Howard/Stein-Hudson Associates, Inc.
CREATIVE SOLUTIONS • EFFECTIVE PARTNERING

MEMORANDUM

To:	Kathy Mullaney Projects Administrator, Permanent Building Committee	Date: August 30, 2013
From:	Robbie Burgess, P.E. Elizabeth Peart	HSH Project No.: 2010190
Subject:	Tolles-Parsons Center Pedestrian Crossing Recommendations for Washington Street	

The purpose of this memorandum is to discuss the methodology used to in the design development for the proposed pedestrian crosswalk for the Tolles-Parsons Center (Center).

The goal of the proposed crosswalk is to provide safe and convenient pedestrian crossing opportunities that will effectively serve all land uses within along the subject portion of Washington Street while minimizing the impact on vehicle movement and on-street parking.

Existing Conditions

HSH evaluated the section of Washington Street from Morton Street to Wellesley Avenue that includes two existing crosswalks; one at the Wellesley Police Department (WPD) Driveway and one serving the St. Paul Church. This area was examined because the development of the Center will generate additional pedestrian traffic as well as shift existing pedestrian trips to the proposed Center crosswalk. Other pertinent information is below.

- The existing on-street parking supply within the area studied is approximately 40 spaces;
- Automatic Traffic Recorder data indicate this area of Washington Street carries approximately 16,400 vehicles per day;
- The existing crosswalk near St. Paul's Church has a pedestrian actuated amber flashing beacon that acts as a warning to motorists;
- The existing crosswalk near the WPD has no warning signal; and
- The 85th Percentile speed on Washington Street eastbound is 32 mph and 33 mph westbound.

Methodology

Because the Center is expected to relocate existing pedestrian crossings and generate new pedestrian crossings the first step was to evaluate if the crossing will require a fully functional traffic signal—one that will remain in the green phase until a pedestrian actuates a push-button, then cycle from yellow to red and return to green after the pedestrian call has been satisfied. Other options such as a hybrid pedestrian beacon or improved static signage were also evaluated.

Traffic Signal Warrants

The Manual of Uniform Traffic Signal Control Devices (MUTCD) provides recommendations for the installation of traffic signals at intersections and other locations in the form of nine Warrants. If any of these are met, along with the application of engineering judgment, a traffic signal is recommended for installation. The warrants are as follows:

- Warrant 1—Eight Hour Vehicular Volume;
- Warrant 2—Four Hour Vehicular Volume;

- Warrant 3—Peak Hour Vehicular Volume;
- Warrant 4—Pedestrian Volume;
- Warrant 5—School Crossing;
- Warrant 6—Coordinated Signal System;
- Warrant 7—Crash Experience;
- Warrant 8—Roadway Network; and
- Warrant 9—Railroad Crossing.

Warrants 1through 4 are vehicular volume based warrants used for applications when side-street traffic is attempting enter a main street. These warrants do not apply.

Warrant 4, the Pedestrian Volume warrant was examined in detail. This warrant is satisfied when the volume of main street traffic is large enough and the demand to cross the main street is high enough that not enough gaps exist in the existing traffic to allow pedestrians to cross.

Warrant 4 is further aggregated to consider two conditions; a peak single hour with high traffic volumes combined with high pedestrian demand, and a four-hour period with lower traffic volume and lower but steady pedestrian demand.

- To satisfy the peak hour, approximately 1,500 vehicles per hour are required combined with at least 133 pedestrian crossings.
- To satisfy the four-hour condition 1,100 vehicles per hour are needed each hour for four hours along with 107 pedestrian crossings per hour for each hour.

HSH employed a conservative approach considering significant traffic growth and a combination coinciding pedestrian demands. **Table 1** shows the estimated weekday pedestrian demand for the Center crosswalk, based on assumed new and relocated crossings as the crosswalk does not exist.

As the table indicates, the average per hour pedestrian crossings are approximately 33 per hour and the peak crossing is 49 per hour. These values are significantly below the requirements to meet the warrants.

The second component of the Pedestrian Volume warrant is the requirement for Washington Street traffic volumes to exceed 1,100 vehicles per hour for four hours or exceed 1,500 vehicles for a single hour. Existing volume date indicates that there are four hours that approach the volume threshold (over 1,000 vehicles per hour, but under 1,100 vehicles per hour) but do not satisfy it. Similarly, the existing peak hour volume at 1,265 vehicles per hour does not satisfy the requirement.

Analogous to the traffic study, existing traffic volume data was increased by 1% per year and re-evaluated. Although closer to satisfying the volume requirement, the increase of 5% still did not.

Warrant 5 does not apply as the existing crosswalk to service the school at St. Paul's will remain and Warrants 6-9 do not apply.

In summary, the Washington Street volume although near minimum thresholds does not meet the lowest required vehicle volumes to satisfy Traffic Signal Warrant 4. More importantly, the pedestrian volumes estimated for this location are well below the minimum requirements. HSH has concluded that a full traffic signal is not warranted given the conditions examined.

Table 1 Trip Estimate for Center's Proposed Washington Street Pedestrian Crossing

Pedestrian Generator	Time of Day (weekday)									
	6 a.m. to 7 a.m.	7 a.m. to 8 a.m.	8 a.m. to 9 a.m.	9 a.m. to 10 a.m.	10a.m. to 11 a.m.	11a.m. to 12 p.m.	12 p.m. to 1 p.m.	1 p.m. to 2 p.m.	2 p.m. to 3 p.m.	3 p.m. to 4 p.m.
Center parkers at WPD lot walking to/from the Center				23	19	18	17	15	12	23
Morton Circle and Washington St. studio residents (senior housing) walking to/from the Center [1]				13	11	10	9	8	7	13
Morton Park visitors walking to/from the park and locations on south side of Washington Street.					5	5	5	5	5	5
Public parkers along both sides Washington Street spaces walking to/from locations on opposite side of street [2]		8	8	8	8	8	8	8	8	8
Total	0	8	8	43	43	41	39	36	32	49

1) In total, these two developments have 72 units of housing. Assume 36 residents visit the Center daily.
2) Walking trips in this row are not related to St. Paul or the Center. It is assumed that pedestrians destined to St. Paul Parish and School will use the Washington Street crosswalk directly in front of St. Paul's Parish.

Pedestrian Hybrid Beacon

The MUTCD provides other installations when the requirements for a full traffic signal are not met. A pedestrian hybrid beacon can be installed. The Hybrid Beacon can be post mounted similar to existing traffic signals or can be a HAWK (High-Intensity Activated CrossWalK Beacon) Similar to a full pedestrian signal, a hybrid beacon is activated by pedestrian push buttons and legally stops traffic for pedestrians.

> *A pedestrian hybrid beacon is a special type of hybrid beacon used to warn and control traffic...to assist pedestrians in crossing a street or highway at a marked crosswalk.*

The threshold for a Hybrid Beacon signal is 20 pedestrian crossings per hour and a two-way vehicle volume of approximately 1,625 vehicles per hour. The lower pedestrian volume requirement with a HAWK beacon indicates that such a beacon is generally installed at locations with lower pedestrian demand.

At the Center location on Washington Street, the pedestrian threshold is met for the Hybrid Beacon but similar to Traffic Signal Warrant 4, the traffic volume threshold is not. However, it is our opinion that engineering judgment applied to the parameters set forth in this memorandum support the installation of a Pedestrian Hybrid Beacon.

The Hybrid Beacon has several benefits for this application. First, it provides many of the same functions as full traffic signal. It is pedestrian actuated, provides a "red" indication to stop traffic, provides WALK/DON'T WALK and count down pedestrian timers. Also the Hybrid Beacon remains dark when not in use which adds to effectiveness as it will not become commonplace to drivers. A full traffic signal that indicates a "green" phase much of the time can become less effective as drivers become accustomed to the "green" signal.

Reccomendations

HSH recommends a series of measures be taken to effectively organize and delineate pedestrian crossings on Washington Street within the study area of the Tolles-Parsons Center:

1—Install Hybrid Pedestrian Beacon east of the Senior Center as shown on HSH's plan. This will be conveniently located for multiple land uses and will have minimal impact on residences. The hybrid beacon can be installed post mounted, or overhead on a mast arm. Existing trees may need to be pruned and street lights may need to be relocated.

2—Remove the crosswalk at the WPD. The extremely low demand that exists for this crosswalk can be relocated to the proposed crosswalk.

3—Retain the existing St. Paul crosswalk. The distance between the new hybrid beacon and the existing St. Paul crosswalk will be about 340 feet. This distance should be sufficient to safely allow for retaining the existing St. Paul crosswalk (with existing control) and installing the new hybrid beacon for the Center.

4—Inform the Public. If a Pedestrian Hybrid Beacon is installed, provide public outreach, education, and demonstrations to allow drivers and pedestrians to understand this newer signal type. Demonstrations can be done with traffic control assistance from the WPD to provide a safe environment for the demonstration.

5—Monitor results. After these improvements are made, the Town should monitor crosswalk operations to ensure that the new hybrid beacon and existing St. Paul crosswalk are providing safe and efficient movement of Washington Street pedestrians and vehicles.

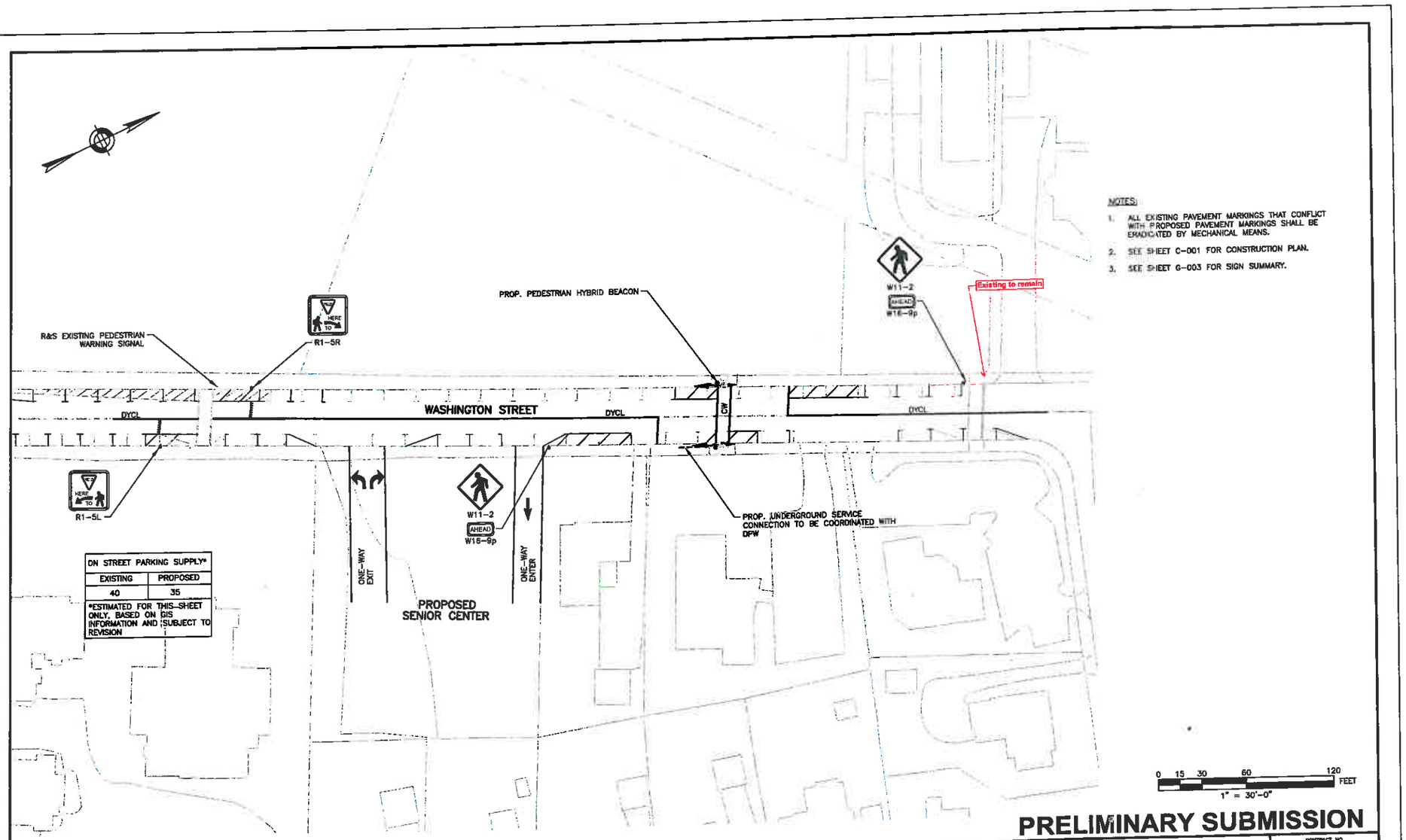
Conclusions

A review of the available data indicates that the Washington Street traffic volumes, and projected pedestrian crossing demand, do not meet the requirement for full pedestrian signal However, there will be periodic times when pedestrians can benefit from alerting vehicles of their presence in the crosswalk., and legally stopping vehicles prior to the crosswalk.

It is our conclusion that, at this Washington Street location, a Pedestrian Hybrid Beacon can provide the necessary driver information and pedestrian information in the form of overhead or post mounted signals to alert drivers and WALK/DON'T WALK indications for pedestrians.

In the absence of traffic volume projections that will exceed those required for a full traffic signal, **we recommend installation of a Pedestrian Hybrid Beacon as the most appropriate for this location.**

Because this installation would be somewhat new to Wellesley, we also recommend a campaign to educate drivers prior to activating the beacon. This could include temporary signage, operational demonstration for the community, notices in the Town newspaper, and information on the Town government website.



NOTES:

1. ALL EXISTING PAVEMENT MARKINGS THAT CONFLICT WITH PROPOSED PAVEMENT MARKINGS SHALL BE ERADICATED BY MECHANICAL MEANS.
2. SEE SHEET C-001 FOR CONSTRUCTION PLAN.
3. SEE SHEET G-003 FOR SIGN SUMMARY.

PRELIMINARY SUBMISSION

Howard/Stein-Hudson Associates, Inc.
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617.482.7080

DATE: 29 AUG 2013
SCALE: 1"=30'-0"

DESIGNED BY: R. BURGESS
DRAWN BY: R. BURGESS
CHECKED BY: D. MATTON
APPROVED BY: T. STOKES

TOLLES-PARSONS CENTER PEDESTRIAN SIGNAL DESIGN AND SIDEWALK IMPROVEMENTS

TRAFFIC PLAN

CONTRACT NO. 2008152
DRAWING NO. T-001
SHEET 5 OF 6

BETA
ENGINEERING SUCCESS **TOGETHER**

August 30, 2013

Mr. Hans Larsen, Executive Director
Board of Selectmen
Town of Wellesley
525 Washington Street
Wellesley, Massachusetts 02482

Re: **"Tolles-Parsons Senior Center Transportation Study – Final Report" Review** **4505-04**

Dear Mr. Larsen:

Per your request, BETA Group, Inc. (BETA) has reviewed the "Tolles-Parsons Senior Center Transportation Study - Final Report" dated August 5, 2013. This report is a revision of a previous report; submitted on September 3, 2009; that proposed a 14,500 square foot Senior Center to be located at 496 Washington Street. The revision was submitted to update traffic analysis based on 2012 traffic volumes and to incorporate an additional 22 parking spaces proposed within the expanded Wellesley Police Department (WPD) parking lot, which is located just north of the proposed Senior Center. The program for the proposed facility did not change. Our comments are discussed below.

Study Area
The study proposes to relocate the Wellesley Senior Center from its existing location in the basement of the Wellesley Community Center, at 219 Washington Street, to a new free-standing building at 496 Washington Street, formerly an American Legion site.

The study area includes four intersections nearby the proposed Senior Center site:

- Washington Street (Route 16)/State Street/Kingsbury Street
- Washington Street (Route 16)/Wellesley Avenue/Brook Street
- Washington Street (Route 16)/Central Street (Route 135)/Grove Street
- Washington Street (Route 16)/Morton Street/WPD Driveway

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It was noted that the proposed Senior Center site will include two driveways, one exclusive entrance and one exclusive exit. These two driveways were also included in the analysis. BETA finds the study area appropriate.

Existing Traffic Volumes
The proponent collected peak hour turning movement volumes at the Washington Street (Route 16)/Morton Street/WPD Driveway intersection on Thursday, May 23, 2013. All other study area intersections were examined using volumes collected in 2012. Data collected in 2012 were adjusted using a 1% annual growth rate to estimate respective 2013 volumes. BETA finds this methodology appropriate.

Existing Intersection Operations
Using the new traffic volume data, the proponent found:

- The intersection of Washington Street/State Street/Kingsbury Street operates at LOS D/E in the AM Peak Hour and LOS C/D in the PM Peak Hour.
- The intersection of Washington Street/Wellesley Avenue/Brook Street operates at LOS C/D in both AM and PM Peak Hours.
- The intersection of Washington Street/Central Street/Grove Street operates at LOS E/F in the AM Peak Hour and LOS D/E in the PM Peak Hour.
- All approaches of the unsignalized intersection of Washington Street/Morton Street/WPD Driveway operate at LOS D or better in both AM and PM Peak Hour.

BETA finds this analysis acceptable.

Crash History
Crash data were obtained from the Wellesley Police Department for the study area intersections between 2010 and 2012. Within the three years, 25 crashes occurred at Washington Street/Kingsbury Street/State Street; 6 crashes occurred at Washington Street/Wellesley Avenue/Brook Street; 9 crashes occurred at Washington Street/Central Street/Grove Street; and 14 crashes occurred at Washington Street/Morton Street/WPD Driveway.

BETA finds this analysis acceptable.

Existing Parking Conditions
The existing parking conditions along Washington Street were examined in 2009 and 2012. The existing site provides 15-20 parking spaces, while Washington Street provides 48 public on-street spaces between Wellesley Avenue and Morton Street. The on-street parking is signed for two-hour parking only. The site has been turned into an informal parking lot, utilized by the adjacent church/school.

Existing Pedestrian Facility Conditions
The proponent conducted sidewalk and crosswalk inventories within the study area and found the overall condition of sidewalks to be in excellent or good condition. The existing crosswalk adjacent the St. Paul Parish provides flashing yellow beacons when the pedestrian pushes a call button.

No-Build (2018) Conditions
No-Build traffic volumes were estimated by applying a 1% growth rate per year for five years. This is consistent with other studies within the Town of Wellesley. Traffic volumes were also adjusted to account for nearby projects that might increase traffic in the study area. Two projects were researched: Wellesley High School, and 494 Washington Street. The Wellesley High School forecasts an increase in students by 2017, these trips were added to the network. The 494 Washington Street Project proposes the addition of eight new condominium units. These projected trips were also added to the network. Future volumes from the Wellesley Inn project were included in the analysis. BETA finds this acceptable.

No-Build (2018) Traffic Operations
Using the adjusted No-Build traffic volume data, the proponent found:

- The intersection of Washington Street/State Street/Kingsbury Street continues to operate at LOS D/E in the AM Peak Hour and LOS C/D in the PM Peak Hour.
- The intersection of Washington Street/Wellesley Avenue/Brook Street degrades to LOS D in the AM Peak Hour, but continues to operate at LOS C in the PM Peak Hour.
- The intersection of Washington Street/Central Street/Grove Street degrades to LOS F in the AM Peak Hour and continues to operate at LOS D/E in the PM Peak Hour.
- All approaches of the unsignalized intersection of Washington Street/Morton Street/WPD Driveway operate at LOS E or better in both the AM and PM Peak Hours.

BETA finds this analysis acceptable.

Trip Generation
Since the Institute of Transportation Engineers *Trip Generation Manual* does not include a specific land use for Senior Centers, the proponent collected empirical data for the existing Wellesley Senior Center location and three other Senior Centers in similar towns, including Franklin, Marshfield, and Winchester, Massachusetts. The proponent concluded that the proposed Senior Center will draw approximately 150 visitors per day based on the proposed program. BETA finds this estimate acceptable.

Mode Share
Mode share was determined in the 2009 study and was retained for this study. BETA finds the mode share percentages to be appropriate.

New Trips
The amount of added trips attributed to the study area network was determined in the 2009 study and were retained for this study. BETA finds this estimation to be appropriate.

Trip Distribution
Trip distribution was determined in the 2009 study and was retained for this study. BETA finds the trip distribution appropriate.

Build (2018) Traffic Operations
Using the adjusted Build traffic volume data, the proponent found:

- The intersection of Washington Street/State Street/Kingsbury Street continues to operate at LOS D/E in the AM Peak Hour and LOS C/D in the PM Peak Hour.
- The intersection of Washington Street/Wellesley Avenue/Brook Street continues to operate at LOS D in the AM Peak Hour and LOS C in the PM Peak Hour.
- The intersection of Washington Street/Central Street/Grove Street continues to operate at LOS F in the AM Peak Hour and LOS D/E in the PM Peak Hour.
- All approaches of the unsignalized intersection of Washington Street/Morton Street/WPD Driveway operate at LOS E or better in both the AM and PM Peak Hours.
- The Senior Center entrance driveway was found to operate at LOS A for both Washington Street approaches in both AM and PM Peak Hours.
- The Senior Center exit driveway was found to operate at LOS E in the AM Peak Hour and LOS C in the PM Peak Hour.

BETA finds this analysis acceptable.

Future Parking Conditions
The proposed Senior Center will have 34 parking spaces on-site, and an additional 22 spaces in the expanded WPD parking lot. Washington Street, between Morton Street and Wellesley Avenue, contains 48 metered on-street spaces. These meters are limited to two-hour use. It is estimated that eight of these metered spaces will be removed to provide room for the new Senior Center driveway, and a crosswalk that will replace the existing crosswalks at the WPD driveway. In total, this yields 56 off-street parking spaces, and 40 on-street parking spaces that are available for use of the Senior Center. It should be noted that the on-street spaces will also be used by St. Paul Parish School/Church activities.

Since the Institute of Transportation Engineers *Parking Generation Manual* does not include a specific land use for senior centers, the proponent estimated potential parking using the previously discussed parking studies and trip generation estimations. The proponent determined that all Senior

Center vehicles could be accommodated by the 56 parking spaces provided within the on-site parking lot and the adjacent WPD parking lot. BETA finds this acceptable.

Sight Distance
The proponent performed a sight distance analysis for both proposed Senior Center driveways and found the available Stopping Sight distance to be sufficient. BETA finds this acceptable.

Roadway and Parking Impacts
Since this project does not greatly increase traffic volumes outside of typical traffic growth, this project **does not meet the Project of Significant Impact requirements for impacted intersections.** Parking needs for the proposed Senior Center can be contained on-site and within the WPD parking lot.

Site Plan Review
The proposed site plan shows a two-lane egress driveway. We question the need for two lanes based on the low exiting traffic volume for the site. We recommend that the egress driveway be stripped for one lane, or the driveway width be reduced to one lane.

The crosswalk at the WPD driveway will be relocated to the **east** of the proposed Senior Center site. Since the crosswalk at the St. Paul Parish will be maintained, we recommend that the relocated crosswalk be spaced at least 300' from the St. Paul Parish crosswalk.

New Signalized Crosswalk Warrant Analysis
In a draft memorandum and an updated memorandum dated August 22, 2013 and August 30, 2013 respectively, the proponent provided a signal warrant analysis for the proposed crosswalk on Washington Street to be located east of the proposed Senior Center. This crosswalk would replace the existing crosswalks at the WPD driveway. The proponent examined warrants for a traditional traffic signal system and a Hybrid Pedestrian Beacon.

Based on the estimated pedestrian and vehicle volumes passing by this crosswalk, this location was not found to meet the traditional traffic signal warrants. The warrant analysis assumes that the St Paul crosswalk will remain in-place. This location did meet the Hybrid Pedestrian Beacon signal warrant for pedestrian volumes (43 vs. 20), but failed to meet the signal warrant for vehicle volumes (1,220 vs. 1,625). Based on the warrant analysis, the proponent proposes the installation of a Hybrid Pedestrian Beacon system at this location. The Hybrid Pedestrian Beacon signal would stop traffic to allow pedestrians to cross similar to the function of a traditional signal. BETA finds this acceptable.

The proponent proposes to keep the existing St Paul crosswalk and the pedestrian amber flashing signal beacon system. Since the spacing between this signal and the proposed Hybrid Pedestrian Signal Beacon meets the minimum requirement of 300 feet, we recommend that the amber flashing beacon system be kept. The potential confusion to motorists that these two pedestrian signal systems may cause should be monitored during the first half of the school year after the installation of the Hybrid Pedestrian Beacon signal system.

If we can be of any further assistance regarding this matter, please contact us at our office.

Very truly yours,
BETA Group, Inc.

Kien Ho, PE, PTOE
Vice President

cc: Terry Connolly, Deputy Director; Tyler de Ruiter, EIT

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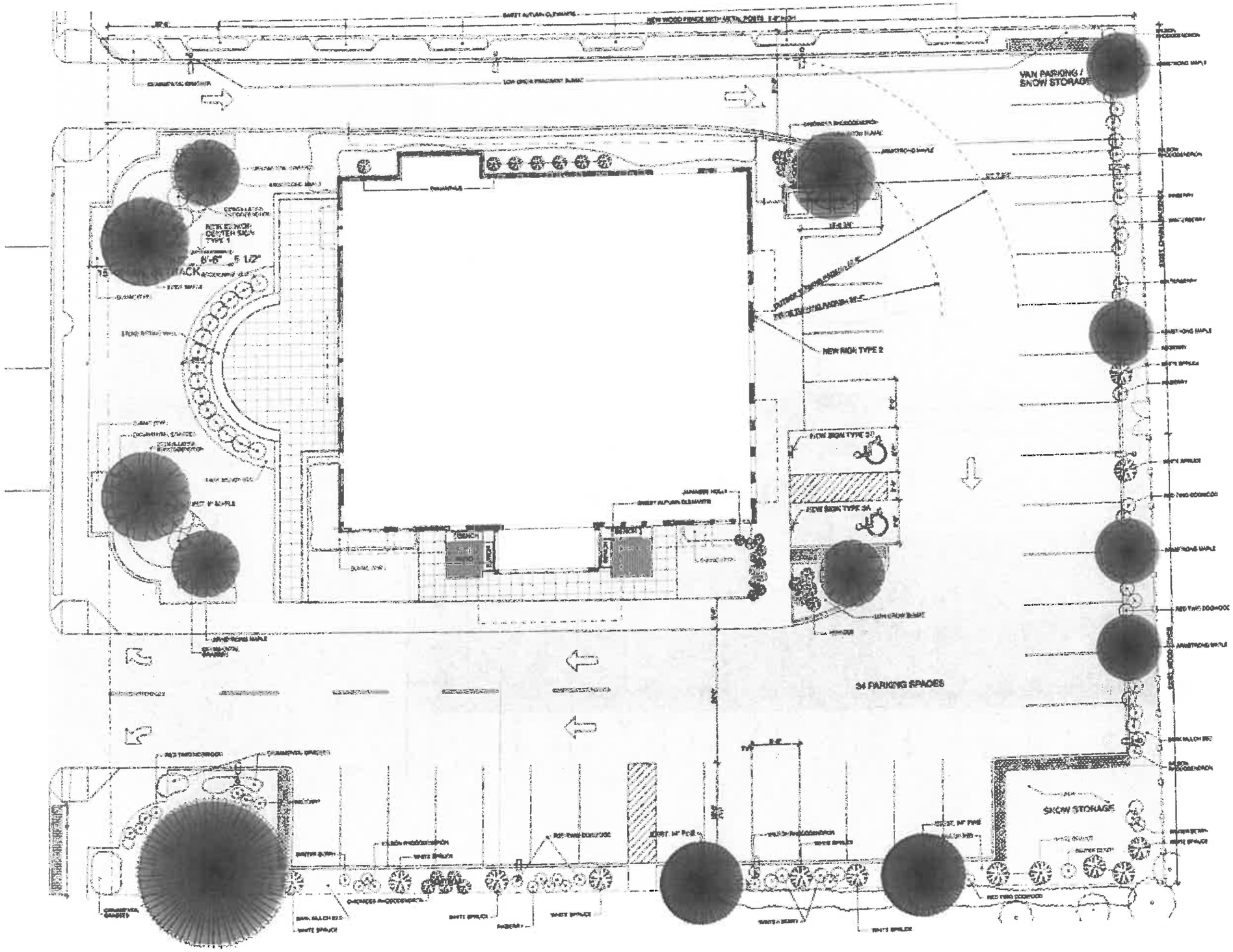
Tolles-Parsons Site 1 Parking Area



Police Station Parking Lot