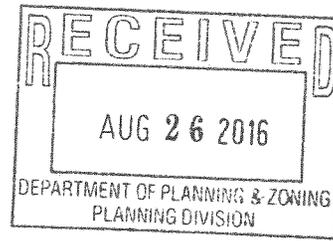


**WELLS + ASSOCIATES**  
MEMORANDUM



**To:** Kristin Calkins  
Fairfax County Department of Transportation

**From:** Michael J. Workosky, PTP, TOPS, TSOS  
John A. Schick

**Re:** Mt. Daniel School  
Fairfax County, Virginia

**Subject:** Traffic Impact Assessment Addendum

**Date:** August 24, 2016

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**INTRODUCTION**

This memorandum serves as an addendum to the Mt. Daniel School Traffic Impact Assessment, dated October 23, 2015, for the Mt. Daniel School located on N. Oak Street in Fairfax County, Virginia as shown on Figure 1.

The existing school is operated by the City of Falls Church and currently serves approximately 348 students in kindergarten and 1<sup>st</sup> grade. The original expansion plans for the school proposed a future student enrollment of 792 students with 84 staff members. The October 2015 TIA concluded that 792 students would not have a significant impact to the key intersections surrounding the site. However, in order to reduce potential impacts and delays along N. Oak Street, the study recommended that the expansion be reduced to 742 students.

Since the October submission, the school building has been modified and the student population has been reduced to a maximum of 660 students and approximately 72 staff members. The updated site plan is shown on Figure 2.

This addendum analyzes the direct impacts of the reduction in students, and includes a trip generation comparison, on-site queuing requirements, and the estimated delays along N. Oak Street. It also discusses potential additional vehicular access to the school from Highland Avenue and Woodland Drive.



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### TRIP GENERATION COMPARISON

The existing Mt. Daniel School serves approximately 348 students in kindergarten and 1<sup>st</sup> grade and has 67 staff members. Plans have since been revised to reduce the expanded Mt. Daniel school development program to a maximum of 660 students and approximately 72 staff members.

The school currently generates 106 AM peak hour trips (78 in and 28 out), 84 midday peak hour trips (35 in and 49 out), and 105 PM peak hour trips (58 in and 47 out). Based on an established rate from the existing traffic counts, the maximum proposed enrollment of 792 students was forecasted to generate 238 AM peak hour trips (176 in and 62 out), 186 midday peak hour (76 in and 110 out), and 238 PM peak hour trips (132 in and 106 out). The current proposal of 660 students is expected to generate 199 AM peak hour trips (147 in and 52 out), 156 midday peak hour trips (64 in and 92 out), and 199 PM peak hour trips (110 in and 89 out). Thus, when compared to existing conditions, the proposed school expansion would generate 93 additional AM peak hour trips, 72 additional midday peak hour trips, and 94 additional PM peak hour trips.

Under the existing conditions, the school operates five (5) school buses achieving a bus ridership of 82% during the AM peak period and 65% during the midday peak period. The increase in student enrollment to 660 would require the school to operate eight (8) school buses in order to maintain current bus ridership rates.

Refer to Table 1 for a comparison of the trip generation estimates.

### ON-SITE QUEUING

It is anticipated that on-site queuing for buses would increase from five (5) to eight (8) buses, and that private vehicle queues would increase from six (6) to 11 vehicles with the school expansion to 660 students during the critical AM peak hour. An illustration of the future conditions shown on Figure 3 indicates that up to 15-vehicle queue could be accommodated on-site without impacting bus circulation and that a queue of 23 total vehicles could be accommodated within the expanded parking lot.

### N. OAK STREET LINK ANALYSIS

As identified in the October TIA, N. Oak Street provides the sole vehicular access to and from the school. This roadway is a narrow two-lane residential street with vehicles parked on both sides, creating an inherent constraint since opposing motorists must yield in these areas. The link analysis results for N. Oak Street reported in the TIA for the AM peak hour in the northbound direction indicated that 792 students would



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degrade the level of service experienced by drivers along N. Oak Street by more than 10 seconds, or one letter grade level of service. The goal of the link analysis was to determine the maximum number of students that could be accommodated without causing more than ten (10) seconds of delay. Based on this metric, it was determined that 742 students was the maximum student population that could be accommodated along N. Oak Street, with an increase in delay of 9.8 seconds (refer to Table 2).

The link analysis was updated assuming the reduced enrollment of 660 students. The analyses indicate that the overall delay would increase by 7.0 seconds along N. Oak Street during the critical AM peak hour in the northbound direction. Thus, reducing the student enrollment would further reduce the overall delay by 2.8 seconds, and maintain the same level of service as existing conditions.

### POTENTIAL SECONDARY ACCESS SCHEMES

Two (2) alternatives have been identified as potential secondary vehicular access points that could serve the Mt. Daniel School – Highland Avenue and Woodland Drive. The following describes these two (2) alternatives and the concerns and issues associated with each.

**Highland Avenue.** Highland Avenue runs parallel to N. Oak Street along the west side of the site and currently serves as an emergency access drive to the school. A paved pedestrian path is currently provided. The driveway is currently narrow and intersects Highland Avenue just to the south of the Highland Avenue/Mt. Daniel Drive intersection.

Converting the emergency access to a full vehicular driveway would create an offset intersection with the all-way stop controlled Highland Drive/Mt. Daniel Drive intersection. This would essentially create two (2) adjacent intersections that would not meet spacing requirements and would create awkward turning maneuvers at the intersection. The new driveway may warrant separate turn lanes on Highland Avenue due to the amount of commuter traffic experienced during the PM peak hour. Separate turn lanes would be difficult to provide given the intersection offset, land constraints, and topography. There would also be associated impacts due to the increase in school traffic along Highland Avenue.

If access was provided via Highland Drive, it would connect to the existing paved areas on the northwest side of the building and be used for drop-off/pick-up only (no parking provided) since this driveway would be unable to connect to the main parking area in front of the school. Since parking would likely only be provided on the east side in front of the school, staff and visitors would not be able to use this access point, limiting its effectiveness.



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**Woodland Drive.** Woodland Drive runs along the northern (rear) of the school's property line. It also has been suggested as a potential secondary access point to/from the school. This driveway would connect to the front parking lot via the east side of the school. This driveway would require overcoming steep elevation changes and likely require high retaining walls given the steep slopes in this area. There would also be environmental impacts (buffer, stormwater, etc.) associated with construction of the driveway which would encroach into the wooded conservation easement surrounding the school. This would result in the loss of trees, outdoor play areas, and parking potentially leading to safety issues for the children due to the need for excessive retaining walls. In addition, Woodland Drive would likely require to be upgraded from the school driveway to Great Falls Street since it appears to be in substandard condition.

A new school driveway on Woodland Road would experience an increase in vehicle trips, and would require all site traffic to use the Woodland Drive/Great Falls Street intersection. This would likely require improvements at the intersection to include separate turn lanes on Great Falls Street and/or Woodland Road. In addition, it appears that there may be limited sight distance at this intersection due to existing trees, structures, utility poles, and the crest of the bridge spanning I-66 that could require the relocation of existing utilities and/or other significant and costly improvements. The need for the potential improvements listed above and impacts to adjacent properties make this a difficult location for secondary access.

It is also noted that these access points are not required from a capacity perspective since all of the intersections surrounding the site are forecasted to operate at acceptable levels of service during the AM, midday, and PM peak hours, with the exception of the southbound approach at the Highland Avenue/West Street intersection that is associated with evening commuter traffic.

### CONCLUSIONS

The previously prepared Traffic Impact Analysis for the Mt. Daniel School indicated that while the intersections surrounding the site could adequately accommodate the proposed expansion to a maximum of 792 students, it recommended a reduction to 742 students to minimize traffic impacts and delays along N. Oak Street.

The expansion plan for the school has been modified to reflect a maximum enrollment of 660 students that would further reduce delays experienced along N. Oak Street and have less impact on the surrounding neighborhood.

Recommended traffic mitigation measures suggested in the original TIA would continue to apply to the reduced site plan to ensure high bus ridership and less dependence on single-occupancy vehicle traffic. A maximum enrollment of 660



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students is not expected to have detrimental impacts on the surrounding roadway network, and would maintain similar levels of service for motorists along N. Oak Street as experienced under current conditions.

The reduction in student population would also reduce on-site queuing during peak periods, and could be effectively managed on-site without impacting the public street system.

While alternative access could be provided at Highland Avenue or Woodland Road, these access points would likely require major geometric improvements in order to be implemented. There may also be land impacts and/or environmental constraints associated with these improvements that would need to be addressed. Further, the traffic study indicated that additional access points were not required from a capacity perspective. Thus, while these new driveways might improve school circulation and reduce impacts along N. Oak Street, they would appear to have limited benefit to the surrounding road network.

Questions regarding this document should be directed to Wells + Associates.

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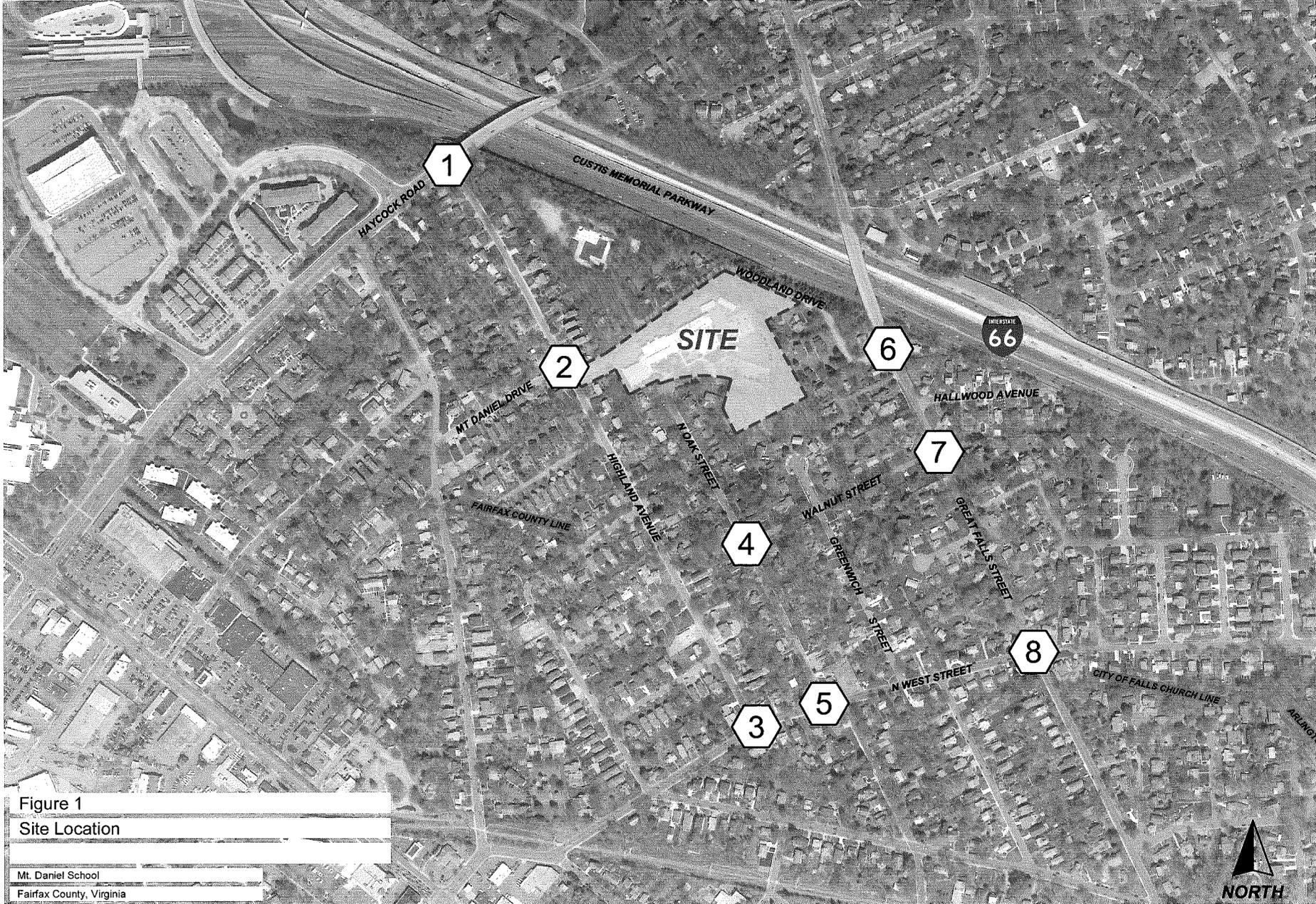


Figure 1  
 Site Location

Mt. Daniel School  
 Fairfax County, Virginia

JCP



□

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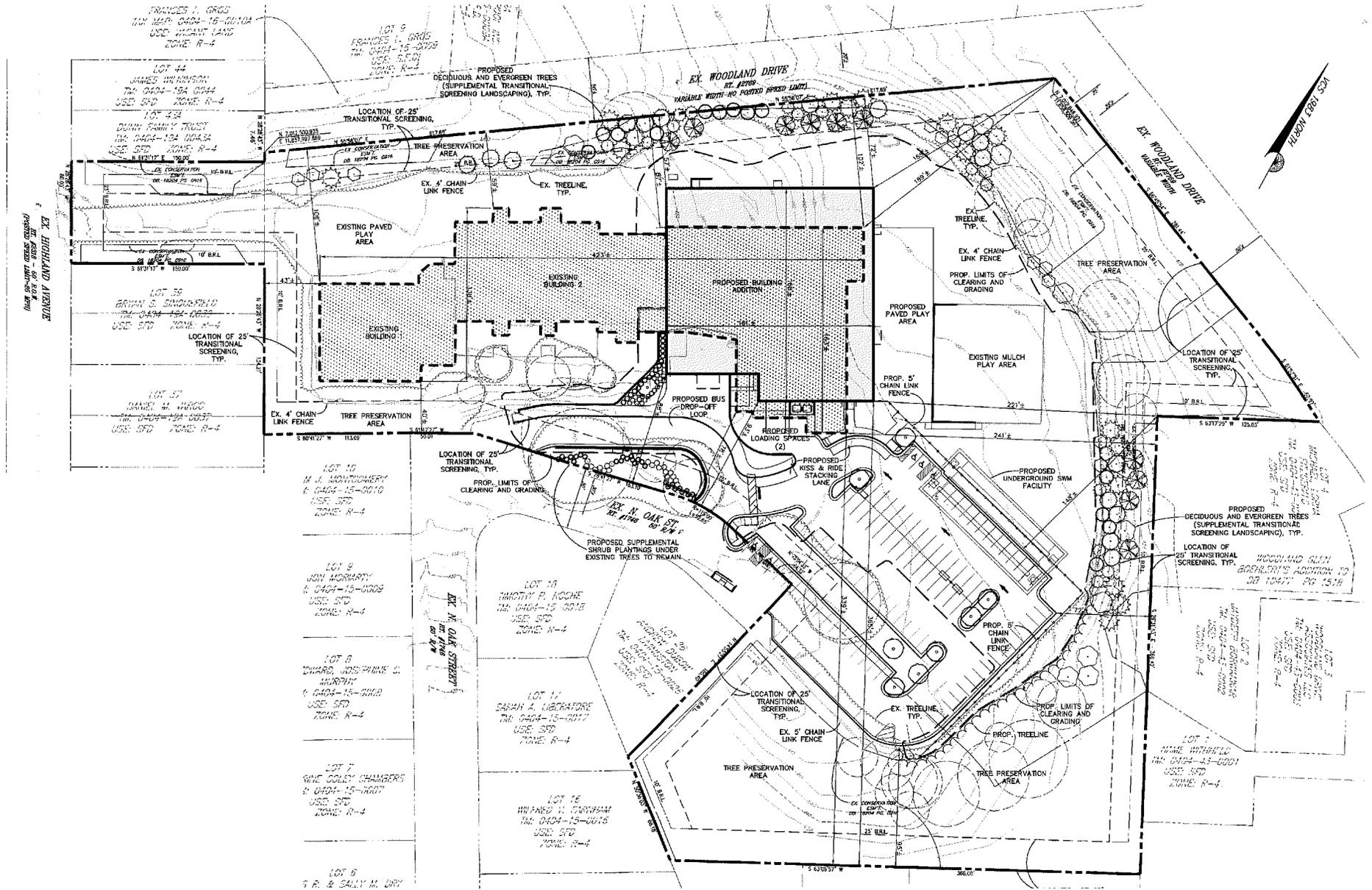


Figure 2  
Proposed Site Plan (Maximum Student Population: 660)

Mt. Daniel School  
Fairfax County, Virginia



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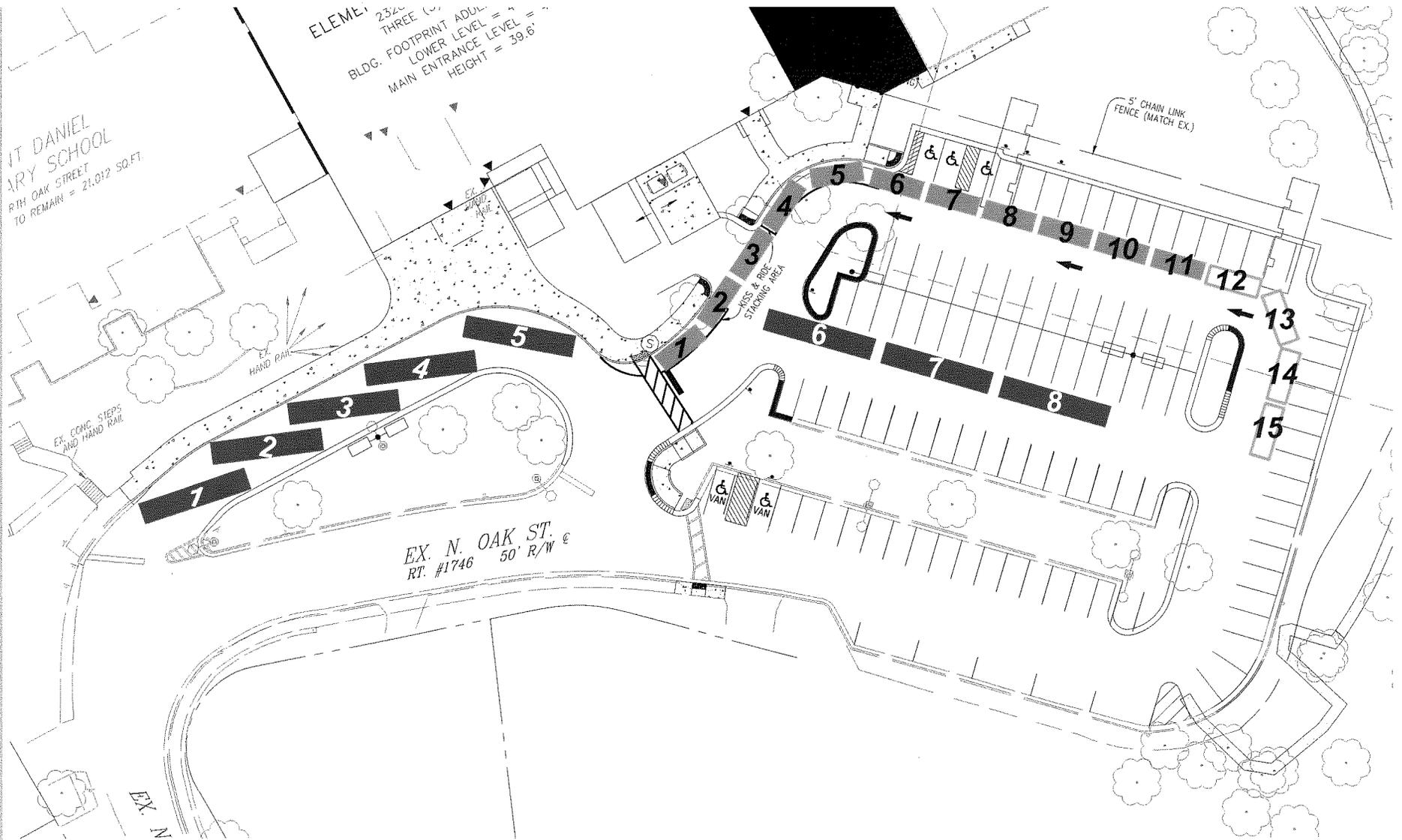


Figure 3  
 Future School Bus and Passenger Car Queues

Mt. Daniel School  
 Fairfax County, Virginia

|  |                            |
|--|----------------------------|
|  | SCHOOL BUS                 |
|  | MAX PASSENGER CAR QUEUE    |
|  | ADDITIONAL AVAILABLE QUEUE |

**NORTH**

Table I  
Mt. Daniel Elementary School  
Site Trip Generation Analysis

| Land Use  | Size                            | Units           | AM Peak Hour<br>(7:45 AM - 8:45 AM) |             |             | Midday Peak Hour<br>(3:30 PM - 4:30 PM) |             |             | PM Peak Hour<br>(5:15 PM - 6:15 PM) |             |             |
|---|---------------------------------|-----------------|-------------------------------------|-------------|-------------|---|-------------|-------------|-------------------------------------|-------------|-------------|
|   |                                 |                 | In                                  | Out         | Total       | In                                      | Out         | Total       | In                                  | Out         | Total       |
| <b>Existing Conditions (348 students) (1)</b>         |                                 |                 |                                     |             |             |   |             |             |                                     |             |             |
| Observed Bus Riders (AM Peak)                         | 287                             | students        | 5                                   | 5           | 10          |   |             |             |                                     |             |             |
| Bus Riders Rate (students per bus)                    |                                 |                 | 57.4                                | 0           | 57.4        |   |             |             |                                     |             |             |
| Observed Bus Riders (Midday Peak)                     | 225                             | students        |                                     |             |             | 5                                       | 5           | 10          |                                     |             |             |
| Bus Riders Rate (students per bus)                    |                                 |                 |                                     |             |             | 0                                       | 45          | 45          |                                     |             |             |
| Pick-up/Drop-offs and School Staff (AM Peak)          | 61                              | students        | <u>73</u>                           | <u>23</u>   | <u>96</u>   |   |             |             |                                     |             |             |
| Pick-up/Drop-offs and School Staff (Midday & PM Peak) | 123                             | students        |                                     |             |             | <u>30</u>                               | <u>44</u>   | <u>74</u>   | <u>58</u>                           | <u>47</u>   | <u>105</u>  |
| <b>Total Observed Existing Vehicle Trips</b>          | <b>348</b>                      | <b>students</b> | <b>78</b>                           | <b>28</b>   | <b>106</b>  | <b>35</b>                               | <b>49</b>   | <b>84</b>   | <b>58</b>                           | <b>47</b>   | <b>105</b>  |
|   | <i>Overall Rate Per Student</i> |                 | <i>0.22</i>                         | <i>0.08</i> | <i>0.30</i> | <i>0.10</i>                             | <i>0.14</i> | <i>0.24</i> | <i>0.17</i>                         | <i>0.14</i> | <i>0.30</i> |
| <b>Maximum Conditions (792 students) (2)</b>          |                                 |                 |                                     |             |             |   |             |             |                                     |             |             |
| Estimated Bus Riders (AM Peak)                        | 653                             | students        | 9                                   | 9           | 18          |   |             |             |                                     |             |             |
| Bus Riders Rate (students per bus)                    |                                 |                 | 72.6                                | 0           | 72.6        |   |             |             |                                     |             |             |
| Estimated Bus Riders (Midday Peak)                    | 512                             | students        |                                     |             |             | 9                                       | 9           | 18          |                                     |             |             |
| Bus Riders Rate (students per bus)                    |                                 |                 |                                     |             |             | 0                                       | 56.9        | 56.9        |                                     |             |             |
| Pick-up/Drop-offs and School Staff (AM Peak)          | 139                             | students        | <u>167</u>                          | <u>53</u>   | <u>220</u>  |   |             |             |                                     |             |             |
| Pick-up/Drop-offs and School Staff (Midday & PM Peak) | 280                             | students        |                                     |             |             | <u>67</u>                               | <u>101</u>  | <u>168</u>  | <u>132</u>                          | <u>106</u>  | <u>238</u>  |
| <b>Total Estimated Vehicle Trips</b>                  | <b>792</b>                      | <b>students</b> | <b>176</b>                          | <b>62</b>   | <b>238</b>  | <b>76</b>                               | <b>110</b>  | <b>186</b>  | <b>132</b>                          | <b>106</b>  | <b>238</b>  |
| <b>TIA Recommended Conditions (742 students) (2)</b>  |                                 |                 |                                     |             |             |   |             |             |                                     |             |             |
| Estimated Bus Riders (AM Peak)                        | 612                             | students        | 9                                   | 9           | 18          |   |             |             |                                     |             |             |
| Bus Riders Rate (students per bus)                    |                                 |                 | 68.0                                | 0           | 68.0        |   |             |             |                                     |             |             |
| Estimated Bus Riders (Midday Peak)                    | 480                             | students        |                                     |             |             | 9                                       | 9           | 18          |                                     |             |             |
| Bus Riders Rate (students per bus)                    |                                 |                 |                                     |             |             | 0                                       | 53.3        | 53.3        |                                     |             |             |
| Pick-up/Drop-offs and School Staff (AM Peak)          | 130                             | students        | <u>156</u>                          | <u>49</u>   | <u>205</u>  |   |             |             |                                     |             |             |
| Pick-up/Drop-offs and School Staff (Midday & PM Peak) | 262                             | students        |                                     |             |             | <u>63</u>                               | <u>94</u>   | <u>157</u>  | <u>123</u>                          | <u>100</u>  | <u>223</u>  |
| <b>Total Estimated Vehicle Trips</b>                  | <b>742</b>                      | <b>students</b> | <b>165</b>                          | <b>58</b>   | <b>223</b>  | <b>72</b>                               | <b>103</b>  | <b>175</b>  | <b>123</b>                          | <b>100</b>  | <b>223</b>  |
| <b>Proposed Conditions (660 students) (2)</b>         |                                 |                 |                                     |             |             |   |             |             |                                     |             |             |
| Estimated Bus Riders (AM Peak)                        | 544                             | students        | 8                                   | 8           | 16          |   |             |             |                                     |             |             |
| Bus Riders Rate (students per bus)                    |                                 |                 | 68.0                                | 0           | 68.0        |   |             |             |                                     |             |             |
| Estimated Bus Riders (Midday Peak)                    | 427                             | students        |                                     |             |             | 8                                       | 8           | 16          |                                     |             |             |
| Bus Riders Rate (students per bus)                    |                                 |                 |                                     |             |             | 0                                       | 53.4        | 53.4        |                                     |             |             |
| Pick-up/Drop-offs and School Staff (AM Peak)          | 116                             | students        | <u>139</u>                          | <u>44</u>   | <u>183</u>  |   |             |             |                                     |             |             |
| Pick-up/Drop-offs and School Staff (Midday & PM Peak) | 233                             | students        |                                     |             |             | <u>56</u>                               | <u>84</u>   | <u>140</u>  | <u>110</u>                          | <u>89</u>   | <u>223</u>  |
| <b>Total Estimated Vehicle Trips</b>                  | <b>660</b>                      | <b>students</b> | <b>147</b>                          | <b>52</b>   | <b>199</b>  | <b>64</b>                               | <b>92</b>   | <b>156</b>  | <b>110</b>                          | <b>89</b>   | <b>199</b>  |
| <b>NET NEW TRIPS (Existing vs. Proposed)</b>          |                                 |                 | <b>69</b>                           | <b>24</b>   | <b>93</b>   | <b>29</b>                               | <b>43</b>   | <b>72</b>   | <b>52</b>                           | <b>42</b>   | <b>94</b>   |

(1) Traffic volumes based on observed count data collected by Wells + Associates on October 8, 2015.

(2) Proposed expansion volumes based observed bus ridership (82% AM / 65% PM) and trip rate per student.

Table 2  
 Mt. Daniel Elementary School  
 N. Oak Street Travel Time Analysis <sup>(1)</sup>

| Scenario     | Direction | Existing Conditions |                     |                 | 2025 Future Conditions without Development |                     |                 | 2025 Future Conditions with Development |                     |                 | Estimated Increase in Peak Hour Delay due to Single Lane Instances <sup>(3)</sup> |                     |                 |
|--------------|-----------|---------------------|---------------------|-----------------|--|---------------------|-----------------|---|---------------------|-----------------|---|---------------------|-----------------|
|              |           | AM<br>Delay (s)     | Midday<br>Delay (s) | PM<br>Delay (s) | AM<br>Delay (s)                            | Midday<br>Delay (s) | PM<br>Delay (s) | AM<br>Delay (s)                         | Midday<br>Delay (s) | PM<br>Delay (s) | AM<br>Delay (s)   | Midday<br>Delay (s) | PM<br>Delay (s) |
| 792 Students | NB        | 76.0                | 74.8                | 74.0            | 76.5                                       | 75.0                | 74.0            | 88.3                                    | 79.0                | 76.0            | 12.3  | 4.3                 | 2.0             |
|              | SB        | 72.8                | 73.0                | 71.5            | 73.0                                       | 73.3                | 71.8            | 78.3                                    | 80.0                | 73.8            | 5.5   | 7.0                 | 2.3             |
| 742 Students | NB        | 76.0                | 74.8                | 74.0            | 76.5                                       | 75.0                | 74.0            | 85.8                                    | 78.3                | 75.5            | 9.8   | 3.5                 | 1.5             |
|              | SB        | 72.8                | 73.0                | 71.5            | 73.0                                       | 73.3                | 71.8            | 77.5                                    | 79.0                | 73.3            | 4.8   | 6.0                 | 1.8             |
| 660 Students | NB        | 76.0                | 74.8                | 74.0            | 76.5                                       | 75.0                | 74.0            | 83.0                                    | 77.5                | 75.0            | 7.0   | 2.8                 | 1.0             |
|              | SB        | 72.8                | 73.0                | 71.5            | 73.0                                       | 73.3                | 71.8            | 76.3                                    | 77.5                | 73.3            | 3.5   | 4.5                 | 1.8             |

Notes:

- (1) Capacity analysis based on Highway Capacity Manual methodology, using Synchro 9.1.
- (2) Average Travel times estimated using both Synchro 9 software and field verification.
- (3) An estimated 2.5 single lane yield instances was used based on field observations.