Portage Street Streetscape Master Plan

2005

PORTAGE STREETSCAPE MASTER PLAN

PREPARED FOR:

DOWNTOWN KALAMAZOO INCORPORATED
KALAMAZOO, MICHIGAN

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PROJECT NO. E16330.2

PREPARED BY:

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Section 1
Executive Summary

EXECUTIVE SUMMARY

Introduction

This Executive Summary provides an overview of the Portage Street Streetscape Master Plan Study, which began in September of 2003 and was completed in March of 2005. It is comprised of four sections:

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- The *Introduction and Background* provides a summary of the project background and study area limits, the goals and objectives, and related studies and activities.
- The *Plan Development Process* provides the project approach and design methodology, a project timeline, and summary of events (See Appendix).
- The *Streetscape Study Area* provides a design description for the four study areas within the project limits.
- The *Appendices* provide the following which should be used as a tool and an integral part of the report:

    - *Appendix "1" Paving Design Palette*
    - *Appendix "2" Planting Design Palette*
    - *Appendix "3" Furniture Design Palette*
    - *Appendix "4" Street Lighting Design Palette*
    - *Appendix "5" Design Outline Specifications*
    - *Appendix "6" Implementation Schedule*
    - *Appendix "7" Estimate of Probable Costs*
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    - *Appendix "9" Traffic Study*
    - *Appendix "10" Maintenance and Care*
    - *Appendix "11" Plan Development Process*

The project corridor study area is defined as the two-mile section of Portage Street starting with Alcott Street intersection on the south and ending at Michigan Avenue. The Portage Street corridor includes approximately 80 businesses ranging from retail to light industrial and individual residences. Approximately 20,000 cars travel Portage Street each day, in addition to Metro Transit buses, bicyclists, wheelchair users, and pedestrians. The planning approach taken relies significantly on local input and feedback from business owners/merchants, neighborhood residents, local government officials, and other stakeholders.

Goals and Objectives

The goal of this project was to identify physical improvements to the Portage Street corridor that will encourage, enhance and support economic revitalization of the project area, both now and in the future.

The goal of the Edison Mainstreet Program is to develop a conceptual streetscape plan that will provide the basis for continued revitalization and future expansion of the Portage Street commercial corridor. The Edison Mainstreet Program has been ongoing for many years and began with the development of the following design principles, goals and objectives for the design of the Portage Street Corridor:

- Enhance retail uses in key areas;
- Enhance distinct identify for key districts, while providing for continuity of design and improved aesthetic appearance throughout corridor;
- Decrease automobile speed at key intersections, while improving traffic flow through corridor;
- Improve pedestrian, wheelchair, and non-motorized access and safety, especially in key retail areas;
- Improve parking efficiency;
- Address roadway engineering problems;
- Increase linkage between public facilities;
- Crime reduction through implementation of Crime Prevention Through Environmental Design (CPTED) principles;
- Minimize driver distractions through consistent visual elements and by undergrounding utilities;
- Maximize public and stakeholder input and creatively address multiple and conflicting stakeholder interests and needs.

Study Area and Design

The project study area includes a two-mile portion of Portage Street referred to as ***"Tier One - Portage Street Primary Corridor,"*** which is that section of Portage Street that is bounded by East Michigan Avenue to the north and Alcott Street to the south. Four distinct districts or commercial nodes make up this corridor. Additionally, the second study area is referred to as ***"Tier Two - Primary Cross Streets,"*** which includes eight important cross streets that in most cases have a direct primary linkage to related activity areas adjacent to Portage Street. The third study area is referred to as ***"Tier Three - Neighborhood Side Streets"*** which includes fifteen side streets within the streetscape study areas.

The *"**Tier One - Portage Street Primary Corridor**"* study area includes four distinct districts that have an overall common design theme, with standard design treatments that are used throughout the Primary Corridor. However, each of the districts has a distinct design theme variation, which is described in Section 2.

The four specific districts within the **"Primary Corridor"** are:

"Portage Gateway District" - The portion of Portage Street between East Michigan Avenue intersection and Walnut Street.

"Crosstown District" - The portion of Portage Street from Walnut Street south to Collins Street.

"Washington Square Market District" - The portion of Portage Street from Collins Street south to Egleston Avenue.

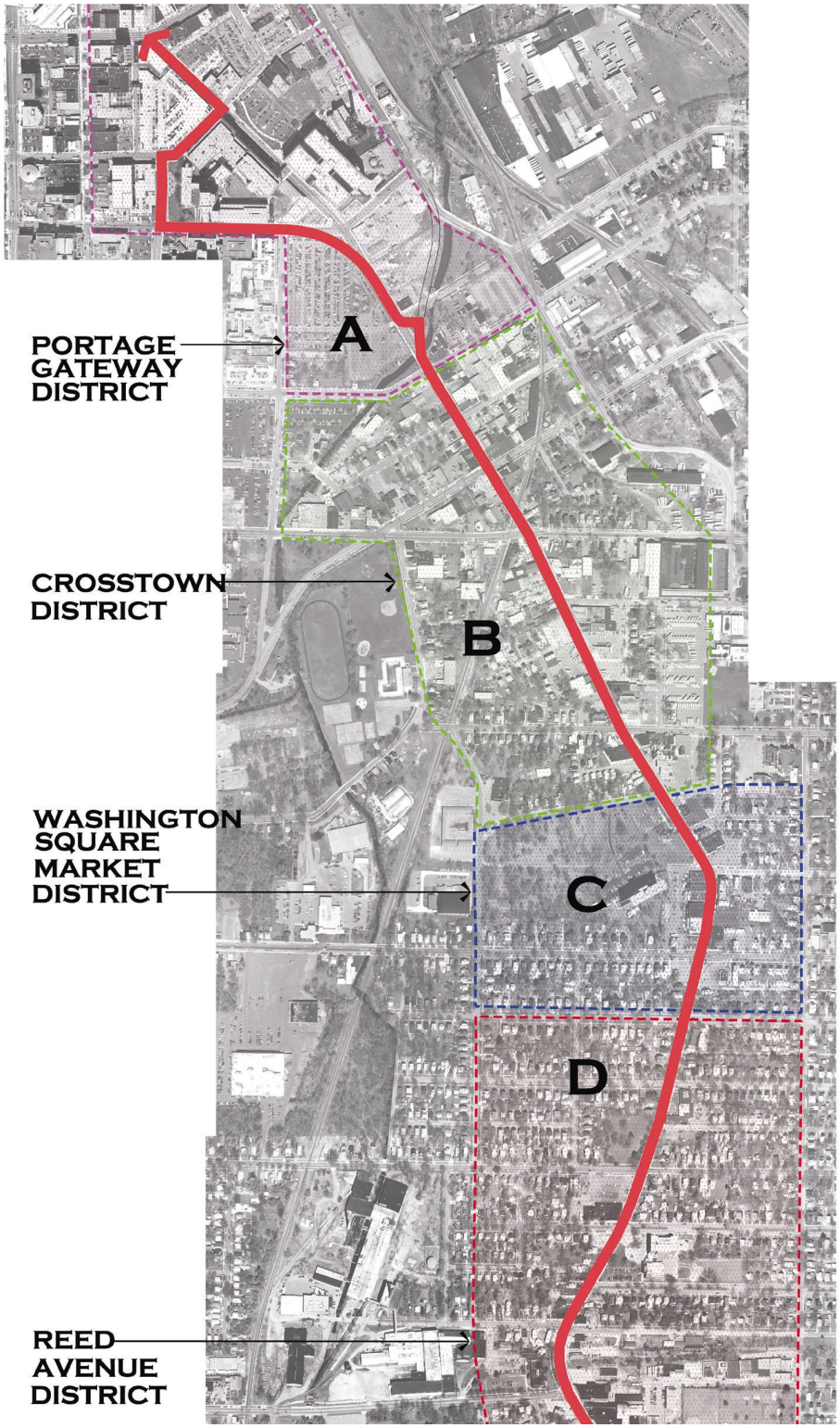
"Reed Avenue District" - The portion of Portage Street between Egleston Avenue and Alcott Street — the southern limit of the study area.

Additionally, there are two other levels of design evaluated in this report: "Primary Cross Streets" and "Neighborhood Side Streets."

Therefore, an important part of the plan focus is to integrate the primary cross streets and the neighborhood side streets, using some of the design concepts from the Primary Corridor.

The Plan also considers important linkages to Portage Street, including past, present, and future planning projects that will be linked visually and physically to the corridor. The following is a list of some of those important projects and linkages, which are described further in Section 2:

- Pfizer Incorporated – Campus Master Plan
- Washington Square Market District
- Central City Parking Lot #5
- "Seven Acres" Housing Development
- Kalamazoo Farmers' Market
- Upjohn Park
- Portage Creek Trailway
- Washington Square Senior Apartments
- Washington Square Neighborhood Preservation Program
- Reed Avenue Park
- Hispanic-Oriented Business Area
- Washington Writers' Academy
- Bronson Methodist Hospital



Portage Street Location Map

Portage Gateway District – East Michigan Avenue to Walnut Street

Crosstown District – Walnut Street to Collins Street

Washington Square Market District – Collins Street to Egleston Avenue

Reed Avenue District – Egleston Avenue to Alcott Avenue

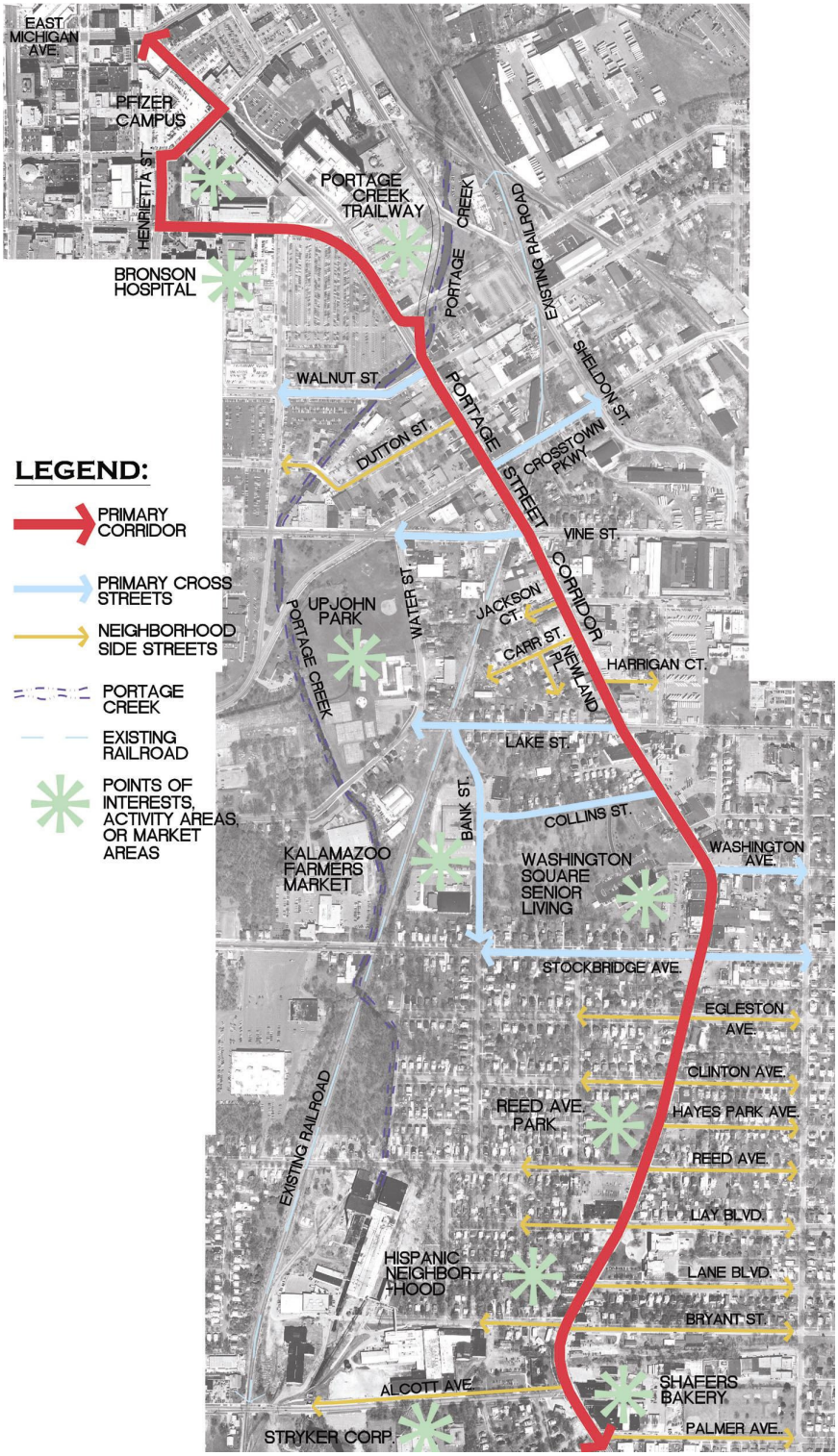
Existing Conditions

The existing conditions along Portage Street were reviewed and evaluated within the public right-of-way between East Michigan Avenue and Alcott Street. The basis for the review and evaluation is defined in "Appendix 8" of the report. Existing conditions were reviewed and evaluated related to their positive and negative elements, including potential impacts of those existing conditions on the streetscape design.

Site Elements reviewed:

- ✓ Street Lighting
- ✓ On-Street Parking
- ✓ Pedestrian Patterns
- ✓ Signage
- ✓ Overhead Utilities
- ✓ Trees
- ✓ View Corridors

The existing **street lighting** along Portage Street was reviewed and evaluated based upon Business Owner Survey results, visual observations, lighting level appearance, lamp type, mounting height, and potential impacts to the design process. Existing **on-street parking** along Portage Street was evaluated using data from the Business Owner Survey, and City-provided survey sheets. **Pedestrian patterns** were reviewed and evaluated based upon field observations, Business Owner Survey results, and data provided by Kalamazoo Area Transportation Services (KATS). Both directional and wayfinding (guiding the user to a particular area or district) **signage** were reviewed and evaluated based upon location, clarity, Business Owner Survey results, and visual impact. Speed limit sign analysis is being performed by the City Engineering Department. The **overhead wires** and utility poles were reviewed and evaluated based upon their locations, Business Owner Survey results, and visual and physical impacts. **Trees** were reviewed and evaluated based upon their location, and physical and visual impact. The existing **view corridors** and primary focal elements were reviewed and evaluated with recommendations outlined.



Portage Street Study Areas

The three tiers are illustrated to the left:

TIER ONE – Primary Corridor

TIER TWO – Primary Cross Street

TIER THREE – Neighborhood Side Streets

A general **summary of the findings** determined that higher levels of street lighting are needed and that business owners preferred pedestrian-scale historic-style ornamental poles and luminaries that would be similar to those used in the downtown. In the parking evaluation, it was determined that the existing on-street parking is less than the recommended standard width of 8', and the frequency of curb cuts made the current parking space layout haphazard, inefficient, and unsafe. Regionally-located off-street parking areas and side street parking is recommended to accommodate parking needs along Portage Street. The pedestrian patterns reveal a need to emphasize more visual crosswalks. Additional directional and wayfinding signs (guiding the user to a particular area or significant business or public institutions) are needed to visually direct both vehicular and pedestrian traffic to important destinations and districts within and outside the Portage Street Corridor.

Traffic Study

A traffic study was conducted to evaluate the impact traffic patterns have on the existing and future roadway system. Proposed streetscape improvements to the Portage Street Corridor are recommended when there were negative impacts found. The study includes the evaluation of nine signalized intersections: Walnut Street, Crosstown Parkway, Vine Street, Lake Street, Washington Avenue, Stockbridge Avenue, Reed Avenue, Bryant Street, and Alcott Street. **Traffic data** was provided by the Kalamazoo Area Transportation Study (KATS), the city of Kalamazoo, and field observations. The field review was conducted by Parsons Brinkerhoff of Michigan (PBM) as the traffic engineer for the project. Data reviewed included signal timings, bus stop locations, pedestrian counts, parking durations, crash data, lane configurations, traffic control devices, and speed limits. A complete traffic evaluation is provided in Appendix "9."

Three of the busiest intersections chosen by the City were reviewed and analyzed based on two percent traffic growth. Traffic modeling software "Synchro Version 6.0" was utilized to analyze the approximate year when those intersections would

require mitigation measures such as turning lanes or road widening and future streetscape expansion. With a two percent growth rate it was determined that the Portage Street corridor would require no mitigation measures until the year 2024.

Recommendations include making the crosswalks more visible, installing more speed limit signs, installing upgraded pedestrian signals and attaching them to the signal poles to minimize safety constraints, upgrading of signal heads at select intersections, installation of tactile warning pavement at all crosswalk ramp locations to accommodate vision-impaired pedestrians.

Project Grant Funding

The Portage Street Streetscape Master Plan is a project of the Edison Mainstreet Program and the city of Kalamazoo. The plan was funded by the Michigan Department of Transportation, the Local Initiatives Support Corporation, and the City of Kalamazoo. Gove Associates, a Kalamazoo-based consulting firm, was selected by a team of Portage Street stakeholders, and directed to respond to the needs expressed by business and property owners in the Edison Mainstreet project area.

Public Input and Participation

A critical component in the Portage Street Streetscape Master Plan process involved public participation and input. Four public meetings were held with the business owners and stakeholders from the project area. Additionally, a survey was conducted with the business and property owners.

Project Orientation Meeting: To begin the process, a kick-off meeting was conducted at the Edison Business Association with Portage Street business owners, Edison Mainstreet Committee Members, Edison Business Association representatives, and city of Kalamazoo business representatives. The purpose of the meeting was to review and discuss the goals and objectives for the streetscape design and to inform the public of the elements that make up a streetscape, such as traffic-calming devices, site furniture elements, wayfinding and directional signage, special paving treatment possibilities, and lighting styles.

Business and Property Owner Issues and Concerns: An integral step in the design process was to engage the Business and Property Owners in the planning process. This was achieved by conducting a survey with over 80 business/property owners, which included interviews over the phone, in person, or via e-mail of each business/property owner to gather results that identified the prevailing "Issues and Concerns" along the Portage Street Corridor.

General categories in the survey addressed were:

- Lighting levels and preferences
- Desires for additional trees or landscape plantings
- Owner willingness to maintain plantings
- "Design Theme" preferences
- Safety perceptions
- Parking
- Positive and negative elements
- Desire for "Street Furniture"
- Desire for landscaping with fencing
- Traffic concerns
- Seating/benches
- Trash receptacles
- Crime concerns
- Signage
- Sidewalk repair
- Bike lanes

General summary of the survey results:

- Lighting Levels are not adequate.
- New "Historic Style" pole lights are desired.
- Most business owners prefer trees or landscaping outside their business and would maintain them.
- Parking is generally adequate.
- Most of the customers use off-street parking.
- Some Positive Elements of Portage Street mentioned were the Washington Square Library, the Portage Street Fire Station, Pfizer, Hoekstra's Hardware, Town and Country Supermarket, Hispanic-Oriented Business area,

Washington Writers' Academy, Family Dollar, and Grapevine Furniture.

- Some Negative Elements of Portage Street include poorly-maintained streets and buildings, vacant buildings, adult businesses, overhead wires and poles, vehicular speed and traffic, and signal timings.
- Most prefer fencing with landscaping to improve views of the parking lots.
- Most respondents want trash receptacles and indicated they were willing to empty them.
- A majority response was there is no room for more "On Street" parking.
- Most respondents note there is not enough room and the street is too dangerous for bike lanes.
- Traffic signals - primary comments note too much "stop and go" traffic.
- Crime - most feel it is a big issue. Comments noted were a need for more police patrols, harsher penalties, curfews, and lighting. Primary crimes noted were vandalism, prostitution, and shoplifting.
- Signage - responses note a need for more directional and wayfinding signs.

Section 2

Streetscape Master Plan

INTRODUCTION AND BACKGROUND

The initiation of a Streetscape Master Plan was originally conceived in 2000, when both the Edison Business Association (EBA) and the Edison Neighborhood Association (ENA) became concerned about the decline in economic activity and private investment, decline in the condition and upkeep of buildings, and a general decline in the overall appearance of Portage Street. The Edison Neighborhood is the largest and most culturally diverse neighborhood in Kalamazoo, yet lacks basic neighborhood serving businesses.

With these conditions realized by city stakeholders, Downtown Tomorrow Incorporated (DTI), and the EBA, with support from the ENA, began working with stakeholders to create a Mainstreet Program for Portage Street, which would be sponsored by the Local Initiatives Support Corporation (LISC). The Edison Mainstreet Program was founded in 2001.

A proposed strategy was to develop a streetscape improvement plan that would support ongoing economic development activity in the project area. Additionally, the plan would increase linkages amongst public facilities and other related projects, which in turn would spur more economic growth and new business opportunities along the Portage Street corridor. Additionally, the plan would address various existing roadway conditions, land uses, motorized and non-motorized traffic, and multiple project goals to enhance current Portage Street uses and desired future uses.

City of Kalamazoo and the Portage Street Corridor

Kalamazoo is located in southwest Michigan, midway between Chicago and Detroit. The city is roughly 25 square miles in area, and has a population of approximately 80,000. The City of Kalamazoo's downtown is surrounded by seven core neighborhoods, including the Edison neighborhood to the southeast. Portage Street, the Edison neighborhood's primary commercial corridor, runs north-south and connects the Kalamazoo-Battle Creek International Airport and Interstate 94 to downtown, and is considered a principal gateway into the city from the south.

Portage Street also connects the northern and southern campuses of one of the city's largest employers, Pfizer Incorporated. Portage Street is also considered an alternative route to another of the city's largest employers, Bronson Methodist Hospital. The Portage Street commercial corridor includes approximately 75 businesses, ranging from retail to light industrial. Approximately 20,000 cars

travel Portage Street each day, in addition to Metro Transit buses, bicyclists, wheelchair users, and walkers.

The first commercial center outside of downtown Kalamazoo, the Portage Street corridor, was once a thriving hub of commercial activity. Portage Street's decline began with the advent of suburban shopping malls and strip malls, and is often linked to the installation of various adult business uses in its former central commercial node, Washington Square. The street is now characterized by a proliferation of underutilized buildings, and weaker small businesses. Portage Street's economic challenges are worsened by its streetscape environment, which inefficiently serves automobile traffic, and pedestrians and other non-motorized transportation users. Narrow and failing sidewalks; a proliferation of utility poles; a lack of bicycle lanes, street furniture, lighting, and other pedestrian amenities; bus shelters; and landscaping help create an environment unfriendly for pedestrian and non-motorized travel and retail uses. Disorganized on-street parking and an underutilized municipal surface parking lot discourage retail uses and frustrate automobile travelers. Utility poles further distract automobile travelers, and clutter the "skyscape" appearance.

Edison Mainstreet Program

One of the priority projects of the City of Kalamazoo's Partners Building Community initiative, the Edison Mainstreet Program exists to spearhead commercial revitalization of the Portage Street corridor. Edison Mainstreet is a local site of the national Center for Commercial Revitalization, which utilizes a four-point revitalization approach in the broad areas of organization, economic restructuring, design, and promotions. Activities are currently being undertaken in each of the four-point areas. Edison Mainstreet is a collaborative grassroots-based effort supported by neighborhood groups, local small businesses and large corporations, lending institutions, Downtown Tomorrow Incorporated, and other stakeholders. As such, many groups' interests were considered in project planning.

Efforts Currently Underway

Edison Mainstreet Program Activity

Across the project area, a number of activities to spur economic growth have been initiated in 2002 and 2003. These include design guidelines for the corridor, which attempt to set a minimum standard for all buildings in the Portage Street corridor, yet are also particularly applicable to the cluster of historic properties located in Washington Square. The guidelines are based upon those developed by EDAW for Kalamazoo's central business district, and include a streetscape

section. This section should be considered in the development of Portage Street's plan.

Edison Mainstreet has also conducted a preliminary traffic analysis including pedestrian counts; vehicle turning movements and approach counts; parking use, duration, and location review; potential areas for additional off-street parking; right-of-way review; sidewalk and curblawn/curbwalk width; crash history; and types of businesses, land use, and zoning.

Edison Mainstreet has also developed a Portage Street Strategic Vision plan for the corridor, which included visioning workshops with stakeholders such as residents, business owners, Edison Mainstreet board members, Downtown Kalamazoo Incorporated representatives, and the city of Kalamazoo staff. The visioning plan identified four distinct "districts" or neighborhood commercial nodes within the project area and provided a nickname for each, for ease of identification and reference purposes. An analysis was completed for each district area, which included a review of the existing businesses, existing building configuration and it relation to the street, existing and potential customer base, as well as desired future uses. Complementary streetscape treatments were recommended for each district, and should be considered by the design team for their recommendations. Finally, Edison Mainstreet has completed a commercial corridor market analysis, the conclusions of which should be considered in land use / streetscape decisions.

A Strategic Market Analysis Report was also developed in March of 2003 for the Edison Mainstreet Program Committee to determine the target market that is most appropriate for the various districts within the Primary Corridor. The Market Study identified the business and residential mix and land uses along the Primary Corridor. It also analyzed the demographic profile and provided recommendations and a strategy for implementation.

Streetscape Study Area

The project study area includes a two-mile portion of Portage Street referred to as ***"Tier One - Portage Street Primary Corridor,"*** which is that section of Portage Street that is bounded by East Michigan Avenue to the north and Alcott Street to the south. Four distinct districts or commercial nodes make up this corridor. Additionally, the second study area is referred to as ***"Tier Two - Primary Cross Streets,"*** which includes eight important cross streets that in most cases have a direct primary linkage to related activity areas adjacent to Portage Street. The

third study area is referred to as ***"Tier Three - Neighborhood Side Streets"*** which includes fifteen side streets within the streetscape study areas.

The *"**Tier One - Portage Street Primary Corridor**"* study area includes four distinct districts that have an overall common design theme and standard design elements that are used throughout the Primary Corridor. However, each of the districts has a distinct design theme variation, which is described in Section 3.

The four specific districts within the **"Primary Corridor"** are:

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Additionally, there are two other levels of design evaluated in this report: "Primary Cross Streets" and "Neighborhood Side Streets."

Therefore, an important part of the plan focus is to integrate the primary cross streets and the neighborhood side streets, using some of the standard concepts from the Primary Corridor.

Goals and Objectives

The goal of this project was to identify physical improvements to the Portage Corridor that encourage, enhance and support economic revitalization of the project area, both now and in the future. The Edison Mainstreet Program has been ongoing for many years and began with the development of the following design principles, goals and objectives for the design of the Portage Street Corridor:

- Enhance retail uses in key areas,
- Enhance distinct identity for key districts; while providing for continuity of design and improved aesthetic appearance,
- Decrease automobile speed at key intersections, while improving traffic flow,

- Improve pedestrian, wheelchair, and non-motorized access and safety, especially in key retail areas,
- Improve parking efficiency,
- Address roadway engineering problems,
- Increase linkages between public facilities,
- Crime reduction through implementation of Crime Prevention Through Environmental Design (CPTED) principles,
- Minimize driver distractions through consistent visual elements and by undergrounding utilities,
- Maximize public and stakeholder input and creatively address multiple and conflicting stakeholder interests and needs,

The primary goals, objectives and design principles were applied to the study area during the existing conditions evaluation, traffic impact study, and master planning process in an effort to develop a plan for the corridor with realistic and achievable direction.

Related Projects and Activities

The Streetscape Study also considers important linkages to Portage Street including past, present and future planning projects that will be linked visually and physically to the Portage Street corridor. The following is a list of some of those important projects and linkages, which are described below:

Related Projects

- Two-Way Traffic
- Pfizer Incorporated – Campus Master Plans
- Washington Square Area Plan
- Central City Parking Lot #5
- "Seven Acres" Housing Development
- Kalamazoo Farmers' Market and Upjohn Park
- Portage Creek Trailway
- Washington Square Senior Apartments

Related Activity Areas

- Washington Square Neighborhood Preservation Program
- Reed Avenue Park
- Hispanic-Oriented Street Business Area
- Washington Writers' Academy
- Bronson Methodist Hospital

Related Projects

Various projects with related design, planning, and engineering considerations are being undertaken by Edison Mainstreet and other community partners'. These projects are in varying stages of planning and implementation, as follows:

Two-Way Traffic: The City of Kalamazoo and the Downtown Development Authority are completing plans for converting major downtown streets from one-way to two-way traffic. This includes plans for streetscape enhancements near the Portage Street project area.

Pfizer Incorporated – Campus Master Plan: Expansion or consolidation plans may impact Pfizer Incorporated's downtown campus, which anchors Portage Street's north end. Pfizer Corporation has also expressed interest in the connectivity between its southern, Portage Street campus in Portage, and the northern downtown campus.

Washington Square Area Plan: A comprehensive plan including several projects relevant to both the public right-of-way and private property including acquisition and redevelopment of buildings currently housing adult entertainment businesses.

Central City Parking Lot 5: The Downtown Development Authority (DDA) in partnership with the city of Kalamazoo has reconstructed this lot located on the east side of Washington Square. This lot serves as the only municipal parking lot for the Portage Street commercial corridor and the Edison neighborhood.

"Seven Acres" Housing Development: The City of Kalamazoo has funded public infrastructure improvements to support the development of approximately 28 market-rate homes in the Edison Neighborhood. In addition to improvements to existing, and provision of new residential streets, the City's support will include sidewalks, pedestrian lighting, pedestrian walking paths, landscaping, and street furniture.

Kalamazoo Farmers' Market and Upjohn Park: These two City-owned developments are undergoing improvements, which began in 2003. Located just west of Portage Street, the Farmers' Market draws 3,000-5,000 visitors per week during the peak summer season; however, few of these visitors venture to Portage Street. A $5 million plan for Upjohn Park has recently been completed. Common infrastructure improvements include sidewalks, pedestrian lighting, pedestrian walking paths, landscaping, and street furniture.

Portage Creek Trailway: The City of Kalamazoo has sought funding for a corridor study for the Portage Creek Trailway, which runs through Upjohn Park and crosses Portage Street.

Washington Square Senior Living Cooperative: Improvements to private property situated between Public Parking Lot No. 5 and the Kalamazoo Farmers' Market will include sidewalks, pedestrian lighting, pedestrian walking paths, landscaping, and fencing.

Washington Square Neighborhood Preservation Program: Housing improvements and neighborhood beautification in the Washington Square area.

Related Activity Areas

Reed Avenue Park: The City of Kalamazoo would like to establish a program for new park equipment, seating, and lighting that has a strong design relationship to the new Portage Street Streetscape Master Plan.

Hispanic-Oriented Business Area: This is a culturally rich section of the Reed Avenue District that reflects the Hispanic heritage of the Edison Neighborhood from Bryant Street to Lane Street. A mix of Hispanic shops are present such as La Mexicana Market, La Azteca Bakery, Maria's Hair Salon, Lucy's Jewelry Shop, and a Music Shop. In addition to these Hispanic businesses, the neighborhood has a prominent Hispanic population established.

Washington Writers' Academy: The Washington Writers' Academy has an ethnically diverse student population. As a boundary magnet school, there has been a tremendous transformation in students. They have become a community of writers engaged in the art of theme writing and publishing. Washington Writers' Academy is located on Portage Street between Lane Boulevard and Lay Boulevard; its playground fronts Portage Street.

Bronson Methodist Hospital: Located just east of the Portage Street / Walnut Street intersection on Johns Street, Bronson Methodist Hospital plays a primary role in the healthcare system for both the City of Kalamazoo and all of southwest Michigan. They are pursing possible expansion opportunities and linkages to the Portage Street Streetscape Master Plan.

Design elements common amongst each of these projects include pedestrian lighting, sidewalks, landscaping, fencing, street furniture, decorative paving patterns, crosswalks, pedestrian paths, and wayfinding signage, among others.

TIER ONE – "PRIMARY CORRIDOR"

The Tier One "Primary Corridor" is defined as the street and pedestrian areas within the public right-of-way along Portage Street, beginning with East Michigan Avenue traveling south to Alcott Street, the southern boundary of the corridor.

The Primary Corridor is made up of four districts that follow along Portage Street from north to south. Beginning at the north end, the areas include the "***The Portage Gateway District*** " - the section of Portage Street between East Michigan Avenue and Walnut Street; "***The Crosstown District***" - the section of Portage Street between Walnut Street and Collins Street; "***The Washington Square Market District***" - the section of Portage Street between Collins Street and Egleston Avenue; and ***"The Reed Avenue District"*** - the section of Portage Street between Egleston Avenue and Alcott Street. The Edison Mainstreet Design Committee formulated these district names that are used for reference purposes only.

OVERALL CORRIDOR DESIGN THEME

The overall design theme for the Tier One "Primary Corridor" was created with the purpose of unifying the existing conditions found throughout the Portage Street corridor. This theme is achieved through the use of common design elements, which become the tools to lend a sense of order, rhythm, and harmony, ultimately creating a friendly and safe environment that encourages pedestrians to shop, walk, and socialize with neighbors and friends. The common design elements and standards used are described below.

Pedestrian Sidewalk Zone

The "Pedestrian Sidewalk Zone" is defined as the area between the roadway curb and the public right-of-way, property line, or building face. It is typical for the public right-of-way to coincide with the edge of the existing public sidewalk. One of the primary goals of the streetscape design is to create a safe and friendly pedestrian environment. This is accomplished through an overall design theme that utilizes a combination of common design elements, to establish a rhythm and sense of order within the pedestrian zone.

An important factor is having a 9.5'-10' wide space sidewalk zone, providing a comfortable separation for pedestrians from vehicular traffic.

In addition, a rhythmic sequence of lights, trees, and paving treatments blend together to create a visual and physical separation between the pedestrian

sidewalk zone and the vehicular roadway zone. This separation is a key component to promote a safe and friendly environment along Portage Street.

Paving Treatments, Patterns, Shapes and Color Ranges

A standard palette of paving patterns, shapes, and color ranges has been developed to promote a consistent unifying theme throughout the Primary Corridor Study Area.

Standard Paver Color Range - The selection for all paver types will be a blend of the "Terra Cotta" and "Rustic Red" standard colors as illustrated below.

Standard Paver Shape - Composed of rectangular 4"x 8" Holland Pavers placed as a perimeter border paver surrounding a middle field of pavers made up of 5" x 9" Unidecor or hexagonal shaped pavers.

Standard Paving Pattern - Selection for the pedestrian paving treatments and the crosswalk paving treatments include a single band of Holland Pavers as a soldier course perimeter border that surrounds a field of Unidecor Pavers laid in a Herringbone pattern.

Border Paver - Rustic Red Color Holland Paver - 4" x 8" (Shown for color and shape only)

Field Pavers - Terra Cotta Color Unidecor Paver - 5" x 9" (Shown for color and shape only)

Paver Patterns - Unidecor pavers laid in a herringbone pattern with 4"x 8" Holland Pavers used as a soldier course perimeter border (Shown for pattern only).

Crosswalk Paving Treatment

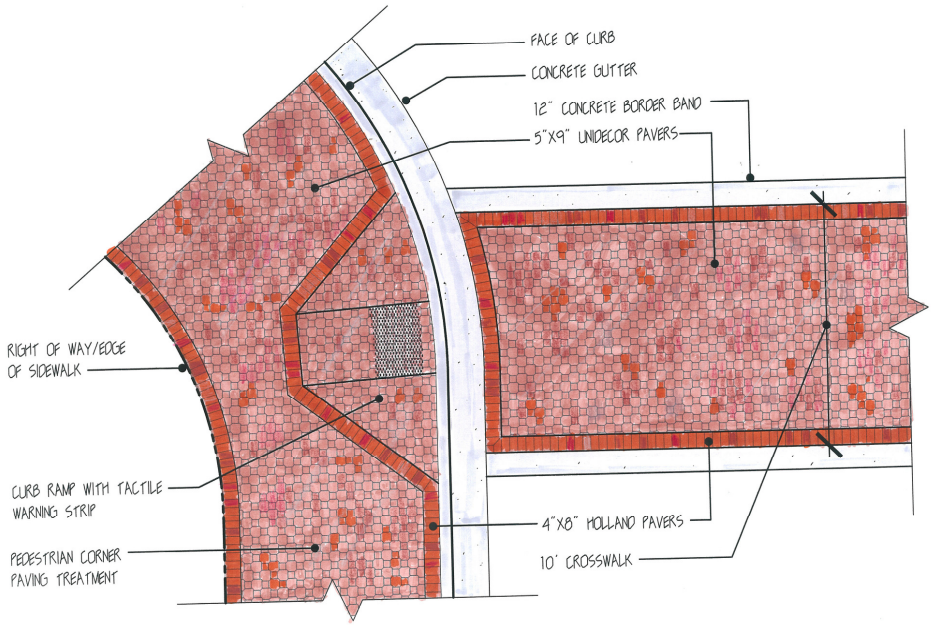
The typical crosswalk paving treatment for signalized intersections includes three different design alternatives, two of which will match the standard color range "Terra Cotta" and "Rustic Red" for pedestrian zones along the Primary Corridor. The three types of crosswalk paving treatments are as follows:

1) The first option includes colored concrete pavers, bordered on both sides by a 12" wide non-colored concrete border band. Due to heavy vehicular traffic, this option requires an 8" concrete base to avoid settling of the pavers.

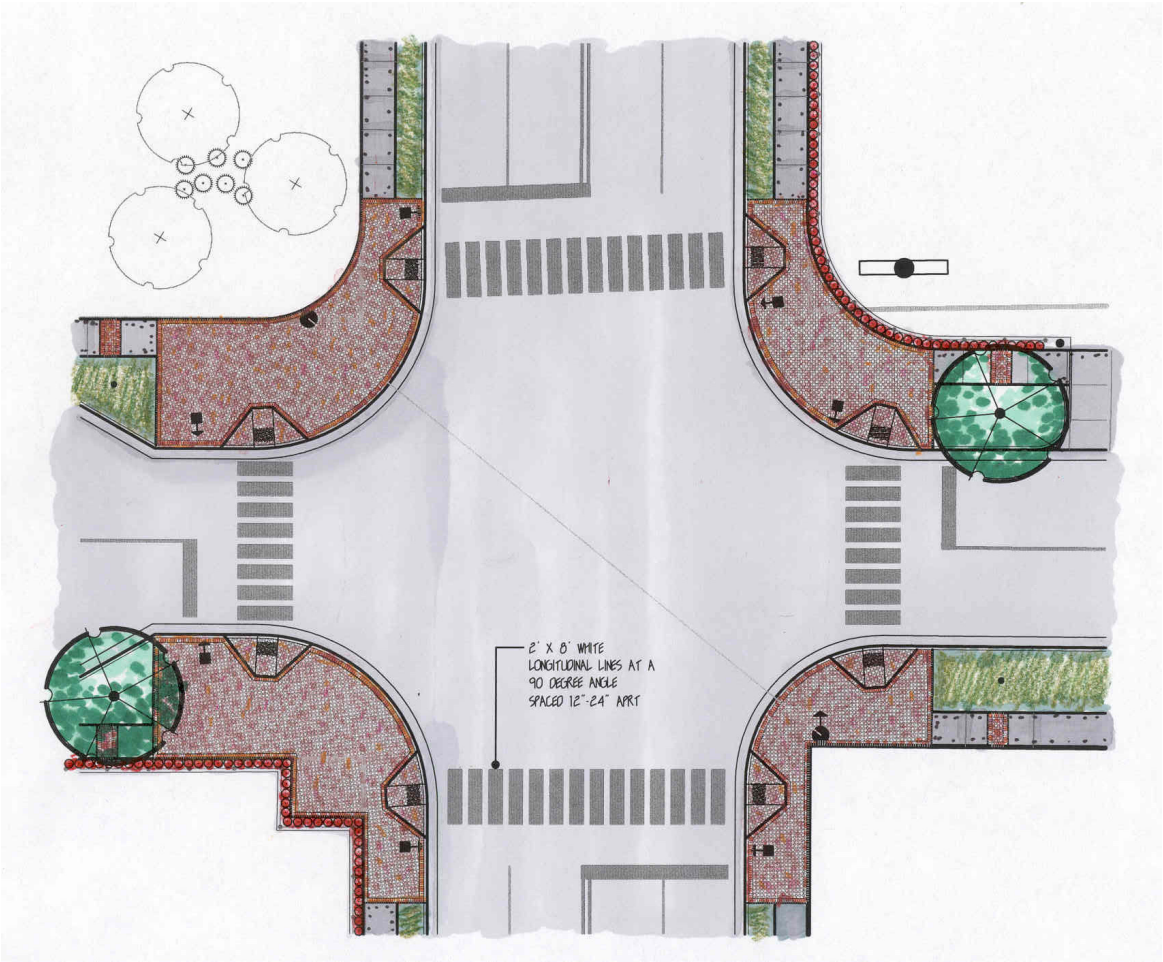
2) The second option includes cast-in-place colored concrete with a broom finish, bordered on both sides by a 12" wide non-colored concrete band. The color used for the concrete shall match the standard color paver range.

3) The third option includes a visually permanent striped crosswalk with 2' x 8' white, bold block striping.

The following illustration is an example of a typical crosswalk section with colored concrete pavers.



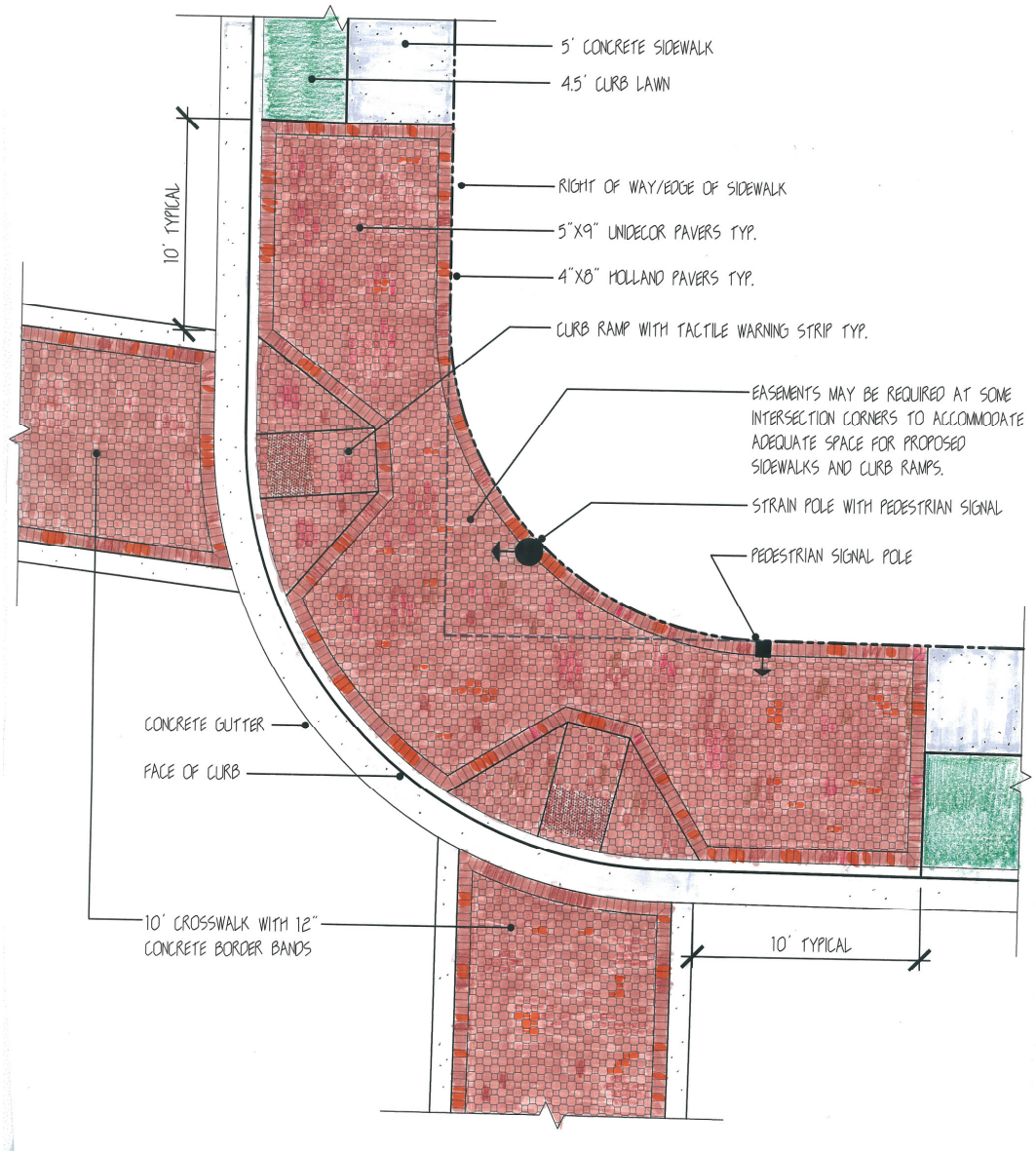
Crosswalk paving treatments shall match the adjacent pedestrian corner paving treatment and shall include 12" concrete border bands. One alternative is colored concrete pavers; a second alternative is colored poured concrete.



One crosswalk alternative is to stripe the crosswalks per MDOT standards with 2' x 8' blocks spaced 12"-24" apart as shown.

Intersection Corner Paving Treatment

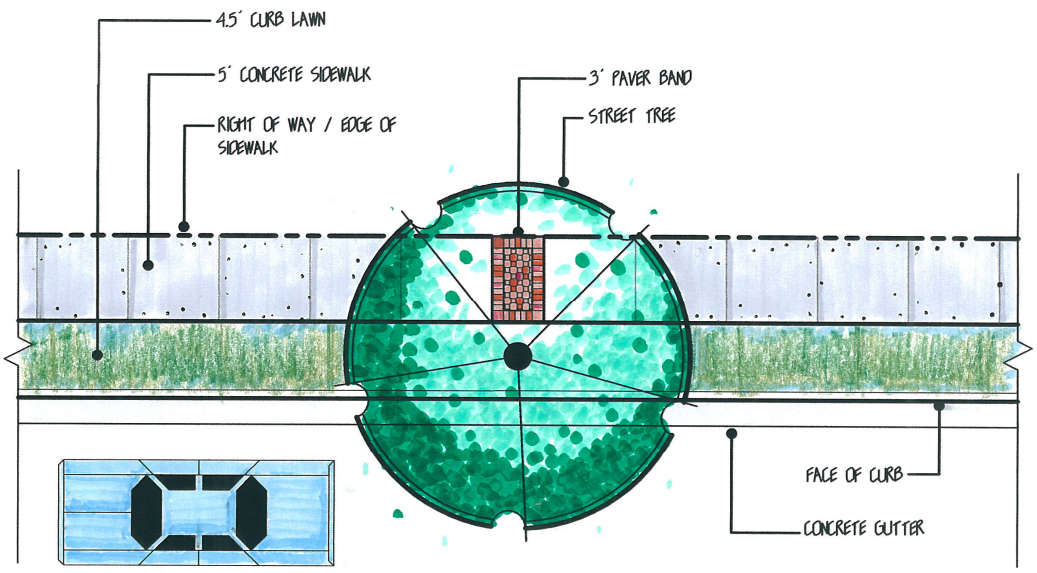
The four corners of signalized intersections (and some non-signalized intersections) will be treated with colored concrete pavers. The color, shape and pattern of the pavers shall match the standard palette described above. The limits of intersection corner paver treatments extend to the city right-of-way and also 10' offset from the edge of the pedestrian crosswalk as illustrated in the diagram below. Note that easements may be required at some intersection corners to accommodate adequate space for proposed paving and curb ramps that extend beyond the limits of the public right-of-way.



Typical Intersection Corner Treatments

Sidewalk Paving Treatments

The physical boundaries of all sidewalk paving treatments are marked by the outside edge of the existing sidewalks along the roadway. However, there are some cases where easements will be required from property owners to achieve the minimum of 9.5' wide pedestrian sidewalk zone.



Sidewalk Paving Treatment

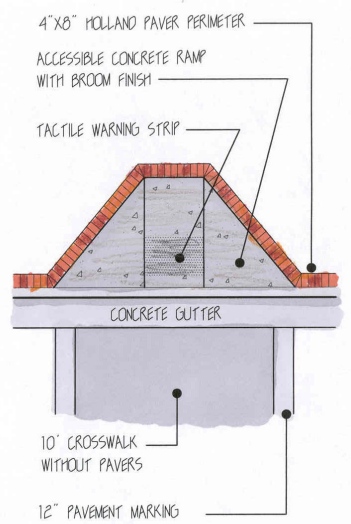
Curb Ramps

Within the Portage Street Primary Corridor, existing pedestrian curb ramps at signalized and non-signalized intersections are unsafe and are either too steep or too narrow, undefined or nonexistent, and do not meet required ADA standards. All new ramps should meet ADA standards including tactile warning strips. The new ramps at signalized intersections will match the paving treatment alternative that is selected. These ramps will include tactile warning strips.

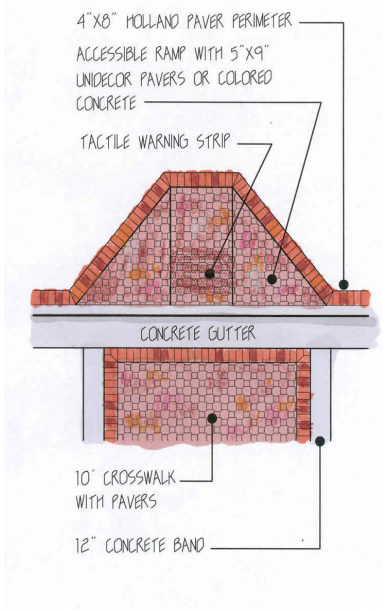
Non-signalized pedestrian crossings without colored pedestrian paving treatments as indicated on the plans will receive standard concrete curb ramps that align with the pedestrian sidewalks. Pedestrian crosswalks are centered with the curb ramps.

These ramps will be cast-in-place concrete with a broom finish and will include tactile warning strips, which will require an ADA-approved concrete form. All curb ramps are required to comply with the American Disabilities Act (ADA) and the Americans with Disabilities Act Accessibility Guidelines (ADAAG).

Placement of the crosswalks and curb ramps will comply with the Michigan Department of Transportation (MDOT) standards referenced in the Manual of Uniform Traffic Control Devices Manual (MUTCD).



Curb ramps at signalized intersections



Curb ramps at non-signalized Intersections.

Trees and Landscaping

A standard planting palette was chosen for the Primary Corridor. This planting palette is divided into four categories that include: Street Trees, Flowering Trees, Shrubs, and Perennials.

The planting design palette took into consideration the feedback provided by the Portage Street business owners, design presentation workshops, meetings with Consumers Energy, and meetings with city representatives such as the City forester, the City planner, the City engineer, and the maintenance department.

The following was noted about the existing and proposed trees and plantings for Portage Street:

Existing Conditions / Public Input

- Currently, existing trees within the public right-of-way are primarily found in the Reed Avenue District adjacent to the Alcott Street intersection and along Portage Street from Reed Avenue to Stockbridge Avenue. The Edison Business Association has planted trees primarily along the Reed Avenue District area and along secondary streets.
- Most business owners preferred new trees and plantings along Portage Street and would be willing to water and maintain them.
- Most business owners with parking that fronts Portage Street preferred landscaping or a fence to soften views.
- There was a preference for the Portage Street planting palette to include a percentage of native species.

Design Palette and Description

As a common planting theme for each district within the Primary Corridor, street trees or flowering trees are spaced 80' on center on each side of the roadway.

Most of the varieties of trees, shrubs and perennials selected for the planting palette were selected based upon their drought and salt tolerance and lower maintenance requirements. Additionally, two or more varieties of trees are typically recommended to provide plant diversity, which creates a natural defense against diseases and insect occurrences. Finally, Michigan native plant varieties make up approximately 30 percent of the Portage Streetscape planting palette. The business owner survey revealed that most Portage Street business owners would provide watering and care for the new plantings.

Portage Street Primary Corridor Planting Palette*

Trees

Greenspire Littleleaf Linden – Tilia cordata 'Greenspire'
Skyline Honeylocust – Gleditsia Triacanthos Inermis 'Skyline'
Japanese Zelkova- Zelkova serrata ' Village Green'
Shingle Oak- Quercus imbricaria
'Emerald Queen' Norway Maple – Acer platanoides 'Emerald Queen'
'Northwood' Red Maple – Acer rubrum 'Northwood'

Flowering Trees

'Forest Pansy' Eastern Redbud – Cercis Canadensis 'Forest Pansy'
'Ballerina' Serviceberry- Amelanchier Canadensis 'Ballerina'
Zumi Crabapple- Malus calocarpa 'Zumi'

Kwanzan Cherry- Prunus serrulata 'Kwanzan'
Cleveland Select Pear- Pyrus calleryana 'Cleveland Select'
Fringe Tree- Chionanthus virginicus
Golden Raintree – Koelreuteria paniculata
Radiant Crabapple – Malus adstringens 'Radiant'

Shrubs

Arrowwood Viburnum – Viburnum dentatum
Gold Flame Spirea – Spirea japonica 'Gold Flame'
Dwarf Burning Bush –Euonymus alatus 'compactus'
Japanese Yew – Taxus x media 'Wards'
Yucca Variegated – Yucca filamentosa 'variegata' or 'Golden Sword'
Dwarf American Cranberry Bush – Viburnum opulus 'nanum'
Arborvitae –Thuja occidentalis
Wild Black Current – Ribes Americana
Shrubby Cinquefoil – Potentilla fruiticosa
Red Osier Dogwood – Cornus stolonifera
Ninebark – Physocarpus opulifolius

Perennials

Autumn Joy Sedum – Sedum erythrostichum 'Autumn Joy'
Black Eyed Susans – Rudbeckia hirta 'Goldstrum'
Blue Fescue Grass – Festuca ovina 'Glauca'
Dwarf Fountain Grass – Pennisetum alopectrodides 'Hamelin'
Dwarf Variegated Maiden Grass – Miscanthus sinensis 'Morning Light'
Moonbeam Coreopsis – Coreopsis verticillata 'Moonbeam'
Stella de Oro Daylilly – Hemerocallis 'Stella de Oro'
Variegated Sedum – Sedum 'Frosty Morn'

*Please refer to Appendix 2 for Tree Planting

Roadway Lane Width And Alignment

In order to provide a more safe vehicular traffic flow along Portage Street, both roadway lane width and alignment geometry were analyzed.

An important recommendation is to standardize the roadway lane widths to provide consistently spaced-lanes, since the existing lane width conditions vary between 9 and 13' wide. The new lane width recommendation is 10.5', where the minimum pedestrian sidewalk zone width of 9.5' could be maintained.

Additional sidewalk width and curb lawn width (approximately 24" to 48") is added to widen the Pedestrian Sidewalk Zone by establishing the new lane width standard and relocating the unsafe on-street parking conditions off of Portage Street. Additional signal improvement and lane recommendations are outlined in the Traffic Study (Appendix 3).

On-Street Parking

Currently, on-street parking along the Portage Street Primary Corridor varies in width between 5' and 7', which is considerably less than the 8' standard typically used for parallel parking. This condition is unsafe for pedestrians due to the narrow widths of these spaces, combined with the high frequency of curb cuts, which break up the quantity of usable spaces available for parking.

To address this unsafe on-street parking condition and to provide the 10' minimum width for the Pedestrian Sidewalk Zone. On-street parking spaces will be relocated to side streets, and supplemented by shared off-street parking where appropriate.

A separate parking feasibility study will be conducted outside of the scope of this study to review potential parking lot locations or a combination of "shared use" private lots or acquired parcels that can be converted to new parking areas.

Street Furniture

The goal for the selection of the design palette was to choose site furniture that would achieve a uniform appearance that would be unique to the Portage Street Primary Corridor.

The street furniture selection took into consideration the feedback provided by the Portage Street Business Owners Survey, design presentation workshops, meetings with the Kalamazoo Metro Transit Authority, and results from the street evaluation and analysis of Portage Street's existing conditions.

The following was noted about existing and proposed street furniture for Portage Street:

Existing Conditions / Public Feedback

- Existing Conditions: Currently, no bench seating, trash receptacles, planter pots, or bus shelters exist within the public right-of-way along the Portage Street Primary Corridor.
- Bench Seating: Survey results and meeting discussions indicated that most respondents would not like bench seating along Portage Street, noting that the new seating would encourage loitering and would negatively affect business along the street.
- Trash Receptacles: Survey results indicated that most business owners would like new trash receptacles and more than half indicated they would empty the receptacles when needed.
- Planter Pots: Public meeting feedback indicated that planter pots and flowers were desired, but pots would need to be designed to prevent theft.
- Bollards: Were viewed as a good idea to protect any new fencing additions. Bollards used to protect ornamental fences and bike rack locations were noted.
- Bus Shelters: Currently, there are many bus stops, but no bus shelters along the Portage Street Primary Corridor. However, in meetings with the Kalamazoo Metro Transit Authority (KMTA), they indicated that they are receptive to the addition of new bus shelters at current bus stop locations that receive higher frequency of bus passengers. Some of the bus stop locations that were discussed included the Town & Country Supermarket / Reed Avenue Park, the Family Dollar location, the Miller Davis location, and one location for the Pfizer Campus.
- Ornamental Fencing: Survey results indicated that most businesses would like new ornamental fencing used with landscaping to improve views of their parking lots. Ornamental black metal fencing of a 48" height is recommended as an aesthetic barrier for parking by the city's code and zoning ordinance for new commercial developments. Fencing additions will in many cases require property-owner easements, because most fencing locations will be over the public right-of-way for approximately 18" to 24", and at intersection corners, the fencing easements will be greater than 24" to accomplish a reasonable space for landscaping and fencing.

- Bike Racks: Public meeting discussions indicated that bike racks would be beneficial. Town & Country Supermarket area and the Family Dollar store were identified as key locations.

Design Palette and Description

The common design theme for the street furniture is the color, style, material, and location identified for each element along the street. Each district within the Primary Corridor will receive a consistent treatment of these design elements, however, high-activity retail niches or special focal points will receive special emphasis.

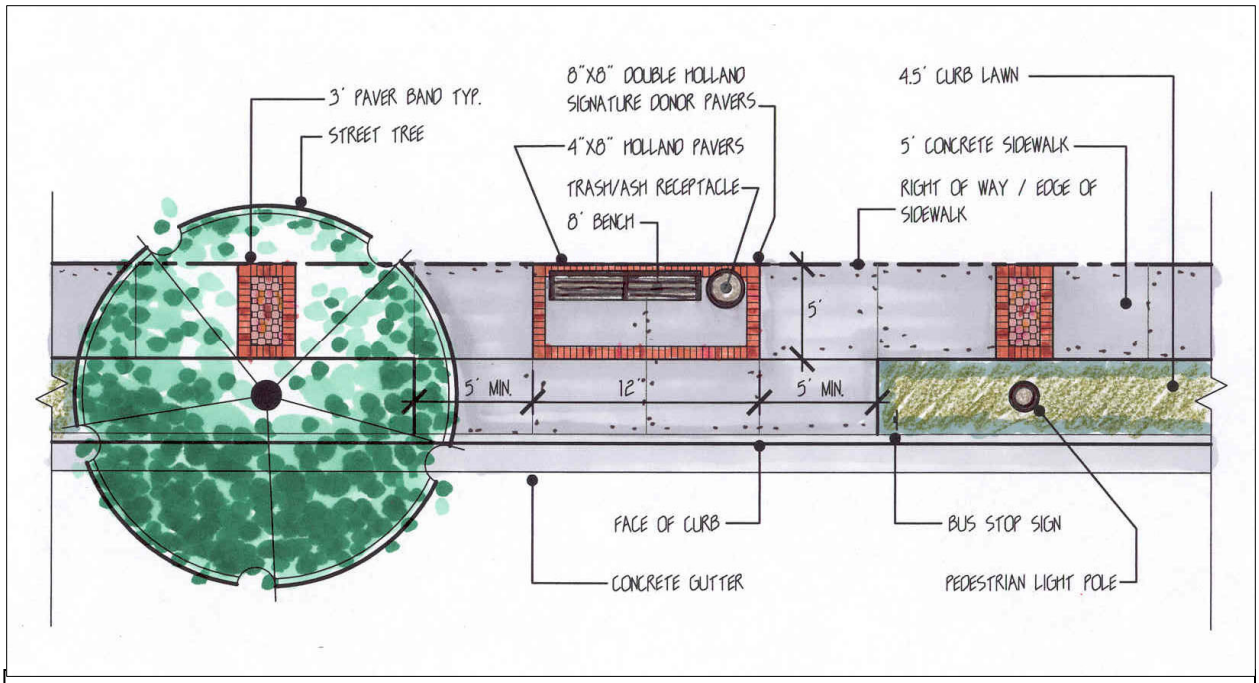
The site furniture design palette is composed of the following design elements: benches, trash receptacles, planter pots, bollards, bus shelters, ornamental fencing, and bike racks, and are described below.

Benches are recommended in each district at bus stop locations where the pedestrian sidewalk zone is wide enough to allow adequate pedestrian circulation both to and around these bus stop locations. The minimum clearance required per ADA guidelines is 3' clearance for wheelchairs. Portage Street business owners did not desire additional bench locations citing concerns that the use of benches may encourage loitering.

Historic Style Bench – 8' long bench with center arm.

The bench **style, size, and color** chosen is a historic style, "Plainwell Series", 8' wide black aluminum bench with a center arm. This bench is large enough to accommodate up to four users, but the center arm will prevent overnight guests. This bench style is to be used throughout the Primary Corridor.

Benches at bus stop locations will also be defined with paving treatment bands that match each district paving treatment design. An example of a bus stop bench paving treatment is illustrated in the image below.

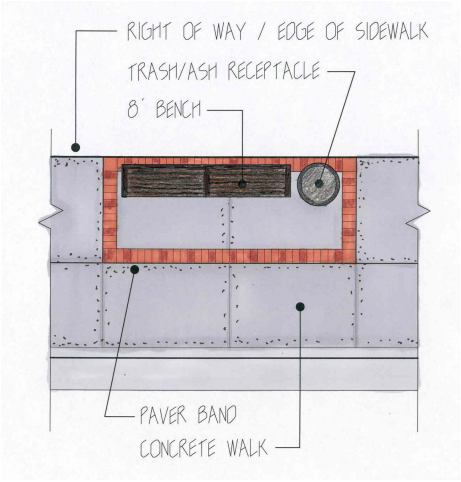


Benches are located at each bus stop where adequate pedestrian circulation can be accomplished

Trash Receptacles are typically found in each district at each bus stop and bush shelter location adjacent to the bench, and are provided to allow bus users to deposit their trash and smoke while waiting for the Metro Transit bus to arrive (refer to the "Bench" description section above for location of trash receptacles).

The trash receptacle's **style, size, and color** is a historic style "Plainwell Series," 35 gallon, 30" diameter, 44.5" tall, black aluminum trash receptacle, which shall match the "Plainwell Series" bench described above.

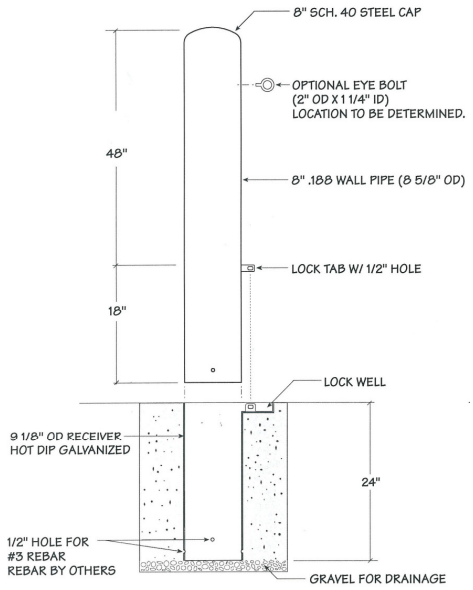
Trash receptacle style matches the bench style.



Trash receptacles are found at all bus stop locations.

Planter Pots are unique to the Washington Square Market District and described later in this section.

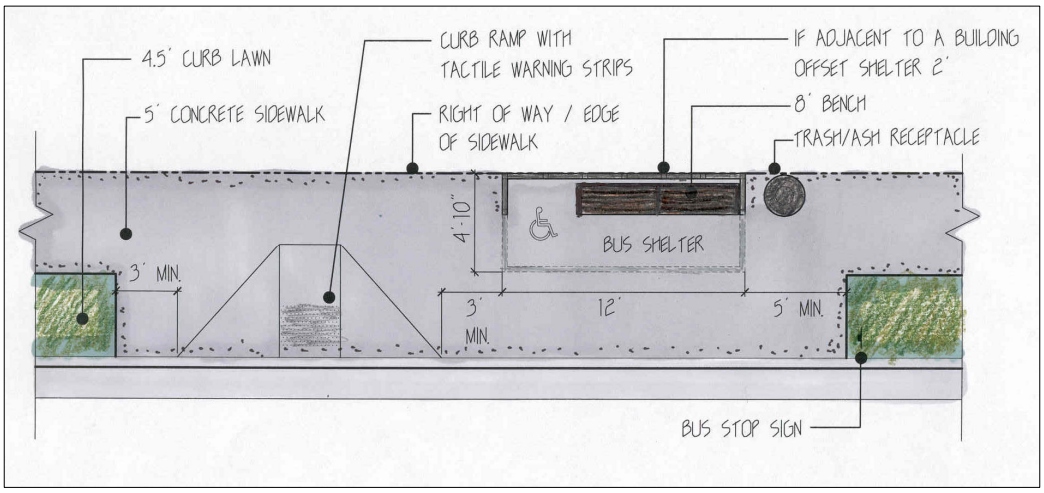
Bollards are used in the streetscape plan primarily in the Crosstown District and at intersections where they are needed to protect new ornamental fencing from truck traffic. Due to the limited public right-of-way space, the bollards will require an easement from the property owner since their location is approximately 18" to 24" past the public right-of-way.



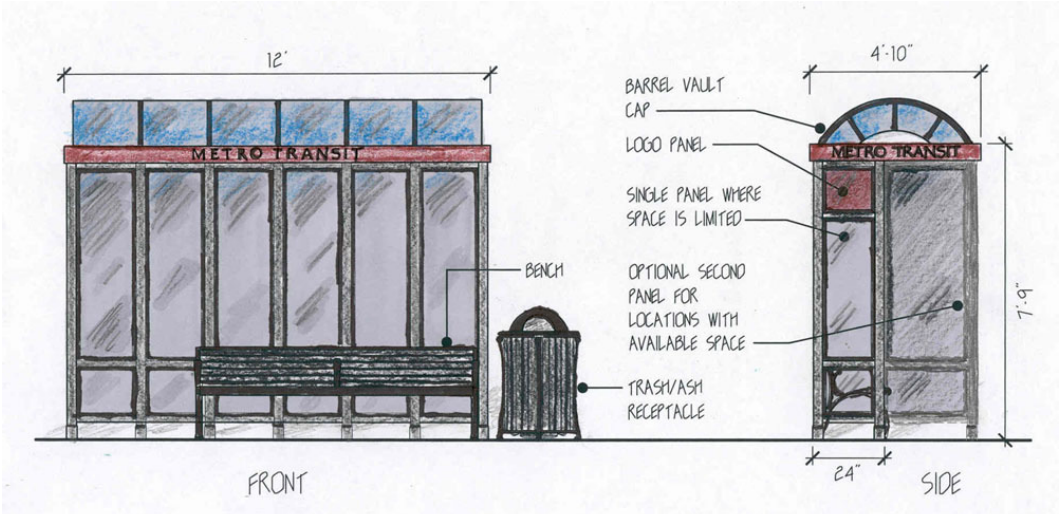
A removable bollard provides flexibility to business owners.

The bollard **style, size, and color** is a simple, low-maintenance 8" diameter, 48" tall, black metal bollard; set in an in-ground metal sleeve which is set in concrete. The bollard can be removed from the sleeve and re-locked in place to accommodate the business owner's specific day-to-day delivery needs.

Bus Shelters are used in the streetscape plan primarily where there is a high incidence of traffic generated by businesses such as the Town & Country Supermarket, Family Dollar, and just north of the Lake Street intersection adjacent to Miller Davis Company. These locations were reviewed with the City of Kalamazoo's Metro Transit Authority and will be modified to accommodate high pedestrian activity areas along Portage Street.



Plan view of bus shelter layout. Keep off buildings a minimum of 1'.



Typical bus shelter design allows flexibility when faced with challenging spaces.

The bus shelters' approximate **style and size** will be black with a logo that reflects the City of Kalamazoo logo as well as a "Metro Transit" logo. The size of the proposed shelter will be 4' to 10" wide x 12' to 6" long. Three sides of the shelter will be enclosed to allow for adequate pedestrian walkways and ADA guideline clearances.

Ornamental Fencing is used in the streetscape plan primarily at signalized intersections and where parking is dominant and detracts from the overall image and views along the corridor. At these locations a combination of new ornamental fencing, bollards, and landscape plantings are recommended to create a visual screen.

The ornamental fencing **style, size, and color** is a 48" tall fence with a black-powder-coated finish, three-quarter inch painted aluminum pickets, and 2" square posts set at 6' apart in a concrete footing below the paved or landscaped surface.

Where the fencing barrier ends at a driveway entrance, a protective and removable bollard would be set 6" away from the fence and out of the primary ingress/egress circulation flow to keep trucks and other vehicles from damaging the ornamental fencing.

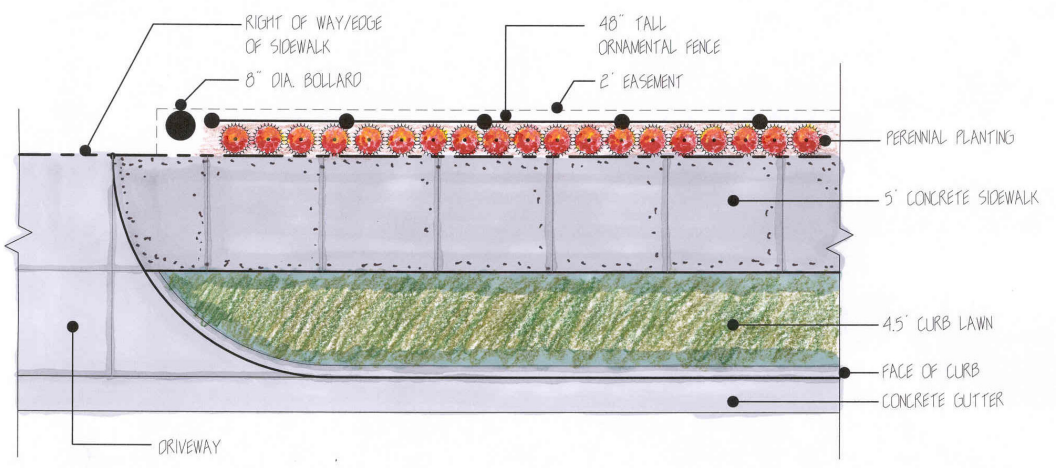
In a number of conditions, due to the narrow public right-of-way, placement of the ornamental fencing will require an easement from a property owner to allow the fencing to be installed on private property

Ornamental fence combined with landscaping is to be used as a design element to screen parking areas.

Bollards are to be placed to protect ornamental fencing in parking areas.

For example, at some intersections fencing would need to be installed past the city right-of-way, which would require a property owner to dedicate an easement to maintain a minimum Pedestrian Sidewalk Zone of 9.5'. The easement areas required to accomplish this are varied and appear to range between 12" to 36" wide.

To determine the length and width of property easement required to maintain the 9.5' wide Pedestrian Sidewalk Zone, a legal survey will be required. This work is outside of the scope of work of this project.



An easement may be required in order to place the fence and landscaping outside the right-of-way.

Bike Racks are used primarily in high-activity retail areas such as the Town & Country Market and Family Dollar. The location of these bike racks will be determined based upon the need of the specific business owner and their patrons, and as such is not included in the streetscape design estimates.

Bike Racks have a multi-loop style, and are black color to match other site furniture along the street.

The bike rack **style, size, and color** chosen matches the overall style of the street furniture design palette. The proposed bike rack is 36" tall, has a multi-loop style (3, 5, 7, or 9 loops), and consists of a 2" diameter, galvanized, schedule-40 steel pipe, with a black powder-coated finish. The end tubes of the bike rack are embedded in a concrete footing for anchorage.

Site Lighting

The goal for the design palette was to choose site lighting that would achieve a uniform appearance, a controlled light distribution pattern, and a safe level of light. Some of the factors considered for the design included feedback provided from the following sources: interviews, survey results from the Portage Street business owners, comments received from design presentation workshops, meetings with the Consumers' Energy Corporation, and results from the existing conditions site evaluation and analysis.

The following public feedback and existing conditions were noted as site lighting issues along the Portage Street Primary Corridor:

Existing Conditions / Public Feedback

- Most survey comments by business owners mentioned a desire to see ornamental street lamps placed along the street. Public feedback also revealed that the pole and luminaire chosen for Portage Street should have a complimentary style, to the "Historic Style" poles and lights used in the downtown Kalamazoo area.

- Most respondents commented that lighting levels are inadequate. Specific areas noted additional lighting is needed in the Lake Street area, the Washington Street area, and the Hispanic Business area.

- Current lighting levels along the Portage Street Primary Corridor are generally less than half the recommended levels of a 1-foot-candle as required by the Illuminating Engineers Society of North America (IESNA) Reference Manual section on "Guidelines for Roadway Lighting" and the Michigan Department of Transportation (MDOT) Traffic Controls Reference Manual.

- The existing cobra head lights along Portage Street are mounted at 25' to 35' height on a wide variety of pole types and materials, many of which are damaged or crooked. These conditions present an irregular lighting distribution and a haphazard and disorganized image along Portage Street. The pole types include wood, metal, fiberglass, and concrete poles.

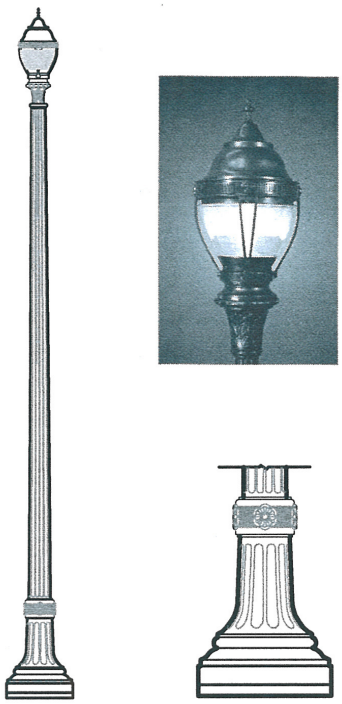
Design Palette and Description

A primary goal for the streetscape lighting design was to create a **safe, comfortable, and inviting environment** in the Pedestrian Sidewalk Zone. This task was best accomplished by selecting a lower pole height (13'), and a "Historic Style" pole with acorn luminaires, which creates a sense of safety and comfort for pedestrians. It was equally important to establish a **safe and consistent light level** that meets the 1-foot-candle minimum recommended by the Illuminating Engineering Society (I.E.S.) and Michigan Department of Transportation (MDOT) as the standard for roadway lighting. In order to provide consistent pedestrian lighting and a sense of rhythm and order along the street, "Historic Style" pole lights are proposed at 80' apart in an alternating rhythm with street trees and paving treatments.

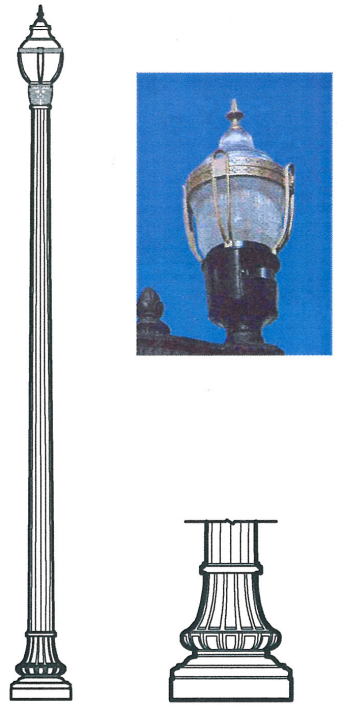
Pedestrian Street Lighting

Additionally, the survey results and public design meetings established the fact that the Portage Street business owners recommended higher light levels for increased safety and new historic-style poles used for lighting of the street and Pedestrian Sidewalk Zone. Two options are proposed for pedestrian street lights, and are described below.

Alternative One proposes the Antique Street Lamps' "New York Series" pole. This pole is cast iron, 13' high, fluted, and mounted to a concrete footing set 4" above the adjacent paving or grade. The luminaire is the Antique Street Lamps' "FS31" acorn style luminaire with black decorative straps and finial, and a 175-watt metal halide lamp. Refer to the image to the right for examples of this alternative.



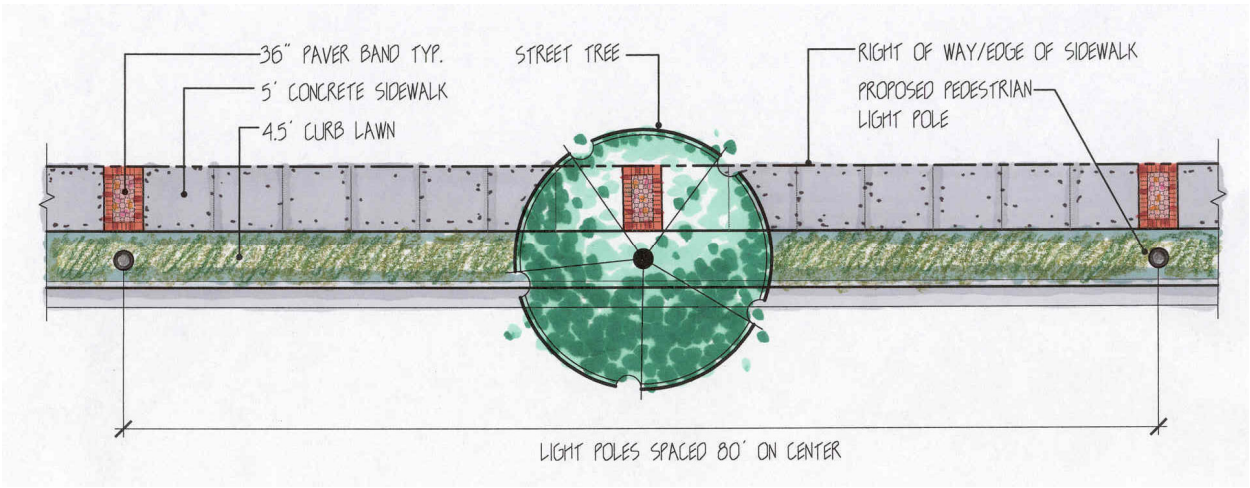
Alternative One



Alternative Two

Alternative Two is the Consumers' Energy standard pole and luminaire: "Washington Series." It is a 14' high, blade-fluted fiberglass pole that is mounted to a concrete footing set 4" above the adjacent paving or grade. The luminaire is the Consumers' Energy standard "Granville Series" acorn-style luminaire with a gold metal alloy strap and finial including a 175-watt metal halide lamp. This alternative pole and lumenaire is shown in the diagram to the left.

Either alternative provides a safe, comfortable, and consistent level of light to both the pedestrian and vehicular areas along the corridor. The Edison Mainstreet Program will determine which alternative they want to use during the construction phase of the project. Refer to the image below regarding the light pole spacing.



The pedestrian pole selected will be spaced 80' on center to provide a consistent and safe level of lighting for pedestrians and roadway travelers.

Signalized Intersection Street Lighting is used to provide lighting at each signalized intersection. The luminaires chosen in the design workshops are an acorn-style pendant luminaire, which will be mounted to new signal poles at each intersection.

The new luminaries will be attached with 6' "Historic-Style Arm Brackets. In addition, a "New York Series" clamshell base is intended to be mounted to these signal poles. The pendant luminaires are 250-watt metal halide lamps which will be adjusted to allow for the optimal light distribution pattern in each intersection.

Each signalized intersection will contain two signal poles with attached lighting at opposite corners. It is important to note that if Alternative Two of the pedestrian street light options were selected, the intersection street lights would require a clamshell base that matches the "Washington Series" pole rather than the "New York Series" pole.

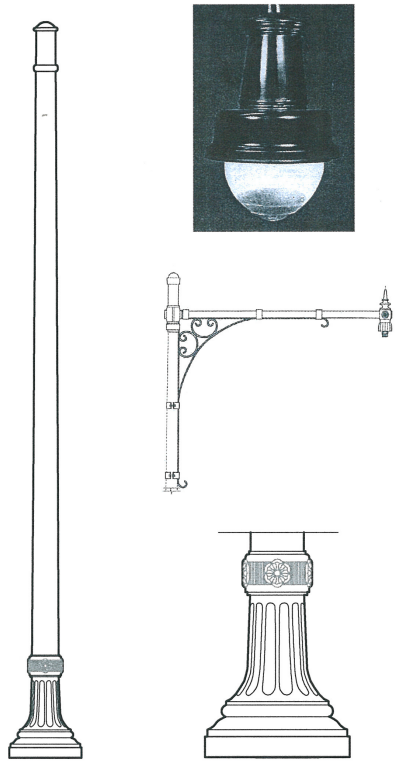
Banners

The goal for the banner design is to create a visual identity that is unique to a significant retail district or public facility identified within or adjacent to the Portage Street Primary Corridor. The banners will be 18" wide x 30" high with flexible hinges and banner arms to allow for high winds.

Use of the banners as a design element for the streetscape will be to achieve the following:

- Identify the "Washington Square Market District" as it is the only true district within the Portage Street Streetscape Master Plan study area.

- Identify the primary street and sidewalk connections to public facilities linked to the Portage Street Primary Corridor such as Upjohn Park, Kalamazoo Farmers' Market, and "Portage Creek Trailway.



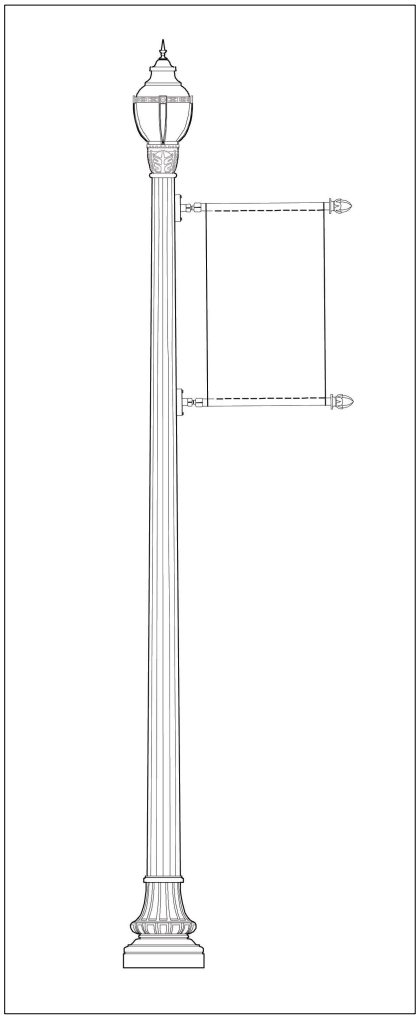
Retrofit arm bracket, luminaire, and base are attached to signal poles at each signalized intersection.

- Identify key retail activity areas within the Reed Avenue District. A series of neighborhood workshops are recommended to develop and identify a neighborhood design theme and logo that represents the area's Hispanic influence.

Since the ornamental street light poles are the prominent architectural design element that is consistently used throughout all Primary Corridor districts, they should be used for banner display along the street. The "Historic Style" poles can be matched with "Historic Style" 42" long banner arms and brackets with "acorn style" ball finials to project a uniform historic character along the Primary Corridor.

Design Palette and Description

It is recommended that the banner style, locations, and information coordinate and be graphically compatible with the wayfinding signage system set forth in the current city of Kalamazoo wayfinding design guidelines. However, the color and the graphic logo designed and developed for each district should be unique.



Banners should be mounted on every other light pole along both sides of the street at 80' on center. The size and placement of the banner should be kept out of normal reach, approximately 9' height minimum. Additionally, the banners should be set back from the face of the roadway curb at least 12" to prevent passing truck traffic or wider vehicles from damaging them. With this in mind, the banner size would need to be no wider than 12" and no longer than 24" inches. A diagram of the recommended banner size and placement on the ornamental light poles is illustrated in the image at the side.

Wayfinding Signs

A sign system design concept or "Wayfinding System" is needed for the Portage Street Primary Corridor to alert travelers to the various activity areas available to them along or adjacent to Portage Street. To accomplish this, the city's Wayfinding sign system is recommended as a standard for the Primary Portage Street Corridor to maintain a design connection to the signage currently used for downtown Kalamazoo.

DISTRICT DESIGN THEMES

Within the Portage Street Primary Corridor there are four districts: the ***Portage Gateway District***, the ***Crosstown District***, the ***Washington Square Market District,*** and the ***Reed Avenue District***. Each district has common design treatments and elements, which provide a sense of order, rhythm, and harmony that will create a friendly and safe environment that encourages pedestrians to shop, walk, and socialize with neighbors and friends. These common design elements and treatments were described in the previous section of this report.

The design goal for each district is to provide a variation on this overall theme that would help create a special or unique character within that district.

CROSSTOWN DISTRICT

Introduction

The study area for the Crosstown District is defined as the section of Portage Street between Walnut and Collins Streets, within the public right-of-way.

Within the Crosstown District there are some existing conditions that are particular to this district and are as follows: The high frequency of driveway aprons with adjacent parking areas directly fronting the pedestrian sidewalk zone along Portage Street, this creates a safety crossing hazard for pedestrians. A lack of trees, fencing or landscape plantings within this district presents a negative visual impression for Portage Street travelers and patrons of the Crosstown District businesses.

It should also be noted that some of the businesses within this district are pedestrian-oriented. It is important to create a design that not only softens the impact of the businesses, but also creates a safe environment for pedestrians to coexist within these areas.

A complete existing conditions evaluation for this district can be referenced in Appendix 2.

District Design Theme Descriptions

Based upon the existing conditions that need to be addressed, and the key linkages to the area, a unique design has been developed for this district that blends the standardized design theme for the entire corridor with a distinctive treatment that characterizes this district. The design theme for the Crosstown District is described below.

Pedestrian Sidewalk Zone

The Pedestrian Sidewalk Zone for the Crosstown District will include a typical 9.5’ wide area between the roadway curb and the public right-of-way. In this zone will be a 5’-wide sidewalk and 4.5’-wide curb lawn.

Combinations of design elements are used to soften the existing urban environment within this zone. This combination includes wider continuous curb lawn areas that provide a green strip along the pedestrian sidewalk zone. Trees and ornamental lights will be spaced 40’ apart in the widened curb lawn areas. Fencing will be used with new landscape shrub or perennial plantings to soften the impact of the parking and driveway areas. To create a special, unique design treatment for the district, combinations of paving, planting, lighting, and fencing are used, which results in both a separation of pedestrian and vehicular traffic as well as a friendly and safe environment for pedestrians.

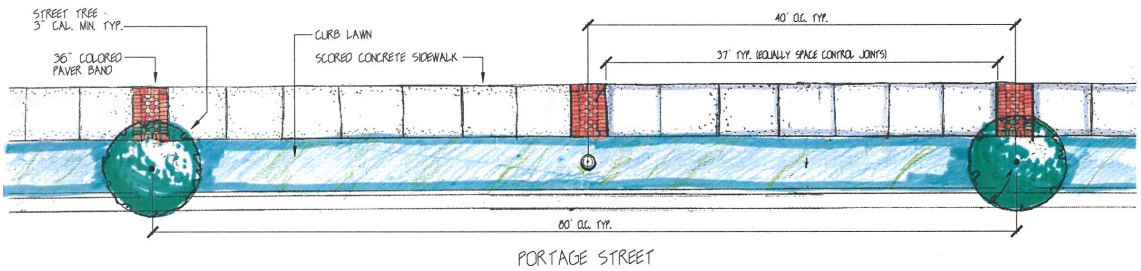
Paving Treatments

The Crosstown District, due to its concentration of automotive-oriented businesses, experiences a high volume of traffic flowing in and out of business parking lots. Therefore, it is important to maintain a functional design. It is important to create a visual link between the Washington Square Market District to the south and the Portage Gateway District to the north. This is achieved by using fewer special paver bands and special paving at non-signalized intersections, and utilizing concrete driveway aprons to match the new concrete sidewalks in the district.

A standard palette of paving patterns, shapes, and color ranges is used within this district throughout the Portage Street Primary Corridor. However, within this district a distinct pedestrian corridor paving treatment is established that provides a unique character, and is described below.

Pedestrian Corridor Paving Treatment 'Type A' - The design theme for this district includes 3' wide paving bands spaced 40' apart, alternating with trees and pedestrian pole lights set in the curb lawn. Between each band is a standard 5'-wide broom-finish, scored-concrete sidewalk. Each paving band has a soldier course around its perimeter made up of Holland Pavers. Inside this perimeter is a field of Unidecor Pavers set in a Herringbone pattern.

The design intent is to provide paving bands, which can be seen easily while traveling the street and provide a feeling of familiarity to pedestrians. Paver colors will be a blend of the "Terra Cotta" and "Rustic Red" color palette.



Pedestrian Corridor Paving Treatment 'Type A'

Trees and Landscape Planting

Since the Crosstown District is a very urban environment with a large amount of paved areas within and adjacent to the pedestrian sidewalk zone, the selection of plants and trees must withstand the harshest of conditions, including summer drought, winter wind and cold, and road salts. To soften the appearance of driveways and parking areas, the design includes a layer of lower plantings along with an upper layer of street trees.

Street Trees

A mix of street trees such as the "Greenspire Little Leaf Linden" and the "Japanese Zelkova" have been selected for their ability to withstand the urban environment. The trees should be a minimum 3" caliper, with a clear branching height of 6'. This will allow pedestrians to view incoming and outgoing traffic from businesses and comfortably walk next to the trees.

Greenspire Little Leaf Linden

Japanese Zelkova

Flowering Trees

Flowering trees have been recommended to provide a visual cue as part of the Wayfinding Design Concept that guides people to important activity areas such as the Kalamazoo Farmers' Market and Upjohn Park.

Cleveland Select Pear

Radiant Crabapple

The "Cleveland Select Pear" tree and "Radiant Crabapple" tree have been selected to mark pedestrian routes. The Cleveland Select Pear tree produces white flowers in the springtime and the Radiant Crabapple tree produces red flowers in mid summer, thus providing color throughout the season. Each of these trees is hardy and can survive the urban environment. The trees should be a minimum 2.5" caliper, with a clear branching height of 5' to 6'.

Perennial Plantings

Fence Planting: To provide a lower planting level for screening of the paved parking lot areas adjacent to the pedestrian sidewalk zone, an array of colorful, drought- and salt-tolerant perennial plantings are placed between the proposed fencing and the sidewalk edge. An alternating sequence of three perennial varieties will be placed in this district.

Intersection Planting: To provide variety and interest at the signalized intersections (Lake Street, Vine Street, and Crosstown Parkway), a more extensive perennial planting list is included, showing ornamental grasses for texture and height at the intersections.

Perennials

Typical Fence Perennial Planting Platette:

Variegated Sedum – Sedum 'Frosty Morn'
Black Eyed Susans – Rudbeckia hirta 'Goldstrum'
Dwarf Variegated Maiden Grass – Miscanthus sinensis 'Morning Light'

Variegated Sedum

Intersection Perennial Planting Palette:

Autumn Joy Sedum – Sedum erythrostichum 'Autumn Joy'
Black Eyed Susans – Rudbeckia hirta 'Goldstrum'
Blue Fescue Grass – Festuca ovina 'Glauca'
Dwarf Variegated Maiden Grass – Miscanthus sinensis 'Morning Light'
Moonbeam Coreopsis – Coreopsis verticillata 'Moonbeam'
Stella de Oro Daylilly – Hemerocallis 'Stella de Oro

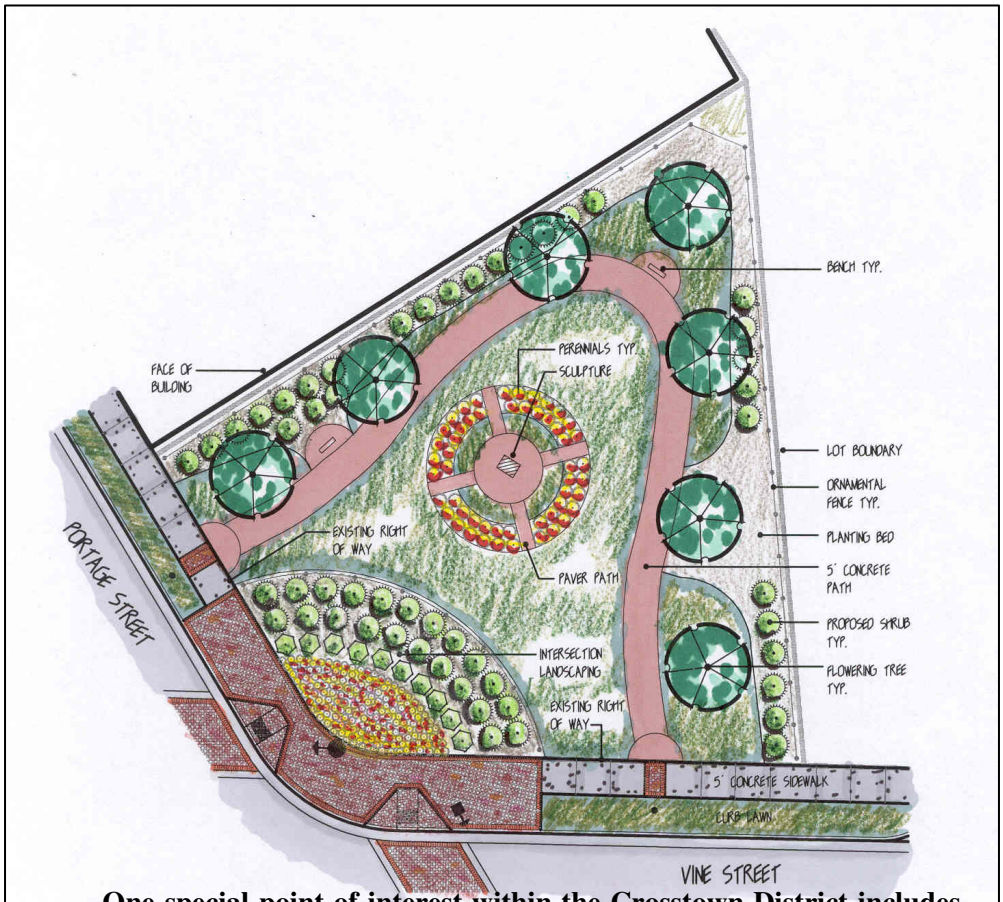
Dwarf Variegated

Black Eyed Susan

Special Points of Interest

Within the Crosstown District there are "Special Points of Interest" which are recognized with special design treatments. Beginning with Lake Street, flowering trees become the focal point to signify a special route to the Kalamazoo Farmers' Market and Upjohn Park. At the Vine Street intersection, there are two features or focal points to note, one on the northeast corner and one on the northwest corner. On the northeast corner there is a small city-owned lot, proposed to become developed into a small neighborhood greenspace or pocket park and would have donor-provided planting beds, benches, and a sculpture created by neighborhood residents. The second focal point is the development of the northwest corner as a landscape feature that has a coordinated planting palette with the northeast corner development.

The improvements to the northwest corner are outside the public right-of-way and therefore would require a landscape easement, or an agreement from the property owner to install the proposed improvements.



One special point of interest within the Crosstown District includes the development of a small neighborhood pocket park on the northeast corner of the Vine Street intersection.

Site Furniture

Site Furniture for the Crosstown District follows the Primary Corridor design standards described in the Primary Corridor section of this report.

Bus Shelters are used only in the highest activity retail centers. For the Crosstown District the shelter is located adjacent to the Miller Davis Company property at the northeast corner of the Lake Street intersection. Other bus stop locations within this district will receive the bench, trash receptacle, and paving treatment recommended for the Primary Corridor.

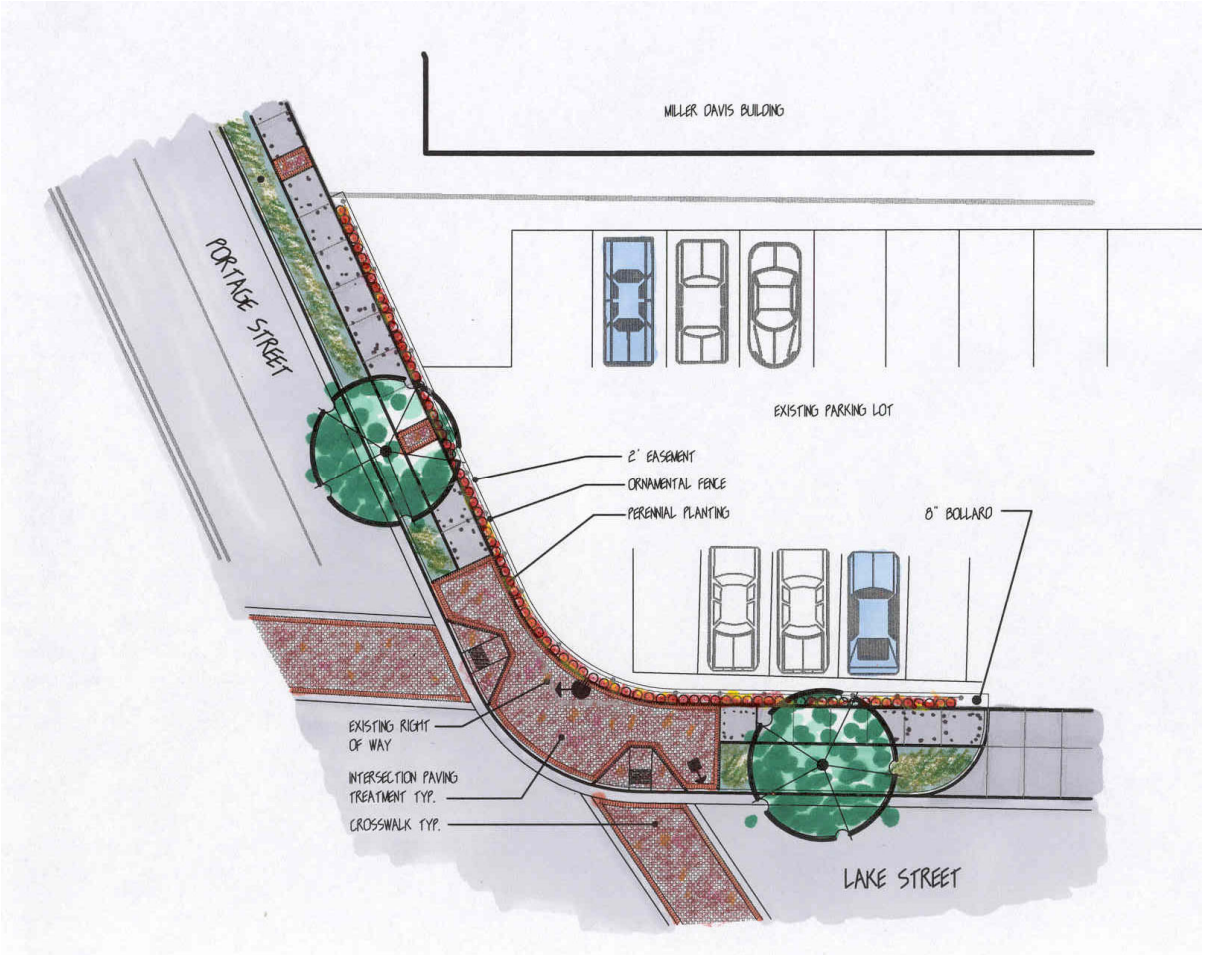
Refer to the Overall Design Theme section of this report for an example of a typical bus shelter elevation and plan and a typical bus stop treatment.

Ornamental Fencing is used in the Crosstown District primarily at signalized intersections and just inside the public right-of-way where parking areas dominate the district.

In order to minimize this appearance, a design treatment is required that will maintain necessary driveway ingress/egress, while screening views of the parking areas.

In order to accomplish this, ornamental fencing is placed 18” from the edge of the sidewalk in front of the parking areas. Additionally, colored and textured perennial plantings are placed within the 2’ wide planting strip between the fence and sidewalk to provide visual screening of the parking areas. Placement of the ornamental fencing will require a two-foot wide easement from affected property owners to allow the new fencing and planting to be installed.

Furthermore, at some intersection corners, ornamental fencing and perennial plantings are proposed to soften the visual impacts of parking areas visible from the street. A good example of this condition is found adjacent to the Miller Davis Company parking lot located on the northeast corner of the Lake Street intersection (refer to the figure at left). The entire image of this intersection will change with the addition of new ornamental fencing and landscape plantings.



Fences with perennial plantings are used at signalized intersections, such as Lake Street, to screen views of parking areas.

WASHINGTON SQUARE MARKET DISTRICT

Introduction

The Washington Square Market District is defined as the portion of Portage Street between Collins (to the north) and Egleston Avenue (to the south). To help understand the proposed design for this district, it is important to first mention the historic background of the area, then identify specific existing issues that should be addressed, and finally recognize key linkages to adjacent areas and projects.

The Washington Square Market District was the first commercial district outside of downtown Kalamazoo in the 1920s and 1930s. During this time, "Historic Style" pole lamps were the primary light source, which provided a friendly and safe pedestrian environment.

The primary retail activity center within this district is a two-block section beginning with the Washington Avenue intersection to the south, and ending with the Stockbridge Avenue intersection to the north. Many of the buildings that are within and directly adjacent to this district are historically significant due to their period and style of architecture. The Washington Square Library and the Portage Street Fire Station are examples of some of the historic points of interest in this area. Also, the original storefront architecture found in the shops between Stockbridge Avenue and Washington Avenue indicates the rich history of the district.

Within the Washington Square Market District there are some existing conditions that are particular to this district such as unsafe roadway alignments and poor lighting that are addressed in this design. The existing roadway alignment between Washington Avenue and Stockbridge Avenue is hazardous for both north- and southbound traffic. This condition requires an adjustment to create a more safe and uniform roadway route for travelers. Existing off-street parking areas at the Stockbridge and Washington Avenue intersections present a negative image for these locations. Existing lighting along the street is dominated by overhead lamps mounted on a variety of pole types, which produce less-than-adequate light levels for the street and pedestrian sidewalk zone. Refer to Appendix 2 for a complete evaluation of the existing conditions for this district.

It should be noted that there are active projects underway that are within or adjacent to the Washington Square Market District that have been considered during the design process of this district. These other projects include: the "Washington Square Area Plan," "Central City Parking Lot 5," "Seven Acres

Housing Development," "Kalamazoo Farmers' Market," and "Upjohn Park." A variety of partners are managing these projects. Design linkages have been considered to tie in or acknowledge these projects with the Washington Square Market District Design Theme.

District Design Theme Descriptions

Based upon the rich history of the district, existing conditions that need to be addressed, and the key linkages to the area, a unique design has been developed for this district that blends the standard design theme for the entire corridor with a distinctive treatment that characterizes this district.

Pedestrian Sidewalk Zone

The "pedestrian sidewalk zone" for the Washington Square Market District has two variations. The first is between Stockbridge and Washington Avenues. In this case the pedestrian sidewalk zone edges are defined by the building storefronts on one side and the roadway curb on the other side. The second variation is found north of the Washington Avenue intersection and south of the Stockbridge Avenue intersection. In this variation, the sidewalk zone is a 9.5' wide area defined by the roadway curb on one side and the sidewalk edge on the other side with curb lawn in between.

Paving Treatments

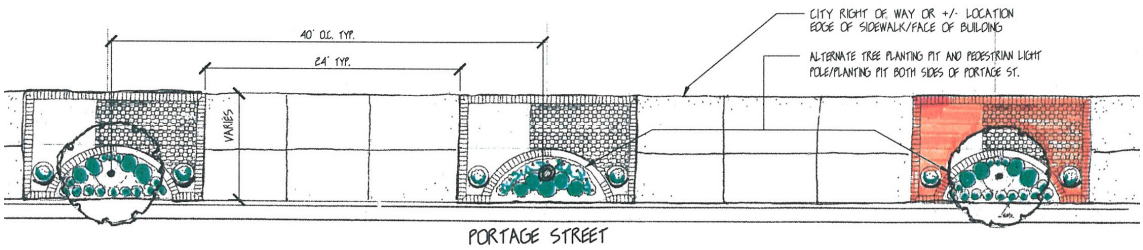
Since the Washington Square Market District is being redeveloped with a retail focus, special emphasis is placed on the paving design to identify this district as a very distinct area along Portage Street, and help restore the district as a thriving retail destination. The paving treatment for the Washington Square Market District incorporates the standardized palette of paving patterns, shapes, and color ranges used throughout the primary corridor, in order to promote a unifying theme along Portage Street. However, in order to achieve a unique character for this district, the standardized palette is used to create a distinct paving treatment design through pattern.

Pedestrian Corridor Paving Treatment 'Type B'

The distinctive paving design theme used for this district includes the use of 16' wide paving bands spaced 40' on center with pedestrian pole light and planting pits. Between each paver band is standard broom-finish concrete paving. Each paving band has a soldier course around its perimeter border made up of Holland Pavers. Inside the perimeter border is a field of Unidecor Pavers set in a

herringbone pattern. Street trees and pedestrian pole lights alternate within the semi-circular planting pit that is adjacent to the roadway curb.

The design intent is to provide significantly wider paving bands, which allow adequate room for planting and planter pots as well as ornamental pole lights and trees. Paver colors will be a blend of the " Terra Cotta" and "Rustic Red" standard palette colors.



Pedestrian Corridor Paving Treatment 'Type B"

Trees and Landscape Planting

Street Trees

Since the Washington Square Market District is intended to become a successful retail shopping district along Portage Street, it is important to choose trees that emphasize the various architecture and signage to provide an attractive visual appearance that will catch the attention of people traveling along Portage Street. To accomplish this, street trees such as the "Skyline Honeylocust" and the "Japanese Zelkova" have been selected since they have less dense foliage and a more arching canopy, which allows less-obstructed views. Additionally, the trees should be a minimum 3" caliper, with a clear branching height of 6', so pedestrians can comfortably walk beneath the trees.

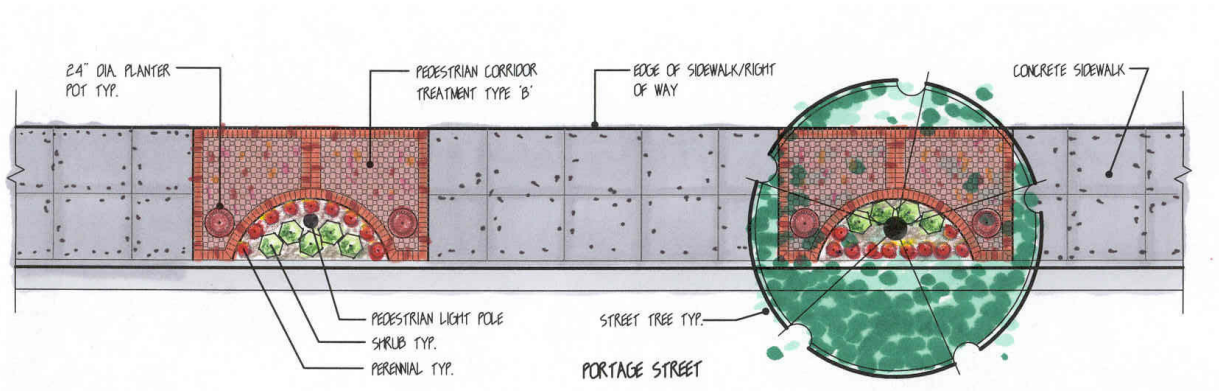
Skyline Honeylocust

Flowering Trees

Flowering trees are used within the public right-of-way in the design theme to provide a visual cue to important linkages from the Portage Street primary corridor. Flowering trees are designated for the cross streets, to guide people to locations such as the Washington Square Senior Apartments, Seven Acres housing development, Kalamazoo Farmers' Market and Upjohn Park. The specific flowering trees that have been selected for the Primary Cross Street are described in the Tier Two Primary Cross Streets "Trees and Landscape Planting" section.

Shrub and Perennial Plantings

To further emphasize this district's special importance, colorful shrubs and perennial plantings are placed in the semi-circular planting pits and planter pots to call attention to the pedestrian zone and shopping activities along the street. Additionally, the intersections have a specific plant palette listed along with the following planting pit palette.



An alternating rhythm of color and texture is displayed by shrubs and flowering perennials within the planter pits.

Plant Palette for the Washington Square Market District

Street Trees

Skyline Honeylocust – Gleditsia Triacanthos Inermis 'Skyline'
Japanese Zelkova- Zelkova serrata ' Village Green'

Shrubs
Gold Flame Spirea – Spirea japonica 'Gold Flame'
Dwarf Burning Bush –Euonymus alatus 'compactus'
Japanese Yew – Taxus x media 'Wards'
Yucca Variegated – Yucca filamentosa 'variegata' or 'Golden Sword'
Dwarf American Cranberry Bush – Viburnum opulus 'nanum'
Wild Black Current – Ribes Americana

Perennials
Autumn Joy Sedum – Sedum erythrostichum 'Autumn Joy'
Black Eyed Susans – Rudbeckia hirta 'Goldstrum'
Blue Fescue Grass – Festuca ovina 'Glauca'
Dwarf Fountain Grass – Pennisetum alopectrodides 'Hamelin'
Dwarf Variegated Maiden Grass – Miscanthus sinensis 'Morning Light'
Moonbeam Coreopsis – Coreopsis verticillata 'Moonbeam'
Stella de Oro Daylilly – Hemerocallis 'Stella de Oro'

Pit Planting Palette
Shrubs
Dwarf American Cranberry Bush – Viburnum opulus 'nanum'
Wild Black Current – Ribes Americana
Gold Flame Spirea – Spirea japonica 'Gold Flame'
Dwarf Burning Bush –Euonymus alatus 'compactus'
Japanese Yew – Taxus x media 'Wards'
Yucca Variegated – Yucca filamentosa 'variegata' or 'Golden Sword'

Perennials
Autumn Joy Sedum – Sedum erythrostichum 'Autumn Joy'
Black Eyed Susans – Rudbeckia hirta 'Goldstrum'
Blue Fescue Grass – Festuca ovina 'Glauca'
Moonbeam coreopsis – Coreopsis verticillata 'Moonbeam'
Stella de Oro Daylilly – Hemerocallis 'Stella de Oro'

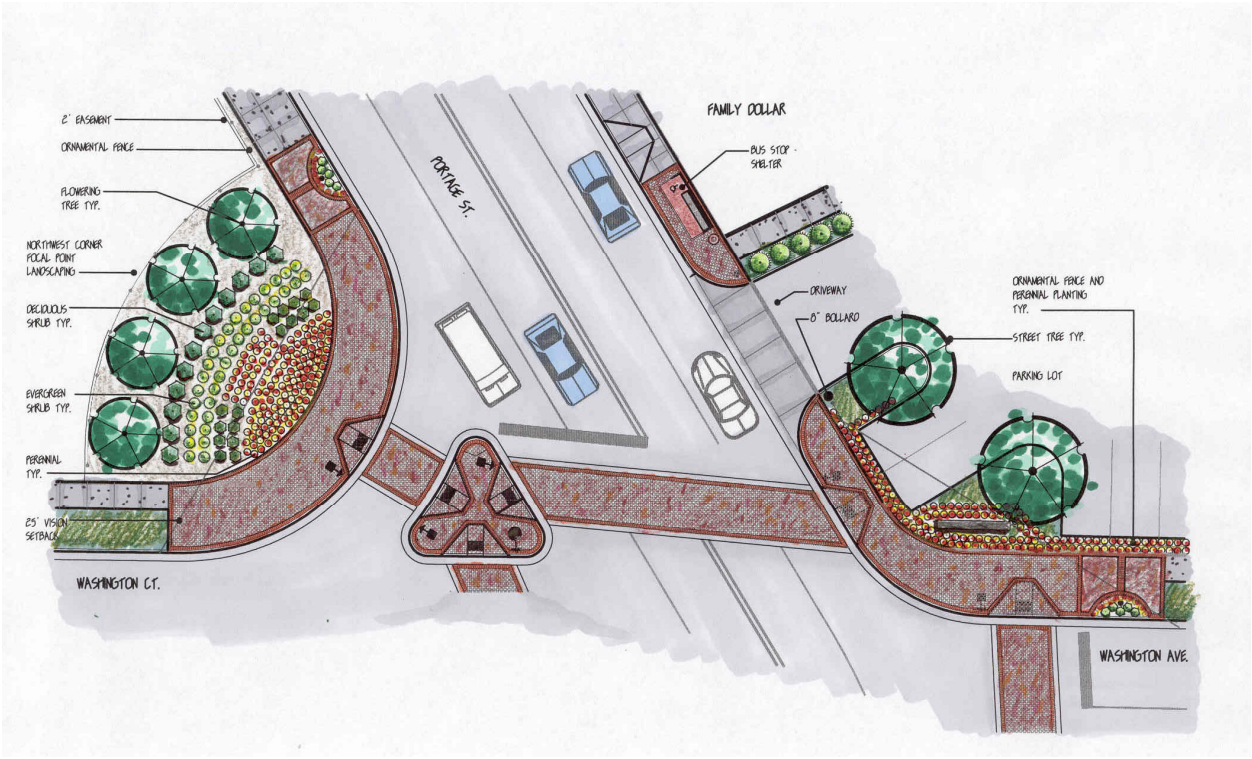
Intersection Planting Palette
Shrubs
Gold Flame Spirea – Spirea japonica 'Gold Flame'
Dwarf Burning Bush – Euonymus alatus 'compactus'
Japanese Yew – Taxus x media 'Wards'

Perennials

Autumn Joy Sedum – Sedum erythrostichum 'Autumn Joy'
Black Eyed Susans – Rudbeckia hirta 'Goldstrum'
Blue Fescue Grass – Festuca ovina 'Glauca'
Dwarf Fountain Grass – Pennisetum alopectrodides 'Hamelin'
Dwarf Variegated Maiden Grass – Miscanthus sinensis 'Morning Light'
Moonbeam Coreopsis – Coreopsis verticillata 'Moonbeam'
Stella de Oro Daylilly – Hemerocallis 'Stella de Oro'

Focal Points or Special Points of Interest

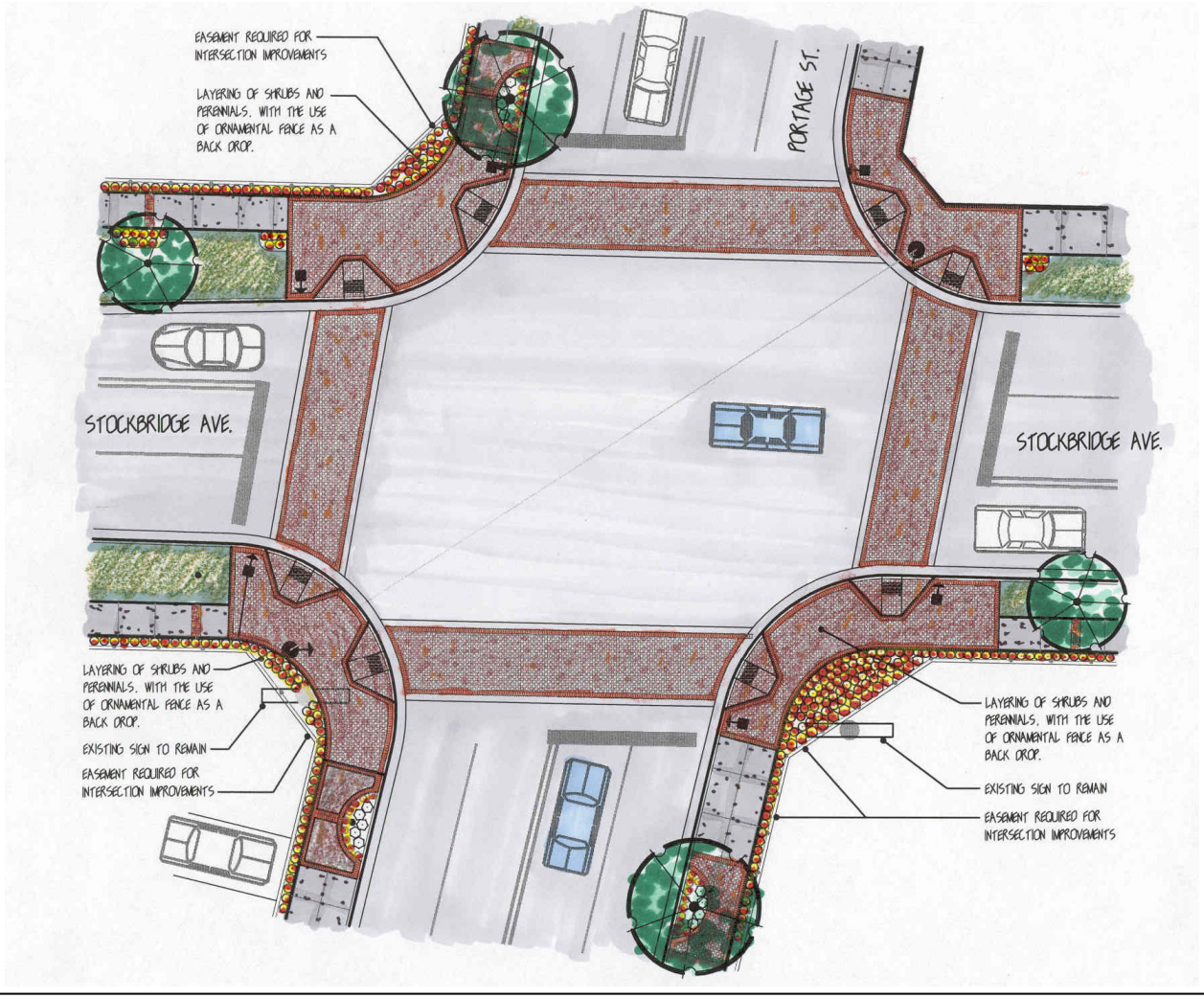
Within the district, there are two primary "Focal Points" that should be highlighted with special design treatments. The first is the Washington Avenue intersection including the northeast and northwest corners of the intersection. The Family Dollar store located at the northeast corner is a primary "Focal Point" for people traveling from the south to north through the district. Additionally, the northwest corner links visually to the northeast corner when approaching the intersection, therefore it will receive a similar design treatment (reference figure on next page).



The Washington Avenue intersection is a primary view corridor, which is an important focal point within the Washington Square Market District.

The second "Focal Point" that is featured within the district is three corners of the Stockbridge Avenue intersection. This is a primary intersection that is currently unattractive due to the dominance of parking lots at each corner.

To unify and connect the focal points at the Washington Avenue intersection with the focal points at the Stockbridge Avenue intersection, a common design theme is utilized which includes layering shrubs and perennial plantings, with ornamental fencing as a backdrop. The proposed fence and plantings will require a dedicated legal easement be acquired from the property owners adjacent to the intersections. These plantings are described in the Washington Square Market District "Trees and Planting" section.



Roadway Lane Width and Alignment

Within this district, the existing roadway alignment between Washington Avenue and Stockbridge Avenue is hazardous for both north and southbound traffic. This condition requires an adjustment to create a safer, more uniform roadway route for travelers.

Site Furniture

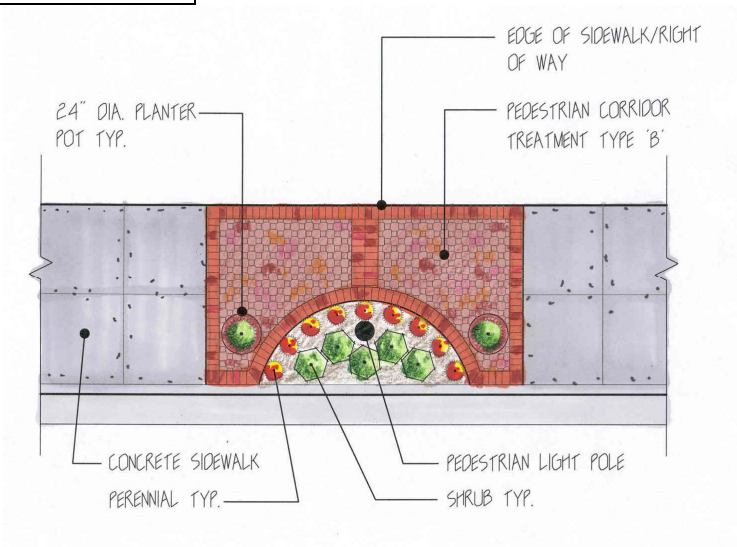
To fully develop the Washington Square Market District into a successful retail district, it is important to use a combination of design elements such as planter pots, enlarged paving bands, and special banners to create a level of hierarchy that clearly identifies Washington Square as a true "Market District."

Planter Pots

Planter pots are to be used as unique architectural elements, placed in pairs on large paver bands to clearly identify the edge of the "pedestrian sidewalk zone." The planter pots are used only in the primary retail activity area between Stockbridge and Washington Avenues. Plantings should be colorful annual or perennial plantings to celebrate this important area of the Washington Square Market District.

The classical style options both match the historic style of the lights, trash receptacles and benches, while the color matches the paving palette.

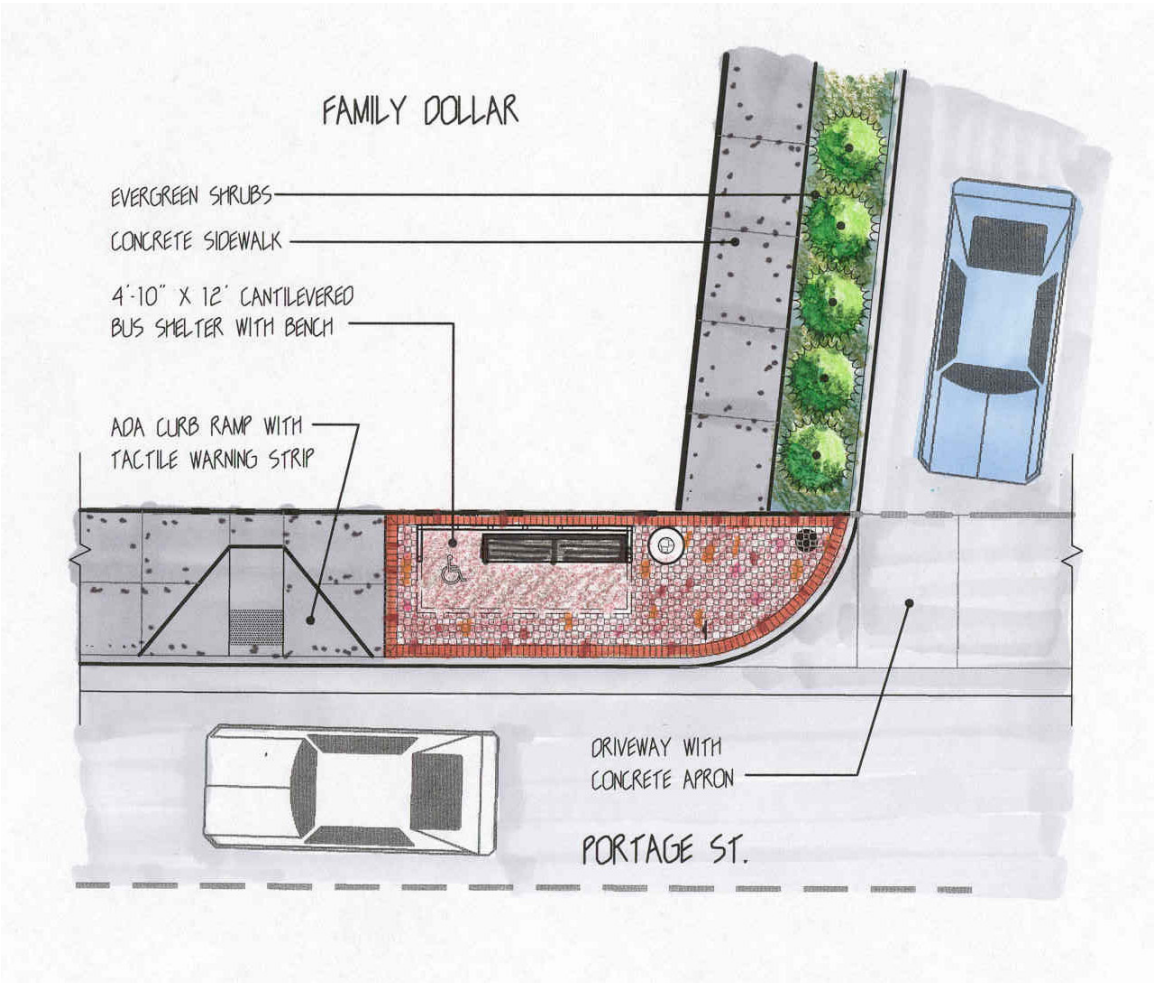
The planter pot **style, size, and color** is a classical style "Mediterranean" or "Grecian" pot, 36" diameter, 36" height, plastic laminate material, with rustic red color to match the streetscape paving palette colors. The manufacturer is Dura-Art Stone.



Planter Pots are grouped in pairs within the primary retail district between Stockbridge Ave. and Washington Ave.

Bus Shelters

Bus Shelters are used only in the highest-retail activity centers found along the Portage Street Primary Corridor. For the Washington Square Market District, the shelter is located adjacent to the Family Dollar store at the northeast corner of the Washington Avenue intersection.



The proposed bus shelter location within the Washington Square Market District is adjacent to the Family Dollar store at the Washington Avenue intersection.

Ornamental Fencing

Ornamental Fencing is to be used in the Washington Square Market District to create softer views of the two primary intersections: Stockbridge and Washington Avenues.

Banners

The typical banner style and size should follow the standard for the Portage Street Primary Corridor mentioned on page 41. The goal for the banner design is to provide a design and appearance that provides a visual identity unique to the district, activity area, or market area. For instance, a specific district, market, or activity area banner would include a distinct color, with a design logo that identifies the activity visually. The banner style, locations, and information should coordinate and be compatible graphically with the wayfinding signage system set forth in the current city of Kalamazoo wayfinding design guidelines. However, the color and the graphic logo designed and developed for each district, market, or activity area should be unique. Banners should be mounted to the light poles for this district along both sides of the street.

The market or activity areas which are recommended to receive these distinct banners include the following:

Washington Square Market District – banners are mounted to each pole light along the Primary Portage Street Corridor beginning approximately 150' south of the Stockbridge Avenue intersection where the semi-circular planting pits begin for the district paving design, and then continuing and ending with the semi-circular planting pits shown at the Collins Street intersection. The banners would be spaced at 80' on center along with the pole lights on both sides of the street.

Upjohn Park and the Kalamazoo Farmers' Market - banners unique in color and logo for the Upjohn Park and Kalamazoo Farmers' Market are mounted to alternating pole lights along Stockbridge and Collins Avenues, which means the banners would be spaced at approximately 120' apart on each side of the street. Both Collins Street and Stockbridge Avenue are the primary directional routes to the Farmers' Market and Upjohn Park from the Washington Square Market District, and the new banners will illustrate the important connection of these routes to the activity areas.

REED AVENUE DISTRICT

Introduction

The study area for the Reed Avenue District is defined as the portion of the Portage Street public right-of-way between Egleston Avenue on the northern end and Alcott Street on the southern end.

To communicate the proposed design for this district, it is essential to first mention the assortment of business types and locations, and then identify existing issues that should be addressed.

The Reed Avenue District is composed of a mixture of both automotive-oriented and pedestrian-oriented businesses. Toward the south end of the district, the businesses tend to be mostly automotive-oriented, which also means wider and more frequent concrete driveway aprons and parking areas. These areas are less safe for and less attractive to pedestrians.

Within the Reed Avenue District there are specific existing conditions beyond those identified within the Primary Corridor descriptions in the previous section. Those issues include the need to provide a strong visual identity to support the rich cultural heritage of the Hispanic population, the need to more strongly unify the business establishments to a common district theme, and a need to establish a safe lighting level and new visible crosswalks. Existing lighting along the street is dominated by overhead lamps mounted on a variety of pole types that produce less-than-adequate light levels for the street and pedestrian sidewalk zone.

The complete evaluation analysis report of the existing conditions for this district is in Appendix 2.

District Design Theme

Based upon the many issues and existing conditions that need to be addressed, a unique design has been developed for this district that blends the standard design theme for the entire corridor with a special design treatment.

Pedestrian Sidewalk Zone

The “pedestrian sidewalk zone” for the Reed Avenue District has three situations. The first is the concentration of Hispanic businesses in the block between Bryant Street and Lane Boulevard. In this case, the pedestrian sidewalk zone is 9.5’ wide, with the building storefronts on one side and the roadway curb on the other side,

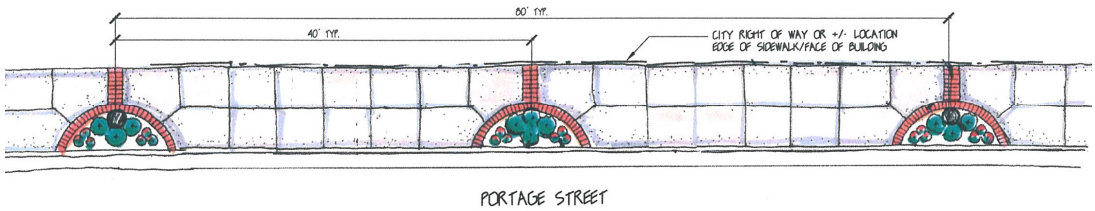
which defines the edges. The second is found north of this area in which the sidewalk zone is a 9.5' wide area defined by open residential lawn areas on one side and the roadway curb on the other side. The third is south of Bryant Street where the public right-of-way is much larger. On the east side of Portage Street, between Bryant Street and Alcott Street, the sidewalk zone is 10' wide, whereas the west side of the sidewalk zone in this location ranges from 10-19' wide.

Paving Treatments

Since the Reed Avenue District is composed of a diverse mixture of commercial businesses and residential housing along the street, it is necessary to define the corridor with a simple design palette for the paving treatment. To achieve this, special emphasis is placed in the paving design to celebrate the cultural background or heritage that represents the local neighborhood. The Hispanic community is very established in and around the Bryant Street to Reed Avenue area and some surrounding areas within the district. By including a symbol of the rich cultural heritage that represents this population, pride and cultural identity can be realized within the community, supporting economic prosperity for the businesses within the district. The paving treatment for the Reed Avenue District incorporates the standard palette of paving patterns, shapes, and color ranges used throughout the primary corridor, in order to promote a unifying theme along Portage Street. However, in order to achieve a unique character for this district, the standardized palette is used to create two different paving treatment designs. One treatment is used to emphasize the active Hispanic businesses and the connection to the supermarket that is described as the "pedestrian corridor paving treatment type "C". The second paving treatment used in this district is described as "pedestrian corridor paving treatment type "A" and is used to unify this district visually with the historic Washington Square Market District.

Pedestrian Corridor Paving Treatment 'Type C' - The first paving design theme used for this district symbolizes the Hispanic heritage of the residents and provides a visual connection to the supermarket. The paving design uses 16"-wide paver bands that become a perimeter border around each tree planting pit and are spaced 40' on center. Between each paver band is broom-finish concrete paving with joints every 5-6' apart. Each paving band is made up of a double soldier course of Holland Pavers that becomes a single soldier course bordering the edge of the semi-circular planting pits. To celebrate the heritage of the Hispanic

neighborhood and businesses, two sets of Double Holland Donor Signature Pavers are used at each linear band. These Donor Signature Pavers will have a special symbol or stamp that is designed by the neighborhood businesses and surrounding residents to represent the rich heritage of the area's Hispanic community.

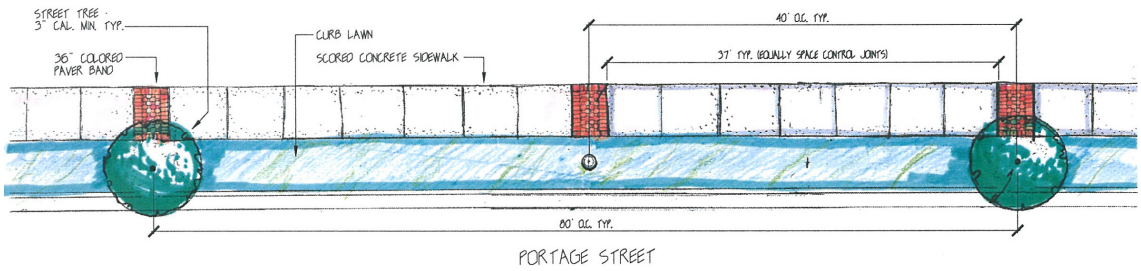


Pedestrian Corridor Paving Treatment "Type C"

<u>Pedestrian Corridor Paving Treatment 'Type A'</u> - The paving design that is used in all other areas for this district includes the use of 3' wide paving bands spaced 40' on center with alternating trees and pedestrian pole lights. Between each band is a standard 5'-wide broom-finish concrete sidewalk. Each paving band has a soldier course around its perimeter made up of Holland Pavers. Inside is a field of Unidecor Pavers set in a herringbone pattern.

The design intent is to provide paving bands that can be seen easily while traveling the street, providing a feeling of comfort and safety to pedestrians.

Paver colors will be a blend of the "Terra Cotta" and "Rustic Red" standard palette colors that can be seen in the "Tier One Primary Corridor – Paving Treatments."



Pedestrian Corridor Paving Treatment 'Type A'

Trees And Landscape Planting

Street Trees

Since the Reed Avenue District has a significant Hispanic community and two strong neighborhood markets, it is essential that the trees emphasize or support the signs and appearance of the Hispanic-oriented shops and the sales and market signs displayed at the supermarket. Since the pedestrian sidewalk zone directly adjacent to the Hispanic businesses is 9.5' wide, the available space allows for street trees that provide shade and comfort for pedestrians.

In order to add color and architectural interest, the street trees are placed in an alternating pattern at 40' on center. To maintain more open views to the businesses, the "Skyline Honeylocust" has been selected as it has less dense foliage and a more arching canopy. The trees should be a minimum 3" caliper, with a clear branching height of 6', so pedestrians can comfortably walk beneath the trees. At the south end of this district, the Shingle Oak is used because of its heavier foliage, to provide screening in areas where automotive-type businesses are prevalent.

Shingle Oak

Skyline Honeylocust

Flowering Trees

Flowering trees are used to highlight the Hispanic-oriented businesses along Bryant Street; in front of the Washington Writers' Academy along Lane Boulevard, and along Lay Boulevard to provide visual cues to emphasize these locations and other prime neighborhood areas. The trees proposed are "Kwanzan Cherry," "Zumi Crabapple" and "Forest Pansy Redbud." These trees have been selected because of the early lavender spring blossoms of the Red Bud, the double pink mid-spring blossoms of the Kwanzan Cherry, and the white long blooming blossoms of the Zumi Crabapple in late spring and summer. Additionally, each of these trees have an upright arching form with a brilliant fall leaf color display. This vibrant combination of colors will emphasize the visual impact of these lively areas.

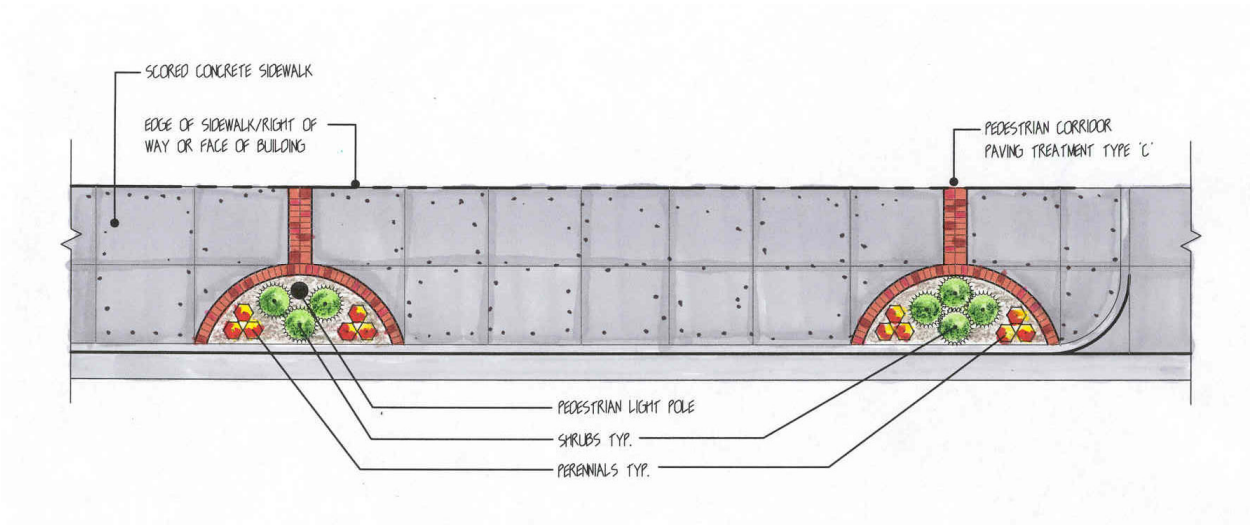
Kwanzan Cherry

Zumi Crabapple

Forest Pansy Redbud

Shrub and Perennial Plantings

To further emphasize the market areas in this district, colorful shrubs and perennial plantings are placed in semi-circular planting pits and planter pots beginning at Bryant Street through to Reed Avenue. This will call attention to the pedestrian zone and shopping activities along the street. The rhythmic pattern of alternating shrubs and perennials is made up of a combined plant palette that is specifically selected for the planting pits and is noted in the following district plant list. Additionally, the intersections have a specific plant list:



A rhythm of color and texture is displayed with an alternating sequence of shrubs and perennial flowering within the planter pots and plant pits along the street.

Plant Palette for the Reed Avenue District

Street Trees

Skyline Honeylocust – Gleditsia triacanthos inermis 'Skyline'
Shingle Oak – Quercus imbricaria

Flowering Trees

Kwanzan Cherry – Prunus serrulata 'Kwanzan'
Eastern Redbud – Cercis canadensis 'Forest Pansy'
Zumi Crabapple – Malus Calocarpa Zumi

Shrubs

Arrowwood Viburnum – Viburnum dentatum
Gold Flame Spirea – Spirea japonica 'Gold Flame'
Dwarf Burning Bush –Euonymus alatus 'compactus'
Japanese Yew – Taxus x media 'Wards'
Yucca Variegated – Yucca filamentosa 'variegata' or 'Golden Sword'

Dwarf American Cranberry Bush – Viburnum opulus 'nanum'
Arborvitae –Thuja occidentalis
Wild Black Current – Ribes Americana
Shrubby Cinquefoil – Potentilla fruiticosa
Red Osier Dogwood – Cornus stolonifera
Ninebark – Physocarpus opulifolius

Perennials

Autumn Joy Sedum – Sedum erythrostichum 'Autumn Joy'
Black Eyed Susans – Rudbeckia hirta 'Goldstrum'
Blue Fescue Grass – Festuca ovina 'Glauca'
Dwarf Fountain Grass – Pennisetum alopectrodides 'Hamelin'
Dwarf Variegated Maiden Grass – Miscanthus sinensis 'Morning Light'
Moonbeam Coreopsis – Coreopsis verticillata 'Moonbeam'
Stella de Oro Daylilly – Hemerocallis 'Stella de Oro'
Variegated Sedum – Sedum 'Frosty Morn'

Pit Planting Palette

Shrubs

Yucca Variegated – Yucca filamentosa 'variegata' or 'Golden Sword'
Gold Flame Spirea – Spirea japonica 'Gold Flame'
Shrubby Cinquefoil - Potentilla fruiticosa

Perennials

Autumn Joy Sedum – Sedum erythrostichum 'Autumn Joy'
Black Eyed Susans – Rudbeckia hirta 'Goldstrum'
Blue Fescue Grass – Festuca ovina 'Glauca'
Moonbeam coreopsis – Coreopsis verticillata 'Moonbeam'

Intersection Planting Palette

Shrubs

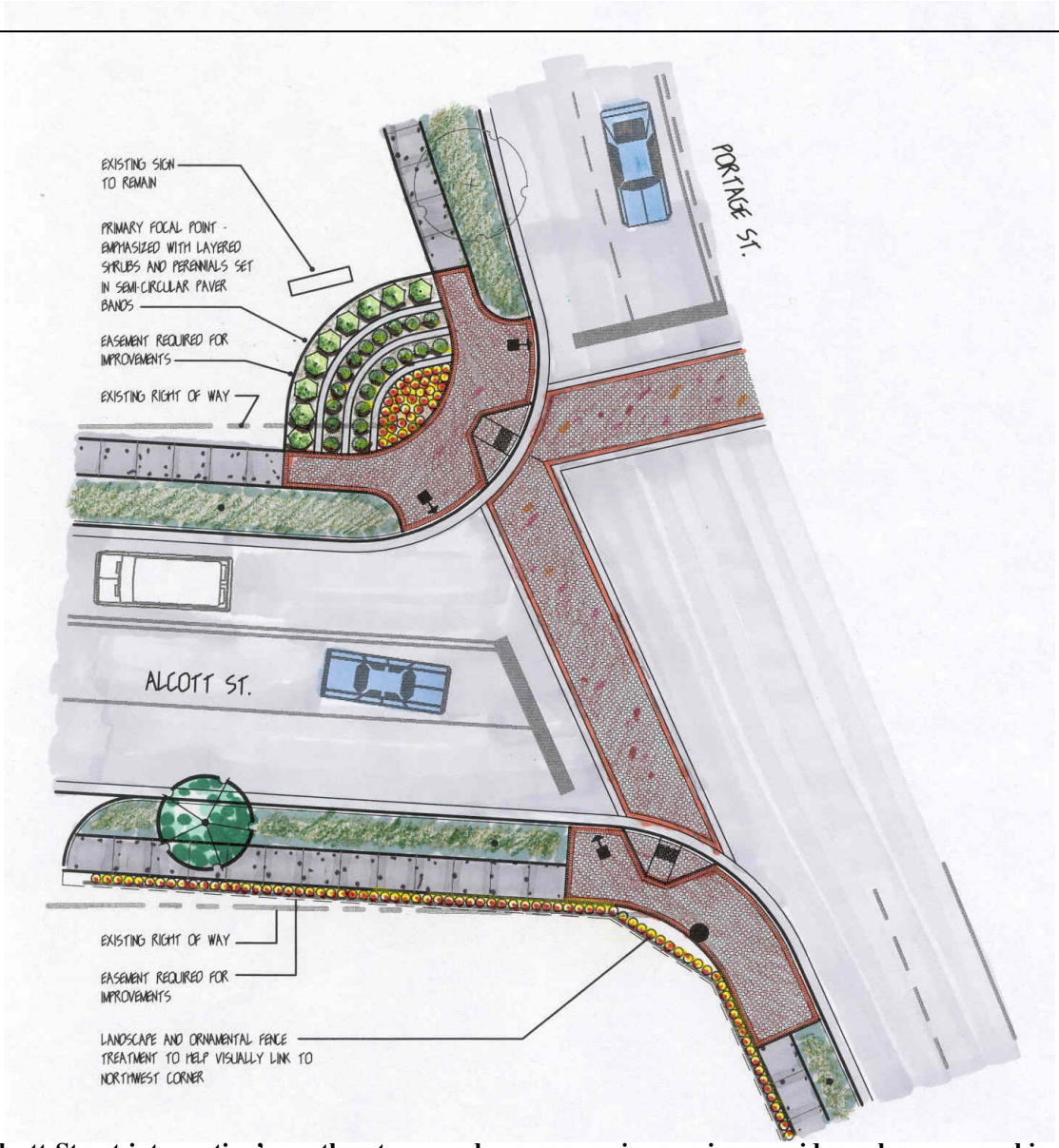
Gold Flame Spirea – Spirea japonica 'Gold Flame'
Dwarf Burning Bush – Euonymus alatus 'compactus'
Japanese Yew – Taxus x media 'Wards'

Perennials

Autumn Joy Sedum – Sedum erythrostichum 'Autumn Joy'
Black Eyed Susans – Rudbeckia hirta 'Goldstrum'
Blue Fescue Grass – Festuca ovina 'Glauca'
Dwarf Fountain Grass – Pennisetum alopectrodides 'Hamelin'
Dwarf Variegated Maiden Grass – Miscanthus sinensis 'Morning Light'
Moonbeam Coreopsis – Coreopsis verticillata 'Moonbeam'
Stella de Oro Daylilly – Hemerocallis 'Stella de Oro'

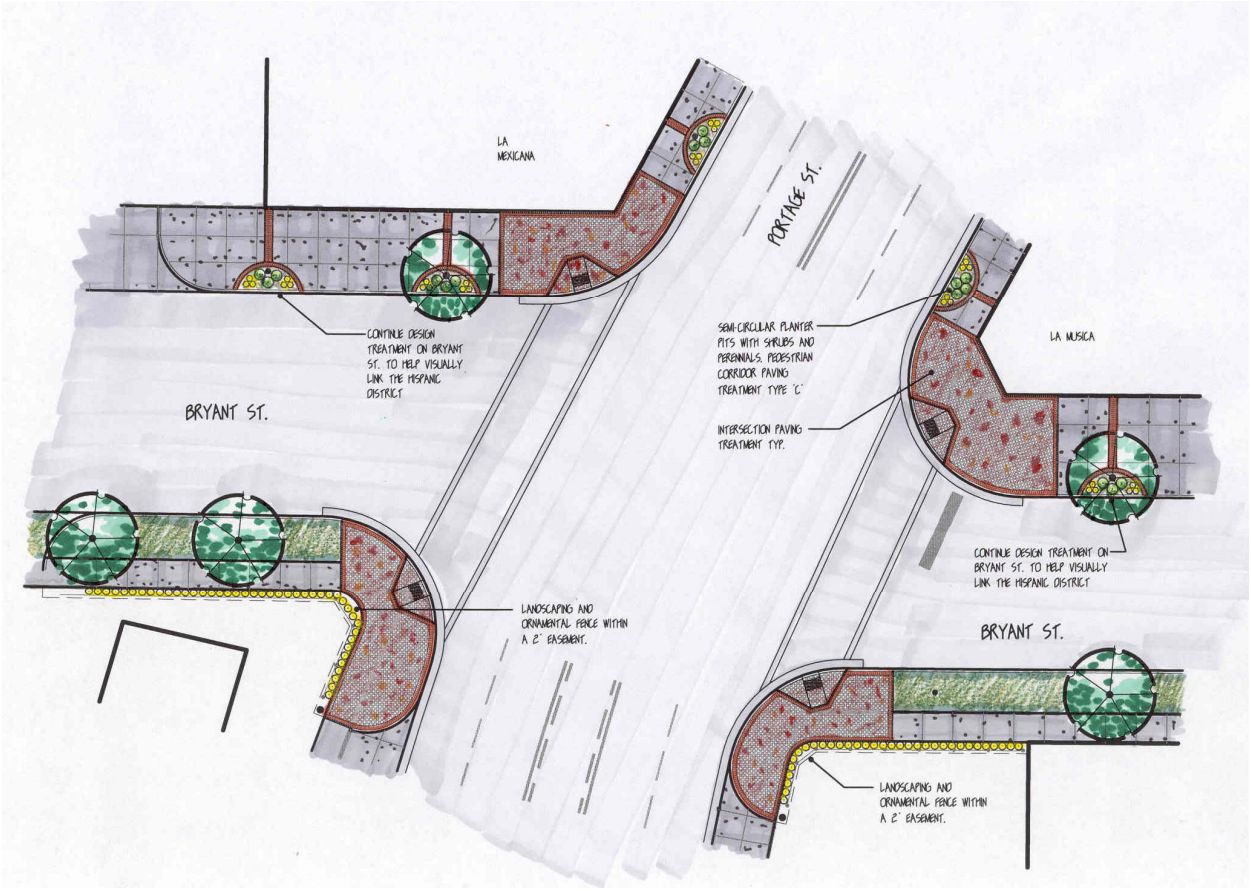
Focal Points or Special Points of Interest

Within the district there are three primary "Focal Points" that are highlighted with special design treatments. The first is the Alcott Street intersection, including the northwest and southwest corners of the intersection.



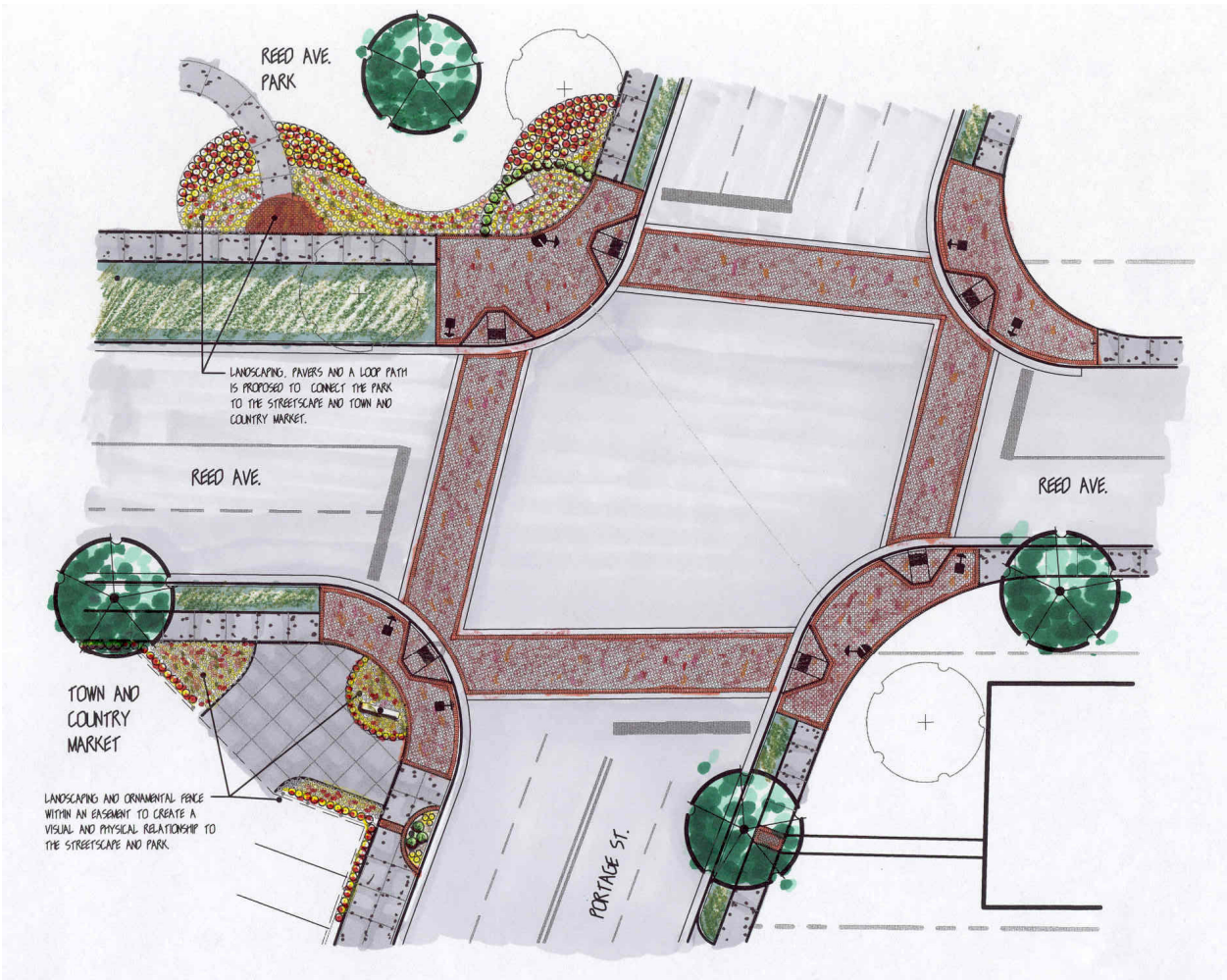
The Alcott Street intersection's northeast corner becomes a primary view corridor, when approaching from the south of the intersection. The layered semi-circular bands of pavers, shrubs, and perennial plantings features the northwest corner, while ornamental black fencing and a similar planting palette for the southwest corner unifies and gives character to this primary intersection.

The second focal point featured within the district is the Hispanic business section along Bryant and Portage Streets, which continues to Lane Boulevard. As travelers approach the Bryant Street intersection from the south, the primary focus or view corridor becomes the Hispanic businesses. Design treatments are proposed to embrace and reflect the rich Hispanic heritage of the neighborhood.



The Bryant Street intersection is a primary view corridor and Focal Point along the street that displays the Hispanic-oriented businesses on both sides of the street. A series of design elements are combined to unveil a colorful display of banners, flowering trees, flowering perennials, and unique signature pavers that display the rich heritage of the neighborhood's, residents and business owners.

The third focal point is the Town & Country Supermarket and Reed Avenue Park, located directly across the street from each other at the intersection of Portage Street and Reed Avenue. A visual and physical relationship should be developed between this neighborhood park and the supermarket to generate additional economic and social activity for both. This relationship is achieved with the development of a pathway entrance placed in close proximity to the pedestrian crossing at Reed Avenue. This pathway provides a loop through the park that would access the recreational and playground amenities within the park itself. With the successful programming and development of the Reed Avenue Park, neighborhood residents and visitors will view the park and adjacent market as a gathering place to meet and have lunch.



Landscaping and ornamental fencing at Reed Avenue Park and the Town and Country Market visually and physically connect these areas to Portage Street.

Street Furniture

To develop the existing markets and shops into a successful retail shopping district, and to celebrate the Hispanic heritage of the neighborhood's residents and business owners, it is important to provide a combination of site furniture design elements. Beyond the standardized site furniture elements that are a part of the primary corridor design, there are some elements that must be detailed further. Site furniture elements are explained further in this section; including bus shelters, ornamental fencing, bike racks, and banners.

Bus Shelters

Bus shelters are used only in the highest activity centers found along the primary corridor. For the Reed Avenue District, the bus shelter is located at the northwest corner of the Reed Avenue and Portage Streets, adjacent to the Reed Avenue Park. Other bus stop locations within this district will receive a bench and paving treatment also used in the primary corridor, referenced in the Overall Design Theme section of this report.

Ornamental Fencing

Used in the Reed Avenue District, at signalized intersections. Many of these intersections have parking lots adjacent to them in very highly visible places. Ornamental fencing is proposed along the parking areas with layered plantings of trees, shrubs, and perennials. Location of fencing is dependent upon dialogue with property owners to arrange the most efficient fence layout for pedestrian and vehicular ingress/egress points.

To screen parking in these locations, ornamental fencing is placed 18" from the edge of the sidewalks in front of the parking areas. The corners of the intersections will require space to maintain clear vision and a zone of safety for pedestrians. The fence/parking lot relationship requires a two-foot wide easement from affected property owners to allow enough space for fencing and plantings while still maintaining 9.5' wide standard pedestrian sidewalk zone. Refer to the Overall Design Theme section of this report to see the typical fence and landscaping relationship.

An example of this type of treatment is found adjacent to the parking lot located on the southeast corner of the Alcott Street intersection. With the addition of ornamental fencing and landscape plantings, the entire appearance of this intersection will be visibly enhanced and be more aesthetically pleasing.

Ornamental fencing could create a more aesthetic view near the Party Factory at Alcott Street.

Banners

The banner style and size will follow the standard for the Portage Street primary corridor. The banner design is to provide a design and appearance that provides visual identity unique to the district, activity area, or market area. These banners would include a distinct color and a design logo that identifies the activity visually to the public. The banner style, locations, and information should coordinate and be compatible graphically with the wayfinding signage system set forth in the current City of Kalamazoo wayfinding design guidelines. However, the color and the graphic logo designed and developed for each area should be unique.

The areas recommended to receive these distinct banners include the following:

- The La Mexicana Market and the Town and Country Supermarket Areas – Banners are to be mounted to every pole light along the street at the semi-circular planting pits beginning at the Bryant Street intersection, and ending with the semi-circular planting pits shown at the Reed Avenue intersection adjacent to the Town and Country Supermarket.
- A series of neighborhood workshops are recommended to develop and identify a neighborhood design theme and logo that represents the Hispanic influences, the Washington Writers' Academy and the Town & Country Supermarket.

TIER TWO – "PRIMARY CROSS STREETS"

The Tier Two "Primary Cross Streets" study area is defined as the most significant cross streets that intersect the Portage Street Primary Corridor. Specifically, the study area for each cross street includes the "pedestrian sidewalk zone" located between the public right of way and the roadway curb or edge of the roadway pavement. The streets listed below were chosen as the most significant streets that intersect with Portage Street. Many will provide design links to important activity or market areas surrounding the primary corridor.

The primary cross streets study area includes the following:

- East Walnut Street, 400-600 block
- East Crosstown Parkway, 700 block
- East Vine Street, 600-700 block
- Lake Street, 600-700 block
- Washington Avenue, 800 block
- Stockbridge Avenue, 500-900 block
- Bank Street, 1100 block- 1300 block
- Collins Street, 500 block to 700 block

In order to create the design theme for the primary cross streets study area, it is necessary to provide a summary of existing conditions. Existing lighting includes cobra head fixtures with 150-200 watt metal halide or sodium vapor lamps mounted on utility poles. Average space is approximately 150' to 200'. Existing sidewalks are of varied width, existing trees are of varied type, spacing, and age. Brief descriptions of existing site conditions for each of the cross streets within the study area follow.

East Walnut Street, 400-600 block

The three-block section of East Walnut Street runs westward from Portage Street over the Portage Creek, and ends at Jasper Street adjacent to Bronson Hospital. Existing conditions along East Walnut Street are described as follows:

- *Existing Trees:* 3' wide curb lawn along the north side of the street, there are no existing trees from Portage Street to Jasper Street. Outside of the sidewalk there are Little Leaf Lindens, English Oaks and Upright Norway Maples (6" to 12" caliper) bordering Pfizer's property.
- *Existing Sidewalk:* 5' wide sidewalk, with 3' wide curb lawn on both the north and south sides of the street. The sidewalk appears to be in good shape.

East Crosstown Parkway, 700 block

The 700 block of East Crosstown Parkway runs eastward from Portage Street to Sheldon Street. Existing conditions are described as follows:

- *Existing Trees:* One Kwanzan Cherry with no existing trees to the railroad tracks. Beyond the railroad tracks, a mix of trees (maples and elms) is sporadically spaced on both sides of the street to Sheldon Street.
- *Existing Sidewalk:* 5' wide sidewalk with 5' wide curb lawn on the north and south sides of the street. Few existing trees are present. The sidewalk may require some replacement east of the railroad tracks.

East Vine Street, 600-700 block

The 600-700 block of East Vine Street runs westward from Portage Street to East Vine Street and Crosstown Parkway. Existing conditions are described as follows:

- *Existing Trees:* Group of Honey Locusts (6-8" caliper), and a few maples (6-10" caliper) spaced thinly to the Crosstown Parkway intersection.
- *Existing Sidewalk:* 5' wide sidewalk and 5' wide curb lawn on both the north and south sides of the street. On the north side of the street the curb lawn area has been replaced by asphalt paving. This area will need to be reclaimed with new grass in preparation for the new tree plantings.

Lake Street, 600-700 block

The 600-700 block of Lake Street runs westward from Portage Street to Bank Street, adjacent to the Kalamazoo Farmers' Market, and to Water Street adjacent to Upjohn Park. Existing conditions along Lake Street are described as follows:

- *Existing Trees:* Primarily mature Red Maples and Norway Maples (12-30"caliper) with mature and recently added Flowering Crabapple trees. A heavy grouping of Sycamores (10-12" caliper) exists in the curb lawn on the north side of Lake Street adjacent to the Portage Street intersection.
- *Existing Sidewalk:* 4' wide sidewalk with 4-5' wide curb lawn on both sides of the street. A high percentage of sidewalk that is cracked or damaged and should be replaced.

Washington Avenue, 800 block

The 800 block section of Washington Avenue runs eastward from Portage Street to Race Street. Existing conditions along this block can generally be described as follows:

- *Existing Trees:* Primarily mature Elms and Maples (24"-36" caliper) at mid-block, and four Mountain Ash trees on the east end adjacent to the Race Street intersection.
- *Existing Sidewalk:* 5' wide sidewalk with 5' wide curb lawn on both sides of the street. The sidewalk has some areas that are cracked or damaged and should be replaced.

Stockbridge Avenue, 500-900 block

The 500-900 block section of Stockbridge Avenue runs eastward from Portage Street to Race Street, and then runs westward from Portage Street to Bank Street. Existing conditions along Stockbridge Avenue are described as follows:

- *Existing Trees:* A consistent canopy of mature trees composed of Elms, Maples, Sycamores, and Oaks. The majority of the trees are mature in size from 24"-36" caliper.

- *Existing Sidewalk:* 5' wide sidewalk with a 7-8' wide curb lawn. Some sidewalk replacements will be required.

Bank Street, 1100 - 1300 block

The 1100-1300 block of Bank Street runs from Stockbridge Avenue to Lake Street at south end. Existing conditions along Bank Street can are described as follows:

- *Existing Trees:* A few Norway Maples (8-10" caliper) along the east side of the street, and a large grouping of Volunteer Maples and Elms are found adjacent to the Portage Creek Bridge. Along the west side of the street from the bridge to Lake Street there are no trees in the public right-of-way.

- *Existing Sidewalk:* 4-5' wide sidewalk on both sides of the street. Sidewalk is directly against the roadway edge of pavement and there is no curb lawn.

Collins Street, 500 to 700 block

The 500-700 block section of Collins Street runs westward from Portage Street to Bank Street. Existing conditions along Collins Street are described as follows:

- *Existing Trees:* Very large Red Maples (30-36"+ caliper) are on the north side of the street. Their roots are encroaching on the narrow 3' wide sidewalk. Along the south side of Collins Street, there are no trees within the public right-of-way.

- *Existing Sidewalk:* 3' wide sidewalk is directly against the roadway curb. This sidewalk is too narrow for pedestrians.

These primary cross streets are often the primary links connecting Portage Street to significant related project and activity areas such as the Kalamazoo Farmers' Market, Upjohn Park, Bronson Methodist Hospital, Portage Creek Trailway, Washington Square Senior Apartments, and the Seven Acres Housing Development.

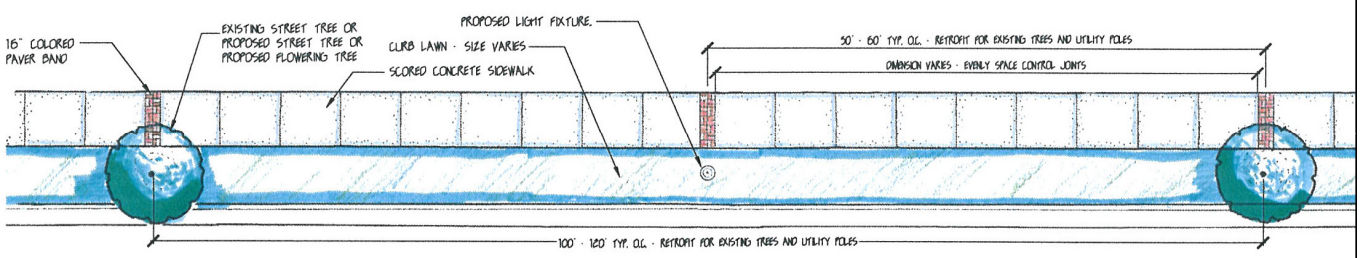
A good example of this is the 600-700 block of Lake Street that leads westward from Portage Street to the Kalamazoo Farmers' Market and Upjohn Park.

Overall Design Theme

The Design Theme for Tier Two "Primary Cross Streets" is a standard design concept that is applied to existing conditions. It should be noted that existing conditions within the pedestrian sidewalk zone do vary. Therefore, the design concept should be applied with the understanding that layout and adjustments will be necessary to retrofit the design concept to the existing site conditions.

Several of the standard design elements were selected from the primary corridor design palette to ensure that the primary cross streets design theme would be visually linked to the primary corridor. Additionally, it was important to provide a design theme that is more understated than the primary corridor.

The selection for the primary cross streets design elements includes paving treatments, street trees, flowering trees, and pedestrian pole lights. The design theme layout and the use of these elements are generally illustrated in the following diagram. Each use of the design elements and application is summarized in the following paragraphs to provide a more specific description.



Pedestrian Corridor Paving Treatment Type 'D' - Bands are spaced at 50'-60' on center to align with new pole lights and new street trees and flowering trees. Preserve existing mature trees along Primary Cross Streets.

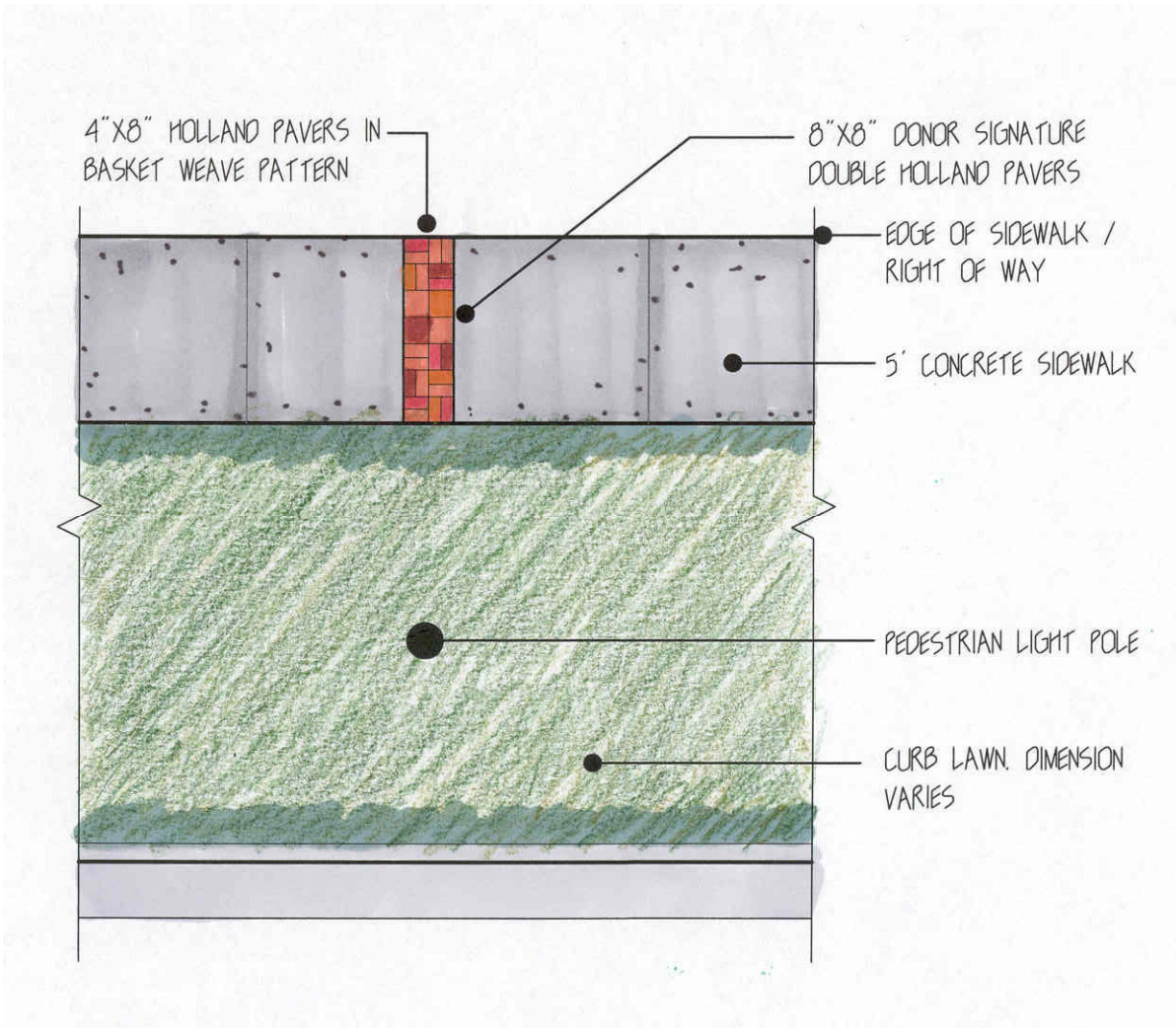
Paving Treatments, Patterns, Shapes, and Color Ranges

A unique paving design was chosen that utilizes the primary corridor standard palette of shapes and color ranges; this promotes a consistent unifying theme. The area has a distinct paving pattern only used in the Tier Two primary cross streets design.

Standard Paver Color Range: A blend of the " Terra Cotta" and "Rustic Red".

Standard Paver Shapes: Rectangular 4"x 8" Holland Pavers with four 8" x 8" square Double Hollandstone Pavers in the middle.

Standard Paving Pattern: 16"-wide band of "Holland Pavers" laid in a herringbone pattern with a central square of four "Double Hollandstone Pavers." The bands are sawcut into the existing 5' wide concrete sidewalk, or set into new concrete replacement sidewalk sections at 50-60' on center. The bands are aligned with new light fixtures and new street trees, flowering trees, or retained existing trees. Preservation of existing trees is a priority and the existing trees will be preserved and worked into the pattern setup by the paving, lights, and tree plan illustrated below.



Holland pavers in a basket-weave pattern with four Double Holland pavers in the center, which would be donor signature pavers.

Boundaries for Pedestrian Paving Treatments

The physical boundaries of all pedestrian paving treatments are within the pedestrian sidewalk zone, located between the roadway curb or edge of roadway pavement and the city right-of-way. The right-of-way is typically marked by the outside edge of the existing sidewalk along the street.

Broken Sidewalk Treatments

Where there is broken sidewalk, replacement with new concrete is recommended. In areas where existing tree roots have caused the concrete sidewalk to uplift, the concrete should be saw cut and removed, replaced with new sand set pavers in a herringbone pattern with metal edging.

Pedestrian Crosswalks and Curb Ramps

Throughout the primary cross streets or Tier Two corridors, existing pedestrian crosswalks are currently striped or marked at signalized intersections. The weathered condition of the crosswalk striping presents a safety hazard to pedestrians. In order to promote a safe integration between pedestrian and vehicular traffic, crosswalks should be well-defined and highly-visible.

Restriping of existing crosswalks is recommended at intersection crossings, to be visible for motorists and pedestrians**.** Each crosswalk should also align with the associated sidewalk pathway and pedestrian ramp. Placement of the crosswalks and curb ramps must comply with the Michigan Department of Transportation (MDOT) standards referenced in the Manual of Uniform Traffic Control Devices) Manual (MUTCD).

Within the primary cross streets study area, existing concrete curb ramps and adjacent corner paving should be replaced to meet ADA standards. These new ramps should be cast in place concrete, broom finished, and must include tactile warning strips. All curb ramps are required to comply with the American Disabilities Act (ADA) and the Americans with Disabilities Act Accessibility Guidelines (AADAG).

Trees and Landscape Planting

The primary cross streets' conditions vary in density, variety, type and shapes of trees. The design approach is to assess the existing tree types along each street. If that street is not a direct link to a special activity or market area, new, more uniform street tree types are proposed. Some of the primary cross streets are primary links to important activity or market areas. These streets will receive special design treatment to include more flowering tree variety, and colorful identification banners to alert travelers along Portage Street that these streets lead to special public places.

A tree planting palette has been developed for each primary cross street, which includes two or more tree types. By using two or more varieties, the possibility of disease or insect infestation is minimized. To promote uniformity along the street, one type will be chosen to match the family of trees found to exist along the street. Uniformity will be evident in the tree form, leaf shape, branching, flowers, and fall leaf coloration.

Street Trees and Flowering Trees

The primary cross streets study areas each have a planting palette as described below:

East Walnut Street, 400-600 block

Walnut Street is the primary entrance to Bronson Methodist Hospital from Portage Street. With that in mind, a colorful and uniform appearance should be provided to project a positive environment for patients and visitors who are entering or exiting the hospital along this corridor. There are some Cleveland Pear and Crabapple trees along Bronson's parking lot. It is recommended to continue the theme to include these flowering tree types. Both of these tree types will add year-around interest. The Cleveland Pear tree will show spring flowers, while the Zumi Crabapple tree will provide white blossoms in late spring with yellow-orange fall foliage and persistent winter fruit.

<u>Tree Planting Palette</u>:
Cleveland Select Pear – Pyrus calleryana 'Cleveland Select'
Zumi Crabapple – Malus sieboldii var. zumi 'Calocarpa'

East Crosstown Parkway, 700 block

The East Crosstown Parkway area runs eastward from Portage Street to Sheldon Street. Since this corridor is not one of the primary linking corridors, street trees are placed in the 5' wide curb lawn with the design treatment shown in the illustration at the beginning of this section. Existing trees found along the corridor are primarily elms, sycamores, and maples, which are of varied age and size. The 'Emerald Queen' Norway Maple and the 'Northwood' Red Maple tree varieties have been selected as the palette for this corridor.

Tree Planting Palette:

Emerald Queen' Norway Maple – Acer platanoides 'Emerald Queen'

Northwood' Red Maple – Acer rubrum 'Northwood'

East Vine Street, 600-700 block

The East Vine Street area is between Portage Street and East Crosstown Parkway. This pedestrian walk-way is one of the primary linking corridors from Portage Street to Upjohn Park. Special treatment is given, which includes Cleveland Select Pear trees and Radiant Crabapple trees. The pear trees will produce white blossoms in the early spring and red-orange foliage in the fall. The Radiant Crabapple trees will produce red blossoms in late spring with yellow orange foliage in the fall and persistent red fruit in the winter. Flowering trees and colorful banners are used in an alternating pattern to create an alley of color to Upjohn Park.

Tree Planting Palette:

Cleveland Select Pear – Pyrus calleryana 'Cleveland Select'

'Radiant' Crabapple – Malus x adstringens 'Radiant'

Lake Street, 600-700 block

The Lake Street area is between Portage Street on the east and Water Street to the west. This route is a primary link from the Crosstown Parkway District to access the Kalamazoo Farmers' Market and Upjohn Park. The design treatment for this route includes the use of the 'Ballerina' Serviceberry and the 'Forest Pansy' Eastern Red Bud Trees. The 'Ballerina' Serviceberry will produce full, white blossoms in the early spring with red foliage in the fall, while the 'Forest Pansy' Eastern Redbud will produce lavender blossoms in early spring with burgundy red foliage in summer and a prolific yellow leaf in the fall. Flowering trees and colorful banners will be used in an alternating pattern to create an alley of color to both the Kalamazoo Farmers' Market and Upjohn Park.

Tree Planting Palette:

'Forest Pansy' Eastern Red Bud – Cercis Canadensis 'Forest Pansy'

'Ballerina' Serviceberry – Amelanchier canadensis 'Ballerina'

Washington Avenue, 800 block

The Washington Avenue area runs eastward from Portage Street to Race Street. This corridor is not a primary linking corridor and it has a strong presence of existing mature Maple and Elm trees; thus, a logical approach is to continue the successful plantings of these trees to provide a uniform appearance along the pedestrian corridor, which will provide a brilliant fall color display. The tree palette includes the 'Emerald Queen' Norway Maple and the 'Northwood' Red Maple tree varieties.

Tree Planting Palette:

'Emerald Queen' Norway Maple – Acer platanoides 'Emerald Queen'

'Northwood' Red Maple – Acer rubrum 'Northwood'

Stockbridge Avenue, 500-900 block

The Stockbridge Avenue area runs westward from Portage Street to Bank Street. The eastern section runs from Portage Street to Race Street. The existing trees along this corridor provide a well-established shade canopy for pedestrians. The character of this street should be maintained and supported with new infill street trees where necessary to maintain this well-developed canopy.

Tree Planting Palette

'Emerald Queen' Norway Maple

'Single Oak' – Quercus umbrcaria

However, the west side of Stockbridge is a primary link, and leads to the Kalamazoo Farmers' Market. Therefore, a special treatment is necessary to provide a visual cue. The trees selected to achieve this task are the 'Forest Pansy' Eastern Redbud and the Fringe Tree. These flowering trees bloom in early spring and can easily be maintained as understory trees beneath the existing mature tree canopy along Stockbridge Avenue.

Tree Planting Palette :

'Forest Pansy' Eastern Redbud – Cercis canadensis 'Forest Pansy'

Fringe Tree – Chionathus virginicus

Bank Street, 1100-1300 block

The Bank Street area is the primary Kalamazoo Farmers' Market route, and connects Stockbridge Avenue on the south end and Lake Street on the north end. The existing pedestrian sidewalk along Bank Street is a 4-5' wide sidewalk directly against the edge of roadway pavement. This corridor will allow for an individual landscaping theme to be expressed for both the Kalamazoo Farmers' Market on the west side of the street and the Seven Acres Housing Development along the east side of the street. Since Bank Street is a central corridor for the Kalamazoo Farmers Market, special treatment is required. Two flowering trees are recommended to provide both spring and summer flowers. The spring season selection is the Radiant Crabapple with its April spring red flowers and its spectacular fall foliage and persistent red fruit in the winter. The summer season selection is the Golden Rain Tree. In June, this tree produces golden panicle flowers with a unique bipinnate compound leaf shape in the

summer and has yellow fall foliage. These trees will be used in an alternating pattern according to the typical design treatment for the primary cross street pedestrian corridor. To create a sense of arrival at both the Kalamazoo Farmers' Market and Upjohn Park, a combination of colorful shrubs and perennial plantings should also be used at each entrance.

Tree Planting Palette:
'Radiant' Crabapple – Malus x adstringens 'Radiant'
Golden Raintree – Koelreuteria paniculata

Collins Street, 500-700 block

The 500-700 block section of Collins Street runs westward from Portage Street to the intersection with Bank Street. There are no existing trees along the south side of Collins Street, and the north side has some large mature Red Maples with a narrow 3' wide sidewalk abutting the curb.

Since Collins Street is the primary entry corridor from the Washington Square Market District, the trees selected should visually connect directly with the Bank Street planting design. The same two flowering trees are selected to make the visual connection from Washington Square to the Kalamazoo Farmers' Market. Both of these trees will be used in an alternating pattern according to the typical design treatment for the primary cross street pedestrian corridor.

Tree Planting Palette:
'Radiant' Crabapple – Malus x adstringens 'Radiant'
Golden Raintree – Koelreuteria paniculata

Banners

The banner design for the primary cross streets will follow the typical banner style and size that is the standard for the primary corridor. The goal is to link the primary routes to the activity areas or market areas, and to provide a process to design a specific banner that represents the activity or market destination.

For the primary cross streets areas, there are five street sections that will link adjacent market or activity areas. Some of these will require banner design treatments that have a specific design logo to the Portage Street corridor but also a similar theme and size to those in downtown Kalamazoo.

The following is a list of the five primary street sections that that provide important connections to primary market or activity areas.

- East Vine Street, 600-700 block –link to Upjohn Park from the Crosstown District.
- Lake Street, 600-700 block – northern link to the Kalamazoo Farmers' Market from the Crosstown District.
- Stockbridge Avenue, 500-900 block – southern link to the Kalamazoo Farmers' Market from Washington Square.
- Bank Street, 1100 block-1300 block – "Main Street" for the Kalamazoo Farmers' Market
- Collins Street, 500 block to 700 block- eastern link to the Kalamazoo Farmers Market from Washington Square.

The design for the banners' logos will be to reflect the activity or the character of the market places. Each design should be formulated with a series of neighborhood workshops that are conducted solely to determine a strong logo that represents both the neighborhood and the activity or market interests.

TIER THREE – "NEIGHBORHOOD SIDE STREETS"

The "Neighborhood Side Streets" study areas are composed of the most prominent streets that intersect the Portage Street Primary Corridor. On a more detailed level, the study area includes the pedestrian sidewalk zone and relationships of this zone to the roadway, the primary cross streets, the primary Portage Street corridor, and primary links to significant related activity areas. The Edison Mainstreet Design Committee chose the streets listed below:

The "Neighborhood Side Streets" study area includes the following streets:

- East Dutton Street, 500-600 block
- Clinton Avenue, 700-900 block
- Hayes Park Avenue, 800-900 block
- Reed Avenue, 600-900 block
- Lay Boulevard, 600-900 block
- Lane Boulevard, 700-900 block
- Bryant Street, 500-900 block
- Alcott Street, 400-800 block
- Palmer Avenue, 800 block
- Fulton Street, 800 block
- Jackson Court
- Carr Street
- Newland Place
- Harrigan Court
- Delaware Court

Design Theme

The design approach for Tier Three neighborhood side streets was to formulate a standard design concept for the pedestrian sidewalk corridor that could be applied to all neighborhood side streets within the listed study area. Additionally, the overall objective is to create a design that injects a sense of order, rhythm, and harmony that encourages pedestrian activity. The overall theme includes built-in flexibility to accommodate existing conditions such as trees, sidewalks, and driveways.

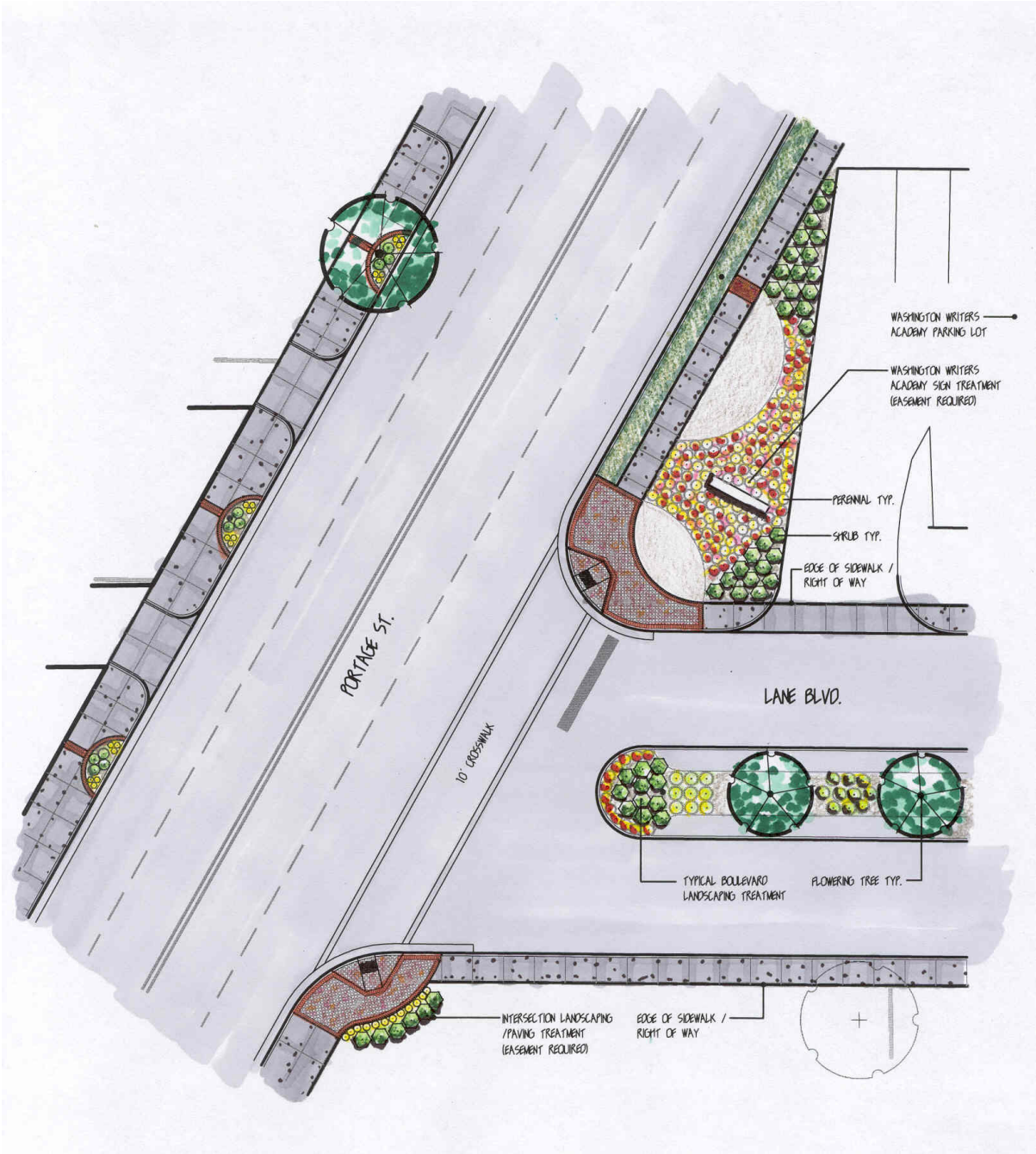
To understand the design theme for the neighborhood side streets area, it is important to provide a brief description of the existing conditions. The conditions include the sidewalk conditions, sidewalk relationship to the street, and tree types and spacing found within the public right-of-way. There are three types of roadways found within the study area: 1) two way, two-lane traffic, 2) one-way street, and 3) two lane boulevards.

Existing conditions that are typical to the all the cross streets include existing 150-200 watt Metal Cobra head lamps mounted to utility poles, spaced approximately 150' to 200' apart. Also included are existing sidewalks of varied width and trees of varied type, spacing and age.

In order for the design theme to accommodate such varied conditions, the design must be flexible in nature. In review of the standard primary corridor design elements, the most flexible element with the most visual impact is the plantings. Therefore, a standardized planting palette has been developed for the pedestrian corridor with a set of guidelines for the design application. The following is the plant palette and its application guidelines:

- Provide flowering trees, two varieties for the streets most directly linked to primary activity or marketplaces;
- Provide replacement or infill flowering trees for all other neighborhood streets;
- Provide flowering shrub and perennial plantings for Lay Boulevard and Lane Boulevard to emphasize the importance of the Washington Writers' Academy to the Edison neighborhood.
- Provide flowering shrub and perennial plantings along Reed Avenue to celebrate Reed Avenue Park as a primary neighborhood park and significantly large landscape space;

- Provide flowering accent trees for one block east and one block west along Bryant Street to celebrate the Hispanic community and its businesses.



Both Lane and Lay Boulevards require a special landscape design treatment including flowering trees and massed arrangements of flowering shrubs and perennial plantings.

- Utilize the primary corridor planting palette for selection of proposed street trees, flowering trees, shrubs, and perennials.

- Where sidewalk is broken, replace with new concrete, except where existing tree roots have caused the concrete sidewalk to uplift. In this condition, saw cut and remove concrete walk, and replace the concrete with new sand set pavers and metal edging in a herringbone pattern similar to the pedestrian corridor paving treatment used for the primary cross streets banding design.

<u>Streets Directly Linked to Primary Activity or Market Places</u>

- Reed Avenue, 600-900 block
- Lay Boulevard, 600-900 block
- Lane Boulevard, 700-900 block
- Bryant Street, 500-900 block

<u>All other Neighborhood Side Streets</u>

- Clinton Avenue, 700-900 block
- Hayes Park Avenue, 800-900 block
- Alcott Street, 400-800 block
- Palmer Avenue, 800 block
- Fulton Street, 800 block
- Jackson Court
- Carr Street
- Newland Place
- Harrigan Court
- Delaware Court

Section 3

Appendices

APPENDIX "1"

PAVING DESIGN PALETTE

PAVING PATTERNS, SHAPES & COLOR RANGES

BORDER PAVERS

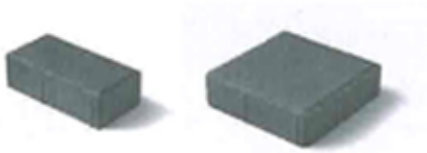
RUSTIC RED COLOR
HOLLAND PAVER 4”x8”
(SHOWN FOR COLOR AND PAVER SHAPE ONLY)

TERRA COTTA COLOR
HOLLAND PAVER 4”x8”
(SHOWN FOR COLOR AND PAVER SHAPE ONLY)

FIELD PAVERS

RUSTIC RED COLOR
UNI-DECOR PAVER 5”x9”

TERRA COTTA COLOR
UNI-DECOR PAVER 5”x9”

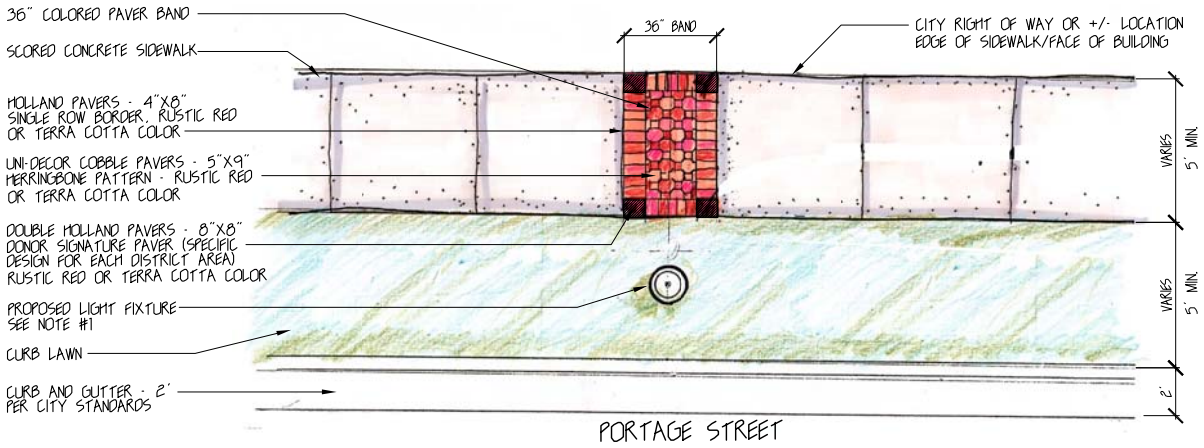


DONOR SIGNATURE PAVERS

DOUBLE HOLLAND PAVER 8”x8”.
(SHOWN FOR SIZE AND SHAPE)
THESE PAVERS WILL BE A DONOR
SIGNATURE PAVER THAT IS UNIQUE
TO A DISTRICT OR REGION OF
PORTAGE STREET.

PAVER PATTERN

UNI-DECOR PAVER IN HERRINGBONE
PATTERN WITH 4”x8” HOLLAND
PAVER AS SOLDIER COURSE PERIMETER EDGE.
(SHOWN FOR PATTERN AND SHAPE)



TYPICAL PEDESTRIAN CORRIDOR PAVING TREATMENT - TYPE 'A'
(CURB LAWN WITH 36" WIDE PAVER BAND): 1/2" = 1'-0"

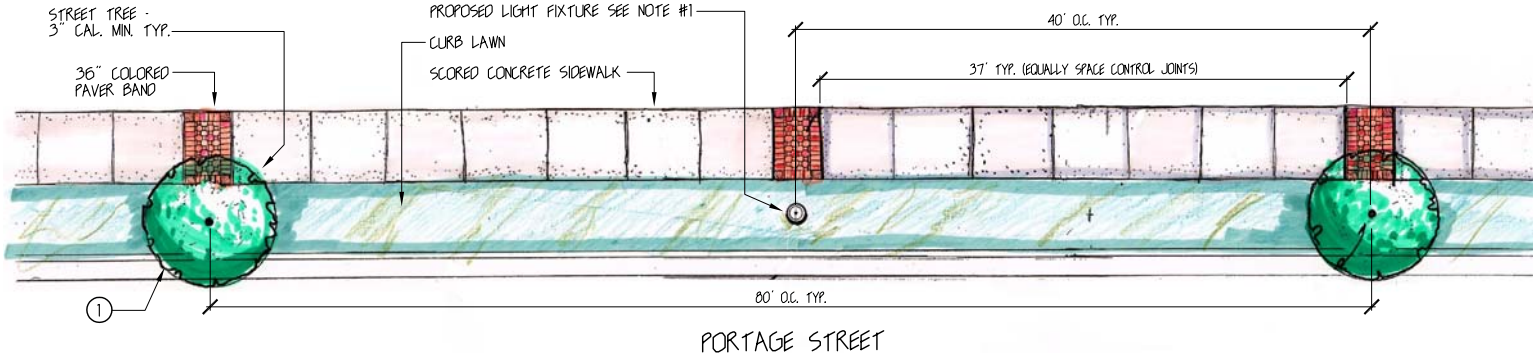
PLANT PALETTE:

1. STREET TREES
   - GREENSPIRE LITTLE LEAF LINDEN
   - JAPANESE ZELKOVA

NOTES:

1. PROPOSED HISTORIC STYLE PEDESTRIAN LIGHT FIXTURES
   OPTION 1 - ORNAMENTAL CAST IRON POLE WITH ACORN LUMINAIRE
   * ANTIQUE STREET LAMPS: FS31 LAMP, NEW YORK SERIES CAST IRON POLE WITH DECORATIVE BASE - BLACK
   * POLE 13' IN HEIGHT WITH 17" DIA. BASE SET 4" ABOVE GRADE.

   OPTION 2 - ORNAMENTAL FIBERGLASS POLE WITH ACORN LUMINAIRE
   * CONSUMERS ENERGY: GRANVILLE SERIES LAMP, FIBERGLASS POLE WITH DECORATIVE BASE - BLACK
   * POLE 14' IN HEIGHT WITH 17" DIA. BASE SET 4" ABOVE GRADE.



TYPICAL PEDESTRIAN CORRIDOR PAVING TREATMENT - TYPE 'A'
(CURB LAWN WITH 36" WIDE PAVER BAND - PATTERN): 1/4" = 1'-0"

NOTE: DRAWING SCALE IS PER A 24"X36" SIZE SHEET

NORTH

SCALE: VARIES 12/10/04

TIER ONE: TYPE 'A' PAVING TREATMENT 36" PAVER BANDS

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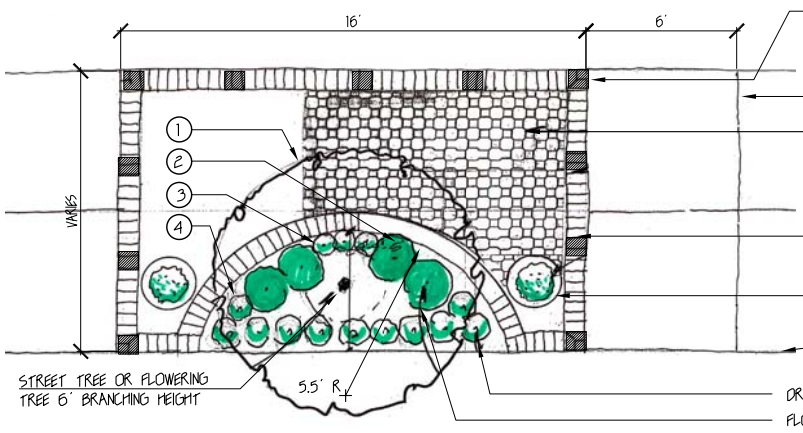
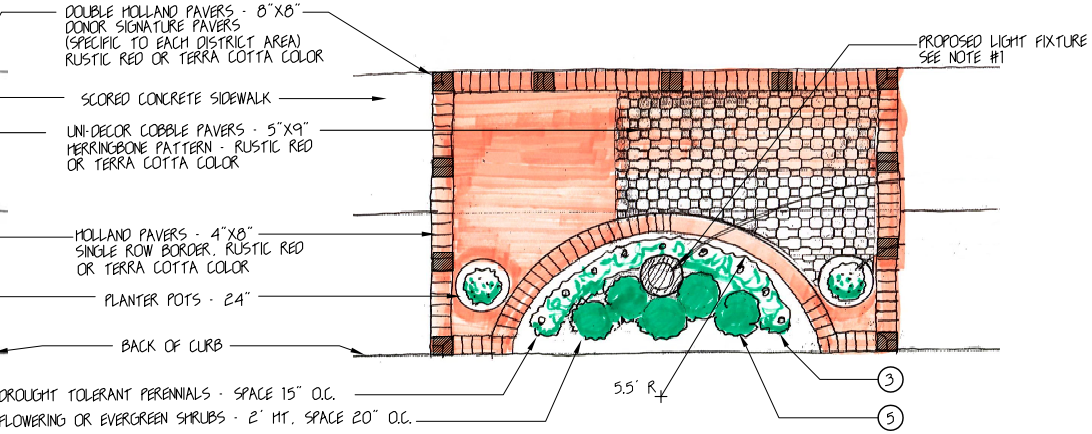
KALAMAZOO, MI 49001





TYPICAL PEDESTRIAN CORRIDOR PAVING TREATMENT - TYPE 'B'
PAVER BAND WITH TREE PLANTING PIT: 1/2" = 1'=0'

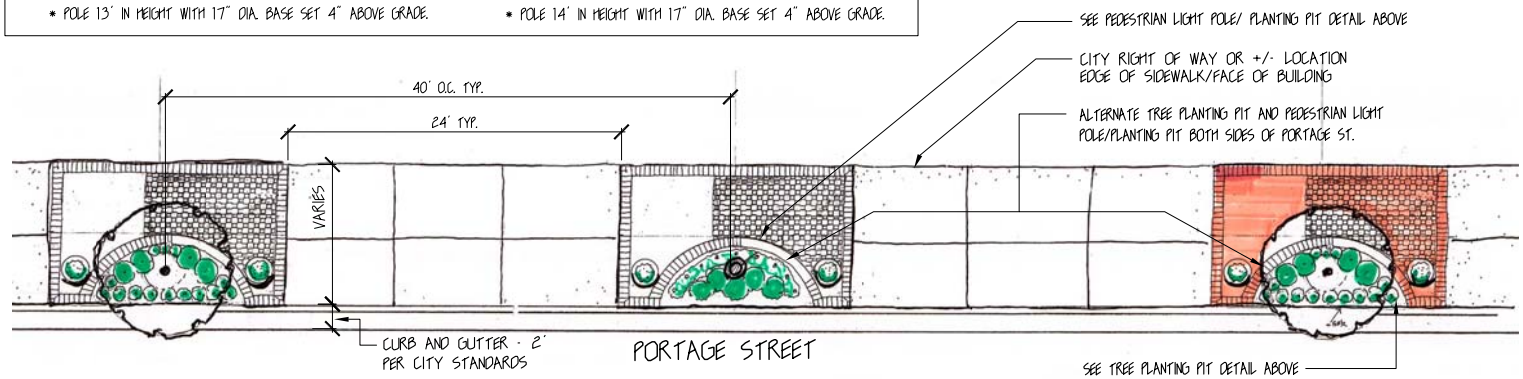
TYPICAL PEDESTRIAN CORRIDOR PAVING TREATMENT - TYPE 'B'
PAVER BAND WITH PEDESTRIAN POLE LIGHT/PLANTING PIT: 1/2" = 1'=0'

NOTES:

1. PROPOSED HISTORIC STYLE PEDESTRIAN LIGHT FIXTURES

OPTION 1 - ORNAMENTAL CAST IRON POLE WITH ACORN LUMINAIRE
* ANTIQUE STREET LAMPS: FS31 LAMP, NEW YORK SERIES CAST IRON POLE WITH DECORATIVE BASE - BLACK
* POLE 13' IN HEIGHT WITH 17" DIA. BASE SET 4" ABOVE GRADE.

OPTION 2 - ORNAMENTAL FIBERGLASS POLE WITH ACORN LUMINAIRE
* CONSUMERS ENERGY: GRANVILLE SERIES LAMP, FIBERGLASS POLE WITH DECORATIVE BASE - BLACK
* POLE 14' IN HEIGHT WITH 17" DIA. BASE SET 4" ABOVE GRADE.



PLANTING PIT PALETTE:

1. STREET TREES (3" CAL. MIN.)
   - JAPANESE ZELKOVA
   - SKYLINE HONEY LOCUST

   FLOWERING TREES (2.5 CAL. MIN.)
   - CLEVELAND PEAR
   - ZUMI CRABAPPLE
2. FLOWERING OR EVERGREEN SHRUBS
   - DWARF AMERICAN CRANBERRY BUSH
   - WILD BLACK CURRENT
   - GOLDFLAME SPIREA
3. DROUGHT TOLERANT PERENNIALS
   - BLACK-EYED SUSAN
   - MOONBEAM COREOPSIS
4. DROUGHT TOLERANT PERENNIALS
   - AUTUMN JOY SEDUM
   - STELLA DE ORO DAYLILY
   - BLUE FESCUE GRASS
5. FLOWERING OR EVERGREEN SHRUBS
   - DWARF BURNING BUSH
   - JAPANESE YEW
   - VARIEGATED YUCCA

NOTE: DRAWING SCALE IS PER A 24"X36" SIZE SHEET

NORTH

SCALE: VARIES 12/10/04

TYPICAL PEDESTRIAN CORRIDOR PAVING TREATMENT - TYPE 'B'
PLANTING/LIGHT PIT PATTERN: 1/4" = 1'=0'

TIER ONE: TYPE 'B' PAVING TREATMENT 16' PAVER BAND / PLANTING PIT

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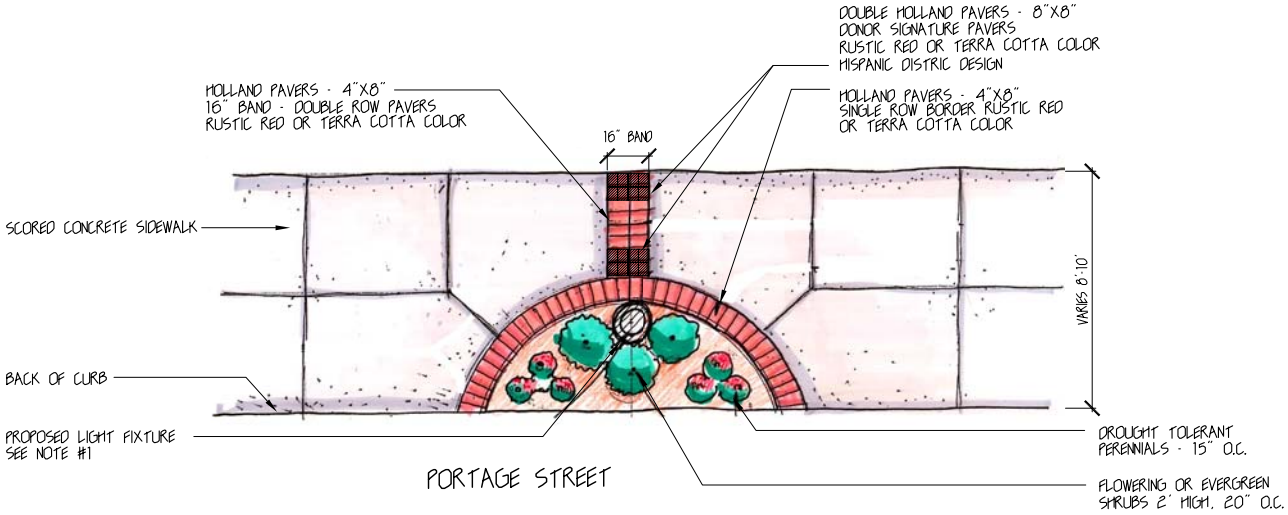
NOTES:

1. PROPOSED HISTORIC STYLE PEDESTRIAN LIGHT FIXTURES

   OPTION 1 - ORNAMENTAL CAST IRON POLE WITH ACORN LUMINAIRE
   * ANTIQUE STREET LAMPS: FS31 LAMP, NEW YORK SERIES CAST IRON POLE WITH DECORATIVE BASE - BLACK
   * POLE 13' IN HEIGHT WITH 17" DIA. BASE SET 4" ABOVE GRADE.

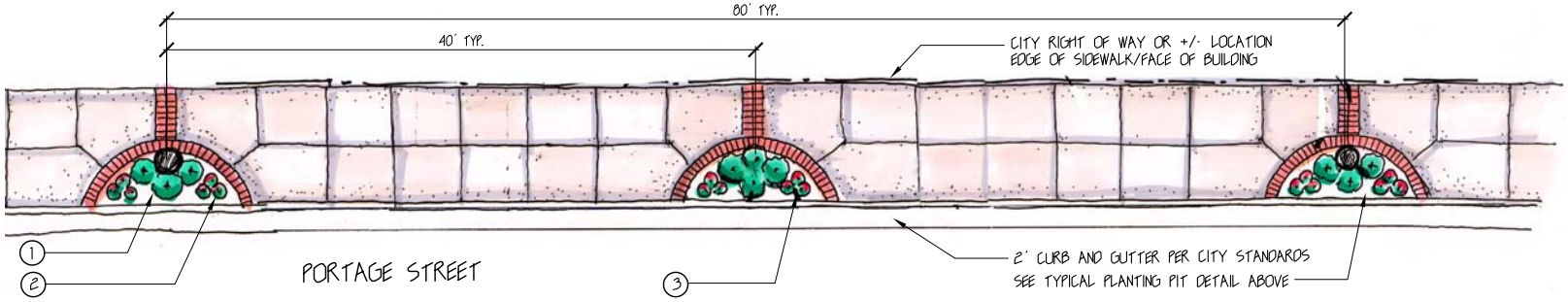
   OPTION 2 - ORNAMENTAL FIBERGLASS POLE WITH ACORN LUMINAIRE
   * CONSUMERS ENERGY: GRANVILLE SERIES LAMP, FIBERGLASS POLE WITH DECORATIVE BASE - BLACK
   * POLE 14' IN HEIGHT WITH 17" DIA. BASE SET 4" ABOVE GRADE.



PLANTING PIT PALETTE:

1. FLOWERING OR EVERGREEN SHRUBS
   - SHRUBBY CINQUEFOIL
   - VARIEGATED YUCCA
   - GOLDFLAME SPIREA
2. DROUGHT TOLERANT PERENNIALS
   - BLACK-EYED SUSAN
   - MOONBEAM COREOPSIS
3. DROUGHT TOLERANT PERENNIALS
   - AUTUMN JOY SEDUM
   - BLUE FESCUE GRASS

TYPICAL PEDESTRIAN CORRIDOR PAVING TREATMENT - TYPE 'C'
PAVER BAND WITH SEMI-CIRCLE PLANTING PIT: 1/2" = 1'-0"



TYPICAL PEDESTRIAN CORRIDOR PAVING TREATMENT - TYPE 'C'
PAVER BAND WITH SEMI-CIRCLE PLANTING PIT - PATTERN: 1/2" = 1'-0"

NOTE: DRAWING SCALE IS PER A 24"X36" SIZE SHEET

NORTH

SCALE: VARIES 12/10/04

TIER ONE: TYPE 'C' PAVING TREATMENT 16" PAVER BAND WITH SEMI-CIRCLE PLANTING PIT

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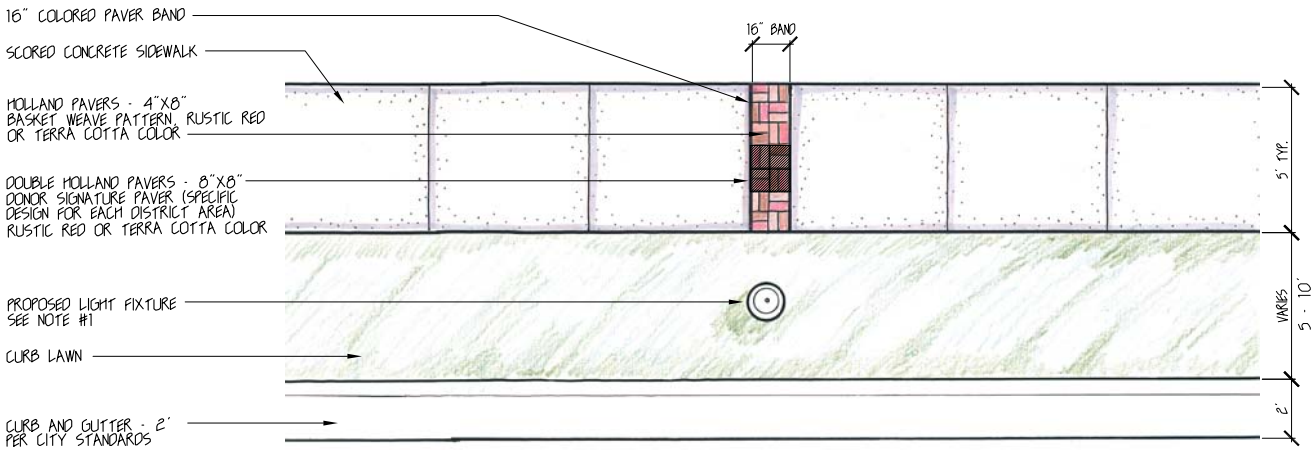


TYPICAL PEDESTRIAN CORRIDOR PAVING TREATMENT - TYPE 'D'
(CURB LAWN WITH 16" WIDE PAVER BAND): 1/2" = 1'-0"

NOTE:
THIS TYPICAL PEDESTRIAN CORRIDOR PAVING TREATMENT APPLIES TO TIER 2-PRIMARY CROSS STREETS. REFER TO THE TIER 2 SECTION OF THE STREETSCAPE REPORT FOR A DESCRIPTION OF THE STREETS WITHIN THIS TIER.

PLANTING PIT PALETTE:

(1) EAST WALNUT-700 BLOCK
- -CLEVELAND SELECT PEAR
- -ZUMI CRABAPPLE

EAST CROSSTOWN PKWY-700 BLOCK
- -EMERALD QUEEN NORWAY MAPLE
- -NORTHWOOD RED MAPLE

EAST VINE ST-600-700 BLOCK
- -CLEVELAND SELECT PEAR
- -RADIANT CRABAPPLE

LAKE ST.-600-700 BLOCK
- -FOREST PANSY EASTERN REDBUD
- -BALLERINA SERVICEBERRY

WASHINGTON AVE.-800 BLOCK
- -EMERALD GREEN NORWAY MAPLE
- -NORTHWOOD RED MAPLE

STOCKBRIDGE AVE.-500 BLOCK
- -FOREST PANSY EASTERN REDBUD
- -FRINGE TREE

BANK ST.-1100-1300 BLOCK
- -RADIANT CRABAPPLE
- -GOLDEN RAINTREE

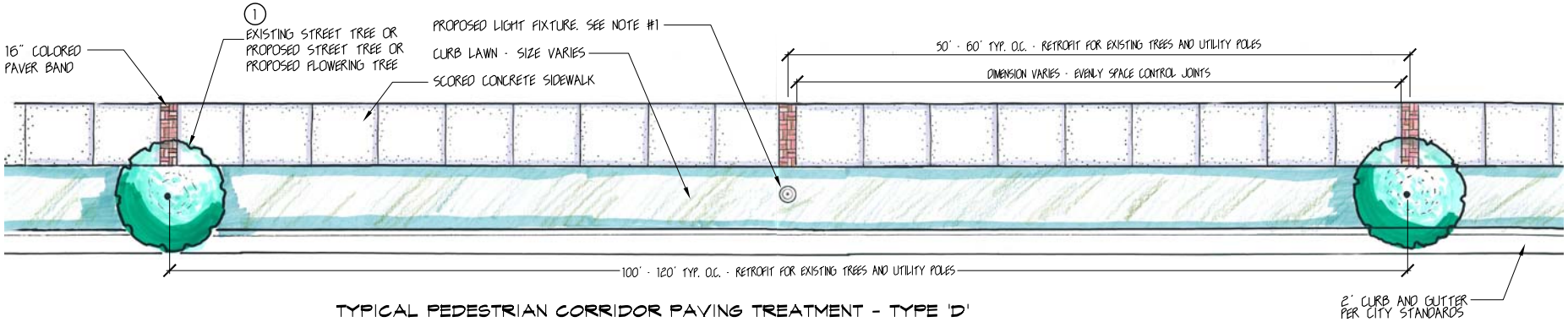
COLLINS ST.-500-700 BLOCK
- -RADIANT CRABAPPLE
- -GOLDEN RAINTREE

NOTES:

1. PROPOSED HISTORIC STYLE PEDESTRIAN LIGHT FIXTURES

   OPTION 1 - ORNAMENTAL CAST IRON POLE WITH ACORN LUMINAIRE
   - * ANTIQUE STREET LAMPS: FS31 LAMP, NEW YORK SERIES CAST IRON POLE WITH DECORATIVE BASE - BLACK
   - * POLE 13' IN HEIGHT WITH 17" DIA. BASE SET 4" ABOVE GRADE.

   OPTION 2 - ORNAMENTAL FIBERGLASS POLE WITH ACORN LUMINAIRE
   - * CONSUMERS ENERGY: GRANVILLE SERIES LAMP, FIBERGLASS POLE WITH DECORATIVE BASE - BLACK
   - * POLE 14' IN HEIGHT WITH 17" DIA. BASE SET 4" ABOVE GRADE.



TYPICAL PEDESTRIAN CORRIDOR PAVING TREATMENT - TYPE 'D'
(CURB LAWN WITH 16" WIDE PAVER BAND - PATTERN): 1/4" = 1'-0"

NOTE: DRAWING SCALE IS PER A 24"X36" SIZE SHEET

NORTH

SCALE: VARIES 12/13/04

TIER TWO: TYPE 'D' PAVING TREATMENT 16" PAVER BAND DETAIL

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KALAMAZOO, MI 49001

APPENDIX "2"

PLANTING DESIGN PALETTE

PLANTING PALETTE-STREET TREES

STREET TREES

SHINGLE OAK
Quercus Imbricaria

LEAVES-FALL COLOR

GREENSPIRE LITTLE LEAF LINDEN
Tilia Cordata 'Greenspire'

LEAVES

JAPANESE ZELKOVA
Zelkova Serrata 'Village Green'

LEAVES

SKYLINE HONEY LOCUST
Gleditsia Triacanthos Inermis 'Skyline'

LEAVES

EMERALD QUEEN NORWAY MAPLE
Acer platanoides 'Emerald Queen'

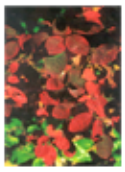
NORTHWOOD RED MAPLE
Acer rubrum 'Northwood'

PLANTING PALETTE-FLOWERING TREES

FLOWERING TREES

GOLDEN RAINTREE
Koelreuteria Paniculata

BALLERINA SERVICEBERRY
Amelanchier Canadensis ‘Ballerina’



FLOWER

RADIANT CRABAPPLE
Malus Adstringens ‘Radiant’

ZUMI CRABAPPLE
Malus Calocarpa ‘Zumi’

CLEVELAND SELECT PEAR
Pyrus Calleryana ‘Cleveland Select’

FOREST PANSY EASTERN REDBUD
Cercis Canadensis ‘Forest Pansy’

KWANZAN CHERRY
Prunus Serrulata ‘Kwanzan’

FRINGE TREE
Chionanthus Virginicus

PLANTING PALETTE-SHRUBS AND PERENNIALS

SHRUBS

JAPANESE YEW
Taxus x Media 'Ward'

WILD BLACK CURRANT
Ribes Americana

NINEBARK
Physocarpus Opulifolius

ARROWWOOD VIBURNUM
Viburnum dentatum

FLOWER & LEAF

GOLD FLAME SPIREA
Spirea Japonica 'Gold Flame'

VARIEGATED YUCCA
Yucca Filamentosa

SHRUBBY CINQUEFOIL
Potentilla Fruticosa

ARBORVITAE
Thuja Occidentalis

DWARF BURNING BUSH
Euonymus Alatus 'Compactus'

RED OSIER DOGWOOD
Cornus Stolonifera

FLOWER

FRUIT

DWARF AMERICAN CRANBERRY BUSH
Viburnum Opulus Nanum

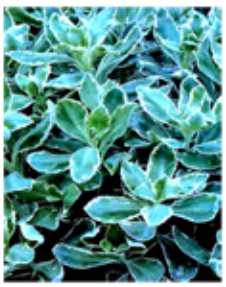
PERENNIALS

BLUE FESCUE GRASS
Festuca Ovina 'Glauca'

STELLA DE ORO DAYLILLY
Hemerocallis 'Stella De Oro'

DWARF FOUNTAIN GRASS
Pennisetum Alopectroides
'Hamelin'

BLACK EYED SUSAN
Rudbeckia Hirta 'Goldstrum'



VARIEGATED SEDUM
Sedum 'Frosty Morn'

AUTUMN JOY SEDUM
Sedum Erythrostichum
'Autumn Joy'

DWARF VAREIGATED
MAIDEN GRASS
Miscanthus Sinensis
'Morning Light'

MOON BEAM COREOPSIS
Coreopsis Verticillata
'Moonbeam'

APPENDIX "3"

FURNITURE DESIGN PALETTE

STREETSCAPE FURNITURE
BENCH, TRASH/ASH RECEPTACLE AND PLANTER POTS

BENCH

(SHOWN FOR STYLE)

LANDSCAPE FORMS “PLAINWELL SERIES”
BENCH - 8’ LENGTH WITH CENTER ARM
BLACK POWDER COAT METAL PARTS
BLACK ALUMINUM SEAT

BENCH

(SHOWN FOR COLOR)

TRASH/ASH RECEPTACLE

LANDSCAPE FORMS “PLAINWELL SERIES”
TRASH/ASH RECEPTACLE WITH SAND PAN
AND SIDE OPENING - 35 GALLON
30” DIAMETER, 44.5” HEIGHT
BLACK POWDER COAT METAL PARTS
BLACK ALUMINUM SIDE PANEL

PLANTER POTS

DURA ART STONE PLANTER POTS - ROUND
GRECIAN OR MEDITERRANEAN STYLE
24” MIN. DIAMETER, 30” HEIGHT
COMPOSITE PLASTIC
RUST COLOR

STREETSCAPE FURNITURE
BOLLARD, BIKE RACK, FENCE, BUS SHELTER

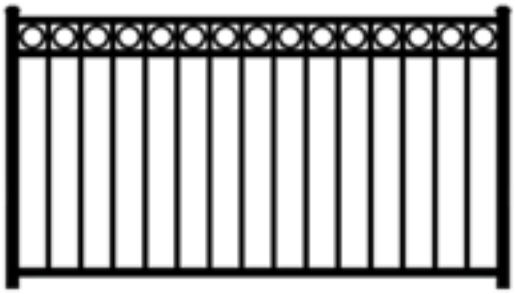
BOLLARD

REMOVABLE METAL BOLLARD WITH LOCKING CAPABILITY 8” DIAMETER, 48” HEIGHT, PAINTED BLACK (MANUFACTURED BY FAIRWEATHER SITE FURNISHINGS, MODEL B-2)

BUS SHELTER

4’-10” X12’ METRO TRANSIT BUS SHELTER ON A CONCRETE SLAB WITH PLAINWELL BENCH AND TRASH/ASH RECEPTACLE (MANUFACTURED BY COLUMBIA EQUIPMENT CO. OR APPROVED EQUAL).

ORNAMENTAL ALUMINUM FENCE



ORNAMENTAL COMMERCIAL GRADE ALUMINUM FENCE - 42” - 48” HEIGHT, PAINTED BLACK (MANUFACTURED BY JERITH OR APPROVED EQUAL)

BIKE RACK

2“ SCHEDULE 40 PIPE MULTIPLE LOOP BIKE RACK - 36” HEIGHT, PAINTED BLACK (MANUFACTURED BY FAIRWEATHER SITE FURNISHINGS, MODEL BR-1 OR APPROVED EQUAL).

APPENDIX "4"

STREET LIGHTING DESIGN PALETTE

STREET LIGHTING
PEDESTRIAN STREET LIGHTING AND INTERSECTION LIGHTING

PEDESTRIAN STREET LIGHT - OPTION 1

ORNAMENTAL CAST IRON POLE WITH ACORN LUMINARIE

LAMP
MANUFACTURER - ANTIQUE STREET LAMPS
STYLE - FS31, 175w, METAL HALIDE
COLOR - BLACK

POLE
MANUFACTURER - ANTIQUE STREET LAMPS
STYLE - NEW YORK SERIES, CAST IRON, 17” BASE
HEIGHT - 13’ WITH BASE SET 4” ABOVE GRADE
COLOR - BLACK

PEDESTRIAN STREET LIGHT - OPTION 2

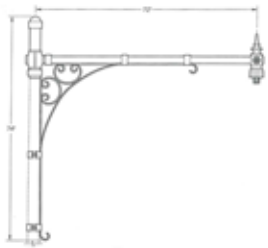
ORNAMENTAL FIBERGLASS POLE WITH ACORN LUMINARIE

LAMP
MANUFACTURER - CONSUMERS ENERGY STANDARD OR HOLOPHANE LIGHTING
STYLE - GRANVILLE SERIES, 175w, METAL HALIDE
COLOR - BLACK

POLE
MANUFACTURER - CONSUMERS ENERGY STANDARD OR SHAKESPEARE LIGHTING
STYLE - WASHINGTON SERIES, FIBERGLASS, 17” BASE
HEIGHT - 14’ WITH BASE SET 4” ABOVE GRADE
COLOR - BLACK

INTERSECTION LIGHTING

NEW MDOT ALUMINUM SIGNAL POLE WITH DECORATIVE ARM AND PENDANT LUMINARIE



LAMP
MANUFACTURER - ANTIQUE STREET LAMPS
STYLE - PENDANT STYLE CM 31, 250w METAL HALIDE
COLOR - BLACK

POLE
MANUFACTURER - UNION METAL (OR APPROVED EQUAL)
STYLE - MDOT STANDARD, ALUMINUM WITH ANTIQUE STREET LAMPS’ NEW YORK SERIES 24” CLAMSHELL BASE
HEIGHT - 36’
COLOR - BLACK

ARM
MANUFACTURER - ANTIQUE STREET LAMPS
STYLE - CAM SERIES 72/1
COLOR - BLACK

APPENDIX "5"

DESIGN OUTLINE SPECIFICATIONS

INTRODUCTION

The following outline specifications provide the information necessary to convey the Portage Street Streetscape primary design components including the definition of the materials, colors and finishes, patterns, dimensions, sizes and shapes, and includes the anchorage materials and patterns or general layouts of those design elements for the Portage Street Streetscape Master Plan Study. This information is intended to be utilized as a tool to be used in combination with the Portage Street Streetscape Design Palette sheets (appendices C, D and E), and the Final Portage Street Streetscape Design Drawings to realize the locations and specific district applications of these design elements. The Master Plan Report then provides the background, design process and specific unique design themes created for each district.

With this collective information, a foundation is set to proceed into construction specifications and working drawings for the Portage Street Streetscape Design Construction Documents Phase of the Project.

The following is a list of the Design Outline Specifications:

- Concrete Pavers
- Concrete Paving
- Trees and Landscaping
- Street Furniture
- Street Lighting and Banner Specifications

CONCRETE PAVER SPECIFICATIONS

1. PAVER COLORS

- Paver colors to be “Rustic Red and Terra Cotta” blend as manufactured by Unilock Corporation, Detroit, Michigan.
- Contractor to submit color samples to indicate color range blend for review and approval by Landscape Architect and the City.

2. PAVER DIMENSIONS

Hollandstone Paver

- 4”x 8” (2 3/8” thickness for pedestrian walk, 3 1/8” thickness for vehicular paving).

Unidecor Paver

- 5”x 9” (2 3/8” thickness for pedestrian walk, 3 1/8” thickness for vehicular paving).

Double Hollandstone Paver (Donor Pavers)

- 8” x 8”(2 3/8” thickness for pedestrian walk, 3 1/8” thickness for vehicular paving).

3. PAVER PATTERNS

Patterns

- 4” x 8”- Laid in a single Soldier Course perimeter band around the paving field of Uni-decor Pavers.
- 8”x 8”- Laid in the corner intersections of the perimeter bands.
- 5”x 9”- Laid in a Herringbone Pattern at 90 degrees to the sidewalk length.

Crosstown Parkway District Paving Treatment Pedestrian

(Pedestrian Paving Treatment – Type ‘D”)

- 3’ x 5’ paver bands spaced as equally as possible at 40’ on center with new 5’ concrete sidewalk spaced in between.
- Bands to be centered with new trees and pole lights placed in the adjacent curb lawn. Field adjust for curb cuts, trees, and existing conditions as required.

Washington Square Market District Pedestrian Paving Treatment

(Pedestrian Paving Treatment Type ‘B’)

- 16’ x 10’ paver bands spaced as equally as possible at 40’ on center with new 10’ wide concrete sidewalk placed in between. The paver bands will border semi-circular planting pits that have alternating new trees and pole lights centered in them. Field adjust for curb cuts, and existing conditions as required

Reed Avenue District Pedestrian Paving Treatment

(Pedestrian Paving Treatment Types 'A' and 'C')

- Two styles of paver bands are designed for this district which are as follows:

  a) Semi-circular planting pit bands
  16" wide paver bands are centered on the semi-circular planting pits and spaced at 40' on center, then crossing the new concrete sidewalk. These planting pits alternate with trees and lights centered in them. Field adjust band layout for curb cuts, and existing conditions as required.

  b) 36" wide paver bands
  3' long x 5' wide paver bands, spaced as equally as possible at 40' on center within the new 5' concrete sidewalk layout. Bands to be centered with new trees and pole lights along the new sidewalk. Field adjust band layout for curb cuts, trees, and existing conditions as required.

4. BASE FOR CONCRETE PAVERS

- Pedestrian Sidewalk Paving: Epoxy Mortar set pavers over 4" minimum reinforced concrete slab with aggregate base below.
- Crosswalk Paving: Sand set pavers over geotextile fabric and 8-10" thick reinforced concrete subslab with aggregate base and drainage weeps to gravel subbase below.

5. PAVER JOINTS

- Sand swept joints, with polymeric jointing sand.

CONCRETE SIDEWALK AND DECORATIVE CONCRETE PAVING SPECIFICATIONS

1. CONCRETE SIDEWALKS

- Typical Pedestiran Sidewalk Dimensions:
  Concrete sidewalks shall typically be 5' wide with broomed finished surface placed at 90 degrees to the direction of pedestrian traffic. Hand tooled score joints shall be placed at approximately 5' on center, and spaced equally between the paver bands shown on the drawings. Expansion joints shall be installed every 25' o.c. Joints shall be filler type A: ASTM B221 elastomeric filler strip, mounted to be flush with adjacent surfaces.
- Surface and Slopes:
  A maximum cross slope of 2% and a maximum longitudinal slope of 4.9%, except for the ADA accessible concrete ramps at each intersection. All concrete will have a positive surface slope away from all buildings and toward drainage or landscape curb lawn areas. No standing water pockets will be acceptable.
- All concrete sidewalks and ramps shall meet ADA and ADAAG standards and guidelines for development
- Concrete sidewalks shall meet the City of Kalamzoo's standards for guidelines for development.
- Concrete to be minimum 4" thickness, reinforced per city standards.
- Concrete to be 3500 psi @ 28 days concrete limestone mix.
- Concrete Materials:
  a) Cement: ASTM C150, Type 1-Normal Type IA-Air Entraining list appropriate blend and cement type.
  b) Fine and Coarse Aggregates: ASTM C33
  c) Water: Clean and not detrimental to concrete.
  d) Admixture: Air Entrainment: ASTM C260
- Reinforcing:
  For concrete to follow standard practices per the Concrete Reinforcing Steel Institute: "Manual of Standard Practice" and "Placing Reinforcing Bars" document. Reinforcing to meet ASTM A615 60ksi yield grade and ASTM A706, 60ksi yield strength. If welded wire fabric is used, it shall be ASTM A497 in flat sheets or coiled rolls. Maintain minimum concrete cover to meet ACI 318 code.

- Quality Control:
  a) Perform work in accordance with ACI 301.
  b) Acquire cement from one source for work.
  c) Conform to ACI 305 when concreting in hot weather.
  d) Conform to ACI 306.1 when concreting in cold weather.
  e) Water: Clean and not detrimental to concrete.
  f) Mock up: provide panel of sufficient size to indicate treatment, finish, jointing and quality of concrete sidewalk installation for Engineers Review.
  g) Place concrete in accordance with ACI 301 and ACI 318.
  h) Layout of walks: Contractor to stake out layout of sidewalk edges for Engineers review prior to forming and installation.
  i) Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete. Protect concrete from premature drying, excessive wetness, cold or hot temperatures.
  j) Separate concrete slab on grade from vertical surfaces such as buildings, curbs, structures with joint filler material, apply sealants in all joint fillers.

2. DECORATIVE CONCRETE

- General Description of Use:

  Stamped and Colored Concrete will be used in all areas of the plan where special paving is indicated. These areas include signalized intersection corner treatments, crosswalks, and 4 different concrete banding treatments.
- Surface and Slopes: Patterned concrete surface shall be an ADA approved stamp pattern or surface texture. No standing water pockets.
- Stamping Pattern & Colors: Stamp pattern for concrete shall match soldier course pattern indicated on the drawings, however where the hexagonal Uni-Décor Pavers are indicated, substitute a “Belgian Basketweave Pattern” or “Herringbone” with two tone color range to

match the "Rustic Red" and the "Terra Cotta" color ranges as manufactured by the "Uni-lock Corporation" phone (800) Unilock.

- All Stamped Concrete shall be integrally batch mixed "Chro-mix Admixture" by LM Scofield per manufacturer specifications. Phone (800) 800-9900 or Approved Equal.
- Concrete to be minimum 4" thickness in pedestrian areas, reinforced per city standards. Concrete in crosswalks to be minimum 10" thick heavily reinforced with gravel subbase, thickness and reinforcing to be determined by structural engineer.
- Concrete to be 3500 psi @ 28 days concrete limestone mix.
- Reinforcing:

  Concrete to follow standard practices per the Concrete Reinforcing Steel Institute. (see "Concrete Sidewalk Specification").
- Quality Control:

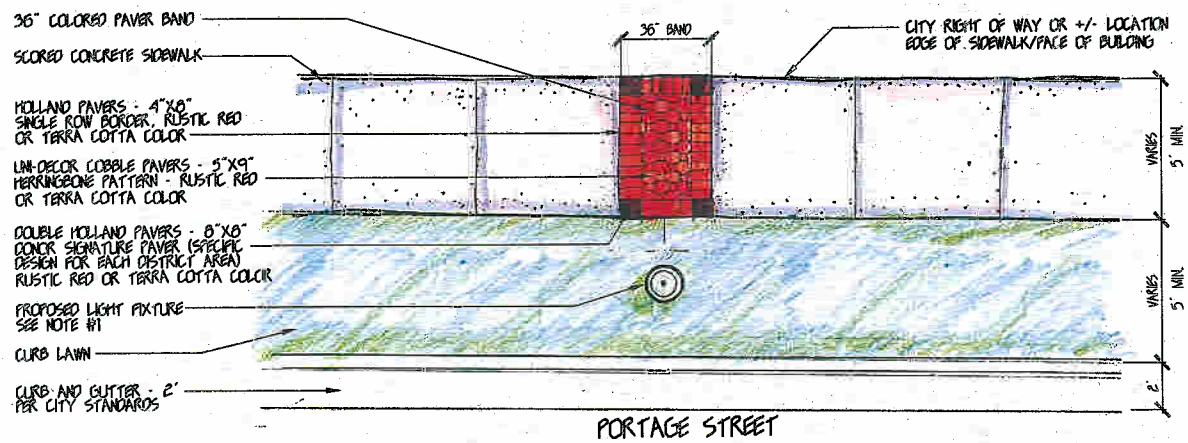
  a) Apply same "Quality Control Specifications as stated in "Concrete Sidewalks" section.

  b) All Decorative Stamped Concrete work shall be installed by a licensed Decorative Stamped Concrete Contractor who shall provide a foreman or supervisor who has completed at least three Decorative Stamped Concrete installations of high quality.

  c) The Decorative Stamped Concrete Contractor shall comply with the current specifications and quality standards issued by the industry.

  d) The Decorative Stamped Concrete Contractor shall provide 2 job site sample mock-ups indicating patterning, color range and detail to be approved by the Engineer or Landscape Architect prior to the start of construction.

  e) Apply color hardener and sealants per manufacturer specifications.



TYPICAL PEDESTRIAN CORRIDOR PAVING TREATMENT - TYPE 'A'
(CURB LAWN WITH 36" WIDE PAVER BAND): 1/2" = 1'-0"

PLANT PALETTE:

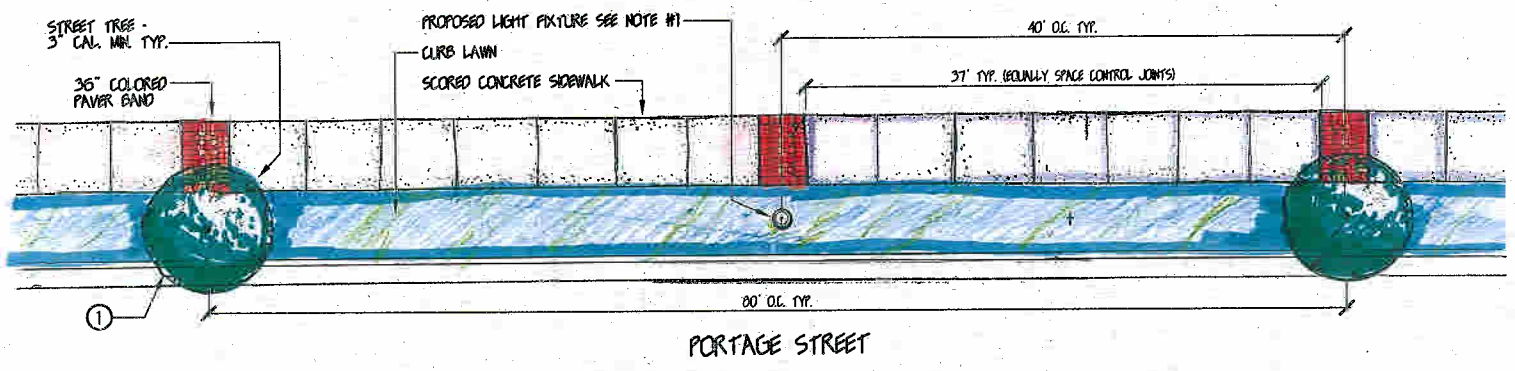
1. STREET TREES
   - GREENSPIRE LITTLE LEAF LINDEN
   - JAPANESE ZELKOVA

NOTES:

1. PROPOSED HISTORIC STYLE PEDESTRIAN LIGHT FIXTURES

   OPTION 1 - ORNAMENTAL CAST IRON POLE WITH ACORN LUMINAIRE
   - ANTIQUE STREET LAMPS FS31 LAMP, NEW YORK SERIES CAST IRON POLE WITH DECORATIVE BASE - BLACK
   - POLE 13' IN HEIGHT WITH 17" DIA. BASE SET 4" ABOVE GRADE.

   OPTION 2 - ORNAMENTAL FIBERGLASS POLE WITH ACORN LUMINAIRE
   - CONSUMERS ENERGY: GRANVILLE SERIES LAMP, FIBERGLASS POLE WITH DECORATIVE BASE - BLACK
   - POLE 14' IN HEIGHT WITH 17" DIA. BASE SET 4" ABOVE GRADE.



TYPICAL PEDESTRIAN CORRIDOR PAVING TREATMENT - TYPE 'A'
(CURB LAWN WITH 36" WIDE PAVER BAND - PATTERN): 1/4" = 1'-0"

NOTE: DRAWING SCALE IS PER A 24"X36" SIZE SHEET

NORTH

SCALE: VARIES 12/10/04

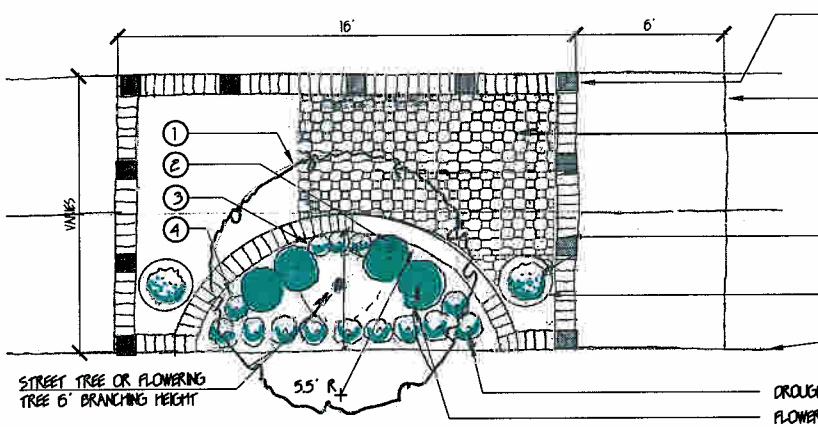
TIER ONE: TYPE 'A' PAVING TREATMENT 36" PAVER BANDS

PORTAGE STREET STREETSCAPE IMPROVEMENTS

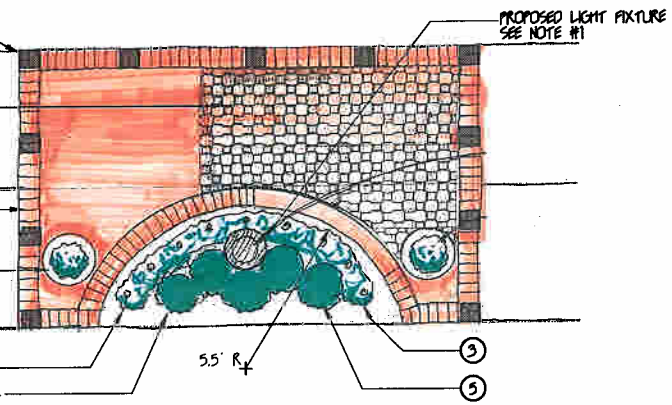
EDISON NEIGHBORHOOD • CITY OF KALAMAZOO

PURCHASING/RISK MANAGEMENT DEPARTMENT • 241 W. SOUTH STREET • KALAMAZOO, MI 49007

GOVE ASSOCIATES INC.
1601 PORTAGE STREET
KALAMAZOO, MI 49001



TYPICAL PEDESTRIAN CORRIDOR PAVING TREATMENT - TYPE 'B'
PAVER BAND WITH TREE PLANTING PIT: 1/2" = 1'=0'



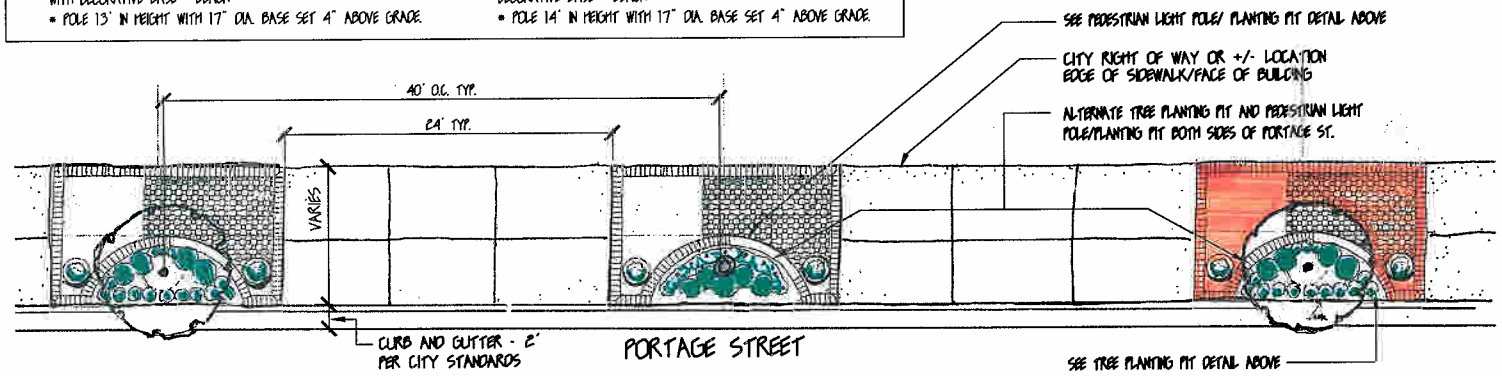
TYPICAL PEDESTRIAN CORRIDOR PAVING TREATMENT - TYPE 'B'
PAVER BAND WITH PEDESTRIAN POLE LIGHT/PLANTING PIT: 1/2" = 1'=0'

NOTES:

1. PROPOSED HISTORIC STYLE PEDESTRIAN LIGHT FIXTURES

OPTION 1 - ORNAMENTAL CAST IRON POLE WITH ACORN LUMINAIRE
- ANTIQUE STREET LAMPS: FS31 LAMP, NEW YORK SERIES CAST IRON POLE WITH DECORATIVE BASE - BLACK
- POLE 13' IN HEIGHT WITH 17" DIA. BASE SET 4" ABOVE GRADE.

OPTION 2 - ORNAMENTAL FIBERGLASS POLE WITH ACORN LUMINAIRE
- CONSUMERS ENERGY: GRANVILLE SERIES LAMP, FIBERGLASS POLE WITH DECORATIVE BASE - BLACK
- POLE 14' IN HEIGHT WITH 17" DIA. BASE SET 4" ABOVE GRADE.



TYPICAL PEDESTRIAN CORRIDOR PAVING TREATMENT - TYPE 'B'
PLANTING/LIGHT PIT PATTERN: 1/4" = 1'=0'

PLANTING PIT PALETTE:

1. STREET TREES (3" CAL. MIN)
   - JAPANESE ZELKOVA
   - SKYLINE HONEY LOCUST

   FLOWERING TREES (2.5 CAL. MIN)
   - CLEVELAND PEAR
   - ZUM CRABAPPLE

2. FLOWERING OR EVERGREEN SHRUBS
   - DWARF AMERICAN CRANBERRY BUSH
   - WILD BLACK CURRANT
   - GOLDFLAME SPIREA

3. DROUGHT TOLERANT PERENNIALS
   - BLACK-EYED SUSAN
   - MOONBEAM COREOPSIS

4. DROUGHT TOLERANT PERENNIALS
   - AUTUMN JOY SEDUM
   - STELLA DE ORO DAYLILY
   - BLUE FESCUE GRASS

5. FLOWERING OR EVERGREEN SHRUBS
   - DWARF BURNING BUSH
   - JAPANESE YEW
   - VARIEGATED YUCCA

NOTE: DRAWING SCALE IS PER A 24"X36" SIZE SHEET

NORTH

SCALE: VARIES 12/10/04

TIER ONE: TYPE 'B' PAVING TREATMENT 16' PAVER BAND / PLANTING PIT

PORTAGE STREET STREETSCAPE IMPROVEMENTS

EDISON NEIGHBORHOOD • CITY OF KALAMAZOO

PURCHASING/RISK MANAGEMENT DEPARTMENT • • 241 W. SOUTH STREET • • KALAMAZOO, MI 49007

CENTRAL CITY

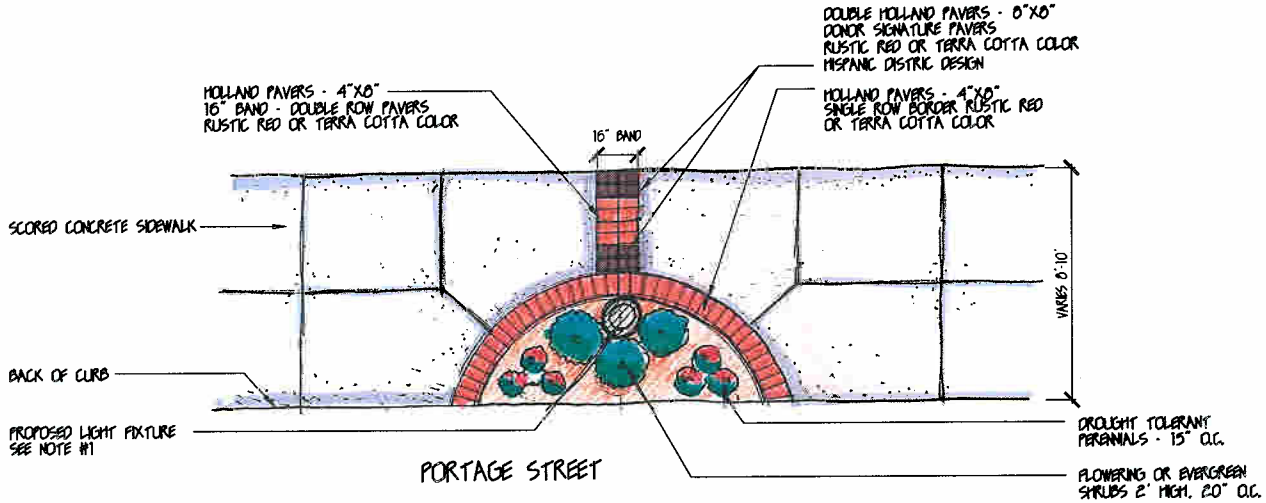
GOVE ASSOCIATES INC.
1601 PORTAGE STREET
KALAMAZOO, MI 49001

NOTES:

1. PROPOSED HISTORIC STYLE PEDESTRIAN LIGHT FIXTURES

   OPTION 1 - ORNAMENTAL CAST IRON POLE WITH ACORN LUMINAIRE
   - ANTIQUE STREET LAMPS FS31 LAMP, NEW YORK SERIES CAST IRON POLE WITH DECORATIVE BASE - BLACK
   - POLE 13' IN HEIGHT WITH 17" DIA. BASE SET 4" ABOVE GRADE.

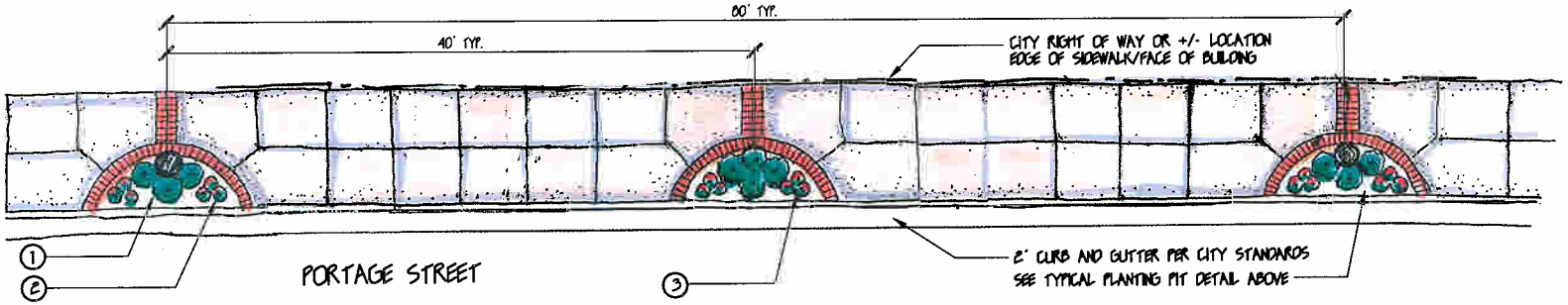
   OPTION 2 - ORNAMENTAL FIBERGLASS POLE WITH ACORN LUMINAIRE
   - CONSUMERS ENERGY: GRANVILLE SERIES LAMP, FIBERGLASS POLE WITH DECORATIVE BASE - BLACK
   - POLE 14' IN HEIGHT WITH 17" DIA. BASE SET 4" ABOVE GRADE.



TYPICAL PEDESTRIAN CORRIDOR PAVING TREATMENT - TYPE 'C'
PAVER BAND WITH SEMI-CIRCLE PLANTING PIT: 1/2" = 1'-0"

PLANTING PIT PALETTE:

1. FLOWERING OR EVERGREEN SHRUBS
   - SHRUBBY CINQUEFOIL
   - VARIEGATED YUCCA
   - GOLDFLAME SPIREA
2. DROUGHT TOLERANT PERENNIALS
   - BLACK-EYED SUSAN
   - MOONBEAM COREOPSIS
3. DROUGHT TOLERANT PERENNIALS
   - AUTUMN JOY SEDUM
   - BLUE FESCUE GRASS



TYPICAL PEDESTRIAN CORRIDOR PAVING TREATMENT - TYPE 'C'
PAVER BAND WITH SEMI-CIRCLE PLANTING PIT - PATTERN: 1/2" = 1'-0"

NOTE: DRAWING SCALE IS PER A 24"X36" SIZE SHEET

NORTH

SCALE: VARIES 12/10/04

TIER ONE: TYPE 'C' PAVING TREATMENT 16" PAVER BAND WITH SEMI-CIRCLE PLANTING PIT

CENTRAL CITY

PORTAGE STREET STREETSCAPE IMPROVEMENTS

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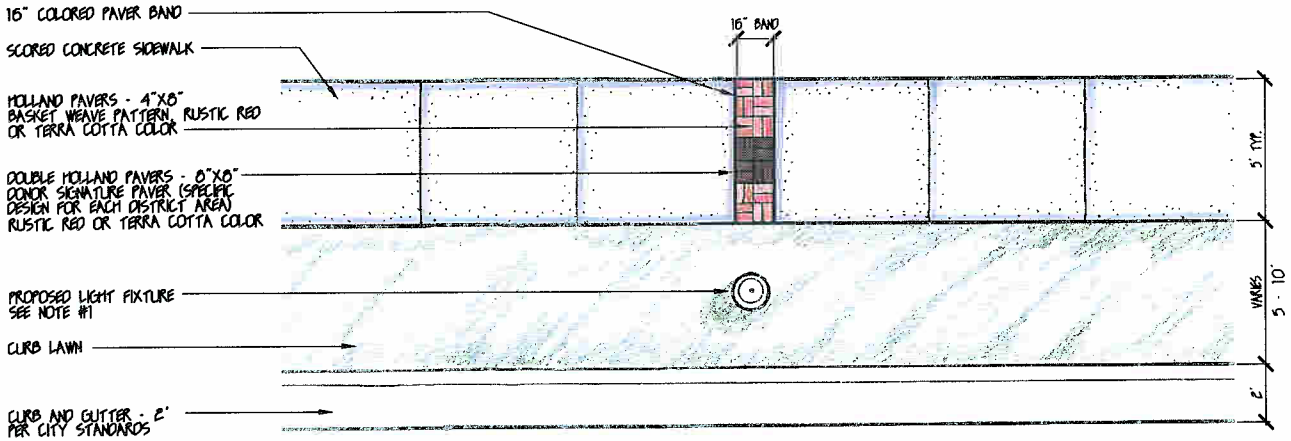


TYPICAL PEDESTRIAN CORRIDOR PAVING TREATMENT - TYPE 'D'
(CURB LAWN WITH 16" WIDE PAVER BAND): 1/2" = 1'-0"

NOTE:
THIS TYPICAL PEDESTRIAN CORRIDOR PAVING TREATMENT APPLIES TO TIER 2-PRIMARY CROSS STREETS. REFER TO THE TIER 2 SECTION OF THE STREETSCAPE REPORT FOR A DESCRIPTION OF THE STREETS WITHIN THIS TIER.

PLANTING PIT PALETTE:

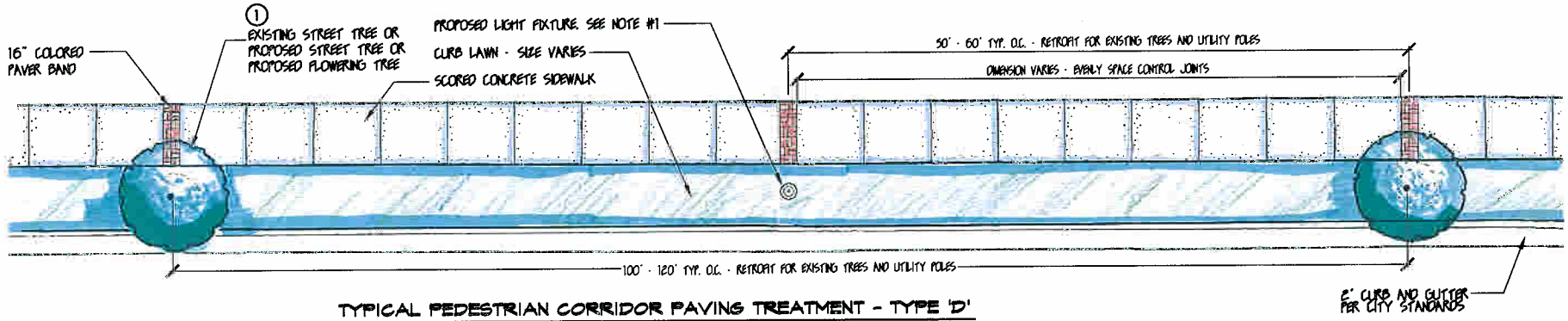
1
- EAST WALNUT-700 BLOCK
  - -CLEVELAND SELECT PEAR
  - -ZUMI CRABAPPLE
- EAST CROSSTOWN PKWY-700 BLOCK
  - -EMERALD QUEEN NORWAY MAPLE
  - -NORTHWOOD RED MAPLE
- EAST VINE ST-600-700 BLOCK
  - -CLEVELAND SELECT PEAR
  - -RADIANT CRABAPPLE
- LAKE ST.-600-700 BLOCK
  - -FOREST PANSY EASTERN REDBUD
  - -BALLERINA SERVICEBERRY
- WASHINGTON AVE.-800 BLOCK
  - -EMERALD GREEN NORWAY MAPLE
  - -NORTHWOOD RED MAPLE
- STOCKBRIDGE AVE.-500 BLOCK
  - -FOREST PANSY EASTERN REDBUD
  - -FRINGE TREE
- BANK ST.-1100-1300 BLOCK
  - -RADIANT CRABAPPLE
  - -GOLDEN RAINTREE
- COLLINS ST.-500-700 BLOCK
  - -RADIANT CRABAPPLE
  - -GOLDEN RAINTREE

NOTES:

1. PROPOSED HISTORIC STYLE PEDESTRIAN LIGHT FIXTURES

   OPTION 1 - ORNAMENTAL CAST IRON POLE WITH ACORN LUMINAIRE
   - ANTIQUE STREET LAMPS FS31 LAMP. NEW YORK SERIES CAST IRON POLE WITH DECORATIVE BASE - BLACK
   - POLE 13' IN HEIGHT WITH 17" DIA. BASE SET 4" ABOVE GRADE.

   OPTION 2 - ORNAMENTAL FIBERGLASS POLE WITH ACORN LUMINAIRE
   - CONSUMERS ENERGY: GRANVILLE SERIES LAMP. FIBERGLASS POLE WITH DECORATIVE BASE - BLACK
   - POLE 14' IN HEIGHT WITH 17" DIA. BASE SET 4" ABOVE GRADE.



TYPICAL PEDESTRIAN CORRIDOR PAVING TREATMENT - TYPE 'D'
(CURB LAWN WITH 16" WIDE PAVER BAND - PATTERN): 1/4" = 1'-0"

NOTE: DRAWING SCALE IS PER A 24"X36" SIZE SHEET

NORTH

SCALE: VARIES 12/13/04

TIER TWO: TYPE 'D' PAVING TREATMENT 16" PAVER BAND DETAIL

PORTAGE STREET STREETSCAPE IMPROVEMENTS

EDISON NEIGHBORHOOD • CITY OF KALAMAZOO

PURCHASING/RISK MANAGEMENT DEPARTMENT • • 241 W. SOUTH STREET • • KALAMAZOO, MI 49007

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1601 PORTAGE STREET
KALAMAZOO, MI 49001

TREES AND LANDSCAPING SPECIFICATIONS

1. PLANT MATERIALS

All Plant Materials Shall Meet the Minimum requirements:

- Certified by the State Department of Agriculture as being free of disease or insects.
- Quality and Size: shall be sound, vigorous and free from disease and shall have a healthy root system, branched limbs and foliage, showing no signs of stress. All measurements such as spread, ball size, quality designation shall be in accordance with the latest edition of AMERICAN STANDARDS FOR NURSERY STOCK (ASFNS), ANSI Z 60.1-2004.
- Trees shall be fully foliated and densely branched with a primary central leader bearing no scars or cracking in the trunk. Trees shall be matched of like species, specimen quality, balled and burlapped in accordance with the ASFNS.
- Shrubs and perennials shall be container grown nursery stock that is healthy, vigorous and with a well established root system that reaches the sides of the container and that maintains a firm ball when removed from the pot, but shall not have excessive root growth encircling the container in accordance with the ASFNS
- Mulch: shall be aged shredded hardwood bark, 3” depth with an underlayment of filter fabric.
- Planting Soil Mixture: planting soil mixture shall be a combination of 1/3 part friable, non-organic topsoil, 1/3 part peat moss, 1/3 part native soil mixture.
- Fertilizers: to be slow release complete fertilizer of 10% nitrogen, 10% phosphorus, 10% potash. Mix in planting soil mixture at a rate of 1.5 lbs per inch of the caliper and 1/2 lbs per foot of shrub height.
- Tree and Shrub Planting Pits verify tree planting pits will provide adequate drainage and will not hold standing water. Penetrate any clay lense layers or impervious layers until a well drained subsoil is reached. If this cannot be achieved, provide contractors drainage solution to the Landscape Architect for review and approval.

- Tree Staking: shall be staked with (3) 2'x 4'x 8' stakes driven vertically into the ground outside the rootball. Double strand 22 gauge galvanized steel wire shall be used with ¾" hose sheaths to stake each tree. Attach visible fluorescent ribbons to each wire to ensure that pedestrians can see guy wires.
- Watering: shall be a part of the Contractors responsibilities for the first year as part of the maintenance agreement. After that period the designated streetscape committee for that area of the Portage Street Primary Corridor will utilize the maintenance endowment fund to hire a landscape contractor for watering of all plant materials.
- Water Irrigation mainline: a designated water tap/quick coupler system shall be provided with a tap every 200' of streetscape on both sides of the street. Therefore a Ford Meter vault will be needed to tap and meter the city water system. The location of these taps will need to be coordinated with the city water engineer Roberto Ferraro.
- Planter Pot Plantings: perennial flowers are to be provided by planter donors. Pots are 24" diameter and 30" high.
- Pot Locations: Two pots, one each to be located on each side of the planter pits as per the Washington Square Market District plan drawings.
- Inspections: All plant material shall be inspected and approved by a registered Landscape Architect prior to any planting installations.

STREET FURNITURE SPECIFICATIONS

1. BENCHES

- Manufacturer – Landscape Forms Incorporated (or approved equal) (contact: Anita Wojda 800-843-7753)
- Model and Style: "Plainwell Series"
- Material: Extruded Aluminum seat panels.
- Dimensions: 96" long x 25" depth x 32 " height, with center arm sub-divider.
- Color and Finish: black powder coat paint.
- Anchorage: provide surface mount option anchored to concrete pad with (4) corrosion resistant anchor bolts. Provide (4)-13/32" holes with counterbore, provide for socket head tamper resistant cap screws.
- Location: Benches to be located at each Bus Stop or Bus Shelter as room allows to maintain a minimum 3' access path in front of each bench for passing pedestrians.

2. TRASH / ASH RECEPTACLES

- Manufacturer – Landscape Forms Incorporated (or approved equal) (contact: Anita Wojda 800-843-7753)
- Model and Style: "Plainwell Series Litter /Ash Receptacle"
- Material: Extruded Aluminum side panels with spun aluminum sand pan in top dome.
- Dimensions: 44.5" high x 30" diameter, with a 35 gallon container
- Finish: black powder coat paint.
- Anchorage: provide surface mount option anchored to concrete pad with (4) corrosion resistant anchor bolts. Provide (4)-.406 holes with counterbore, provide for socket head tamper resistant cap screws.
- Location: Trash/Ash Receptacles to be located at each Bus Stop or Bus Shelter as room allows.

3. PLANTER POTS

- Manufacturer – Dura Art Stone Incorporated (or approved equal) *(phone # 800-821-1120)
- Model and Style: "Grecian Style or Mediterranean Style," provide drainage trays
- Material: Composite Laminate Pots.
- Dimensions: 24" diameter x 30 " height.
- Color and Finish: Rust Color
- Anchorage: provide threaded stainless steel sleeve cast in the concrete below the center of the planter pots. Provide threaded stainless steel rod to fit sleeve, provide stainless steel lock nut and nylon washer to secure rod to inside bottom of pot.
- Location: Two pots to be located on each side of the planter pits as per the plan drawings. (Pots are only for Washington Square Market District)

4. BOLLARDS (Installed as Fence Protection)

- Manufacturer – Fairweather Site Furnishings (or approved equal) (phone # 800-323-1798)
- Model and Style: "Removable Flip Top Style Bollard"
- Material: Galvanized Steel Pipe with Steel Embedment Sleeve.
- Dimensions: 6-5/8" diameter x 48" height above ground. 57" long pipe, with 48" above ground and 9" below ground in sleeve.
- Color and Finish: provide black plastic post cover for exposed portion of bollard.
- Anchorage: provide lockable padlock and hinged flip top cap when pipe is not in use.
- Location: To be placed at vehicular curb cut entrances as a protective measure for new fencing additions. Proposed locations for bollards and fencing shall be reviewed with property owners in meetings to be sure all site and owner issues are addressed.

5. BUS SHELTERS

- Manufacturer – Columbia Equipment Company (or approved equal)
- Model and Style: "Lower Grand Avenue Old Fashioned Style" Two bus shelter configurations will be used due to the narrow space availability.
  1) A three sided cantilevered version with single side wall panels (2'-5" wide)
  2) A three sided non-cantilevered version with full side wall panels (4'-6" wide)
- Framing Material: Aluminum framing: 2 ½" x 2 ½" x 1/8" thick.
- Ornamental Grillwork: Solid Aluminum bars are used for the rings in each of the lower window panels and in the roof barrel vault construction.
- Windows: Vandal resistant safety Glazing including ¼" thick Acrylic clear panels. These are anchored to the aluminum frame with tamper-proof pop rivets, which are finished to match the shelter paint color and finish. (6) rear windows and (2) side windows.
- Display Panels: A custom display panel is proposed for the top of the sidewall paneling. Here donators of the shelter and streetscape can be displayed.
- Graphics or Logo: "Metro Transit" can be prominently displayed on either the fascia or sides of the Shelter along with either the Central City or the City of Kalamazoo Logo.
- Lighting: Internal lighting is recommended for security and visibility, however the lighting will require special protective shields to avoid vandalism to the fixtures.
- Protective Coating: Protective paint coating to be polyester TGIC powder coating on all surfaces, black color.
- Dimensions: Shelter is 12' long x 4'-10" wide at the ground. Height above ground is 7'-9", with top of barrel vault roof reaching 10' height. Single side panel dimension is 2'-5".
- Color and Finish: Black, powder coat paint.

- Anchorage: the four aluminum tube posts shall be anchored with a embed mounting below ground into 12" square x 30" depth concrete footing. An alternative mounting option is to provide cast aluminum sleeves in the concrete with a slip liner so the posts and the entire structure can be removed for maintenance or repairs. A vandal proof stainless steel pin would be required along with a post cover plate to prevent theft.
- Locations: Review specific locations with Metro Transit and affected property owners during the construction drawings phase to be sure the proper easements can be acquired and surveyed if they are needed.

6. BIKE RACKS

Model and Manufacturer:

- Manufacturer – Fairweather Site Furnishings (or approved equal) (phone # 800-323-1798)
- Model and Style: BR-1 (specify 3,5,7, 9, or 11 loops based upon each need of the property owners)
- Material: Hot Dipped Galvanized Steel Pipe ASTM 123, 3 to 4 mils thick.
- Protective Coating: Protective paint coating to be polyester TGIC powder coating 4 mils thick on all surfaces, black color.
- Dimensions: 2" Schedule 40 steel pipe, ASTM A106B x 36" height above ground.
- Color and Finish: Black, powder coat
- Anchorage: 12" embed mounting below ground into 10" diameter x 24" depth concrete footing.
- Center support addition: specify center support for 7,9,11 loop only.
- Locations: Bike Racks should be located on the property owners' private property rather than the city right-of-way to keep conflicts with walkers along the pedestrian sidewalk zone. Each individual property owner will determine the locations of bike racks. The ideal locations will be where people tend to tie up their bicycles currently, such as signs or fence posts.

STREET LIGHTING AND BANNER SPECIFICATIONS

(2 DESIGN ALTERNATIVES)

PEDESTRIAN STREET LIGHT – ALTERNATIVE 1

1. ORNAMENTAL ACORN LUMINAIRE WITH CAST IRON POLE

Luminaire

- Manufacturer – Antique Street Lamps (or approved equal) (phone # 512-977-8444)
  Contact: Mike Anderson, West Michigan Lighting – Phone # 616-364-6421 and Cell # 616-437-2896.
- Luminaire – Acorn Style Fixture: with cap.
- Style: Model FS 31C
- Height: 37.5” high
- Lens: Acrylic Refractive ARF
- Color and Finish: factory primed and painted with black gloss paint
- Lamp: 175 watt metal halide
- Voltage: 277
- Globe: R3 Refractive Globe, Type 3

Pole

- Manufacturer – Antique Street Lamps (or approved equal)
  Phone # 512- 977-8444
  Contact: Mike Anderson, West Michigan Lighting – Phone # 616-364-6421 and Cell # 616-437-2896.
- Style: New York Series “Cast Iron Post”.
- Height: 13’ high
- Base: 17” diameter base
- Material: Cast Iron
- Finish: black powder coat paint
- Anchorage: (4) – ¾” hot dip galvanized L-type anchor bolts 24” long installed on a 12” diameter bolt circle.
- Access Door: a hand hold access door shall be provided at the base.

- Hardware: all hardware to be stainless steel. All easily accessible exterior hardware shall be tamper resistant.
- Weatherproof Electrical Outlet: (1) 120 volt, weatherproof, GFP, electrical outlet located at 9' height.
- Concrete Base Footing: to be 18" diameter, reinforced concrete footing depth to be a minimum of 5' below adjacent grade. Elevation of footing to be 4" above adjacent grade or paved surface.

PEDESTRIAN STREET LIGHT – ALTERNATE 2
(Consumers Energy Standard)

2. ORNAMENTAL ACORN LUMINAIRE WITH FIBERGLASS POLE

Luminaire

- Manufacturer – Holophane Lighting Industries (phone # 616) -662-0354)
- Luminaire – Acorn Style Fixture: with cap
- Style: Grandville Series
- Height: 37.5" high
- Lens: Acrylic Refractive
- Color and Finish: factory primed and painted with black flat paint
- Lamp: 175 watt metal halide
- Voltage: 277
- Globe: Refractive Globe, Type 3

Pole

- Manufacturer – Shakespeare Composite Structures (phone #800-800-9008)
- Style: Washington Series
- Height: 14' high
- Base: 17" diameter base
- Material: reinforced fiberglass composite
- Finish: Molded-in black color, gloss finish; uv resistant polyurethane coating
- Anchorage: galvanized anchor bolts (4)-5/8" x 4" set in concrete base.

- Hardware: all exposed hardware to be stainless steel. All easily accessible exterior hardware shall be tamper resistant
- Weatherproof Electrical Outlet: (1) 120 volt, weatherproof, GFP, electrical outlet located as near to top as practical
- Concrete Base Footing: to be 18" diameter reinforced concrete footing depth to be a minimum of 42" below ground. Elevation of footing to be 4" above adjacent grade

BANNER OPTION TO BE USED WITH EITHER POLE ALTERNATIVE

- Manufacturer of Banner Arms – Antique Street Lamps (or approved equal) (phone # 512-977-8444)
  Contact: Mike Anderson, West Michigan Lighting – Phone # 616-364-6421 and Cell # 616-437-2896.
- Manufacturer of Banner Fabric: Kalamazoo Banner Works (phone # 269-388-4532)
- Banner Size: 12" wide x 24" long (maximum size allowable by Consumers Energy)
- Banner Design: determined based upon neighborhood design workshops.
- Banner Fabric: fade resistant with a coated rain resistant finish.
- Quantity of Banners: one Banner per every other light pole, located on the street side of the pole, 90 degrees to the direction of traffic.
- Quantity of Banner Arms per Banner: (2) – (1 top and 1 bottom)
- Length of Banner Arms: 20" long
- Banner Arm Anchorage: "Bolt on" to pole, provide a breakaway swivel hinge for high winds or stress damage from traffic movements
- Arm diameter: 1" diameter
- End Cap of Banner Arm: Acorn Style End Cap
- Material: Cast Iron
- Finish: black powder coat paint
- Anchorage: 4 – ¾" hot dip galvanized L-type anchor bolts
- Hardware: all hardware to be stainless steel. All easily accessible exterior hardware shall be tamper resistant

TRAFFIC SIGNAL POLE SPECIFICATIONS

1. POLE MATERIALS AND MANUFACTURER

- Signal Poles: shall be MDOT approved, high strength galvanized steel.
- ASTM A 572, Grade 50, or approved equal.
- Pole Height: 36' with 18" Bolt Circle with Base Cover.
- Anchor Bolts: Provide (4) high strength with washers ASTM A 307 1-3/4" diameter x 120" long with a 6" "L" bend are required.
- Manufacturer: Union Metal Corporation (or approved equal). (Contact Representative: Carrier and Gable: Mike Schasser : (248) 477-8700 or cell (586) 206-0009) Union Metal Contact: Brian Phelps (330) 686-2491
- Hand Hold Opening: shall be provided with a minimum 11" x 7" opening. The cover plate shall be secured with stainless steel hex head caps or approved equal.
- Pole Top: shall be provided with means of securing it to the top shaft.
- Support of Cable: shall be provided on the inside of the shaft near the top by a hook or other suitable device.
- Air Circulation: Provision shall be made for free air circulation inside the shaft to remove moisture caused by condensation or from other sources.
- Strain Pole Clamp: 2 piece per manufacturer specifications.
- Concrete Footing: High strength reinforced concrete footing, per structural engineering drawings and specifications.
- Painting: Pole to be powder coat painted black, ornamental base, arm and light fixtures are to be retrofitted and powder coat painted black to match.

2. ORNAMENTAL SIGNAL POLE LIGHTING WITH BASE COVER, ARM BRACKET AND LUMENAIRE

Provide the following additions to the selected MDOT approved signal pole

- Decorative Clamshell Base Cover and Arm: Shall be the New York Series, 24" diameter base and 72" Cam 72/1 arm, aluminum, powder coat black painted finish, complete with hardware assembly per manufacturer specifications. Verify retrofit conditions, and any additional brackets, seals necessary to provide uniform fit to MDOT pole specified.
- Lumenaire: Pendant Style Cm 31, 250 watt metal halide lamp, mounted with the 72" cam arm bracket to the traffic signal / strain pole.
- Mounting, height and orientation of lumenaire and arm bracket, will be determined by the City Engineer with review by the Landscape Architect.
- Manufacturer: of arms, base cover and lumenaire to be Antique Street Lamps (or approved equal)

  (phone # 512-977-8444)

  Contact: Mike Anderson, West Michigan Lighting – Phone # 616-364-6421 and Cell # 616-437-2896.

APPENDIX "6"

IMPLEMENTATION SCHEDULE

The City of Kalamazoo and DKI as the city appointed authority are working to establish grant, donor and stakeholder's endowment funds that are specifically designate for the Portage Street Streetscape Improvement Project.

Within this project there are four work areas that are addressed in the implementation schedule which follows:

AREA #1: "Gateway District" beginning at the Walnut/Portage Street intersection continuing north through the current Pitcher/Portage Street intersection northwest to "Henrietta Street," then proceeding eastward to South Street and then north on Portage Street, ending at Michigan Avenue.

AREA #2: "Crosstown District" is defined as the section of portage Street between Walnut Street and Collins Street; within the public right-of-way.

AREA #3: "Washington Square Market District" is defined as the portion of the Portage Street public right-of-way between Collins Street on the northern end and Egleston Avenue on the southern end.

AREA #4: "Reed Street District" is defined as the portion of the Portage Street public right-of-way between Egleston Avenue on the northern end and Alcott Street on the southern end.

The following tables provide a guideline "Implementation Schedule" for the Portage Street Streetscape Improvements, including district priorities, tasks, and targets for development date completion.

Priority #1 – Gateway District
(Area #1)

	Work Item	Start Date	Target Completion Date
	NOTE:		
	This will be completed once a design and cost estimate for streetscape and items are established and approved by the stakeholders of Portage Street and the city.		

Priority #2 – Washington Square Market District
(Area #3)

	Work Item	Start Date	Target Completion Date
1	Establish Funding Streetscape Program Committees	December 2005	February 2006
2	Establish Funding Programs, Methods and Endowments	December 2005	January 2006
3	Initiate Topographic/Boundary Survey of Existing Conditions and All Utility Locations	March 2006	April 2007
4	Negotiate Easements with Business/Property Owners and Impacts from Concept Plans	April 2006	May 2006
5	Engage Engineering Firm – Complete Engineering Design Construction Drawings and Specifications	May 2006	September 2006
6	Finalize Legal Easements from Surveyed Drawings	June 2006	July 2006
7	Bidding of Construction	September 2006	October 2006
8	Award of Construction Contract	October 2006	N/A
9	Begin Construction of Washington Square Market District	October 2006	June 2007

Priority #3 – Crosstown District
(Area #2)

	Work Item	Start Date	Target Completion Date
1	Establish Funding Streetscape Program Committees	May 2006	September 2006
2	Establish Funding Programs, Methods and Endowments	April 2006	August 2006
3	Initiate Topographic/Boundary Survey of Existing Conditions and All Utility Locations	September 2006	November 2006
4	Negotiate Easements with Business/Property Owners and Impacts from Concept Plans	October 2006	November 2006
5	Engage Engineering Firm – Complete Engineering Design Construction Drawings and Specifications	October 2006	January 2007
6	Finalize Legal Easements from Surveyed Drawings	January 2007	February 2007
7	Bidding of Construction	February 2007	March 2007
8	Award of Construction Contract	April 2007	April 2007
9	Construction of Crosstown district	May 2007	August 2007

Priority #4 –Reed Avenue District
(Area #4)

	Work Item	Start Date	Target Completion Date
1	Establish Funding Streetscape Program Committees	August 2006	September 2006
2	Establish Funding Programs, Methods and Endowments	August 2006	November 2006
3	Initiate Topographic/Boundary Survey of Existing Conditions and All Utility Locations	December 2006	February 2007
4	Negotiate Easements with Business/Property Owners and Impacts from Concept Plans	March 2007	April 2007
5	Engage Engineering Firm – Complete Engineering Design Construction Drawings and Specifications	March 2007	May 2007
6	Finalize Legal Easements from Surveyed Drawings	April 2007	May 2007
7	Bidding of Construction	May 2007	June 2007
8	Award of Construction Contract	June 2007	June 2007
9	Begin Construction of Reed Avenue District	July 2007	November 2007

APPENDIX "7"

ESTIMATE OF PROBABLE COSTS

PORTAGE STREET STREETSCAPE IMPROVEMENTS

- ENGINEERS ESTIMATE OF PROBABLE PROJECT COST-

(Area 2)

TIER ONE AREA 2 - CROSSTOWN PARKWAY DISTRICT: Walnut Street to Collins Street

CONSTRUCTION COSTS	**$**	**3,022,102.00**
PRIVATE UTILITY WORK	**$**	**1,239,000.00**
Sub-Total =	**$**	**4,261,102.00**
LANDSCAPE ARCHTECTURE & ENGINEERING	**$**	**639,165.30**
LEGAL	**$**	**45,000.00**
EASEMENT ALLOWANCE	**$**	**30,000.00**
CONTINGENCIES	**$**	**426,110.20**
TOTAL PROJECT BUDGET ESTIMATE	**$**	**5,401,377.50**

DEDUCTIVE ALTERNATES =	**$**	**152,500.00**
ADDITION ALTERNATES =	**$**	**14,450.00**

PORTAGE STREET STREETSCAPE
IMPROVEMENTS
- ENGINEERS ESTIMATE OF PROBABLE PROJECT COST-
(Area 2)

TIER ONE AREA 2 - CROSSTOWN PARKWAY DISTRICT: Walnut Street to Collins Street

ITEM #	*ITEM DESCRIPTION*	*ITEM TOTAL*	*UNIT*	*UNIT COST*	*TOTAL PRICE*
GENERAL SITE REQUIREMENTS					
S -1	Mobilization	1	LS	$ 82,000.00	$ 82,000.00
S-2	Permits, Bonds and Insurance (5% of const. Est.)	1	LS	$ 28,000.00	$ 28,000.00
S-3	Project Sign	2	LS	$ 500.00	$ 1,000.00
S-4	Traffic Controls and Staging (per 100 lf of roadway)	1	LS	$ 16,000.00	$ 16,000.00
				SUBTOTAL	**$ 127,000.00**
DEMOLITION					
D-1	Remove Concrete Sidewalk	43500	SF	$ 2.00	$ 87,000.00
D-2	Remove Concrete Driveways (6-8"depth)	16000	SF	$ 3.00	$ 48,000.00
D-3	Remove Concrete Curb and Gutter	6800	LF	$ 2.00	$ 13,600.00
D-4	Remove and Relocate Fire Hydrant	10	EA	$ 2,000.00	$ 20,000.00
D-5	Bituminous Saw-Cutting	6800	LF	$ 1.50	$ 10,200.00
D-6	Remove Concrete Paving (4"depth)	21000	SYD	$ 6.00	$ 126,000.00
D-7	Remove / Rotomil Bituminous Pavement	3800	SYD	$ 3.00	$ 11,400.00
D-8	Remove Asphalt Roadway Full Depth (varies 2-5' wide, assume average of 3' the distance of the roadway`	21000	SYD	$ 4.00	$ 84,000.00
D-9	Remove Existing Trees (Assumed Allowance)	1	LS	$ 10,000.00	$ 10,000.00
D-10	Remove Existing Cobra Head Pole Lights	1	LS	$ 6,000.00	$ 6,000.00
				SUBTOTAL	**$ 416,200.00**
NEW PEDESTRIAN SIDEWALK IMPROVEMENTS					
SP-1	Concrete Sidewalk	40000	SF	$ 4.00	$ 160,000.00
SP-2	Concrete Handicap Ramps	3400	SF	$ 5.50	$ 18,700.00
SP-3	Paving Crosswalk - Colored Concrete Pavers (on concrete slab)	14000	SF	$ 14.00	$ 196,000.00
SP-4	Pedestrian Areas at Intersection Corners - Colored Concrete Pavers (on concrete slab)	16000	SF	$ 12.00	$ 192,000.00
SP-5	New Colored Concrete Paver Bands (on concrete base)	3850	SF	$ 12.00	$ 46,200.00
SP-6	Sand Subbase (MDOT 2NS, 4"depth)	3100	CYD	$ 10.00	$ 31,000.00
				SUBTOTAL	**$ 643,900.00**

PORTAGE STREET STREETSCAPE IMPROVEMENTS

- ENGINEERS ESTIMATE OF PROBABLE PROJECT COST-

(Area 2)

NEW ROADWAY IMPROVEMENTS					
R-1	Conc. Curb and Gutter (MDOT C4)	6800	LF	$ 14.00	$ 95,200.00
R-2	Conc. Curb and Gutter (MDOT Detail M)	1000	LF	$ 18.00	$ 18,000.00
R-3	Machine Grading Modified	41	STA	$ 1,200.00	$ 49,200.00
R-4	Aggregate Base Course (MDOT 22A)	6080	TON	$ 15.00	$ 91,200.00
R-5	MDOT Bituminous Mix	4100	TON	$ 48.00	$ 196,800.00
R-6	Concrete Drive Approaches (6-inch)	16000	SF	$ 6.00	$ 96,000.00
R-7	Adjustment of Manhole Covers	50	EA	$ 200.00	$ 10,000.00
R-8	Replacement/Relocation of Catch Basins	40	EA	$ 1,800.00	$ 72,000.00
R-9	Adjustment of Electrical Boxes	10	EA	$ 100.00	$ 1,000.00
R-10	Adjustment of Gas Shut Off	40	EA	$ 100.00	$ 4,000.00
R-11	Adjustment of Water Valve Box	36	EA	$ 180.00	$ 6,480.00
R-12	Replace Water Valve Box	12	EA	$ 250.00	$ 3,000.00
R-13	Adjustment of Water Shut Off	40	EA	$ 100.00	$ 4,000.00
R-14	Pavement Marking, 4 inch white	7000	LF	$ 1.00	$ 7,000.00
R-15	Pavement Marking, 4 inch yellow	6200	LF	$ 1.00	$ 6,200.00
R-16	Pavement Marking, 24 inch stop bars	614	LF	$ 3.00	$ 1,842.00
R-17	Pavement Marking Symbols	32	EA	$ 250.00	$ 8,000.00
				SUBTOTAL	**$ 669,922.00**
SITE ELECTRICAL & LIGHTING ITEMS					
SE- 1	13' Pedestrian Light Pole & Lumenaire (includes GFI receptacle)	97	EA.	$ 5,000.00	$ 485,000.00
SE- 2	Banner Arms and Banners (1per Pole on the streetside)	97	EA.	$ 800.00	$ 77,600.00
SE- 3	2" Conduit extensions from existing pole lights	4100	LF	$ 3.00	$ 12,300.00
SE- 4	Transformer Circuit Panel Junction Boxes (Exterior grade)	20	EA.	$ 100.00	$ 2,000.00
SE- 5	Photoelectric Cells (1 per circuit) (figure 5 lights per circuit)	20	EA.	$ 500.00	$ 10,000.00
SE- 6	Light fixture/arm and ornamental base for Traffic Strain Pole	10	EA	$ 10,000.00	$ 100,000.00
SE- 7	New Electrical Service	40	EA.	$ 500.00	$ 20,000.00
				SUBTOTAL	**$ 706,900.00**

PORTAGE STREET STREETSCAPE IMPROVEMENTS

- ENGINEERS ESTIMATE OF PROBABLE PROJECT COST-

(Area 2)

LANDSCAPE					
L-1	Street Trees (2.5-3" caliper)	45	EA.	$ 325.00	$ 14,625.00
L-2	Flowering Street Trees (2.5-3" caliper)	45	EA	$ 325.00	$ 14,625.00
L-3	Shrubs (3 gal. cans)	190	EA.	$ 25.00	$ 4,750.00
L-4	Tree Pit Mulch Topping with Filter Fabric	90	EA.	$ 25.00	$ 2,250.00
L-5	Perennials (1 gal. Can)	2100	EA	$ 13.00	$ 27,300.00
L-6	Planter Pots (24 inch)	4	EA	$ 570.00	$ 2,280.00
L-7	Under Mulch (Filter Fabric)	1500	SYD	$ 1.00	$ 1,500.00
L-8	Mulch (3 inch thick) (Bark)	160	CYD	$ 30.00	$ 4,800.00
L-9	Topsoil , Seed and Mulch (4" depth) (include disturbed edges of replaced walks)	5000	SYD	$ 3.00	$ 15,000.00
L-10	Repair disturbed landscape beds (figure 2' past row line) (Allowance)	1	LS	$ 10,000.00	$ 10,000.00
L-11	Pruning Existing Trees	1	LS	$ 10,000.00	$ 10,000.00
L-12	PVC Mainline Irrigation Piping	8200	LF	$ 5.00	$ 41,000.00
L-13	Irrigation watermain tap	7	EA	$ 7,000.00	$ 49,000.00
L-14	Irrigation Quick Coupler w/Box	48	EA	$ 150.00	$ 7,200.00
L-15	Irrigation Line Directional Drilling	700	LF	$ 20.00	$ 14,000.00
				SUBTOTAL	**$ 218,330.00**
SITE FURNITURE					
SF-1	Benches (8') with Concrete Pad and Paver	10	EA.	$ 2,135.00	$ 21,350.00
SF-2	Black Ornamental Fencing (42" ht.)	2400	LF	$ 60.00	$ 144,000.00
SF-3	Black Protection Bollard (8" diameter, steel)	38	EA.	$ 600.00	$ 22,800.00
SF-4	Bus Shelter	1	EA.	$ 9,000.00	$ 9,000.00
SF-5	Trash Ash Receptacle at each benched bus stop and shelter	10	EA.	$ 1,270.00	$ 12,700.00
SF-6	Repair disturbed landscape beds (figure 2' past row line) (Allowance)	1	LS	$ 10,000.00	$ 10,000.00
SF-7	Pruning Existing Trees (allowance)	1	LS	$ 10,000.00	$ 10,000.00
				SUBTOTAL	**$ 229,850.00**

PORTAGE STREET STREETSCAPE IMPROVEMENTS

- ENGINEERS ESTIMATE OF PROBABLE PROJECT COST-

(Area 2)

MISCELLANEOUS ITEMS					
M-1	Erosion Control (Allowance)	1	LS	$ 5,000.00	$ 5,000.00
M-2	Utility Company Demolition Work (Consumers Power, SBC, Charter Communication, Midwest Communication)	1	LS	$ 310,000.00	$ 310,000.00
M-3	Utility Company Underground Relocations (Consumers Power, SBC, Charter Communication, Midwest Communication)	1	LS	$ 929,000.00	$ 929,000.00
M-4	Project Clean Up	1	LS	$ 5,000.00	$ 5,000.00
				SUBTOTAL	**$ 1,249,000.00**
ALTERNATES					
ALT-1	Consumers Energy Fiberglass Pedestrian Pole (14' ht.)	97	EA	$ 4,500.00	$ 436,500.00
ALT-2	Paving Crosswalk - *Integral Colored Concrete Slab* w/12 inch Wide Concrete Edges, Broom Finish	14000	SF	$ 10.00	$ 140,000.00
ALT-3	Standard Intersection Pedestrian Areas at Intersection Corners - *Integral Colored Concrete Paving* -stamped or broomed and scored	16000	SF	$ 9.00	$ 144,000.00
ALT-4	Irrigation Bubblers (for tree pit and intersection planting as required)	134	EA	$ 100.00	$ 13,400.00
ALT-5	Irrigation Valves w/Box	7	EA	$ 150.00	$ 1,050.00
EXPLANATION OF ALTERNATIVES					
ALT-1	**Deductive Alternate:** Substitute the Consumers Energy Fiberglass Pole Light (14' ht.) for the Cast Iron Antique Street Lamp Pole Light (13' ht.)				$ 48,500.00
ALT-2	**Deductive Alternate:** Substitute the Crosswalk Colored Concrete Pavers for Poured Colored Concrete Slab				$ 56,000.00
ALT-3	**Deductive Alternate:** Substitute the Intersection Pedestrian Colored Concrete Pavers for Poured Colored Concrete Paving				$ 48,000.00
				IF ALTERNATES 1,2,&3 ARE TAKEN, THEN DEDUCT =	$ 152,500.00
ALT-4&5	**Add Alternate:** Add Irrigation bubblers and valve boxes to water tree pits (these can be made to be below mulch level bubblers to conceal them).				$ 14,450.00
				IF ADDITION ALTERNATES 4&5 ARE TAKEN, THEN ADD =	$ 14,450.00

PORTAGE STREET STREETSCAPE
IMPROVEMENTS
- ENGINEERS ESTIMATE OF PROBABLE PROJECT COST-
(Area 4)

TIER ONE AREA 4 - REED AVENUE DISTRICT: Egleston Boulevard to Alcott Street

CONSTRUCTION COSTS	**$**	**2,123,267.00**
PRIVATE UTILITY WORK	**$**	**936,000.00**
Sub-Total =	**$**	**3,059,267.00**
LANDSCAPE ARCHTECTURE & ENGINEERING	**$**	**458,890.05**
LEGAL	**$**	**35,000.00**
EASEMENT ALLOWANCE	**$**	**20,000.00**
CONTINGENCIES	**$**	**305,926.70**

TOTAL PROJECT BUDGET ESTIMATE $ 3,879,083.75

DEDUCTIVE ALTERNATES =	**$**	**113,700.00**
ADDITION ALTERNATES =	**$**	**20,500.00**

PORTAGE STREET STREETSCAPE
IMPROVEMENTS
- ENGINEERS ESTIMATE OF PROBABLE PROJECT COST-
(Area 4)

TIER ONE AREA 4 - REED AVENUE DISTRICT: Egleston Boulevard to Alcott Street

ITEM #	*ITEM DESCRIPTION*	*ITEM TOTAL*	*UNIT*	*UNIT COST*	*TOTAL PRICE*
GENERAL SITE REQUIREMENTS					
S -1	Mobilization	1	LS	$ 62,000.00	$ 62,000.00
S-2	Permits, Bonds and Insurance (5% of const. Est.)	1	LS	$ 20,000.00	$ 20,000.00
S-3	Project Sign	2	LS	$ 500.00	$ 1,000.00
S-4	Traffic Controls and Staging (per 100 lf of roadway)	1	LS	$ 12,000.00	$ 12,000.00
				SUBTOTAL	**$ 95,000.00**
DEMOLITION					
D-1	Remove Concrete Sidewalk	37400	SF	$ 2.00	$ 74,800.00
D-2	Remove Concrete Driveways (6-8"depth)	8465	SF	$ 3.00	$ 25,395.00
D-3	Remove Concrete Curb and Gutter	5600	LF	$ 2.00	$ 11,200.00
D-4	Remove and Relocate Fire Hydrant	10	EA	$ 2,000.00	$ 20,000.00
D-5	Bituminous Saw-Cutting	3600	LF	$ 1.50	$ 5,400.00
D-6	Remove Concrete Paving (4"depth)	15500	SYD	$ 6.00	$ 93,000.00
D-7	Remove / Rotomil Bituminous Pavement	2800	SYD	$ 3.00	$ 8,400.00
D-8	Remove Asphalt Roadway Full Depth (varies 2-5' wide, assume average of 3' the distance of the roadway)	15500	SYD	$ 4.00	$ 62,000.00
D-9	Remove Existing Trees (Assumed Allowance)	1	LS	$ 10,000.00	$ 10,000.00
D-10	Remove Existing Cobra Head Pole Lights	1	LS	$ 3,000.00	$ 3,000.00
				SUBTOTAL	**$ 313,195.00**
NEW PEDESTRIAN SIDEWALK IMPROVEMENTS					
SP-1	Concrete Sidewalk	37500	SF	$ 4.00	$ 150,000.00
SP-2	Concrete Handicap Ramps	2300	SF	$ 5.50	$ 12,650.00
SP-3	Paving Crosswalk - Colored Concrete Pavers (on concrete slab)	10400	SF	$ 14.00	$ 145,600.00
SP-4	Pedestrian Areas at Intersection Corners - Colored Concrete Pavers (on concrete slab)	15200	SF	$ 12.00	$ 182,400.00
SP-5	New Colored Concrete Paver Bands (on concrete base)	3886	SF	$ 12.00	$ 46,632.00
SP-6	Sand Subbase (MDOT 2NS, 4"depth)	2000	CYD	$ 10.00	$ 20,000.00
				SUBTOTAL	**$ 557,282.00**

PORTAGE STREET STREETSCAPE IMPROVEMENTS

- ENGINEERS ESTIMATE OF PROBABLE PROJECT COST-

(Area 4)

NEW ROADWAY IMPROVEMENTS					
R-1	Conc. Curb and Gutter (MDOT C4)	4900	LF	$ 14.00	$ 68,600.00
R-2	Conc. Curb and Gutter (MDOT Detail M)	750	LF	$ 18.00	$ 13,500.00
R-3	Machine Grading Modified	31	STA	$ 1,200.00	$ 37,200.00
R-4	Aggregate Base Course (MDOT 22A)	3600	TON	$ 15.00	$ 54,000.00
R-5	MDOT Bituminous Mix	3100	TON	$ 48.00	$ 148,800.00
R-6	Concrete Drive Approaches (6-inch)	8465	SF	$ 6.00	$ 50,790.00
R-7	Adjustment of Manhole Covers	52	EA	$ 200.00	$ 10,400.00
R-8	Replacement/Relocation of Catch Basins	40	EA	$ 1,800.00	$ 72,000.00
R-9	Adjustment of Electrical Boxes	15	EA	$ 100.00	$ 1,500.00
R-10	Adjustment of Gas Shut Off	50	EA	$ 100.00	$ 5,000.00
R-11	Adjustment of Water Valve Box	40	EA	$ 180.00	$ 7,200.00
R-12	Replace Water Valve Box	10	EA	$ 250.00	$ 2,500.00
R-13	Adjustment of Water Shut Off	50	EA	$ 100.00	$ 5,000.00
R-14	Pavement Marking, 4 inch white	7900	LF	$ 1.00	$ 7,900.00
R-15	Pavement Marking, 4 inch yellow	6400	LF	$ 1.00	$ 6,400.00
R-16	Pavement Marking, 24 inch stop bars	470	LF	$ 3.00	$ 1,410.00
R-17	Pavement Marking Symbols	10	EA	$ 250.00	$ 2,500.00
				SUBTOTAL	**$ 494,700.00**
SITE ELECTRICAL & LIGHTING ITEMS					
SE- 1	13' Ornamental Pedestrian Light Pole & Lumenaire (includes GFI receptacle)	53	EA.	$ 5,000.00	$ 265,000.00
SE- 2	Banner Arms and Banners (1per pole on one side)	53	EA.	$ 800.00	$ 42,400.00
SE- 3	2" Conduit extensions from existing pole lights	3600	LF	$ 3.00	$ 10,800.00
SE- 4	Transformer Circuit Panel Junction Boxes (Exterior grade)	11	EA.	$ 100.00	$ 1,100.00
SE- 5	Photoelectric Cells (1 per circuit) (figure 5 lights per circuit)	11	EA.	$ 500.00	$ 5,500.00
SE- 6	Ornamental Light fixture / arm and base for existing MDOT Traffic Strain Pole	4	EA	$ 5,500.00	$ 22,000.00
SE- 7	New Electrical Service	50	EA.	$ 500.00	$ 25,000.00
				SUBTOTAL	**$ 371,800.00**

PORTAGE STREET STREETSCAPE IMPROVEMENTS

- ENGINEERS ESTIMATE OF PROBABLE PROJECT COST-

(Area 4)

LANDSCAPE					
L-1	Street Trees (2.5-3" caliper)	34	EA.	$ 325.00	$ 11,050.00
L-2	Flowering Street Trees (2.5-3" caliper)	34	EA	$ 325.00	$ 11,050.00
L-3	Shrubs (3 gal. cans)	600	EA.	$ 25.00	$ 15,000.00
L-4	Tree Pit Mulch Topping with Filter Fabric	68	EA.	$ 25.00	$ 1,700.00
L-5	Perennials (1 gal. can)	850	EA	$ 13.00	$ 11,050.00
L-6	Planter Pots (24 inch)	0	EA	$ 570.00	$ -
L-7	Under Mulch (Filteer Fabric)	900	SYD	$ 1.00	$ 900.00
L-8	Mulch (3 inch thick) (Bark)	130	CYD	$ 30.00	$ 3,900.00
L-9	Topsoil , Seed and Mulch (4" depth) (include disturbed edges of replaced walks)	4000	SYD	$ 3.00	$ 12,000.00
L-10	Repair disturbed landscape beds (figure 2' past row line) (Allowance)	1	LS	$ 10,000.00	$ 10,000.00
L-11	Pruning Existing Trees	1	LS	$ 10,000.00	$ 10,000.00
L-12	PVC Mainline Irrigation Piping	5600	LF	$ 5.00	$ 28,000.00
L-13	Irrigation watermain tap	6	EA	$ 7,000.00	$ 42,000.00
L-14	Irrigation Quick Coupler w/Box	32	EA	$ 150.00	$ 4,800.00
L-15	Irrigation Line Directional Drilling	630	LF	$ 20.00	$ 12,600.00
				SUBTOTAL	**$ 174,050.00**
SITE FURNITURE					
SF-1	Benches (8') with Concrete Pad and Paver	8	EA.	$ 2,135.00	$ 17,080.00
SF-2	Black Ornamental Fencing (42" ht.)	750	LF	$ 60.00	$ 45,000.00
SF-3	Black Protection Bollard (8" diameter, steel)	10	EA.	$ 600.00	$ 6,000.00
SF-4	Bus Shelter	1	EA.	$ 9,000.00	$ 9,000.00
SF-5	Trash Ash Receptacle at each benched bus stop and shelter	8	EA.	$ 1,270.00	$ 10,160.00
SF-6	Repair disturbed landscape beds (figure 2' past row line) (Allowance)	1	LS	$ 10,000.00	$ 10,000.00
SF-7	Pruning Existing Trees (allowance)	1	LS	$ 10,000.00	$ 10,000.00
				SUBTOTAL	**$ 107,240.00**

PORTAGE STREET STREETSCAPE IMPROVEMENTS

- ENGINEERS ESTIMATE OF PROBABLE PROJECT COST-

(Area 4)

MISCELLANEOUS ITEMS					
M-1	Erosion Control (Allowance)	1	LS	$ 5,000.00	$ 5,000.00
M-2	Utility Company Demolition Work (Consumers Power, SBC, Charter Communication, Midwest Communication)	1	LS	$ 234,000.00	$ 234,000.00
M-3	Utility Company Underground Relocations (Consumers Power, SBC, Charter Communication, Midwest Communication)	1	LS	$ 702,000.00	$ 702,000.00
M-4	Project Clean Up	1	LS	$ 5,000.00	$ 5,000.00
				SUBTOTAL	**$ 946,000.00**
ALTERNATES					
ALT-1	Consumers Energy Fiberglass Pedestrian Pole (14' ht.)	53	EA	$ 4,500.00	$ 238,500.00
ALT-2	Paving Crosswalk - *Integral Colored Concrete Slab* w/12 inch Wide Concrete Edges, Broom Finish	10400	SF	$ 10.00	$ 104,000.00
ALT-3	Standard Intersection Pedestrian Areas at Intersection Corners - *Integral Colored Concrete Paving* -stamped or broomed and scored	15200	SF	$ 9.00	$ 136,800.00
ALT-4	Irrigation Bubblers (for tree pit and intersection planting as required)	190	EA	$ 100.00	$ 19,000.00
ALT-5	Irrigation Valves w/Box	10	EA	$ 150.00	$ 1,500.00
EXPLANATION OF ALTERNATIVES					
ALT-1	**Deductive Alternate:** Substitute the Consumers Energy Fiberglass Pole Light (14' ht.) for the Cast Iron Antique Street Lamp Pole Light (13' ht.)				$ 26,500.00
ALT-2	**Deductive Alternate:** Substitute the Crosswalk Colored Concrete Pavers for Poured Colored Concrete Slab				$ 41,600.00
ALT-3	**Deductive Alternate:** Substitute the Intersection Pedestrian Colored Concrete Pavers for Poured Colored Concrete Paving				$ 45,600.00
				IF ALTERNATES 1,2,&3 ARE TAKEN, THEN DEDUCT =	$ 113,700.00
ALT-4&5	**Add Alternate:** Add Irrigation bubblers and valve boxes to water tree pits (these can be made to be below mulch level bubblers to conceal them).				$ 20,500.00
				IF ADDITION ALTERNATES 4&5 ARE TAKEN, THEN ADD =	$ 20,500.00

PORTAGE STREET STREETSCAPE IMPROVEMENTS

- ENGINEERS ESTIMATE OF PROBABLE PROJECT COST-

(Area 3)

TIER ONE AREA 3 - WASHINGTON SQUARE MARKET DISTRICT: Collins Street to Egleston Boulevard

CONSTRUCTION COSTS	**$**	**1,604,905.00**
PRIVATE UTILITY WORK	**$**	**759,000.00**
Sub-Total =	**$**	**2,363,905.00**
LANDSCAPE ARCHTECTURE & ENGINEERING	**$**	**354,585.75**
LEGAL	**$**	**25,000.00**
EASEMENT ALLOWANCE	**$**	**30,000.00**
CONTINGENCIES	**$**	**236,390.50**

TOTAL PROJECT BUDGET ESTIMATE $ 3,009,881.25

DEDUCTIVE ALTERNATES =	**$**	**69,600.00**
ADDITION ALTERNATES =	**$**	**5,950.00**

PORTAGE STREET STREETSCAPE
IMPROVEMENTS
- ENGINEERS ESTIMATE OF PROBABLE PROJECT COST-
(Area 3)

TIER ONE AREA 3 - WASHINGTON SQUARE MARKET DISTRICT: Collins Street to Egleston Boulevard

ITEM #	*ITEM DESCRIPTION*	*ITEM TOTAL*	*UNIT*	*UNIT COST*	*TOTAL PRICE*
GENERAL SITE REQUIREMENTS					
S -1	Mobilization	1	LS	$ 50,000.00	$ 50,000.00
S-2	Permits, Bonds and Insurance (5% of const. Est.)	1	LS	$ 20,000.00	$ 20,000.00
S-3	Project Sign	2	LS	$ 500.00	$ 1,000.00
S-4	Traffic Controls and Staging (per 100 lf of roadway)	1	LS	$ 12,000.00	$ 12,000.00
				SUBTOTAL	**$ 83,000.00**
DEMOLITION					
D-1	Remove Concrete Sidewalk	21500	SF	$ 2.00	$ 43,000.00
D-2	Remove Concrete Driveways (6-8"depth)	5400	SF	$ 3.00	$ 16,200.00
D-3	Remove Concrete Curb and Gutter	4100	LF	$ 2.00	$ 8,200.00
D-4	Remove and Relocate Fire Hydrant	6	EA	$ 2,000.00	$ 12,000.00
D-5	Bituminous Saw-Cutting	4100	LF	$ 1.50	$ 6,150.00
D-6	Remove Concrete Paving (4"depth)	13000	SYD	$ 6.00	$ 78,000.00
D-7	Remove / Rotomil Bituminous Pavement	2300	SYD	$ 3.00	$ 6,900.00
D-8	Remove Asphalt Roadway Full Depth (varies 2-5' wide, assume average of 3' the distance of the roadway)	13000	SYD	$ 4.00	$ 52,000.00
D-9	Remove Existing Trees (Assumed Allowance)	1	LS	$ 10,000.00	$ 10,000.00
D-10	Remove Existing Cobra Head Pole Lights	1	LS	$ 3,000.00	$ 3,000.00
				SUBTOTAL	**$ 235,450.00**
NEW PEDESTRIAN SIDEWALK IMPROVEMENTS					
SP-1	Concrete Sidewalk	21500	SF	$ 4.00	$ 86,000.00
SP-2	Concrete Handicap Ramps	1900	SF	$ 5.50	$ 10,450.00
SP-3	Paving Crosswalk - Colored Concrete Pavers (on concrete slab)	6900	SF	$ 14.00	$ 96,600.00
SP-4	Pedestrian Areas at Intersection Corners - Colored Concrete Pavers (on concrete slab)	10000	SF	$ 12.00	$ 120,000.00
SP-5	New Colored Concrete Paver Bands (on concrete base)	6300	SF	$ 12.00	$ 75,600.00
SP-6	Sand Subbase (MDOT 2NS, 4"depth)	1900	CYD	$ 10.00	$ 19,000.00
				SUBTOTAL	**$ 407,650.00**

PORTAGE STREET STREETSCAPE IMPROVEMENTS

- ENGINEERS ESTIMATE OF PROBABLE PROJECT COST-

(Area 3)

NEW ROADWAY IMPROVEMENTS					
R-1	Conc. Curb and Gutter (MDOT C4)	4200	LF	$ 14.00	$ 58,800.00
R-2	Conc. Curb and Gutter (MDOT Detail M)	430	LF	$ 18.00	$ 7,740.00
R-3	Machine Grading Modified	25	STA	$ 1,200.00	$ 30,000.00
R-4	Aggregate Base Course (MDOT 22A)	3600	TON	$ 15.00	$ 54,000.00
R-5	MDOT Bituminous Mix	2500	TON	$ 48.00	$ 120,000.00
R-6	Concrete Drive Approaches (6-inch)	5400	SF	$ 6.00	$ 32,400.00
R-7	Adjustment of Manhole Covers	30	EA	$ 200.00	$ 6,000.00
R-8	Replacement/Relocation of Catch Basins	60	EA	$ 1,800.00	$ 108,000.00
R-9	Adjustment of Electrical Boxes	20	EA	$ 100.00	$ 2,000.00
R-10	Adjustment of Gas Shut Off	25	EA	$ 100.00	$ 2,500.00
R-11	Adjustment of Water Valve Box	20	EA	$ 180.00	$ 3,600.00
R-12	Replace Water Valve Box	5	EA	$ 250.00	$ 1,250.00
R-13	Adjustment of Water Shut Off	24	EA	$ 100.00	$ 2,400.00
R-14	Pavement Marking, 4 inch white	6000	LF	$ 1.00	$ 6,000.00
R-15	Pavement Marking, 4 inch yellow	5000	LF	$ 1.00	$ 5,000.00
R-16	Pavement Marking, 24 inch stop bars	240	LF	$ 3.00	$ 720.00
R-17	Pavement Marking Symbols	12	EA	$ 250.00	$ 3,000.00
				SUBTOTAL	**$ 443,410.00**
SITE ELECTRICAL & LIGHTING ITEMS					
SE- 1	13' Pedestrian Light Pole & Lumenaire (includes GFI receptacle)	24	EA.	$ 5,000.00	$ 120,000.00
SE- 2	Banner Arms and Banners (1per Pole on the streetside)	24	EA.	$ 800.00	$ 19,200.00
SE- 3	2" Conduit extensions from existing pole lights	2400	LF	$ 3.00	$ 7,200.00
SE- 4	Transformer Circuit Panel Junction Boxes (Exterior grade)	5	EA.	$ 100.00	$ 500.00
SE- 5	Photoelectric Cells (1 per circuit) (figure 5 lights per circuit)	5	EA.	$ 500.00	$ 2,500.00
SE- 6	Ornamental Light fixture / arm and base for existing MDOT Traffic Strain Pole	4	EA	$ 5,500.00	$ 22,000.00
SE- 7	New Electrical Service	24	EA.	$ 500.00	$ 12,000.00
				SUBTOTAL	**$ 183,400.00**

PORTAGE STREET STREETSCAPE IMPROVEMENTS

- ENGINEERS ESTIMATE OF PROBABLE PROJECT COST-

(Area 3)

LANDSCAPE					
L-1	Street Trees (2.5-3" caliper)	30	EA.	$ 325.00	$ 9,750.00
L-2	Flowering Street Trees (2.5-3" caliper)	30	EA	$ 325.00	$ 9,750.00
L-3	Shrubs (3 gal. cans)	280	EA.	$ 25.00	$ 7,000.00
L-4	Tree Pit Mulch Topping with Filter Fabric	60	EA.	$ 25.00	$ 1,500.00
L-5	Perennials (1 gal. Can)	1520	EA	$ 13.00	$ 19,760.00
L-6	Planter Pots (24 inch)	86	EA	$ 570.00	$ 49,020.00
L-7	Under Mulch (Filter Fabric)	900	SYD	$ 1.00	$ 900.00
L-8	Mulch (3 inch thick) (Bark)	130	CYD	$ 30.00	$ 3,900.00
L-9	Topsoil , Seed and Mulch (4" depth) (include disturbed edges of replaced walks)	4600	SYD	$ 3.00	$ 13,800.00
L-10	Repair disturbed landscape beds (figure 2' past row line) (Allowance)	1	LS	$ 10,000.00	$ 10,000.00
L-11	Pruning Existing Trees	1	LS	$ 10,000.00	$ 10,000.00
L-12	PVC Mainline Irrigation Piping	4100	LF	$ 5.00	$ 20,500.00
L-13	Irrigation watermain tap	4	EA	$ 7,000.00	$ 28,000.00
L-14	Irrigation Quick Coupler w/Box	24	EA	$ 150.00	$ 3,600.00
L-15	Irrigation Line Directional Drilling	300	LF	$ 20.00	$ 6,000.00
				SUBTOTAL	**$ 193,480.00**
SITE FURNITURE					
SF-1	Benches (8') with Concrete Pad	3	EA.	$ 2,135.00	$ 6,405.00
SF-2	Black Ornamental Fencing (42" ht.)	75	LF	$ 60.00	$ 4,500.00
SF-3	Black Protection Bollard (8" diameter, steel)	8	EA.	$ 600.00	$ 4,800.00
SF-4	Bus Shelter	1	EA.	$ 9,000.00	$ 9,000.00
SF-5	Trash Ash Receptacle at each benched bus stop and shelter	3	EA.	$ 1,270.00	$ 3,810.00
SF-6	Repair disturbed landscape beds (figure 2' past row line) (Allowance)	1	LS	$ 10,000.00	$ 10,000.00
SF-7	Pruning Existing Trees (allowance)	1	LS	$ 10,000.00	$ 10,000.00
				SUBTOTAL	**$ 48,515.00**

PORTAGE STREET STREETSCAPE IMPROVEMENTS

- ENGINEERS ESTIMATE OF PROBABLE PROJECT COST-

(Area 3)

MISCELLANEOUS ITEMS					
M-1	Erosion Control (Allowance)	1	LS	$ 5,000.00	$ 5,000.00
M-2	Utility Company Demolition Work (Consumers Power, SBC, Charter Communication, Midwest Communication)	1	LS	$ 189,000.00	$ 189,000.00
M-3	Utility Company Underground Relocations (Consumers Power, SBC, Charter Communication, Midwest Communication)	1	LS	$ 570,000.00	$ 570,000.00
M-4	Project Clean Up	1	LS	$ 5,000.00	$ 5,000.00
				SUBTOTAL	**$ 769,000.00**
ALTERNATES					
ALT-1	Consumers Energy Fiberglass Pedestrian Pole (14' ht.)	24	EA	$ 4,500.00	$ 108,000.00
ALT-2	Paving Crosswalk - I*ntegral Colored Concrete Slab* w/12 inch Wide Concrete Edges, Broom Finish	6900	SF	$ 10.00	$ 69,000.00
ALT-3	Standard Intersection Pedestrian Areas at Intersection Corners - *Integral Colored Concrete Paving* -stamped or broomed and scored	10000	SF	$ 9.00	$ 90,000.00
ALT-4	Irrigation Bubblers (for tree pit and intersection planting as required)	52	EA	$ 100.00	$ 5,200.00
ALT-5	Irrigation Valves w/Box	5	EA	$ 150.00	$ 750.00
EXPLANATION OF ALTERNATIVES					
ALT-1	**Deductive Alternate:** Substitute the Consumers Energy Fiberglass Pole Light (14' ht.) for the Cast Iron Antique Street Lamp Pole Light (13' ht.)				$ 12,000.00
ALT-2	**Deductive Alternate:** Substitute the Crosswalk Colored Concrete Pavers for Poured Colored Concrete Slab				$ 27,600.00
ALT-3	**Deductive Alternate:** Substitute the Intersection Pedestrian Colored Concrete Pavers for Poured Colored Concrete Paving				$ 30,000.00
	IF ALTERNATES 1,2,&3 ARE TAKEN, THEN DEDUCT =				$ 69,600.00
ALT-4&5	**Add Alternate:** Add Irrigation bubblers and valve boxes to water tree pits (these can be made to be below mulch level bubblers to conceal them).				$ 5,950.00
	IF ADDITION ALTERNATES 4&5 ARE TAKEN, THEN ADD =				$ 5,950.00

PORTAGE STREET STREETSCAPE
IMPROVEMENTS
- ENGINEERS ESTIMATE OF PROBABLE PROJECT COST-
(Area 5A)

TIER TWO AREA 5A PRIMARY CROSS STREET: Stockbridge Ave.(Portage St-Bank St)(1110' Roadway)

CONSTRUCTION COSTS	**$**	**121,610.00**
Sub-Total =	**$**	**121,610.00**
LANDSCAPE ARCHTECTURE & ENGINEERING	**$**	**18,150.00**
LEGAL	**$**	**8,000.00**
EASEMENT ALLOWANCE	**$**	**8,000.00**
CONTINGENCIES	**$**	**12,000.00**

STOCKBRIDGE AVENUE BUDGET ESTIMATE (Portage St. to Bank St.) TOTAL = $ 167,760.00

PER LINEAR FOOT COST FOR IMPROVEMENTS - BOTH SIDES OF THE ROAD = $150 PER LINEAR FOOT OF ROADWAY

PORTAGE STREET STREETSCAPE
IMPROVEMENTS
- ENGINEERS ESTIMATE OF PROBABLE PROJECT COST-
(Area 5A)

TIER TWO AREA 5A PRIMARY CROSS STREET: Stockbridge Ave.(Portage St- Bank St)(1110' Roadway)

ITEM #	*ITEM DESCRIPTION*	*ITEM TOTAL*	*UNIT*	*UNIT COST*	*TOTAL PRICE*
GENERAL SITE REQUIREMENTS					
S -1	Mobilization	1	LS	$ 2,500.00	$ 2,500.00
S-2	Permits, Bonds and Insurance (5% of const. Est.)	1	LS	$ 5,700.00	$ 5,700.00
S-3	Project Sign	1	LS	$ 500.00	$ 500.00
S-4	Traffic Controls and Staging	1	LS	$ 1,500.00	$ 1,500.00
				SUBTOTAL	**$ 10,200.00**
DEMOLITION					
D-1	Remove Concrete Sidewalk (222 LF) (Presumes 10% Replaced)	1110	SF	$ 2.00	$ 2,220.00
D-2	Concrete Sawcutting (400 LF)	400	LF	$ 10.00	$ 4,000.00
				SUBTOTAL	**$ 6,220.00**
NEW PEDESTRIAN SIDEWALK IMPROVEMENTS					
SP-1	Concrete Sidewalk with grading (222 LF) (Presumes 10% Replaced)	1110	SF	$ 4.00	$ 4,440.00
SP-2	New Colored Concrete Bands 36" wide (on concrete base)	690	SF	$ 14.00	$ 9,660.00
				SUBTOTAL	**$ 4,440.00**
SITE ELECTRICAL & LIGHTING ITEMS					
SE- 1	13' Ornamental Pedestrian Light Pole & Lumenaire (includes GFI receptacle)	18	EA.	$ 4,000.00	$ 72,000.00
SE- 2	Banner Arms and Banners (1per Pole on the streetside)	18	EA.	$ 800.00	$ 14,400.00
SE- 3	2" Conduit extensions from existing power poles	900	LF	$ 3.00	$ 2,700.00
SE- 4	Transformer Circuit Panel Junction Boxes (Exterior grade)	4	EA.	$ 500.00	$ 2,000.00
SE- 5	Photoelectric Cells (1 per circuit) (figure 5 lights per circuit in island)	4	EA.	$ 200.00	$ 800.00
SE- 6	Directional Drilling (under driveways)	540	EA.	$ 25.00	$ 13,500.00
				SUBTOTAL	**$ 91,900.00**
LANDSCAPE					
L-1	Flowering Street Trees (2.5-3" caliper)	24	EA.	$ 325.00	$ 7,800.00
L-2	Tree Pit Mulch Topping with Filter Fabric	24	EA.	$ 25.00	$ 600.00
L-3	Topsoil , Seed (700SF) (include disturbed edges of replaced walks)	150	SYD	$ 3.00	$ 450.00
				SUBTOTAL	**$ 8,850.00**

PORTAGE STREET STREETSCAPE IMPROVEMENTS

- ENGINEERS ESTIMATE OF PROBABLE PROJECT COST-

(Area 5B)

TIER TWO AREA 5B PRIMARY CROSS STREET: Stockbridge Avenue (Portage St- Race St.)(500' Roadway)

CONSTRUCTION COSTS	**$**	**68,260.00**
Sub-Total =	**$**	**68,260.00**
LANDSCAPE ARCHTECTURE & ENGINEERING	**$**	**11,000.00**
LEGAL	**$**	**5,000.00**
EASEMENT ALLOWANCE	**$**	**5,000.00**
CONTINGENCIES	**$**	**7,000.00**

STOCKBRIDGE AVENUE BUDGET ESTIMATE (Portage St. to Race St.) TOTAL = $ 96,260.00

PER LINEAR FOOT COST FOR IMPROVEMENTS - BOTH SIDES OF THE ROAD = $86 PER LINEAR FOOT OF ROADWAY

PORTAGE STREET STREETSCAPE
IMPROVEMENTS
- ENGINEERS ESTIMATE OF PROBABLE PROJECT COST-
(Area 5B)

TIER TWO AREA 5B PRIMARY CROSS STREET: Stockbridge Avenue (Portage St- Race St.)(500' Roadway)

ITEM #	*ITEM DESCRIPTION*	*ITEM TOTAL*	*UNIT*	*UNIT COST*	*TOTAL PRICE*
GENERAL SITE REQUIREMENTS					
S -1	Mobilization	1	LS	$ 2,500.00	$ 2,500.00
S-2	Permits, Bonds and Insurance (5% of const. Est.)	1	LS	$ 3,250.00	$ 3,250.00
S-3	Project Sign	1	LS	$ 500.00	$ 500.00
S-4	Traffic Controls and Staging	1	LS	$ 1,500.00	$ 1,500.00
				SUBTOTAL	**$ 7,750.00**
DEMOLITION					
D-1	Remove Concrete Sidewalk (250 LF) (Presumes 25% Replaced)	1250	SF	$ 2.00	$ 2,500.00
D-2	Concrete Sawcutting (210 LF)	210	LF	$ 10.00	$ 2,100.00
				SUBTOTAL	**$ 4,600.00**
NEW PEDESTRIAN SIDEWALK IMPROVEMENTS					
SP-1	Concrete Sidewalk with grading (250 LF) (Presumes 25% Replaced)	1250	SF	$ 4.00	$ 5,000.00
SP-2	New Colored Concrete Bands 16" wide (on concrete base)	160	SF	$ 14.00	$ 2,240.00
				SUBTOTAL	**$ 5,000.00**
SITE ELECTRICAL & LIGHTING ITEMS					
SE- 1	13' Ornamental Pedestrian Light Pole & Lumenaire (includes GFI receptacle)	11	EA.	$ 4,000.00	$ 44,000.00
SE- 2	Banner Arms and Banners (1per Pole on the streetside)	0	EA.	$ 800.00	$ -
SE- 3	2" Conduit extensions from existing power poles	500	LF	$ 3.00	$ 1,500.00
SE- 4	Transformer Circuit Panel Junction Boxes (Exterior grade)	2	EA.	$ 500.00	$ 1,000.00
SE- 5	Photoelectric Cells (1 per circuit) (figure 5 lights per circuit in island)	2	EA.	$ 200.00	$ 400.00
SE- 6	Directional Drilling (under driveways)	350	EA.	$ 25.00	$ 8,750.00
				SUBTOTAL	**$ 46,900.00**
LANDSCAPE					
L-1	Street Trees (2.5-3" caliper)	10	EA.	$ 325.00	$ 3,250.00
L-2	Tree Pit Mulch Topping with Filter Fabric	10	EA.	$ 25.00	$ 250.00
L-3	Topsoil , Seed (700SF) (include disturbed edges of replaced walks)	170	SYD	$ 3.00	$ 510.00
				SUBTOTAL	**$ 4,010.00**

PORTAGE STREET STREETSCAPE
IMPROVEMENTS
- ENGINEERS ESTIMATE OF PROBABLE PROJECT COST-
(Area 6A)

TIER THREE AREA 6A NEIGHBORHOOD SIDE STREET: Reed Avenue (Banks St -Race St.)(1630' Roadway)

CONSTRUCTION COSTS	**$**	**39,190.00**
Sub-Total =	**$**	**39,190.00**
LANDSCAPE ARCHTECTURE & ENGINEERING	**$**	**6,000.00**
LEGAL	**$**	**8,000.00**
EASEMENT ALLOWANCE	**$**	**8,000.00**
CONTINGENCIES	**$**	**5,000.00**

STOCKBRIDGE AVENUE BUDGET ESTIMATE
(Banks St. to Race St.) TOTAL = $ 66,190.00

PER LINEAR FOOT COST FOR IMPROVEMENTS - BOTH SIDES OF THE ROAD = $41 PER LINEAR FOOT OF ROADWAY

PORTAGE STREET STREETSCAPE
IMPROVEMENTS
- ENGINEERS ESTIMATE OF PROBABLE PROJECT COST-
(Area 6A)

TIER THREE AREA 6A NEIGHBORHOOD SIDE STREET: Reed Avenue (Banks St-Race St.)(1630' Roadway)

ITEM #	*ITEM DESCRIPTION*	*ITEM TOTAL*	*UNIT*	*UNIT COST*	*TOTAL PRICE*
GENERAL SITE REQUIREMENTS					
S -1	Mobilization	1	LS	$ 1,500.00	$ 1,500.00
S-2	Permits, Bonds and Insurance (5% of const. Est.)	1	LS	$ 1,800.00	$ 1,800.00
S-3	Project Sign	1	LS	$ 500.00	$ 500.00
S-4	Traffic Controls and Staging	1	LS	$ 1,000.00	$ 1,000.00
				SUBTOTAL	**$ 4,800.00**
DEMOLITION					
D-1	Remove Concrete Sidewalk (815 LF) (Presumes 25% Replaced)	4075	SF	$ 2.00	$ 8,150.00
D-2	Concrete Sawcutting (Allowance)	1	LS	$ 5,000.00	$ 5,000.00
				SUBTOTAL	**$ 13,150.00**
NEW PEDESTRIAN SIDEWALK IMPROVEMENTS					
SP-1	Concrete Sidewalk with grading (815 LF) (Presumes 25% Replaced)	1110	SF	$ 4.00	$ 4,440.00
				SUBTOTAL	**$ 4,440.00**
LANDSCAPE					
L-1	Flowering Street Trees (2.5-3" caliper)	38	EA.	$ 325.00	$ 12,350.00
L-2	Tree Pit Mulch Topping with Filter Fabric	38	EA.	$ 25.00	$ 950.00
L-3	Topsoil, Seed and Mulch (include disturbed edges of replaced walks)(Allowance)	1	LS	$ 3,500.00	$ 3,500.00
				SUBTOTAL	**$ 16,800.00**

PORTAGE STREET STREETSCAPE IMPROVEMENTS

- ENGINEERS ESTIMATE OF PROBABLE PROJECT COST-

(Area 6B)

TIER THREE AREA 6B -NEIGHBORHOOD SIDE STREET: Lane Blvd. (Portage St.-Race St.)(1150' Roadway)

CONSTRUCTION COSTS	**$**	**83,750.00**
Sub-Total =	**$**	**83,750.00**
LANDSCAPE ARCHTECTURE & ENGINEERING	**$**	**12,000.00**
LEGAL	**$**	**6,000.00**
EASEMENT ALLOWANCE	**$**	**8,000.00**
CONTINGENCIES	**$**	**10,000.00**
LANE BOULEVARD BUDGET ESTIMATE (Portage St. to Race St.TOTAL =	**$**	**119,750.00**
PER LINEAR FOOT COST FOR BOULEVARD IMPROVEMENTS =	**$103.00 PER LINEAR FOOT OF ROADWAY**	

PORTAGE STREET STREETSCAPE
IMPROVEMENTS
- ENGINEERS ESTIMATE OF PROBABLE PROJECT COST-
(Area 6B)

TIER THREE AREA 6B -NEIGHBORHOOD SIDE STREET: Lane Blvd. (Portage St.-Race St.)(1150' Roadway)

ITEM #	*ITEM DESCRIPTION*	*ITEM TOTAL*	*UNIT*	*UNIT COST*	*TOTAL PRICE*
GENERAL SITE REQUIREMENTS					
S -1	Mobilization	1	LS	$ 2,500.00	$ 2,500.00
S-2	Permits, Bonds and Insurance (5% of const. Est.)	1	LS	$ 4,000.00	$ 4,000.00
S-3	Project Sign	1	LS	$ 500.00	$ 500.00
S-4	Traffic Controls and Staging	1	LS	$ 1,500.00	$ 1,500.00
				SUBTOTAL	**$ 8,500.00**
DEMOLITION					
D-1	Remove Concrete Sidewalk (230 LF) (Presumes 10% Replaced)	1150	SF	$ 2.00	$ 2,300.00
				SUBTOTAL	**$ 2,300.00**
NEW PEDESTRIAN SIDEWALK IMPROVEMENTS					
SP-1	Concrete Sidewalk with grading (230 LF) (Presumes 10% Replaced)	1150	SF	$ 4.00	$ 4,600.00
				SUBTOTAL	**$ 4,600.00**
SITE ELECTRICAL & LIGHTING ITEMS					
SE- 1	13' Ornamental Pedestrian Light Pole & Lumenaire (includes GFI receptacle)	6	EA.	$ 4,000.00	$ 24,000.00
SE- 2	Upgrade existing Transformer Circuit Panel Junction Boxes (Exterior grade)	3	EA.	$ 500.00	$ 1,500.00
SE- 3	Upgrade to new Photoelectric Cells (1 per circuit) (figure 2 lights per circuit in island)	6	EA.	$ 200.00	$ 1,200.00
				SUBTOTAL	**$ 26,700.00**
LANDSCAPE					
L-1	Flowering Street Trees (2.5-3" caliper) (islands)	30	EA.	$ 325.00	$ 9,750.00
L-2	Flowering Street Trees (by sidewalk)	42	EA.	$ 325.00	$ 13,650.00
L-3	Shrubs (3 gal. cans)	320	EA.	$ 25.00	$ 8,000.00
L-4	Tree Pit Mulch Topping with Filter Fabric	72	EA.	$ 25.00	$ 1,800.00
L-5	Perennials (1 gal. can)	200	EA.	$ 13.00	$ 2,600.00
L-6	Under Mulch (Filter Fabric)	690	SYD	$ 1.00	$ 690.00
L-7	Mulch (3 inch thick) (Bark)	60	CYD	$ 30.00	$ 1,800.00
L-8	Topsoil , Seed and Mulch Islands (4680 SF) (include disturbed edges of replaced walks)	1120	SYD	$ 3.00	$ 3,360.00
L-9	Aluminum Bed Edging (4" deep x 3/16" thick	1560	LF	$ 6.00	$ 9,360.00
L-10	Bed Excavation and Preparation (6240 SF±)	1	LS	$ 3,000.00	$ 3,000.00
				SUBTOTAL	**$ 41,650.00**

APPENDIX "8"

SITE EVALUATION

Introduction

The following report is a review and evaluation of the existing conditions found along the Portage Street Study Area which includes the street and areas within the public right-of-way beginning at the north end of Portage Street at East Michigan Avenue, heading south to Alcott Street. Existing conditions, positive and negative elements, including potential impacts of the existing conditions to the streetscape design within the Portage Street corridor were evaluated.

The evaluation is outlined according to the four districts running from north to south along the Portage Street corridor. These areas include the "The Portage Gateway District " – the portion of Portage Street from East Michigan Avenue south to Crosstown Parkway; "The Crosstown District" – the portion of Portage Street from Crosstown Parkway south to Collins Street; "The Washington Square Market District" – the portion of Portage Street from Collins Street south to Egleston Boulevard; and "The Reed Avenue District" – the portion of Portage Street from Egleston Boulevard south to Alcott Street.

The following are the elements evaluated in this report with the description of the basis for review and evaluation:

Elements evaluated in this report include the following:

- ✓ Street Lighting
- ✓ On-Street Parking
- ✓ Pedestrian Patterns
- ✓ Signage
- ✓ Overhead Wires
- ✓ Trees and Miscellaneous
- ✓ View and Focal Points

The following is a list of the evaluation items and a description of the basis for review and evaluation:

Street Lighting Review

The existing street lighting along Portage Street is reviewed and evaluated based upon, Business Owner Survey comments and results, visual impacts, lighting level appearance, lamp type and mounting height and potential impacts to the design process.

On Street Parking Review

The existing street parking along Portage Street is evaluated using data from the Business Owner Survey results, and City provided survey sheets.

Pedestrian Patterns

The existing pedestrian patterns and trends of use along the Portage Street corridor is reviewed and evaluated based upon the field observations, Business Owner Survey results, and data provided by Kalamazoo Area Transportation Services (KATS).

Signage Review

The existing signage for directional and wayfaring (signs guiding the user to a particular area or district) signage was reviewed and evaluated based upon location, clarity, Business Owner Survey results, and visual impact upon the Portage Street corridor. Speed limit sign analysis is being performed by the City Traffic Engineering Department.

Overhead Wires

The existing overhead wires and utility poles are reviewed and evaluated based upon their locations, Business Owner Survey results, and visual and physical impacts to the study areas.

Trees and Miscellaneous

The existing trees are generally reviewed and evaluated based upon their location, and physical and visual impact to the study areas.

PORTAGE GATEWAY DISTRICT

This section of Portage Street is a pedestrian oriented area south of downtown between East Michigan Avenue and Crosstown Parkway. The area from East Michigan Avenue to the Portage/Pitcher Street intersection is composed of the Pfizer Campus including larger buildings and parking lots, surface and ramp parking, and multi-story office buildings. From Pitcher to Crosstown, a mix of small retail, bar and service oriented shops exist.

Street Lighting

The current street lighting in this area is provided by fixtures mounted to either concrete poles at 25' or 30' in height, or utility poles at 30' in height. Fixtures and lamp wattages are cobra head lights, primarily 250 watt mercury vapor lamps except for the area between Lovell and South Street, which lines the west side of the street at 35' in height with 400 watt high pressure sodium lamps. Light levels appear to be reasonable from East Michigan Avenue to Pitcher Street. Light levels appear to be limited on Portage Street from the Pitcher Street intersection to the Walnut Street intersection. From Walnut Street south, light levels along the street appear to be adequate. The Cobra head light fixtures can provide glare and distraction to drivers along Portage Street.

Many of the light fixtures in this district are mounted to concrete poles, which are currently used throughout the City; however, some light fixtures are mounted to utility poles with extension brackets. Spacing of the lights is fairly uniform and one cost-effective approach would be to consider reuse of these poles with new fixtures fitted to the poles.

Most survey comments mentioned a desire to see new ornamental street lamps placed along the street. Some comments mentioned lighting levels were inadequate.

Parking

Currently street parking is provided on both sides of Portage Street, from East Michigan Avenue to South Street, with 90 minute parking from 8 am to 6 pm. From South Street to Lovell Street, metered parking is on both sides of the street in front of the Pfizer Campus, and no parking is allowed in the last 200 feet or so proceeding south to Lovell Street. From Lovell Street to Pitcher Street, parking is unrestricted on the east side and one hour parking is permitted on the west side

from 7 am to 4 pm. This parking becomes a traffic lane from 4 pm to 6 pm. From the Portage Street/Pitcher Street intersection south to Walnut Street, one hour parking is permitted on the east side from 8 am to 6 pm, then on the west side one hour parking is permitted from 7 am to 4 pm, becoming a traffic lane between 4 pm to 6 pm daily. From Dutton/Second Street to Crosstown, one hour parking is permitted on the east side from 7 am to 5 pm, then on the west side, one hour parking is provided from 7 am- 4 pm, becoming a traffic lane from 4 pm to 6 pm.

Pedestrian Patterns

- East Michigan Avenue: 115 people from the north, 1 person from the east, 8 people from the south and 32 people from the west.
- Lovell Street: 5 people from the north, 12 people from the east, 36 people from the south and 5 people from the west.
- Walnut Street: 4 people from the north, 0 people from the east, 2 people from the south and 2 people from the west.
- Crosstown Parkway: 13 people from the north, 19 people from the east, 3 people from the south and 4 people from the west.

East Michigan Avenue has the largest quantity of pedestrian activity due to the retail nature of the street, along with restaurant establishments. Crosstown Parkway has some activity visiting the shops, and "On the Rocks."

Traffic crosswalks occur at the signalized intersections: East Michigan, South Street Lovell, Pitcher, Walnut and Crosstown Parkway. The current striping is worn and barely visible in many of these areas except for East Michigan Avenue. Pedestrian crossing striping should be reapplied with permanent markings.

Signage Review

There is currently some directional, wayfaring signage in this corridor which identifies important routes towards downtown or important landmarks within and beyond the study area.

Existing directional, wayfaring signage in this corridor is found at the Portage Street /South Street intersection, Portage / Pitcher Street intersection, and Lovell Street / Portage Street intersections. Additional direction, wayfaring signage should be incorporated as part of the design process.

Design of the directional and wayfaring signage should identify significant areas to locate such land uses as the Upjohn Park, the Portage Creek Trailway, the Pfizer Corporation Campus, and the Kalamazoo Farmers Market. The signage here should match the graphic standards outlined in the City of Kalamazoo Design Standards.

Overhead Wires

The existing overhead wires and utility poles present a negative impact to this area along the west side of Portage Street from Lovell Street south to Walnut. From Walnut Street south to Crosstown, the poles and wires become a very dominant negative visual element. The wires should be buried underground and the poles rewired from the street.

Trees and Miscellaneous Comments

The existing trees along this section of Portage Street are found primarily on the east side of Portage Street between South Street and East Michigan Avenue, and adjacent to the Pfizer parking lot between Lovell Street and Walnut Street. The trees along the Pfizer parking lot present a strong vertical presence along the west side of the street and provide some screening of views to the large parking area beyond. However, the east side of the street is lacking in trees or landscape treatments to soften views of the eastern parking areas.

From Walnut to Crosstown, the are many curb cuts that might be eliminated or narrowed to allow adequate space for new aesthetic improvements such as landscape tree or shrub plantings or possibly ornamental fencing treatments that provide a visual rhythm and sense of comfort for pedestrians who walk along Portage Street.

CROSSTOWN DISTRICT

This section of Portage Street is composed of many automotive oriented businesses, retail and service establishments. These businesses feature services and products that market to passing commuters to and from the downtown area. High volume traffic was noted in the Business Owner Surveys as an important element to be maintained for the success of those businesses.

Street Lighting

The current street lighting in this area is provided by fixtures mounted to either concrete poles at 25-30' in height, or utility poles at 30' in height. Fixtures and lamps are Cobra headlights, primarily 250-watt mercury vapor lamps. Light levels appear to be reasonable from Crosstown Parkway to Collins Street. Lack of light levels appear to be at the Vine Street intersection. The Cobra head light fixtures tend to provide glare and distraction to drivers along Portage Street.

Parking

Currently on-street parking is provided on both sides of Portage Street with timed restrictions. From Crosstown Parkway to Vine Street, there is one hour parking from 7 am to 5 pm on the east side, and parking on the west side becoming a traffic lane from 4 pm-6 pm. From Vine Street to Jackson Street, there is one hour parking from 2 pm to 5 pm on the east side, then parking on the west side becomes a traffic lane from 4 pm to 6 pm. From Jackson to Carr Street, there is no parking allowed on either side. From Carr to Harrigan Streets, there is one hour parking from 7 am to 4 pm on the east side and parking on the west from 7 am to 4 pm, becoming a traffic lane from 4 pm to 6 pm. Currently the space designated for parking is not adequate to safely accommodate these parking lanes in the current street layout.

Pedestrian Patterns

The existing pedestrian activity along this section of Portage Street is mostly near the Lake Street intersection. The KATS Pedestrian Observation Study conveyed the following pedestrian activity at crossings approaching at each intersection during the day observed:

- Crosstown Parkway: refer to the the Gateway district
- Vine Street: no information provided
- Lake Street: 6 people from the north, 1 person from the east, 1 person from the south and 2 people from the west.
- Collins Street: refer to the Washington Square District

Some pedestrian activity is present along Lake Street. In the Business Owner Surveys some connection was suggested along Lake Street, west to Upjohn Park and then east to the Boys and Girls Club and the St. Joseph Catholic Church.

Traffic crosswalks occur at the signalized intersections: Crosstown Parkway, Vine Street, Lake Street and Collins Street. The current striping is worn and needs to be reapplied with permanent markings.

Signage Review

Currently, there is no directional and wayfaring signage in this corridor which identifies important routes towards downtown or important landmarks within and beyond the study area. Design of the directional and wayfaring signage should identify significant areas to locate such land uses as Upjohn Park, Banks Street Farmers Market, and the Boys and Girls Club. The signage here should match the graphic standards outlined in the City of Kalamazoo Design Standards.

A dominant negative visual element is found in the billboards adjacent to the railroad tracks both on the north and south bound views between Vine Street and Crosstown Parkway.

Overhead Wires

The existing overhead wires and utility poles present a dominant negative impact to this area especially due to the lack of tree plantings. The wires should be buried underground and the poles removed from the street.

Trees and Miscellaneous Comments

The existing few trees along this section of Portage Street are difficult to visualize. Some nice flowering pears run along the east side of Portage adjacent to Miller Davis on Lake Street.

This area is dominated by many concrete curb cuts. Some of these curb cuts can be eliminated, or narrowed to allow adequate space for new aesthetic improvements such as landscape trees or shrub plantings or possibly ornamental fencing treatments that provide a visual rhythm and sense of comfort for pedestrians who walk along Portage Street.

WASHINGTON SQUARE MARKET DISTRICT

In the 1930s and 1940s, this section of Portage Street thrived as a primary retail shopping area including pharmacies, hardware's, thrift shops, furniture, grocery and clothing stores. During this period in time, on-street parking was on both sides of the street, with two lane traffic to and from this area and the downtown. Pedestrian scale acorn type pole lights were the primary source of light and provided a pedestrian mall environment. The Edison Main Street Design Guidelines and the Washington Square Redevelopment Plan identify a primary priority for the district is to rejuvenate the district to a thriving neighborhood retail market area with historic character, as it once existed in the 1930s and 1940s.

Street Lighting

Fixtures mounted to utility poles at 30' in height provide the current street lighting. These utility poles tend to dominant the streetscape and are visually distracting to people driving down Portage Street. Fixtures are Cobra heads, primarily 150-watt high-pressure sodium, which provides minimal light levels, and does not assure pedestrians a feeling of safety. Light levels appear to be minimum somewhat; with Cobra head light fixtures that provide glare and distraction to drivers along Portage Street.

The intent of Edison Mainstreet is to return this section of Portage Street to the thriving retail district, as it existed in the 1930s and 1940s. To achieve this, lighting should be of a historic character and should be designed to be pedestrian in scale such as a 12 to 14' in height ornamental pole and period style light fixtures. However, from the Business Owner Surveys many people mentioned that they didn't want to loose the spill light provided to side streets by the overhead fixtures.

Existing historic style pole lights have been utilized in and around the Washington Square Library area. During the design phase, consideration should be given on how these poles and fixtures blend with the intended design solution for this section of Portage Street.

Parking

Currently parking is provided on both sides of the street. On the east side of the street, parking is limited to one hour from 7 am to 5 pm. On the west side of the street parking is for 30 minutes from 7 am to 3 pm (traffic lane from 3 pm to 6 pm).

Currently, the parking area is not striped and the space allocated for parking is approximately 5 to 7' wide and is less than the safe standard of 8' minimum for on-street parking. With the existing lane widths through this area, parking should be considered off-street, but close to the businesses.

With the renovation of the Washington Square Parking Lot on the west side of Portage Street between Washington and Stockbridge, adequate parking is provided for that side of the street. However, businesses on the east side of Portage Street need City parking, one could be considered in the previous "De Ja Vue" parking area behind the stores.

Pedestrian Patterns

The existing pedestrian use patterns along this section of Portage Street are trips to neighborhood stores such as the Quik Stop, Chicago Sub Pizza, Sir Bills, Family Dollar, Howards, or walking to the bus line. Once this area is renovated successfully and developed into an activity center with new retail, restaurants and stores – pedestrian activity will increase.

The KATS Pedestrian Observation Study conveyed the following pedestrian activity at each intersection during the day observed:

- Collins Street: 7 people from the north, 2 people from the east, 2 people from the south and 4 people from the west.
- Washington Street: 0 people from the north, 0 people from the east, 14 people from the south and 5 people from the west.
- Stockbridge Street: 19 people from the north, 0 people from the east, 0 people from the south and 22 people from the west.

Traffic crosswalks occur at the signalized intersections: Washington Street and Stockbridge Streets. The current crosswalk striping is worn and should be replaced with permanent markings.

Signage Review

Currently, there is no directional signage in this corridor that identifies this area as " The Washington Square District." However, there are some well-established directional signs to the "Banks Street Farmers Market" and identification signage for the new west side Washington Square parking lot. Design of the wayfaring signage should identify significant landmarks and districts, and should match the graphic standards outlined in the City of Kalamazoo Design Standards.

Overhead Wires

The existing overhead wires and utility poles present a dominant negative impact to this area. Additionally, at the corner of Washington Street and Portage, on the southwest corner, one utility pole has been damaged numerous times by truck/bus traffic due to the alignment of this intersection and the physical proximity of this pole to the road.

Trees and Miscellaneous Comments

The existing few trees along this section of Portage Street are primarily located at the Washington Square Library and across the street by the Commercia Bank. South of this area there are no trees planted along the corridor except for some mature existing trees that run approximately 200' north of Elgeston Boulevard. New street trees and shrub plantings or possibly ornamental fencing treatments would provide a visual rhythm and sense of comfort for pedestrians who walk along Portage Street.

REED AVENUE DISTRICT

The existing overhead wires and utility poles present a dominant negative impact to this area. Additionally, at the corner of Washington Street and Portage, on the southwest corner, one utility pole has been damaged numerous times by truck/bus traffic due to the alignment of this intersection and the physical proximity of this pole to the road.

Street Lighting

The light fixtures are reasonably consistent with existing Cobra head fixtures of 250 watt, and 175-watt mercury vapor lamps mounted to both utility poles and concrete poles. Most of the light fixtures in this district are mounted to concrete poles, which are currently used throughout the City. These poles provide a sense of consistency and uniformity along the street at night. Some fixtures are mounted to utility poles; they should to be fitted to new poles that match the existing concrete poles, if the concrete pole lights remain.

Light levels are reasonable, however there are some dimmer areas of the street such as the area between Egleston and Clinton Streets. One area reported in the Business Owner Surveys, the Hispanic market area at the Bryant Street intersection, has existing Cobra head light fixtures, which reportedly provide glare and distraction to drivers along Portage Street.

Along the south district, due to the quantity of existing 25' high concrete light poles and their additional contribution to larger overall light levels, it would be most cost-effective to utilize these poles for overhead lighting on the street with the possibility of replacing the existing Cobra head fixtures with new cut-off fixtures that provide more illumination to the street.

Parking

Currently parking is on-street, but time regulated. From Stockbridge to Egleston Street, there is no parking allowed on the east side with parking allowed on the west side after 6 pm. From Egleston Street to Clinton Street, there is no parking allowed on the east side of the street, while time regulated parking is permitted on the west side of the street. From Clinton Street to Hays Park, there is parking on the west side of the street only, with a timed traffic lane from 4 pm to 6 pm in this area. From Hays Park to Reed Street, there is no parking on either side of the street. From Reed to Lay Street, there is parking on the west side of the street

only, with a timed traffic lane from 4 pm to 6 pm in this area. From Lay Street to Bryant Street, there is parking on the west side of the street only, with a timed traffic lane from 4 pm to 6 pm in this area. From Bryant Street to Alcott Street, there is no parking on either side of Portage Street.

Currently, the on-street parking zone in front of the La Mexicana Market becomes a congestion problem when the traffic lane becomes a parking lane after 4 pm. Signage with a flashing merge indicator light set closer to the Reed Street intersection would notify motorists of the upcoming timed parking lane. On-street parking along this section of Portage Street is less than the standard of 8' minimum for on-street parking. With the existing lane widths through this area, parking should be considered off street but close to the businesses.

Pedestrian Patterns

The KATS Pedestrian Observation Study conveyed the following pedestrian activity at each intersection during the day observed:

- Clinton Street: people from the north, people from the east, people from the south and people from the west.
- Reed Avenue: 2 people from the north, 1 person from the east, 1 person from the south and 9 people from the west.
- Lay Street: 16 people from the north, 15 people from the east, 46 people from the south and 19 people from the west.
- Bryant Street: 12 people from the north, 13 people from the east, 1 person from the south and 0 people from the west.
- Alcott Street: 1 person from the north, 0 people from the east, 0 people from the south and 0 people from the west.

Traffic crosswalks occur at the signalized intersections: Reed Street and Alcott Streets. The current crosswalk striping is worn and should be replaced with permanent markings.

Signage Review

Currently, there is no directional and wayfaring signage in this corridor which identifies specific districts such as the Hispanic shopping area, Town and Country Market and to the north of this area "The Washington Square District." Design of the directional and wayfaring signage in these areas should match the graphic standards outlined in the City of Kalamazoo Design Standards.

Overhead Wires

The existing overhead wires and utility poles present a dominant negative impact to this area. However, due to the mature existing trees that line the street along the west side of Portage north of Alcott up toward Stockbridge, the utility poles in this area are much less dominant visually than in other areas north of Stockbridge.

Trees and Miscellaneous Comments

Much of this section of the Portage Street corridor is residential in character. Matures Trees mark the south end of this corridor adjacent to the Alcott Street intersection. Then from Reed Avenue north, trees provide a warm residential character as an entrance to the Washington Square District north of Stock Bridge. There are three beautiful boulevards that along this section of the Portage Street corridor, Egleston Boulevard, Lay Street and Lane Street. There is good potential unify these gems with thematic landscaping and or lighting treatments.

This district has a strong Hispanic cultural identity with the shopping area at its south end near Bryant Street. Additionally, the Town & Country Market adjacent to Reed Avenue intersection is used locally by pedestrians as commuters to and from the downtown areas. These areas require special pedestrian oriented design features to further promote the businesses in this area.

APPENDIX "9"

TRAFFIC STUDY

PORTAGE STREETSCAPE TRAFFIC IMPACT STUDY

FINAL REPORT

PREPARED FOR:

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MARCH, 2005

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1.0 INTRODUCTION

This chapter outlines the study background and purpose, as well as the study area for the traffic analysis.

1.1 Study Background and Purpose

Downtown Kalamazoo Incorporated (DKI), in cooperation with the Edison Mainstreet Program, will be improving the Portage Street corridor located within the City of Kalamazoo's Edison neighborhood. The improvements will consist of a streetscape project that will transform Portage Street into a signature gateway to downtown Kalamazoo. The streetscape improvements will serve as a means to support on-going economic development activity in the project area and increase linkages amongst public facilities and other area projects.

Portage Street, the Edison neighborhood's primary commercial corridor, runs north-south and connects the Kalamazoo-Battle Creek airport and I-94 to downtown. It is considered to be the principal gateway into the city from the southeast and represents many visitors' first impressions of the city. The Portage Street commercial corridor from Alcott Street to East Michigan Avenue includes approximately 90 businesses, ranging from retail to light industrial. Approximately 20,000 vehicles travel Portage Street each day, in addition to Metro Transit buses, some bicyclists, and pedestrians.

The purpose of this study is to determine the traffic impact this project will have on the existing and future roadway system and streetscape, and to recommend improvements to the roadway system if there are any negative traffic impacts.

1.2 Study Area

The study area for this traffic analysis is along Portage Street between Walnut Street to the north and Alcott Street to the south, and includes nine intersections:

- Portage Street and Walnut Street
- Portage Street and Crosstown Parkway
- Portage Street and Vine Street
- Portage Street and Lake Street
- Portage Street and Washington Avenue
- Portage Street and Stockbridge Avenue
- Potage Street and Reed Avenue
- Portage Street and Bryant Street
- Portage Street and Alcott Street

2.0 SITE RECONNAISSANCE

In addition to the data provided by the Downtown Kalamazoo Incorporated, the City of Kalamazoo, and the Kalamazoo Area Transportation Study (KATS), a field review was conducted to determine the physical characteristics of the study intersections and roadways. Lane configurations, traffic control devices, and speed limits were identified. The following sections detail the characteristics of the study roadways and intersections.

2.1 Study Intersections

The study area is along Portage Street between Walnut Street to the north and Alcott Street to the south. The study area includes the nine intersections listed in Chapter 1.0. One of the nine study intersections is stop controlled, Portage Street at Bryant Street, with Bryant Street stopping for Portage Street. The remaining study intersections are signalized intersections.

The signalized intersections have faintly painted crosswalks and pedestrian signals indicating when it is safe for pedestrians to cross the roadway. No pedestrian push buttons are provided within the study area. In general, pedestrian crossings are not visible to both pedestrians and motorists.

The City has indicated that several of the traffic signal controllers along the study corridor are old and showing symptoms of "dial creep." As a result, the traffic controllers can not reliably maintain a timing plan. Replacement of these controllers is the only solution to this problem.

2.2 Study Roadways

Portage Street

Portage Street is a four-lane roadway throughout the study area. In some locations, on-street parking is available during the AM and PM peak hours. During the AM peak hour, the on-street parking replaces one travel lane. Bus stops are located along Portage Street, varying from 30- to 200-feet from the intersection. The lane width along Portage Street varies throughout the study area, ranging from nine-feet to 18-feet. The speed limit is posted at 30 miles per hour (mph) south of Alcott Street north to Bryant Street. North of Bryant Street the speed limit is posted at 25 mph for the remainder of the study area; however, there are very few 25 mph speed limit signs posted within the study area. There is a perceived feeling that vehicles are traveling faster than the 25 mph speed limit according to local businesses and pedestrians.

Walnut Street

Walnut Street is a two-lane roadway that intersects with Portage Street. The speed limit is posted at 25 mph. There is on-street parking on the north side of the roadway to the east and west of Portage Street. There is on-street parking on the south side of the roadway to the east of Portage Street. Along Portage Street, on-street parking is permitted along the east side of the roadway, south of Walnut Street. There is on-street parking permitted on the west side of Portage Street, south of Walnut Street, except during the PM peak period.

Crosstown Parkway

Crosstown Parkway is a two-lane roadway with left-turn pockets provided at the Portage Street intersection. The speed limit is posted at 25 mph. On-street parking is permitted on the south side of Crosstown Parkway east of Portage Street. Along Portage Street, on-street parking is permitted along the east side of the roadway, north and south of Crosstown Parkway. There is on-street parking permitted on the west side of Portage Street, north and south of Crosstown Parkway, except during the PM peak period.

Vine Street

Vine Street is a four-lane roadway, narrowing to a two-lane roadway approximately 150-feet east of Portage Street. The speed limit is posted at 30 mph. On-street parking is permitted along both sides of Vine Street east of Portage Street. Along Portage Street, on-street parking is permitted along the east side of the roadway, north and south of Vine Street. There is on-street parking permitted on the west side of Portage Street, north and south of Vine Street, except during the PM peak period.

Lake Street

Lake Street is a two-lane roadway that intersects with Portage Street. The speed limit is posted at 25 mph. There is on-street parking on the south side of the roadway to the east and west of Portage Street, and on the north side of the roadway to the west of Portage Street. Along Portage Street, on-street parking is permitted along the east side of the roadway, north and south of Lake Street. There is on-street parking permitted on the west side of Portage Street, north of Lake Street, except during the PM peak period. The signal heads at this intersection appear to be eight-inch lenses.

Washington Avenue

Washington Avenue is a two-lane roadway that intersects with Portage Street. The speed limit is posted at 25 mph. There is on-street parking on the both sides of the roadway to the east of Portage Street. Along Portage Street, on-street parking is permitted along the east side of the roadway, north and south of Washington Avenue. There is on-street parking permitted on the west side of Portage Street, south of Washington Avenue, except during the PM peak period. Sight distance problems exist at this intersection due to a tight curve and narrow lanes along Portage Street and buildings located close to the roadway. The signal heads at this intersection appear to be eight-inch lenses.

Stockbridge Avenue

Stockbridge Avenue is a two-lane roadway with left-turn pockets provided at the Portage Street intersection. The speed limit is posted at 25 mph. There is no on-street parking on both sides of the roadway east and west of Portage Street. Along Portage Street, there is no on-street parking permitted south of Stockbridge Avenue. On-street parking is permitted north of Stockbridge Avenue on the east side of the roadway, and on the west side of Portage Street for 30 minute durations except during the PM peak period.

Reed Avenue

Reed Avenue is a two-lane roadway with an eastbound right-turn pocket provided at the Portage Street intersection. The speed limit is posted at 25 mph. On-street parking is permitted on both sides of the roadway, to the east and west of Portage Street. Along Portage Street, no on-street parking is permitted in this area. The signal heads at this intersection appear to be eight-inch lenses.

Bryant Street

Bryant Street is a two-lane, stop controlled roadway at Portage Street. Bryant Street must stop for Portage Street traffic. Crosswalks are only provided across Bryant Street. Pedestrians

cannot cross Portage Street at this intersection due to safety and sight distance issues. The speed limit is posted at 25 mph along Bryant Street. In this location, Portage Street has a posted speed limit of 25 mph north of Bryant Street and 30 mph to the south. On-street parking is permitted on both sides of the roadway, to the east and west of Portage Street. Along Portage Street, on-street parking is permitted after the PM peak period along southbound Portage Street (replacing one through lane of travel). No warning signs are posted prior to losing one southbound travel lane. Sight distance is limited at this intersection due to a tight curve and narrow lanes along Portage Street and buildings located close to the roadway.

Alcott Street

Alcott Street is an offset intersection, with the western leg located south of the eastern leg. The eastern leg of Alcott Street is an underutilized, stop-controlled roadway. It is used primarily by Schafer's Bakery (although the sign still indicates that this is Aunt Millie's Bakery Outlet) and a few other businesses located in the area. During the field review, no vehicles were observed using this roadway. During the PM peak hour, only one vehicle entered the roadway from northbound Portage Street. No vehicles were counted exiting the roadway. The eastern leg of Alcott Street was not included in the traffic analysis for this reason. West of Portage Street, Alcott Street is a three-lane roadway. The speed limit is posted at 25 mph. There is no on-street parking on either side of the roadway. Along Portage Street, no on-street parking is permitted in this area. This intersection is signalized and a northbound Portage Street left-turn arrow and an eastbound Alcott Street right-turn arrow are provided. The signal heads at this intersection appear to be eight-inch lenses, but both the right-turn and left-turn arrows are 12-inch lenses.

3.0 DATA COLLECTION

Vehicular and Pedestrian Volumes

The City of Kalamazoo conducted PM peak hour turning-movement counts at eight of the nine study intersections on October 7 and 8, 2003. A peak hour turning-movement count was later conducted for the intersection of Portage Street and Bryant Street by the City of Kalamazoo on February 3, 2004. Counts were collected on a Tuesday, Wednesday, or Thursday during non-holiday weeks.

Individual intersection PM peak hour data was utilized in the traffic analysis. The peak hour factor (PHF) for each intersection was determined from the turning-movement count data and provided by the City of Kalamazoo.

The Kalamazoo Area Transportation Study (KATS) provided pedestrian volumes at each of the study intersections, except for the intersection of Portage Street and Vine Street. Since this intersection is closely spaced to Crosstown Parkway, the pedestrian volumes from the intersection of Portage Street and Crosstown Parkway were utilized for the intersection of Portage Street and Vine Street. Appendix A contains a summary of pedestrian volumes.

Other Data

- The signal timing plans for the eight signalized intersections were obtained from the City of Kalamazoo.
- The bus stop locations and frequencies, within the study area, were provided by the City of Kalamazoo. At each bus stop within the study area during the peak hours of the day, there are two bus stops per hour.
- KATS provided parking duration data for on-street parking locations throughout the study area.
- Crash data for the study intersections was obtained from the City of Kalamazoo. The second page of the UD-10 reports was provided by KATS for critical crash locations.

4.0 CRASH ANALYSIS

Traffic crashes cause property damage, injuries, and loss of life and also add to driver delay and frustration. An intersection crash analysis was performed for the nine study intersections along Portage Street. The three most recent and complete years of crash data (for years 2000, 2001, and 2002) were obtained from the City of Kalamazoo. The data included the crash types, the hazardous action causing the crash, and the total number of crashes, fatalities, Injury A, Injury B, Injury C, property damage only crashes.

4.1 UD-10 Definitions

The data obtained from the City of Kalamazoo was compiled from the UD-10s for the crashes. The usage of UD-10 reports began in 1992 and they provide a more uniform way of compiling crash data. All local police departments, sheriff jurisdictions, and the Department of State Police must fill out a UD-10 report at the crash scene. Michigan law requires that crash reports be forwarded to the Director of the Department of State Police. These forms are strictly for providing statistical information on crash data.

There are six basic crash types that are summarized by the UD-10 forms. The definitions of the crash types used in the UD-10 form are taken directly from the *State of Michigan UD-10 Traffic Crash Report Instruction Manual*, revised in September 1994. The manual was produced and distributed by the Michigan Department of State Police, and the Office of Highway Safety Planning. The crash types are based on the intended direction of travel, regardless of points(s) of impact or direction vehicles ultimately face after the crash.

- **Single Motor Vehicle:** A single or multiple unit crash, which involves only one motor vehicle as defined in the manual. This includes those cases in which a motor vehicle was: 1) the only traffic unit; and 2) the only motor vehicle involved in a collision with a bicyclist, pedestrian, animal, railroad train, or any other non-motorized object. Any motorized (i.e., self-propelled) vehicle or device is considered a “motor vehicle” even though the vehicle or device may not be defined as a motor vehicle on the Michigan Motor Vehicle Code or other applicable legislation.
- **Head On:** The intended direction of travel of both vehicles must be towards each other.
- **Angle:** This will be marked when the intended direction of travel is basically perpendicular for both drivers and there is a side impact of approximately 90°. If the side impact takes place during a “Head On-Left Turn”, “Rear End-Left Turn”, or “Rear End-Right Turn”, it is not an “Angle”.
- **Rear End:** When the vehicles are traveling in the same direction, one behind the other, and no turn in involved. Area of damage on the vehicles is not the determining factor. Any crash involving any vehicle backing into another is not considered a “rear-end” crash.
- **Sideswipe:** Vehicles traveling in the same direction, or vehicles traveling in opposite directions, making side contact or if a vehicle spins out of control and makes contact with another vehicle traveling in the same direction. “Sideswipe” differs from “Angle” in that a sideswipe is a glancing impact and should not in itself stop the forward movement of the vehicle. An angle crash is a more direct impact and may stop the forward movement of one vehicle.
- **Other/Unknown:** The crash does not fit in one of the other selections.

The *State of Michigan UD-10 Traffic Crash Report Instruction Manual*, revised September 1994, uses the following injury severity classifications.

- **Fatal Injury (K):** Any injury that results in death due to a motor vehicle traffic crash.
- **Incapacitating Injury (A):** Any injury, other than fatal, which prevents the injured person from walking, driving, or normally continuing the activities which he or she was capable of performing prior to the motor vehicle traffic crash.
- **Non-incapacitating Evident Injury (B):** Any injury, other than fatal and incapacitating, which is evident at the scene of the crash.
- **Possible Injury (C):** Any injury reported or claimed which is not a fatal, incapacitating, or non-incapacitating evident injury.

4.2 Determination of Critical Crash Location

The Crash Frequency and Crash Rate Methods were utilized in identifying whether the intersections analyzed were critical crash locations. The Crash Frequency Method ranks locations by descending crash frequency; that is the average number of crashes per year. The Crash Frequency Method does not take into account the differing amounts of traffic at the locations, assigning ranking solely on the number of crashes, even if the location has a relatively low number of crashes for its traffic volume.

$$\text{Crash_Frequency} = \frac{(\text{Total_Number_of_Crashes})}{(\text{Number_of_Years})}$$

The crash rate method evaluates the number of crashes based on the Average Daily Traffic (ADT) while the Crash Frequency Method ranks locations by descending crash frequency; that is the average number of crashes per year.

$$\text{Crash_Rate} = \frac{(\text{Number_of_Crashes}) * (1{,}000{,}000)}{(\text{Average_Daily_Entering_Volume}) * (365\text{Days/Year}) * (\text{Number_of_Years})}$$

Table 4-1 summarizes the total number of crashes with injuries or property damage, the primary, secondary, and tertiary crash types, and the primary reason the crashes occurred for the nine study intersections within our study area between 2000 and 2002. The primary crash types at the study intersections involve angle and rear end crashes.

Utilizing Table 3-1 of the *Southeast Michigan Council of Governments Traffic Safety Manual*, Second Edition (September 1997), the crash frequency and rate at the study intersections were compared to the regional crash frequencies and rates for an urban arterial based on the average daily traffic (ADT) volume entering the intersection. It is typically assumed that the PM peak hour volume is 10-percent of the ADT. Since the ADT counts were not available, the ADT volume entering the intersection was estimated by multiplying the PM peak hour entering volume by 10. Based on this threshold, critical crash locations were identified. An intersection was considered to be a critical crash location if the intersection exceeded the threshold for frequency and/or rate based on the regional crash frequency and rate. These two methods, in conjunction with one another, provide a fairly complete picture of traffic safety conditions.

Table 4-2 displays the estimated ADT volume entering the intersection, overall crash frequency, crash rate, and whether the intersection is considered a critical crash location.

Based on the crash analysis, four out of the nine study intersections are considered to be critical crash locations based on either crash frequency, crash rate, or both. UD-10 reports were

Table 4-1: Three-Year Crash Summary (Years 2000-2002)

Intersection with Portage Street	Three Year Crash Data (Years 2000 - 2002)						Three Year Crash Data			Primary Reason for Crashes
	Total Crashes	Fatal Crashes	Injury A	Injury B	Injury C	Property Damage Only	Primary Crash Type	Secondary Crash Type	Tertiary Crash Type	
Walnut Street	28	0	0	3	3	22	28.6% Sideswipe same direction	25.0% Rear end	21.4% Angle	Sideswipe: no primary reason; rear end: unable to stop; angle: disregard traffic control
Crosstown Parkway	28	0	0	0	4	24	39.3% Angle	28.6% Rear end	10.7% Other/ Unknown	Angle: failed to yield; rear end: unable to stop; other/unknown: no primary reason
Vine Street	45	0	2	4	3	36	33.3% Rear end	24.4% Angle	13.3% Sideswipe same direction	Rear end: unable to stop; angle: no primary reason; sideswipe: improper lane use
Lake Street	45	0	0	1	3	41	35.6 % Angle	24.4% Rear end	24.4% Sideswipe same direction	Angle: failed to yield; rear end: unable to stop; sideswipe: either improper passing or none
Washington Court	26	0	0	1	3	22	42.3% Rear end	38.5% Sideswipe same direction	11.5% Single motor vehicle	92% of crashes occurred along Portage Street; rear end: unable to stop; sideswipe: no primary cause; single motor vehicle: speed too fast
Stockbridge Avenue	62	0	1	3	10	48	40.3% Angle	37.1% Rear end	8.1% Sideswipe same direction	Angle: disregard traffic control; rear end: unable to stop; sideswipe: no primary reason
Reed Avenue	44	0	1	5	6	32	31.8% Angle	31.8% Rear end	11.4% Sideswipe same direction	Angle: disregard traffic control; rear end: unable to stop; sideswipe: either improper turn or other
Bryant Street	24	0	0	1	3	20	37.5% Rear end	20.8% Angle	8.3% Sideswipe same direction	Rear end: unable to stop; angle: failed to yield; sideswipe: no primary reason
Alcott Street	23	0	0	1	3	19	34.8% Rear end	21.7% Single motor vehicle	17.4% Sideswipe same direction	Rear end: unable to stop; single motor vehicle: no primary reason; sideswipe: improper lane use

Table 4-2: Identification of Critical Crash Locations

Intersection with Portage Street	Estimated ADT Entering Intersection (PM peak hour * 10)	Crash Freq.	Critical Crash Fequency Threshold	Crash Rate	Critical Crash Rate Threshold	Critical Intersection?	
						Freq.	Rate
Walnut Street	14,150	9.33	14.32	1.81	2.28	No	No
Crosstown Parkway	15,620	9.33	14.32	1.64	2.28	No	No
Vine Street	16,270	15.00	14.32	2.53	2.28	**Yes**	**Yes**
Lake Street	16,110	15.00	14.32	2.55	2.28	**Yes**	**Yes**
Washington Court	12,820	8.67	14.32	1.85	2.28	No	No
Stockbridge Avenue	20,500	20.67	21.67	2.76	1.91	No	**Yes**
Reed Avenue	18,590	14.67	14.32	2.16	2.28	**Yes**	No
Bryant Street	17,060	8.00	14.32	1.28	2.28	No	No
Alcott Street	20,990	7.67	21.67	1.00	1.91	No	No

requested for the four critical crash locations. It should be noted that only the second page of the UD-10 reports were available for review.

4.3 Crash Recommendations

This section summarizes the crash analysis for the critical crash locations identified within the study area.

Vine Street at Portage Street

This intersection is categorized as a critical crash location based on both crash frequency and crash rate. The intersection experienced 45 crashes during the three-year period, averaging 15.00 crashes per year. The primary crash type is rear end crashes, followed by angle and sideswipe same direction crashes. The primary reason listed for rear end crashes was vehicles were unable to stop in assured clear distance. There was no primary reason listed for the angle crashes; however the primary reason listed for the sideswipe crashes was improper lane use. Regardless of whether the crash type was rear end, angle, or sideswipe same direction, in the majority of the cases the weather was clear, the crashes occurred in the daylight, and the roadway was dry.

Rear end crashes are common at signalized intersections; however drivers may not be paying attention if vehicles are slowing down to complete a turn (no turn pockets are provided at any of the approaches). The sideswipe crashes may also be due to vehicles slowing down to complete a turn; vehicles may swerve into the adjacent lane to avoid the vehicle slowing down in front of them. In addition, on-street parking may contribute to sideswipe crashes. There is on-street parking on the west side during the AM peak hour which removes one travel lane. Vehicles driving in the right-lane may have to unexpectedly change lanes to avoid hitting a parked vehicle.

Based on the review of the UD-10 diagrams, the majority of the crashes are due to driver error (driver's not paying attention to the roadway). Three vehicles (one vehicle on Portage Street and two on Vine Street) waiting to turn left stated they did not see the oncoming vehicle (due to opposing vehicles waiting to turn left) and turned left in front of the oncoming vehicle. No conclusive causes for these crashes can be determined from the UD-10 reports. ***The addition of Portage Street turn pockets (specifically left-turn pockets) may assist in reducing the crashes along Portage Street by removing turning vehicles from the through traffic stream. However, one of the goals of the future streetscaping project is to promote a pedestrian friendly corridor, which means certain ROW requirements are needed in order to provide a safe pedestrian zone (see Section 6.1). Turn pockets should only be provided if pedestrian safety will not be compromised in doing so, i.e. enough of a buffer can be provided between motorists and pedestrians for both to utilize the corridor safely.***

Lake Street at Portage Street

This intersection is categorized as a critical crash location based on both crash frequency and crash rate. The intersection experienced 45 crashes during the three-year period, averaging 15.00 crashes per year. The primary crash type is angle crashes, followed by rear end and sideswipe same direction crashes. The primary reason listed for angle crashes was vehicles failed to yield. The primary reason listed for the rear end crashes was unable to stop in assured clear distance and the primary reason listed for the sideswipe crashes was either improper passing or no reason provided. The majority of the angle and rear end crashes occurred on

Portage Street, whereas the majority of sideswipe crashes occurred on Lake Street. Regardless of whether the crash type was angle, rear end, or sideswipe same direction, in the majority of the cases the weather was clear, the crashes occurred in the daylight, and the roadway was dry. ***Increased clearance intervals (yellow and/or all-red times) in the traffic signal may help to reduce the number of angle crashes by providing more time for vehicles to clear the intersection before a conflicting movement is permitted to travel through the intersection.***

The signal heads at this intersection have eight-inch lenses. Some of the angle and rear end crashes may be due to drivers not seeing the traffic signal in time to stop. Larger signal lenses improve the visibility of the traffic signal. ***It is recommended that the signal lenses be upgraded to 12-inch lenses at the intersection of Portage Street and Lake Street.***

Rear end crashes are common at signalized intersections; however vehicles may not be paying attention if vehicles are slowing down to complete a turn (no turn pockets are provided at any of the approaches). The sideswipe crashes may also be due to vehicles slowing down to complete a turn; vehicles may swerve into the adjacent lane to avoid the vehicle slowing down in front of them. The approach lanes to the intersection are not to narrow, however there is on-street parking on the east side of Portage Street. There is on-street parking on the west side of Portage Street which removes a travel lane, except between the hours of 4:00 to 6:00 PM. Vehicles may be driving in the right-lane to unexpectedly have to change lanes to avoid hitting a parked vehicle.

Based on the review of the UD-10 diagrams, the majority of the crashes are due to driver error (driver's not paying attention to the roadway). Three vehicles on Portage Street waiting to turn left stated they did not see the oncoming vehicle (due to opposing vehicles waiting to turn left) and turned left in front of the oncoming vehicle. Two left-turning vehicles slowed prior to completing a turn were hit from behind. Two vehicles failed to see a crossing pedestrian when completing a turn and hit the pedestrian. No conclusive causes for these crashes can be determined from the UD-10 reports. ***The addition of Portage Street turn pockets (specifically left-turn pockets) may assist in reducing the crashes along Portage Street by removing turning vehicles from the through traffic stream. However, one of the goals of the future streetscaping project is to promote a pedestrian friendly corridor, which means certain ROW requirements are needed in order to provide a safe pedestrian zone (see Section 6.1). Turn pockets should only be provided if pedestrian safety will not be compromised in doing so, i.e. enough of a buffer can be provided between motorists and pedestrians for both to utilize the corridor safely.***

Stockbridge Avenue at Portage Street

This intersection is categorized as a critical crash location based on crash rate. This intersection had the highest number of crashes during the three-year period: 62 crashes, averaging 20.67 crashes per year. The primary crash type at this intersection are angle crashes, followed by rear end and sideswipe same direction crashes. The primary reason for the angle crashes was that drivers were disregarding the traffic control. The primary reason listed for the rear end crashes was unable to stop in assured clear distance and there was no primary reason listed for the sideswipe. The majority of the angle, rear end, and sideswipe same direction crashes occurred on Portage Street. Regardless of whether the crash type was angle, rear end, or sideswipe same direction, in the majority of the cases the weather was clear, the crashes occurred in the daylight and the roadway was dry. ***Increased clearance intervals (yellow and/or all-red times) in the traffic signal may help to reduce the number of angle***

crashes by providing more time for vehicles to clear the intersection before a conflicting movement is permitted to travel through the intersection.

Rear end crashes are common at signalized intersections; however vehicles may not be paying attention if vehicles are slowing down to complete a turn (no turn pockets are provided at any of the Portage Street approaches). The sideswipe crashes may also be due to vehicles slowing down to complete a turn; vehicles may swerve into the adjacent lane to avoid the vehicle slowing down in front of them. The approach lanes to the intersection are not to narrow, however there is on-street parking on the east side of Portage Street. There is on-street parking on the west side during the AM peak hour which removes one travel lane. Vehicles may be driving in the right-lane to unexpectedly have to change lanes to avoid hitting a parked vehicle.

The UD-10 reports were reviewed for this intersection to determine if there was a primary cause to the crashes that could be corrected; many of the diagrams were unreadable or had no descriptions. Based on the review of the UD-10 diagrams, the majority of the crashes are due to driver error (driver's not paying attention to the roadway) or running a red light. No conclusive causes for these crashes can be determined from the UD-10 reports. ***The addition of Portage Street turn pockets (specifically left-turn pockets) may assist in reducing the crashes along Portage Street by removing turning vehicles from the through traffic stream. However, one of the goals of the future streetscaping project is to promote a pedestrian friendly corridor, which means certain ROW requirements are needed in order to provide a safe pedestrian zone (see Section 6.1). Turn pockets should only be provided if pedestrian safety will not be compromised in doing so, i.e. enough of a buffer can be provided between motorists and pedestrians for both to utilize the corridor safely.***

Reed Avenue and Portage Street

This intersection is categorized as a critical crash location based on crash frequency. The intersection experienced 44 crashes during the three-year period, averaging 14.67 crashes per year. The primary crash type at this intersection are angle crashes, followed by rear end and sideswipe same direction crashes. The primary reason for the angle crashes was that drivers were disregarding the traffic control. The primary reason listed for the rear end crashes was unable to stop in assured clear distance and the primary reason listed for the sideswipe crashes was either improper turn or no reason provided. The majority of the angle and rear end crashes occurred on Portage Street, whereas the majority of sideswipe crashes occurred on Reed Avenue. Regardless of whether the crash type was angle, rear end, or sideswipe same direction, in the majority of the cases the weather was clear, the crashes occurred in the daylight, and the roadway was dry. ***Increased clearance intervals (yellow and/or all-red times) in the traffic signal may help to reduce the number of angle crashes by providing more time for vehicles to clear the intersection before a conflicting movement is permitted to travel through the intersection.***

The signal head at this intersection has eight-inch lenses. Some of the angle and rear end crashes may be due to drivers not seeing the traffic signal in time to stop. Larger signal lenses improve the visibility of the traffic signal. ***It is recommended that the signal lenses be upgraded to 12-inch lenses at the intersection of Portage Street and Reed Avenue.***

Rear end crashes are common at signalized intersections; however vehicles may not be paying attention if vehicles are slowing down to complete a turn (no turn pockets are provided at any of the Portage Street approaches).

The UD-10 reports were reviewed for this intersection to determine if there was a primary cause to the crashes that could be corrected; some of the diagrams were unreadable or had no descriptions. Based on the review of the UD-10 diagrams, the majority of the crashes are due to driver error (driver's not paying attention to the roadway) or running a red light. No conclusive causes for these crashes can be determined from the UD-10 reports. ***The addition of Portage Street turn pockets (specifically left-turn pockets) may assist in reducing the crashes along Portage Street by removing turning vehicles from the through traffic stream. However, one of the goals of the future streetscaping project is to promote a pedestrian friendly corridor, which means certain ROW requirements are needed in order to provide a safe pedestrian zone (see Section 6.1). Turn pockets should only be provided if pedestrian safety will not be compromised in doing so, i.e. enough of a buffer can be provided between motorists and pedestrians for both to utilize the corridor safely.***

5.0 EXISTING CONDITIONS

This section describes the traffic engineering software utilized, analysis assumptions, level of service, and traffic analysis results for the Existing Conditions.

5.1 Traffic Engineering Software

Synchro, version 6.0, was utilized to analyze traffic operations. Synchro was developed by Trafficware. Synchro is a complete software package capable of quickly modeling and optimizing traffic signal timings. Synchro optimizes splits, cycle lengths, and offsets, seeking to reduce stops and delays. Program features allow for complex and non-standard phasing, multiple intersections sharing a single controller, and analysis of closely-spaced intersections.

5.2 Analysis Assumptions

Certain assumptions were made regarding the traffic analysis and they are outlined in this section of the report.

- The bus stop locations along Portage Street were provided by the City of Kalamazoo; at all locations the bus frequencies were two (2) stops per hour.
- The parking maneuvers were estimated based on Portage Street parking duration data provided by the Kalamazoo Area Transportation Study (KATS). Parking duration data was provided for select businesses within the study area. The parking duration data was scattered throughout the study area and most values were low. An average value of 2.7 parking maneuvers per hour was obtained; however, this value seemed low. If on-street parking is available for a given approach along Portage Street, an estimated value of four (4) parking maneuvers per hour was input into Synchro. No data was available for the side streets. If on-street parking is permitted on the side streets, it is input into Synchro; however no value for the number of parking maneuvers per hour was input. Synchro still uses this information in the analysis (even if no value has been input).
- The percent of heavy vehicles in the traffic mix was assumed to be five-percent along Portage Street, per the City of Kalamazoo. A value of two-percent was used for the side streets.
- Pedestrian data was provided by KATS for each of the study intersections, except for the intersection of Portage Street and Vine Street. Since this intersection is closely spaced to Crosstown Parkway, the pedestrian volumes from the intersection of Portage Street and Crosstown Parkway were utilized for the intersection of Portage Street and Vine Street. Any future signal timing optimizations will allow for proper pedestrian crossing times at all study intersections.
- The Portage Street lane widths were provided by the City of Kalamazoo. At most locations the lane widths varied for each lane along Portage Street. Synchro does not have the capability to input a different lane width for each lane across the roadway. For instance if the through lanes were 10-feet and 11-feet wide, only one value can be input. For this traffic analysis, the narrower lane width was input into Synchro. The side streets were modeled as 12-foot lanes.
- Individual intersection PM peak hour data was input into Synchro to provide a worse case scenario for that intersection.
- The area type in Synchro was input as “other” as this project is not located within a central business district.

- The level of service (LOS) considered to be acceptable by the City of Kalamazoo is LOS D or better.

5.3 Level of Service

Intersection delay can be equated to level of service, which is a method of determining how a roadway is operating. The level of service is defined in terms of total (control) delay, which is a measure of driver discomfort, frustration, fuel consumption, and lost travel time. The level of service criteria for signalized and unsignalized intersections are provided in the 2000 Highway Capacity Manual, Special Report 209 and are given in Tables 5-1 and 5-2, respectively.

For signalized intersections, control delay includes the initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay. Control delay for signalized intersections may also be referred to as signal delay. LOS E is no longer considered to be at a volume to capacity ratio of one (V/C = 1.0). Therefore, it is possible to have V/C < 1 and still have an overall intersection performance of LOS F. This is because delay is based on control delay. Long delays with lower V/C ratios can exist if cycle lengths are long, a lane group is disadvantaged by the signal timing, or the signal progression is poor. The reverse is also possible, where a saturated lane group (V/C > 1.0) may have short delays if the cycle length is short and/or the signal progression is good. For unsignalized intersections the level of service is determined by looking at the control delay for the minor legs of the intersection.

Table 5-1: Level of Service for Signalized Intersections Based on Control Delay

Level of Service	Description	Average Control Delay Per Vehicle (seconds)
A	Operations with very low control delay occurring with favorable progression and/or short cycle lengths.	≤ 10.0
B	Operations with low control delay occurring with good progression and/or short cycle lengths.	> 10.0 and ≤ 20.0
C	Operations with average control delays resulting from fair progression and/or longer cycle lengths. Individual cycle failures begin to appear.	> 20.0 and ≤ 35.0
D	Operations with longer control delays due to a combination of unfavorable progression, long cycle lengths, or high volume-to-capacity (V/C) ratios. Many vehicles stop and individual cycle failures are noticeable.	> 35.0 and ≤ 55.0
E	Operations with high control delay values indicating poor progression, long cycle lengths, and high V/C ratios. Individual cycle failures are frequent occurrences. This is considered to be the limit of acceptable delay.	> 55.0 and ≤ 80.0
F	Operation with control delays unacceptable to most drivers occurring due to oversaturation, poor progression, or very long cycle lengths.	> 80.0

Source: 2000 Highway Capacity Manual, Special Report 209

Table 5-2: Level of Service for Unsignalized Intersections Based on Control Delay

Level of Service	Description	Average Stopped Delay Per Vehicle (seconds)
A	Little or no delay.	≤ 10.0
B	Short traffic delays.	> 10.0 and ≤ 15.0
C	Average traffic delays.	> 15.0 and ≤ 25.0
D	Long traffic delays.	> 25.0 and ≤ 35.0
E	Very long traffic delays.	> 35.0 and ≤ 50.0
F	Demand exceeds capacity resulting in extreme delays and queuing.	> 50.0

Source: 2000 Highway Capacity Manual, Special Report 209

5.4 Existing Traffic Conditions

PM peak period turning-movement counts were taken at the nine study intersections along Portage Street. Individual PM peak hour turning-movement data was utilized in the traffic analysis. The following illustrate the specific PM peak hour for each of the nine study intersections:

- Portage Street and Walnut Street: 4:30-5:30 PM
- Portage Street and Crosstown Parkway: 4:30-5:30 PM
- Portage Street and Vine Street: 4:30-5:30 PM
- Portage Street and Lake Street: 4:30-5:30 PM
- Portage Street and Washington Street: 4:45-5:45 PM
- Portage Street and Stockbridge Avenue: 4:30-5:30 PM
- Potage Street and Reed Avenue: 4:30-5:30 PM
- Portage Street and Bryant Street: 4:45-5:45 PM
- Portage Street and Alcott Street: 4:45-5:45 PM

The existing data collected were input into Synchro 6.0, which determines the control delay and level of service by movement, approach, and for the whole intersection. The level of service (LOS) is based on the amount of delay experienced by drivers traveling along the roadway through an intersection.

Figure 5-1 on the following page shows the Existing Conditions PM peak hour traffic volumes for the study corridor. Table 5-3 summarizes the delay and levels of service for the nine study intersections.

Appendix B within this report contains the Existing Conditions traffic volume data and Synchro analysis output.

Figure 5-1: Existing Conditions PM Peak Hour Traffic Volumes

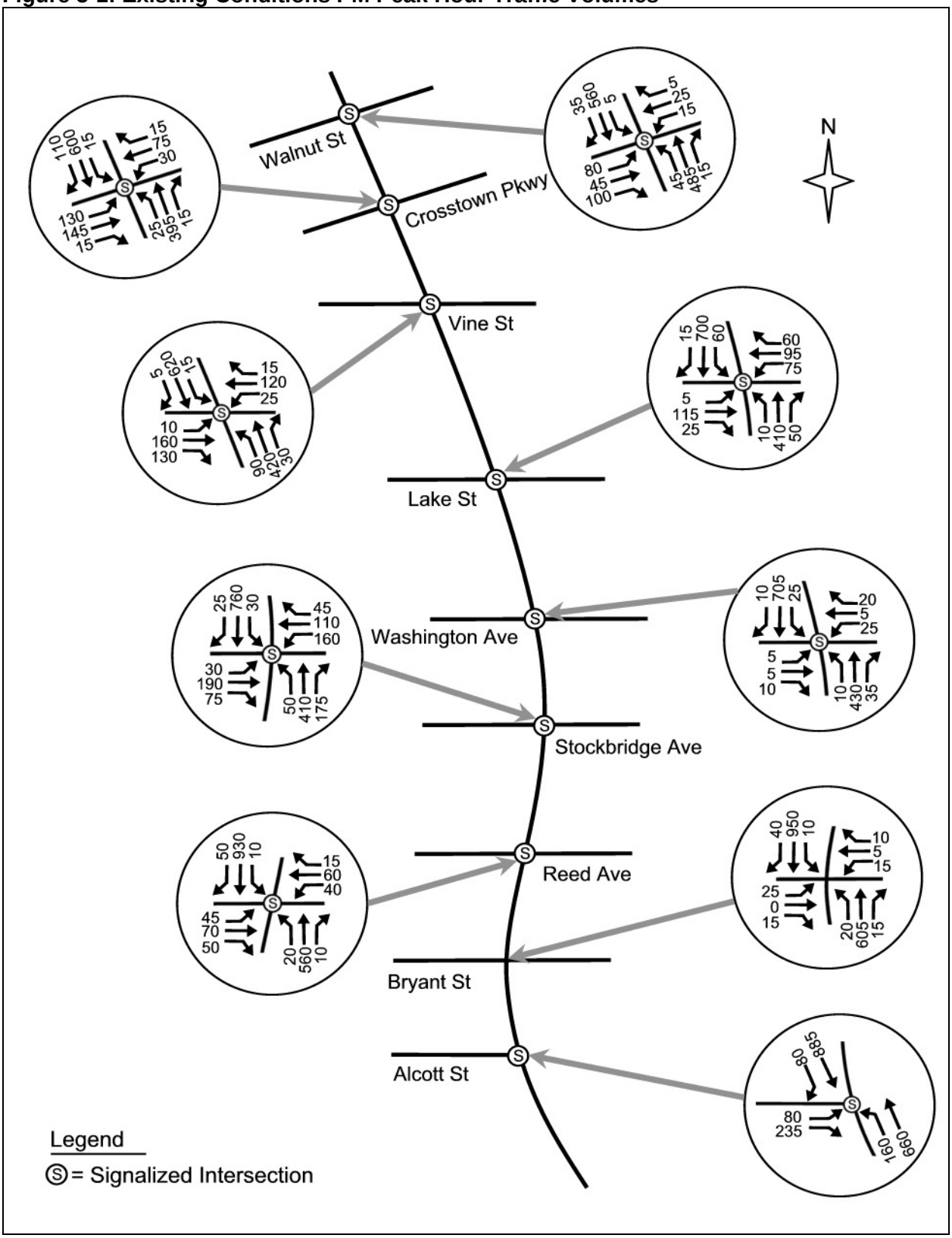


Table 5-3: Existing Conditions Delay and Level of Service Results

Portage Street Intersection	Signalized or Unsignalized	PM Peak Hour	
		Delay (seconds / vehicle)	Level of Service
Walnut Street	Signalized	30.6	C
Crosstown Parkway	Signalized	10.5	B
Vine Street	Signalized	11.7	B
Lake Street	Signalized	9.2	A
Washington Avenue	Signalized	11.1	B
Stockbridge Avenue	Signalized	14.2	B
Reed Avenue	Signalized	17.4	B
Bryant Street	Unsignalized	*51.7	F
Alcott Street	Signalized	14.1	B

*Delay is shown for stop-controlled side-street only

In the PM peak hour, all of the signalized study intersections operate at an acceptable level of service (LOS D or better). All of the signalized intersection approaches also operate at acceptable levels of service during the PM peak hour. The Bryant Street approach at the Bryant Street and Portage Street intersection is the only intersection reporting a failing level of service (level of service E or F). This intersection is unsignalized with stop-control for the Bryant Street approach; therefore, Bryant Street vehicles must wait for Portage Street vehicles to clear before they complete their movement. Portage Street traffic operates freely and experiences almost no delay traveling through the intersection. As stated in Chapter 2 of this report, sight distance is limited at this intersection due to a tight curve, narrow lanes along Portage Street, and buildings located close to the roadway. Vehicle and pedestrian volumes, as well as the crash history, do not warrant a traffic signal at this location currently.

The pedestrian clearance intervals at each of the signalized study intersections were also checked to verify there was enough time provided for the safe crossing of pedestrians. All of the signalized study intersections were verified as having sufficient pedestrian clearance intervals (see Appendix C).

6.0 FUTURE CONDITIONS

This section describes the purpose of the streetscaping project, the methodology behind the Future Conditions analysis, and the traffic analysis results for the Future Conditions. The Future Conditions analysis was conducted in Synchro 6.0 to identify potential negative impacts to the traffic network with the streetscaping plan in place.

6.1 Project Purpose

The purpose of the Portage Street streetscaping project is to reclaim the substandard parking lane along the northbound and southbound outside travel lanes of Portage Street and convert this area to additional curb lawn for landscaping and additional sidewalk width to enhance the pedestrian realm of the corridor and also provide a more consistent travel-lane width. The goal is to produce a visually memorable gateway corridor into the City of Kalamazoo that services both motorized and non-motorized modes of travel effectively and safely, while specifically promoting and encouraging a pedestrian friendly corridor.

The streetscaping project intends to maintain the existing lane configuration along Portage Street and the intersecting roadways within the study area once the project is completed. Currently, the lane widths along Portage Street within the study area vary from 9-feet to 18-feet, and on-street parking is currently available along both sides of Portage Street for many of the blocks within the study corridor. The streetscaping plan proposes setting a standard lane-width of 10.5-feet throughout the study corridor. The 10.5-feet travel lanes allow for the ROW requirements necessary for the enhancement of the pedestrian realm (12-feet from the back of each curb), as well as promote traffic calming along the corridor. It is expected that the new lane-widths will help to reduce traffic speeds, a problem that currently exists, and encourage driver awareness of the corridor, particularly the pedestrian realm. New curb will be constructed at the edge of the 10.5-foot outside travel lanes, and any of the old travel/parking lane area that falls outside of the curbline will be reclaimed as curb lawn and/or pedestrian walkway to enhance the pedestrian realm of the corridor.

The City of Kalamazoo has indicated that due to the large amount of commercial vehicles traveling the corridor, they would prefer to have 11-foot lanes where possible. In order to still meet the ROW requirements necessary to make improvements to the pedestrian realm and effectively service vehicle flow along the corridor, it is recommended that where the pedestrian realm exceeds 12-feet, the lane-widths of Portage Street should be 11-feet. In other words, Portage Street should have 11-foot travel lanes wherever a 12-foot minimum pedestrian zone (from back of curb) can be maintained on both sides of the roadway.

Based on the lane-width survey conducted by the City of Kalamazoo (see Appendix D), there is currently one block that would have to take from the pedestrian realm in order to meet the proposed 10.5-foot travel lanes. The block is between Bryant Street and Lane Boulevard, and it would require taking two feet from the existing pedestrian realm.

In most cases, due to the substandard parking width, speed of traffic, and frequency of curb cuts along Portage Street, the parking is not highly utilized. The plan to provide parking is to develop some of the existing vacant lots and for the city to acquire property to create regionalized off-street parking lot areas.

6.2 Methodology

To determine a future analysis year, the failure years for three intersections within the Portage Street study corridor were determined. These intersections were selected by the City of Kalamazoo and are listed below:

- Alcott Street at Portage Street
- Stockbridge Street at Portage Street
- Crosstown Street at Portage Street

The failure year was determined as the year when signal optimization or traffic control measures within the existing pavement footprint alone would not keep these intersections from falling to a level of service (LOS) F during the PM peak hour. This provides an estimate of how long the existing roadway can last before major roadway improvements (widening) are required. Per the City of Kalamazoo, a two-percent growth per year was utilized to predict future traffic volumes along the study corridor.

The analysis for the failure years of the three study intersections was conducted in Synchro 6.0. Improvements that could be performed within the existing pavement footprint, such as signal optimization, revised signal phasing, and laneage changes, were utilized to maximize the amount of time before the study intersections reached a LOS F. The analysis results are provided in Table 6-1.

Table 6-1: Failure Year Analysis Results

Intersection	Years Until Failure	Calendar Year
Alcott/Portage	26	2030
Stockbridge/Portage	20	2024
Crosstown/Portage	40	2044

Based on the analysis of failure years, the study team selected 2024 as the Future Conditions analysis year. The Future Conditions analysis was conducted by modeling the expected Year-2024 traffic volumes in Synchro 6.0 for the PM peak hour at all study intersections.

6.3 Future Traffic Conditions

2024 PM peak hour control delay and levels of service were determined for each of the study intersections. Figure 6-1 on the next page illustrates the forecasted 2024 traffic volumes along the Portage Street study corridor used in the Future Conditions analysis. Again, the future volumes were determined by applying a two-percent per year traffic growth for 20 years (2004-2024).

Table 6-2 summarizes the projected Project Conditions delay and levels of service (LOS) for the nine study intersections. Appendix E within this report contains the Future Conditions analysis output.

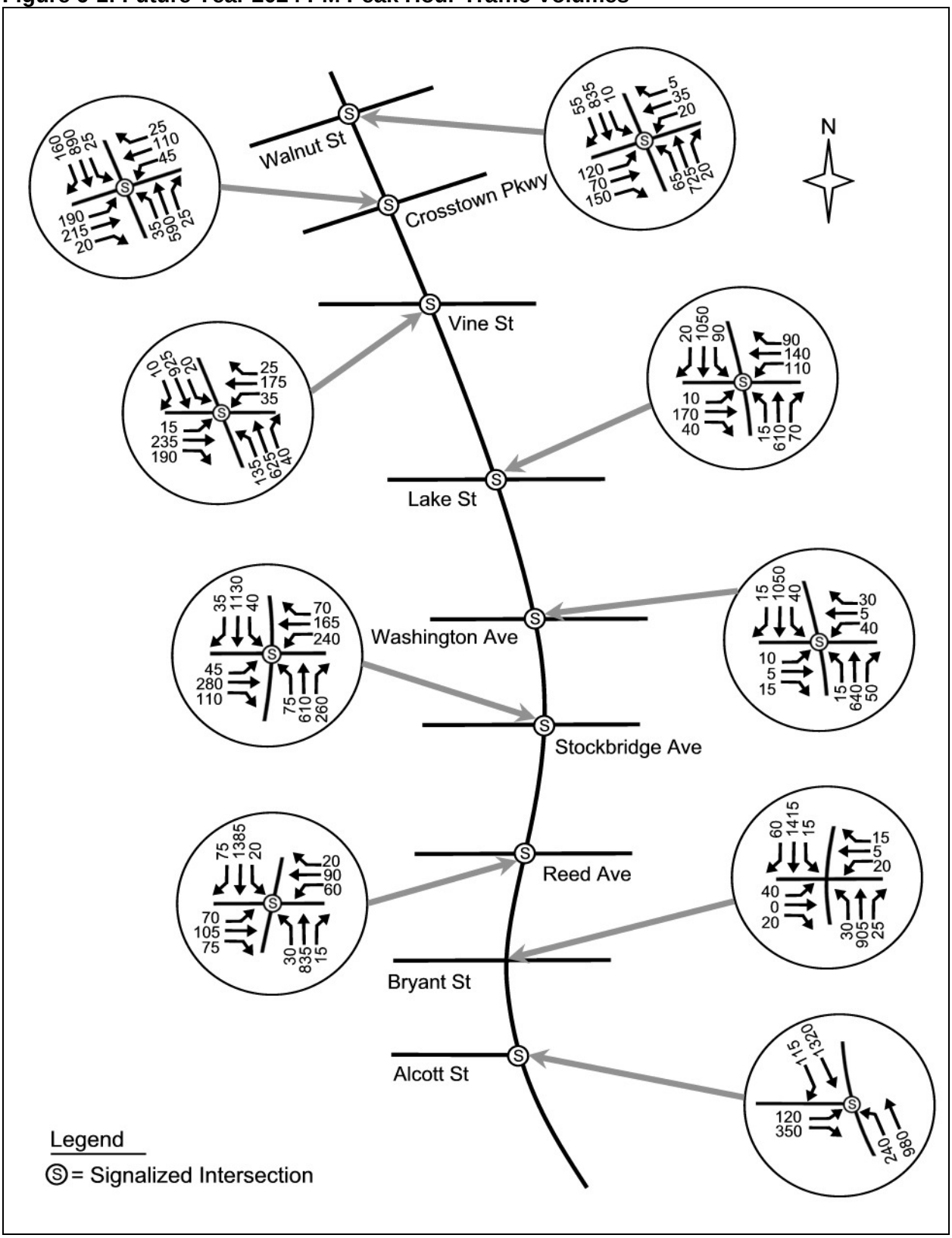
Table 6-2: Future Conditions (Year-2024) Delay and Level of Service Results

Portage Street Intersection	Signalized or Unsignalized	PM Peak Hour	
		Delay (seconds / vehicle)	Level of Service
Walnut Street	Signalized	72.9	**E**
Crosstown Parkway	Signalized	15.1	B
Vine Street	Signalized	59.2	**E**
Lake Street	Signalized	23.0	C
Washington Avenue	Signalized	21.4	C
Stockbridge Avenue	Signalized	90.6	**F**
Reed Avenue	Signalized	61.0	**E**
Bryant Street	*Unsignalized	Exceeds 100	**F**
Alcott Street	Signalized	52.6	D

*Delay is shown for controlled side-street only

Under the Future Conditions in the PM peak hour, several of the study intersections are expected to operate at unacceptable levels of service (LOS E and F). These poor levels of

Figure 6-1: Future Year 2024 PM Peak Hour Traffic Volumes



service are largely attributable to the existing signal timing plans. Currently, there are several different cycle lengths being run at the various intersections during the same time periods. The different cycle lengths make it impossible for consistent progression through the study corridor.

6.4 Mitigated Future Year-2024 Conditions

In order to obtain acceptable levels of service in 2024, mitigation measures are expected to be required. The first mitigation measure that would apply to all of the signalized study intersections is to optimize the signal timings along the study corridor. The optimized signal timings should all have the same cycle length so that progression along Portage Street can be achieved. Progressing Portage Street through signal timing adjustments is expected to significantly increase the capacity of the study corridor.

The only other mitigation expected to be required is at the intersection of Stockbridge Avenue and Portage Street. The poor level of service expected at this intersection is caused by a large northbound right-turn volume reducing the through capacity of the northbound Portage Street approach, as well as a projected large westbound left-turn volume queuing and reducing the through capacity of the westbound Stockbridge Avenue approach. It is recommended that a 75-foot northbound Portage Street right-turn pocket as well as a lagging permitted-protected left-turn signal phase for the westbound Stockbridge Avenue approach be implemented at this intersection. With these mitigation measures in place, the intersection is expected to operate at an acceptable level of service.

Table 6-3 summarizes the projected Mitigated Project Conditions delay and levels of service (LOS) for the nine study intersections. Appendix E within this report contains the Mitigated Future Year-2024 Conditions traffic volume and analysis output.

Table 6-3: Mitigated Future Conditions (Year-2024) Delay and Level of Service Results

Portage Street Intersection	Signalized or Unsignalized	PM Peak Hour	
		Delay (seconds / vehicle)	Level of Service
Walnut Street	Signalized	44.2	D
Crosstown Parkway	Signalized	11.2	B
Vine Street	Signalized	15.2	B
Lake Street	Signalized	29.0	C
Washington Avenue	Signalized	6.8	A
Stockbridge Avenue	Signalized	49.5	D
Reed Avenue	Signalized	29.4	C
Bryant Street	*Unsignalized	Exceeds 100	F
Alcott Street	Signalized	44.9	D

*Delay is shown for controlled side-street only

As shown in Table 6-3, all of the study intersections are expected to operate at acceptable levels of service (LOS A-D), with the exception of the intersection of Bryant Street at Portage Street. This intersection is stop-controlled on the minor street (Bryant Street). The poor level of service results from left-turn vehicles on the Bryant Street approaches not finding regularly occurring gaps in the Portage Street traffic stream to complete their maneuvers. Since Bryant Street is a largely residential street, the motorists using this street are expected to be familiar with the neighborhood street network and know that if they are going to make a left-turn from Bryant Street, they should expect potentially significant delay.

As stated in Chapter 2 of this report, sight distance is limited at this intersection due to a tight curve and buildings located close to the roadway. **Traffic and pedestrian volumes, as well as the crash history, do not justify the installation of a traffic signal at this location. No pedestrian crossings should be provided at this location due to the sight distance limitations.** Since the expected left-turn volumes from Bryant Street are relatively low, it is recommended that no change be made to the control or striping of the intersection at this time. Pedestrians can cross at the Alcott Street intersection approximately 400-feet to the south of Bryant Street.

7.0 MAINTENANCE OF TRAFFIC STAGING PLANS AND ANALYSES

According to Gove Associates, the streetscaping project is anticipated to begin construction in approximately two-years (2006). PBM analyzed two possible staging options for the maintenance of traffic (MOT) along Portage Street during the streetscaping construction:

- Option A would involve closure of one travel lane. Three travel lanes (two in one direction and one in the opposing direction) would be maintained. Figure 7-1 illustrates Option A.
- Option B would involve closure of one travel lane. One travel lane would be maintained in each direction with one center left-turn lane. Figure 7-2 illustrates Option B.

Both MOT options were modeled in Synchro 6.0 for the year 2006. Two-years of growth at two-percent per year was applied to the existing traffic volumes. The PM peak hour comparative measures of effectiveness (MOE) results of the two alternatives are shown in Table 7-1. It should be noted that for Option A, only the worst-case scenario is shown for the PM peak hour, i.e. one travel lane southbound with two travel lanes northbound. The Synchro models utilized the existing signal timings.

Figure 7-1: Maintenance of Traffic - Option A

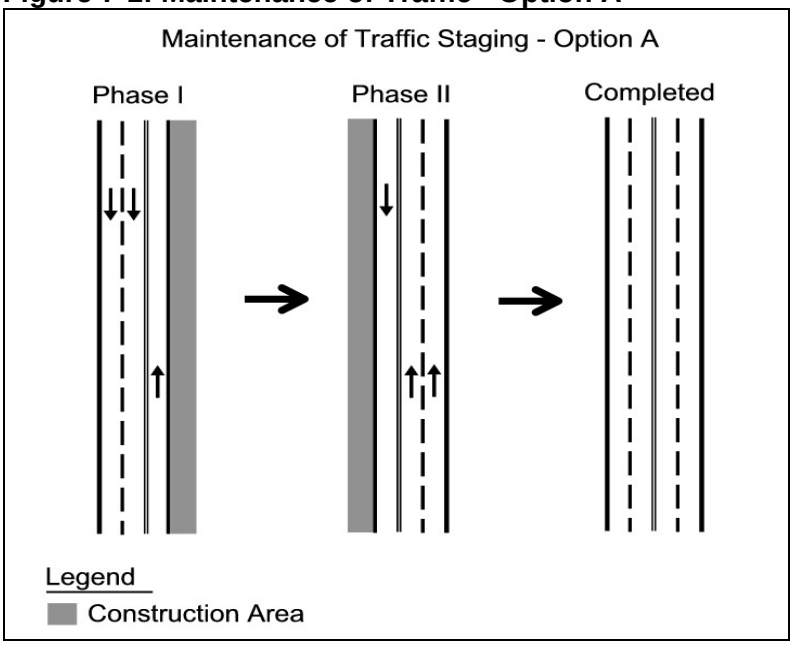


Figure 7-2: Maintenance of Traffic - Option B

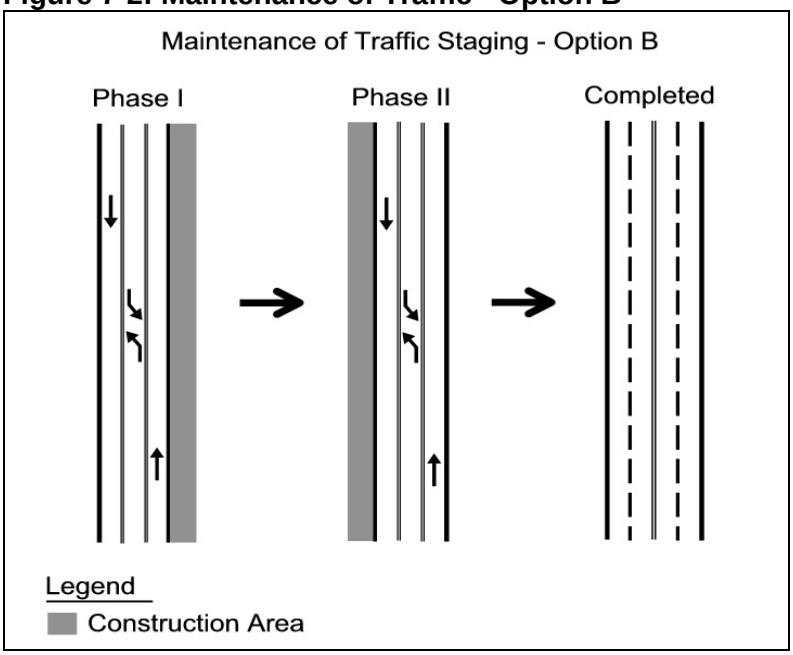


Table 7-1: MOT Options A and B MOE Results

Measures of Effectiveness	Portage Street PM Peak Hour	
	Southbound	
	Option A	Option B
Total Delay (hr)	264	223
Stops (#)	4841	4632
Total Travel Time (hr)	299	258
Fuel Consumed (gal)	253	222
Fuel Economy (mpg)	3.5	4.0

Based on the results shown in the above table, the major movement southbound out of the city is expected to experience more delay in Option A than Option B for the PM peak hour. Another drawback of Option A is the potential for large queues to form behind left-turn vehicles in the direction where only one travel lane is maintained. Because of the close proximity of the intersections within the study corridor, the likelihood of these long queues forming and spilling back through adjacent intersections in Option A is high. These queues also pose a potential safety risk as motorists would be making unexpected stops to wait for the queues to disperse or for a left-turn vehicle to clear. This could potentially increase the number of rear-end crashes in the study corridor during the construction process.

PBM recommends **Option B** for the MOT staging of the Portage Streetscape Project because left-turn vehicles can be stored in the center left-turn lane while vehicle flow is maintained in the outside travel lanes for all phases of construction.

There are currently several different traffic signal cycle lengths running within the study corridor. The different cycle lengths do not allow for true progression along Portage Street within the study area. It is recommended that the signals within the study area be retimed with a common cycle length so that progression can be achieved. This would also increase the capacity of

Portage Street within the study area. If the signals were retimed to a common cycle length before construction on the streetscaping project began, it is expected that there would be approximately a 45-percent reduction in overall delay during the construction period. Table 7-2 illustrates the benefits of a signal optimization effort on the recommended MOT Option B. Table 7-3 illustrates the levels of service expected for the study intersections with the MOT Option B in place (with existing signal timings and optimized signal timings).

Table 7-2: MOT Option B MOE Results for Existing and Optimized Signal Timings

Measures of Effectiveness	Portage Street PM Peak Hour					
	Northbound		Southbound		Total	
	Option B Existing	Option B Optimized	Option B Existing	Option B Optimized	Option B Existing	Option B Optimized
Total Delay (hr)	68	41	223	121	291	162
Stops (#)	3366	2501	4632	3294	7998	5795
Total Travel Time (hr)	93	65	258	156	351	222
Fuel Consumed (gal)	92	69	222	143	314	211
Fuel Economy (mpg)	6.9	9.3	4.0	6.3	4.9	7.2

Table 7-3: MOT Option B Delay and Level of Service Results by Intersection

Portage Street Intersection	Portage Street PM Peak Hour			
	Option B Existing		Option B Optimized	
	Delay (s)	LOS	Delay (s)	LOS
Walnut Street	142.3	F	116.5	F
Crosstown Parkway	26.0	C	13.3	B
Vine Street	36.9	D	13.1	B
Lake Street	14.2	B	17.2	B
Washington Avenue	62.5	E	12.3	B
Stockbridge Avenue	61.4	E	31.2	C
Reed Avenue	117.1	F	59.4	E
Bryant Street	Exceeds 500	F	Exceeds 500	F
Alcott Street	126.4	F	96.5	F

Appendix F contains the analyses for the Existing and Optimized Option B delay and level of service results.

8.0 CONCLUSIONS AND RECOMMENDATIONS

The following recaps the conclusions and recommendations made within this report:

Existing Operations

- There are currently several different traffic signal cycle lengths running within the study corridor. The different cycle lengths do not allow for true progression along Portage Street within the study area. It is strongly recommended that the signals within the study area be retimed with a common cycle length so that progression can be achieved. This would also increase the capacity of Portage Street within the study area.

- The City has indicated that several of the traffic signal controllers along the study corridor are old and showing symptoms of "dial creep." As a result, the traffic controllers can not reliably maintain a timing plan. It is recommended that the controllers identified by the City as showing signs of "dial creep" be replaced with updated traffic signal controllers. In addition to these controller upgrades, the City may want to consider installing vehicle and pedestrian detection on the side streets with the new controllers. Detection would eliminate side street signal phases when there are no vehicles or pedestrians present on the side street and serve to increase the capacity of Portage Street by minimizing the disruption to the Portage Street through traffic.

- The existing pedestrian clearance times at the signalized intersections are sufficient.

- Traffic and pedestrian volumes, as well as the crash history, do not justify the installation of a traffic signal at the intersection of Bryant Street and Portage Street. No pedestrian crossings should be provided at this location due to the sight distance limitations. Pedestrians should cross at the Alcott Street traffic signal located approximately 400-feet south of Bryant Street.

Existing Safety

- It is recommended that all crosswalks are repainted so they are visible to both pedestrians and vehicular traffic. Crosswalk markings with diagonal or longitudinal lines will assist in increasing the visibility of pedestrians to motorists. Paint striping can be used in combination with some other pavement type to further enhance the crosswalk visibility. Downtown Kalamazoo has many areas where brick inlays have been used to mark a crosswalk, which can aid in enhancing driver awareness of the pedestrian crossing. In addition to repainting the crosswalks, advanced pedestrian crossing signs should be installed along the study corridor to enforce awareness in the motorist that they are in a pedestrian-friendly area.

- It is recommended that additional 25 mph speed limit signs should be installed along Portage Street so that vehicles are aware of the 25 mph speed limit. The Michigan Manual of Uniform Traffic Control Devices states that speed limit signs should be located at the points of change from one speed limit to another, or as near there as possible.

- Several intersections within the study area appear to have eight-inch signal lenses. It is recommended that the signal heads be upgraded to 12-inch lenses to improve the visibility of the traffic signal. These locations are as follows:
    - Lake Street at Portage Street
    - Washington Avenue at Portage Street
    - Reed Avenue at Portage Street
    - Alcott Street at Portage Street

- It is recommended that no mid-block pedestrian crossings be provided within the study corridor due to the close proximity of signalized intersections, which provide numerous pedestrian crossings throughout the study corridor.

- It is recommended that the pedestrian signals along the corridor be considered for being upgraded to audible pedestrian signals in an effort to increase safety for visually impaired pedestrians. Consideration would need to be given to the noise impact on the adjacent neighborhoods when identifying locations for these upgrades.

- In order to minimize visual clutter and pedestrian impediments at the intersections, it is recommended that the pedestrian signals be attached to the same poles that support the traffic signals as opposed to mounting on their own separate pedestals. In addition to creating a visually cleaner corridor for both motorists and pedestrians, this would also reduce the number of fixed objects at an intersection that would pose a potential safety hazard if a vehicle were to lose control.

- It is recommended that Americans with Disabilities Act (ADA) approved curb ramps with tactile warning surfaces be constructed for all of the curb cuts along the corridor where pedestrians cross. This is expected to aid in creating a safer pedestrian environment for pedestrians that are visually impaired.

- The addition of Portage Street turn pockets (specifically left-turn pockets) may assist in reducing the crashes along Portage Street at Vine Street, Lake Street, Stockbridge Avenue, and Reed Avenue by removing turning vehicles from the through traffic stream. However, one of the goals of the future streetscaping project is to promote a pedestrian friendly corridor, which means certain ROW requirements are needed in order to provide a safe pedestrian zone (see Section 6.1). Turn pockets should only be provided if pedestrian safety will not be compromised in doing so, i.e. enough of a buffer can be provided between motorists and pedestrians for both to utilize the corridor safely.

- It is recommended that the clearance intervals (yellow and/or all-red times) in the traffic signals at three critical crash locations be increased. Increasing one or both of these intervals may help to reduce the number of angle crashes by providing more time for vehicles to clear the intersection before a conflicting movement is permitted to travel through the intersection. The locations are as follows:
    - Lake Street at Portage Street
    - Stockbridge Avenue at Portage Street
    - Reed Avenue at Portage Street

Future Operations

- With a two-percent growth rate per year, the study intersections are not expected to reach a failing level of service F until 2024 with the project in place. A corridor signal optimization effort as well as the addition of a turn pocket at one study intersection is expected to remedy the failing levels of service in 2024 (see Section 6.4).

- It is recommended that where the pedestrian realm exceeds 12-feet, the lane-widths of Portage Street should be 11-feet. In other words, Portage Street should have 11-foot travel lanes wherever a 12-foot minimum pedestrian zone (from back of curb) can be maintained on both sides of the roadway.

Maintenance of Traffic

- PBM recommends a maintenance of traffic plan where one travel lane would be closed along Portage Street, and one travel lane would be maintained in each direction with one center left-turn lane during the construction of the streetscape project.

Appendix A

Summary of Pedestrian Volumes

PARSONS BRINCKERHOFF COMPUTATION SHEET

Page ____ of ____

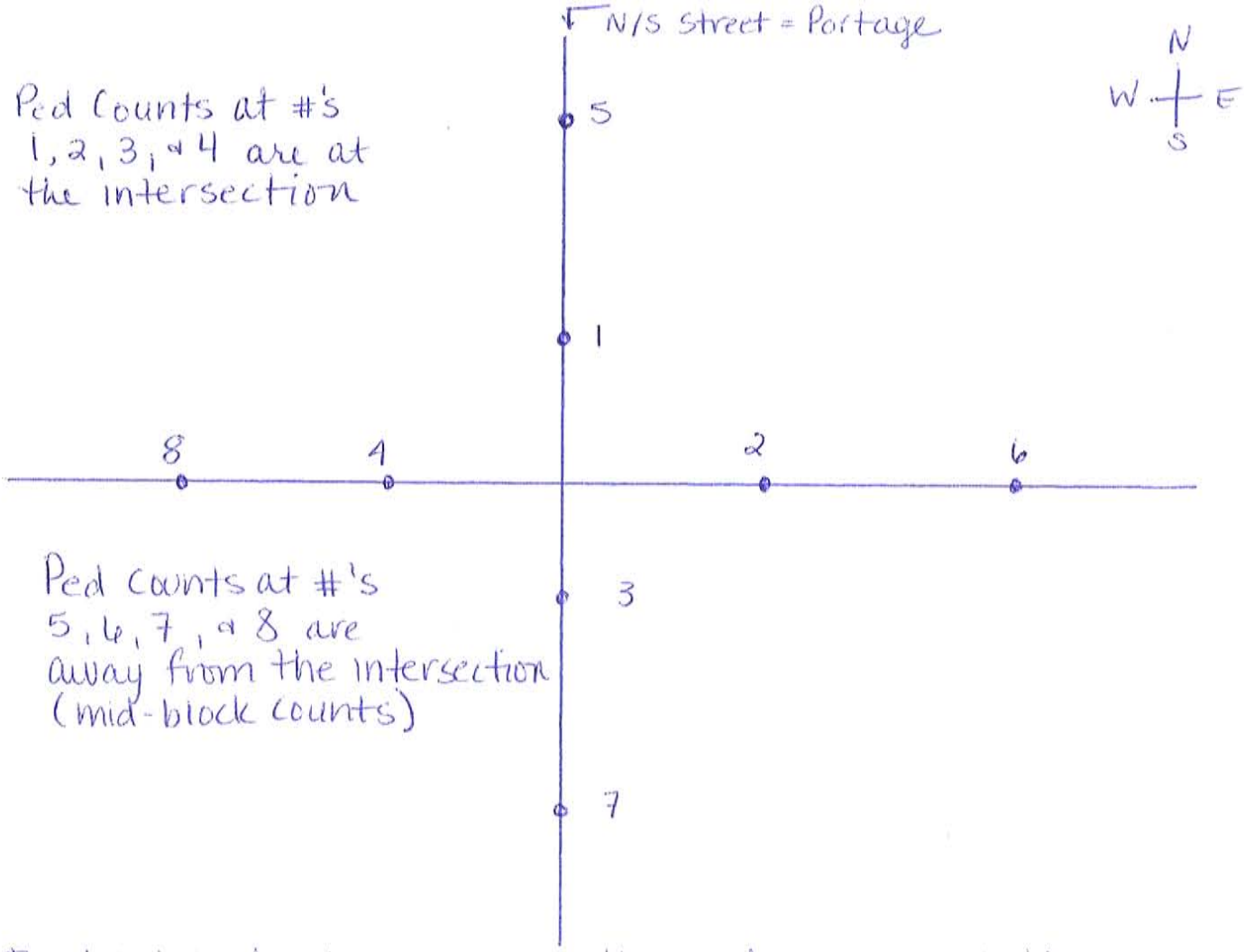
Made by L. Powell

Date 2-3-04

Checked by ____

Date ____

Subject Legend for Pedestrian Volumes



Ped Counts at #'s 1, 2, 3, & 4 are at the intersection

Ped counts at #'s 5, 6, 7, & 8 are away from the intersection (mid-block counts)

The total ped volumes sum the ped counts at the intersection and away from the intersection; therefore, they represent a worse-case scenario.

There are no ped counts for Portage / Vine. For the traffic analysis the ped counts at Portage / Crosstown were used for Portage / Vine due to close proximity of the intersections.

PARSONS BRINCKERHOFF COMPUTATION SHEET

Subject: Portage / Walnut Ped Counts

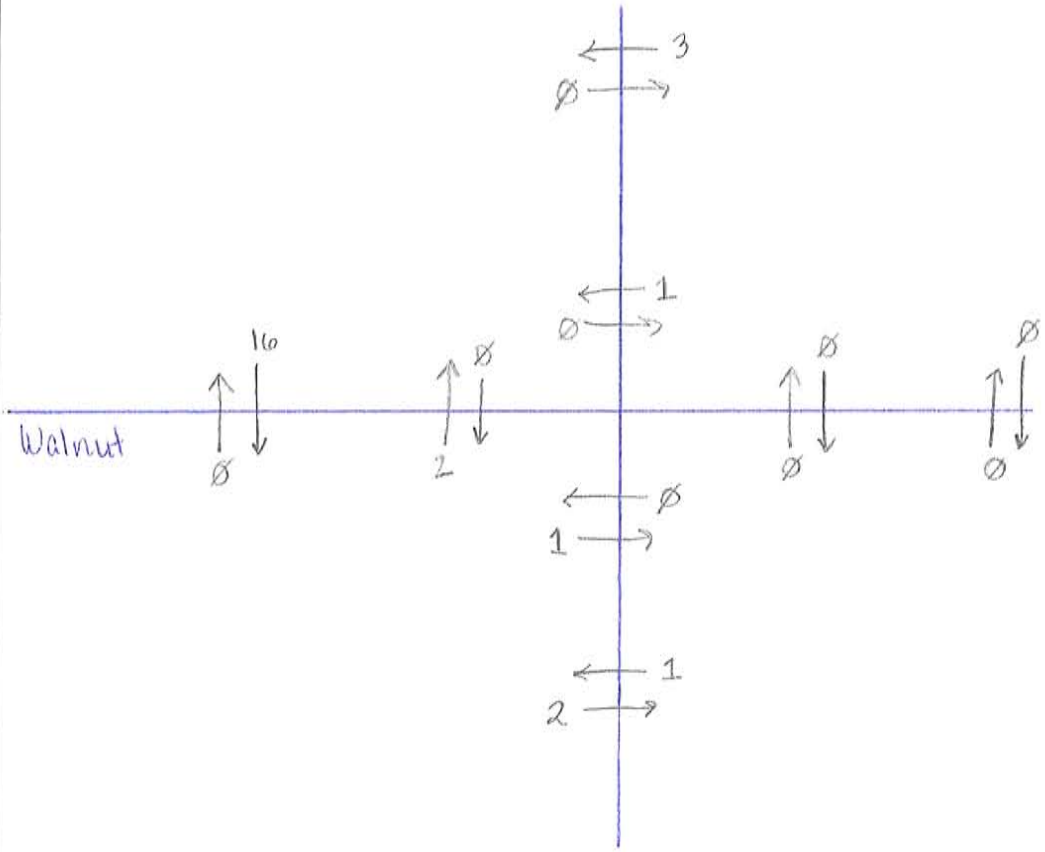
Page ____ of ____

Made by: L. Powell

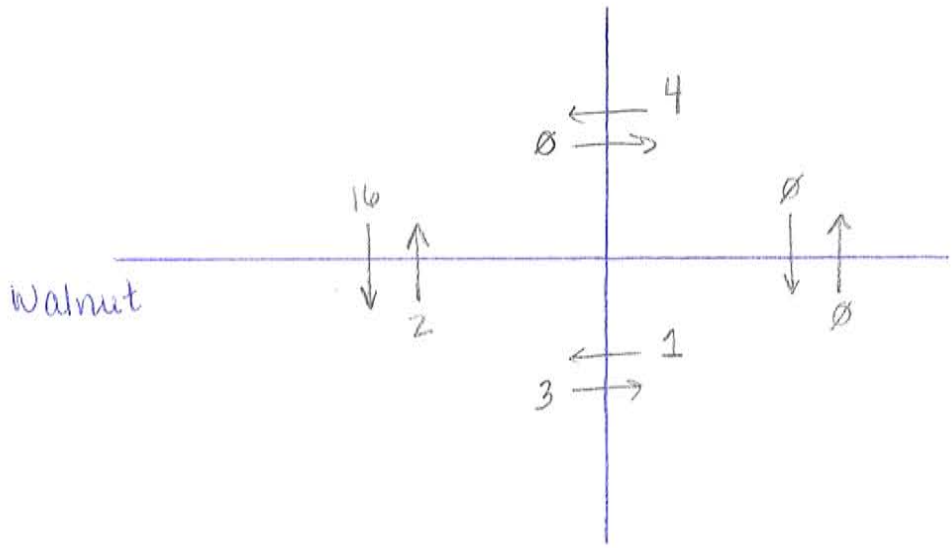
Date: 3-4-04

Checked by: ____

Date: ____



No Ped Counts in PM PK HR (4^{30} - 5^{30} p)
- Used 3^{45} - 4^{45} pm data



Total Ped's
- Worse Case Scenario

PARSONS BRINCKERHOFF COMPUTATION SHEET

Page ____ of ____

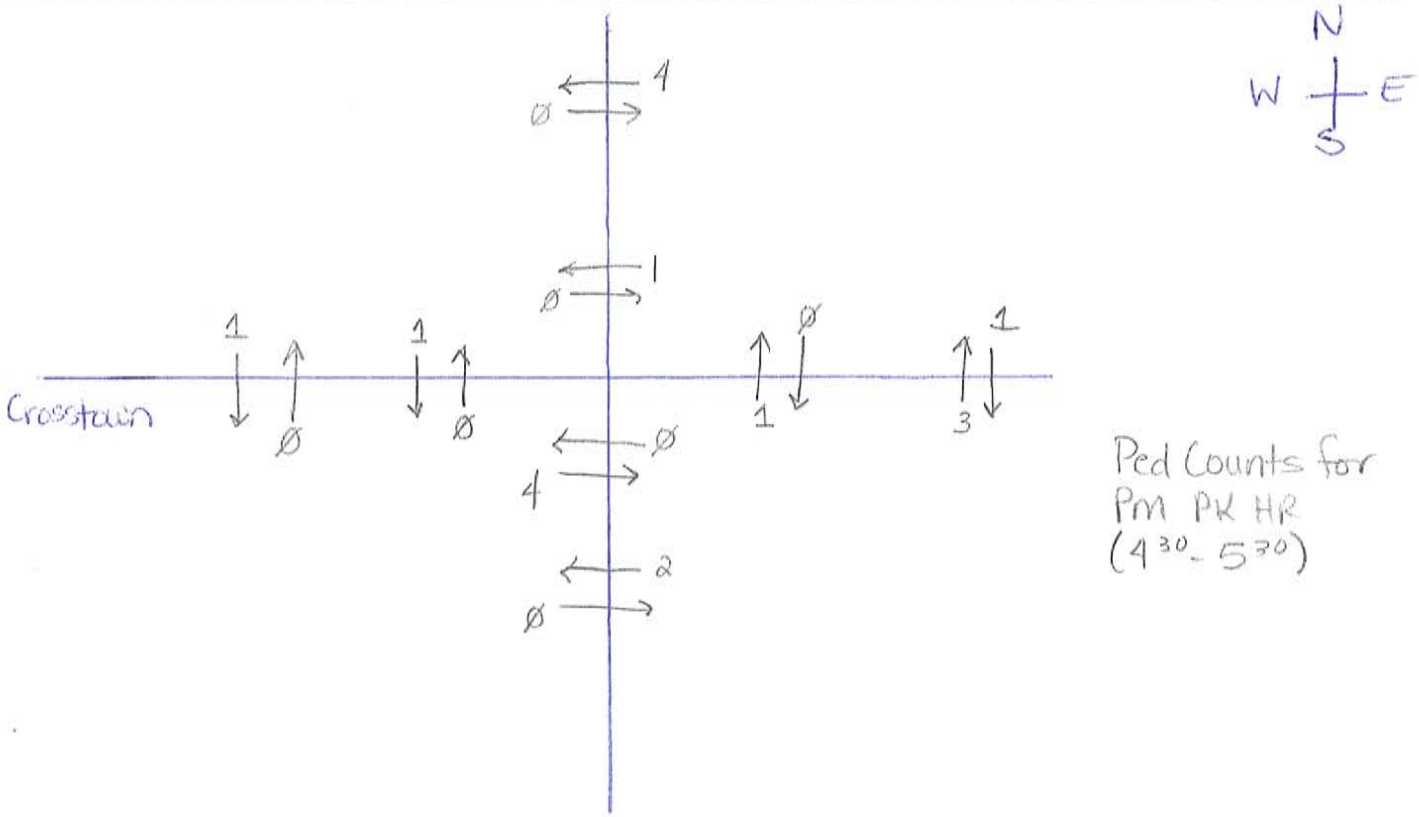
Made by L. Powell

Date 2-3-04

Checked by ____

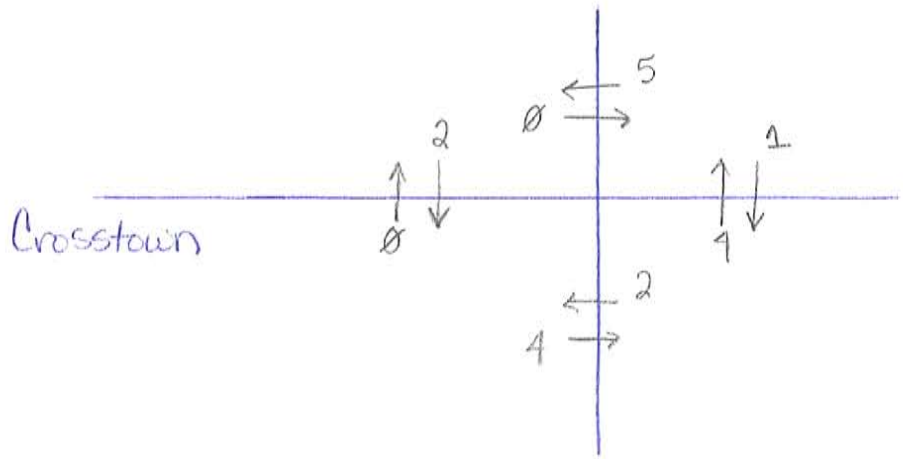
Date ____

Subject Portage / Crosstown Ped Counts



Ped Counts for PM PK HR (4:30 - 5:30)

Total Peds - Worse-Case Scenario



PARSONS BRINCKERHOFF COMPUTATION SHEET

Subject: Portage / Lake Ped Counts

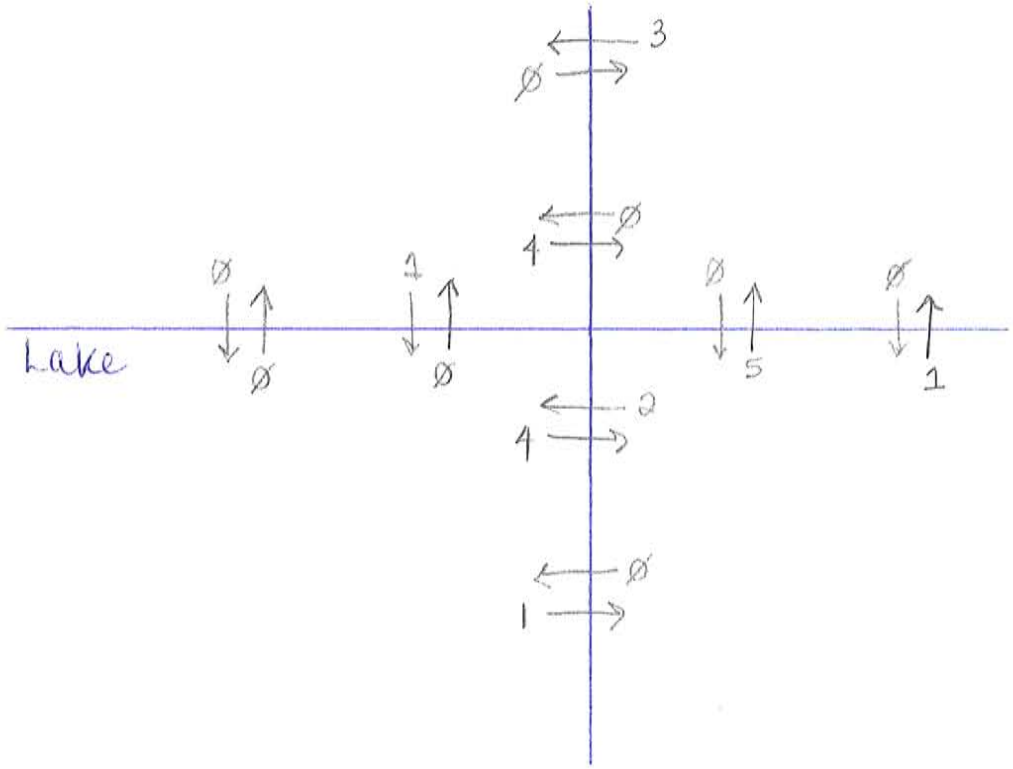
Page ____ of ____

Made by: L. Powell

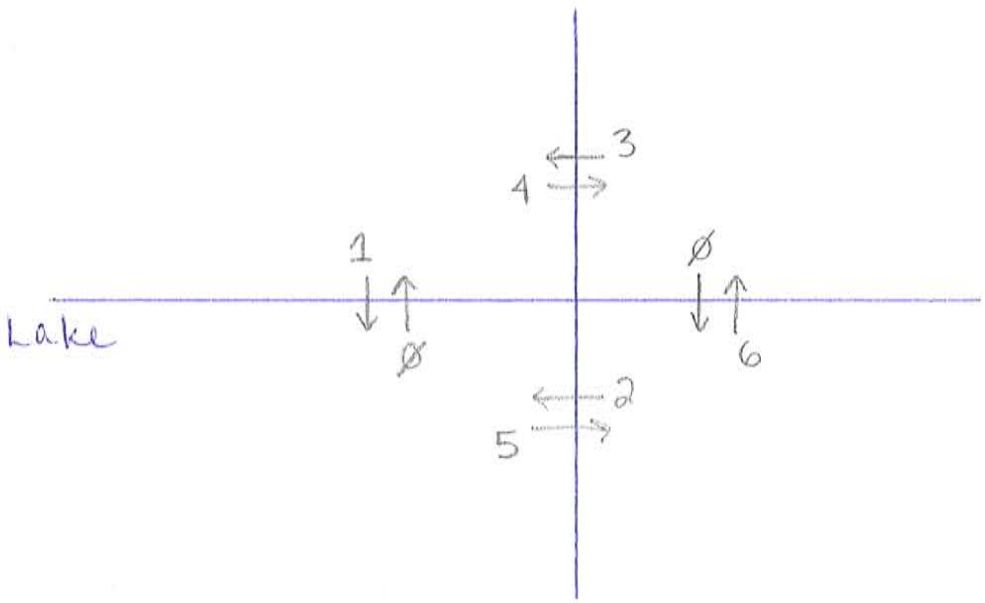
Date: 2-3-04

Checked by: ____

Date: ____



Ped Counts for PM PK HR (4:30 - 5:30)



Total Peds - Worse Case Scenario

PARSONS BRINCKERHOFF COMPUTATION SHEET

Subject: Portage/Washington Ped Counts

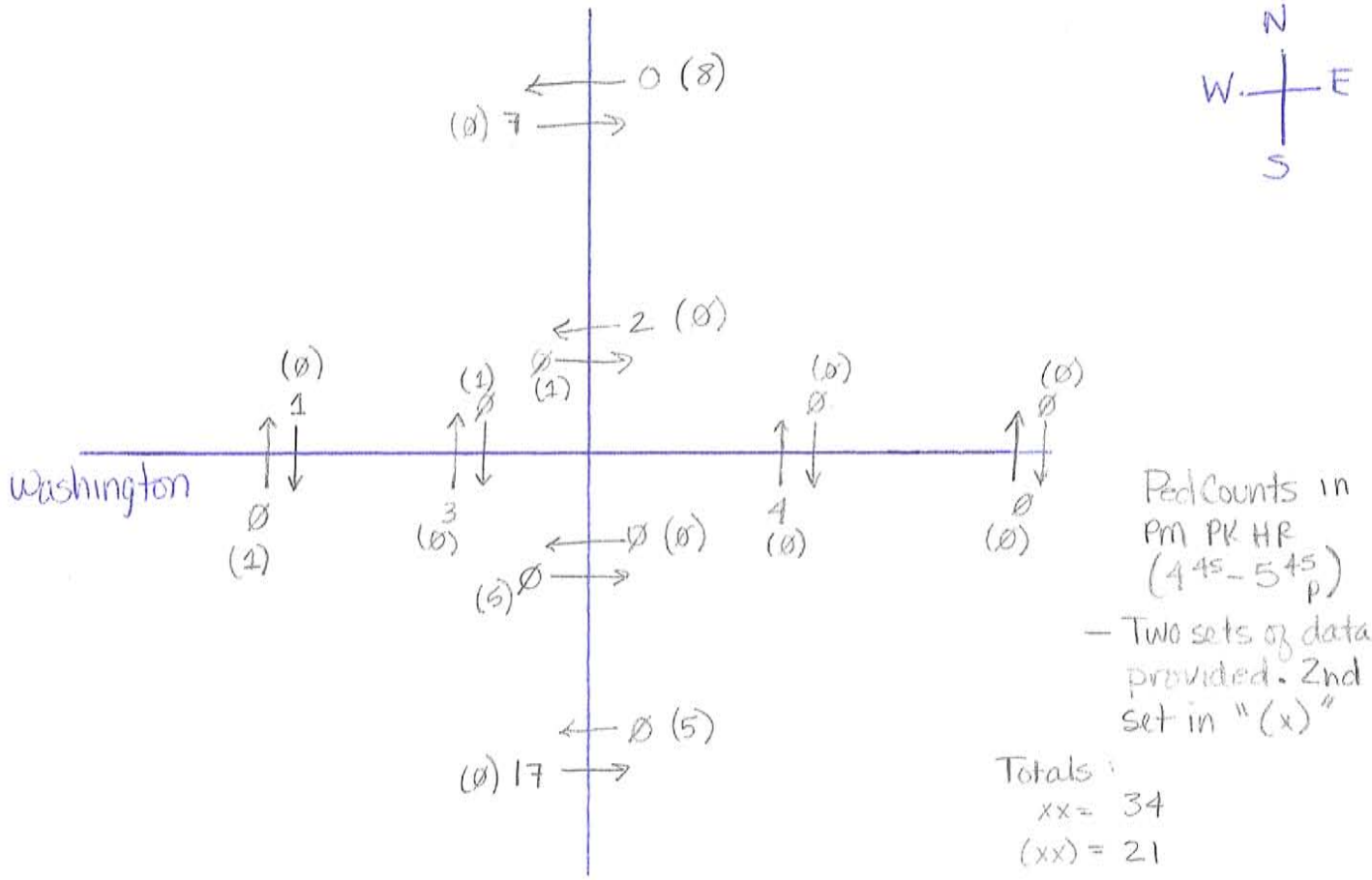
Page ____ of ____

Made by: L. Powell

Date: 2-4-04

Checked by: ____

Date: ____



Ped Counts in PM PK HR (4^{45} - 5^{45} p)

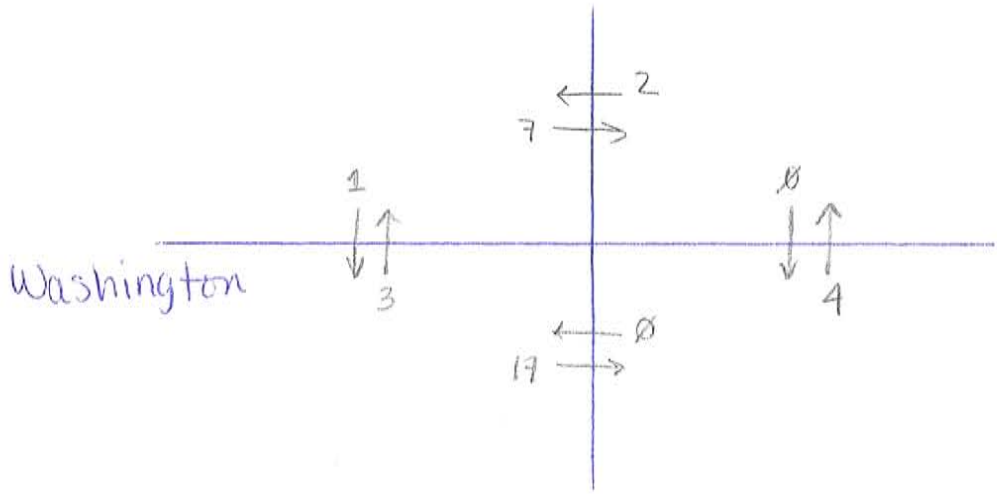
- Two sets of data provided. 2nd set in "(x)"

Totals:

xx = 34

(xx) = 21

Total Peds - Worse Case Scenario



PARSONS BRINCKERHOFF COMPUTATION SHEET

Page ____ of ____

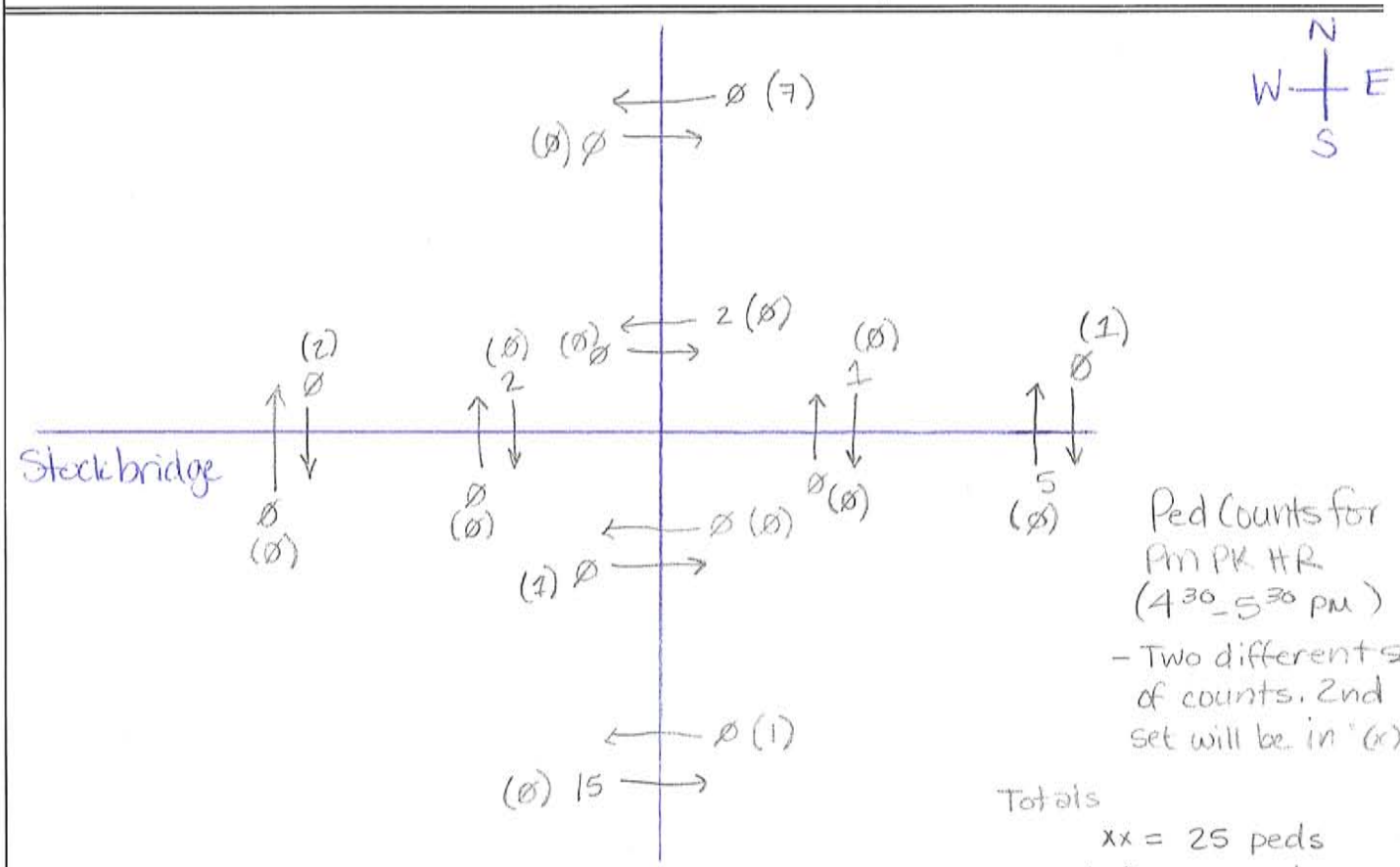
Made by L. Powell

Date 2-3-04

Checked by ____

Date ____

Subject Portage / Stockbridge Ped Counts



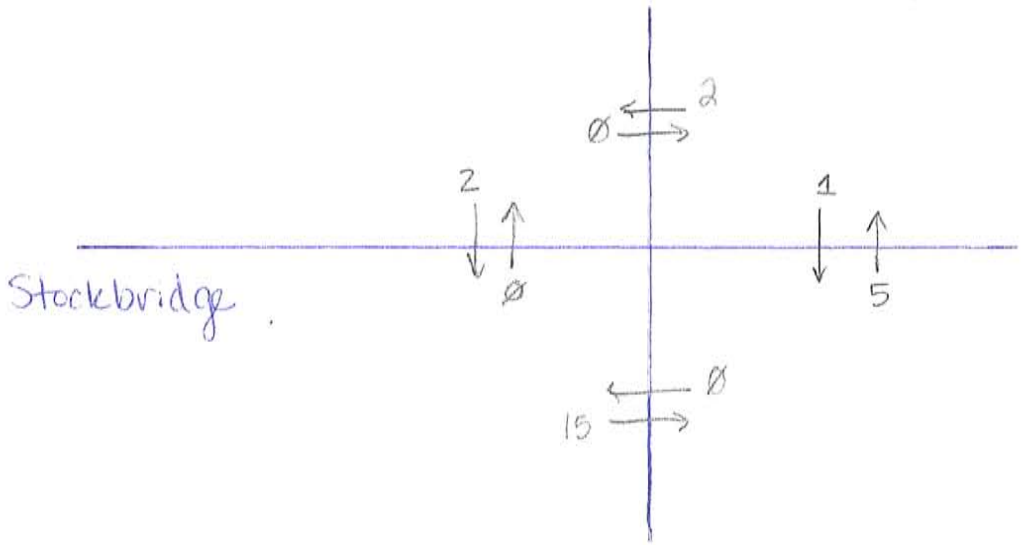
Ped Counts for PM PK HR (4^{30}-5^{30} PM)

- Two different sets of counts. 2nd set will be in "(x)"

Totals

xx = 25 peds

(xx) = 12 peds



Total Peds

- Worse Case Scenario

PARSONS BRINCKERHOFF COMPUTATION SHEET

Subject: Portage / Reed Ped Counts

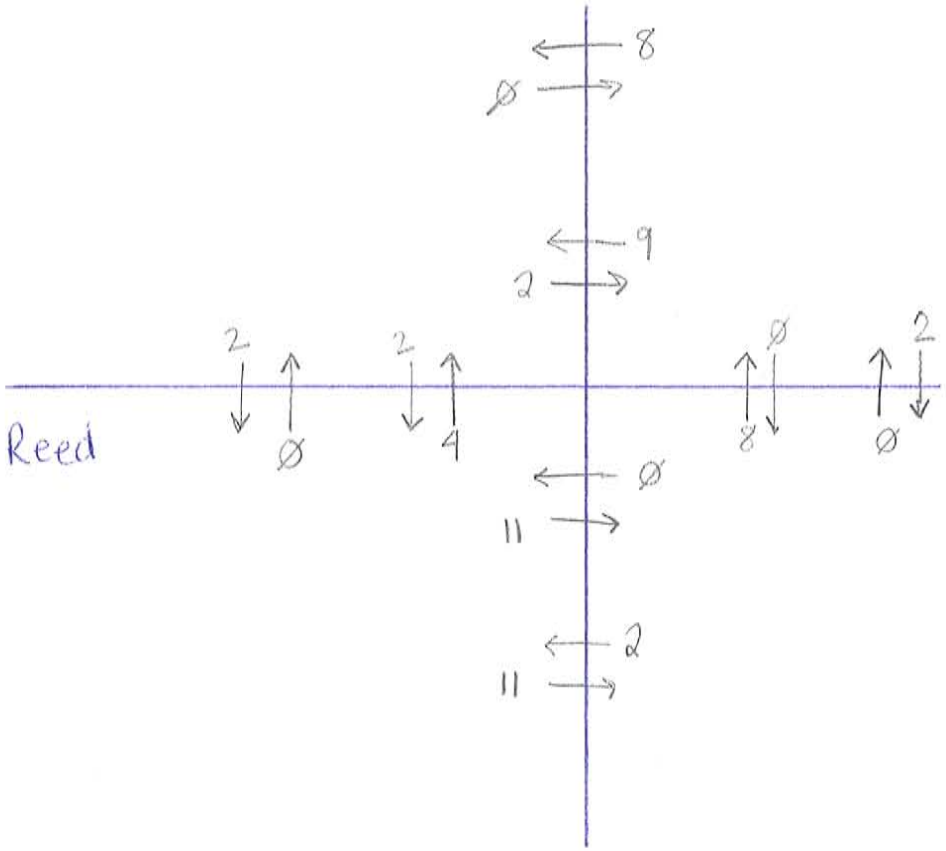
Page ____ of ____

Made by: L. Powell

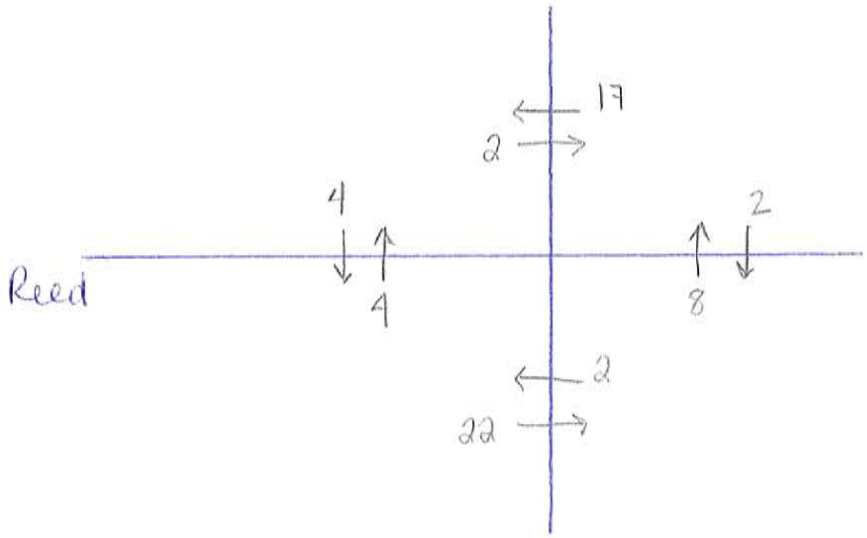
Date: 2-3-04

Checked by: ____

Date: ____



Ped Counts for PM PK HR (4:30 - 5:30)



Total Peds - Worse Case Scenario

PARSONS BRINCKERHOFF COMPUTATION SHEET

Subject: Portage / Bryant Ped Counts

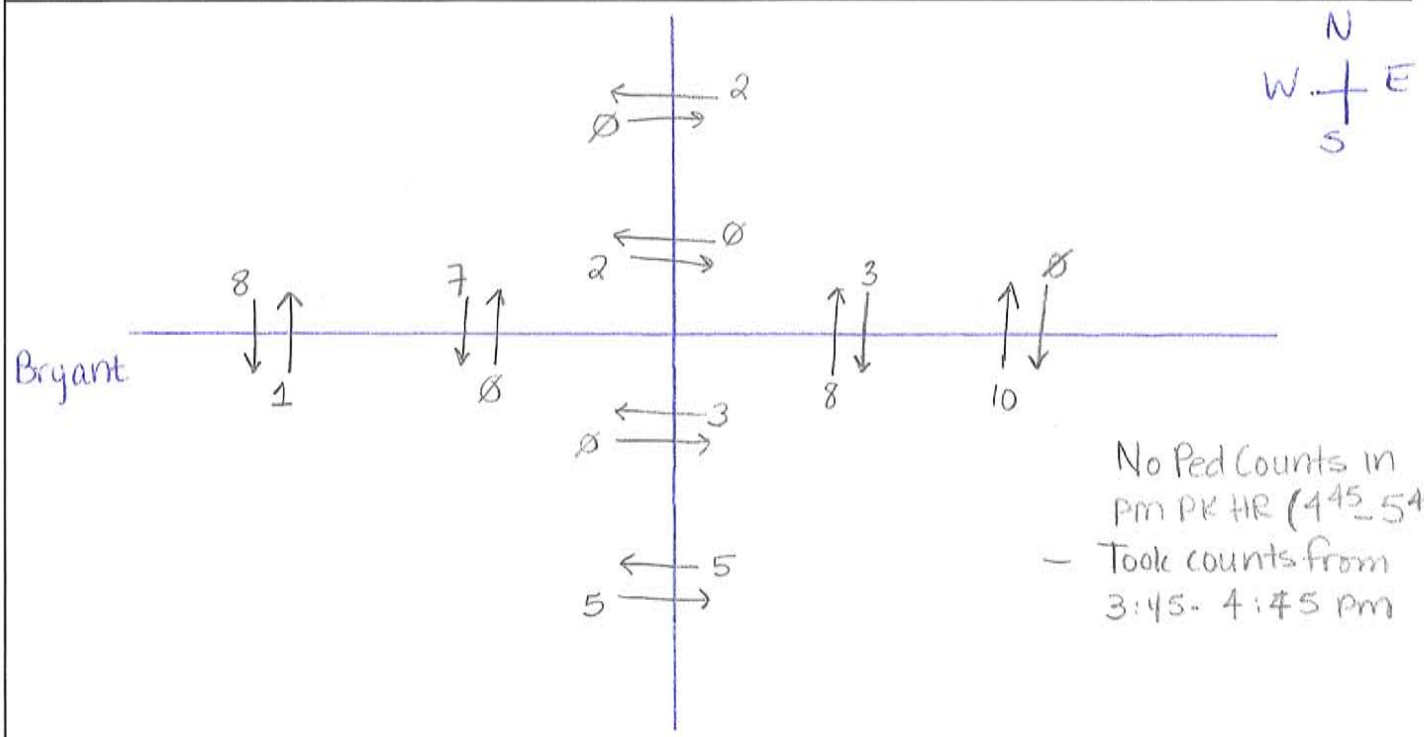
Page ____ of ____

Made by: L. Powell

Date: 2-3-04

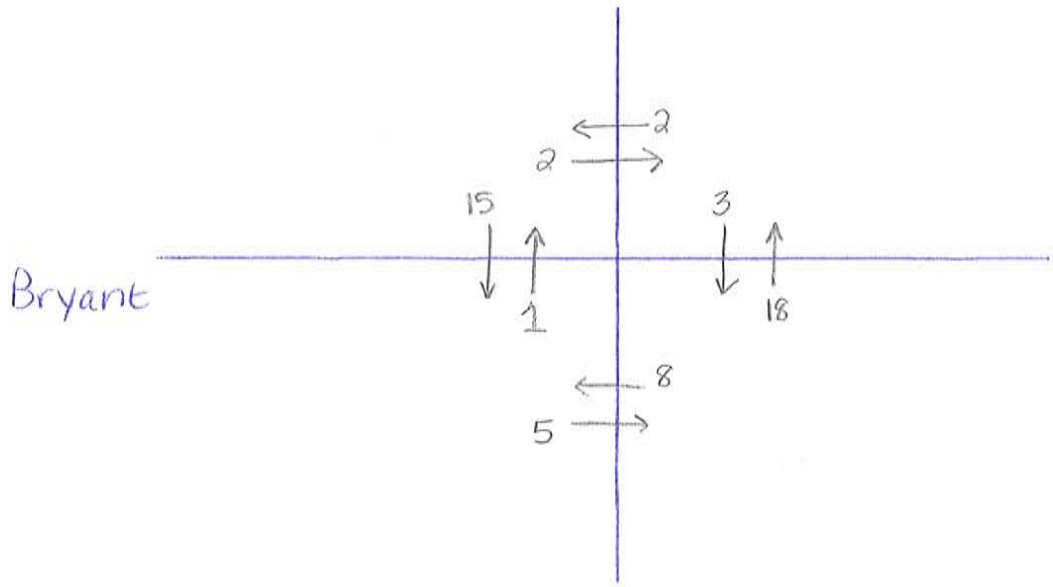
Checked by: ____

Date: ____



No Ped Counts in pm PK HR (4:45-5:45)
- Took counts from 3:45-4:45 pm

Total Peds
- Worse-Case Scenario



PARSONS BRINCKERHOFF COMPUTATION SHEET

Subject: Portage / Alcott Ped Counts

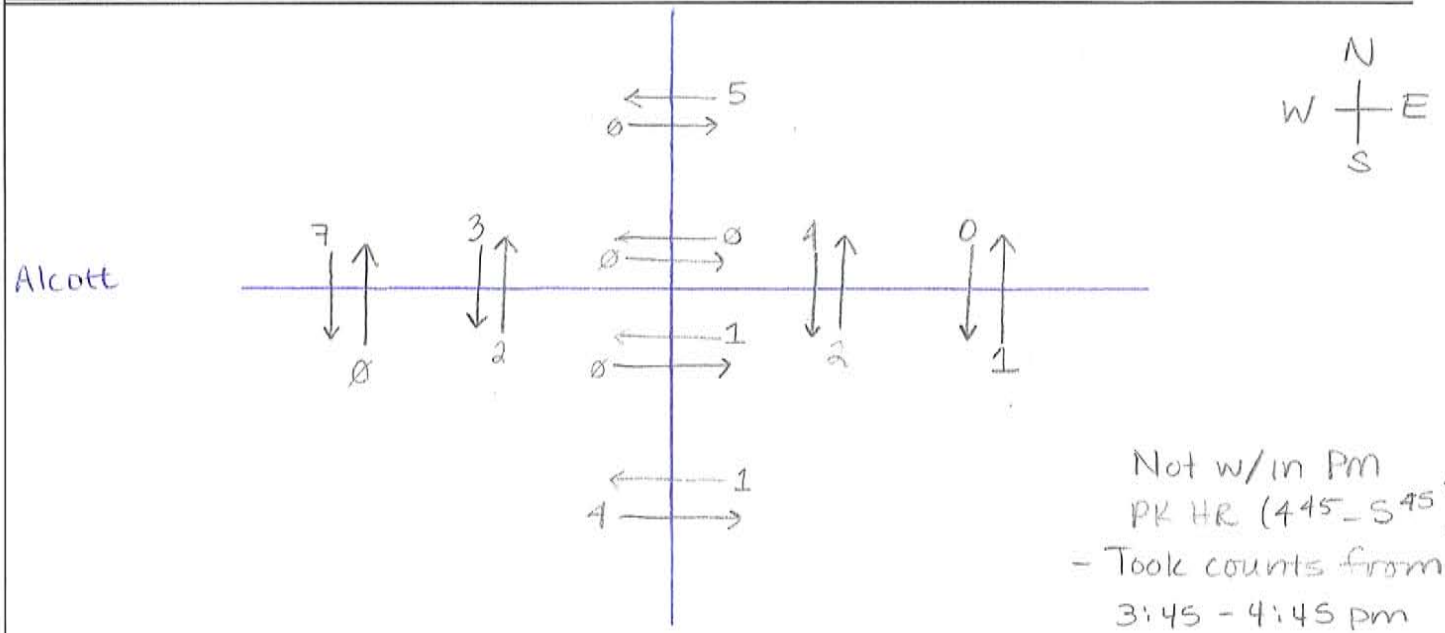
Page ____ of ____

Made by: L. Powell

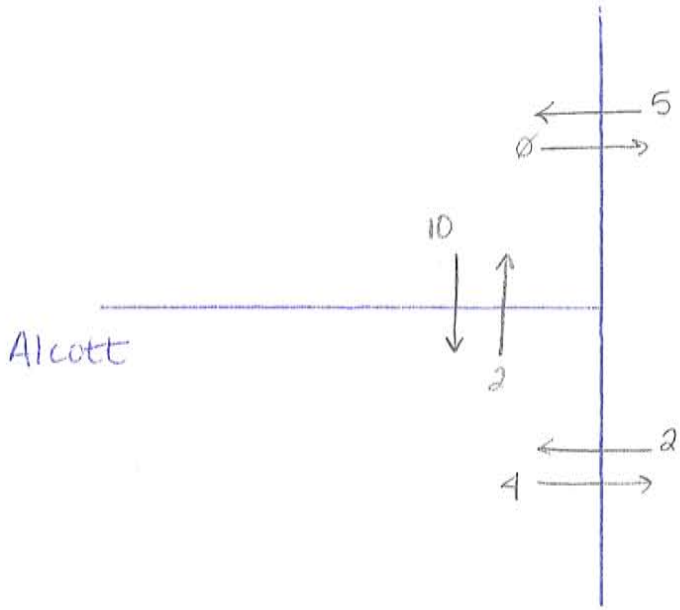
Date: 2-3-04

Checked by: ____

Date: ____



Not w/in PM
PK HR (4^45 - 5^45)
- Took counts from
3:45 - 4:45 pm



Total peds
- Worse Case
Scenario

Appendix B

Existing Conditions Traffic Volume and Analysis Output

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	10	10	10	12	12	12
Total Lost time (s)		4.0	4.0		4.0	4.0		4.0			4.0	
Lane Util. Factor		1.00	1.00		1.00	1.00		0.95			0.95	
Frpb, ped/bikes		1.00	0.98		1.00	0.98		1.00			1.00	
Flpb, ped/bikes		1.00	1.00		1.00	1.00		1.00			1.00	
Frt		1.00	0.85		1.00	0.85		0.99			0.99	
Flt Protected		0.97	1.00		0.98	1.00		1.00			1.00	
Satd. Flow (prot)		1787	1542		1827	1554		2975			3383	
Flt Permitted		0.78	1.00		0.87	1.00		1.00			1.00	
Satd. Flow (perm)		1437	1542		1627	1554		2975			3383	
Volume (vph)	80	47	102	13	24	3	44	486	13	6	560	37
Peak-hour factor, PHF	0.71	0.65	0.67	0.65	0.67	0.38	0.92	0.91	0.54	0.30	0.91	0.77
Adj. Flow (vph)	113	72	152	20	36	8	48	534	24	20	615	48
RTOR Reduction (vph)	0	0	105	0	0	6	0	4	0	0	6	0
Lane Group Flow (vph)	0	185	47	0	56	2	0	602	0	0	677	0
Confl. Peds. (#/hr)	4		4	4		4						
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	5%	5%	5%	5%	5%	5%
Bus Blockages (#/hr)	0	2	2	0	0	0	0	2	2	0	2	2
Parking (#/hr)								4				
Turn Type	Perm		Perm	Perm		Perm	Split			Split		
Protected Phases		4			8		2	2		6	6	
Permitted Phases	4		4	8		8						
Actuated Green, G (s)		19.5	19.5		19.5	19.5		19.5			29.5	
Effective Green, g (s)		21.0	21.0		21.0	21.0		21.0			31.0	
Actuated g/C Ratio		0.25	0.25		0.25	0.25		0.25			0.36	
Clearance Time (s)		5.5	5.5		5.5	5.5		5.5			5.5	
Lane Grp Cap (vph)		355	381		402	384		735			1234	
v/s Ratio Prot								c0.20			c0.20	
v/s Ratio Perm		c0.13	0.03		0.03	0.00						
v/c Ratio		0.52	0.12		0.14	0.01		0.82			0.55	
Uniform Delay, d1		27.7	24.9		25.0	24.1		30.2			21.4	
Progression Factor		1.00	1.00		1.00	1.00		1.00			1.00	
Incremental Delay, d2		5.4	0.7		0.7	0.0		9.9			1.8	
Delay (s)		33.0	25.5		25.7	24.1		40.1			23.2	
Level of Service		C	C		C	C		D			C	
Approach Delay (s)		29.6			25.5			40.1			23.2	
Approach LOS		C			C			D			C	

Intersection Summary

HCM Average Control Delay	30.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	85.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	55.5%	ICU Level of Service	B
Analysis Period (min)	15		

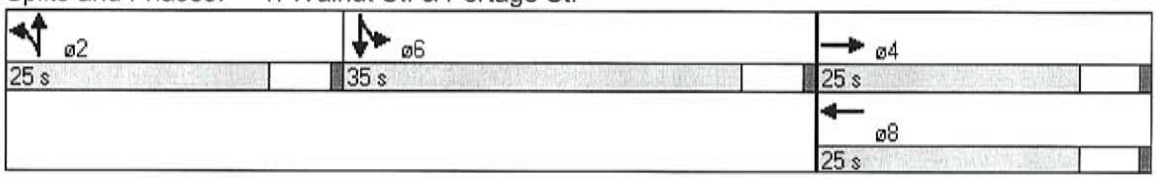
c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBT	SBT
Lane Configurations								
Volume (vph)	80	47	102	13	24	3	486	560
Turn Type	Perm		Perm	Perm		Perm		
Protected Phases		4			8		2	6
Permitted Phases	4		4	8		8		
Detector Phases	4	4	4	8	8	8	2	6
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	21.5	21.5	21.5	21.5	21.5	21.5	21.5	21.5
Total Split (s)	25.0	25.0	25.0	25.0	25.0	25.0	25.0	35.0
Total Split (%)	29.4%	29.4%	29.4%	29.4%	29.4%	29.4%	29.4%	41.2%
Yellow Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lead/Lag								
Lead-Lag Optimize?								
Recall Mode	Max	Max	Max	Max	Max	Max	Max	Max
Act Effct Green (s)		21.0	21.0		21.0	21.0	21.0	31.0
Actuated g/C Ratio		0.25	0.25		0.25	0.25	0.25	0.36
v/c Ratio		0.52	0.31		0.14	0.02	0.82	0.55
Control Delay		33.8	7.9		26.2	14.3	40.7	23.2
Queue Delay		0.0	0.0		0.0	0.0	0.0	0.0
Total Delay		33.8	7.9		26.2	14.3	40.7	23.2
LOS		C	A		C	B	D	C
Approach Delay		22.1			24.7		40.7	23.2
Approach LOS		C			C		D	C

Intersection Summary

Cycle Length: 85
Actuated Cycle Length: 85
Offset: 28 (33%), Referenced to phase 2:NBTL, Start of Green
Natural Cycle: 65
Control Type: Pretimed
Maximum v/c Ratio: 0.82
Intersection Signal Delay: 29.3 Intersection LOS: C
Intersection Capacity Utilization 55.5% ICU Level of Service B
Analysis Period (min) 15

Splits and Phases: 1: Walnut St. & Portage St.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	10	10	10	11	11	11
Total Lost time (s)	4.0	4.0		4.0	4.0			4.0			4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			0.95			0.95	
Frpb, ped/bikes	1.00	1.00		1.00	1.00			1.00			1.00	
Flpb, ped/bikes	1.00	1.00		0.99	1.00			1.00			1.00	
Frt	1.00	0.98		1.00	0.97			0.99			0.98	
Flt Protected	0.95	1.00		0.95	1.00			1.00			1.00	
Satd. Flow (prot)	1761	1830		1761	1804			2967			3229	
Flt Permitted	0.67	1.00		0.62	1.00			0.88			0.94	
Satd. Flow (perm)	1251	1830		1146	1804			2605			3040	
Volume (vph)	128	144	15	29	74	16	24	394	16	17	597	108
Peak-hour factor, PHF	0.80	0.84	0.75	0.60	0.71	0.67	0.75	0.93	0.67	0.85	0.82	0.93
Adj. Flow (vph)	160	171	20	48	104	24	32	424	24	20	728	116
RTOR Reduction (vph)	0	7	0	0	14	0	0	6	0	0	20	0
Lane Group Flow (vph)	160	184	0	48	114	0	0	474	0	0	844	0
Confl. Peds. (#/hr)	5		6	6		5	2		5	5		2
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	5%	5%	5%	5%	5%	5%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	2	2	0	2	2
Parking (#/hr)								4				
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	20.0	20.0		20.0	20.0			30.0			30.0	
Effective Green, g (s)	21.0	21.0		21.0	21.0			31.0			31.0	
Actuated g/C Ratio	0.35	0.35		0.35	0.35			0.52			0.52	
Clearance Time (s)	5.0	5.0		5.0	5.0			5.0			5.0	
Lane Grp Cap (vph)	438	641		401	631			1346			1571	
v/s Ratio Prot		0.10			0.06							
v/s Ratio Perm	c0.13			0.04				0.18			c0.28	
v/c Ratio	0.37	0.29		0.12	0.18			0.35			0.54	
Uniform Delay, d1	14.5	14.1		13.2	13.5			8.6			9.7	
Progression Factor	1.00	1.00		1.00	1.00			0.42			1.00	
Incremental Delay, d2	2.3	1.1		0.6	0.6			0.6			1.3	
Delay (s)	16.9	15.2		13.8	14.2			4.2			11.0	
Level of Service	B	B		B	B			A			B	
Approach Delay (s)		16.0			14.1			4.2			11.0	
Approach LOS		B			B			A			B	

Intersection Summary

HCM Average Control Delay	10.5	HCM Level of Service	B
HCM Volume to Capacity ratio	0.47		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	62.9%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Volume (vph)	128	144	29	74	24	394	17	597
Turn Type	Perm		Perm		Perm		Perm	
Protected Phases		4		8		2		6
Permitted Phases	4		8		2		6	
Detector Phases	4	4	8	8	2	2	6	6
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0
Total Split (s)	25.0	25.0	25.0	25.0	35.0	35.0	35.0	35.0
Total Split (%)	41.7%	41.7%	41.7%	41.7%	58.3%	58.3%	58.3%	58.3%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lead/Lag								
Lead-Lag Optimize?								
Recall Mode	Max	Max	Max	Max	Max	Max	Max	Max
Act Effct Green (s)	21.0	21.0	21.0	21.0		31.0		31.0
Actuated g/C Ratio	0.35	0.35	0.35	0.35		0.52		0.52
v/c Ratio	0.37	0.30	0.12	0.20		0.36		0.54
Control Delay	17.6	14.8	14.3	12.4		4.2		10.8
Queue Delay	0.0	0.0	0.0	0.0		0.0		0.0
Total Delay	17.6	14.8	14.3	12.4		4.2		10.8
LOS	B	B	B	B		A		B
Approach Delay		16.1		12.9		4.2		10.8
Approach LOS		B		B		A		B

Intersection Summary

Cycle Length: 60
Actuated Cycle Length: 60
Offset: 35 (58%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 45
Control Type: Pretimed
Maximum v/c Ratio: 0.54
Intersection Signal Delay: 10.3 — Intersection LOS: B
Intersection Capacity Utilization 62.9% — ICU Level of Service B
Analysis Period (min) 15

Splits and Phases: 2: Crosstown Pkwy. & Portage St.

ø2 — 35 s	ø4 — 25 s
ø6 — 35 s	ø8 — 25 s

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	10	10	10	11	11	11
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		0.95			0.95			0.95			0.95	
Frpb, ped/bikes		0.99			1.00			1.00			1.00	
Flpb, ped/bikes		1.00			1.00			1.00			1.00	
Frt		0.93			0.98			0.99			1.00	
Flt Protected		1.00			0.99			0.99			1.00	
Satd. Flow (prot)		3251			3255			2944			3299	
Flt Permitted		0.94			0.87			0.70			0.94	
Satd. Flow (perm)		3054			2859			2086			3103	
Volume (vph)	11	157	127	23	117	17	90	418	28	13	621	5
Peak-hour factor, PHF	0.55	0.82	0.74	0.72	0.84	0.61	0.94	0.90	0.64	0.81	0.80	0.42
Adj. Flow (vph)	20	191	172	32	139	28	96	464	44	16	776	12
RTOR Reduction (vph)	0	57	0	0	16	0	0	10	0	0	2	0
Lane Group Flow (vph)	0	326	0	0	183	0	0	594	0	0	802	0
Confl. Peds. (#/hr)	5		6	6		5	2		5	5		2
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	5%	5%	5%	5%	5%	5%
Bus Blockages (#/hr)	0	2	2	0	0	0	0	2	2	0	2	2
Parking (#/hr)					0			4				
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		25.0			25.0			25.0			25.0	
Effective Green, g (s)		26.0			26.0			26.0			26.0	
Actuated g/C Ratio		0.43			0.43			0.43			0.43	
Clearance Time (s)		5.0			5.0			5.0			5.0	
Lane Grp Cap (vph)		1323			1239			904			1345	
v/s Ratio Prot												
v/s Ratio Perm		c0.11			0.06			c0.28			0.26	
v/c Ratio		0.25			0.15			0.66			0.60	
Uniform Delay, d1		10.8			10.3			13.5			13.0	
Progression Factor		1.00			1.00			0.96			0.53	
Incremental Delay, d2		0.4			0.3			3.6			1.7	
Delay (s)		11.2			10.5			16.5			8.6	
Level of Service		B			B			B			A	
Approach Delay (s)		11.2			10.5			16.5			8.6	
Approach LOS		B			B			B			A	

Intersection Summary			
HCM Average Control Delay	11.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.45		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	64.3%	ICU Level of Service	C
Analysis Period (min)	15		

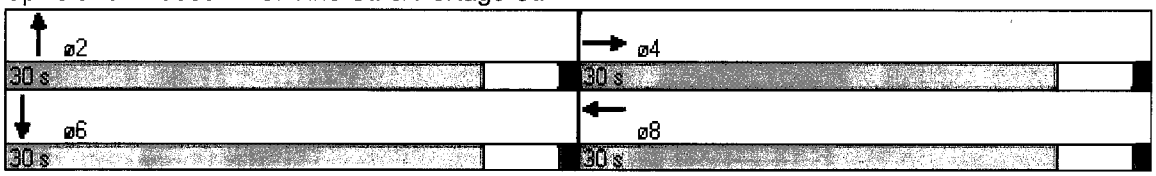
c Critical Lane Group

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Volume (vph)	11	157	23	117	90	418	13	621
Turn Type	Perm		Perm		Perm		Perm	
Protected Phases		4		8		2		6
Permitted Phases	4		8		2		6	
Detector Phases	4	4	8	8	2	2	6	6
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0
Total Split (s)	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0
Total Split (%)	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lead/Lag								
Lead-Lag Optimize?								
Recall Mode	Max	Max	Max	Max	Max	Max	Max	Max
Act Effct Green (s)		26.0		26.0		26.0		26.0
Actuated g/C Ratio		0.43		0.43		0.43		0.43
v/c Ratio		0.28		0.16		0.66		0.60
Control Delay		8.6		9.2		16.7		8.7
Queue Delay		0.0		0.0		0.0		0.0
Total Delay		8.6		9.2		16.7		8.7
LOS		A		A		B		A
Approach Delay		8.6		9.2		16.7		8.7
Approach LOS		A		A		B		A

Intersection Summary

Cycle Length: 60
Actuated Cycle Length: 60
Offset: 38 (63%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 45
Control Type: Pretimed
Maximum v/c Ratio: 0.66
Intersection Signal Delay: 11.2 — Intersection LOS: B
Intersection Capacity Utilization 64.3% — ICU Level of Service C
Analysis Period (min) 15

Splits and Phases: 3: Vine St. & Portage St.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	10	10	10	11	11	11
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			0.95			0.95	
Frpb, ped/bikes		1.00			1.00			1.00			1.00	
Flpb, ped/bikes		1.00			1.00			1.00			1.00	
Frt		0.97			0.97			0.98			1.00	
Flt Protected		1.00			0.98			1.00			1.00	
Satd. Flow (prot)		1619			1762			2937			3285	
Flt Permitted		0.97			0.84			0.92			0.88	
Satd. Flow (perm)		1578			1500			2712			2897	
Volume (vph)	6	115	25	73	95	59	9	408	47	59	702	13
Peak-hour factor, PHF	0.50	0.87	0.69	0.68	0.77	0.87	0.56	0.92	0.78	0.87	0.84	0.65
Adj. Flow (vph)	12	132	36	107	123	68	16	443	60	68	836	20
RTOR Reduction (vph)	0	15	0	0	18	0	0	17	0	0	3	0
Lane Group Flow (vph)	0	165	0	0	280	0	0	502	0	0	921	0
Confl. Peds. (#/hr)	7		7	7		7	1		6	6		1
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	5%	5%	5%	5%	5%	5%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	2	2	0	2	2
Parking (#/hr)		0						4				
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		18.0			18.0			32.0			32.0	
Effective Green, g (s)		19.0			19.0			33.0			33.0	
Actuated g/C Ratio		0.32			0.32			0.55			0.55	
Clearance Time (s)		5.0			5.0			5.0			5.0	
Lane Grp Cap (vph)		500			475			1492			1593	
v/s Ratio Prot												
v/s Ratio Perm		0.10			c0.19			0.19			c0.32	
v/c Ratio		0.33			0.59			0.34			0.58	
Uniform Delay, d1		15.6			17.2			7.5			8.9	
Progression Factor		1.00			1.00			1.01			0.28	
Incremental Delay, d2		1.8			5.3			0.6			1.3	
Delay (s)		17.4			22.5			8.1			3.9	
Level of Service		B			C			A			A	
Approach Delay (s)		17.4			22.5			8.1			3.9	
Approach LOS		B			C			A			A	

Intersection Summary

HCM Average Control Delay	9.2	HCM Level of Service	A
HCM Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	74.9%	ICU Level of Service	D
Analysis Period (min)	15		

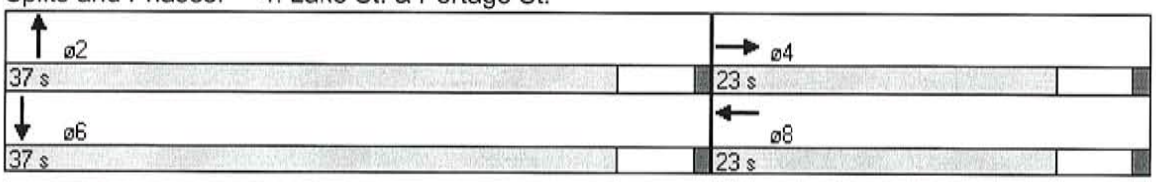
c Critical Lane Group

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Volume (vph)	6	115	73	95	9	408	59	702
Turn Type	Perm		Perm		Perm		Perm	
Protected Phases		4		8		2		6
Permitted Phases	4		8		2		6	
Detector Phases	4	4	8	8	2	2	6	6
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0
Total Split (s)	23.0	23.0	23.0	23.0	37.0	37.0	37.0	37.0
Total Split (%)	38.3%	38.3%	38.3%	38.3%	61.7%	61.7%	61.7%	61.7%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lead/Lag								
Lead-Lag Optimize?								
Recall Mode	Max	Max	Max	Max	Max	Max	Max	Max
Act Effct Green (s)		19.0		19.0		33.0		33.0
Actuated g/C Ratio		0.32		0.32		0.55		0.55
v/c Ratio		0.35		0.61		0.34		0.58
Control Delay		16.1		21.9		7.7		3.9
Queue Delay		0.0		0.0		0.0		0.0
Total Delay		16.1		21.9		7.7		3.9
LOS		B		C		A		A
Approach Delay		16.1		21.9		7.7		3.9
Approach LOS		B		C		A		A

Intersection Summary

Cycle Length: 60
Actuated Cycle Length: 60
Offset: 5 (8%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 45
Control Type: Pretimed
Maximum v/c Ratio: 0.61
Intersection Signal Delay: 8.9 — Intersection LOS: A
Intersection Capacity Utilization 74.9% — ICU Level of Service D
Analysis Period (min) 15

Splits and Phases: 4: Lake St. & Portage St.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	10	10	10	9	9	9
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			0.95			0.95	
Frpb, ped/bikes		0.99			0.99			1.00			1.00	
Flpb, ped/bikes		1.00			0.99			1.00			1.00	
Frt		0.95			0.94			0.99			1.00	
Flt Protected		0.99			0.97			1.00			1.00	
Satd. Flow (prot)		1710			1512			2956			3067	
Flt Permitted		0.93			0.87			0.91			0.93	
Satd. Flow (perm)		1620			1342			2694			2859	
Volume (vph)	6	5	11	25	2	18	10	429	34	26	706	10
Peak-hour factor, PHF	0.50	0.42	0.69	0.63	0.50	0.56	0.50	0.82	0.71	0.93	0.72	0.50
Adj. Flow (vph)	12	12	16	40	4	32	20	523	48	28	981	20
RTOR Reduction (vph)	0	11	0	0	22	0	0	11	0	0	2	0
Lane Group Flow (vph)	0	29	0	0	54	0	0	580	0	0	1027	0
Confl. Peds. (#/hr)	9		17	17		9	4		4	4		4
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	5%	5%	5%	5%	5%	5%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	2	2	0	2	2
Parking (#/hr)					0			4				
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		18.0			18.0			32.0			32.0	
Effective Green, g (s)		19.0			19.0			33.0			33.0	
Actuated g/C Ratio		0.32			0.32			0.55			0.55	
Clearance Time (s)		5.0			5.0			5.0			5.0	
Lane Grp Cap (vph)		513			425			1482			1572	
v/s Ratio Prot												
v/s Ratio Perm		0.02			c0.04			0.22			c0.36	
v/c Ratio		0.06			0.13			0.39			0.65	
Uniform Delay, d1		14.3			14.6			7.7			9.5	
Progression Factor		1.00			1.00			1.00			1.09	
Incremental Delay, d2		0.2			0.6			0.8			1.8	
Delay (s)		14.5			15.2			8.5			12.1	
Level of Service		B			B			A			B	
Approach Delay (s)		14.5			15.2			8.5			12.1	
Approach LOS		B			B			A			B	

Intersection Summary

HCM Average Control Delay	11.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.46		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	57.3%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Volume (vph)	6	5	25	2	10	429	26	706
Turn Type	Perm		Perm		Perm		Perm	
Protected Phases		4		8		2		6
Permitted Phases	4		8		2		6	
Detector Phases	4	4	8	8	2	2	6	6
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0
Total Split (s)	23.0	23.0	23.0	23.0	37.0	37.0	37.0	37.0
Total Split (%)	38.3%	38.3%	38.3%	38.3%	61.7%	61.7%	61.7%	61.7%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lead/Lag								
Lead-Lag Optimize?								
Recall Mode	Max	Max	Max	Max	Max	Max	Max	Max
Act Effct Green (s)		19.0		19.0		33.0		33.0
Actuated g/C Ratio		0.32		0.32		0.55		0.55
v/c Ratio		0.08		0.17		0.40		0.65
Control Delay		10.8		11.0		8.4		12.4
Queue Delay		0.0		0.0		0.0		0.0
Total Delay		10.8		11.0		8.4		12.4
LOS		B		B		A		B
Approach Delay		10.8		11.0		8.4		12.4
Approach LOS		B		B		A		B

Intersection Summary

Cycle Length: 60
Actuated Cycle Length: 60
Offset: 35 (58%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 50
Control Type: Pretimed
Maximum v/c Ratio: 0.65
Intersection Signal Delay: 11.0 — Intersection LOS: B
Intersection Capacity Utilization 57.3% — ICU Level of Service B
Analysis Period (min) 15

Splits and Phases: 5: Washington Ave. & Portage St.

ø2	ø4
37 s	23 s
ø6	ø8
37 s	23 s

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	10	10	10	10	10	10
Total Lost time (s)	4.0	4.0		4.0	4.0			4.0			4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			0.95			0.95	
Frpb, ped/bikes	1.00	0.99		1.00	1.00			0.99			1.00	
Flpb, ped/bikes	1.00	1.00		0.99	1.00			1.00			1.00	
Frt	1.00	0.95		1.00	0.96			0.95			1.00	
Flt Protected	0.95	1.00		0.95	1.00			1.00			1.00	
Satd. Flow (prot)	1767	1751		1755	1774			2998			3172	
Flt Permitted	0.63	1.00		0.45	1.00			0.79			0.92	
Satd. Flow (perm)	1181	1751		837	1774			2371			2913	
Volume (vph)	29	189	75	162	110	45	50	407	174	27	758	24
Peak-hour factor, PHF	0.91	0.86	0.65	0.79	0.81	0.80	0.74	0.94	0.73	0.84	0.83	0.75
Adj. Flow (vph)	32	220	115	205	136	56	68	433	238	32	913	32
RTOR Reduction (vph)	0	35	0	0	28	0	0	105	0	0	5	0
Lane Group Flow (vph)	32	300	0	205	164	0	0	634	0	0	972	0
Confl. Peds. (#/hr)	2		15	15		2	2		6	6		2
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	5%	5%	5%	5%	5%	5%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	2	2	0	2	2
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	19.0	19.0		19.0	19.0			25.0			25.0	
Effective Green, g (s)	20.0	20.0		20.0	20.0			26.0			26.0	
Actuated g/C Ratio	0.37	0.37		0.37	0.37			0.48			0.48	
Clearance Time (s)	5.0	5.0		5.0	5.0			5.0			5.0	
Lane Grp Cap (vph)	437	649		310	657			1142			1403	
v/s Ratio Prot		0.17			0.09							
v/s Ratio Perm	0.03			c0.24				0.27			c0.33	
v/c Ratio	0.07	0.46		0.66	0.25			0.55			0.69	
Uniform Delay, d1	11.0	12.9		14.2	11.8			9.9			10.9	
Progression Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Incremental Delay, d2	0.3	2.4		10.6	0.9			1.9			2.8	
Delay (s)	11.3	15.3		24.8	12.7			11.9			13.7	
Level of Service	B	B		C	B			B			B	
Approach Delay (s)		14.9			18.9			11.9			13.7	
Approach LOS		B			B			B			B	

Intersection Summary

HCM Average Control Delay	14.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	54.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	78.2%	ICU Level of Service	D
Analysis Period (min)	15		

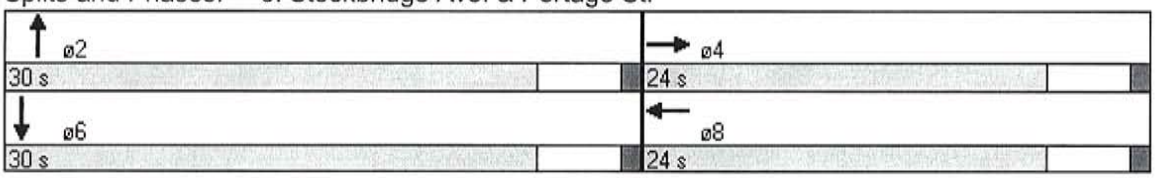
c Critical Lane Group

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Volume (vph)	29	189	162	110	50	407	27	758
Turn Type	Perm		Perm		Perm		Perm	
Protected Phases		4		8		2		6
Permitted Phases	4		8		2		6	
Detector Phases	4	4	8	8	2	2	6	6
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0
Total Split (s)	24.0	24.0	24.0	24.0	30.0	30.0	30.0	30.0
Total Split (%)	44.4%	44.4%	44.4%	44.4%	55.6%	55.6%	55.6%	55.6%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lead/Lag								
Lead-Lag Optimize?								
Recall Mode	Max	Max	Max	Max	Max	Max	Max	Max
Act Effct Green (s)	20.0	20.0	20.0	20.0		26.0		26.0
Actuated g/C Ratio	0.37	0.37	0.37	0.37		0.48		0.48
v/c Ratio	0.07	0.49	0.66	0.28		0.59		0.69
Control Delay	11.7	13.8	27.7	10.5		9.5		14.1
Queue Delay	0.0	0.0	0.0	0.0		0.0		0.0
Total Delay	11.7	13.8	27.7	10.5		9.5		14.1
LOS	B	B	C	B		A		B
Approach Delay		13.6		19.4		9.5		14.1
Approach LOS		B		B		A		B

Intersection Summary

Cycle Length: 54
Actuated Cycle Length: 54
Offset: 35 (65%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 50
Control Type: Pretimed
Maximum v/c Ratio: 0.69
Intersection Signal Delay: 13.5 Intersection LOS: B
Intersection Capacity Utilization 78.2% ICU Level of Service D
Analysis Period (min) 15

Splits and Phases: 6: Stockbridge Ave. & Portage St.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	10	10	10	9	9	9
Total Lost time (s)		4.0	4.0		4.0			4.0			4.0	
Lane Util. Factor		1.00	1.00		1.00			0.95			0.95	
Frpb, ped/bikes		1.00	0.95		1.00			1.00			1.00	
Flpb, ped/bikes		0.99	1.00		0.99			1.00			1.00	
Frt		1.00	0.85		0.99			1.00			0.99	
Flt Protected		0.98	1.00		0.98			1.00			1.00	
Satd. Flow (prot)		1804	1358		1611			3172			3046	
Flt Permitted		0.82	1.00		0.87			0.83			0.94	
Satd. Flow (perm)		1509	1358		1426			2636			2878	
Volume (vph)	46	69	49	39	60	13	21	561	10	12	928	51
Peak-hour factor, PHF	0.64	0.86	0.82	0.70	0.56	0.81	0.53	0.90	0.63	0.75	0.80	0.71
Adj. Flow (vph)	72	80	60	56	107	16	40	623	16	16	1160	72
RTOR Reduction (vph)	0	0	41	0	5	0	0	2	0	0	6	0
Lane Group Flow (vph)	0	152	20	0	174	0	0	677	0	0	1242	0
Confl. Peds. (#/hr)	19		24	24		19	8		10	10		8
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	5%	5%	5%	5%	5%	5%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	2	2	0	2	2
Parking (#/hr)			0		0							
Turn Type	Perm		Perm	Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)		25.0	25.0		25.0			46.0			46.0	
Effective Green, g (s)		26.0	26.0		26.0			46.0			46.0	
Actuated g/C Ratio		0.32	0.32		0.32			0.58			0.58	
Clearance Time (s)		5.0	5.0		5.0			4.0			4.0	
Lane Grp Cap (vph)		490	441		463			1516			1655	
v/s Ratio Prot												
v/s Ratio Perm		0.10	0.01		c0.12			0.26			c0.43	
v/c Ratio		0.31	0.04		0.38			0.45			0.75	
Uniform Delay, d1		20.3	18.5		20.8			9.7			12.7	
Progression Factor		1.00	1.00		1.00			1.71			1.00	
Incremental Delay, d2		1.6	0.2		2.3			0.9			3.2	
Delay (s)		21.9	18.7		23.1			17.5			15.9	
Level of Service		C	B		C			B			B	
Approach Delay (s)		21.0			23.1			17.5			15.9	
Approach LOS		C			C			B			B	

Intersection Summary

HCM Average Control Delay	17.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	64.3%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations									
Volume (vph)	46	69	49	39	60	21	561	12	928
Turn Type	Perm		Perm	Perm		Perm		Perm	
Protected Phases		4			8		2		6
Permitted Phases	4		4	8		2		6	
Detector Phases	4	4	4	8	8	2	2	6	6
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	21.5	21.5	21.5	21.0	21.0	20.5	20.5	20.5	20.5
Total Split (s)	30.0	30.0	30.0	30.0	30.0	50.0	50.0	50.0	50.0
Total Split (%)	37.5%	37.5%	37.5%	37.5%	37.5%	62.5%	62.5%	62.5%	62.5%
Yellow Time (s)	5.0	5.0	5.0	5.0	5.0	4.0	4.0	4.0	4.0
All-Red Time (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lead/Lag									
Lead-Lag Optimize?									
Recall Mode	Max	Max	Max	Max	Max	Max	Max	Max	Max
Act Effct Green (s)		26.0	26.0		26.0		46.0		46.0
Actuated g/C Ratio		0.32	0.32		0.32		0.58		0.58
v/c Ratio		0.31	0.12		0.38		0.45		0.75
Control Delay		22.5	6.4		22.9		17.8		16.3
Queue Delay		0.0	0.0		0.0		0.0		0.0
Total Delay		22.5	6.4		22.9		17.8		16.3
LOS		C	A		C		B		B
Approach Delay		17.9			22.9		17.8		16.3
Approach LOS		B			C		B		B

Intersection Summary

Cycle Length: 80
Actuated Cycle Length: 80
Offset: 74 (93%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 60
Control Type: Pretimed
Maximum v/c Ratio: 0.75
Intersection Signal Delay: 17.4 — Intersection LOS: B
Intersection Capacity Utilization 64.3% — ICU Level of Service C
Analysis Period (min) 15

Splits and Phases: 7: Reed Ave. & Portage St.

ø2	ø4
50 s	30 s
ø6	ø8
50 s	30 s

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	25	0	13	14	4	10	20	606	16	10	948	40
Peak Hour Factor	0.89	0.92	0.65	0.44	0.33	0.83	0.71	0.95	0.57	0.63	0.87	0.71
Hourly flow rate (vph)	28	0	20	32	12	12	28	638	28	16	1090	56
Pedestrians		16			21			13			4	
Lane Width (ft)		12.0			12.0			10.0			9.0	
Walking Speed (ft/s)		4.0			4.0			4.0			4.0	
Percent Blockage		1			2			1			0	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)								356			724	
pX, platoon unblocked	0.83	0.83	0.80	0.83	0.83	0.95	0.80			0.95		
vC, conflicting volume	1563	1909	602	1339	1923	358	1162			687		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1276	1694	253	1005	1711	264	953			612		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.2			4.2		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	64	100	97	77	82	98	95			98		
cM capacity (veh/h)	79	69	584	141	67	681	552			876		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	48	56	347	347	561	601
Volume Left	28	32	28	0	16	0
Volume Right	20	12	0	28	0	56
cSH	123	132	552	1700	876	1700
Volume to Capacity	0.39	0.42	0.05	0.20	0.02	0.35
Queue Length 95th (ft)	41	46	4	0	1	0
Control Delay (s)	51.7	51.0	1.6	0.0	0.5	0.0
Lane LOS	F	F	A		A	
Approach Delay (s)	51.7	51.0	0.8		0.2	
Approach LOS	F	F				

Intersection Summary			
Average Delay	3.2		
Intersection Capacity Utilization	48.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	12	12	11	11	11	11
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	
Frpb, ped/bikes	1.00	0.99	1.00	1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.85	1.00	1.00	0.99	
Flt Protected	0.95	1.00	0.95	1.00	1.00	
Satd. Flow (prot)	1770	1562	1662	3310	3251	
Flt Permitted	0.95	1.00	0.13	1.00	1.00	
Satd. Flow (perm)	1770	1562	231	3310	3251	
Volume (vph)	81	235	162	658	884	78
Peak-hour factor, PHF	0.84	0.73	0.76	0.91	0.79	0.70
Adj. Flow (vph)	96	322	213	723	1119	111
RTOR Reduction (vph)	0	33	0	0	0	0
Lane Group Flow (vph)	96	289	213	723	1230	0
Confl. Peds. (#/hr)	5	6	12			12
Heavy Vehicles (%)	2%	2%	5%	5%	5%	5%
Bus Blockages (#/hr)	0	0	0	2	2	2
Turn Type		pm+ov	pm+pt			
Protected Phases	4	5	5	2	6	
Permitted Phases		4	2	5		
Actuated Green, G (s)	17.0	27.0	54.0	54.0	40.0	
Effective Green, g (s)	18.0	28.0	54.0	54.0	40.0	
Actuated g/C Ratio	0.22	0.35	0.68	0.68	0.50	
Clearance Time (s)	5.0	4.0	4.0	4.0	4.0	
Lane Grp Cap (vph)	398	625	335	2234	1626	
v/s Ratio Prot	0.05	c0.06	c0.08	0.22	c0.38	
v/s Ratio Perm		0.13	0.35			
v/c Ratio	0.24	0.46	0.64	0.32	0.76	
Uniform Delay, d1	25.4	20.2	20.1	5.4	16.1	
Progression Factor	1.00	1.00	1.00	1.00	0.65	
Incremental Delay, d2	1.4	2.4	8.9	0.4	2.6	
Delay (s)	26.8	22.6	29.0	5.8	13.1	
Level of Service	C	C	C	A	B	
Approach Delay (s)	23.6			11.1	13.1	
Approach LOS	C			B	B	

Intersection Summary

HCM Average Control Delay	14.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	4.0
Intersection Capacity Utilization	59.3%	ICU Level of Service	B
Analysis Period (min)	15		

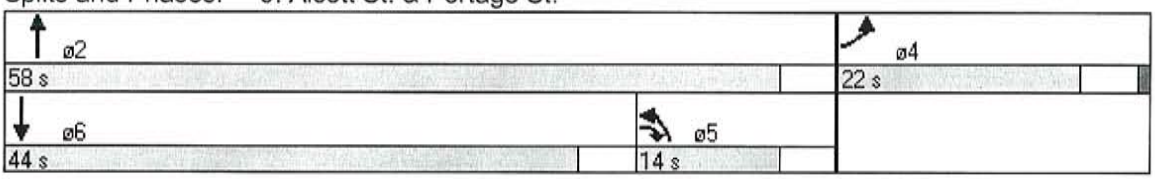
c Critical Lane Group

Lane Group	EBL	EBR	NBL	NBT	SBT
Lane Configurations					
Volume (vph)	81	235	162	658	884
Turn Type		pm+ov	pm+pt		
Protected Phases	4	5	5	2	6
Permitted Phases		4	2	5	
Detector Phases	4	5	5	2	6
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	22.0	8.0	8.0	22.0	22.0
Total Split (s)	22.0	14.0	14.0	58.0	44.0
Total Split (%)	27.5%	17.5%	17.5%	72.5%	55.0%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	0.0	0.0	0.0	0.0
Lead/Lag		Lag	Lag		Lead
Lead-Lag Optimize?					
Recall Mode	Max	Max	Max	Max	Max
Act Effct Green (s)	18.0	28.0	54.0	54.0	40.0
Actuated g/C Ratio	0.22	0.35	0.68	0.68	0.50
v/c Ratio	0.24	0.56	0.64	0.32	0.76
Control Delay	27.4	19.8	28.4	5.9	13.4
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	27.4	19.8	28.4	5.9	13.4
LOS	C	B	C	A	B
Approach Delay	21.5			11.0	13.4
Approach LOS	C			B	B

Intersection Summary

Cycle Length: 80
Actuated Cycle Length: 80
Offset: 10 (13%), Referenced to phase 2:NBTL and 6:SBT, Start of Green
Natural Cycle: 65
Control Type: Pretimed
Maximum v/c Ratio: 0.76
Intersection Signal Delay: 13.9 Intersection LOS: B
Intersection Capacity Utilization 59.3% ICU Level of Service B
Analysis Period (min) 15

Splits and Phases: 9: Alcott St. & Portage St.



Appendix C

Existing Pedestrian Clearance Intervals Calculations

PARSONS BRINCKERHOFF COMPUTATION SHEET

Page 1 of 3

Made by MH

Date 6/30/04

Checked by

Date

Subject Verification that Existing Signal Timings Provide Enough Time for Peds to Cross Street

Portage @ Walnut ✓ok

* Walnut Green Time

FDW = (12' + 10' + 12' + 15') ÷ 4 ft/s ≃ 13 sec

Walk = 7 sec

W + FDW = 20 sec < Existing Walnut Green time + Yellow

* Portage Green Time

FDW = (12' + 12' + 12') ÷ 4 ft/s ≃ 9 sec

W = 7 sec

FDW + W = 16 sec < Existing Portage Green time + Yellow

Portage @ Crosstown ✓ok

* Crosstown Green Time

FDW = (11' + 11' + 11' + 17') ÷ 4 ft/s ≃ 13 sec

Walk = 7 sec

W + FDW = 7 + 13 = 20 sec < Existing Crosstown Green + Yellow

* Portage Green Time

FDW = (12 + 12 + 12') ÷ 4 ft/s = 9 sec

Walk = 7 sec

W + FDW = 16 sec < Existing Portage Green + Yellow

Portage @ Vine ✓ok

* Vine Green Time

FDW = (11' [illegible] 17') [illegible] ft/s ≃ 13 sec

Walk = 7 sec

W + FDW = 20 sec < Existing Vine Green + Yellow

* Portage Green Time

FDW = (12' + 12' + 12' + 12') ÷ 4 ft/s = 12 sec

Walk = 7 sec

W + FDW = 19 sec < Existing Portage Green + Yellow

PARSONS BRINCKERHOFF COMPUTATION SHEET

Page 2 of 3

Made by MH

Date 6/[illegible]/01

Checked by

Date

Subject

Portage @ Lake Yoke

* Lake Green Time
  FDW = (12'+11'+10'+13') ÷ 4 ft/s ≃ 13 sec
  Walk = 7 sec
  W+FDW = 20 sec < Existing Lake Green + Yellow
* Portage Green Time
  FDW = (12'+12'+12') ÷ 4 ft/sec = 9 sec
  Walk = 7 sec
  W+FDW = 16 sec < Existing Portage Green + Yellow

Portage @ Washington Yoke

* Washington Green Time
  FDW = (9'+11'+10'+18') ÷ 4 ft/s ≃ 12 sec
  Walk = 7 sec
  W+FDW = 19 sec < Existing Washington Green + Yellow
* Portage Green Time
  FDW = (12'+12') ÷ 4 ft/s = 6 sec
  Walk = 7 sec
  W+FDW = 13 sec < Existing Portage Green + Yellow

Portage @ Stockbridge Yoke

* Stockbridge Green Time
  FDW = (10'+10'+10'+17') ÷ 4 ft/s ≃ 12 sec
  Walk = 7 sec
  W+FDW = 19 sec < Existing Stockbridge Green + Yellow
* Portage Green Time
  FDW = (10'+10'+10'+10') ÷ 4 ft/s ≃ 10 sec
  Walk = 7 sec
  W+FDW = 17 sec < Existing Portage Green + Yellow

PARSONS BRINCKERHOFF COMPUTATION SHEET

Page 3 of 3

Made by MH

Date

Checked by

Date

Subject

Portage @ Reed Jobe

* Reed Green Time

FDW = (11' + 9' + 11' + 12') ÷ 4 ft/s = 11 sec

Walk = 7 sec

W+FDW = 18 sec < Existing Reed Green + Yellow

* Portage Green Time

FDW = (12' + 12' + 12') ÷ 4 ft/s = 9 sec

Walk = 7 sec

W+FDW = 16 sec < Existing Portage Green + Yellow

Portage @ Alcott Jobe

* Alcott Green Time

FDW = (11' + 11' + 10' + 12') ÷ 4 ft/s ≈ 11 sec

Walk = 7 sec

W+FDW = 18 sec < Existing Alcott Green + Yellow

* Portage Green Time

FDW = (12' + 12' + 12') ÷ 4 ft/s = 9 sec

Walk = 7 sec

W+FDW = 16 sec < Existing Portage Green + Yellow

Appendix D

Existing Lane Width Survey

PORTAGE STREET SURVEY

ON STREET *Portage* BETWEEN *Michigan* AND *South*

EAST CURB LAWN WIDTH *N/A* WEST CURB LAWN WIDTH *N/A*

EAST SIDEWALK/CURBWALK WIDTH *8'*

WEST SIDEWALK/CURBWALK WIDTH *6'*

LANE WIDTHS FROM EAST TO WEST *24, 25*

PARKING ON EAST SIDE *90 Minute Parking 8 a.m. – 6 p.m. Freight loading zone in front of Wheaton*

PARKING ON WEST SIDE *90 Minute Parking 8 a.m. – 6 p.m.*

METRO ON EAST SIDE *N/A*

METRO ON WEST SIDE *N/A*

ON STREET *Portage* BETWEEN *South* AND *Lovell*

EAST CURB LAWN WIDTH *N/A* WEST CURB LAWN WIDTH *N/A*

EAST SIDEWALK/CURBWALK WIDTH *9 ½'*

WEST SIDEWALK/CURBWALK WIDTH *8 ½'*

LANE WIDTHS FROM EAST TO WEST *23 ½ , 23 ½*

PARKING ON EAST SIDE *Half meters/half no parking*

PARKING ON WEST SIDE *Half meters/half no parking*

METRO ON EAST SIDE *N/A*

METRO ON WEST SIDE *N/A*

PORTAGE STREET SURVEY

ON STREET *Portage* BETWEEN *Lovell* AND *Pitcher*

EAST CURB LAWN WIDTH *N/A* WEST CURB LAWN WIDTH *N/A*

EAST SIDEWALK/CURBWALK WIDTH *7'*

WEST SIDEWALK/CURBWALK WIDTH *6'*

LANE WIDTHS FROM EAST TO WEST *17, 10, 10, 10*

PARKING ON EAST SIDE *No restrictions*

PARKING ON WEST SIDE *1 hr. parking 7 a.m. – 4 p.m. Traffic Lane 4 p.m. – 6 p.m.*

METRO ON EAST SIDE *N/A*

METRO ON WEST SIDE *N/A*

ON STREET *Portage* BETWEEN *Pitcher* AND *Walnut*

EAST CURB LAWN WIDTH *N/A* WEST CURB LAWN WIDTH *N/A*

EAST SIDEWALK/CURBWALK WIDTH *5 ½'*

WEST SIDEWALK/CURBWALK WIDTH *5 ½'*

LANE WIDTHS NEAR PITCHER *11, 11, 11, 11, 11*

LANE WIDTHS NEAR WALNUT *12, 10, 12, 15* E to W 15' 12' 10' 12'

PARKING ON EAST SIDE *No Parking*

PARKING ON WEST SIDE *No Parking*

METRO ON EAST SIDE *N/A*

METRO ON WEST SIDE *N/A*

PORTAGE STREET SURVEY

ON STREET *Portage* BETWEEN *Walnut* AND *Second/Dutton*

EAST CURB LAWN WIDTH *N/A* WEST CURB LAWN WIDTH *N/A*

EAST SIDEWALK/CURBWALK WIDTH *7'*

WEST SIDEWALK/CURBWALK WIDTH *5' 8"*

LANE WIDTHS FROM EAST TO WEST *16, 11, 11, 11*

PARKING ON EAST SIDE *1 hr parking 8 a.m. – 6 p.m.*

PARKING ON WEST SIDE *1 hr parking 7 a.m. – 4 p.m. Traffic Lane 4 p.m. – 6 p.m.*

METRO ON EAST SIDE *Near Walnut*

METRO ON WEST SIDE *N/A*

ON STREET *Portage* BETWEEN *Second/Dutton* AND *Crosstown*

EAST CURB LAWN WIDTH *N/A* WEST CURB LAWN WIDTH *N/A*

EAST SIDEWALK/CURBWALK WIDTH *7'*

WEST SIDEWALK/CURBWALK WIDTH *6'*

LANE WIDTHS FROM EAST TO WEST *17, 11, 11, 11*

PARKING ON EAST SIDE *1 hr parking 7 a.m. – 5 p.m.*

PARKING ON WEST SIDE *1 hr parking 7 a.m. – 4 p.m. Traffic Lane 4p.m.–6p.m.*

METRO ON EAST SIDE *N/A*

METRO ON WEST SIDE *N/A*

PORTAGE STREET SURVEY

ON STREET *Portage* BETWEEN *Crosstown* AND *Vine*

EAST CURB LAWN WIDTH *N/A* WEST CURB LAWN WIDTH *N/A*

EAST SIDEWALK/CURBWALK WIDTH *7'4"*

WEST SIDEWALK/CURBWALK WIDTH *8'8"*

LANE WIDTHS FROM EAST TO WEST *17, 11, 11, 11*

PARKING ON EAST SIDE *1 hr parking 7 a.m. – 5 p.m.*

PARKING ON WEST SIDE *Traffic Lane 4 p.m. – 6 p.m.*

METRO ON EAST SIDE *Near Crosstown*

METRO ON WEST SIDE *Near Vine*

ON STREET *Portage* BETWEEN *Vine* AND *Jackson*

EAST CURB LAWN WIDTH *2'* WEST CURB LAWN WIDTH *N/A*

EAST SIDEWALK/CURBWALK WIDTH *5'*

WEST SIDEWALK/CURBWALK WIDTH *4'*

LANE WIDTHS FROM EAST TO WEST *18, 10, 9, 11*

PARKING ON EAST SIDE *1 hr parking 2 p.m. – 5 p.m.*

PARKING ON WEST SIDE *Traffic Lane 4 p.m. – 6 p.m.*

METRO ON EAST SIDE *Near Vine*

METRO ON WEST SIDE *Near Jackson*

PORTAGE STREET SURVEY

ON STREET *Portage* BETWEEN *Jackson* AND *Carr*

EAST CURB LAWN WIDTH *3* WEST CURB LAWN WIDTH *N/A*

EAST SIDEWALK/CURBWALK WIDTH *4'*

WEST SIDEWALK/CURBWALK WIDTH *7'*

LANE WIDTHS FROM EAST TO WEST *17, 11, 10, 11*

PARKING ON EAST SIDE _____

PARKING ON WEST SIDE _____

METRO ON EAST SIDE *Near Jackson*

METRO ON WEST SIDE *N/A*

ON STREET *Portage* BETWEEN *Carr* AND *Harrigan*

EAST CURB LAWN WIDTH *2* WEST CURB LAWN WIDTH *2*

EAST SIDEWALK/CURBWALK WIDTH *4'*

WEST SIDEWALK/CURBWALK WIDTH *7'*

LANE WIDTHS FROM EAST TO WEST *18, 10, 10, 12*

PARKING ON EAST SIDE *1 hr. parking 7 a.m. – 5 p.m.*

PARKING ON WEST SIDE *1 hr parking 7 a.m. – 4 p.m. Traffic Lane 4 p.m. – 6 p.m.*

METRO ON EAST SIDE *N/A*

METRO ON WEST SIDE *N/A*

PORTAGE STREET SURVEY

ON STREET *Portage* BETWEEN *Harrigan* AND *Lake*

EAST CURB LAWN WIDTH *2* WEST CURB LAWN WIDTH *2*

EAST SIDEWALK/CURBWALK WIDTH *5'*

WEST SIDEWALK/CURBWALK WIDTH *7'*

LANE WIDTHS FROM EAST TO WEST *18, 10, 11, 12*

PARKING ON EAST SIDE *1 hr 7 a.m. – 5 p.m.*

PARKING ON WEST SIDE *1 hr parking 7 a.m. –4 p.m. Traffic Lane 4 p.m. – 6 p.m.*

METRO ON EAST SIDE *Near Lake*

METRO ON WEST SIDE *Near Lake*

ON STREET *Portage* BETWEEN *Lake* AND *Collins*

EAST CURB LAWN WIDTH *2* WEST CURB LAWN WIDTH *N/A*

EAST SIDEWALK/CURBWALK WIDTH *5'*

WEST SIDEWALK/CURBWALK WIDTH *7'*

LANE WIDTHS FROM EAST TO WEST *18, 10, 11, 11*

PARKING ON EAST SIDE *1 hr parking 7 a.m. – 5 p.m.*

PARKING ON WEST SIDE *No Parking*

METRO ON EAST SIDE *Near Washington*

METRO ON WEST SIDE *N/A*

PORTAGE STREET SURVEY

ON STREET *Portage* BETWEEN *Collins* AND *Washington*

EAST CURB LAWN WIDTH *3* WEST CURB LAWN WIDTH *2 ½*

EAST SIDEWALK/CURBWALK WIDTH *4'*

WEST SIDEWALK/CURBWALK WIDTH *5'*

LANE WIDTHS FROM EAST TO WEST *18, 10, 11, 9*

PARKING ON EAST SIDE *1 hr parking 7 a.m. – 5 p.m.*

PARKING ON WEST SIDE *No Parking*

METRO ON EAST SIDE *Near Washington*

METRO ON WEST SIDE *N/A*

ON STREET *Portage* BETWEEN *Washington* AND *Stockbridge*

EAST CURB LAWN WIDTH *N/A* WEST CURB LAWN WIDTH *N/A*

EAST SIDEWALK/CURBWALK WIDTH *8'*

WEST SIDEWALK/CURBWALK WIDTH *7'* 7' parking lane

LANE WIDTHS FROM EAST TO WEST *17, 10, 10, 10*

PARKING ON EAST SIDE *1 hr parking 7 a.m. – 5 p.m.*

PARKING ON WEST SIDE *30 minute parking 7a.m.–3 p.m. Traffic Lane 3p.m.–6p.m.*

METRO ON EAST SIDE *N/A*

METRO ON WEST SIDE *Near Stockbridge*

PORTAGE STREET SURVEY

ON STREET *Portage* BETWEEN *Stockbridge* AND *Egleston*

EAST CURB LAWN WIDTH *3* WEST CURB LAWN WIDTH *3*

EAST SIDEWALK/CURBWALK WIDTH *4'*

WEST SIDEWALK/CURBWALK WIDTH *4'*

LANE WIDTHS FROM EAST TO WEST *15, 10, 10, 10*

PARKING ON EAST SIDE _____

PARKING ON WEST SIDE *Traffic Lane 4 p.m. – 6 p.m.*

METRO ON EAST SIDE *Near Stockbridge*

METRO ON WEST SIDE *N/A*

ON STREET *Portage* BETWEEN *Egleston* AND *Clinton*

EAST CURB LAWN WIDTH *3* WEST CURB LAWN WIDTH *3*

EAST SIDEWALK/CURBWALK WIDTH *4'*

WEST SIDEWALK/CURBWALK WIDTH *4'*

LANE WIDTHS FROM EAST TO WEST *16, 11, 10, 11*

PARKING ON EAST SIDE _____

PARKING ON WEST SIDE *Traffic Lane 4 p.m. – 6 p.m.*

METRO ON EAST SIDE *N/A*

METRO ON WEST SIDE *Near Clinton*

PORTAGE STREET SURVEY

ON STREET *Portage* BETWEEN *Clinton* AND *Hays Park*

EAST CURB LAWN WIDTH *3* WEST CURB LAWN WIDTH *3*

EAST SIDEWALK/CURBWALK WIDTH *4'*

WEST SIDEWALK/CURBWALK WIDTH *4'*

LANE WIDTHS FROM EAST TO WEST *13, 11, 11, 11*

PARKING ON EAST SIDE

PARKING ON WEST SIDE *Traffic Lane 4 p.m. – 6 p.m.*

METRO ON EAST SIDE *N/A*

METRO ON WEST SIDE *N/A*

ON STREET *Portage* BETWEEN *Hays Park* AND *Reed*

EAST CURB LAWN WIDTH *3 ½* WEST CURB LAWN WIDTH *3*

EAST SIDEWALK/CURBWALK WIDTH *4'*

WEST SIDEWALK/CURBWALK WIDTH *4'*

LANE WIDTHS FROM EAST TO WEST *12, 11, 9, 11*

PARKING ON EAST SIDE

PARKING ON WEST SIDE *No Parking*

METRO ON EAST SIDE *N/A*

METRO ON WEST SIDE *N/A*

PORTAGE STREET SURVEY

ON STREET *Portage* BETWEEN *Reed* AND *Lay*

EAST CURB LAWN WIDTH *3 ½* WEST CURB LAWN WIDTH *N/A*

EAST SIDEWALK/CURBWALK WIDTH *4'*

WEST SIDEWALK/CURBWALK WIDTH *8'*

LANE WIDTHS FROM EAST TO WEST *13, 10, 9, 11*

PARKING ON EAST SIDE

PARKING ON WEST SIDE *Traffic Lane 4 p.m. – 6 p.m.*

METRO ON EAST SIDE *Near Lay*

METRO ON WEST SIDE *Near Lay*

ON STREET *Portage* BETWEEN *Lay* AND *Lane*

EAST CURB LAWN WIDTH *N/A* WEST CURB LAWN WIDTH *3 ½*

EAST SIDEWALK/CURBWALK WIDTH *8'*

WEST SIDEWALK/CURBWALK WIDTH *4'*

LANE WIDTHS FROM EAST TO WEST *16, 9, 10, 10*

PARKING ON EAST SIDE

PARKING ON WEST SIDE *Traffic Lane 4 p.m. – 6 p.m.*

METRO ON EAST SIDE *N/A*

METRO ON WEST SIDE *N/A*

PORTAGE STREET SURVEY

ON STREET *Portage* BETWEEN *Lane* AND *Bryant*

EAST CURB LAWN WIDTH *N/A* WEST CURB LAWN WIDTH *N/A*

EAST SIDEWALK/CURBWALK WIDTH *7'*

WEST SIDEWALK/CURBWALK WIDTH *7 ½ '*

LANE WIDTHS FROM EAST TO WEST *13, 9, 9, 9*

PARKING ON EAST SIDE

PARKING ON WEST SIDE *Traffic Lane 4 p.m. – 6 p.m.*

METRO ON EAST SIDE *N/A*

METRO ON WEST SIDE *N/A*

ON STREET *Portage* BETWEEN *Bryant* AND *Alcott*

EAST CURB LAWN WIDTH *N/A* WEST CURB LAWN WIDTH *13*

EAST SIDEWALK/CURBWALK WIDTH *10 ½ '*

WEST SIDEWALK/CURBWALK WIDTH *4'*

LANE WIDTHS FROM EAST TO WEST *12, 10, 11, 11*

PARKING ON EAST SIDE *No Parking*

PARKING ON WEST SIDE *No Parking*

METRO ON EAST SIDE *N/A*

METRO ON WEST SIDE *N/A*

Appendix E

Future Conditions Analysis Output

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	10	10	10	12	12	12
Total Lost time (s)		4.0	4.0		4.0	4.0		4.0			4.0	
Lane Util. Factor		1.00	1.00		1.00	1.00		0.95			0.95	
Frpb, ped/bikes		1.00	0.98		1.00	0.98		1.00			1.00	
Flpb, ped/bikes		1.00	1.00		1.00	1.00		1.00			1.00	
Frt		1.00	0.85		1.00	0.85		0.99			0.99	
Flt Protected		0.97	1.00		0.98	1.00		1.00			1.00	
Satd. Flow (prot)		1787	1542		1827	1554		2975			3383	
Flt Permitted		0.77	1.00		0.76	1.00		1.00			1.00	
Satd. Flow (perm)		1410	1542		1422	1554		2975			3383	
Volume (vph)	80	47	102	13	24	3	44	486	13	6	560	37
Peak-hour factor, PHF	0.71	0.65	0.67	0.65	0.67	0.38	0.92	0.91	0.54	0.30	0.91	0.77
Growth Factor (vph)	149%	149%	149%	149%	149%	149%	149%	149%	149%	149%	149%	149%
Adj. Flow (vph)	168	108	227	30	53	12	71	796	36	30	917	72
RTOR Reduction (vph)	0	0	105	0	0	9	0	4	0	0	6	0
Lane Group Flow (vph)	0	276	122	0	83	3	0	899	0	0	1013	0
Confl. Peds. (#/hr)	4		4	4		4						
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	5%	5%	5%	5%	5%	5%
Bus Blockages (#/hr)	0	2	2	0	0	0	0	2	2	0	2	2
Parking (#/hr)								4				
Turn Type	Perm		Perm	Perm		Perm	Split			Split		
Protected Phases		4			8		2	2		6	6	
Permitted Phases	4		4	8		8						
Actuated Green, G (s)		19.5	19.5		19.5	19.5		19.5			29.5	
Effective Green, g (s)		21.0	21.0		21.0	21.0		21.0			31.0	
Actuated g/C Ratio		0.25	0.25		0.25	0.25		0.25			0.36	
Clearance Time (s)		5.5	5.5		5.5	5.5		5.5			5.5	
Lane Grp Cap (vph)		348	381		351	384		735			1234	
v/s Ratio Prot								c0.30			c0.30	
v/s Ratio Perm		c0.20	0.08		0.06	0.00						
v/c Ratio		0.79	0.32		0.24	0.01		1.22			0.82	
Uniform Delay, d1		30.0	26.2		25.6	24.1		32.0			24.5	
Progression Factor		1.00	1.00		1.00	1.00		1.00			1.00	
Incremental Delay, d2		16.8	2.2		1.6	0.0		112.5			6.2	
Delay (s)		46.8	28.4		27.2	24.2		144.5			30.7	
Level of Service		D	C		C	C		F			C	
Approach Delay (s)		38.5			26.8			144.5			30.7	
Approach LOS		D			C			F			C	

Intersection Summary			
HCM Average Control Delay	72.9	HCM Level of Service	E
HCM Volume to Capacity ratio	0.93		
Actuated Cycle Length (s)	85.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	74.6%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	10	10	10	11	11	11
Total Lost time (s)	4.0	4.0		4.0	4.0			4.0			4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			0.95			0.95	
Frpb, ped/bikes	1.00	1.00		1.00	1.00			1.00			1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00			1.00	
Frt	1.00	0.98		1.00	0.97			0.99			0.98	
Flt Protected	0.95	1.00		0.95	1.00			1.00			1.00	
Satd. Flow (prot)	1762	1830		1762	1804			2967			3229	
Flt Permitted	0.62	1.00		0.49	1.00			0.78			0.93	
Satd. Flow (perm)	1147	1830		913	1804			2313			3001	
Volume (vph)	128	144	15	29	74	16	24	394	16	17	597	108
Peak-hour factor, PHF	0.80	0.84	0.75	0.60	0.71	0.67	0.75	0.93	0.67	0.85	0.82	0.93
Growth Factor (vph)	149%	149%	149%	149%	149%	149%	149%	149%	149%	149%	149%	149%
Adj. Flow (vph)	238	255	30	72	155	36	48	631	36	30	1085	173
RTOR Reduction (vph)	0	7	0	0	14	0	0	6	0	0	21	0
Lane Group Flow (vph)	238	278	0	72	177	0	0	709	0	0	1267	0
Confl. Peds. (#/hr)	5		6	6		5	2		5	5		2
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	5%	5%	5%	5%	5%	5%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	2	2	0	2	2
Parking (#/hr)								4				
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	20.0	20.0		20.0	20.0			30.0			30.0	
Effective Green, g (s)	21.0	21.0		21.0	21.0			31.0			31.0	
Actuated g/C Ratio	0.35	0.35		0.35	0.35			0.52			0.52	
Clearance Time (s)	5.0	5.0		5.0	5.0			5.0			5.0	
Lane Grp Cap (vph)	401	641		320	631			1195			1551	
v/s Ratio Prot		0.15			0.10							
v/s Ratio Perm	c0.21			0.08				0.31			c0.42	
v/c Ratio	0.59	0.43		0.23	0.28			0.59			0.82	
Uniform Delay, d1	16.0	14.9		13.8	14.1			10.1			12.1	
Progression Factor	1.00	1.00		1.00	1.00			0.82			1.00	
Incremental Delay, d2	6.3	2.1		1.6	1.1			0.2			4.9	
Delay (s)	22.3	17.1		15.4	15.2			8.5			17.0	
Level of Service	C	B		B	B			A			B	
Approach Delay (s)		19.5			15.2			8.5			17.0	
Approach LOS		B			B			A			B	

Intersection Summary			
HCM Average Control Delay	15.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	82.2%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	10	10	10	11	11	11
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		0.95			0.95			0.95			0.95	
Frpb, ped/bikes		0.99			1.00			1.00			1.00	
Flpb, ped/bikes		1.00			1.00			1.00			1.00	
Frt		0.93			0.98			0.99			1.00	
Flt Protected		1.00			0.99			0.99			1.00	
Satd. Flow (prot)		3251			3255			2944			3299	
Flt Permitted		0.93			0.83			0.53			0.93	
Satd. Flow (perm)		3024			2710			1578			3059	
Volume (vph)	11	157	127	23	117	17	90	418	28	13	621	5
Peak-hour factor, PHF	0.55	0.82	0.74	0.72	0.84	0.61	0.94	0.90	0.64	0.81	0.80	0.42
Growth Factor (vph)	149%	149%	149%	149%	149%	149%	149%	149%	149%	149%	149%	149%
Adj. Flow (vph)	30	285	256	48	208	42	143	692	65	24	1157	18
RTOR Reduction (vph)	0	16	0	0	22	0	0	10	0	0	2	0
Lane Group Flow (vph)	0	555	0	0	276	0	0	890	0	0	1197	0
Confl. Peds. (#/hr)	5		6	6		5	2		5	5		2
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	5%	5%	5%	5%	5%	5%
Bus Blockages (#/hr)	0	2	2	0	0	0	0	2	2	0	2	2
Parking (#/hr)					0			4				
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		25.0			25.0			25.0			25.0	
Effective Green, g (s)		26.0			26.0			26.0			26.0	
Actuated g/C Ratio		0.43			0.43			0.43			0.43	
Clearance Time (s)		5.0			5.0			5.0			5.0	
Lane Grp Cap (vph)		1310			1174			684			1326	
v/s Ratio Prot												
v/s Ratio Perm		c0.18			0.10			c0.56			0.39	
v/c Ratio		0.42			0.24			1.32dl			0.90	
Uniform Delay, d1		11.8			10.7			17.0			15.8	
Progression Factor		1.00			1.00			0.91			0.66	
Incremental Delay, d2		1.0			0.5			145.0			6.8	
Delay (s)		12.8			11.2			160.5			17.2	
Level of Service		B			B			F			B	
Approach Delay (s)		12.8			11.2			160.5			17.2	
Approach LOS		B			B			F			B	

Intersection Summary			
HCM Average Control Delay	59.2	HCM Level of Service	E
HCM Volume to Capacity ratio	0.86		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	88.8%	ICU Level of Service	E
Analysis Period (min)	15		

dl Defacto Left Lane. Recode with 1 though lane as a left lane.
c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	10	10	10	11	11	11
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			0.95			0.95	
Frpb, ped/bikes		1.00			1.00			1.00			1.00	
Flpb, ped/bikes		1.00			1.00			1.00			1.00	
Frt		0.97			0.97			0.98			1.00	
Flt Protected		1.00			0.98			1.00			1.00	
Satd. Flow (prot)		1619			1763			2937			3285	
Flt Permitted		0.97			0.71			0.89			0.82	
Satd. Flow (perm)		1568			1275			2615			2719	
Volume (vph)	6	115	25	73	95	59	9	408	47	59	702	13
Peak-hour factor, PHF	0.50	0.87	0.69	0.68	0.77	0.87	0.56	0.92	0.78	0.87	0.84	0.65
Growth Factor (vph)	149%	149%	149%	149%	149%	149%	149%	149%	149%	149%	149%	149%
Adj. Flow (vph)	18	197	54	160	184	101	24	661	90	101	1245	30
RTOR Reduction (vph)	0	15	0	0	18	0	0	17	0	0	3	0
Lane Group Flow (vph)	0	254	0	0	427	0	0	758	0	0	1373	0
Confl. Peds. (#/hr)	7		7	7		7	1		6	6		1
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	5%	5%	5%	5%	5%	5%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	2	2	0	2	2
Parking (#/hr)		0						4				
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		18.0			18.0			32.0			32.0	
Effective Green, g (s)		19.0			19.0			33.0			33.0	
Actuated g/C Ratio		0.32			0.32			0.55			0.55	
Clearance Time (s)		5.0			5.0			5.0			5.0	
Lane Grp Cap (vph)		497			404			1438			1495	
v/s Ratio Prot												
v/s Ratio Perm		0.16			c0.34			0.29			c0.51	
v/c Ratio		0.51			1.06			0.53			0.92	
Uniform Delay, d1		16.7			20.5			8.6			12.3	
Progression Factor		1.00			1.00			0.93			0.49	
Incremental Delay, d2		3.7			60.8			1.1			6.6	
Delay (s)		20.4			81.3			9.0			12.6	
Level of Service		C			F			A			B	
Approach Delay (s)		20.4			81.3			9.0			12.6	
Approach LOS		C			F			A			B	

Intersection Summary			
HCM Average Control Delay	23.0	HCM Level of Service	C
HCM Volume to Capacity ratio	0.97		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	97.3%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	10	10	10	9	9	9
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			0.95			0.95	
Frpb, ped/bikes		0.99			0.99			1.00			1.00	
Flpb, ped/bikes		1.00			0.99			1.00			1.00	
Frt		0.95			0.94			0.99			1.00	
Flt Protected		0.99			0.97			1.00			1.00	
Satd. Flow (prot)		1711			1512			2956			3067	
Flt Permitted		0.92			0.84			0.83			0.91	
Satd. Flow (perm)		1594			1306			2460			2793	
Volume (vph)	6	5	11	25	2	18	10	429	34	26	706	10
Peak-hour factor, PHF	0.50	0.42	0.69	0.63	0.50	0.56	0.50	0.82	0.71	0.93	0.72	0.50
Growth Factor (vph)	149%	149%	149%	149%	149%	149%	149%	149%	149%	149%	149%	149%
Adj. Flow (vph)	18	18	24	59	6	48	30	780	71	42	1461	30
RTOR Reduction (vph)	0	16	0	0	33	0	0	11	0	0	2	0
Lane Group Flow (vph)	0	44	0	0	80	0	0	870	0	0	1531	0
Confl. Peds. (#/hr)	9		17	17		9	4		4	4		4
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	5%	5%	5%	5%	5%	5%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	2	2	0	2	2
Parking (#/hr)					0			4				
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		18.0			18.0			32.0			32.0	
Effective Green, g (s)		19.0			19.0			33.0			33.0	
Actuated g/C Ratio		0.32			0.32			0.55			0.55	
Clearance Time (s)		5.0			5.0			5.0			5.0	
Lane Grp Cap (vph)		505			414			1353			1536	
v/s Ratio Prot												
v/s Ratio Perm		0.03			c0.06			0.35			c0.55	
v/c Ratio		0.09			0.19			0.64			1.00	
Uniform Delay, d1		14.4			14.9			9.4			13.4	
Progression Factor		1.00			1.00			1.00			0.96	
Incremental Delay, d2		0.3			1.0			2.4			14.8	
Delay (s)		14.7			16.0			11.8			27.7	
Level of Service		B			B			B			C	
Approach Delay (s)		14.7			16.0			11.8			27.7	
Approach LOS		B			B			B			C	

Intersection Summary			
HCM Average Control Delay	21.4	HCM Level of Service	C
HCM Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	73.8%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	10	10	10	10	10	10
Total Lost time (s)	4.0	4.0		4.0	4.0			4.0			4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			0.95			0.95	
Frpb, ped/bikes	1.00	0.99		1.00	1.00			0.99			1.00	
Flpb, ped/bikes	1.00	1.00		0.99	1.00			1.00			1.00	
Frt	1.00	0.95		1.00	0.96			0.95			1.00	
Flt Protected	0.95	1.00		0.95	1.00			1.00			1.00	
Satd. Flow (prot)	1767	1750		1760	1773			2998			3172	
Flt Permitted	0.51	1.00		0.26	1.00			0.59			0.87	
Satd. Flow (perm)	956	1750		488	1773			1771			2758	
Volume (vph)	29	189	75	162	110	45	50	407	174	27	758	24
Peak-hour factor, PHF	0.91	0.86	0.65	0.79	0.81	0.80	0.74	0.94	0.73	0.84	0.83	0.75
Growth Factor (vph)	149%	149%	149%	149%	149%	149%	149%	149%	149%	149%	149%	149%
Adj. Flow (vph)	47	327	172	306	202	84	101	645	355	48	1361	48
RTOR Reduction (vph)	0	14	0	0	28	0	0	106	0	0	5	0
Lane Group Flow (vph)	47	485	0	306	258	0	0	995	0	0	1452	0
Confl. Peds. (#/hr)	2		15	15		2	2		6	6		2
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	5%	5%	5%	5%	5%	5%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	2	2	0	2	2
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	19.0	19.0		19.0	19.0			25.0			25.0	
Effective Green, g (s)	20.0	20.0		20.0	20.0			26.0			26.0	
Actuated g/C Ratio	0.37	0.37		0.37	0.37			0.48			0.48	
Clearance Time (s)	5.0	5.0		5.0	5.0			5.0			5.0	
Lane Grp Cap (vph)	354	648		181	657			853			1328	
v/s Ratio Prot		0.28			0.15							
v/s Ratio Perm	0.05			c0.63				c0.56			0.53	
v/c Ratio	0.13	0.75		1.69	0.39			1.17			1.09	
Uniform Delay, d1	11.3	14.8		17.0	12.5			14.0			14.0	
Progression Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Incremental Delay, d2	0.8	7.7		333.5	1.8			87.7			54.4	
Delay (s)	12.0	22.5		350.5	14.3			101.7			68.4	
Level of Service	B	C		F	B			F			E	
Approach Delay (s)		21.6			188.1			101.7			68.4	
Approach LOS		C			F			F			E	

Intersection Summary			
HCM Average Control Delay	90.6	HCM Level of Service	F
HCM Volume to Capacity ratio	1.40		
Actuated Cycle Length (s)	54.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	109.7%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	10	10	10	9	9	9
Total Lost time (s)		4.0	4.0		4.0			4.0			4.0	
Lane Util. Factor		1.00	1.00		1.00			0.95			0.95	
Frpb, ped/bikes		1.00	0.95		1.00			1.00			1.00	
Flpb, ped/bikes		0.99	1.00		0.99			1.00			1.00	
Frt		1.00	0.85		0.99			1.00			0.99	
Flt Protected		0.98	1.00		0.98			1.00			1.00	
Satd. Flow (prot)		1808	1358		1613			3172			3046	
Flt Permitted		0.71	1.00		0.81			0.62			0.93	
Satd. Flow (perm)		1314	1358		1329			1973			2844	
Volume (vph)	46	69	49	39	60	13	21	561	10	12	928	51
Peak-hour factor, PHF	0.64	0.86	0.82	0.70	0.56	0.81	0.53	0.90	0.63	0.75	0.80	0.71
Growth Factor (vph)	149%	149%	149%	149%	149%	149%	149%	149%	149%	149%	149%	149%
Adj. Flow (vph)	107	120	89	83	160	24	59	929	24	24	1728	107
RTOR Reduction (vph)	0	0	11	0	5	0	0	2	0	0	6	0
Lane Group Flow (vph)	0	227	78	0	262	0	0	1010	0	0	1853	0
Confl. Peds. (#/hr)	19		24	24		19	8		10	10		8
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	5%	5%	5%	5%	5%	5%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	2	2	0	2	2
Parking (#/hr)			0		0							
Turn Type	Perm		Perm	Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)		25.0	25.0		25.0			46.0			46.0	
Effective Green, g (s)		26.0	26.0		26.0			46.0			46.0	
Actuated g/C Ratio		0.32	0.32		0.32			0.58			0.58	
Clearance Time (s)		5.0	5.0		5.0			4.0			4.0	
Lane Grp Cap (vph)		427	441		432			1134			1635	
v/s Ratio Prot												
v/s Ratio Perm		0.17	0.06		c0.20			0.51			c0.65	
v/c Ratio		0.53	0.18		0.61			0.89			1.13	
Uniform Delay, d1		22.0	19.3		22.7			14.8			17.0	
Progression Factor		1.00	1.00		1.00			1.76			1.00	
Incremental Delay, d2		4.7	0.9		6.2			9.8			68.3	
Delay (s)		26.7	20.2		28.9			35.9			85.3	
Level of Service		C	C		C			D			F	
Approach Delay (s)		24.9			28.9			35.9			85.3	
Approach LOS		C			C			D			F	

Intersection Summary			
HCM Average Control Delay	61.0	HCM Level of Service	E
HCM Volume to Capacity ratio	0.94		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	77.9%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	25	0	13	14	4	10	20	606	16	10	948	40
Peak Hour Factor	0.89	0.92	0.65	0.44	0.33	0.83	0.71	0.95	0.57	0.63	0.87	0.71
Hourly flow rate (vph)	42	0	30	47	18	18	42	950	42	24	1624	84
Pedestrians		16			21			13			4	
Lane Width (ft)		12.0			12.0			10.0			9.0	
Walking Speed (ft/s)		4.0			4.0			4.0			4.0	
Percent Blockage		1			2			1			0	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)								356			724	
pX, platoon unblocked	0.58	0.58	0.51	0.58	0.58	0.87	0.51			0.87		
vC, conflicting volume	2319	2826	883	1978	2847	521	1724			1013		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1888	2767	0	1297	2803	304	1461			869		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.2			4.2		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	0	100	95	8	0	97	81			96		
cM capacity (veh/h)	0	8	544	52	8	591	225			645		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	72	83	517	517	835	896
Volume Left	42	47	42	0	24	0
Volume Right	30	18	0	42	0	84
cSH	0	26	225	1700	645	1700
Volume to Capacity	Err	3.24	0.19	0.30	0.04	0.53
Queue Length 95th (ft)	Err	Err	17	0	3	0
Control Delay (s)	Err	Err	7.9	0.0	1.0	0.0
Lane LOS	F	F	A		A	
Approach Delay (s)	Err	Err	3.9		0.5	
Approach LOS	F	F				

Intersection Summary			
Average Delay	Err		
Intersection Capacity Utilization	66.1%	ICU Level of Service	C
Analysis Period (min)	15		

Error occurs because delay is so excessive

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	12	12	11	11	11	11
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	
Frpb, ped/bikes	1.00	0.99	1.00	1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.85	1.00	1.00	0.99	
Flt Protected	0.95	1.00	0.95	1.00	1.00	
Satd. Flow (prot)	1770	1562	1662	3310	3251	
Flt Permitted	0.95	1.00	0.09	1.00	1.00	
Satd. Flow (perm)	1770	1562	159	3310	3251	
Volume (vph)	81	235	162	658	884	78
Peak-hour factor, PHF	0.84	0.73	0.76	0.91	0.79	0.70
Growth Factor (vph)	149%	149%	149%	149%	149%	149%
Adj. Flow (vph)	144	480	318	1077	1667	166
RTOR Reduction (vph)	0	7	0	0	0	0
Lane Group Flow (vph)	144	474	318	1077	1833	0
Confl. Peds. (#/hr)	5	6	12			12
Heavy Vehicles (%)	2%	2%	5%	5%	5%	5%
Bus Blockages (#/hr)	0	0	0	2	2	2
Turn Type		pm+ov	pm+pt			
Protected Phases	4	5	5	2	6	
Permitted Phases		4	2	5		
Actuated Green, G (s)	17.0	27.0	54.0	54.0	40.0	
Effective Green, g (s)	18.0	28.0	54.0	54.0	40.0	
Actuated g/C Ratio	0.22	0.35	0.68	0.68	0.50	
Clearance Time (s)	5.0	4.0	4.0	4.0	4.0	
Lane Grp Cap (vph)	398	625	295	2234	1626	
v/s Ratio Prot	0.08	c0.09	c0.13	0.33	c0.56	
v/s Ratio Perm		0.21	0.59			
v/c Ratio	0.36	0.76	1.08	0.48	1.13	
Uniform Delay, d1	26.2	23.0	31.8	6.3	20.0	
Progression Factor	1.00	1.00	1.00	1.00	0.86	
Incremental Delay, d2	2.5	8.4	74.7	0.7	60.4	
Delay (s)	28.7	31.4	106.5	7.0	77.6	
Level of Service	C	C	F	A	E	
Approach Delay (s)	30.7			29.7	77.6	
Approach LOS	C			C	E	

Intersection Summary			
HCM Average Control Delay	52.6	HCM Level of Service	D
HCM Volume to Capacity ratio	0.94		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	4.0
Intersection Capacity Utilization	76.9%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	10	10	10	12	12	12
Total Lost time (s)		4.0	4.0		4.0	4.0		4.0			4.0	
Lane Util. Factor		1.00	1.00		1.00	1.00		0.95			0.95	
Frpb, ped/bikes		1.00	0.98		1.00	0.98		1.00			1.00	
Flpb, ped/bikes		1.00	1.00		1.00	1.00		1.00			1.00	
Frt		1.00	0.85		1.00	0.85		0.99			0.99	
Flt Protected		0.97	1.00		0.98	1.00		1.00			1.00	
Satd. Flow (prot)		1787	1543		1828	1555		2975			3383	
Flt Permitted		0.77	1.00		0.69	1.00		1.00			1.00	
Satd. Flow (perm)		1410	1543		1280	1555		2975			3383	
Volume (vph)	80	47	102	13	24	3	44	486	13	6	560	37
Peak-hour factor, PHF	0.71	0.65	0.67	0.65	0.67	0.38	0.92	0.91	0.54	0.30	0.91	0.77
Growth Factor (vph)	149%	149%	149%	149%	149%	149%	149%	149%	149%	149%	149%	149%
Adj. Flow (vph)	168	108	227	30	53	12	71	796	36	30	917	72
RTOR Reduction (vph)	0	0	111	0	0	9	0	3	0	0	7	0
Lane Group Flow (vph)	0	276	116	0	83	3	0	900	0	0	1012	0
Confl. Peds. (#/hr)	4		4	4		4						
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	5%	5%	5%	5%	5%	5%
Bus Blockages (#/hr)	0	2	2	0	0	0	0	2	2	0	2	2
Parking (#/hr)								4				
Turn Type	Perm		Perm	Perm		Perm	Split			Split		
Protected Phases		4			8		2	2		6	6	
Permitted Phases	4		4	8		8						
Actuated Green, G (s)		16.0	16.0		16.0	16.0		24.0			23.5	
Effective Green, g (s)		17.5	17.5		17.5	17.5		25.5			25.0	
Actuated g/C Ratio		0.22	0.22		0.22	0.22		0.32			0.31	
Clearance Time (s)		5.5	5.5		5.5	5.5		5.5			5.5	
Lane Grp Cap (vph)		308	338		280	340		948			1057	
v/s Ratio Prot								c0.30			c0.30	
v/s Ratio Perm		c0.20	0.08		0.06	0.00						
v/c Ratio		0.90	0.34		0.30	0.01		0.95			0.96	
Uniform Delay, d1		30.4	26.4		26.1	24.5		26.6			27.0	
Progression Factor		1.00	1.00		1.00	1.00		0.96			1.00	
Incremental Delay, d2		30.5	2.8		2.7	0.0		16.9			19.2	
Delay (s)		60.9	29.2		28.8	24.5		42.4			46.2	
Level of Service		E	C		C	C		D			D	
Approach Delay (s)		46.6			28.2			42.4			46.2	
Approach LOS		D			C			D			D	

Intersection Summary			
HCM Average Control Delay	44.2	HCM Level of Service	D
HCM Volume to Capacity ratio	0.94		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	74.6%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	10	10	10	11	11	11
Total Lost time (s)	4.0	4.0		4.0	4.0			4.0			4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			0.95			0.95	
Frpb, ped/bikes	1.00	1.00		1.00	1.00			1.00			1.00	
Flpb, ped/bikes	0.99	1.00		1.00	1.00			1.00			1.00	
Frt	1.00	0.98		1.00	0.97			0.99			0.98	
Flt Protected	0.95	1.00		0.95	1.00			1.00			1.00	
Satd. Flow (prot)	1760	1829		1761	1803			2967			3229	
Flt Permitted	0.58	1.00		0.46	1.00			0.77			0.93	
Satd. Flow (perm)	1081	1829		845	1803			2301			2994	
Volume (vph)	128	144	15	29	74	16	24	394	16	17	597	108
Peak-hour factor, PHF	0.80	0.84	0.75	0.60	0.71	0.67	0.75	0.93	0.67	0.85	0.82	0.93
Growth Factor (vph)	149%	149%	149%	149%	149%	149%	149%	149%	149%	149%	149%	149%
Adj. Flow (vph)	238	255	30	72	155	36	48	631	36	30	1085	173
RTOR Reduction (vph)	0	5	0	0	11	0	0	5	0	0	15	0
Lane Group Flow (vph)	238	280	0	72	180	0	0	710	0	0	1273	0
Confl. Peds. (#/hr)	5		6	6		5	2		5	5		2
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	5%	5%	5%	5%	5%	5%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	2	2	0	2	2
Parking (#/hr)								4				
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	26.0	26.0		26.0	26.0			44.0			44.0	
Effective Green, g (s)	27.0	27.0		27.0	27.0			45.0			45.0	
Actuated g/C Ratio	0.34	0.34		0.34	0.34			0.56			0.56	
Clearance Time (s)	5.0	5.0		5.0	5.0			5.0			5.0	
Lane Grp Cap (vph)	365	617		285	609			1294			1684	
v/s Ratio Prot		0.15			0.10							
v/s Ratio Perm	c0.22			0.09				0.31			c0.43	
v/c Ratio	0.65	0.45		0.25	0.30			0.55			0.76	
Uniform Delay, d1	22.5	20.7		19.2	19.5			11.1			13.3	
Progression Factor	1.00	1.00		1.00	1.00			0.50			0.26	
Incremental Delay, d2	8.8	2.4		2.1	1.2			1.1			2.0	
Delay (s)	31.3	23.1		21.3	20.7			6.6			5.4	
Level of Service	C	C		C	C			A			A	
Approach Delay (s)		26.8			20.9			6.6			5.4	
Approach LOS		C			C			A			A	

Intersection Summary			
HCM Average Control Delay	11.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	82.2%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	10	10	10	11	11	11
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		0.95			0.95			0.95			0.95	
Frpb, ped/bikes		0.99			1.00			1.00			1.00	
Flpb, ped/bikes		1.00			1.00			1.00			1.00	
Frt		0.93			0.98			0.99			1.00	
Flt Protected		1.00			0.99			0.99			1.00	
Satd. Flow (prot)		3248			3254			2944			3299	
Flt Permitted		0.92			0.67			0.60			0.93	
Satd. Flow (perm)		2998			2202			1780			3061	
Volume (vph)	11	157	127	23	117	17	90	418	28	13	621	5
Peak-hour factor, PHF	0.55	0.82	0.74	0.72	0.84	0.61	0.94	0.90	0.64	0.81	0.80	0.42
Growth Factor (vph)	149%	149%	149%	149%	149%	149%	149%	149%	149%	149%	149%	149%
Adj. Flow (vph)	30	285	256	48	208	42	143	692	65	24	1157	18
RTOR Reduction (vph)	0	92	0	0	17	0	0	7	0	0	1	0
Lane Group Flow (vph)	0	479	0	0	281	0	0	893	0	0	1198	0
Confl. Peds. (#/hr)	5		6	6		5	2		5	5		2
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	5%	5%	5%	5%	5%	5%
Bus Blockages (#/hr)	0	2	2	0	0	0	0	2	2	0	2	2
Parking (#/hr)					0			4				
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		16.0			16.0			54.0			54.0	
Effective Green, g (s)		17.0			17.0			55.0			55.0	
Actuated g/C Ratio		0.21			0.21			0.69			0.69	
Clearance Time (s)		5.0			5.0			5.0			5.0	
Lane Grp Cap (vph)		637			468			1224			2104	
v/s Ratio Prot												
v/s Ratio Perm		c0.16			0.13			c0.50			0.39	
v/c Ratio		0.75			0.60			0.73			0.57	
Uniform Delay, d1		29.5			28.4			7.8			6.4	
Progression Factor		1.00			1.00			1.10			0.24	
Incremental Delay, d2		8.0			5.6			3.3			0.8	
Delay (s)		37.5			34.1			11.9			2.3	
Level of Service		D			C			B			A	
Approach Delay (s)		37.5			34.1			11.9			2.3	
Approach LOS		D			C			B			A	

Intersection Summary			
HCM Average Control Delay	15.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	88.8%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	10	10	10	11	11	11
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			0.95			0.95	
Frpb, ped/bikes		1.00			0.99			1.00			1.00	
Flpb, ped/bikes		1.00			1.00			1.00			1.00	
Frt		0.97			0.97			0.98			1.00	
Flt Protected		1.00			0.98			1.00			1.00	
Satd. Flow (prot)		1618			1761			2936			3285	
Flt Permitted		0.96			0.71			0.87			0.79	
Satd. Flow (perm)		1561			1265			2571			2614	
Volume (vph)	6	115	25	73	95	59	9	408	47	59	702	13
Peak-hour factor, PHF	0.50	0.87	0.69	0.68	0.77	0.87	0.56	0.92	0.78	0.87	0.84	0.65
Growth Factor (vph)	149%	149%	149%	149%	149%	149%	149%	149%	149%	149%	149%	149%
Adj. Flow (vph)	18	197	54	160	184	101	24	661	90	101	1245	30
RTOR Reduction (vph)	0	11	0	0	13	0	0	13	0	0	2	0
Lane Group Flow (vph)	0	258	0	0	432	0	0	762	0	0	1374	0
Confl. Peds. (#/hr)	7		7	7		7	1		6	6		1
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	5%	5%	5%	5%	5%	5%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	2	2	0	2	2
Parking (#/hr)		0						4				
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		28.0			28.0			42.0			42.0	
Effective Green, g (s)		29.0			29.0			43.0			43.0	
Actuated g/C Ratio		0.36			0.36			0.54			0.54	
Clearance Time (s)		5.0			5.0			5.0			5.0	
Lane Grp Cap (vph)		566			459			1382			1405	
v/s Ratio Prot												
v/s Ratio Perm		0.16			c0.34			0.30			c0.53	
v/c Ratio		0.45			0.94			0.55			0.98	
Uniform Delay, d1		19.5			24.7			12.2			18.0	
Progression Factor		1.00			1.00			0.93			0.81	
Incremental Delay, d2		2.6			29.5			1.4			16.8	
Delay (s)		22.1			54.1			12.7			31.4	
Level of Service		C			D			B			C	
Approach Delay (s)		22.1			54.1			12.7			31.4	
Approach LOS		C			D			B			C	

Intersection Summary			
HCM Average Control Delay	29.0	HCM Level of Service	C
HCM Volume to Capacity ratio	0.96		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	97.3%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	10	10	10	9	9	9
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			0.95			0.95	
Frpb, ped/bikes		0.99			0.99			1.00			1.00	
Flpb, ped/bikes		1.00			0.99			1.00			1.00	
Frt		0.95			0.94			0.99			1.00	
Flt Protected		0.99			0.97			1.00			1.00	
Satd. Flow (prot)		1705			1505			2956			3067	
Flt Permitted		0.91			0.82			0.86			0.91	
Satd. Flow (perm)		1570			1274			2543			2782	
Volume (vph)	6	5	11	25	2	18	10	429	34	26	706	10
Peak-hour factor, PHF	0.50	0.42	0.69	0.63	0.50	0.56	0.50	0.82	0.71	0.93	0.72	0.50
Growth Factor (vph)	149%	149%	149%	149%	149%	149%	149%	149%	149%	149%	149%	149%
Adj. Flow (vph)	18	18	24	59	6	48	30	780	71	42	1461	30
RTOR Reduction (vph)	0	19	0	0	33	0	0	8	0	0	2	0
Lane Group Flow (vph)	0	41	0	0	80	0	0	873	0	0	1531	0
Confl. Peds. (#/hr)	9		17	17		9	4		4	4		4
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	5%	5%	5%	5%	5%	5%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	2	2	0	2	2
Parking (#/hr)					0			4				
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		16.0			16.0			54.0			54.0	
Effective Green, g (s)		17.0			17.0			55.0			55.0	
Actuated g/C Ratio		0.21			0.21			0.69			0.69	
Clearance Time (s)		5.0			5.0			5.0			5.0	
Lane Grp Cap (vph)		334			271			1748			1913	
v/s Ratio Prot												
v/s Ratio Perm		0.03			c0.06			0.34			c0.55	
v/c Ratio		0.12			0.29			0.50			0.80	
Uniform Delay, d1		25.5			26.5			5.9			8.7	
Progression Factor		1.00			1.00			1.20			0.27	
Incremental Delay, d2		0.8			2.8			0.7			1.5	
Delay (s)		26.2			29.2			7.8			3.8	
Level of Service		C			C			A			A	
Approach Delay (s)		26.2			29.2			7.8			3.8	
Approach LOS		C			C			A			A	

Intersection Summary			
HCM Average Control Delay	6.8	HCM Level of Service	A
HCM Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	73.8%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	10	10	10	10	10	10
Total Lost time (s)	4.0	4.0		4.0	4.0			4.0	4.0		4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			0.95	1.00		0.95	
Frpb, ped/bikes	1.00	0.99		1.00	1.00			1.00	0.97		1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00	1.00		1.00	
Frt	1.00	0.95		1.00	0.96			1.00	0.85		1.00	
Flt Protected	0.95	1.00		0.95	1.00			0.99	1.00		1.00	
Satd. Flow (prot)	1767	1746		1770	1773			3175	1375		3172	
Flt Permitted	0.44	1.00		0.17	1.00			0.54	1.00		0.90	
Satd. Flow (perm)	822	1746		310	1773			1730	1375		2866	
Volume (vph)	29	189	75	162	110	45	50	407	174	27	758	24
Peak-hour factor, PHF	0.91	0.86	0.65	0.79	0.81	0.80	0.74	0.94	0.73	0.84	0.83	0.75
Growth Factor (vph)	149%	149%	149%	149%	149%	149%	149%	149%	149%	149%	149%	149%
Adj. Flow (vph)	47	327	172	306	202	84	101	645	355	48	1361	48
RTOR Reduction (vph)	0	24	0	0	19	0	0	0	162	0	3	0
Lane Group Flow (vph)	47	475	0	306	267	0	0	746	193	0	1454	0
Confl. Peds. (#/hr)	2		15	15		2	2		6	6		2
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	5%	5%	5%	5%	5%	5%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	2	2	0	2	2
Turn Type	Perm			pm+pt			Perm		Perm	Perm		
Protected Phases		4		3	8			2			6	
Permitted Phases	4			8			2		2	6		
Actuated Green, G (s)	19.0	19.0		33.0	32.0			38.0	38.0		38.0	
Effective Green, g (s)	20.0	20.0		33.0	33.0			39.0	39.0		39.0	
Actuated g/C Ratio	0.25	0.25		0.41	0.41			0.49	0.49		0.49	
Clearance Time (s)	5.0	5.0		4.0	5.0			5.0	5.0		5.0	
Lane Grp Cap (vph)	206	437		292	731			843	670		1397	
v/s Ratio Prot		0.27		c0.12	0.15							
v/s Ratio Perm	0.06			c0.31				0.43	0.14		c0.51	
v/c Ratio	0.23	1.09		1.05	0.37			1.20dl	0.29		1.04	
Uniform Delay, d1	23.9	30.0		31.9	16.3			18.5	12.2		20.5	
Progression Factor	1.00	1.00		1.00	1.00			1.25	2.82		0.56	
Incremental Delay, d2	2.6	68.5		65.8	1.4			9.1	0.7		30.4	
Delay (s)	26.4	98.5		97.7	17.7			32.3	35.2		41.9	
Level of Service	C	F		F	B			C	D		D	
Approach Delay (s)		92.3			59.0			33.3			41.9	
Approach LOS		F			E			C			D	

Intersection Summary

HCM Average Control Delay	49.5	HCM Level of Service	D
HCM Volume to Capacity ratio	1.01		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	101.2%	ICU Level of Service	G
Analysis Period (min)	15		

dl Defacto Left Lane. Recode with 1 though lane as a left lane.
c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	10	10	10	9	9	9
Total Lost time (s)		4.0	4.0		4.0			4.0			4.0	
Lane Util. Factor		1.00	1.00		1.00			0.95			0.95	
Frpb, ped/bikes		1.00	0.95		1.00			1.00			1.00	
Flpb, ped/bikes		0.99	1.00		0.99			1.00			1.00	
Frt		1.00	0.85		0.99			1.00			0.99	
Flt Protected		0.98	1.00		0.98			1.00			1.00	
Satd. Flow (prot)		1808	1358		1613			3172			3046	
Flt Permitted		0.67	1.00		0.74			0.65			0.93	
Satd. Flow (perm)		1240	1358		1210			2079			2845	
Volume (vph)	46	69	49	39	60	13	21	561	10	12	928	51
Peak-hour factor, PHF	0.64	0.86	0.82	0.70	0.56	0.81	0.53	0.90	0.63	0.75	0.80	0.71
Growth Factor (vph)	149%	149%	149%	149%	149%	149%	149%	149%	149%	149%	149%	149%
Adj. Flow (vph)	107	120	89	83	160	24	59	929	24	24	1728	107
RTOR Reduction (vph)	0	0	18	0	4	0	0	2	0	0	6	0
Lane Group Flow (vph)	0	227	71	0	263	0	0	1010	0	0	1853	0
Confl. Peds. (#/hr)	19		24	24		19	8		10	10		8
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	5%	5%	5%	5%	5%	5%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	2	2	0	2	2
Parking (#/hr)			0		0							
Turn Type	Perm		Perm	Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)		21.0	21.0		21.0			50.0			50.0	
Effective Green, g (s)		22.0	22.0		22.0			50.0			50.0	
Actuated g/C Ratio		0.28	0.28		0.28			0.62			0.62	
Clearance Time (s)		5.0	5.0		5.0			4.0			4.0	
Lane Grp Cap (vph)		341	373		333			1299			1778	
v/s Ratio Prot												
v/s Ratio Perm		0.18	0.05		c0.22			0.49			c0.65	
v/c Ratio		0.67	0.19		0.79			0.78			1.04	
Uniform Delay, d1		25.7	22.2		26.8			10.9			15.0	
Progression Factor		1.00	1.00		1.00			1.39			0.74	
Incremental Delay, d2		9.9	1.1		17.1			4.3			21.1	
Delay (s)		35.6	23.3		44.0			19.5			32.2	
Level of Service		D	C		D			B			C	
Approach Delay (s)		32.1			44.0			19.5			32.2	
Approach LOS		C			D			B			C	

Intersection Summary			
HCM Average Control Delay	29.4	HCM Level of Service	C
HCM Volume to Capacity ratio	0.97		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	77.9%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	25	0	13	14	4	10	20	606	16	10	948	40
Peak Hour Factor	0.89	0.92	0.65	0.44	0.33	0.83	0.71	0.95	0.57	0.63	0.87	0.71
Hourly flow rate (vph)	42	0	30	47	18	18	42	950	42	24	1624	84
Pedestrians		16			21			13			4	
Lane Width (ft)		12.0			12.0			10.0			9.0	
Walking Speed (ft/s)		4.0			4.0			4.0			4.0	
Percent Blockage		1			2			1			0	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)								356			724	
pX, platoon unblocked	0.56	0.56	0.50	0.56	0.56	0.88	0.50			0.88		
vC, conflicting volume	2319	2826	883	1978	2847	521	1724			1013		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1917	2826	0	1306	2864	316	1444			877		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.2			4.2		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	0	100	94	3	0	97	81			96		
cM capacity (veh/h)	0	7	527	49	7	585	221			645		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	72	83	517	517	835	896
Volume Left	42	47	42	0	24	0
Volume Right	30	18	0	42	0	84
cSH	0	23	221	1700	645	1700
Volume to Capacity	Err	3.61	0.19	0.30	0.04	0.53
Queue Length 95th (ft)	Err	Err	17	0	3	0
Control Delay (s)	Err	Err	8.1	0.0	1.0	0.0
Lane LOS	F	F	A		A	
Approach Delay (s)	Err	Err	4.1		0.5	
Approach LOS	F	F				

Intersection Summary			
Average Delay	Err		
Intersection Capacity Utilization	66.1%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	12	12	11	11	11	11
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	
Frpb, ped/bikes	1.00	0.99	1.00	1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.85	1.00	1.00	0.99	
Flt Protected	0.95	1.00	0.95	1.00	1.00	
Satd. Flow (prot)	1770	1563	1662	3310	3251	
Flt Permitted	0.95	1.00	0.09	1.00	1.00	
Satd. Flow (perm)	1770	1563	155	3310	3251	
Volume (vph)	81	235	162	658	884	78
Peak-hour factor, PHF	0.84	0.73	0.76	0.91	0.79	0.70
Growth Factor (vph)	149%	149%	149%	149%	149%	149%
Adj. Flow (vph)	144	480	318	1077	1667	166
RTOR Reduction (vph)	0	8	0	0	0	0
Lane Group Flow (vph)	144	472	318	1077	1833	0
Confl. Peds. (#/hr)	5	6	12			12
Heavy Vehicles (%)	2%	2%	5%	5%	5%	5%
Bus Blockages (#/hr)	0	0	0	2	2	2
Turn Type		pm+ov	pm+pt			
Protected Phases	4	5	5	2	6	
Permitted Phases		4	2	5		
Actuated Green, G (s)	16.0	26.0	55.0	55.0	41.0	
Effective Green, g (s)	17.0	27.0	55.0	55.0	41.0	
Actuated g/C Ratio	0.21	0.34	0.69	0.69	0.51	
Clearance Time (s)	5.0	4.0	4.0	4.0	4.0	
Lane Grp Cap (vph)	376	606	295	2276	1666	
v/s Ratio Prot	0.08	c0.10	c0.13	0.33	0.56	
v/s Ratio Perm		0.20	c0.60			
v/c Ratio	0.38	0.78	1.08	0.47	1.10	
Uniform Delay, d1	27.0	23.8	31.8	5.8	19.5	
Progression Factor	1.00	1.00	1.00	1.00	0.57	
Incremental Delay, d2	2.9	9.6	74.7	0.7	49.9	
Delay (s)	29.9	33.4	106.5	6.5	61.0	
Level of Service	C	C	F	A	E	
Approach Delay (s)	32.6			29.3	61.0	
Approach LOS	C			C	E	

Intersection Summary

HCM Average Control Delay	44.9	HCM Level of Service	D
HCM Volume to Capacity ratio	0.95		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	4.0
Intersection Capacity Utilization	76.9%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Appendix F

Maintenance of Traffic Analysis Results

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	10	10	10	12	12	12
Total Lost time (s)		4.0	4.0		4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes		1.00	0.97		1.00	0.97	1.00	1.00		1.00	1.00	
Flpb, ped/bikes		0.99	1.00		1.00	1.00	1.00	1.00		1.00	1.00	
Frt		1.00	0.85		1.00	0.85	1.00	0.99		1.00	0.99	
Flt Protected		0.97	1.00		0.98	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1782	1523		1825	1535	1604	1465		1719	1776	
Flt Permitted		0.78	1.00		0.87	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1432	1523		1616	1535	1604	1465		1719	1776	
Volume (vph)	80	47	102	13	24	3	44	486	13	6	560	37
Peak-hour factor, PHF	0.71	0.65	0.67	0.65	0.67	0.38	0.92	0.91	0.54	0.30	0.91	0.77
Growth Factor (vph)	104%	104%	104%	104%	104%	104%	104%	104%	104%	104%	104%	104%
Adj. Flow (vph)	117	75	158	21	37	8	50	555	25	21	640	50
RTOR Reduction (vph)	0	0	105	0	0	6	0	2	0	0	3	0
Lane Group Flow (vph)	0	192	53	0	58	2	50	578	0	21	687	0
Confl. Peds. (#/hr)	4		4	4		4						
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	5%	5%	5%	5%	5%	5%
Bus Blockages (#/hr)	0	2	2	0	0	0	0	2	2	0	2	2
Parking (#/hr)								4				
Turn Type	Perm		Perm	Perm		Perm	Split			Split		
Protected Phases		4			8		2	2		6	6	
Permitted Phases	4		4	8		8						
Actuated Green, G (s)		19.5	19.5		19.5	19.5	19.5	19.5		29.5	29.5	
Effective Green, g (s)		21.0	21.0		21.0	21.0	21.0	21.0		31.0	31.0	
Actuated g/C Ratio		0.25	0.25		0.25	0.25	0.25	0.25		0.36	0.36	
Clearance Time (s)		5.5	5.5		5.5	5.5	5.5	5.5		5.5	5.5	
Lane Grp Cap (vph)		354	376		399	379	396	362		627	648	
v/s Ratio Prot							0.03	c0.39		0.01	c0.39	
v/s Ratio Perm		c0.13	0.04		0.04	0.00						
v/c Ratio		0.54	0.14		0.15	0.01	0.13	1.60		0.03	1.06	
Uniform Delay, d1		27.8	25.0		25.0	24.1	24.9	32.0		17.4	27.0	
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		5.9	0.8		0.8	0.0	0.7	280.9		0.1	52.3	
Delay (s)		33.7	25.8		25.8	24.2	25.5	312.9		17.5	79.3	
Level of Service		C	C		C	C	C	F		B	E	
Approach Delay (s)		30.1			25.6			290.1			77.5	
Approach LOS		C			C			F			E	

Intersection Summary			
HCM Average Control Delay	142.3	HCM Level of Service	F
HCM Volume to Capacity ratio	1.07		
Actuated Cycle Length (s)	85.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	69.7%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	10	10	10	11	11	11
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	0.99		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	0.99	1.00		0.99	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.98		1.00	0.97		1.00	0.99		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1756	1827		1755	1800		1604	1460		1655	1694	
Flt Permitted	0.67	1.00		0.61	1.00		0.13	1.00		0.40	1.00	
Satd. Flow (perm)	1242	1827		1122	1800		218	1460		693	1694	
Volume (vph)	128	144	15	29	74	16	24	394	16	17	597	108
Peak-hour factor, PHF	0.80	0.84	0.75	0.60	0.71	0.67	0.75	0.93	0.67	0.85	0.82	0.93
Growth Factor (vph)	104%	104%	104%	104%	104%	104%	104%	104%	104%	104%	104%	104%
Adj. Flow (vph)	166	178	21	50	108	25	33	441	25	21	757	121
RTOR Reduction (vph)	0	7	0	0	14	0	0	3	0	0	10	0
Lane Group Flow (vph)	166	192	0	50	119	0	33	463	0	21	868	0
Confl. Peds. (#/hr)	5		6	6		5	2		5	5		2
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	5%	5%	5%	5%	5%	5%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	2	2	0	2	2
Parking (#/hr)								4				
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	20.0	20.0		20.0	20.0		30.0	30.0		30.0	30.0	
Effective Green, g (s)	21.0	21.0		21.0	21.0		31.0	31.0		31.0	31.0	
Actuated g/C Ratio	0.35	0.35		0.35	0.35		0.52	0.52		0.52	0.52	
Clearance Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lane Grp Cap (vph)	435	639		393	630		113	754		358	875	
v/s Ratio Prot		0.10			0.07			0.32			c0.51	
v/s Ratio Perm	c0.13			0.04			0.15			0.03		
v/c Ratio	0.38	0.30		0.13	0.19		0.29	0.61		0.06	0.99	
Uniform Delay, d1	14.6	14.2		13.3	13.6		8.3	10.3		7.2	14.4	
Progression Factor	1.00	1.00		1.00	1.00		0.76	0.58		1.00	1.00	
Incremental Delay, d2	2.5	1.2		0.7	0.7		3.9	2.3		0.3	28.6	
Delay (s)	17.2	15.4		13.9	14.2		10.2	8.2		7.5	43.0	
Level of Service	B	B		B	B		B	A		A	D	
Approach Delay (s)		16.2			14.2			8.4			42.2	
Approach LOS		B			B			A			D	

Intersection Summary			
HCM Average Control Delay	26.0	HCM Level of Service	C
HCM Volume to Capacity ratio	0.75		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	70.2%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	10	10	10	11	11	11
Total Lost time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		0.95			0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes		0.99			1.00		1.00	1.00		1.00	1.00	
Flpb, ped/bikes		1.00			1.00		1.00	1.00		1.00	1.00	
Frt		0.93			0.98		1.00	0.99		1.00	1.00	
Flt Protected		1.00			0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		3233			3249		1604	1453		1659	1731	
Flt Permitted		0.94			0.87		0.15	1.00		0.28	1.00	
Satd. Flow (perm)		3034			2845		260	1453		498	1731	
Volume (vph)	11	157	127	23	117	17	90	418	28	13	621	5
Peak-hour factor, PHF	0.55	0.82	0.74	0.72	0.84	0.61	0.94	0.90	0.64	0.81	0.80	0.42
Growth Factor (vph)	104%	104%	104%	104%	104%	104%	104%	104%	104%	104%	104%	104%
Adj. Flow (vph)	21	199	178	33	145	29	100	483	46	17	807	12
RTOR Reduction (vph)	0	52	0	0	16	0	0	6	0	0	1	0
Lane Group Flow (vph)	0	346	0	0	191	0	100	523	0	17	818	0
Confl. Peds. (#/hr)	5		6	6		5	2		5	5		2
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	5%	5%	5%	5%	5%	5%
Bus Blockages (#/hr)	0	2	2	0	0	0	0	2	2	0	2	2
Parking (#/hr)					0			4				
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		25.0			25.0		25.0	25.0		25.0	25.0	
Effective Green, g (s)		26.0			26.0		26.0	26.0		26.0	26.0	
Actuated g/C Ratio		0.43			0.43		0.43	0.43		0.43	0.43	
Clearance Time (s)		5.0			5.0		5.0	5.0		5.0	5.0	
Lane Grp Cap (vph)		1315			1233		113	630		216	750	
v/s Ratio Prot								0.36			c0.47	
v/s Ratio Perm		c0.11			0.07		0.38			0.03		
v/c Ratio		0.26			0.15		0.88	0.83		0.08	1.09	
Uniform Delay, d1		10.9			10.3		15.6	15.1		10.0	17.0	
Progression Factor		1.00			1.00		0.76	0.77		1.07	0.77	
Incremental Delay, d2		0.5			0.3		51.4	10.3		0.3	49.9	
Delay (s)		11.4			10.6		63.3	22.0		11.0	62.9	
Level of Service		B			B		E	C		B	E	
Approach Delay (s)		11.4			10.6			28.5			61.9	
Approach LOS		B			B			C			E	

Intersection Summary			
HCM Average Control Delay	36.9	HCM Level of Service	D
HCM Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	71.9%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	10	10	10	11	11	11
Total Lost time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes		0.99			0.99		1.00	1.00		1.00	1.00	
Flpb, ped/bikes		1.00			1.00		1.00	1.00		1.00	1.00	
Frt		0.97			0.97		1.00	0.98		1.00	1.00	
Flt Protected		1.00			0.98		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1614			1754		1604	1442		1655	1728	
Flt Permitted		0.97			0.83		0.12	1.00		0.37	1.00	
Satd. Flow (perm)		1573			1475		205	1442		642	1728	
Volume (vph)	6	115	25	73	95	59	9	408	47	59	702	13
Peak-hour factor, PHF	0.50	0.87	0.69	0.68	0.77	0.87	0.56	0.92	0.78	0.87	0.84	0.65
Growth Factor (vph)	104%	104%	104%	104%	104%	104%	104%	104%	104%	104%	104%	104%
Adj. Flow (vph)	12	137	38	112	128	71	17	461	63	71	869	21
RTOR Reduction (vph)	0	15	0	0	18	0	0	8	0	0	1	0
Lane Group Flow (vph)	0	172	0	0	293	0	17	516	0	71	889	0
Confl. Peds. (#/hr)	7		7	7		7	1		6	6		1
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	5%	5%	5%	5%	5%	5%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	2	2	0	2	2
Parking (#/hr)		0						4				
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		18.0			18.0		32.0	32.0		32.0	32.0	
Effective Green, g (s)		19.0			19.0		33.0	33.0		33.0	33.0	
Actuated g/C Ratio		0.32			0.32		0.55	0.55		0.55	0.55	
Clearance Time (s)		5.0			5.0		5.0	5.0		5.0	5.0	
Lane Grp Cap (vph)		498			467		113	793		353	950	
v/s Ratio Prot								0.36			c0.51	
v/s Ratio Perm		0.11			c0.20		0.08			0.11		
v/c Ratio		0.35			0.63		0.15	0.65		0.20	0.94	
Uniform Delay, d1		15.7			17.5		6.6	9.5		6.8	12.5	
Progression Factor		1.00			1.00		0.55	0.91		0.23	0.38	
Incremental Delay, d2		1.9			6.3		2.0	2.9		0.5	8.1	
Delay (s)		17.6			23.8		5.7	11.5		2.1	12.8	
Level of Service		B			C		A	B		A	B	
Approach Delay (s)		17.6			23.8			11.3			12.0	
Approach LOS		B			C			B			B	

Intersection Summary			
HCM Average Control Delay	14.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.82		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	82.6%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	10	10	10	9	9	9
Total Lost time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes		0.98			0.98		1.00	1.00		1.00	1.00	
Flpb, ped/bikes		1.00			0.98		1.00	1.00		1.00	1.00	
Frt		0.94			0.94		1.00	0.99		1.00	1.00	
Flt Protected		0.99			0.97		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1689			1492		1604	1452		1544	1610	
Flt Permitted		0.93			0.86		0.12	1.00		0.32	1.00	
Satd. Flow (perm)		1601			1323		205	1452		514	1610	
Volume (vph)	6	5	11	25	2	18	10	429	34	26	706	10
Peak-hour factor, PHF	0.50	0.42	0.69	0.63	0.50	0.56	0.50	0.82	0.71	0.93	0.72	0.50
Growth Factor (vph)	104%	104%	104%	104%	104%	104%	104%	104%	104%	104%	104%	104%
Adj. Flow (vph)	12	12	17	41	4	33	21	544	50	29	1020	21
RTOR Reduction (vph)	0	12	0	0	23	0	0	5	0	0	1	0
Lane Group Flow (vph)	0	29	0	0	55	0	21	589	0	29	1040	0
Confl. Peds. (#/hr)	9		17	17		9	4		4	4		4
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	5%	5%	5%	5%	5%	5%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	2	2	0	2	2
Parking (#/hr)					0			4				
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		18.0			18.0		32.0	32.0		32.0	32.0	
Effective Green, g (s)		19.0			19.0		33.0	33.0		33.0	33.0	
Actuated g/C Ratio		0.32			0.32		0.55	0.55		0.55	0.55	
Clearance Time (s)		5.0			5.0		5.0	5.0		5.0	5.0	
Lane Grp Cap (vph)		507			419		113	799		283	886	
v/s Ratio Prot								0.41			c0.65	
v/s Ratio Perm		0.02			c0.04		0.10			0.06		
v/c Ratio		0.06			0.13		0.19	0.74		0.10	1.17	
Uniform Delay, d1		14.3			14.6		6.8	10.2		6.4	13.5	
Progression Factor		1.00			1.00		1.00	1.00		0.59	0.92	
Incremental Delay, d2		0.2			0.7		3.6	6.0		0.4	84.5	
Delay (s)		14.5			15.3		10.4	16.2		4.2	97.0	
Level of Service		B			B		B	B		A	F	
Approach Delay (s)		14.5			15.3			16.0			94.5	
Approach LOS		B			B			B			F	

Intersection Summary			
HCM Average Control Delay	62.5	HCM Level of Service	E
HCM Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	59.3%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	10	10	10	10	10	10
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	0.98		1.00	0.99		1.00	0.99		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		0.99	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.95		1.00	0.96		1.00	0.95		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1765	1739		1746	1769		1604	1569		1601	1666	
Flt Permitted	0.63	1.00		0.44	1.00		0.15	1.00		0.19	1.00	
Satd. Flow (perm)	1162	1739		802	1769		260	1569		318	1666	
Volume (vph)	29	189	75	162	110	45	50	407	174	27	758	24
Peak-hour factor, PHF	0.91	0.86	0.65	0.79	0.81	0.80	0.74	0.94	0.73	0.84	0.83	0.75
Growth Factor (vph)	104%	104%	104%	104%	104%	104%	104%	104%	104%	104%	104%	104%
Adj. Flow (vph)	33	229	120	213	141	58	70	450	248	33	950	33
RTOR Reduction (vph)	0	35	0	0	28	0	0	37	0	0	2	0
Lane Group Flow (vph)	33	314	0	213	171	0	70	661	0	33	981	0
Confl. Peds. (#/hr)	2		15	15		2	2		6	6		2
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	5%	5%	5%	5%	5%	5%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	2	2	0	2	2
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	19.0	19.0		19.0	19.0		25.0	25.0		25.0	25.0	
Effective Green, g (s)	20.0	20.0		20.0	20.0		26.0	26.0		26.0	26.0	
Actuated g/C Ratio	0.37	0.37		0.37	0.37		0.48	0.48		0.48	0.48	
Clearance Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lane Grp Cap (vph)	430	644		297	655		125	755		153	802	
v/s Ratio Prot		0.18			0.10			0.42			c0.59	
v/s Ratio Perm	0.03			c0.27			0.27			0.10		
v/c Ratio	0.08	0.49		0.72	0.26		0.56	0.88		0.22	1.22	
Uniform Delay, d1	11.0	13.1		14.6	11.9		9.9	12.6		8.1	14.0	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.3	2.6		13.9	1.0		16.9	13.5		3.2	111.5	
Delay (s)	11.4	15.7		28.4	12.8		26.8	26.1		11.3	125.5	
Level of Service	B	B		C	B		C	C		B	F	
Approach Delay (s)		15.3			20.9			26.1			121.8	
Approach LOS		B			C			C			F	

Intersection Summary			
HCM Average Control Delay	61.4	HCM Level of Service	E
HCM Volume to Capacity ratio	1.00		
Actuated Cycle Length (s)	54.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	78.1%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	10	10	10	9	9	9
Total Lost time (s)		4.0	4.0		4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes		1.00	0.92		0.99		1.00	1.00		1.00	1.00	
Flpb, ped/bikes		0.99	1.00		0.99		1.00	1.00		1.00	1.00	
Frt		1.00	0.85		0.99		1.00	1.00		1.00	0.99	
Flt Protected		0.98	1.00		0.98		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1793	1313		1597		1604	1667		1539	1598	
Flt Permitted		0.81	1.00		0.87		0.09	1.00		0.27	1.00	
Satd. Flow (perm)		1488	1313		1409		147	1667		437	1598	
Volume (vph)	46	69	49	39	60	13	21	561	10	12	928	51
Peak-hour factor, PHF	0.64	0.86	0.82	0.70	0.56	0.81	0.53	0.90	0.63	0.75	0.80	0.71
Growth Factor (vph)	104%	104%	104%	104%	104%	104%	104%	104%	104%	104%	104%	104%
Adj. Flow (vph)	75	83	62	58	111	17	41	648	17	17	1206	75
RTOR Reduction (vph)	0	0	42	0	5	0	0	1	0	0	3	0
Lane Group Flow (vph)	0	158	20	0	181	0	41	664	0	17	1278	0
Confl. Peds. (#/hr)	19		24	24		19	8		10	10		8
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	5%	5%	5%	5%	5%	5%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	2	2	0	2	2
Parking (#/hr)			0		0							
Turn Type	Perm		Perm	Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)		25.0	25.0		25.0		46.0	46.0		46.0	46.0	
Effective Green, g (s)		26.0	26.0		26.0		46.0	46.0		46.0	46.0	
Actuated g/C Ratio		0.32	0.32		0.32		0.58	0.58		0.58	0.58	
Clearance Time (s)		5.0	5.0		5.0		4.0	4.0		4.0	4.0	
Lane Grp Cap (vph)		484	427		458		85	959		251	919	
v/s Ratio Prot								0.40			c0.80	
v/s Ratio Perm		0.11	0.02		c0.13		0.28			0.04		
v/c Ratio		0.33	0.05		0.40		0.48	0.69		0.07	1.39	
Uniform Delay, d1		20.4	18.5		20.9		10.0	12.0		7.5	17.0	
Progression Factor		1.00	1.00		1.00		1.67	1.74		1.00	1.00	
Incremental Delay, d2		1.8	0.2		2.6		15.5	3.4		0.5	182.5	
Delay (s)		22.2	18.7		23.5		32.2	24.4		8.0	199.5	
Level of Service		C	B		C		C	C		A	F	
Approach Delay (s)		21.2			23.5			24.8			197.0	
Approach LOS		C			C			C			F	

Intersection Summary			
HCM Average Control Delay	117.1	HCM Level of Service	F
HCM Volume to Capacity ratio	1.03		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	90.7%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	25	0	13	14	4	10	20	606	16	10	948	40
Peak Hour Factor	0.89	0.92	0.65	0.44	0.33	0.83	0.71	0.95	0.57	0.63	0.87	0.71
Hourly flow rate (vph)	29	0	21	33	13	13	29	663	29	17	1133	59
Pedestrians		16			21			13			4	
Lane Width (ft)		12.0			12.0			10.0			9.0	
Walking Speed (ft/s)		4.0			4.0			4.0			4.0	
Percent Blockage		1			2			1			0	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)								356			724	
pX, platoon unblocked	0.59	0.59	0.47	0.59	0.59	0.77	0.47			0.77		
vC, conflicting volume	1956	1984	1192	1958	1998	703	1208			714		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	2050	2097	1405	2052	2122	616	1439			630		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	0	100	74	0	48	97	86			98		
cM capacity (veh/h)	12	25	79	15	24	372	216			713		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	50	58	29	693	17	1192
Volume Left	29	33	29	0	17	0
Volume Right	21	13	0	29	0	59
cSH	18	21	216	1700	713	1700
Volume to Capacity	2.74	2.79	0.14	0.41	0.02	0.70
Queue Length 95th (ft)	169	189	12	0	2	0
Control Delay (s)	1226.2	1194.4	24.3	0.0	10.2	0.0
Lane LOS	F	F	C		B	
Approach Delay (s)	1226.2	1194.4	1.0		0.1	
Approach LOS	F	F				

Intersection Summary			
Average Delay	64.6		
Intersection Capacity Utilization	68.2%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	12	12	11	11	11	11
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	
Frpb, ped/bikes	1.00	0.98	1.00	1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.85	1.00	1.00	0.99	
Flt Protected	0.95	1.00	0.95	1.00	1.00	
Satd. Flow (prot)	1770	1548	1662	1735	1706	
Flt Permitted	0.95	1.00	0.09	1.00	1.00	
Satd. Flow (perm)	1770	1548	159	1735	1706	
Volume (vph)	81	235	162	658	884	78
Peak-hour factor, PHF	0.84	0.73	0.76	0.91	0.79	0.70
Growth Factor (vph)	104%	104%	104%	104%	104%	104%
Adj. Flow (vph)	100	335	222	752	1164	116
RTOR Reduction (vph)	0	29	0	0	0	0
Lane Group Flow (vph)	100	306	222	752	1280	0
Confl. Peds. (#/hr)	5	6	12			12
Heavy Vehicles (%)	2%	2%	5%	5%	5%	5%
Bus Blockages (#/hr)	0	0	0	2	2	2
Turn Type		pm+ov	pm+pt			
Protected Phases	4	5	5	2	6	
Permitted Phases		4	2	5		
Actuated Green, G (s)	17.0	27.0	54.0	54.0	40.0	
Effective Green, g (s)	18.0	28.0	54.0	54.0	40.0	
Actuated g/C Ratio	0.22	0.35	0.68	0.68	0.50	
Clearance Time (s)	5.0	4.0	4.0	4.0	4.0	
Lane Grp Cap (vph)	398	619	295	1171	853	
v/s Ratio Prot	0.06	c0.06	0.09	c0.43	c0.75	
v/s Ratio Perm		0.14	0.41			
v/c Ratio	0.25	0.49	0.75	0.64	1.50	
Uniform Delay, d1	25.5	20.4	30.3	7.5	20.0	
Progression Factor	1.00	1.00	1.00	1.00	0.87	
Incremental Delay, d2	1.5	2.8	16.2	2.7	225.8	
Delay (s)	27.0	23.2	46.5	10.2	243.2	
Level of Service	C	C	D	B	F	
Approach Delay (s)	24.1			18.5	243.2	
Approach LOS	C			B	F	

Intersection Summary			
HCM Average Control Delay	126.4	HCM Level of Service	F
HCM Volume to Capacity ratio	1.03		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	4.0
Intersection Capacity Utilization	86.1%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	10	10	10	12	12	12
Total Lost time (s)		4.0	4.0		4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes		1.00	0.97		1.00	0.97	1.00	1.00		1.00	1.00	
Flpb, ped/bikes		0.99	1.00		1.00	1.00	1.00	1.00		1.00	1.00	
Frt		1.00	0.85		1.00	0.85	1.00	0.99		1.00	0.99	
Flt Protected		0.97	1.00		0.98	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1783	1524		1825	1536	1604	1465		1719	1776	
Flt Permitted		0.78	1.00		0.86	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1433	1524		1603	1536	1604	1465		1719	1776	
Volume (vph)	80	47	102	13	24	3	44	486	13	6	560	37
Peak-hour factor, PHF	0.71	0.65	0.67	0.65	0.67	0.38	0.92	0.91	0.54	0.30	0.91	0.77
Growth Factor (vph)	104%	104%	104%	104%	104%	104%	104%	104%	104%	104%	104%	104%
Adj. Flow (vph)	117	75	158	21	37	8	50	555	25	21	640	50
RTOR Reduction (vph)	0	0	111	0	0	6	0	2	0	0	3	0
Lane Group Flow (vph)	0	192	47	0	58	2	50	578	0	21	687	0
Confl. Peds. (#/hr)	4		4	4		4						
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	5%	5%	5%	5%	5%	5%
Bus Blockages (#/hr)	0	2	2	0	0	0	0	2	2	0	2	2
Parking (#/hr)								4				
Turn Type	Perm		Perm	Perm		Perm	Split			Split		
Protected Phases		4			8		2	2		6	6	
Permitted Phases	4		4	8		8						
Actuated Green, G (s)		16.0	16.0		16.0	16.0	24.0	24.0		23.5	23.5	
Effective Green, g (s)		17.5	17.5		17.5	17.5	25.5	25.5		25.0	25.0	
Actuated g/C Ratio		0.22	0.22		0.22	0.22	0.32	0.32		0.31	0.31	
Clearance Time (s)		5.5	5.5		5.5	5.5	5.5	5.5		5.5	5.5	
Lane Grp Cap (vph)		313	333		351	336	511	467		537	555	
v/s Ratio Prot							0.03	c0.39		0.01	c0.39	
v/s Ratio Perm		c0.13	0.03		0.04	0.00						
v/c Ratio		0.61	0.14		0.17	0.01	0.10	1.24		0.04	1.24	
Uniform Delay, d1		28.2	25.2		25.3	24.4	19.2	27.2		19.1	27.5	
Progression Factor		1.00	1.00		1.00	1.00	0.96	1.05		1.00	1.00	
Incremental Delay, d2		8.7	0.9		1.0	0.0	0.3	122.3		0.1	121.5	
Delay (s)		36.9	26.1		26.3	24.5	18.8	150.9		19.3	149.0	
Level of Service		D	C		C	C	B	F		B	F	
Approach Delay (s)		32.0			26.1			140.4			145.2	
Approach LOS		C			C			F			F	

Intersection Summary			
HCM Average Control Delay	116.5	HCM Level of Service	F
HCM Volume to Capacity ratio	1.08		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	69.7%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	10	10	10	11	11	11
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	0.99		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	0.99	1.00		0.99	1.00		1.00	1.00		0.99	1.00	
Frt	1.00	0.98		1.00	0.97		1.00	0.99		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1752	1827		1752	1799		1604	1460		1653	1694	
Flt Permitted	0.64	1.00		0.51	1.00		0.20	1.00		0.44	1.00	
Satd. Flow (perm)	1182	1827		947	1799		337	1460		774	1694	
Volume (vph)	128	144	15	29	74	16	24	394	16	17	597	108
Peak-hour factor, PHF	0.80	0.84	0.75	0.60	0.71	0.67	0.75	0.93	0.67	0.85	0.82	0.93
Growth Factor (vph)	104%	104%	104%	104%	104%	104%	104%	104%	104%	104%	104%	104%
Adj. Flow (vph)	166	178	21	50	108	25	33	441	25	21	757	121
RTOR Reduction (vph)	0	5	0	0	11	0	0	3	0	0	7	0
Lane Group Flow (vph)	166	194	0	50	122	0	33	463	0	21	871	0
Confl. Peds. (#/hr)	5		6	6		5	2		5	5		2
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	5%	5%	5%	5%	5%	5%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	2	2	0	2	2
Parking (#/hr)								4				
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	18.0	18.0		18.0	18.0		52.0	52.0		52.0	52.0	
Effective Green, g (s)	19.0	19.0		19.0	19.0		53.0	53.0		53.0	53.0	
Actuated g/C Ratio	0.24	0.24		0.24	0.24		0.66	0.66		0.66	0.66	
Clearance Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lane Grp Cap (vph)	281	434		225	427		223	967		513	1122	
v/s Ratio Prot		0.11			0.07			0.32			c0.51	
v/s Ratio Perm	c0.14			0.05			0.10			0.03		
v/c Ratio	0.59	0.45		0.22	0.29		0.15	0.48		0.04	0.78	
Uniform Delay, d1	27.1	26.0		24.6	25.0		5.1	6.7		4.7	9.4	
Progression Factor	1.00	1.00		1.00	1.00		0.78	0.78		0.20	0.53	
Incremental Delay, d2	8.8	3.3		2.3	1.7		1.2	1.4		0.0	1.8	
Delay (s)	35.9	29.3		26.8	26.6		5.1	6.7		1.0	6.8	
Level of Service	D	C		C	C		A	A		A	A	
Approach Delay (s)		32.3			26.7			6.6			6.7	
Approach LOS		C			C			A			A	

Intersection Summary			
HCM Average Control Delay	13.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	70.2%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	10	10	10	11	11	11
Total Lost time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		0.95			0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes		0.98			1.00		1.00	1.00		1.00	1.00	
Flpb, ped/bikes		1.00			1.00		1.00	1.00		1.00	1.00	
Frt		0.93			0.98		1.00	0.99		1.00	1.00	
Flt Protected		1.00			0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		3227			3247		1604	1453		1657	1731	
Flt Permitted		0.93			0.85		0.22	1.00		0.40	1.00	
Satd. Flow (perm)		3016			2787		378	1453		695	1731	
Volume (vph)	11	157	127	23	117	17	90	418	28	13	621	5
Peak-hour factor, PHF	0.55	0.82	0.74	0.72	0.84	0.61	0.94	0.90	0.64	0.81	0.80	0.42
Growth Factor (vph)	104%	104%	104%	104%	104%	104%	104%	104%	104%	104%	104%	104%
Adj. Flow (vph)	21	199	178	33	145	29	100	483	46	17	807	12
RTOR Reduction (vph)	0	134	0	0	17	0	0	4	0	0	1	0
Lane Group Flow (vph)	0	265	0	0	191	0	100	525	0	17	818	0
Confl. Peds. (#/hr)	5		6	6		5	2		5	5		2
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	5%	5%	5%	5%	5%	5%
Bus Blockages (#/hr)	0	2	2	0	0	0	0	2	2	0	2	2
Parking (#/hr)					0			4				
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		19.0			19.0		51.0	51.0		51.0	51.0	
Effective Green, g (s)		20.0			20.0		52.0	52.0		52.0	52.0	
Actuated g/C Ratio		0.25			0.25		0.65	0.65		0.65	0.65	
Clearance Time (s)		5.0			5.0		5.0	5.0		5.0	5.0	
Lane Grp Cap (vph)		754			697		246	944		452	1125	
v/s Ratio Prot								0.36			c0.47	
v/s Ratio Perm		c0.09			0.07		0.26			0.02		
v/c Ratio		0.35			0.27		0.41	0.56		0.04	0.73	
Uniform Delay, d1		24.7			24.2		6.7	7.7		5.0	9.3	
Progression Factor		1.00			1.00		1.30	1.19		0.36	0.29	
Incremental Delay, d2		1.3			1.0		4.2	2.0		0.1	2.8	
Delay (s)		25.9			25.1		12.9	11.2		1.9	5.5	
Level of Service		C			C		B	B		A	A	
Approach Delay (s)		25.9			25.1			11.4			5.4	
Approach LOS		C			C			B			A	

Intersection Summary			
HCM Average Control Delay	13.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	71.9%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	10	10	10	11	11	11
Total Lost time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes		0.99			0.99		1.00	1.00		1.00	1.00	
Flpb, ped/bikes		1.00			1.00		1.00	1.00		0.99	1.00	
Frt		0.97			0.97		1.00	0.98		1.00	1.00	
Flt Protected		1.00			0.98		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1612			1751		1604	1442		1653	1728	
Flt Permitted		0.97			0.77		0.15	1.00		0.39	1.00	
Satd. Flow (perm)		1572			1376		261	1442		672	1728	
Volume (vph)	6	115	25	73	95	59	9	408	47	59	702	13
Peak-hour factor, PHF	0.50	0.87	0.69	0.68	0.77	0.87	0.56	0.92	0.78	0.87	0.84	0.65
Growth Factor (vph)	104%	104%	104%	104%	104%	104%	104%	104%	104%	104%	104%	104%
Adj. Flow (vph)	12	137	38	112	128	71	17	461	63	71	869	21
RTOR Reduction (vph)	0	11	0	0	14	0	0	6	0	0	1	0
Lane Group Flow (vph)	0	176	0	0	297	0	17	518	0	71	889	0
Confl. Peds. (#/hr)	7		7	7		7	1		6	6		1
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	5%	5%	5%	5%	5%	5%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	2	2	0	2	2
Parking (#/hr)		0						4				
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		22.0			22.0		48.0	48.0		48.0	48.0	
Effective Green, g (s)		23.0			23.0		49.0	49.0		49.0	49.0	
Actuated g/C Ratio		0.29			0.29		0.61	0.61		0.61	0.61	
Clearance Time (s)		5.0			5.0		5.0	5.0		5.0	5.0	
Lane Grp Cap (vph)		452			396		160	883		412	1058	
v/s Ratio Prot								0.36			c0.51	
v/s Ratio Perm		0.11			c0.22		0.07			0.11		
v/c Ratio		0.39			0.75		0.11	0.59		0.17	0.84	
Uniform Delay, d1		22.9			25.9		6.4	9.4		6.7	12.4	
Progression Factor		1.00			1.00		1.18	1.10		0.67	0.47	
Incremental Delay, d2		2.5			12.4		1.1	2.4		0.7	6.1	
Delay (s)		25.4			38.3		8.7	12.7		5.2	11.9	
Level of Service		C			D		A	B		A	B	
Approach Delay (s)		25.4			38.3			12.6			11.4	
Approach LOS		C			D			B			B	

Intersection Summary			
HCM Average Control Delay	17.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	82.6%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	10	10	10	9	9	9
Total Lost time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes		0.97			0.98		1.00	1.00		1.00	1.00	
Flpb, ped/bikes		0.99			0.98		1.00	1.00		1.00	1.00	
Frt		0.94			0.94		1.00	0.99		1.00	1.00	
Flt Protected		0.99			0.97		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1679			1481		1604	1452		1542	1610	
Flt Permitted		0.93			0.85		0.13	1.00		0.37	1.00	
Satd. Flow (perm)		1577			1288		220	1452		607	1610	
Volume (vph)	6	5	11	25	2	18	10	429	34	26	706	10
Peak-hour factor, PHF	0.50	0.42	0.69	0.63	0.50	0.56	0.50	0.82	0.71	0.93	0.72	0.50
Growth Factor (vph)	104%	104%	104%	104%	104%	104%	104%	104%	104%	104%	104%	104%
Adj. Flow (vph)	12	12	17	41	4	33	21	544	50	29	1020	21
RTOR Reduction (vph)	0	13	0	0	26	0	0	4	0	0	1	0
Lane Group Flow (vph)	0	28	0	0	52	0	21	590	0	29	1040	0
Confl. Peds. (#/hr)	9		17	17		9	4		4	4		4
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	5%	5%	5%	5%	5%	5%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	2	2	0	2	2
Parking (#/hr)					0			4				
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		16.0			16.0		54.0	54.0		54.0	54.0	
Effective Green, g (s)		17.0			17.0		55.0	55.0		55.0	55.0	
Actuated g/C Ratio		0.21			0.21		0.69	0.69		0.69	0.69	
Clearance Time (s)		5.0			5.0		5.0	5.0		5.0	5.0	
Lane Grp Cap (vph)		335			274		151	998		417	1107	
v/s Ratio Prot								0.41			c0.65	
v/s Ratio Perm		0.02			c0.04		0.10			0.05		
v/c Ratio		0.08			0.19		0.14	0.59		0.07	0.94	
Uniform Delay, d1		25.2			25.8		4.3	6.6		4.1	11.0	
Progression Factor		1.00			1.00		0.83	0.62		0.55	0.33	
Incremental Delay, d2		0.5			1.5		1.6	2.1		0.2	10.9	
Delay (s)		25.7			27.4		5.2	6.2		2.5	14.6	
Level of Service		C			C		A	A		A	B	
Approach Delay (s)		25.7			27.4			6.2			14.2	
Approach LOS		C			C			A			B	

Intersection Summary			
HCM Average Control Delay	12.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	59.3%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	10	10	10	10	10	10
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	0.98		1.00	0.99		1.00	0.99		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		0.98	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.95		1.00	0.96		1.00	0.95		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1763	1732		1741	1768		1604	1567		1604	1666	
Flt Permitted	0.56	1.00		0.35	1.00		0.09	1.00		0.26	1.00	
Satd. Flow (perm)	1041	1732		638	1768		144	1567		432	1666	
Volume (vph)	29	189	75	162	110	45	50	407	174	27	758	24
Peak-hour factor, PHF	0.91	0.86	0.65	0.79	0.81	0.80	0.74	0.94	0.73	0.84	0.83	0.75
Growth Factor (vph)	104%	104%	104%	104%	104%	104%	104%	104%	104%	104%	104%	104%
Adj. Flow (vph)	33	229	120	213	141	58	70	450	248	33	950	33
RTOR Reduction (vph)	0	23	0	0	19	0	0	25	0	0	2	0
Lane Group Flow (vph)	33	326	0	213	180	0	70	673	0	33	981	0
Confl. Peds. (#/hr)	2		15	15		2	2		6	6		2
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	5%	5%	5%	5%	5%	5%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	2	2	0	2	2
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	24.0	24.0		24.0	24.0		46.0	46.0		46.0	46.0	
Effective Green, g (s)	25.0	25.0		25.0	25.0		47.0	47.0		47.0	47.0	
Actuated g/C Ratio	0.31	0.31		0.31	0.31		0.59	0.59		0.59	0.59	
Clearance Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lane Grp Cap (vph)	325	541		199	553		85	921		254	979	
v/s Ratio Prot		0.19			0.10			0.43			c0.59	
v/s Ratio Perm	0.03			c0.33			0.49			0.08		
v/c Ratio	0.10	0.60		1.07	0.33		0.82	0.73		0.13	1.00	
Uniform Delay, d1	19.5	23.3		27.5	21.1		13.2	11.9		7.4	16.5	
Progression Factor	1.00	1.00		1.00	1.00		0.63	0.55		1.07	0.68	
Incremental Delay, d2	0.6	4.9		83.7	1.6		50.5	4.3		0.4	19.1	
Delay (s)	20.2	28.2		111.2	22.6		58.8	10.9		8.3	30.3	
Level of Service	C	C		F	C		E	B		A	C	
Approach Delay (s)		27.5			68.4			15.2			29.6	
Approach LOS		C			E			B			C	

Intersection Summary			
HCM Average Control Delay	31.2	HCM Level of Service	C
HCM Volume to Capacity ratio	1.03		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	78.1%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	10	10	10	9	9	9
Total Lost time (s)		4.0	4.0		4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes		1.00	0.92		0.99		1.00	1.00		1.00	1.00	
Flpb, ped/bikes		0.99	1.00		0.99		1.00	1.00		0.99	1.00	
Frt		1.00	0.85		0.99		1.00	1.00		1.00	0.99	
Flt Protected		0.98	1.00		0.98		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1795	1313		1598		1604	1667		1537	1598	
Flt Permitted		0.73	1.00		0.86		0.07	1.00		0.33	1.00	
Satd. Flow (perm)		1341	1313		1388		124	1667		533	1598	
Volume (vph)	46	69	49	39	60	13	21	561	10	12	928	51
Peak-hour factor, PHF	0.64	0.86	0.82	0.70	0.56	0.81	0.53	0.90	0.63	0.75	0.80	0.71
Growth Factor (vph)	104%	104%	104%	104%	104%	104%	104%	104%	104%	104%	104%	104%
Adj. Flow (vph)	75	83	62	58	111	17	41	648	17	17	1206	75
RTOR Reduction (vph)	0	0	48	0	5	0	0	1	0	0	3	0
Lane Group Flow (vph)	0	158	14	0	181	0	41	664	0	17	1278	0
Confl. Peds. (#/hr)	19		24	24		19	8		10	10		8
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	5%	5%	5%	5%	5%	5%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	2	2	0	2	2
Parking (#/hr)			0		0							
Turn Type	Perm		Perm	Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)		16.5	16.5		16.5		54.5	54.5		54.5	54.5	
Effective Green, g (s)		17.5	17.5		17.5		54.5	54.5		54.5	54.5	
Actuated g/C Ratio		0.22	0.22		0.22		0.68	0.68		0.68	0.68	
Clearance Time (s)		5.0	5.0		5.0		4.0	4.0		4.0	4.0	
Lane Grp Cap (vph)		293	287		304		84	1136		363	1089	
v/s Ratio Prot								0.40			c0.80	
v/s Ratio Perm		0.12	0.01		c0.13		0.33			0.03		
v/c Ratio		0.54	0.05		0.60		0.49	0.58		0.05	1.17	
Uniform Delay, d1		27.7	24.7		28.1		6.1	6.8		4.2	12.8	
Progression Factor		1.00	1.00		1.00		1.17	1.18		1.25	1.08	
Incremental Delay, d2		7.0	0.3		8.4		16.0	1.8		0.1	81.3	
Delay (s)		34.6	25.0		36.4		23.1	9.8		5.3	95.0	
Level of Service		C	C		D		C	A		A	F	
Approach Delay (s)		31.9			36.4			10.6			93.9	
Approach LOS		C			D			B			F	

Intersection Summary			
HCM Average Control Delay	59.4	HCM Level of Service	E
HCM Volume to Capacity ratio	1.03		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	90.7%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	25	0	13	14	4	10	20	606	16	10	948	40
Peak Hour Factor	0.89	0.92	0.65	0.44	0.33	0.83	0.71	0.95	0.57	0.63	0.87	0.71
Hourly flow rate (vph)	29	0	21	33	13	13	29	663	29	17	1133	59
Pedestrians		16			21			13			4	
Lane Width (ft)		12.0			12.0			10.0			9.0	
Walking Speed (ft/s)		4.0			4.0			4.0			4.0	
Percent Blockage		1			2			1			0	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)								356			724	
pX, platoon unblocked	0.48	0.48	0.37	0.48	0.48	0.77	0.37			0.77		
vC, conflicting volume	1956	1984	1192	1958	1998	703	1208			714		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	2280	2337	1521	2283	2368	616	1565			630		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	0	100	60	0	2	97	80			98		
cM capacity (veh/h)	1	13	52	6	13	372	150			713		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	50	58	29	693	17	1192
Volume Left	29	33	29	0	17	0
Volume Right	21	13	0	29	0	59
cSH	2	9	150	1700	713	1700
Volume to Capacity	31.00	6.14	0.20	0.41	0.02	0.70
Queue Length 95th (ft)	Err	Err	17	0	2	0
Control Delay (s)	Err	Err	34.7	0.0	10.2	0.0
Lane LOS	F	F	D		B	
Approach Delay (s)	Err	Err	1.4		0.1	
Approach LOS	F	F				

Intersection Summary			
Average Delay	531.5		
Intersection Capacity Utilization	68.2%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	12	12	11	11	11	11
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	
Frpb, ped/bikes	1.00	0.97	1.00	1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.85	1.00	1.00	0.99	
Flt Protected	0.95	1.00	0.95	1.00	1.00	
Satd. Flow (prot)	1770	1540	1662	1735	1706	
Flt Permitted	0.95	1.00	0.08	1.00	1.00	
Satd. Flow (perm)	1770	1540	143	1735	1706	
Volume (vph)	81	235	162	658	884	78
Peak-hour factor, PHF	0.84	0.73	0.76	0.91	0.79	0.70
Growth Factor (vph)	104%	104%	104%	104%	104%	104%
Adj. Flow (vph)	100	335	222	752	1164	116
RTOR Reduction (vph)	0	46	0	0	0	0
Lane Group Flow (vph)	100	289	222	752	1280	0
Confl. Peds. (#/hr)	5	6	12			12
Heavy Vehicles (%)	2%	2%	5%	5%	5%	5%
Bus Blockages (#/hr)	0	0	0	2	2	2
Turn Type		pm+ov	pm+pt			
Protected Phases	4	5	5	2	6	
Permitted Phases		4	2	5		
Actuated Green, G (s)	17.0	22.0	54.0	54.0	45.0	
Effective Green, g (s)	18.0	23.0	54.0	54.0	45.0	
Actuated g/C Ratio	0.22	0.29	0.68	0.68	0.56	
Clearance Time (s)	5.0	4.0	4.0	4.0	4.0	
Lane Grp Cap (vph)	398	520	191	1171	960	
v/s Ratio Prot	0.06	c0.03	c0.07	0.43	c0.75	
v/s Ratio Perm		0.15	0.71			
v/c Ratio	0.25	0.56	1.16	0.64	1.33	
Uniform Delay, d1	25.5	24.2	34.5	7.5	17.5	
Progression Factor	1.00	1.00	1.00	1.00	0.52	
Incremental Delay, d2	1.5	4.2	115.7	2.7	152.0	
Delay (s)	27.0	28.4	150.2	10.2	161.1	
Level of Service	C	C	F	B	F	
Approach Delay (s)	28.1			42.1	161.1	
Approach LOS	C			D	F	

Intersection Summary			
HCM Average Control Delay	96.5	HCM Level of Service	F
HCM Volume to Capacity ratio	1.02		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	4.0
Intersection Capacity Utilization	86.1%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

APPENDIX "10"

MAINTENANCE AND CARE

Maintenance and Care of the New Streetscape

The following is a summary evaluation of the maintenance issues and approach that should be taken in regards to the care and routine maintenance of the new design improvement items that are proposed for the Portage Street Streetscape Master Plan. The primary focus of this evaluation is the "Primary Corridor."

Since the city has limited funding resources for maintenance and care of the new streetscape, one or more maintenance endowment funds should be established whose sole purpose is to generate and provide the funding which will be required for the care and maintenance of the streetscape improvement items. A team oversight committee should be created which should include some representatives from the maintenance endowment fund as well as key leaders from DKI, the Edison Mainstreet Committee, the Edison Business Association, and the Edison Neighborhood Association, and possibly city Departments, to follow DKI's current maintenance policies.

The purpose of this endowment fund will be to get business owners together with Edison Mainstreet Program leadership to generate interest and pooling of funding resources along with determining the responsible party for each of the maintenance items.

With the leadership help of the City of Kalamazoo, DKI, the Edison Neighborhood Association and the Edison Business Association, a volunteer labor task force can be mobilized to handle the more seasonal streetscape maintenance and plant care items such as pruning, mulching, and perennial or annual replacement plantings. To make these tasks more fun, and to instill a sense of ownership from the Portage Street business owners and the Edison neighborhood, a celebration of spring, or fall can be initiated along with a festival event such as a "Portage Street Playing in the Dirt Again Festival."

A second program should be initiated to allow business owners the opportunity to participate in the care of planting and/or furniture that is directly adjacent to their business. As a donor toward the care of those areas of the street they would achieve recognition from other participating business owners through marketing

exposure in the newspaper and possibly a plaque or sign placed in their selected planting bed.

The following is a list of general streetscape maintenance items, and a list that provides the anticipated care required for those items. However, these will vary and should not be held as a given, since there are many unknown variables such as the weather and vandalism:

Landscape plantings

- new seasonal plantings in pots (twice a year)
- replacement plantings (as required)
- watering (spring, summer and fall) average 3 times a week
- mulching (twice a year spring and fall)
- shrub and perennial pruning (average once or twice a year)
- curb lawn overseeding / aeration (fall, spring)

Site Paving

- Sidewalk cleaning – repairs as needed
- Paver replacements – as needed
- Sidewalk cleaning and snow removal – per city ordinance

Site Furniture

- Benches – painting or repairs
- Trash/Ash Receptacle – painting or repairs, cleaning and emptying
- Fencing – replacement sections, painting or repairs
- Bollards – paint touch-ups
- Bike Racks – painting

Site Lighting

- Fixture replacements – as needed
- Pole painting – (once every 3 years)
- Seasonal lights and banner installation/removals – as required for festivals and seasonal activities.

Bus Stops and Shelters

- Trash/Ash Receptacle – litter removal
- Bench repairs and painting
- Bus Shelter – Sponsor display panel coordination

In order to implement an effective maintenance program for Portage Street, the private maintenance of streetscape elements should be coordinated with the city's maintenance procedures and timing. This will help to provide a well-coordinated and organized maintenance plan for Portage Street.

Ideally, to ensure the most consistent quality maintenance for the streetscape, a maintenance program and contractor(s) should be retained and monitored by the Endowment Oversight Committee.

APPENDIX "11"

PLAN DEVELOPMENT PROCESS

PLAN DEVELOPMENT PROCESS

The creation of a well-planned process was essential to the successful development of a well-conceived Streetscape Master Plan for the Portage Street corridor. Both a project timeline and a brief summary are provided that record the public meetings and the sequence of events for the "Portage Street Streetscape Master Plan" project.

Project Events Timeline

To provide an overview of the project events and the plan development process, an outline conveys the sequence of events required to develop the Portage Street Streetscape Master Plan.

September 29, 2003

- **Project Data Collection Meeting**

The purpose of the meeting was to collect project base information and prior design studies that were used to build the foundation for design of the Master Plan. The meeting was held with the City of Kalamazoos representative, Downtown Kalamazoo Incorporated (DKI), and the master plan designers of Gove Associates. A list of existing available data was inventoried, with a punch list of items to be acquired from the City and affiliated agencies.

November – January 2004

- **Interview and Survey of the Portage Business Owners**

To define an appropriate design for the Portage Streetscape Master Plan, it was essential to gain public input from the business owners along the street study area. To gather and analyze this information, the business owners were interviewed and surveyed to determine the appropriate design elements to include in the streetscape design for Portage Street.

December – February 2004

- **Portage Street Site Analysis and Evaluation Report**

As part of the data collection process, an on-site inventory and analysis was conducted of the project area existing site conditions along Portage Street. This included a site review which provided an analysis of existing site condition factors in the project study area such as street lighting, on-street parking, pedestrian patterns, signage, overhead wires, trees and miscellaneous items.

January 27, 2004

- **Streetscape Orientation: Public Meeting #1**

Portage Streetscape Design Elements: "Imagine the Possibilities"

One of the most important factors that needed to be established was to provide a definition of the streetscape design and elements that make up a typical streetscape design. Additionally, the goal was to help the public visualize the possibilities that could be achieved in the new design for Portage Street. To convey the basics of streetscape design, Gove Associates provided a PowerPoint presentation to the Business Owners and the City of Kalamazoo Representatives so that a thorough understanding of Streetscape design principles could be established. With this information, business owners could make well-founded decisions as to what design elements they would like to see in the new streetscape design for Portage Street.

February 2, 2004

- **Business Owner Interview / Survey Results: Public Meeting #2:**

To unveil the Portage Street Business Owner Interview results, Gove Associates produced a PowerPoint Presentation to illustrate the interview survey questions and answers. The resulting consensus was presented which indicated the design element preferences that the business owners preferred for the streetscape design. Additionally, there was discussion about potential design ideas and specific Portage Street issues.

February 17, 2004

- **Site Meeting and Utility Companies Estimates of Probable Costs**

For the many existing power pole and cables to be put underground is a primary segment of the streetscape estimate of probable costs. Gove Associates held a site meeting with representatives of the power company (Consumers Energy), the television cable company (Charter Communications), the telephone cable company (SBC Ameritech) and the fiber optic cable company (Midwest Communications), to review the entire Primary Corridor work study area. The utility companies were asked to provide an estimate of probable costs to underground their own utility for each district within the Portage Street Primary Corridor. The costs were provided to Gove Associates in late February.*

*SBC Ameritech did not provide a cost estimate.

March 1, 2004

- **Design Review Meeting with Edison Mainstreet Design Committee**

The purpose of this meeting was to review the Portage Street Business Owner Survey results, detailed schematics of the intersection designs, lighting design alternatives, discuss design linkages to the Kalamazoo Farmers Market and Upjohn Park, to present the probable cost to place street utilities underground, and discuss traffic study items.

May 7, 2004

- **Design Approval and Consensus: Public Meeting #3**

The goal of this meeting was to present the schematic design concept plans and design material presentation boards to the public. The purpose of the meeting was to obtain final approval and identify any design areas that required improvement. A suggestion made was the preference to have pedestrian streetlights that could cast a downward angle that is shielded from the vision of travelers and pedestrians. There was a suggestion that native plants and a good mixture of plant varieties be included to prevent the onset of disease, which might eliminate a certain plant species.

May 13, 2004

- **Final Schematic Design Approval Meeting: Public Meeting #4**

Gove Associates presented the design concept plan to the Portage Street business owners. The purpose of the meeting was to finalize approval of the design schematics so that the design development plans could begin. The public show of hands indicated full support of the design plans

May 14 - July 2004

- **Schematic Design Plan Drawings and Streetscape Design Palette Presentations**

Following the survey results and the design presentation to the business owners and the Edison Mainstreet Design Committee, an open invitation was extended to the Portage Street Business Owners to encourage them to review the plans and to provide feedback, to support or to change the schematic design plans, and the streetscape planting, lighting, paving and furniture boards, including proposed light fixtures that were on display in the conference room of Gove Associates. The Portage Street Business Owners were in support of the Portage Streetscape

Master Plan Schematic Plans and Sketches, and they also approved the plant palette, paver palette, lighting palette, and the furniture palette.

July 1, 2004

- **Wayfaring Design Meeting at Gove Associates**

Wayfaring sign design concepts were discussed for the Portage Street Primary Corridor with DKI. Gove proposed the Wayfaring sign system to be the same as the downtown system.

July 15, 2004

- **Final Schematic Design Consensus: Edison Mainstreet Design Committee Review**

Final presentation was conducted by Gove to the Design Committee of the Schematic Design District plans, and detailed design element boards for the entire Portage Street Primary Corridor. All the four districts' designs were approved.

August 24, 2004

- **City Parks Review Meeting**

A representative of the city requested that the Reed Avenue Park be considered in the design process. A Reed Avenue park improvements budget was provided to Gove Associates and DKI, so some elements could be incorporated in the design for the streetscape.

October, 2004

- **Traffic Study Review**

The Traffic Study was reviewed and approved by the City of Kalamazoo Engineering Department (see Appendix B for review)

December, 2004

- **Master Plan Report Outline and Deliverables Review**

DKI reviewed a draft outline of the final report and the final deliverables for the project.

November 12, 2004

- **Design Coordination Meeting with the City and Downtown Design Planners**

Gove Associates presented the streetscape design plans to the city engineers, and downtown plan designers "Land Design Associates" and "Pollack Design Associates," to coordinate downtown planning with the Portage Streetscape Design Plans.

November 22, 2004

- **Design Workshop Meeting with the Cities Downtown Design Planners**

DKI scheduled an initial design workshop including the Portage Streetscape Designers, Gove Associates, the downtown plan designers "Land Design Associates" and "Pollack Design Associates," members of the Edison Mainstreet Design Committee, and representatives of the City of Kalamazoo engineering department, to discuss possible rerouting of the Portage Gateway District to allow a more pedestrian friendly route to the downtown and provide a pedestrian friendly campus for both the Pfizer Corporation and Bronson Hospital.

December 2, 2004

- **City Engineering Meeting: Traffic Signal Pole Grant Funding (CMAQ)**

A coordination meeting was conducted to discuss the traffic signal pole and signal head grant funding requirements, and the preferred signal pole specifications and locations.

October 2004 – March 2005

- **Final Master Plan Report and Reviews**

DKI, the Edison Mainstreet Design Committee and the City reviewed a series of draft reports, to be sure a fully coordinated report is accomplished.

September 2004 – March 2005

- **Streetscape Design Development Plans and Deliverables**

A draft of the Portage Streetscape design development plans was prepared, including design sketches, boards, supplemental reports, design outline

specifications, implementation strategy and estimates of probable costs, for review by DKI and the Edison Mainstreet Design Committee.

February 18, 2005

- A report review was conducted at the offices of DKI to receive feedback on the report draft from DKI and the City.

March 2005

- A second review meeting to be conducted with the City Arborist and Maintenance Department to undertake a final review of the plant palette, and to discuss any issues and concerns.