Chapter 4 • Master Plan & Planning Principles

4.1 Master Plan

The intention of this project is to create a new neighborhood that integrates into the adjacent urban fabric of Brewer's Hill and at the same time provides new places to live and work near downtown on the spectacular waterfront of the Milwaukee River.

4.1.1 Urban Pattern

Precedents

Brewer's Hill is a traditional neighborhood laid out on a grid of streets and blocks oriented in a north-south direction and part of the continuous urban grid of Milwaukee. It has a strong pattern of housing in the form of two-story duplex units on 35-foot wide lots facing the streets. Mid-block unpaved 20-foot wide service alleys provide access to garages and on occasion to secondary units. The average density is 15-18 dwelling units per acre. The integrated neighborhood has a mix of incomes and life styles as well as a variety of building types. There are numerous retail and commercial parcels often located on corner lots within the residential fabric.

Street and Block Layout

The proposed plan is organized around a series of blocks arranged between streets and pedestrian pathways that connect into the surrounding neighborhood. The block layout acknowledges the existing pattern of site ownership, utility access, and certain site constraints as illustrated in Figure 4.1.1.

Neighborhood Fabric

The aim of the plan is to make a new neighborhood that is traditional in character and integrated into the adjacent urban fabric. It is not intended to be a segregated "gated" community which turns its back on the surrounding area. The urban pattern of streets and blocks will permit a mix of uses and building types. This flexible pattern is responsive to changing market conditions and a diverse range of market sectors as well as making the neighborhood feel and look more like a traditional neighborhood.

4.1.2 Linkages & Open Space

The quality of a street should enhance not only the experience of using the street as a link between places, but should also serve to create another memorable public open space and a place for neighborhood interaction. Streets and pedestrian paths are open spaces as well as linkages. Conversely, what we usually recognize as open space, parks and squares, also act as linkages by connecting the neighborhood fabric around them.

New public open spaces and linkages, in the form of landscaped vehicular and pedestrian streets, parks and squares are proposed as part of the Master Plan. Additions and extensions to the existing system of public open space are also proposed, including linkages to Kilbourn Park and the Brewer's Hill neighborhood, as well as the creation of a major addition to the Riverwalk. The types of existing and proposed open space in the study area are described below.

Site Access

Currently access to the site is restricted to the two points where Commerce Street joins the existing street grid. At the south, Commerce Street connects with Pleasant Street at a five-way intersection with Palmer Street. At the north end of the site, Commerce Street joins Humboldt Avenue via a low underpass and a connector street to the Humboldt Avenue bridge.

The Pleasant Street intersection is improved as part of an improvements project for Commerce Street to accommodate the Brewer's Point Apartments as far as the Holton Street viaduct. The street right-of-way is widened and realigned to improve the appearance of the Pleasant Street intersection.

At Humboldt Avenue, it is recommended that Commerce Street be realigned approximately 150 feet to the north so as to create a new intersection and roadway extension eastward through the Humboldt Yards to North Avenue as illustrated in Figure 4.1.2. The existing street with its limited 11-foot headroom would be retained as a minor access to service the two existing commercial buildings on Commerce Street next to the Humboldt Avenue bridge. The new road would ascend the bluff at a grade no steeper than 8%, a typical maximum for streets in this region.

Vehicular Streets

Vehicular streets fall into two main categories:

- **Major Circulation Streets** Commerce Street is the only major circulation street. It is distinguished from other streets by a posted 25 miles per hour speed limit and a 36-foot curb-to-curb dimension.

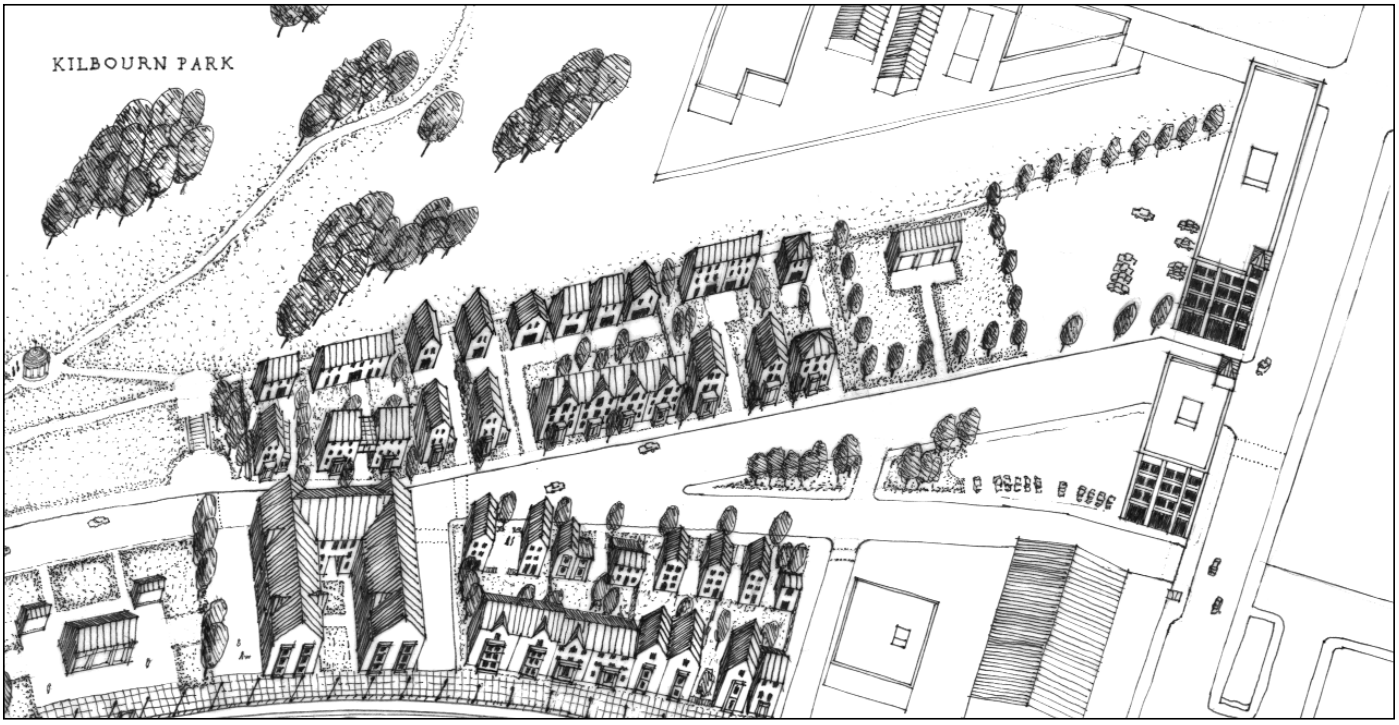

Figure 4.1.2

Commerce Street supports two-way traffic with parallel parking on both sides, which in turn promotes traffic calming.

- **Minor Circulation Streets** All streets, except Commerce Street are minor circulation streets. These streets differ from the other streets by a posted 15 mph speed limit and a 36-foot curb-to-curb dimension. Minor circulation streets are two-way with parallel parking on one or both sides. Two different conditions are illustrated in Figures 4.1.3 and 4.1.4. One condition shows development on both sides of the street, while the second shows development around the square.

The Riverwalk

The plan proposes to continue the Riverwalk which currently extends from downtown as far as the Pleasant Street bridge along the length of the site to Humboldt Avenue (Figure 4.1.5). This will provide a fully accessible, continuous pedestrian and bicycle path. A series of connectors (Figure 4.1.3) will link the Riverwalk to Commerce Street and the Brewer's Hill street grid. These connectors also provide a visual link to the river and permit public access to the water. The creation of an attractive Riverwalk is a key component of this project, as envisioned in the 1992 Milwaukee Riverlink Guidelines. Along the length of the project area, a number of riverwalk conditions could be encountered. Typical conditions include Rock Revetment (Figure 4.1.6.), Rock Revetment with Access (Figure 4.1.7.), Vertical Structural Edge (Figure 4.1.8.), and Vertical Structural Edge with Access (Figure 4.1.9.).

Steps to Link the Existing Streets to the New Development

An important aspect of the intention of integrating the new neighborhood into Brewer's Hill is to provide multiple linkages for access. Seven new points of access (Figure 4.1.1) are proposed in the form of steps or ramps from the top of the bluff to the new neighborhood below. These grand terraced steps and ramps are attractively designed to promote use, as well as to provide opportunities for quiet contemplation (Figure 4.1.10).

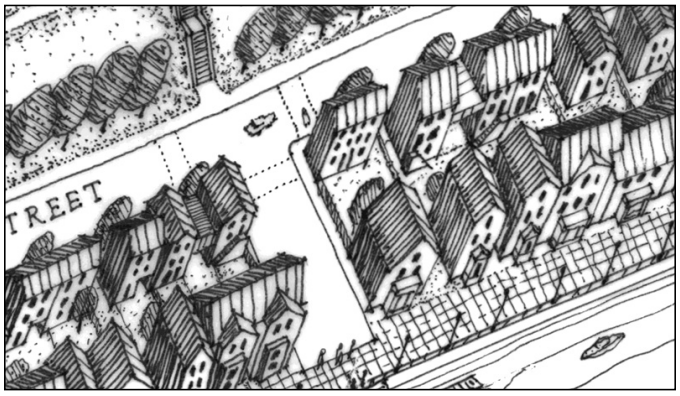

Figure 4.1.3

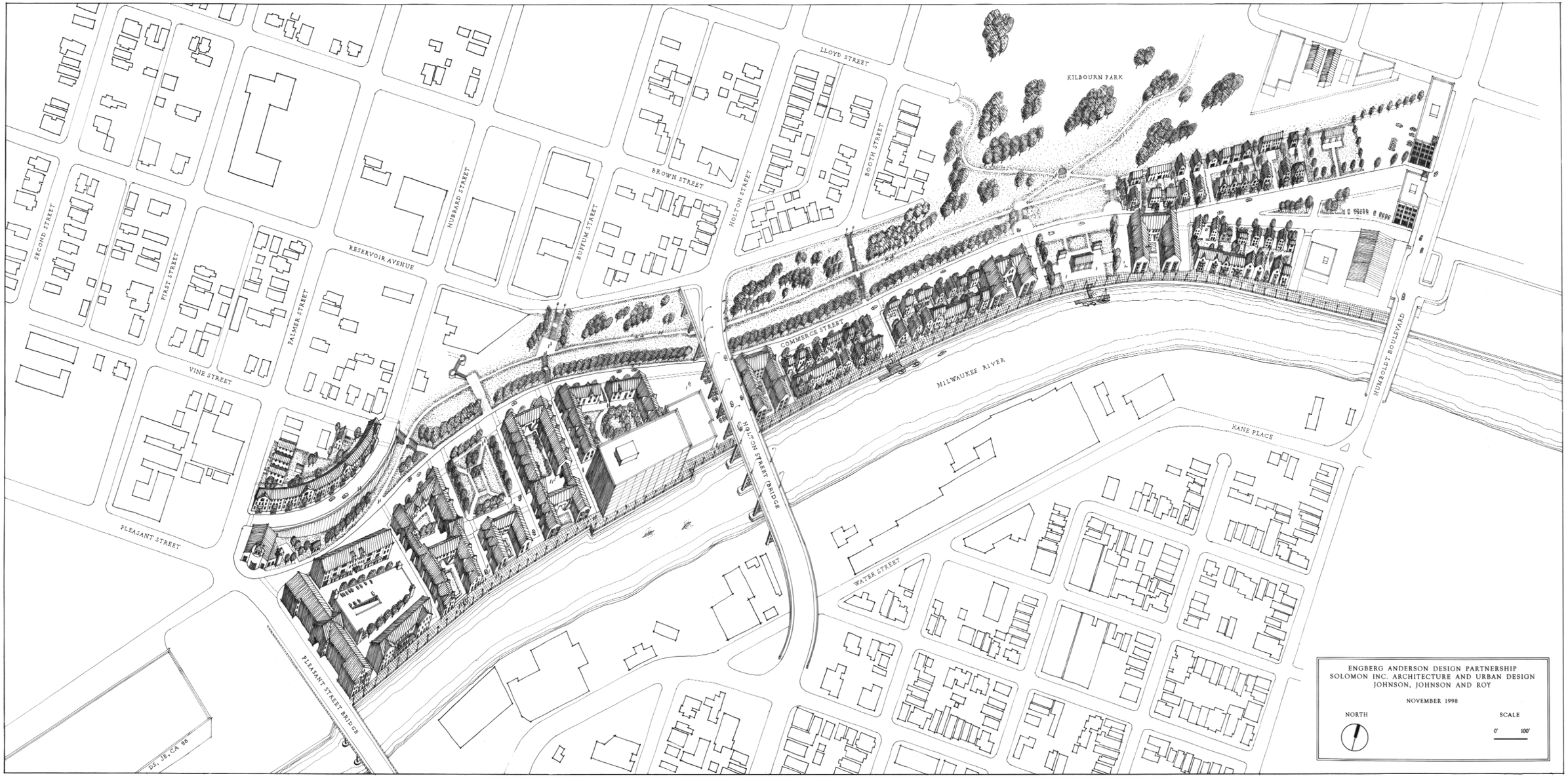

Figure 4.1.1 • Three-Dimensional Site Drawing

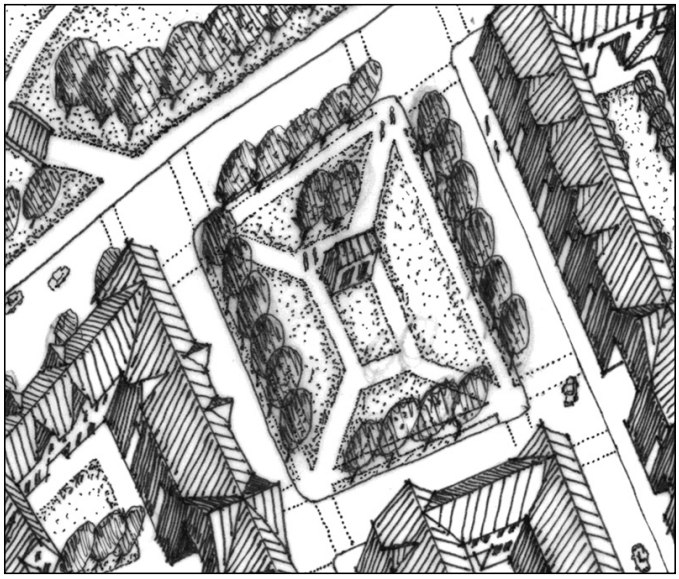

Figure 4.1.4

Where Vine Street and Hubbard Street meet there is at present a 30-foot high retaining wall separating the existing residential neighborhood from the former railroad right-of-way. It is proposed that new public steps and ramps be built at this point to connect the new and existing neighborhoods.

In addition, new steps would be provided at the intersection of Buffum Street and Reservoir Avenue and also at a point half way along Hubbard Street between Vine and Reservoir. The new connections are important for the successful integration of the two neighborhoods as well as helping the economic revitalization of Brewer's Hill.

Vertical Access to the Riverfront at Holton Street

The existing steps from the Holton Street Viaduct to Commerce Street are proposed to be supplemented with a new elevator on the side of the bridge. This will improve pedestrian access from Brewer's Hill to the waterfront as well as provide compliance with the Americans with Disability Act (ADA).

Beer Line Incline

Every project looks for something "special" that sets it apart from everything else. Typically, this element aids in creating a special sense of place and attracts people because of its uniqueness. The Beer Line Incline, or inclined railroad, similar to those inclines found on the steep bluff conditions around Pittsburgh, Pennsylvania and Dubuque, Iowa is proposed for this project to run from Brown Street to the micro-brewery and Riverwalk.

Bicycle Path on the Former Railroad Grade

Similar to other locations in Milwaukee, it is proposed to build a bicycle path on the alignment of the former railroad grade linking Pleasant Street with Humboldt Street. This trail will interconnect with Kilbourn park and provide an naturally landscaped path for cyclists and hikers (Figure 4.1.11).

Milwaukee River

The Milwaukee River is arguably the most prominent linkage and open space at the Beer Line "B" site. It is scenic, a recreational facility, and a transportation link. Traffic on this portion of the Milwaukee River will be primarily limited to traffic from downtown (due to low water conditions upstream of the former North Avenue

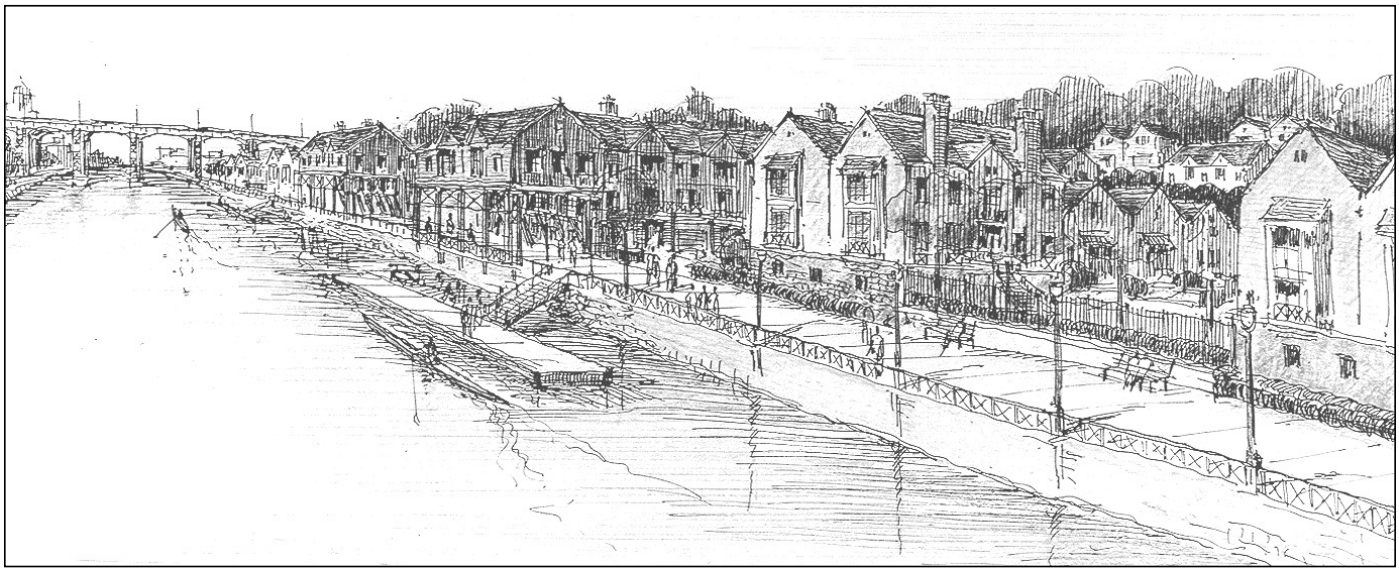

Figure 4.1.5 • View of Riverwalk looking towards Holton Street Bridge

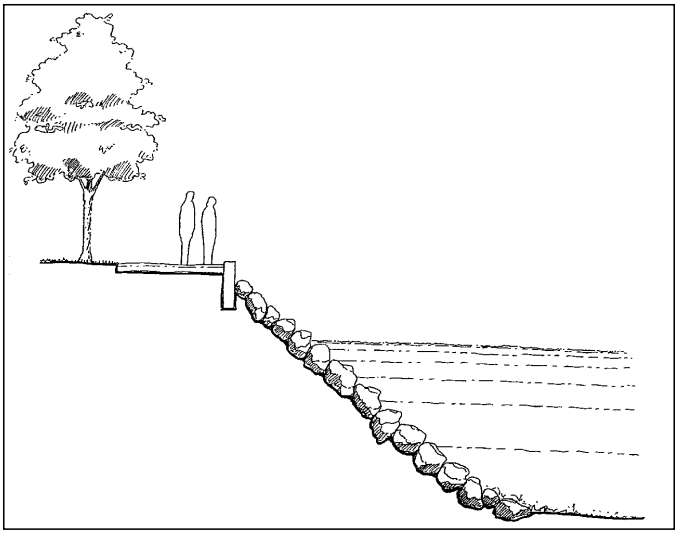

Figure 4.1.6

Dam). With the possibility of water taxi service to the residential and commercial development as one source of traffic, another source may be residents with boat slips at limited locations along the Beer Line "B" site.

One of the current uses of the river which needs to be preserved is the river traffic associated with the Milwaukee Rowing Club. To maintain this vibrant use of the river, the number of finger piers should be limited, as should the length (20′ maximum). To further encourage recreational use of the river as linkage, public small craft access points will be established at several points along the Beer Line "B" riverfront. Each riverside development parcel is suggested to engage the river amenity visually and, preferably, physically.

The Residential Square

A new residential square is proposed for the former

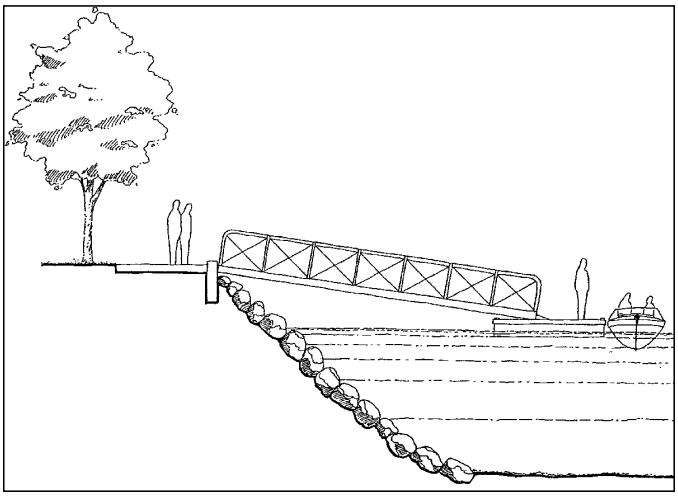

Figure 4.1.7

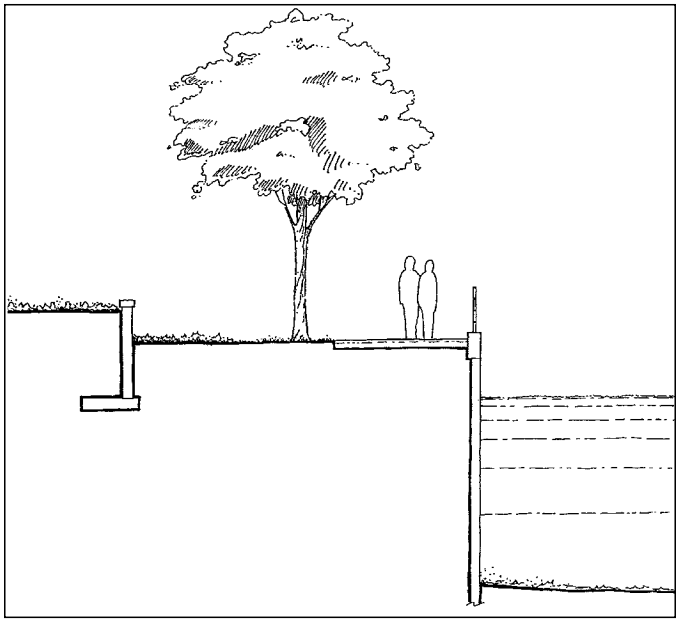

Figure 4.1.8

Trostel Tannery Site next to Commerce Street. Owing to certain limitations for excavation and development, there are restrictions on where construction can take place (Figure 4.1.12). These limitations have been turned into an asset through the proposed creation of a new residential square. This square, 120 feet by 180 feet in area and bounded on all four sides by streets, is similar in scale to the residential square (200 feet by 240 feet) within the Park East project located on Lyon Street between Cass and Marshall Streets. It is intended to receive a combination of hard and soft surface landscape treatment, and with a formal treatment of paths and plantings. Development of a small café and possible public restroom facilities should be encouraged (Figure 4.1.4).

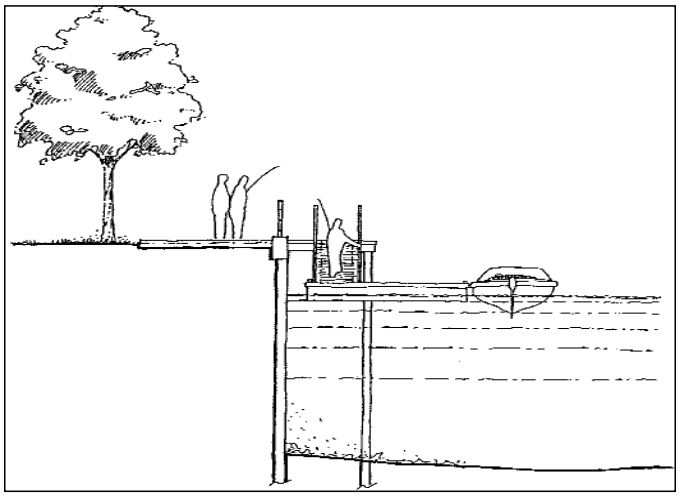

Figure 4.1.9

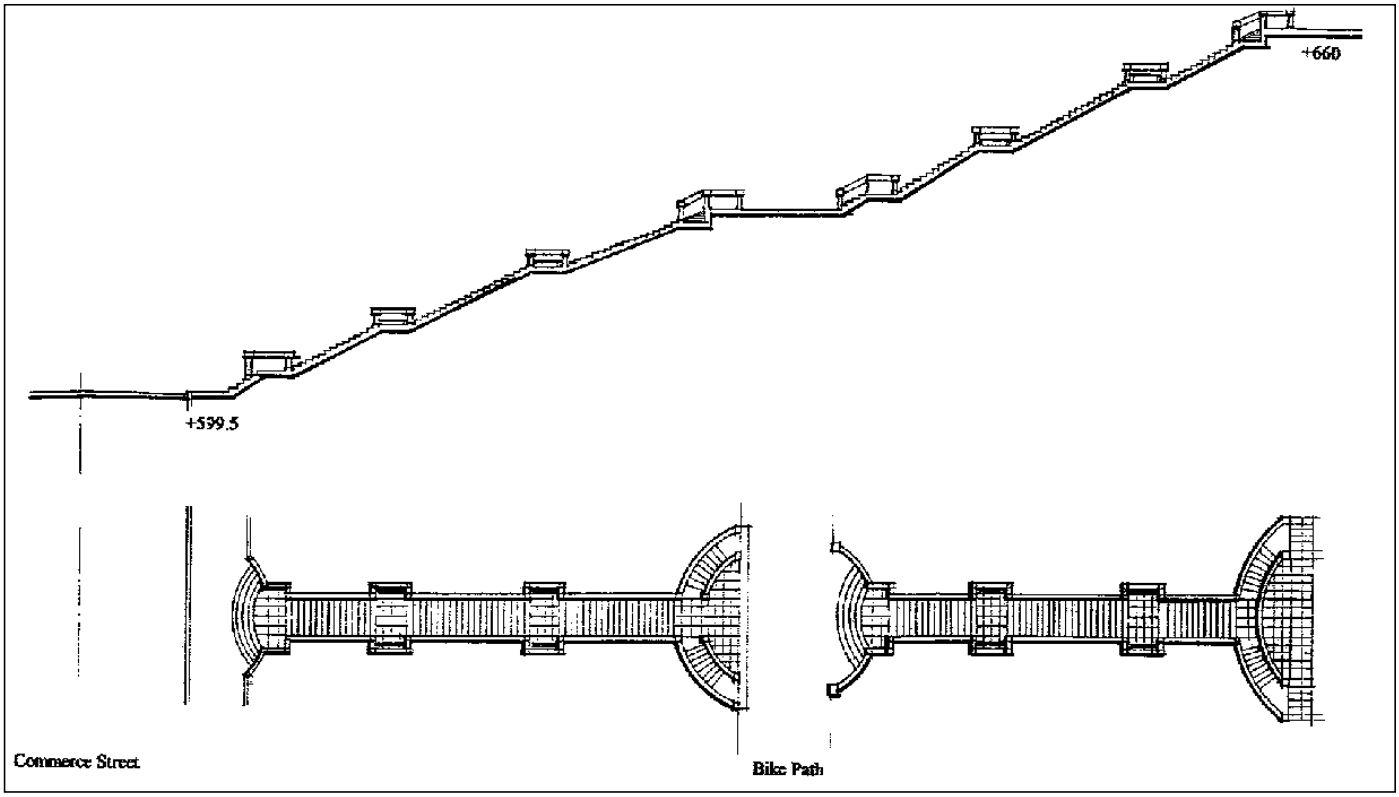

Figure 4.1.10

The Bluff

Additional open space is identified along the steep bluff where, at this time, development may not be economically or physically warranted. The bluff, if undeveloped, is intended to receive planting in a picturesque manner, to maintain its scenic qualities as well as physically maintaining the slope from erosion. It is recommended that non-native invasive trees and shrubs be replaced with native species. If future development is warranted, it is intended that the character of the bluff as naturalistic and scenic landscape reasonably be maintained within the parameters of development.

Kilbourn Park Extension to the River

It is proposed that a panhandle shaped extension from Kilbourn Park on the top of the bluff down the slope to the Riverwalk be created (Figure 4.1.11). This approximately 300-foot wide extension will provide access for the public to the water as well as link the new neighborhood to the park above. Steps and ramps are needed to provide access between the two levels.

4.1.3 Development Parcels

This subsection identifies specific parcels and the opportunities and character for each.

Pleasant Street Gateway

The buildings on this site are proposed to provide the opportunity for a mixed-use development on the parcel of land bounded by Pleasant Street, the river, Commerce Street and the Trostel Property. This site is ideally suited for a mixed-use commercial, retail or entertainment development because of its high visibility from both sides of the river and its location on Pleasant Street. It is proposed that any development should be built to the right-of-way of Pleasant Street, Commerce Street, and the Riverwalk. For commercial development, a parking ratio of 3 cars per 1,000 square feet of development is recommended. Consequently, a parking area in the center of site has been provided. This site has sufficient area for one level of parking to accommodate one floor of commercial space around it. Thus, if a two-story commercial development were to be built, it would require two levels of parking, and three levels for three floors of development, etc.

It is intended that the two parcels on either side of the Commerce Street entry to the site from the south be

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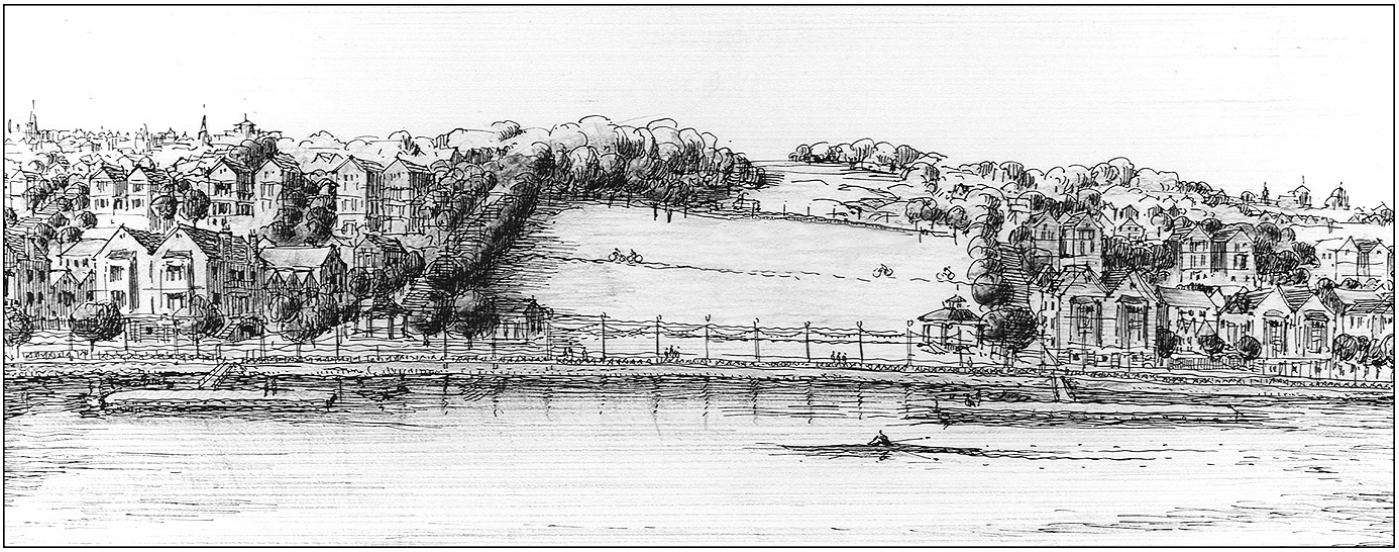

Figure 4.1.11 • View of proposed extension of Kilbourn Park down to the Riverwalk

designed in such a way that they read as "gateway buildings". This implies that they should be designed to balance each other in height, scale, materials and detail (Figure 4.1.13).

If mixed-use pattern is preferred when development is imminent, the parcels facing Commerce Street and the Riverwalk could be built to accommodate housing with retail below. Alternatively, each building could be designed to accommodate a mix of uses organized vertically with two levels of housing over commercial or retail at ground level.

The Hubbard Street Promontory

The need to allow access to the Deep Tunnel Sewer and the desire to complete the existing block bounded by Palmer Street, Vine Street, and Commerce Street has been resolved by the Hubbard Street extension and promontory. The Promontory would be lined with a row of three-story residential buildings with integral garages beneath. The eastern end of the Promontory would connect to Palmer Street. The continuous vertical facades of the building combined with the retaining wall below for the street extension will produce a coordinated visual image unique to Milwaukee (Figure 4.1.14).

Residential Development of the Trostel Site

It is proposed that the Trostel site be developed as a higher density residential neighborhood with three-story walk-up housing apartments or condominiums over congregate parking. The eight parcels surrounding the square are to be developed as a consistent neighborhood with buildings defining the street walls to create an urban room Figure 4.1.4).

Additional Development of the Brewer's Point Site

The existing Brewer's Point development has converted the former industrial buildings into apartments.

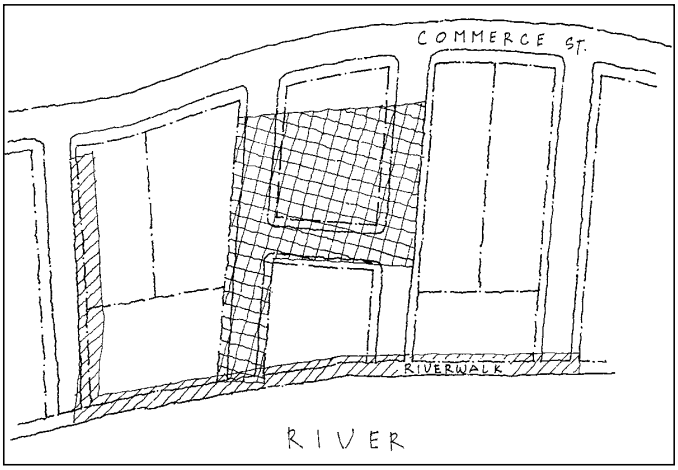

Figure 4.1.12

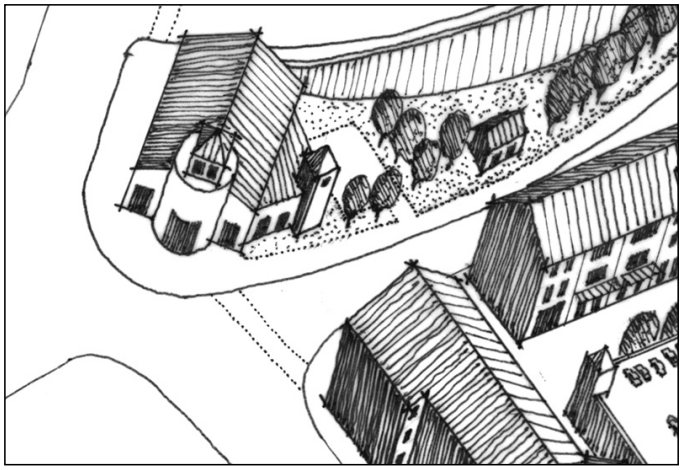

Figure 4.1.13

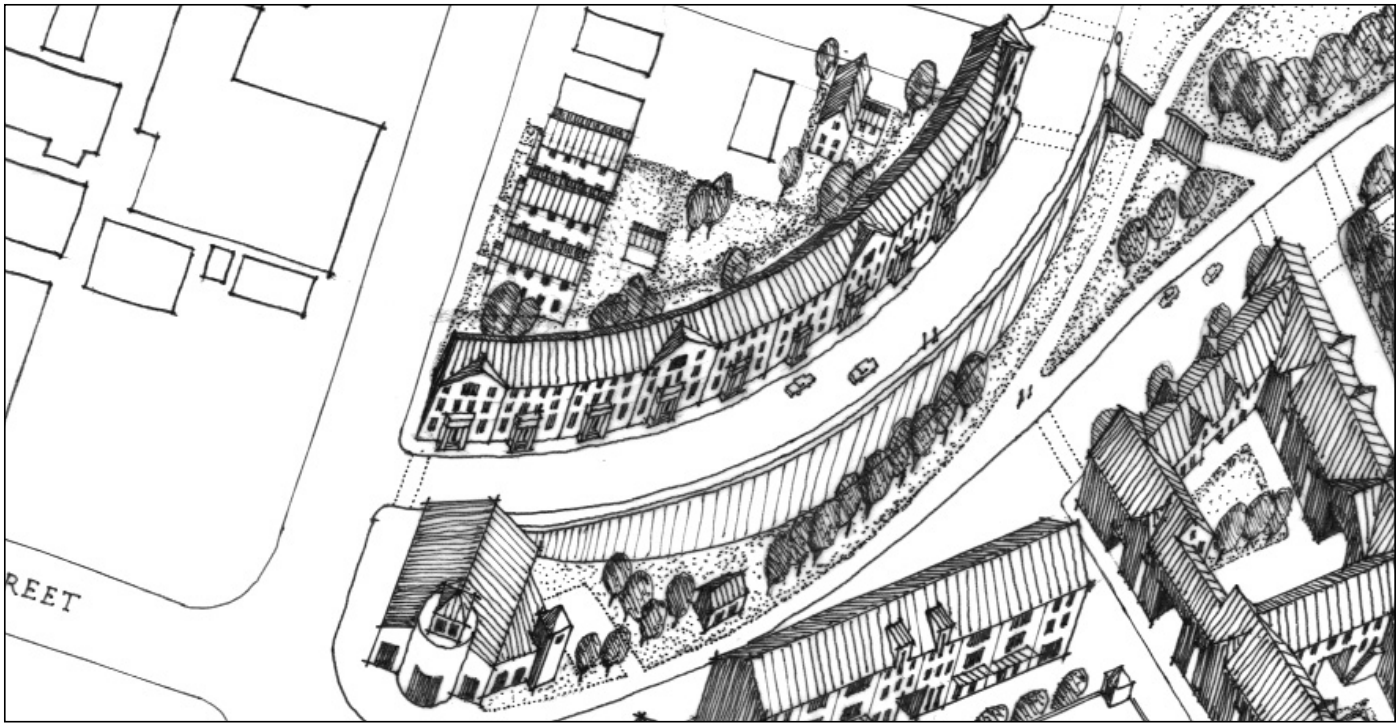

Figure 4.1.14

However, the portion of the site facing Commerce Street has been left open as a parking lot. It is proposed that a parking deck be constructed on the site of the lot, and that a row of lowrise townhouses or apartments over garage parking be built along the edges of the site to define the streetwall and maintain continuity of the new urban fabric. Access to the below grade parking could be via a ramp from Commerce Street (Figure 4.1.15).

Riverside Housing North of Holton Street

The flat land site between Commerce Street and the Riverwalk varies and can accommodate a band of housing oriented both to the street and the water. Various alternate configurations can be used to respond both to market conditions as well as different densities (Figure 4.1.16).

Humboldt Avenue Gateway

The plan proposes that two buildings be built on either side of the new alignment for Commerce Street where it meets Humboldt Avenue. These two sites can accommodate mixed-use buildings with surface parking at the rear. They should be built to the streetwall to define the edge of the site as well as provide continuity of the urban fabric along Humboldt Avenue (Figure 4.1.2).

4.2 Alternative Land Use

The development program for the project area was based on providing an economically feasible mixed-use urban community. The program focused on two primary uses: housing and commercial/mixed-use. The resulting Land Use Plan creatively integrates multiple housing types and commercial/mixed-use with extensive open space, amenities and linkages to adjacent neighborhoods and parks.

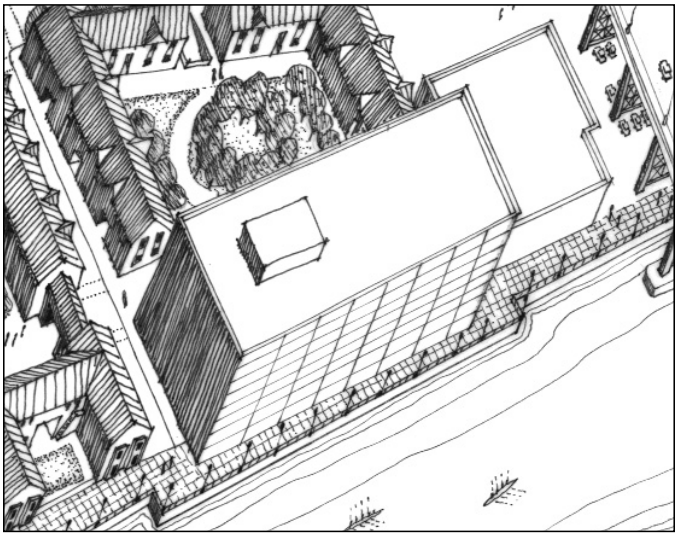

Figure 4.1.15

Figure 4.1.16

The development of commercial uses will be heavily market-driven. Although well positioned for internal and external visibility, if the market will not support the proposed commercial activities on the east and west end of the project area, those land areas are then intended to accommodate additional housing.

4.3 Density

To encourage the creation of a vital mixed-income community, the Land Use Plan provides for a diversity of housing types, including single-family homes, townhouses, condominiums and apartments. As a result, density varies from 12 - 15 dwelling units per acre for single family homes and townhouses, up to 40 dwelling units per acre for multi-family residential. Figure 4.1.1 illustrates the proposed residential densities.

4.4 Proposed Foundation/Ground Improvement Alternatives

Foundations and costs for the proposed one- to three-story commercial and residential developments will depend on location within the study area and the structures' tolerance for differential settlements. Normally, we anticipate maximum total settlements of 1 to 1.5 inches with differential settlements of approximately one-half the total. Additional development costs may results if less settlement is desired or if ground improvements are needed to achieve normal settlement limits.

The following paragraphs present an overview of general foundation conditions for Zones A, B and C as delineated on Figure 4.4.1 and a discussion of foundation alternatives and relative costs in more detail.

4.4.1 Foundations for Structures Located in Zone A

Generally, the worst foundation support conditions are expected for structures (or portions of structures) to be located in Zone A soils as shown on Figures 6.3.4 and 6.3.5. Zone A soils typically have loose or soft fill material overlying 1 to 6 feet of buried, relatively compressible organic silt and clay (estuarine deposits).

Without ground improvement, these soils will generally be suitable for supporting only very light structures and those with higher settlement tolerance (e.g., one-story timber or steel framed structures with flexible metal or timber skins). More heavily loaded one-story structures, masonry structures and multi-story structures will likely require deep foundations or ground improvement with shallow foundations. Most of the existing or previous structures in this area have deep foundations such as driven piles or drilled shafts.

4.4.2 Foundations for Structures Located in Zone B

Foundation support conditions in Zone B differ from Zone A in that the relatively compressible estuarine

deposits are generally absent and that depths to stronger, less compressible soils are less. However, thick, variable-compressibility fill deposits are often present.

In most portions of Zone B, the poor fill quality results in similar foundation support alternatives as those identified for Zone A. In some portions of Zone B, shallow foundations may be feasible without ground improvement for lightly to moderately loaded commercial and residential structures.

4.4.3 Foundations for Structures Located in Zone C

Foundation support conditions in Zone C are generally better than those in Zone A and B due to stiffer soils. Fill soils exist, but are generally thinner, stronger and/or less compressible than in Zones A and B. Fill deposits are underlain by low compressibility glacial soils.

Shallow foundations are more likely to be feasible in Zone C. Although better soils are generally present, the slopes in Zone C will require use of earth-retaining walls and stepped foundations that are designed to resist variable earth pressures.

4.4.4 Deep Foundations

Deep foundation alternatives in Zone A and B include mini-piles, driven piles, pressure injected drilled piles, and drilled shafts. To support the anticipated loads from the proposed one- to three-story commercial and residential developments, low to moderate capacity (15 to 60 kips) deep foundations should be suitable.

Mini-piles typically have diameters ranging from 4 to 7 inches and design capacities ranging from 15 to 40 kips each depending on diameter, depth and soil strength. They may consist of closed-end pipe that is driven or pushed to a suitable toe bearing depth. They may also consist of helical piers such as Atlas Piers or Chance Piers. Helical piers are screwed into the ground until a minimum torque resistance is achieved. Within soil Zone A, we estimate that mini-piles with 15 to 30 kips design capacities may be achieved at depths ranging from 25 to 40 feet. In both zones, higher capacities up to approximately 50 kips per pile are likely to be achievable at deeper depths if more substantial loads are intended.

Higher design capacities may also be achieved with piles or drilled shafts. We estimate that 10- to 13-inch diameter piles or tapered, fluted piles that are driven to depths ranging from 25 to 50 feet may achieve design capacities ranging from 30 to 60 kips within Zone A and from 40 to 80 kips in Zone B. Similarly sized drilled shafts may achieve approximately 75 percent of these design capacity estimates at similar depths. Treated timber piles with 12- to 14-inch butt diameters and 30- to 50-foot lengths might achieve design capacities ranging from 30 to 60 kips each. Steel "H" piles are also feasible, but would likely require 20 to 30 percent deeper penetration depths to achieve similar design capacity as driven pipe piles.

An important consideration in selecting the type of deep foundation if necessary, will be the likely presence of obstructions such as cobbles, boulders, abandoned foundations and rubble fill. Generally, heavy-walled steel pipe and "H" piles with toe protection and rotary-bit-drilled mini-piles are better able to penetrate through soils with frequent obstructions. Driven light-walled steel pipe and timber piles, helical piers, and auger-drilled shafts are more likely to encounter installation difficulties in soils with frequent obstructions.

4.4.5 Aggregate Piers and Piled Footings

Within Zone B soils and possibly Zone A soils, an alternate to piles and drilled shafts may be aggregate piers, compaction-grout columns or piled footings.

Aggregate piers or Geo-Piers involve auger drilling of 2- to 3-foot diameter shafts to depths of 15 to 25 feet, then backfilling and compacting 12- to 18-inch thick lifts of crushed stone. To be cost-effective, the holes must stay open and free of water long enough to place and compact the aggregate. The piers are typically spaced 6 to 10 feet apart. They typically enable net allowable bearing pressures to be increased by 2 to 5 times the net allowable bearing pressures without piers.

Compaction-grout columns or piled footings involve drilling or driving a deep foundation element through the compressible layers and sufficiently into a bearing layer to achieve a geotechnical factor of safety of approximately 1.0 with the deep foundation element supporting approximately one half of the load. These elements are placed below shallow spread footings

which also support approximately one half of the load. The cost savings over conventional deep foundations is that half as many deep foundation elements are used.

The preceding alternatives act to stiffen the existing soil and allow it to support higher allowable bearing pressures on shallow spread foundations. The method is only feasible if the existing shallow soils have some usable load-carrying capacity and if a stronger, less-compressible bearing stratum exists within 15 to 25 feet below the surface. This criteria is generally met in the Zone B soils but not the Zone A soils.

4.4.6 Dynamic Compaction and Surcharging

Another set of alternatives for foundations in Zones A and B is that of shallow foundations bearing on soils which have been improved by dynamic compaction or surcharging.

Dynamic compaction involves densification of compressible soils by repeatedly impacting it with a heavy, 8- to 20-ton, tamper which is dropped by a crane from heights of 20 to 50 feet. It is performed in grid patterns that are closest in footing areas and wider in slab-on-grade areas. After compaction, the resulting surface craters are leveled and compacted with a vibratory roller. Dynamic compaction is more suitable for densifying granular soils and rubble soils that are above the water table. It is generally not recommended for improving zones of saturated cohesive soils such as organic deposits, silts and clays that are near or below the water table. It is also generally not feasible near (within 100 feet) of existing basements, dockwalls, and underground facilities. We anticipate that dynamic compaction may be feasible for some Zone B soils but not for Zone A soils.

Surcharging involves densification or compression of loose or soft soils by placing a surcharge weight over the building footprint area and the allowing it to remain in-place long enough to consolidate the soil. Typically, soil fill is used for the surcharge. We estimate that surcharge piles that are 7 to 10 feet high and left in-place for 2 to 3 months would allow Zone A and B soils to be sufficiently improved such that shallow spread footings may be designed based on net allowable bearing pressure in the range of 1,000 to 2,000 pounds per square foot (psf). Surcharging is more feasible for cohesive soils such as the organic deposits, silts and clays commonly found in Zone A and Zone B soils. It is less feasible within loose granular or rubble fill soils. In addition, surcharging near the existing dockwalls would require careful analysis of dockwall stability and monitoring to ensure that anticipated lateral movements are acceptable.

4.4.7 Overexcavation and Backfilling

Another alternative for improving foundation conditions within Zone A and B soils is that of excavating to remove the more compressible soils followed by backfilling with materials placed in lifts and compacted with a cementitious flowable fill. This alternative would generally require sloped or braced excavations and groundwater cutoff or dewatering below the water table. In addition, landfilling or treatment of the removed soil and water may be necessary if it is found to be impacted by contaminants. If the relatively compressible fill and organic soils are removed and replaced with material that has been compacted to approximately 95 percent of the materials' maximum dry density as established by testing in accordance with ASTM D1557, Modified Proctor Method, shallow spread foundations bearing on the new fill could likely be designed based on net allowable bearing pressures of 3,000 psf.

4.4.8 Relative Foundation and Ground Improvement Costs

Foundation and earth-retaining costs are anticipated to be greater for development within the Beer Line "B" study area than for relatively flat, good ground sites elsewhere in the Milwaukee area. However, these costs are not anticipated to be significantly different than those for similar developments in the lower Milwaukee and Menomonee River valleys. Many variables will influence the ultimate development costs for foundations including type of facility (e.g., basements, loads and settlement sensitivity), the owner's and designer's willingness to accept risk, and the specific subsurface conditions of each parcel. Generally, higher foundation costs are anticipated in Zone A soils than in Zone B or C soils.

In order to help assess possible foundation costs, unit cost ranges for various alternatives were prepared and are listed in Table 4.4.1. The listed cost estimates are considered order-of-magnitude estimates for foundation costs beyond those typically estimated for shallow foundations supporting typical one- to three-story

residential and commercial buildings at good ground sites in the Milwaukee Metropolitan area. The general need for ground improvement was previously discussed. More specific foundation and ground improvement assessments should be made for individual parcels and proposed developments as design information becomes available.

4.5 Environmental Management

This section provides an overview of the conditions of the Beer Line "B" project area from an environmental regulatory and construction perspective and provides general discussion on how these issues may be addressed during redevelopment.

4.5.1 Site Environmental Conditions Overview

The evaluation of the Beer Line "B" Planning Area was completed by first reviewing existing informational sources concerning environmental conditions and then completing soil and groundwater testing to: 1) provide additional information regarding suspected or known issues, and 2) provide baseline information where no previous information existed. The site evaluations included testing soil and groundwater samples for RCRA metals, polycyclic aromatic hydrocarbons, volatile organic compounds, cyanide, boron and pesticides. The soil and groundwater testing completed was sufficient to provide a broad overview of the site conditions. Additional testing on a parcel-by-parcel basis is advisable prior to purchasing, or constructing on individual parcels.

The area has had a long history of primarily industrial activity dating to the original development of the City of Milwaukee, and consequently there is the potential for numerous environmental issues. These include identified issues and yet undiscovered issues. The identified issues generally fall into the category of low-level contamination associated with fill soil. There were some low-level groundwater contamination issues identified but these were sporadic. A more detailed discussion of the past parcel uses and results of testing performed on individual parcels is found in Section 7.4. Fill-related construction issues are generally manageable during redevelopment and would not typically provide significant obstacles. Further discussion of these considerations is provided below.

4.5.2 Environmental Issue Management

Regulatory Issues

Resolution of the issues identified during this study has become much easier in the past few years due to changes in Wisconsin Department of Natural Resources (WDNR) codes and policies. These changes primarily relate to closure flexibility with the groundwater quality standards; generic soil direct contact and groundwater protection-based standards; and guidance from the WDNR concerning performance-based closure. Redevelopment planning that includes coordination with WDNR from the early stages of the project will assist in reducing delays due to environmental contamination issues.

The issues identified within the planning area predominantly relate to surficial fill soils have contaminant concentrations exceeding NR 720, Wisconsin Administrative Code Generic Residual Contaminant Levels for direct contact with soil and, in some cases, contain non-exempt solid wastes, such as cinders and possibly coal. Significant groundwater impacts were not identified across the BLB project area. Some limited areas of groundwater exceedances of PALs were noted and may require additional investigation, monitoring and/or a groundwater use restriction.

If significant groundwater impacts are not present, a performance-based closure can be considered for affected soils rather than in-situ treatment or removal and disposal. Under a performance-based closure, direct contact issues can be managed by limiting the potential for contact with the fill soil by integrating engineering controls (i.e., direct contact barriers) into the site redevelopment planning and making deed notifications identifying the presence of these materials. Direct contact barriers can include, but are not limited to: soil covers (2 to 3 feet thick), geomembranes, geotextiles, buildings and pavements. It is possible that some contaminated soil may require landfilling, however, the limited available soil and groundwater data and numerous permutations of scenarios make estimating possible costs impossible.

The classification of a site as an abandoned landfill depends on the quantity and distribution of non-exempt fills present on-site. Additional soils information and fill characterization would be required to determine if

any of the parcels would be classified as abandoned landfills under NR500, WAC. This classification would require that "an exemption to construction on an abandoned landfill" be applied for and approved by WDNR prior to construction. These exemptions are not considered significant barriers to redevelopment but add additional cost and time. At this time, WDNR has not granted purchaser protection to purchasers of "abandoned landfill" sites; therefore, these sites pose a perception of a higher risk to a potential purchaser.

Past experience would suggest that one of the most onerous obstacles to overcome is the time required to resolve the issues with the WDNR given typical fast-paced development schedules. Coordination with WDNR from the outset of the development planning of the site will facilitate acceptance of the project by WDNR. An allowance of two to four months for site characterization and negotiations with the WDNR is advisable. Typically, a more detailed program of soil and groundwater testing would be required, followed by submittal to the WDNR of a strategic remedial plan which integrates environmental solutions and redevelopment plans. This integration generally entails specific design details relating to foundation depths; current and future property usage; utilities; pavement areas; building locations; health and safety issues; and affected soil and groundwater management during construction.

Construction Issues

Previously unidentified concerns typically arise during construction. Sufficient exploration preceding the actual site construction activities serves to limit the unexpected issues and also tends to reduce the costs to manage these issues. When these issues are known prior to construction, more creative and less costly material management options are typically available. Issues that arise during construction may result in higher material handling costs (i.e., landfilling of contaminated soil) and possible construction delays. Contingency plans should be part of the development planning process and construction schedule. Also, contingency costs for environmental issues should be included in the development of economic analysis.