,000	sf	0.083	1,079	1.8	1,942
14	WATERFRONT PARK	recreational	11.2	acres		500	1.8	900
15	COMMUNITY BOATHOUSE	public	4,750	sf	0.083	394	1.8	710
		marina	32	slips	5	160	1.8	288
17	AUTO PARTS STORE	commercial	10,800	sf	0.165	1,782	1.8	3,208
18	GAS STATION	commercial	4	islands	300	1,200	1.8	2,160
20	ICE HOUSE	restaurant	225	seats	15	3,375	1.8	6,075
		florist	1,164	sf	0.083	97	1.8	174
21	SHANTY - ON - THE - SHORE	restaurant	87	seats	15	1,305	1.8	2,349
22	SAILWORKS BUILDING	office	13,575	sf	0.083	1,127	1.8	2,028
		retail	4,524	sf	0.083	375	1.8	676
23	BRICK BUILDING	office	21,210	sf	0.083	1,760	1.8	3,169
24	DOCKSIDE CAFE	restaurant	150	seats	15	2,250	1.8	4,050
	BUILDING	ofice	6,300	sf	0.083	523	1.8	941
25	VERMONT RAILWAY	office	4,800	sf	0.083	398	1.8	717
		warehouse	1,600	sf	0.055	88	1.8	158
		roundhouse	14,000	sf	-	300	1.8	540
26	WASTEWATER FACILITY	public	3,200	sf	0.083	266	1.8	478
27	PERKINS PIER	office	1,632	sf	0.055	90	1.8	162
		marina	80	slips	5	400	1.8	720
28	LAKE CHAMPLAIN	restaurant	40	seats	15	600	1.8	1,080
	TRANSPORTATION	warehouse	4,725	sf	0.055	260	1.8	468
					SUBTOTAL	27,889 gpd		50,200 gpd
						0.03 mgd		0.05 mgd

NOTES:

1 Sewage generation rates are based on rates supplied by the City of Burlington Department of Public Works. They are as follows:

Residential -	63 gpd per person and 2.6 people per home =	180.0	gpd/home
Commercial -	15 gpd per 100 sf =	0.165	gpd/sf
Retail/ Public -	15 gpd and 200 sf per person =	0.083	gpd/sf
Office -	15 gpd and 200 sf per person =	0.083	gpd/sf
Restaurant -	15 gpd per seat		
Marina -	5 gpd per slip		
Warehouse -	5 gpd per 100 sf =	0.055	gpd/sf

2 The numbers in the left hand column refer to the Existing and Proposed Condition plans

3 These Figures represent a 10% increase in the water generation rates due to irrigation

TABLE 4

PROPOSED WATER USAGE CALCULATIONS

Prepared by: VHB Inc.

BURLINGTON WATERFRONT INFRASTRUCTURE STUDY
Burlington, Vermont

NO.	USE	TYPE OF USE	SIZE (note 1)	GENERATION RATE (note 1)	WATER (gpd)	PEAKING FACTOR	PEAK DAY WATER USE (gpd)
	PROPOSED						
1	RECREATION CENTER	recreational	58,000 sf	0.165	9,570	1.8	17,226
2	MORAN POWER PLANT	museum gift shop theater restaurant	70,000 sf	0.165	11,550	1.8	20,790
6	VON TURKEVICH	residential	35 homes	180.0	5,733	1.8	14,333
8	MAIN STREET LANDING	residential	77 homes	180.0	13,860	1.8	24,948
	102 LAKE STREET	retail	27,000 sf	0.083	2,241	1.8	4,034
		office	22,100 sf	0.083	1,834	1.8	3,302
							0
9	BARRY MOSSMAN'S HOUSING	residential	19 homes	180.0	3,420	1.8	6,156
12	BARRY MOSSMAN'S PROJECT	office	36,000 sf	0.083	2,988	1.8	5,378
		retail	9,000 sf	0.083	747	1.8	1,345
13	PEASE GRAIN SITE	theater, museum	50,200 sf	0.165	8,283	1.8	14,909
16	NAVAL RESERVE SITE	research center	12,000 sf	0.165	1,980	1.8	3,564
		museum	23,000 sf	0.165	3,795	1.8	6,831
		retail	2,000 sf	0.083	166	1.8	299
		restaurant	100 seats	15	1,500	1.8	2,700
		marina	28 slips	5	140	1.8	252
19	UNION STATION	residential	20 homes	180.0	3,600	1.8	6,480
		retail	45,000 sf	0.083	3,735	1.8	6,723
		office	59,500 sf	0.083	4,939	1.8	8,889
29	TRANSPORTATION CENTER	parking	400 spaces	-	-		-
		retail	30,000 sf	0.083	2,490	1.8	4,482
		office	15,000 sf	0.083	1,245	1.8	2,241
		public	8,000 sf	0.083	664	1.8	1,195
				PROPOSED FLOWS	84,480 gpd		156,077 gpd
				EXISTING FLOWS	26,581 gpd		66,453 gpd
				TOTAL	111,061 gpd		222,530 gpd
					0.11 mgd		0.22 mgd

NOTES:

1 Sewage generation rates are based on rates supplied by the City of Burlington Department of Public Works. They are as follows:

Residential -	63 gpd per person and 2.6 people per home =	180.0 gpd/home
Commercial -	15 gpd per 100 sf =	0.165 gpd/sf
Retail/ Public -	15 gpd and 200 sf per person =	0.083 gpd/sf
Office -	15 gpd and 200 sf per person =	0.083 gpd/sf
Restaurant -	15 gpd per seat	
Marina -	5 gpd per slip	
Warehouse -	5 gpd per 100 sf =	0.055 gpd/sf

2 The numbers in the left hand column refer to the Existing and Proposed Condition plans

3 These Figures represent a 10% increase in the water generation rates due to irrigation

TRANSPORTATION

EXISTING CONDITIONS

Lake Street

Lake Street is a 22-foot wide roadway which runs parallel to Lake Champlain between King Street and north of the Moran Station. Parking is located to the south of College Street where 12 spaces exist. To the north of College Street 75 spaces exist. Land use along Lake Street consists of open spaces, residential apartment units and business/commercial.

College Street

College Street connects the downtown Central Business District to the Waterfront area. The roadway width is 32-34 feet and accommodate one travel lane per direction. Sidewalks exist on both sides of the roadway. Traffic volumes on College Street over the railroad crossing is 1,700 vehicles on a daily basis with 158 evening peak hour trips. Land use along College Street is primarily business/commercial.

PROJECT IMPACTS

Traffic volumes generated by the Waterfront redevelopment have been estimated in previous traffic studies[3] for the City. Based upon this study, a 50% buildout of the Waterfront is anticipated with a daily trip generation of approximately 10,000 vehicle trips. Peak hour trip generation estimates based upon the previous study are in the order of 650 morning vehicle trips and 1,000 evening vehicle trips.

The Burlington Waterfront infrastructure study[4] also estimated the trip distribution of the Waterfront traffic into and out of the area.

Ibid.

Ibid.

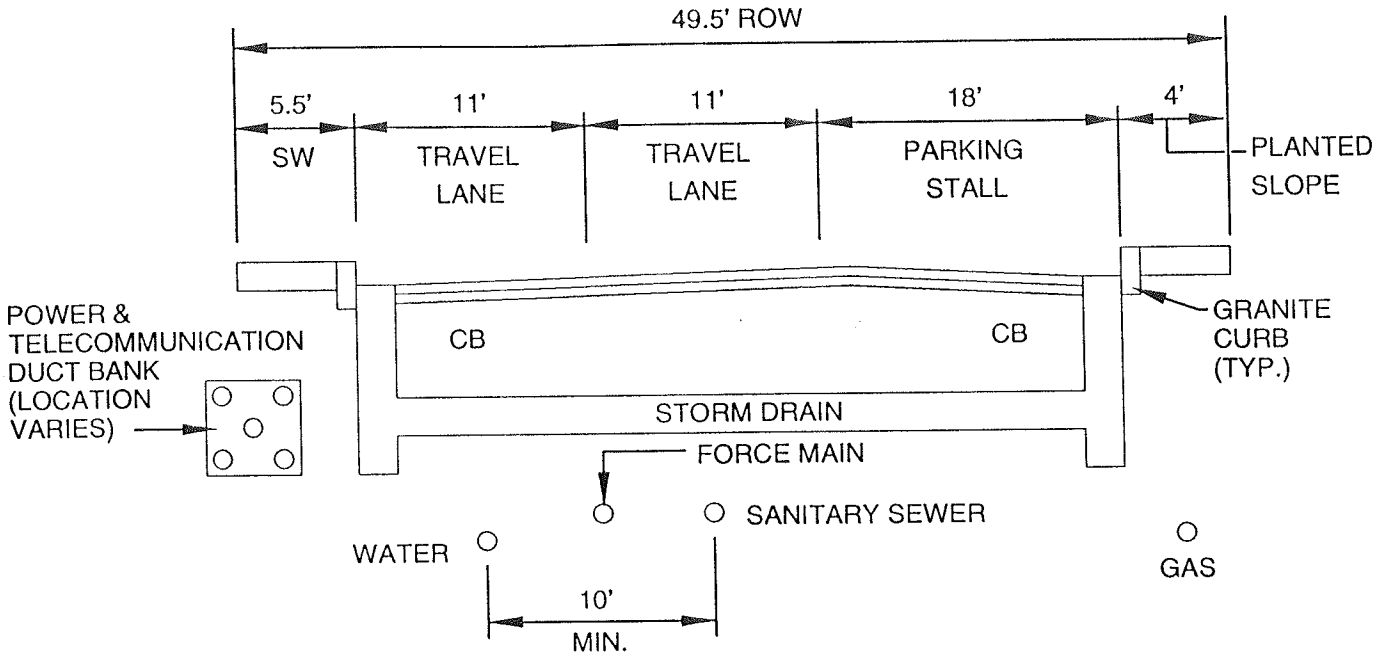
These corridors are as follows:

Northern Corridor (North Ave./ Northern Connector)	30%
Pearl/Riverside Corridor	30%
Main Street Corridor	15%
Southern Corridor (Route 7 via Pine St., St. Paul St., Winooski Ave.)	25%
	100%

This distribution was utilized for the assignment of the Waterfront traffic.

MITIGATION

Based upon the Burlington Waterfront infrastructure study, traffic levels on Lake Street north of College Street are less than 6,000 vehicles per day. College Street north of Lake Street is anticipated to accommodate less than 7,000 vehicles per day. In the vicinity of the railroad crossing, daily traffic volumes are anticipated to be in the order of 2,000 vehicles per day. The roadway cross-section shown in Figure 2 is anticipated to remain the same accommodating one travel lane per direction. The proposed design of Lake Street is discussed in the Lake Street Improvements section of this report in more detail.



LAKE STREET

COLLEGE STREET TO
DEPOT STREET

LEGEND:

SW	SIDEWALK
CB	CATCH BASIN

Not to Scale

Vanasse Hangen Brustlin, Inc.

Lake Street
Cross Section

Figure 2

50403e.dwg

LAKE STREET IMPROVEMENTS

The expanded infrastructure improvements for the waterfront area include upgrading Lake Street to two full lanes, parking on the west side of the street, sidewalks, and street trees. The intent is to have all the utilities underground and in the street right-of-way, allowing for the least amount of disturbance for necessary needed repairs.

EXISTING CONDITIONS

Presently, Lake Street has 75 parallel and ninety degree parking spaces on the west side of the street. The ninety degree parking only works well for small cars, due to limited space and uneven road widths. The travel lanes are very narrow and do not fully allow for two way traffic and parking. There is a grade difference of up to 5' between Lake Street down to the Central Vermont Railway right-of-way. On the west side of the street, there is a relatively small grade change to bordering properties.

Several businesses and the Waterfront Park account for the largest demand of the on street parking spaces. Some of the businesses and the park have off street parking however, there may be a fee associated with it.

PROPOSED OPTIONS

After reviewing the site conditions and future proposed development, three options were studied. Each option has parking on the west side of the street only. Based on input from city representatives, there is a desire to accommodate people who wish to view the lake from their parked car. The three options look at parallel parking, forty five degree parking and ninety degree parking. The goal was to increase the parking count from the present count, have a minimum of a five foot sidewalk with a five foot planting strip to include street trees, two eleven foot travel lanes, curbs on both sides of the road, and a four foot planted slope on the west side of street to meet existing grades.

<u>OPTION A: 90 DEGREE PARKING</u>
Total Proposed Parking: 135 Spaces

This layout has the greatest parking spaces however, a six foot landscape easement is needed on the east side of the street. The sidewalk connects with the Waterfront Park walk. The advantage of this plan is the easy access for entering and exiting parking bays.

The representatives from the Burlington Public Works Department prefer this plan overall because it has the greatest increase in public parking spaces and offers ease of access.

OPTION B: 45 DEGREE PARKING
Total Proposed Parking: 110 Spaces

The advantage of this layout is it fits into the existing right-of-way. The proposed sidewalk is 4'-6" wide with street trees in a five foot planting strip. The disadvantage is it is difficult to enter and exit parking bays without driving to the end of the street to turn around.

OPTION C: PARALLEL PARKING
Total Proposed Parking: 64 Spaces

This scheme fits into the city's ideal plan for future street improvements however, there is less proposed parking than exists today. There are sidewalks on both sides of the street: a five foot walk on the east side with a five foot planting strip, and a four foot walk on the west side. The additional sidewalk on the west side of the street is an added pedestrian connection to access all the future developments.

UTILITIES

EXISTING CONDITIONS

Electric

Burlington Electric Department (BED) electric service lines and Green Mountain Power (GMP) transmission lines run above ground through the site. The primary feed to the waterfront is overhead cables, running from north to south in Lake Street and east of Lake Street. The electrical service along Battery Street, Park Street and Sherman Street are all underground. These are presented in the Utilities Plan - Plan 4.

Telephone

The telephone service to the city of Burlington is provided by New England Telephone (NET). Underground telephone lines run along the east side of Battery Street and Sherman Street and service customers along the route. Telephone service to the existing buildings in the waterfront area is provided on overhead poles.

Gas

Vermont Gas Company provides gas service to the Greater Burlington area. There presently are 6 inch low pressure gas mains in Battery Street, Park Street, and Sherman Street and a 4 inch high pressure main exists in Lake Street that terminates at the Burlington Electric Department gas turbine station adjacent to the abandoned Moran Station. This main also serves the Coast Guard building. A 4 inch gas main runs down College Street to the Community Boathouse. Various smaller gas services meet the needs of the remainder of the Waterfront area.

PROJECT IMPACTS

Electric

The planned waterfront developments' electrical power requirements will be a significant increase to current power usage. Based on conversation with BED, the existing service lines are adequate to serve the proposed development.

The area is currently served by BED overhead lines. Aerial transmission lines by Green Mountain Power. Both these aerial power lines have a significant aesthetic impact on the waterfront.

Telephone

The area will be adequately served by NET with additional telephone services brought in on an as needed basis.

Gas

A significant increase in gas usage is expected for the Waterfront project. New development along the Waterfront will require a new high pressure gas main. The greatest need for gas will be during the winter months, assuming that the development will be heated with natural gas.

MITIGATION

Electric

The proposed power lines will be relocated underground and include a electric and communications duct bank large enough to handle all the existing overhead transmission and service lines. The utility power line relocations from overhead to underground along Lake Street will be completed by BED & GMP.

Telephone

The proposed telephone system is recommended to be undergrounded in the same duct bank as the electrical and cable TV.

Gas

New development along the Waterfront will require a new high pressure gas main. Vermont Gas Company will install the new main once the development is under construction.

PHASING OF CONSTRUCTION

INTRODUCTION

The proposed first phase of the waterfront development includes the following:

- Von Turkevich's Housing
- Moran Plant
- Main Street Landing - 102 Lake Street
- Naval Reserve Site
- Recreation Center
- Mossman Site (corner of Battery & Main streets)
- Pease Grain Site
- Waterfront Site

All other proposed development is either currently permitted, under review or to be constructed in the future.

Depending on construction timing, utilities within Lake and College Streets should be installed simultaneously with road work. This will eliminate future costs for roadway reconstruction and utility interruption.

UTILITIES

Electric and telephone services to the Phase I and Phase II Waterfront development will be on an as-needed basis. Many of the existing structures to be renovated in Phases I and II are assumed to currently have electric and/or gas service. These services will remain and possibly be upgraded. Gas service to the Waterfront area will be provided by Vermont Gas Company. Discussions regarding additional service should begin between Vermont Gas and the city of Burlington during the financing of the project. The burial of the aerial power transmission lines would need to be coordinated with the power companies (BED, GMP) and would depend on project needs.

SANITARY SEWER

In order for the proposed sewer collection system to operate properly the following construction sequence could be utilized.

- Individual development wastewater systems would be designed based on location, elevation and configuration and in no case shall septic systems be allowed for proposed new construction.

- Upgrade the sewage lift station at the water treatment plant to handle the additional flows. This lift station upgrade could be designed to

also handle the additional flows associated with Phase II. Also increase size of force main from 4 inch to 6 inch.

- Pump station at foot of College Street. Upgrade station to handle all Phase I & II development.

- Force main to manhole in Battery/College site intersection. Increase size from 6 inch to 8 inch when Phase II wastewater flows warrant.

WATER DISTRIBUTION SYSTEM

The proposed water system improvements will not be required until Phase II construction. All individual developments will be improved based on development sequencing. Individual developments will include separate water connection(s) to the existing mains in the waterfront area. Depending on roadway widening (Lake Street) proposed water services should be installed at the same time.

STORMWATER COLLECTION SYSTEM

Depending on each individual development or group of adjacent developments, each outlet into the lake could be constructed at any time. Based on the previously mentioned phasing the sequence of construction could be as follows:

- North of Depot Street, Lake Street intersection, outlet to be at Recreation Center shoreline.

- The proposed Main Street Landing site and other Phase I developments could be connected to new storm drain system in Lake Street. This could outlet into the lake south east of the U.S. Coast Guard Station.

- Existing problem areas (i.e., waterfront park) could be reviewed and improvements designed to mitigate the problems.

- Other Phase I and II developments would continue to drain as they do now.

PRELIMINARY COST ESTIMATE

Preliminary cost estimates have been prepared for the roadway work and utility infrastructure improvements as illustrated on Plan 2-4.

These costs are based on 1993 construction cost data. The costs are not based upon detailed survey or construction documents and are therefore preliminary in nature and subject to revision as the scope becomes more detailed.

I.	Roadway Work (Paving, sidewalks, lighting, curbs)	$ . . 760,000
II.	Sanitary Sewer System	$ . . 475,000
III.	Stormwater Collection System	$ . . 500,000
IV.	Water Distribution System	$ . . . 50,000
V.	Utilities	
	Gas	$ NA
	Electric (BED)	$ 1,400,000
	Electric (GMP)	$ 910,000
	Miscellaneous	$ 50,000
	Telephone	$ NA*
	CATV	$ . . . NA
	TOTAL	$ 4,145,000**

* Conversation with Gary Sondberg of N.E. Telephone Company indicate some costs would be incurred by Burlington. The extent of these costs are not known at this time.

** Includes 20% for construction contingencies and 20% for engineering, design and construction administration.

NOTES:

1. Engineering costs for both design and construction supervision are included in the above figures.

2. Right-of-Way acquisition and legal costs are not included in the above estimates.

3. Street lighting is included in the roadway work but power supply costs are included in the utilities section.

4. Utility costs do not include service connections.

5. Infrastructure costs do not include site specific utilities.

6. Gas Service Costs - to be negotiated with Vermont Gas Company.

7. Communication costs (Tel. & CTV) must be estimated by the respective companies.

A review of the proposed development for Phase I and the location of these development parcels indicates development throughout the Waterfront Park area. It is recommended to remove overhead wires and encase these transmission and communication lines in duct work under Lake Street. All of this construction should be scheduled during the reconstruction of Lake Street and College Street. Therefore, there are very few infrastructure costs that could be delayed for a Phase II construction.

The Phase I program could be divided into construction areas which could spread bonding over a period of 3 to 5 years. More detailed design is required to establish these construction zones.

Costs associated with Phase II include:

• Upgrade of College Street Pump Station	$ 140,000
• Upgrade Water Treatment Plant Lift Station	105,000
Total Phase II	$ 245,000

If a Phase II construction plan is incorporated, costs for Phase I could be reduced to $3,900,000.

FUNDING

A number of infrastructure improvements have been identified in this study. This study shows preliminary cost estimates for infrastructure improvements including roadway work, sanitary sewer system, stormwater connection system, water distribution system, and utilities including underground placement of electric and communication's utilities to be in excess of $4,000,000. Since this work is essential to the future development of public and private projects on the waterfront, an appropriate funding mechanism will need to be determined to support the phased installation of infrastructure.

The report prepared by Humstone Squires Associates, dated March 13, 1989, discusses issues of financing waterfront infrastructure improvements. The report concludes that the preferable option for financing these improvements includes impact fees and the development exactions which represent on and off site improvements to specific development sites and special charges for sanitary sewer, recreation and parking. In addition to these options which are recommended by the Humstone Squires Associates report, the City of Burlington could consider the development of a special assessment district for the waterfront. With the cooperation of the abutters, a citywide special assessment district vote may be avoided. The special assessment district has the advantage of creating a discreet entity to address the unique waterfront issues. Among these issues are the need to provide a higher level of aesthetic benefit and infrastructure management than is generally found throughout the city. With this differing level of quality, including for example, underground utilities, impact fees alone cannot appropriately address the issues.

With respect to impact fees, an area for impact fee assessment which has emerged in recent years is that of storm water utilities. Given the level of treatment now required for stormwater run off, planning literature has been moving in the direction of recommending the establishment of stormwater utilities for municipalities. These utilities can develop appropriate impact fees which may be assessed against projects. It would appear that the stormwater collection and management issues relating to the waterfront fully justify the development of a stormwater utility impact fee for the City of Burlington, and that such a development would provide for collection and specialized treatment of stormwater runoff without further increasing sewer charges.

Transportation impact fees is another method to equitably share the funding of the proposed College Street and Lake Street improvements among future roadway users (developments) and the city/state resources. The system can be based upon the capacity of the new roadway with the

city/state share based upon the existing traffic use of the capacity and the remaining cost is allocated to future users of the corridor. This type of transportation impact fee has been successfully implemented in several New England Communities.

An additional area of investigation should be that of tax increment financing (TIF). Tax increment financing is enabled in Vermont under Title 24 VSA, Section 1891-1900. It appears that both Burlington and Rutland are Vermont communities which have some experience in attempting to use tax increment financing, but have found difficulty with the enabling statute and with federal tax code requirements. While the full extent of these issue surrounding previous attempts to develop TIF districts is not clear at this time, the potential benefits of tax increment financing to provide for the bonding necessary to meet the infrastructure needs of the waterfront suggest a second look at this funding mechanism. It is recommended that the Department of Planning and Zoning and the Department of Public Works coordinate with the City Treasurer and the City Attorney in a new effort to isolate and overcome issues relating to tax increment financing, such that this mechanism may be fully explored for its use on the waterfront.

SUMMARY OF RECOMMENDATIONS

To finance waterfront infrastructure improvements, the following mechanisms are recommended:

1. Special assessment district and impact fees, as recommended in the 1989 Humstone Squires Associates report.

2. Addition of stormwater utility services to the present Burlington impact fee ordinance.

3. Exploration of tax increment financing as the primary funding vehicle for Burlington waterfront improvements.

4. Transportation Impact Assessment.

CONSTRUCTION COST ESTIMATE

DATE PREPARED: 9/3/93

SHEET 1 OF 1

PROJECT :
Burlington Waterfront Study

LOCATION :
Burlington, Vermont

Vanasse Hangen Brustlin, Inc.

BASIS FOR ESTIMATE
- [x] STUDY
- [ ] PRELIMINARY DESIGN
- [ ] FINAL DESIGN
- OTHER (SPECIFY) _____

DEPARTMENT	ESTIMATOR :	CHECKED BY
Land Development	DMA	FLD

SUBJECT :

COST ESTIMATE : Water Distribution and Utilities Only

ITEM NO	ITEM DESCRIPTION	UNIT	UNIT PRICE	QUANTITY	TOTAL COST
1	WATER DISTRIBUTION SYSTEM ALLOWANCE	LS	$50,000	1	$50,000
2	GAS - to be negotiated with Vermont Gas Co.	LS	-	-	N/A
	ELECTRICAL :				
3	Burlington Electric Department power lines	LS	$1,000,000	1	$1,000,000
4	Green Mountain Power transmission lines	LS	$650,000	1	$650,000
5	Miscellaneous : power pole removals	LS	$35,000	1	$35,000
6	TELEPHONE (by others)	-	-	-	-
7	CATV (by others)	-	-	-	-
8	WELL POINTING	LS	$100,000	1	$100,000
				SUB-TOTAL	$1,835,000
	CONSTRUCTION CONTINGENCIES (20%)				$367,000
	ENGINEERING (20%)				$367,000
				TOTAL	$2,569,000
				SAY	$2,600,000

CONSTRUCTION COST ESTIMATE

DATE PREPARED: 9/3/93

SHEET 1 OF 1

PROJECT :
Burlington Waterfront Study

LOCATION :
Burlington, Vermont

Vanasse Hangen Brustlin, Inc.

BASIS FOR ESTIMATE
- [x] STUDY
- [ ] PRELIMINARY DESIGN
- [ ] FINAL DESIGN
- OTHER (SPECIFY) _____

DEPARTMENT
Land Development

CHECKED BY
FLD

SUBJECT :

COST ESTIMATE :Stormwater Collection System Only

ITEM NO	ITEM DESCRIPTION	UNIT	UNIT PRICE	QUANTITY	TOTAL COST
1	4' DIA. PRECAST CATCH BASINS (incl. frames & grates)	EA	$2,500	19	$47,500
2	4' DIA. PRECAST DRAIN MANHOLES (incl. frames & covers)	EA	$2,000	12	$24,000
3	12" REINFORCED CONCRETE PIPE (Class III)	LF	$20	750	$15,000
4	18" REINFORCED CONCRETE PIPE (Class III)	LF	$25	375	$9,375
5	24" REINFORCED CONCRETE PIPE (Class III)	LF	$40	700	$28,000
6	30" REINFORCED CONCRETE PIPE (Class III)	LF	$62	300	$18,600
7	36" REINFORCED CONCRETE PIPE (Class III)	LF	$80	325	$26,000
8	OIL/WATER SEPARATOR	EA	$10,000	3	$30,000
9	FLARED END SECTION (Incl. rip rap and shore protection)	EA	$2,000	3	$6,000
10	RECHARGE SYSTEM (Incl. perf. pipe, gravel blanket, & manholes)	LS	$100,000	1	$100,000
11	WELL POINTING	LS	$50,000	1	$50,000
			-	-	-
				SUB-TOTAL	$354,475
	CONSTRUCTION CONTINGENCIES (20%)				$70,895
	ENGINEERING (20%)				$70,895
				TOTAL	$496,265
				SAY	$500,000

CONSTRUCTION COST ESTIMATE

DATE PREPARED: 9/3/93

SHEET 1 OF 1

PROJECT :
Burlington Waterfront Study

LOCATION :
Burlington, Vermont

Vanasse Hangen Brustlin, Inc.

BASIS FOR ESTIMATE
- [x] STUDY
- [ ] PRELIMINARY DESIGN
- [ ] FINAL DESIGN
- OTHER (SPECIFY) _____

DEPARTMENT	ESTIMATOR :	CHECKED BY
Land Development	DMA	FLD

SUBJECT :

COST ESTIMATE : Sanitary Sewer Only

ITEM NO	ITEM DESCRIPTION	UNIT	UNIT PRICE	QUANTITY	TOTAL COST
1	8" PVC GRAVITY SANITARY SEWER MAIN	LF	$25	2415	$60,375
2	4" DIAMETER PRECAST SEWER MANHOLES	EA	$2,000	10	$20,000
3	COLLEGE STREET PUMP STATION UPGRADE	LS	$100,000	1	$100,000
	(Incl. allowance for emergency storage or power generator)				
4	REPLACE EXISTING 4" FORCE MAIN W/ 6" D.I.P. FORCE MAIN	LF	$20	1250	$25,000
5	UPGRADE WATER TREATMENT PLANT LIFT STATION	LS	$75,000	1	$75,000
6	WELL POINTING	LS	$50,000	1	$50,000
				SUB-TOTAL	$330,375
	CONSTRUCTION CONTINGENCIES (20%)				$66,075
	ENGINEERING (20%)				$66,075
				TOTAL	$462,525
				SAY	$475,000
	PHASE I IMPROVEMENTS				$275,000
	PHASE II IMPROVEMENTS				$200,000

VHB

Computations

Project Burlington Water Front Project # 50403.15
Location Burl., VT. Sheet ____ of ____
Calculated by GLB Date 8/25/93
Checked by ____ Date ____
Title Cost Est. - study

LAKE ST / COLLEGE ST

PAVEMENT UNIT COST :

• BIT. CONC :	4"	× .056 T/SY-IN ×	34.00/T	=	#	7.61/SY
• GRAVEL :	18"	× 1/36 ×	14.00/CY	=		7.00/SY
• SAND :	15"	× 1/36 ×	10.00/CY	=		5.00/SY
• EXCAVATION :	40"	× 1/36 ×	6.00/CY	=		6.67/SY
						26.28/SY

SAY # 26.00/SY

APPENDIX B
CONSTRUCTION COST ESTIMATE: ROADWAY ITEMS ONLY

CONSTRUCTION COST ESTIMATE

DATE PREPARED: 8/25/93

SHEET 1 OF 1

PROJECT :
Burlington Waterfront Study

LOCATION :
Burlington, Vermont

Vanasse Hangen Brustlin, Inc.

BASIS FOR ESTIMATE
- [X] STUDY
- [ ] PRELIMINARY DESIGN
- [ ] FINAL DESIGN
- OTHER (SPECIFY) _____

DEPARTMENT: Highway

ESTIMATOR : GLB

CHECKED BY: FLD

SUBJECT :

COST ESTIMATE : Roadway Items Only

ITEM NO	ITEM DESCRIPTION	UNIT	UNIT PRICE	QUANTITY	TOTAL COST
1	FULL DEPTH PAVEMENT				
2	Lake Street :	SY	$26.00	10200	$265,200.00
3	College Street :	SY	$26.00	1600	$41,600.00
4	VERTICAL GRANITE CURB	LF	$22.00	3200	$70,400.00
5	CURBING REMOVED AND RESET	LF	$8.00	700	$5,600.00
6	4 " LOAM & SEED	SY	$2.50	2600	$6,500.00
7	ROADWAY LIGHTING	EA	$2,500.00	27	$67,500.00
8	SIGNING & STRIPING	LS	$2,000.00	1	$2,000.00
9	EROSION CONTROL MEASURES	LS	$2,000.00	1	$2,000.00
10	MISC. IMPROVEMENTS (10%)	LS	$46,080.00	1	$46,080.00
				SUB-TOTAL	$506,880.00
	CONSTRUCTION CONTINGENCIES (20%)				$101,376.00
	ENGINEERING (20%)				$101,376.00
				TOTAL	$755,712.00
				SAY	$760,000.00

APPENDIX C
BURLINGTON WATERFRONT DEVELOPMENT AND PARKING REQUIREMENTS: TABLE AND PLAN

BURLINGTON WATERFRONT
DEVELOPMENT AND PARKING REQUIREMENTS TABLE

5 August 1993
Revised 13 September 1993

SITE	EXISTING OR PROPOSED	PUBLIC, PRIVATE, OR PRIVATE NON-PROFIT	SQUARE FOOTAGE	# OF PARKING SPACES PROVIDED OR PROPOSED	# OF PARKING SPACES REQUIRED[1]
1. Recreation Center	Proposed	Public	58,000 s.f.	110	83 (Museum Rate)
2. Moran Plant	Proposed	Private Non-Profit	Public Science Museum, Small Gift Shop, I-Max Theater, Small Restaurant, Public Space-70,000 s.f.		100 (Museum Rate)
3. Water Plant	Existing	Public	Treatment Plant - 27,000 s.f., Building - 17,900 s.f.		36 (Public Util.)
4. U.S. Coast Guard	Existing	Public	Building - 5,000 s.f. 3 Docks		17 (Police, Fire)
5. Public Boat Launch	Existing	Public ½ City, ½ Coast Guard	No structure	26 spaces with trailers	- 0 -
6. Von Turkevich Housing	Proposed	Private	35 Residential Units		55 (Multi-unit rental)
7. Harry Atkinson's Building	Existing	Private	15 Residential Units 1 & 2 Bedrooms		25 (Multi-unit Rental)
8. Main Street Landing - 102 Lake Street	Proposed	Private	Housing - 122,400 s.f. (77 Units) Retail - 27,000 s.f. Office - 22,100 s.f.	440	57 (Res) 180 (Gen. Retail) 74 (Office)
9. Housing	Proposed	Private	19 Residential Units 1 & 2 Bedrooms	38	31 (Multi-unit)
10. Haigh Building	Existing	Private	Restaurant - 3,000 s.f. (75 tables inside, 45 outside) Office - 1,1100 s.f.	85	30 (Restaurant) 37 (Office)

SITE	EXISTING OR PROPOSED	PUBLIC, PRIVATE, OR PRIVATE NON-PROFIT	SQUARE FOOTAGE	# OF PARKING SPACES PROVIDED OR PROPOSED	# OF PARKING SPACES REQUIRED[1]
11. McKensie Building	Existing	Private	Office - 15,207 s.f.	65	51
12. Barry Mossman's Proj. College - Lake	Proposed	Private	Office - 36,000 s.f. Retail - 9,000 s.f.	65	120 (Office) 60 (Retail)
13. Pease Grain Site	Proposed	Private Non-Profit	Theater, Museum - 50,200 s.f.	60	72 (Museum)
14. Waterfront Park	Existing	Public	11.2 acres - 60'x 205' tent for large events	80	62 (Open air market)
15. Community Boathouse	Existing	Public	4,750 s.f., existing 32 slips	- 0 -	48
16. Naval Reserve Site	Proposed	Private Non-Profit	Lake Research Center, Museum, Retail, Restaurant - 39,000 s.f., existing 28 boat slips	- 0 -	130 (research facility), 42 (boat slips)
17. Sanel Auto Parts	Existing	Private	Commercial - 10,800 s.f.	15	22 (Wholesale Dist.)
18. Spillane's Auto Service Center	Existing	Private	Gas Station - 1,830 s.f. 6 service bays, 1 pump island	10	24 (Gas Station)
19. Union Station Site	Proposed	Private	Housing - 27,400 s.f. (20 units) Retail - 45,000 s.f. Office - 59,500 s.f.	Proposed: 305 (private) 100 (public) Existing: 25	31 (Housing) 199 (Office) 300 (Gen. Retail)
20. The Ice House Building	Existing	Private	Restaurant - 3,744 s.f. 125 seats Florist - 1,164 s.f.	34	32 (Restaurant) 8 (Gen. Retail)
21. Shanty-On-The Shore Building	Existing	Private	Restaurant - 2,256 s.f. 87 seats	33	22 (Restaurant)
22. Sailworks Building	Existing	Private	Retail - 1,500 s.f. Office - 3,000 s.f.		10 (Retail) 10 (Office)
23. Brick Building	Existing	Private	Office - 7,070 s.f.		24 (Office)
24. Dockside Cafe Building	Existing	Private	Restaurant (150 seats) Office - 2,100 s.f.		7-office 38-restaurant

SITE	EXISTING OR PROPOSED	PUBLIC, PRIVATE, OR PRIVATE NON-PROFIT	SQUARE FOOTAGE	# OF PARKING SPACES PROVIDED OR PROPOSED	# OF PARKING SPACES REQUIRED[1]
25. Vermont Railroad Property	Existing	Private	Roundhouse - 14,000 s.f. Office Bldg - 4,800 s.f. Storage Bldg. - 1,600 s.f.	16	16-office 2-storage
26. Waste Water Facility	Existing	Public	Office - 3,200 s.f.	11	7 (Utility)
27. Perkins Pier	Existing	Public	Small Bldg - 1,632 s.f. Existing 80 boat slips and 20 moorings	75 spaces w/trailer, 65 spaces w/o	150 (Wharf)
28. Lake Champlain Transportation, Inc.	Existing	Private	Restaurant - 45 seats Warehouse - 4,725 s.f. Proposed Restaurant - 9,200 s.f. (306 seats) Office - 2,000 s.f.	45	12-restaurant 4-warehouse 77-prop. rest. 7-office
29. Burlington Regional Transportation Center	Proposed	Public/Private	Retail - 30,000 s.f. Office - 15,000 s.f. Public Space - 8,000 s.f.	400 spaces	
TOTAL PARKING SPACES				2,078	2,312

EXISTING ON-STREET PARKING

- College Street - 16 spaces
- Lake Street south to Main Street - 12 spaces
- Battery Street from Maple to Main Street - 38 spaces
- Union Station Parking - 25 spaces
- Lake Street south of College Street - 75 spaces

1. Number of spaces as required by current zoning without provision for shared uses.

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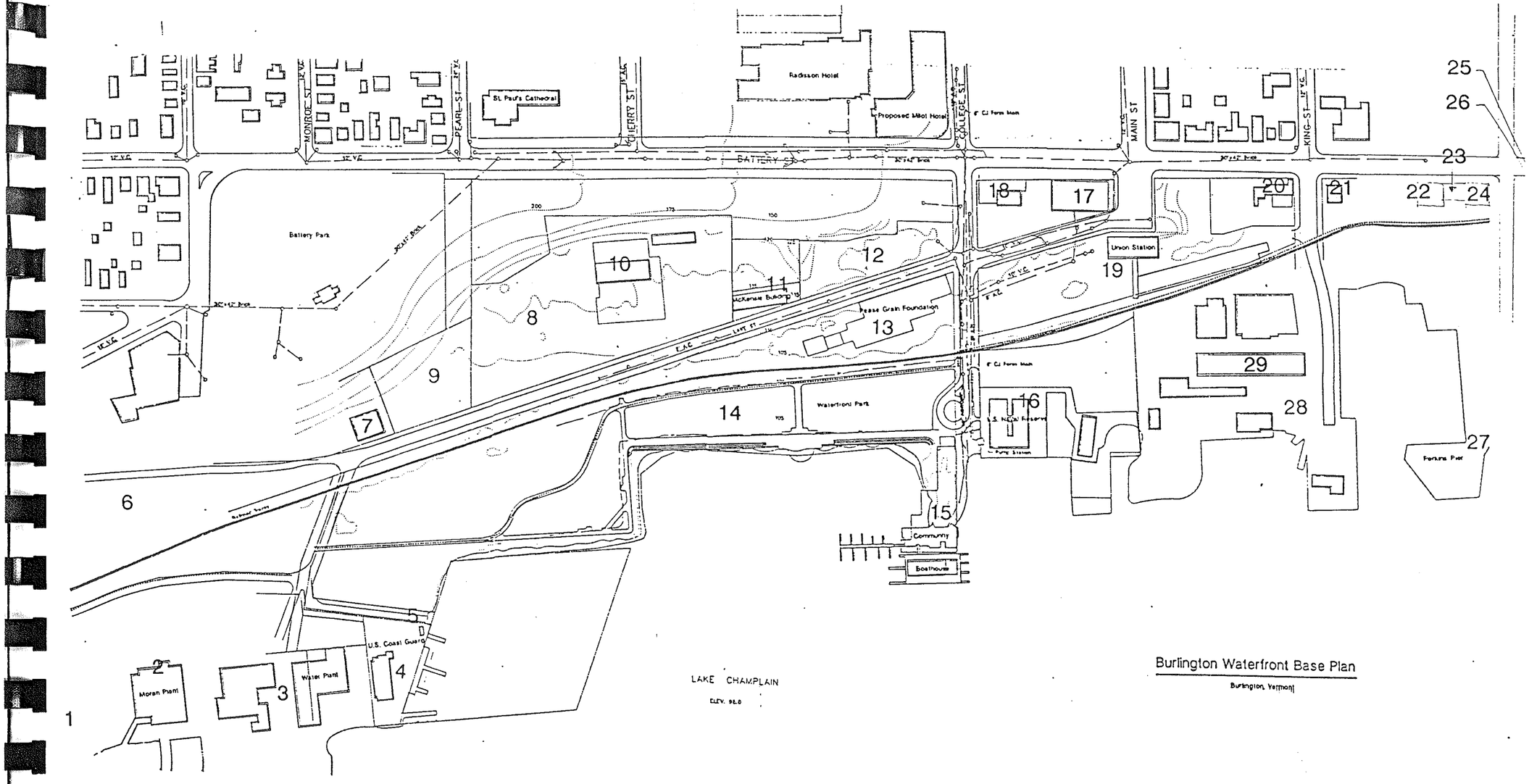
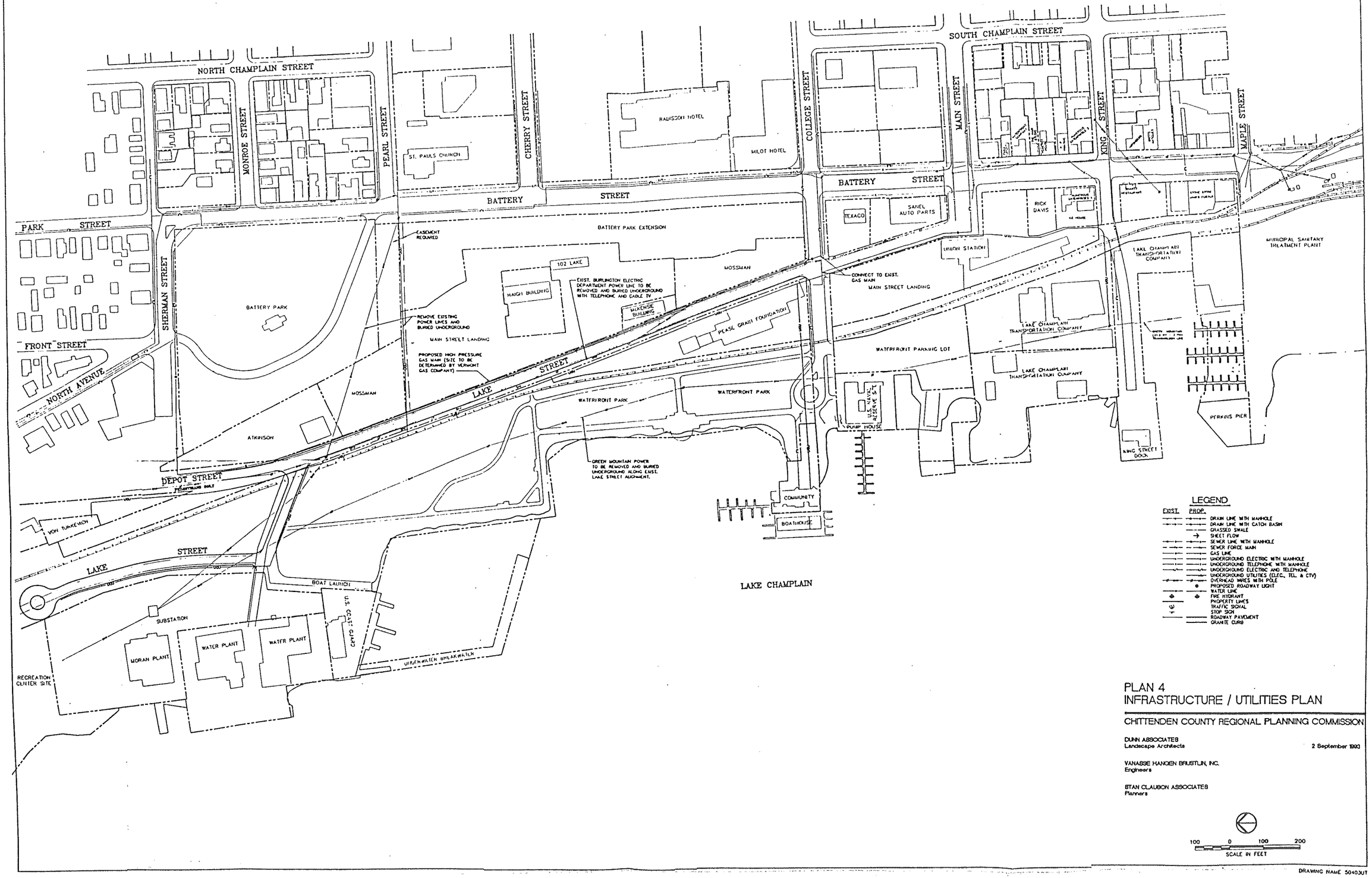
Susan G. Robinson, Editor. *Financing Growth: Who Benefits, Who Pays and How Much*. Government Finance Research Center of the Government Finance Officers Association, 1990.



Burlington Waterfront Base Plan

Burlington, Vermont



LEGEND

EXIST.	PROP.	
		DRAIN LINE WITH MANHOLE
		DRAIN LINE WITH CATCH BASIN
		GRASSED SWALE
		SHEET FLOW
		SEWER LINE WITH MANHOLE
		SEWER FORCE MAIN
		GAS LINE
		UNDERGROUND ELECTRIC WITH MANHOLE
		UNDERGROUND TELEPHONE WITH MANHOLE
		UNDERGROUND ELECTRIC AND TELEPHONE
		UNDERGROUND UTILITIES (ELEC., TEL. & CTV)
		OVERHEAD WIRES WITH POLE
		PROPOSED ROADWAY LIGHT
		WATER LINE
		FIRE HYDRANT
		PROPERTY LINES
		TRAFFIC SIGNAL
		STOP SIGN
		ROADWAY PAVEMENT
		GRANITE CURB

PLAN 4
INFRASTRUCTURE / UTILITIES PLAN

CHITTENDEN COUNTY REGIONAL PLANNING COMMISSION

DUNN ASSOCIATES
Landscape Architects

VANASSE HANGEN BRUSTLIN, INC.
Engineers

STAN CLAUSON ASSOCIATES
Planners

2 September 1993

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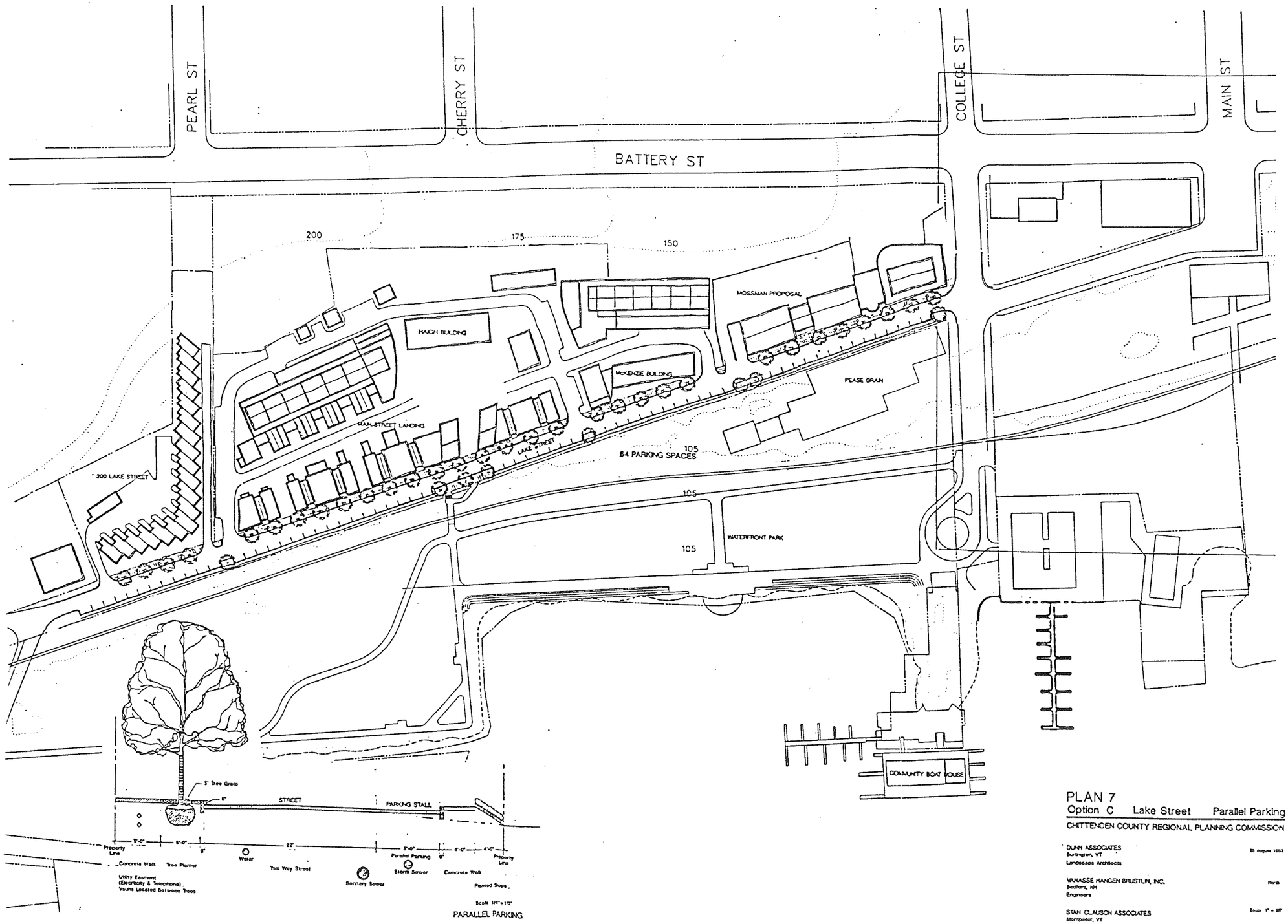
SCALE IN FEET

DRAWING NAME 5040JUT

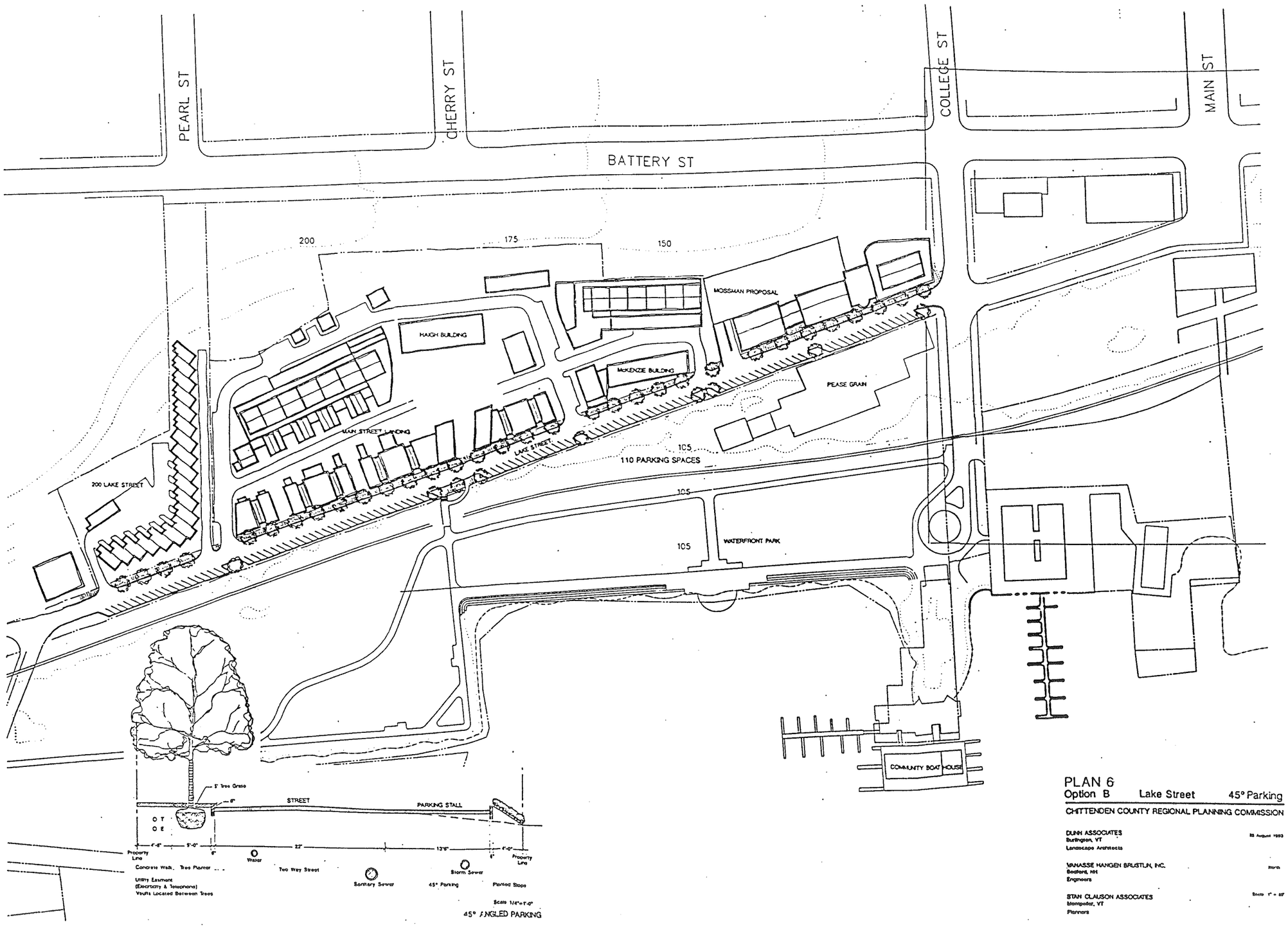


PLAN 7
Option C Lake Street Parallel Parking
CHITTENDEN COUNTY REGIONAL PLANNING COMMISSION

DUNN ASSOCIATES
Burlington, VT
Landscape Architects

VANASSE HANGEN BRUSTLIN, INC.
Bedford, NH
Engineers

STAN CLAUSON ASSOCIATES
Montpelier, VT
Planners



PLAN 6
Option B Lake Street 45° Parking

CHITTENDEN COUNTY REGIONAL PLANNING COMMISSION

DUNN ASSOCIATES
Burlington, VT
Landscape Architects

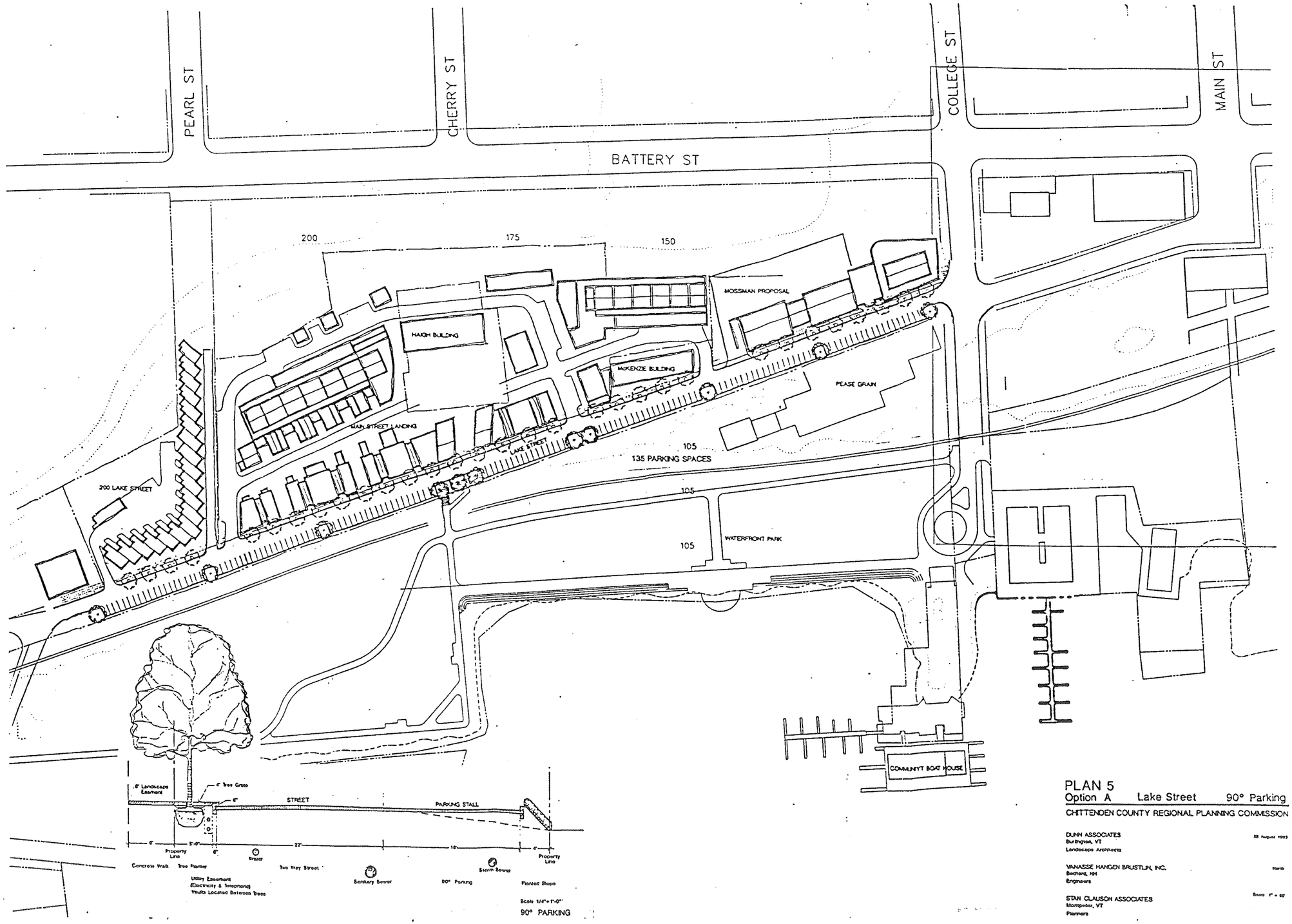
28 August 1993

VANASSE HANGEN BRUSTLIN, INC.
Bedford, NH
Engineers

March

STAN CLAUSON ASSOCIATES
Montpelier, VT
Planners

Scale 1" = 60'



PLAN 5
Option A Lake Street 90° Parking

CHITTENDEN COUNTY REGIONAL PLANNING COMMISSION

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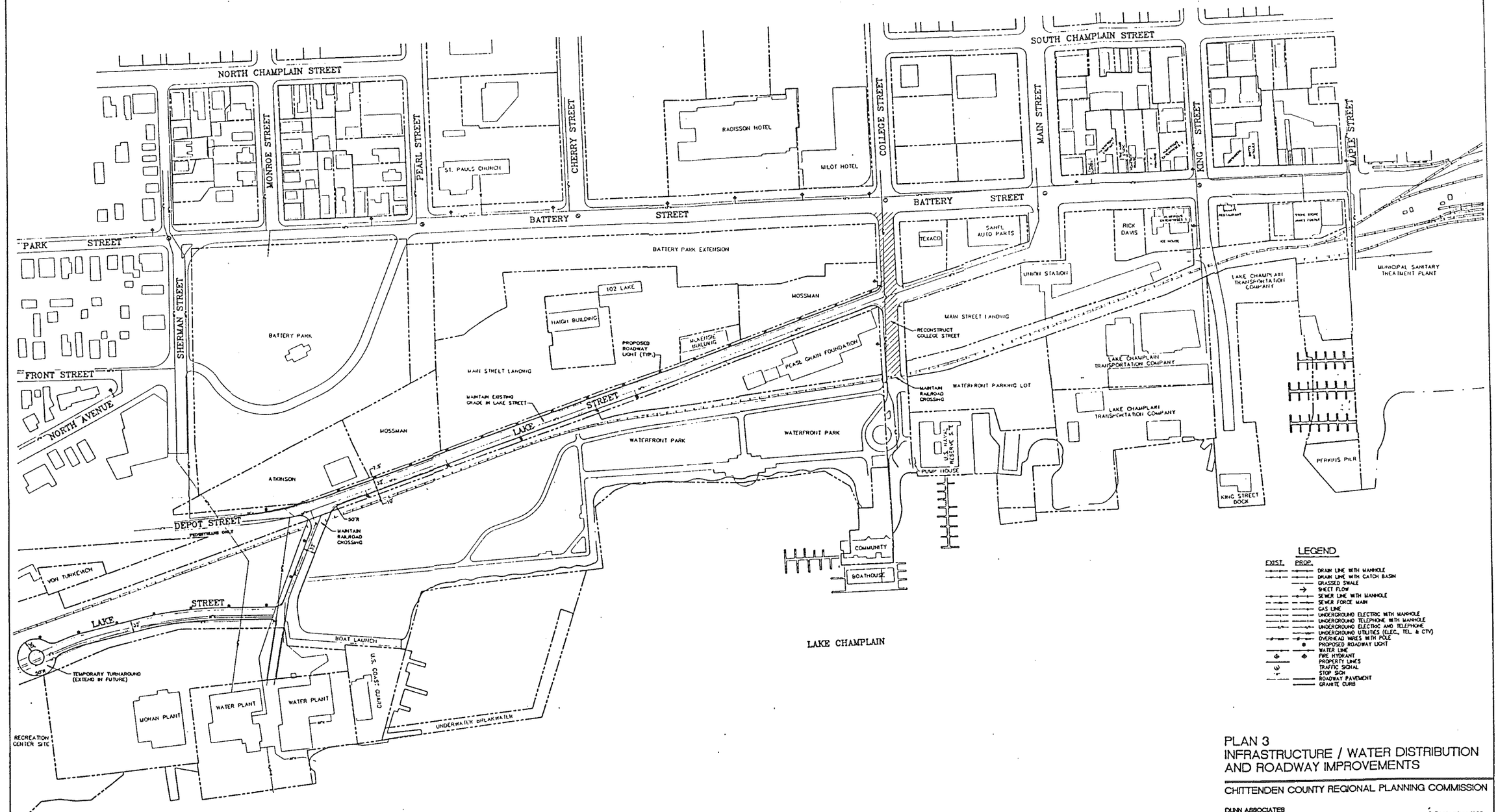
VANASSE HANGEN BRUSTLIN, INC.
Bedford, NH
Engineers

STAN CLAUSON ASSOCIATES
Montpelier, VT
Planners

28 August 1992

North

Scale 1" = 80'



LEGEND

EXST.	PROP.	
		DRAIN LINE WITH MANHOLE
		DRAIN LINE WITH CATCH BASIN
		GRASSED SWALE
		SHEET FLOW
		SEWER LINE WITH MANHOLE
		SEWER FORCE MAIN
		GAS LINE
		UNDERGROUND ELECTRIC WITH MANHOLE
		UNDERGROUND TELEPHONE WITH MANHOLE
		UNDERGROUND ELECTRIC AND TELEPHONE
		UNDERGROUND UTILITIES (ELEC., TEL. & CTV)
		OVERHEAD WIRES WITH POLE
		PROPOSED ROADWAY LIGHT
		WATER LINE
		FIRE HYDRANT
		PROPERTY LINES
		TRAFFIC SIGNAL
		STOP SIGN
		ROADWAY PAVEMENT
		GRANITE CURB

PLAN 3
INFRASTRUCTURE / WATER DISTRIBUTION AND ROADWAY IMPROVEMENTS

CHITTENDEN COUNTY REGIONAL PLANNING COMMISSION

DUNN ASSOCIATES
Landscape Architects

VANASSE HANGEN BRUSTLIN, INC.
Engineers

STAN CLAUSON ASSOCIATES
Planners

2 September 1993

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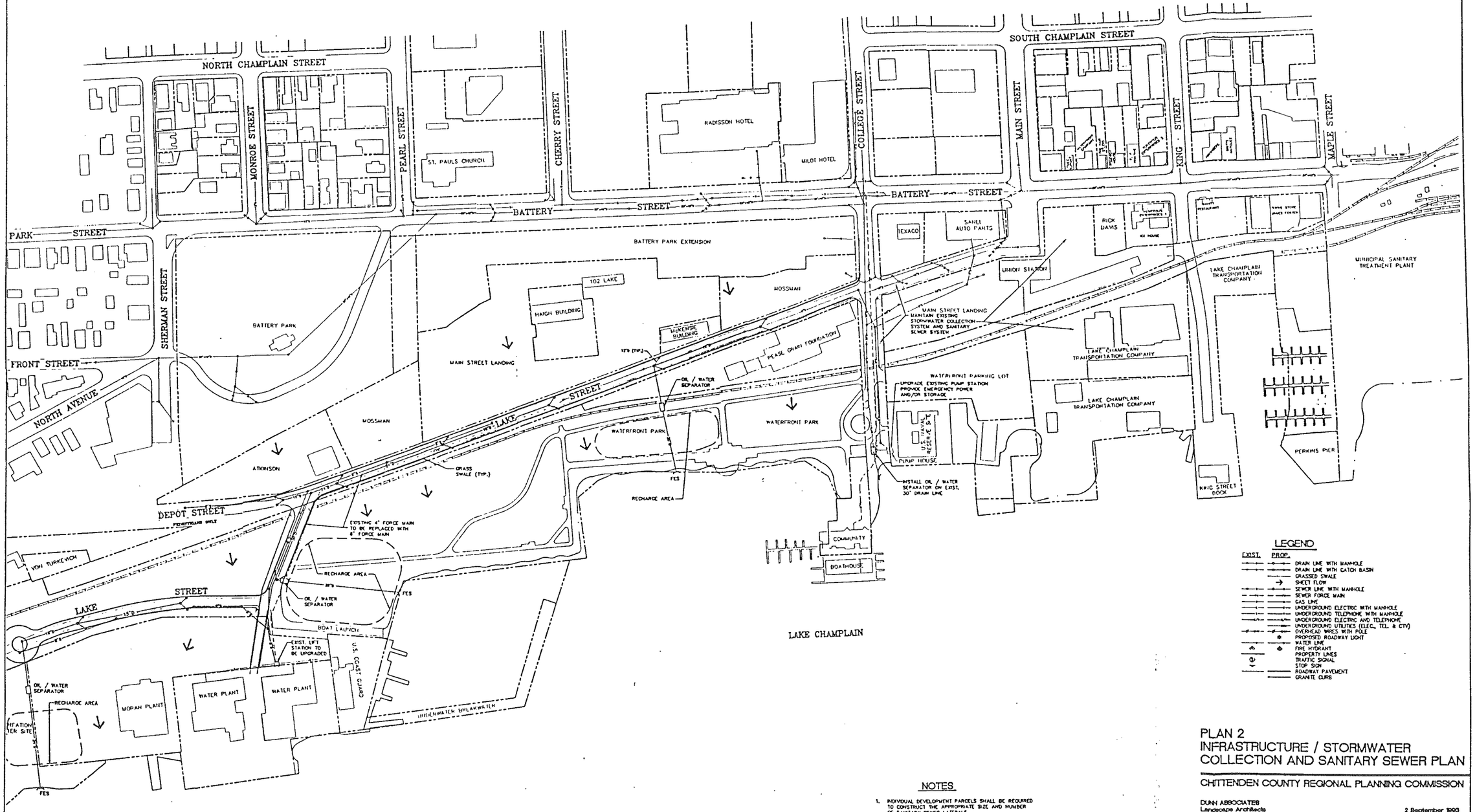
SCALE IN FEET

DRAWING NAME 50403UT2



NOTES

1. INDIVIDUAL DEVELOPMENT PARCELS SHALL BE REQUIRED TO CONSTRUCT THE APPROPRIATE SIZE AND NUMBER OF SANITARY SEWER LATERALS.
2. EACH PARCEL SHALL CONNECT TO THE PROPOSED STORM DRAIN SYSTEM.
3. ALL PROPOSED CATCH BASINS SHALL HAVE DEBRIS SUMPS AND OIL TRAPS.

LEGEND

EXIST.	PROP.	
		DRAIN LINE WITH MANHOLE
		DRAIN LINE WITH CATCH BASIN
		GRASSED SWALE
	→	SHEET FLOW
		SEWER LINE WITH MANHOLE
		SEWER FORCE MAIN
		GAS LINE
		UNDERGROUND ELECTRIC WITH MANHOLE
		UNDERGROUND TELEPHONE WITH MANHOLE
		UNDERGROUND ELECTRIC AND TELEPHONE
		UNDERGROUND UTILITIES (ELEC., TEL. & CTV)
		OVERHEAD WIRES WITH POLE
		PROPOSED ROADWAY LIGHT
		WATER LINE
		FIRE HYDRANT
		PROPERTY LINES
		TRAFFIC SIGNAL
		STOP SIGN
		ROADWAY PAVEMENT
		GRANITE CURB

PLAN 2
INFRASTRUCTURE / STORMWATER COLLECTION AND SANITARY SEWER PLAN

CHITTENDEN COUNTY REGIONAL PLANNING COMMISSION

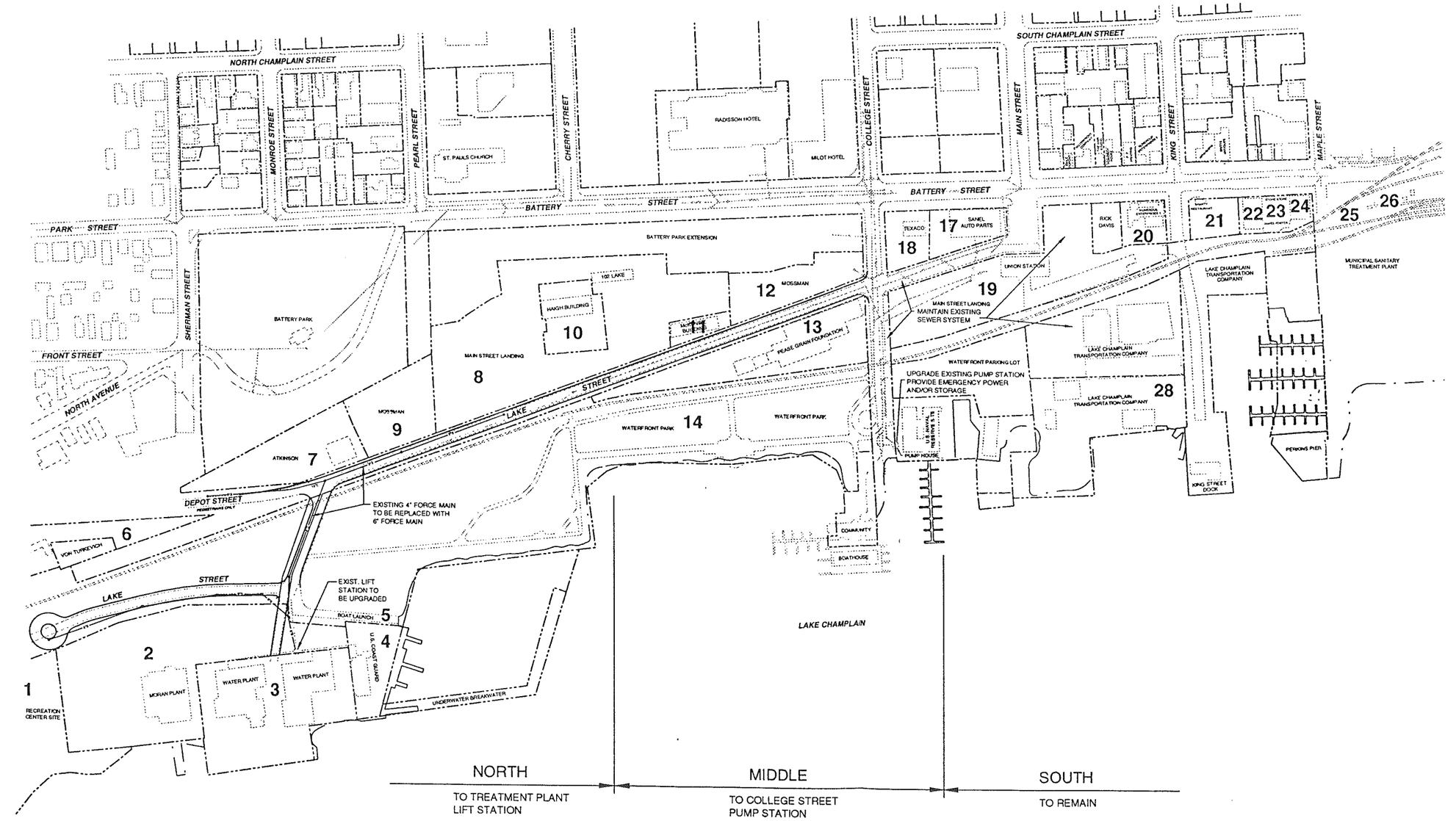
DUNN ASSOCIATES
Landscape Architects

VANASSE HANGEN BRUSTLIN, INC.
Engineers

BTAIN CLAUSON ASSOCIATES
Planners

2 September 1993

100 0 100 200
SCALE IN FEET



0 150 300 Feet

NOTE

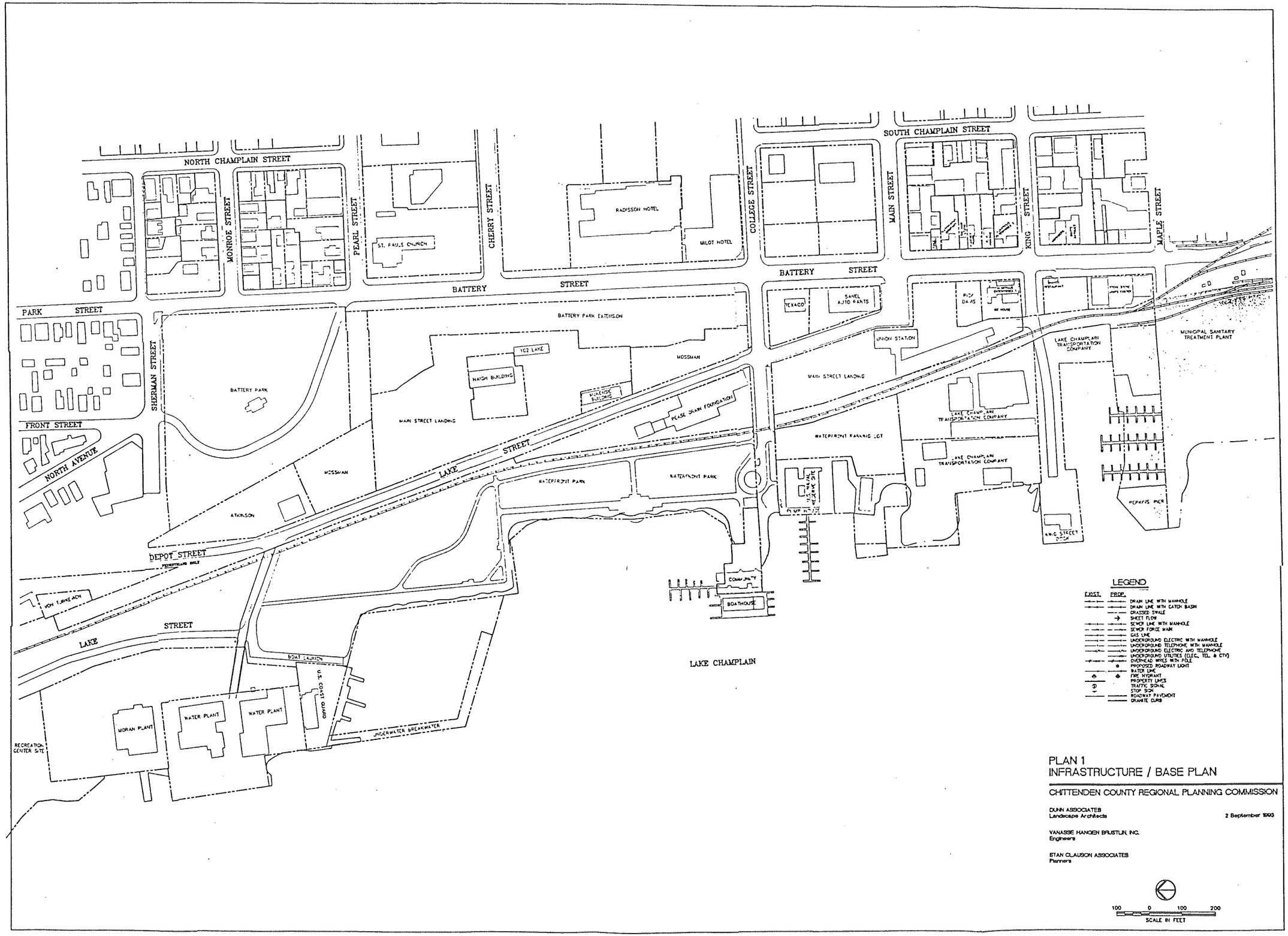
1. INDIVIDUAL DEVELOPMENT PARCELS SHALL BE REQUIRED TO CONSTRUCT THE APPROPRIATE SIZE AND NUMBER OF SANITARY SEWER LATERALS.

Vanasse Hangen Brustlin, Inc.

FIGURE 1

SANITARY SEWER BASIN AREAS

50403G-1



PLAN 1
INFRASTRUCTURE / BASE PLAN

CHITTENDEN COUNTY REGIONAL PLANNING COMMISSION

DUNN ASSOCIATES
Landscape Architects

2 September 1993

VANASSE HANGEN BRUSTLIN, INC.
Engineers

STAN CLAUSON ASSOCIATES
Planners