



P.O. Box 637
142 OLDWICK ROAD
OLDWICK, NEW JERSEY
08858-0637

908.439.9111
908.439.9117 ACSMILE



916 SOMERSET STREET
WATCHUNG
NEW JERSEY
07069

908.757.3500
908.757.3512 ACSMILE

gary@garydean.com

**ACCESS EVALUATION
AND RECOMMENDATIONS
FOR
RIDGE HIGH SCHOOL**

**SOUTH FINLEY AVENUE
BERNARDS TOWNSHIP
SOMERSET COUNTY, NEW JERSEY**

AUGUST 9, 2006

DRAFT

GARY W. DEAN, P.E., P.P.
NJ License No. 33722

TRAFFIC ENGINEERING
PARKING STUDIES
HIGHWAY DESIGN
DOT ACCESS PERMITS
MUNICIPAL CONSULTING

Somerset County Bernards Twp 2005-08-09 Traffic Evaluation Recommendations.doc

INTRODUCTION

Ridge High School (RHS) in Bernards Township is located along South Finley Avenue at the traffic signal controlled intersection with Lake Road. Although the school property itself has frontage only along South Finley Avenue, surrounding properties to the north and the east are part of the Bernards Township municipal properties which afford opportunities for alternate means of school access.

South Finley Avenue is under Somerset County jurisdiction (County Route 613) and as of this report date, the County has no corridor or intersection improvements in the six-year capital program planned for this area.

As a result of increased student population and growing traffic concerns for the single means of ingress and egress via the current driveway, this analysis has been completed to evaluate access alternatives and to identify other means to improve traffic access to Ridge High School. As part of this evaluation, consideration has been given to the recently approved 15 million dollar bond to add additional classroom space and auditorium that will permit an ultimate school enrollment, up to 1,800 students an increase of approximately 9%.

With these increases, the resultant changes in traffic impacts associated with additional traffic movements with alternate access principally along Collyer Lane and/or South Maple Avenue have been reviewed. Although at one point rejected due to unidentified objections from the County engineer's office, this analysis has focused on pursuing an alternate access to South Finley Avenue through the Health Department property with consideration given towards a restriction to employees, buses, or "off peak" use as a means to alleviate congestion, particularly for significant events at the high school.

Ridge High School currently has approximately 1,650 students in grades 9 – 12 of which 45% are juniors and seniors with 108 teachers. Due to growth within Bernards Township, additional student growth is anticipated of approximately 9% within the foreseeable future.

Because of the current congestion experienced at South Finley Avenue and Lake Road not only during normal school hours, but for athletic and other significant school events, the Board of Education has commissioned this traffic access evaluation to investigate the reasons for the congestion and to further explore additional improvements for vehicular access through other municipal properties.

As is typically the case with high schools, although courtesy bussing is provided to all students, many seniors (and in the spring months, juniors) have reached an age with driving privileges and thus no longer avail themselves of bus service. Approximately 170 student parking permits have been issued, or 10% of the student body. Furthermore, only 18 busses provide service, therefore many students are dropped off (as evidenced by the traffic counts) further resulting in significant congestion.

This activity has lead to increased vehicular activity at the single means of access via South Finley Avenue. Although beyond the scope of this particular analysis, it is assumed that sufficient on-site parking will exist for individual student travel means and that to date, "off-campus" parking (and pedestrian activity) has not been of material concern.

The purpose of this analysis has been to identify the level of service impacts that may occur with the various access options. Operational improvements to the existing access and traffic signal.

EXISTING CONDITIONS

Ridge High School is currently served by a single, two-way access that forms the fourth "leg" of the intersection formed by South Finley Avenue and Lake Road. As part of this evaluation, construction plans and traffic signal operational plans prepared by the Somerset County engineer's office were obtained including the current signal timing and "phasing" for entering/exiting movements to the high school driveway.

The Ridge High School campus itself is entirely self-contained with no other regular means of vehicular ingress or egress except South Finley Avenue. Although not accessible for regular vehicular access, an interconnection exists between Ridge High School and the Cedar Hills School on Peachtree Road that in turn leads to Homestead Road and Winding Lane.

In this study, traffic counts have not been independently conducted by Gary Dean Associates, P.C. (GDA); rather data was used as compiled by the Bernards Township Police Department, Engineering office and County engineering office. Traffic counts were collected in late May/early June 2006 by County personnel including automatic traffic recorders (ATR's) along South Finley Avenue and South Maple Avenue in the school vicinity and public works annex. As expected, the data consistently shows a morning peak hour on Finley Avenue occurring at 8:00 a.m. largely due to commuter flows in the school vicinity. School traffic actually peak early during commuter traffic.

Concurrent with the collection of automatic (machine) data, manual intersection traffic counts were conducted by Township staff at the intersections of South Maple Avenue and Collyer Lane and South Finley Avenue and Collyer Lane and at the school access. Traffic counts were conducted during peak school hours from 7:00 a.m. to 9:00 a.m. and from 2:00 p.m. to 4:00 p.m. in early June, prior to the dismissal of local schools for summer recess.

In terms of the actual peak hour of school traffic, that peak hour occurred from 7:00 a.m. to 8:00 a.m. and from 2:15 p.m. to 3:15 p.m. Based on the automatic traffic recorder data, this

"peak" does not coincide with the maximum roadway activity along South Finley Avenue which occurs approximately 60 minutes following the school "peak."

Similarly during the afternoon peak hour, the commuter peak does not begin until approximately 5:00 p.m., whereas maximum school activity was observed between 2:15 and 3:15 p.m. Appended Figures A & B show the peak hour traffic at each location based on the counts compiled. For example, from the manual intersection counts at South Finley Avenue, Lake Road and the high school, the peak hour volumes depicted are during the 7:00 to 8:00 a.m. during maximum school activity. The other peak hour volumes represent those volumes that occur later (for example between 8:00 and 9:00 a.m. and between 4:30 and 5:30 p.m. at the off-site locations. As a result, the traffic volumes depicted represent the "worst case" traffic volumes actually found at each location during peak hours.

As noted, maximum high school activity occurs during the morning peak hour with nearly 30% less traffic experienced during the afternoon. This change principally relates to after school activities which tend to more evenly distribute overall traffic at the school over a several hour period, whereas during the morning virtually all school traffic is concentrated just prior to the start of classes. As a note, the traffic volume data compiled did not identify the specific vehicle types characterized between busses and passenger vehicles. Therefore at this time it is difficult to accurately assess the operating impacts of larger volumes. Assuming all of the school busses arrive/depart within the peak hour, the overall impacts are less.

As further evidenced from the counts conducted at the high school entrance, peak traffic activity at the school and resulting congestion occurs for a very limited duration, generally between 7:15 and 7:35 a.m. This "sub-peak" occurs principally as a result of inbound school traffic with the highest concentration occurring between 7:15 and 7:30 a.m. Throughout the balance of the morning peak hour in particular, traffic generally flowed smoothly with minimal congestion or disruption.

Within a traffic engineering evaluation the traffic concentration within the peak hour itself is calculated through a term known as a peak hour factor. This calculation evaluates the uniformity of traffic over the course of an hour based on shorter duration, observations, in this case 15 minutes. The manual traffic counts were conducted in 15 minute intervals to identify the concentration of school related traffic.

Tables I & II show the 15 minute traffic counts conducted at both the school driveways and for the "ambient" through traffic along South Finley Avenue. Appended Figures C and D show a graphical summary of the traffic concentration during school arrival and dismissal hours.

During the afternoon peak hour, school traffic was somewhat more evenly distributed than during the morning with a more uniform distribution. Some of this can be attributed to different dismissal hours, participation in after school activity and alternate means of transportation with fewer parent pick-up/drop-offs then observed during the morning peak hours.

EXISTING OPERATING CONDITIONS

Analysis of Existing Traffic Volumes

A volume/capacity Level of Service analysis¹ was conducted for the existing traffic volumes using the updated Highway Capacity Manual (HCM) procedures. This type of analysis is performed to assess intersection operations and to identify any areas of excessive delay or congestion. For this evaluation, operating conditions were evaluated at the traffic signal controlled intersection of South Finley Avenue, Lake Road and the high school access and the unsignalized intersections of South Finley Avenue and Collyer Lane and South Maple Avenue and Collyer Lane.

As indicated previously, the actual peak hour of operating conditions was evaluated representing the "worst case" conditions. Appended Figures E & F depict a summary of the level of service analysis for each of the affected intersections for the morning and afternoon peak hour. A description of the conditions follows:

South Finley Avenue/Lake Road/Ridge High School

Based on plan information obtained from the County engineer's office, the intersection currently operates on a relatively long cycle length (the time required for one complete sequence of green, yellow, and red phasing) of 113 seconds. Furthermore, South Finley Avenue operates with a pre-timed (or fixed) interval that permits unopposed left turn school ingress. However as this is a fixed length interval and not demand sensitive, there are certain inherent inefficiencies in the current signal operation, resulting in poor traffic movement.

To that end, the analysis identified a Level of Service "F" condition during the morning peak hour for eastbound left and through movements from Lake Road, principally continuing into the high school. As noted from the traffic volume counts, there is limited left turn traffic (by

¹ See Technical Appendix for volume/capacity analysis and Level of Service descriptions.

comparison) thus it is the school traffic that is contributing to the longer delays along with a relatively short amount of signal "green" time given to the Lake Road approach.

By contrast, we note that the high school driveway is given more time for exiting traffic than for entering traffic from Lake Road. The two phases operate independent of one another thus there also certain inherent inefficiencies in such an operation.

To be described in a subsequent section of this report, there are significant operational improvements that can be immediately implemented that will provide a dramatic improvement in mitigating congestion and improving operations.

During the afternoon peak hour, the signal operates with a shorter overall cycle length which in general should result in less overall delay. However again due to certain inefficiencies in the traffic signal timing and operations, very poor levels of services are calculated on the northbound Finley Avenue approach with both the through/right movements and left turn movements onto Lake Road operating under Level of Service "F" conditions. Southbound traffic on Finley Avenue also operates with longer delays at LOS "E."

By contrast, operations entering and exiting the school are appreciably better in the LOS "D" and "C" range. In general, the overall traffic signal "green" time is evenly allocated between through traffic on Finley Avenue and both the Lake Road and high school approaches.

Recommendations

Regardless of the access alternate (if any) chosen by the Board of Education and/or Township Committee, the traffic signal operations should be immediately corrected (given the approaching school year) to lessen overall delay and improve traffic flow. A separate technical memorandum will be forwarded to the Township Engineer for conveyance to Somerset County that will include recommendations for improved traffic signal timing,

and/or hardware equipment (with added capital costs) that will improve operating efficiency of the intersection.

≈ South Finley Avenue and Collyer Lane

During the morning peak hour, the intersection operated with only average delays at acceptable service levels. The westbound left turn movement from Collyer Lane onto southbound Finley Avenue operated at a LOS "D" with an average delay of 30 seconds. During the afternoon peak hour, longer delays were observed resulting in a LOS "F" condition with a calculated maximum queue length between seven and eight vehicles.

No visual observations were made to confirm these findings, however based on past experience, the actual operating conditions are generally slightly better than found through the HCS analysis with less queuing. At this time, it is not recommended that the intersection be considered for improvements such as the installation of a traffic signal or other artificial means to improve the left turn level of service.

To a certain degree, the downstream traffic signal at Lake Road/Ridge High School provide an artificial means of metering by creating "gaps" in northbound Finley Avenue traffic, resulting in additional opportunities for traffic from Collyer Lane to turn left. Periodic monitoring of the traffic conditions at this location is recommended and the impact of adding additional school related traffic through a connection between Ridge High School and the municipal complex requires close evaluation.

≈ South Maple Avenue and Collyer Lane

During both morning and afternoon peak hours, acceptable levels of service are provided with this intersection experiencing the least amount of delay among the three locations analyzed. Overall queuing is calculated to be relatively minimal (between 2 –3 vehicles) at peak times with delays ranging between 20 and 26 seconds in LOS "C" to "D" range. For

peak hour conditions, this operation is typically characterized as within acceptable parameters.

ACCESS ALTERNATES

Based on prior work efforts completed by the municipal engineer, consideration has been given to four alternates to improve access to Ridge High School. Based on a March 2006 map and memorandum to the Mayor and Township Committee by Peter Messina, these four alternates included:

- ≡ A new high school access through the Municipal Public Works Department/Sempf House to South Maple Avenue.
- ≡ New access to South Maple Avenue through the varsity field parking lot (alternate rejected due to design constraints).
- ≡ Connection to Collyer Lane through the Municipal complex.
- ≡ Alternate connection to South Finley Avenue through the Municipal Health Department property.

As Mr. Messina has investigated the feasibility of each alternate in terms of cost and environmental impacts, it is beyond the scope of this analysis to further evaluate the design constraints of each option. We note that Alternate 4 had been rejected as not viable for Somerset County. We believe that further exploration of this alternate should be pursued due to the modest cost to implement the improvement (based on a relatively short length of driveway required) and presumed minimal earth work impact due to favorable grades.

It is unclear to GDA why the alternate has been consistently rejected by the County, particularly if the access were available only for special events, athletic programming, and/or restricted to use by faculty and/or busses only. The existing separation distance between the signalized intersection and the access is more than sufficient to address safety and/or congestion concerns particularly if the access were restricted to either certain turning movements and/or ingress/egress only.

At minimum, there is significant value in vigorously pursuing this alternate, given the minimal construction cost to connect the Ridge High School to the access with the further recommendation to explore reconfiguring the Health Department parking field and access to increase the separation distance from the traffic signal. At minimum, such an access would be particularly beneficial if its use were restricted to school busses only in allowing a more efficient egress from the school property, particularly in light of current queuing found at the signalized intersection.

In addition to the four alternates analyzed, a final option exists which requires no new roadway connections or capital expense related to new internal roadways.

As previously identified, the current traffic signal operations are South Finley Avenue, Lake Road, and the Ridge High School access operate with inherent inefficiencies due to the current signal programming. In this analysis, a student population increase of up to 35% was first considered. This estimate was based on an initially assumed student enrollment of approximately 1,350 students and with an increase of up to 1,800 students, a 35% traffic increase could arise.

Following subsequent consultation with the Board of Education, it was learned that the current student population is significantly higher than estimated, thus the overall increases would be lower – 9%. Even under the “worst case” initial (an erroneous) school traffic increase, overall operations at the traffic signal can be improved to LOS “C” and “D” with revisions to the traffic signal operations. These improvements include:

- ≈ The installation of actuated north and southbound left turn phases that would be demand sensitive, providing only the necessary signal “green” time where there is a corresponding traffic demand.
- ≈ Reduction in the traffic signal cycle length to eliminate long queues and to allow the signal sequencing to occur more frequently.

≡ Elimination of the "split" phase Lake Road and the school driveway which, if necessary, consideration given to the advance left turn phases for Lake Road and the school. In general, these improvements can be realized through a reprogramming of the existing signal operations and the installation of additional equipment with an estimated maximum cost of \$40,000.

With these improvements alone, overall traffic delays and congestion can be reduced not only entering and exiting Ridge High School, but would also improve traffic flow along South Finley Avenue and on Lake Road. Irrespective of the other access alternates that may be under consideration, this particular improvement would yield the greatest immediate improvement, thus potentially deferring any of the suggested roadway and access improvement costs to further evaluation and determination of need.

Regarding the other access alternatives, each is considered separately below.

1. New high school access through the Municipal Public Works Department/Sempf House. As evidenced by the traffic counts, most of the high school traffic arrives/departs to the south on South Finley Avenue. As depicted on Figure A, approximately 44% of the total entering traffic during the morning peak hour originates from the south. However exiting traffic during the morning peak hour is evenly distributed between movements continuing south, north and west on Lake Road.

During the afternoon peak hour, approximately 47% of the arriving traffic originates from the south with approximately 43% of the exiting traffic continuing south.

Based on this distribution, the provision of an alternate access to South Maple Avenue could reduce some of the south oriented traffic currently traveling through the signalized intersection. However, given the alternate route, requiring the use of cross road and travel on South Maple Avenue, combined with the significant traverse

of the new roadway, such a connection would appear to have limited benefit particularly during the morning peak hours to appreciably eliminate arrival traffic. As the departure during the morning peak hours is evenly distributed among the three approaches, there would be minimal benefit in providing the connection.

In terms of overall levels of service, operating conditions would not significantly change at Collyer Lane and North Maple Avenue, due to the potential reassignment of current traffic on Collyer Lane that would continue as a southbound through movement on South Maple Avenue and potentially use a new connector roadway. Although the overall intersection levels of service might marginally improve due to a decrease in the number of left turn movements from Collyer Lane onto Maple Avenue, the effect would not be significant and there are currently favorable levels of service at the intersection. Consequently, while there will not be a negative impact due to the additional traffic movements potentially assigned to South Maple Avenue, there would not be an appreciable change in the operating conditions at the traffic signal controlled intersection. Therefore there appears to be limited technical justification from a traffic engineering perspective to consider such an alternate. The expense and environmental disturbance required to construct such a road in comparison with the benefits suggest that this particular alternate would not be a cost effective improvement at this time.

2. Connection to Collyer Lane through the Municipal Complex. This particular alternate (particularly if restricted to one-way exiting flow for parent pick-up/drop-off) would significantly improve traffic conditions at the Lake Road/South Finley Avenue signalized intersection. By dramatically reducing the amount of exiting traffic at this location, a reallocation of signal "green" time could be effectuated and in turn assigned to South Finley Avenue thus improving overall traffic conditions. The relatively minimal cost makes such a connection to the existing loop road around the Municipal Complex perimeter, would readily facilitate (combined with pedestrian

walkway improvements on campus) to facilitate a highly efficient drop-off/pick-up circulation operating generally in a counterclockwise flow.

However the connection once intersecting with the Municipal Complex, necessitates either the creation of an entirely new access road (which has limited feasibility due to steep grades) or necessitates an improvement at the Collyer Lane entrance to the Municipal Complex.

As identified under the analysis of existing conditions, there are currently deficient (Level of Service "F") conditions turning from Collyer Lane onto South Finley Avenue. There is limited separation distance between the Municipal Complex driveway and South Finley Avenue allowing limited stacking particularly during peak hours.

One of two options exists to remedy the level of service and/or eliminate the impact of additional traffic to include:

- ≡ Installation of a traffic signal at Collyer Lane and South Finley Avenue.
- ≡ Relocation of the Municipal Complex driveway further east to provide greater separation distance.

If such a connection from the Ridge High School to the Municipal Complex were provided, it would be problematic to enforce a "no left turn" restriction as it would negatively affect police egress and others on municipal business. However given that the pick-up/drop-off activity is limited to the hours generally before the municipal offices open, turning movement restrictions for a finite duration could be considered that would obviously necessitate enforcement (at least during the initial phases of implementation) thus directing all traffic to continue east on Collyer Lane to South Maple Avenue.

It is beyond the scope of this analysis to address the cost implications associated with the relocation of the monuments at the municipal driveway and/or the grading implications, however a greater and more cost effective scheme can be realized in comparison with the alternate access to South Maple Avenue.

3. Finally, the alternate connection to South Finley Avenue through the Municipal Health Department property could be considered particularly for busses and employees, to reduce current congestion at the signalized intersection. If the driveway could be relocated further north, or restricted to right turn entering/right turn exiting, school busses could quickly exit the school property, thus avoiding the queuing and delays at the traffic signal. Again due to the relatively minimal cost to implement this initial improvement should be further explored with the County and the Engineer's office particularly for special events and other significant school functions.

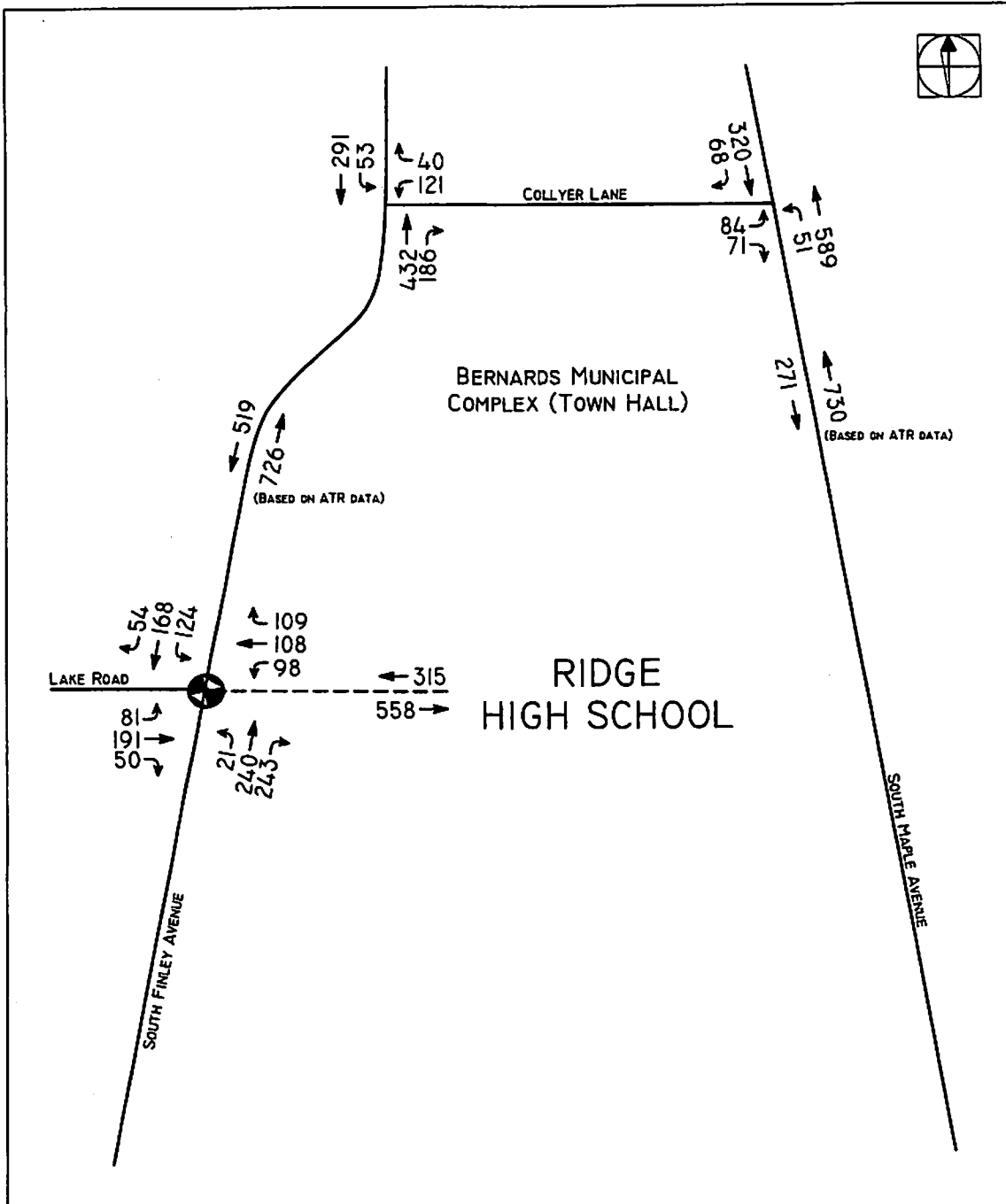
CONCLUSIONS

To improve traffic operations at Ridge High School, this analysis recommends the following improvements:

- ≈ Modification in the traffic signal operations that would provide significantly improved levels of service without any additional roadway improvements to accommodate significant increases in traffic activity.
- ≈ Connection through the Health Department driveway with consideration given to access control and/or turning restrictions to address previously expressed concerns by Somerset County.
- ≈ Connection through the Municipal Complex to Collyer Lane with associated driveway improvements to improve separation from the Collyer Lane/South Finley intersection. A new access road connection to South Maple Avenue appears to be the most expensive alternate and would likely yield the least benefit in terms of reducing traffic congestion at Lake Road and South Finley Avenue.

In general, however, the traffic congestion associated with the high school use is very limited in duration and principally concentrated only during morning peak hour drop-off time. With improvements to the traffic signal operation to become more demand sensitive, the inefficiencies that currently result in traffic congestion along South Finley Avenue can be eliminated thus obviating the initial need for significant capital expenditure for new roadway access. As the overall problem is fairly brief in duration and unique to the high school operations, the initial traffic signal improvements and access through the Health Department should be first considered as a cost effective means to significantly improve traffic operations.

TECHNICAL APPENDIX

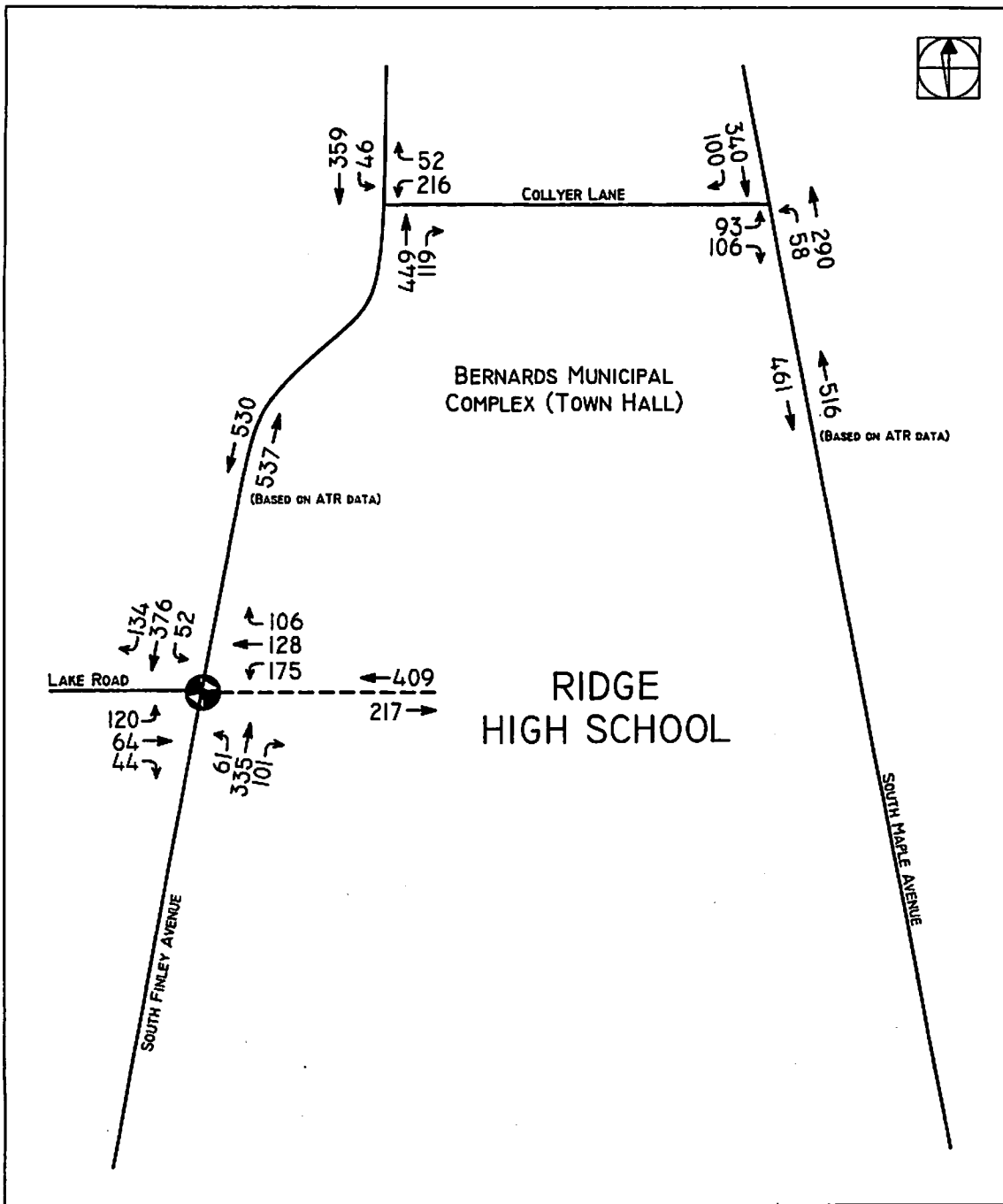


RIDGE HIGH SCHOOL
 TOWNSHIP OF BERNARDS
 SOMERSET COUNTY, NEW JERSEY

FIGURE A

EXISTING TRAFFIC VOLUMES
 MORNING PEAK HOUR
 7:00 TO 8:00 A.M.





RIDGE HIGH SCHOOL
 TOWNSHIP OF BERNARDS
 SOMERSET COUNTY, NEW JERSEY



FIGURE B

EXISTING TRAFFIC VOLUMES
 AFTERNOON PEAK HOUR
 2:15 TO 3:15 P.M.

Figure C
Ridge High School
Bernards Township, Somerset County, New Jersey
Morning Hours

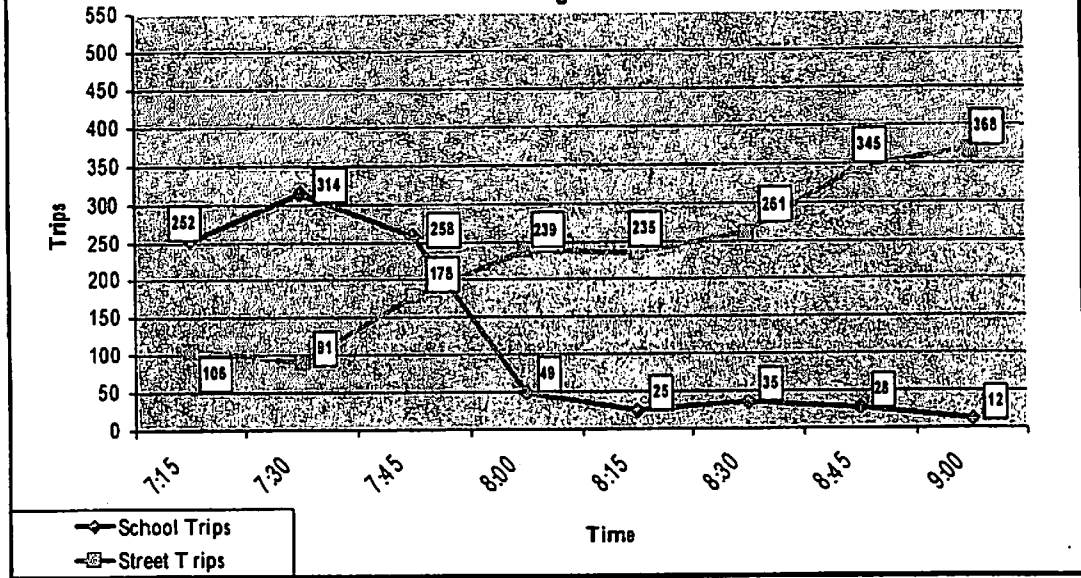
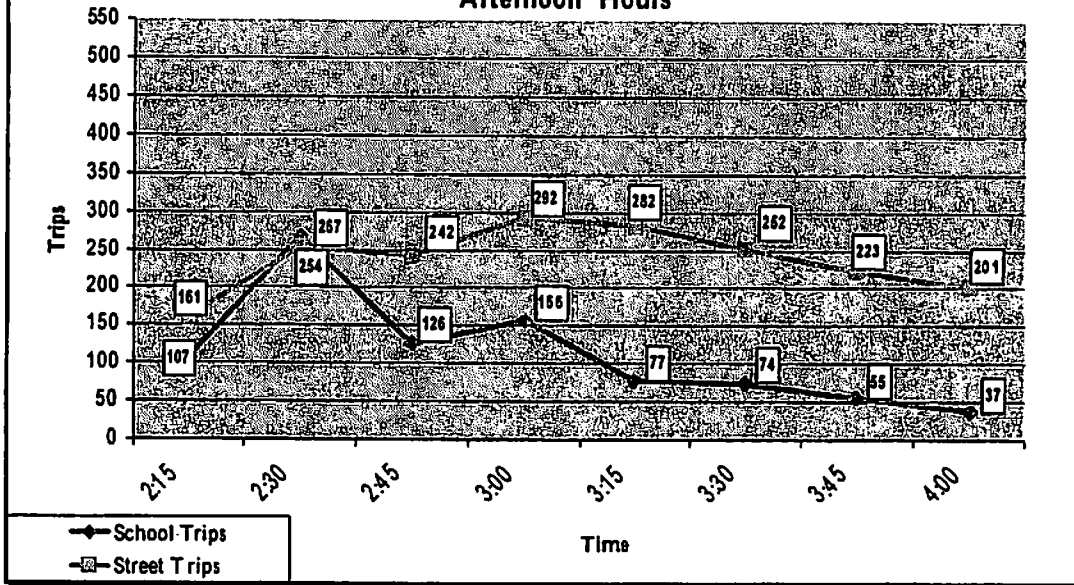
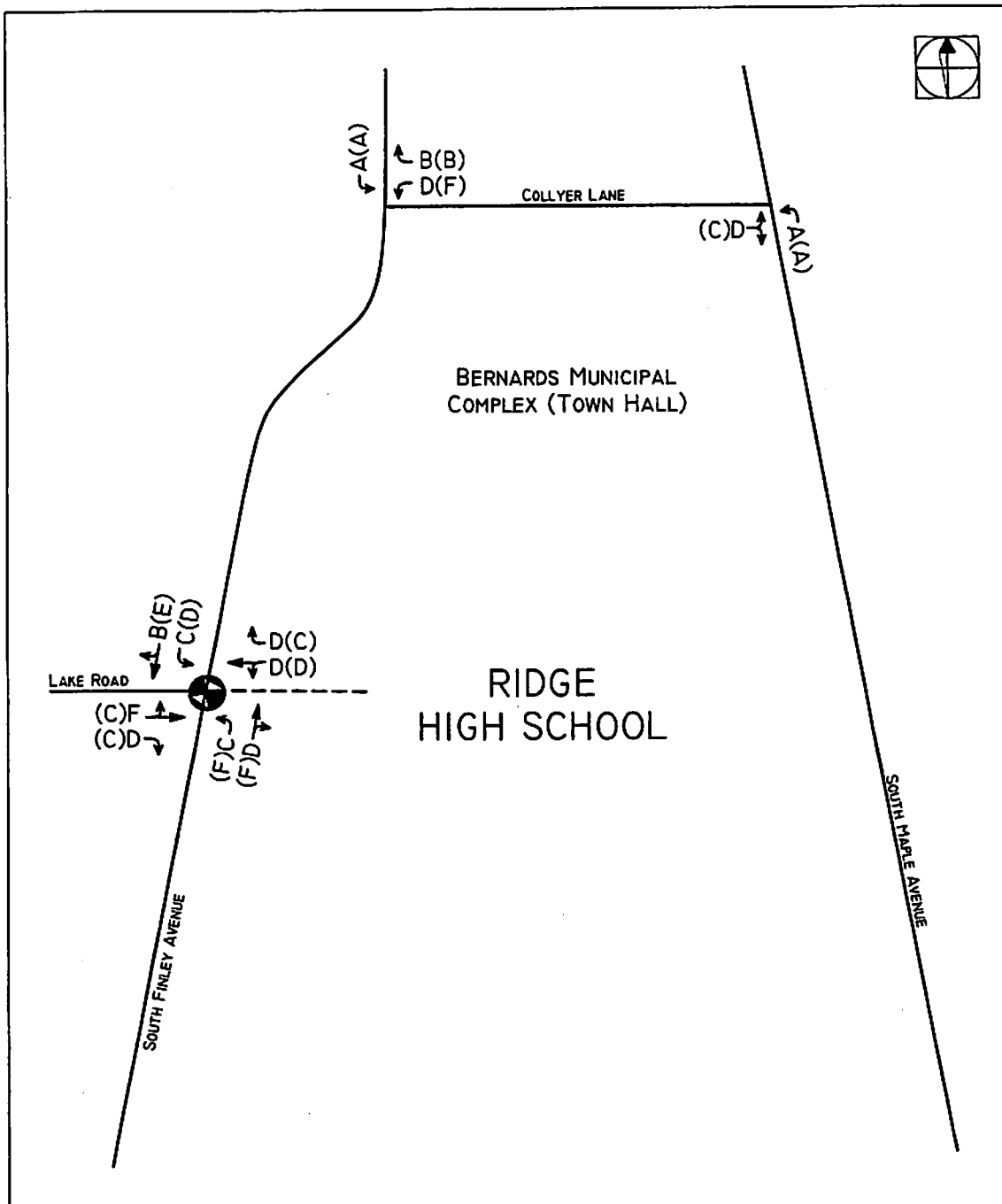


Figure D
Ridge High School
Bernards Township, Somerset County, New Jersey
Afternoon Hours



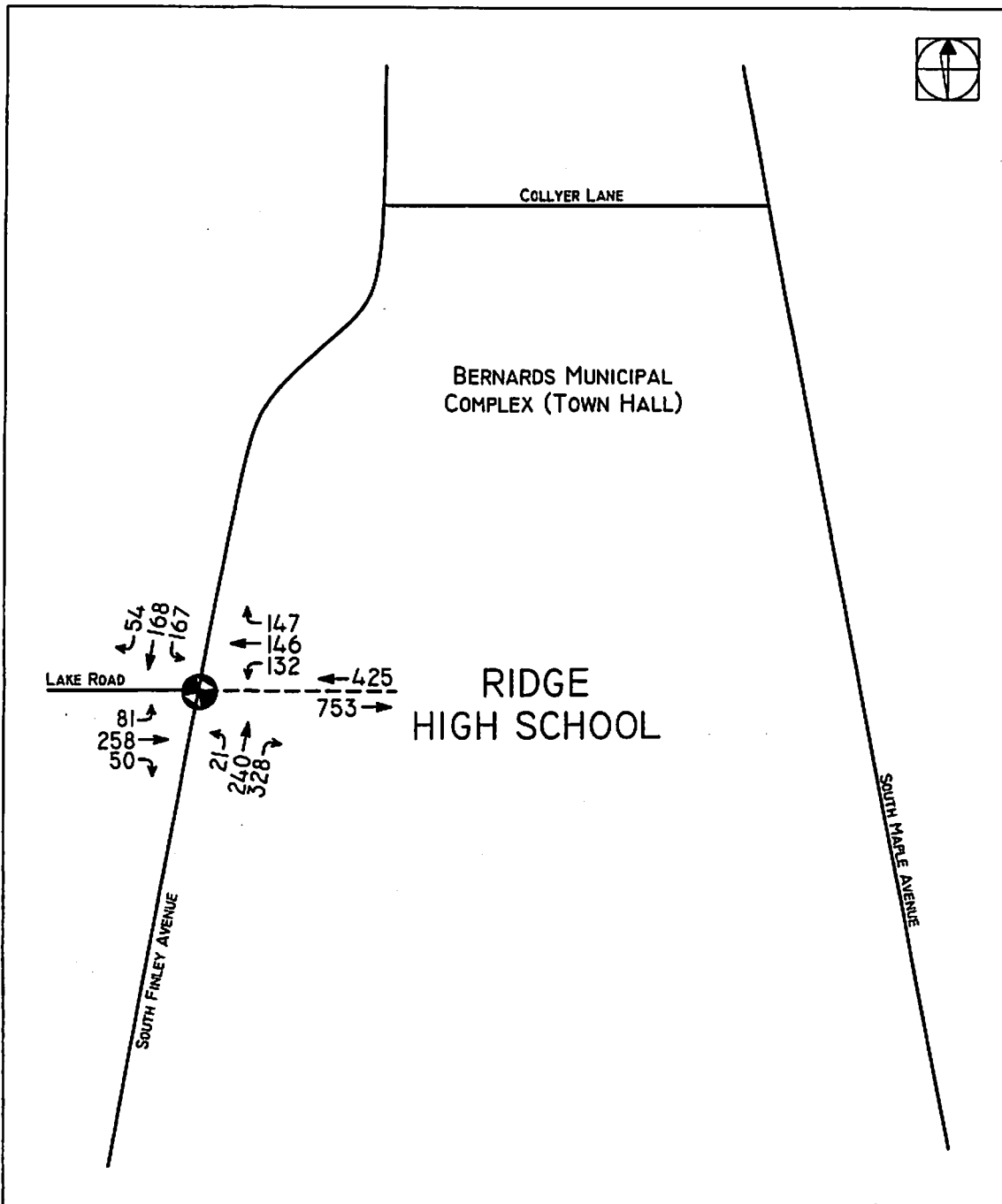


RIDGE HIGH SCHOOL
 TOWNSHIP OF BERNARDS
 SOMERSET COUNTY, NEW JERSEY

FIGURE E



EXISTING LEVELS OF SERVICE
 MORNING (EVENING) PEAK HOURS

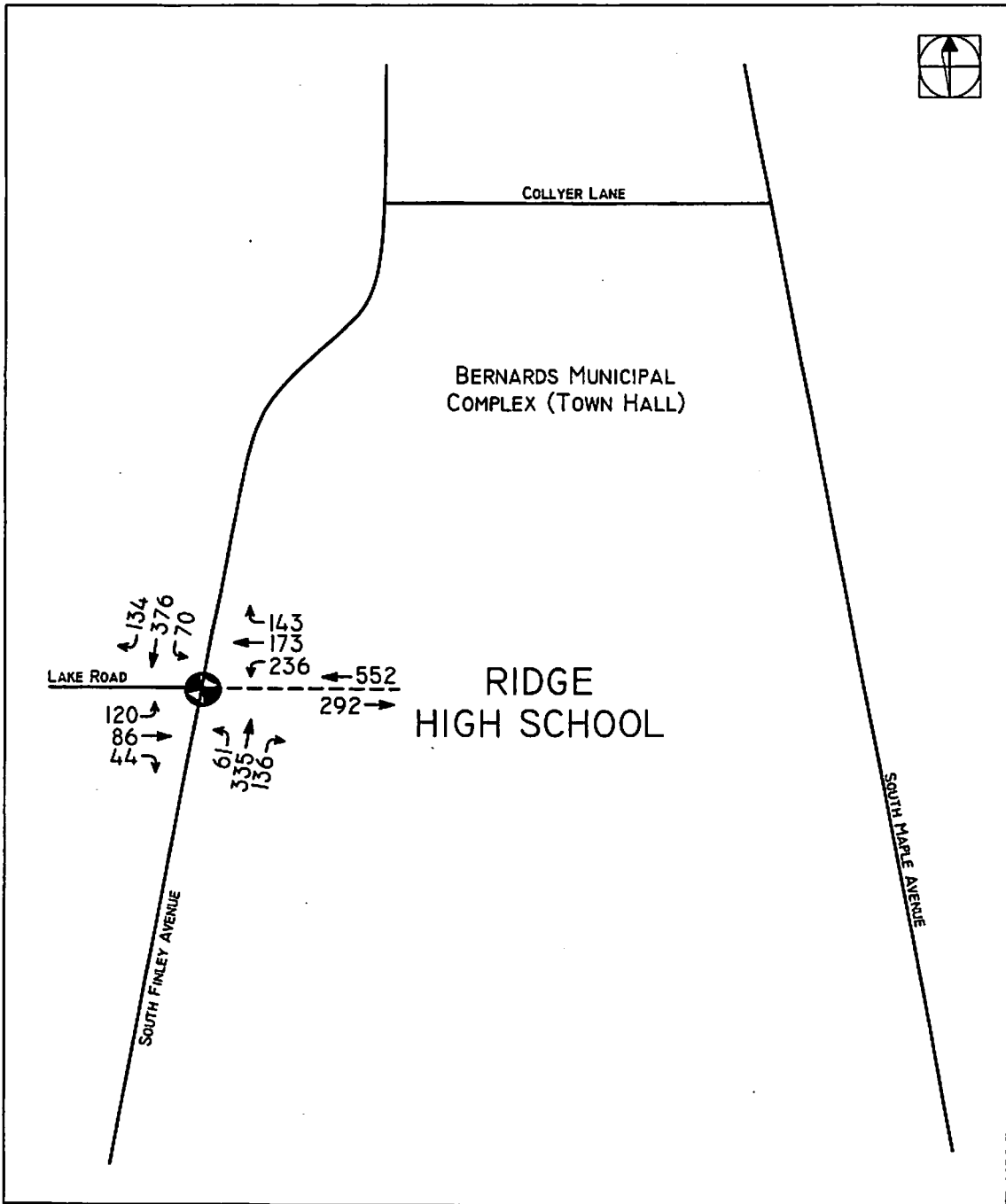


RIDGE HIGH SCHOOL
 TOWNSHIP OF BERNARDS
 SOMERSET COUNTY, NEW JERSEY

FIGURE F



FUTURE TRAFFIC VOLUMES
 MORNING PEAK HOUR
 (ASSUMED 35% ENROLLMENT INCREASE)

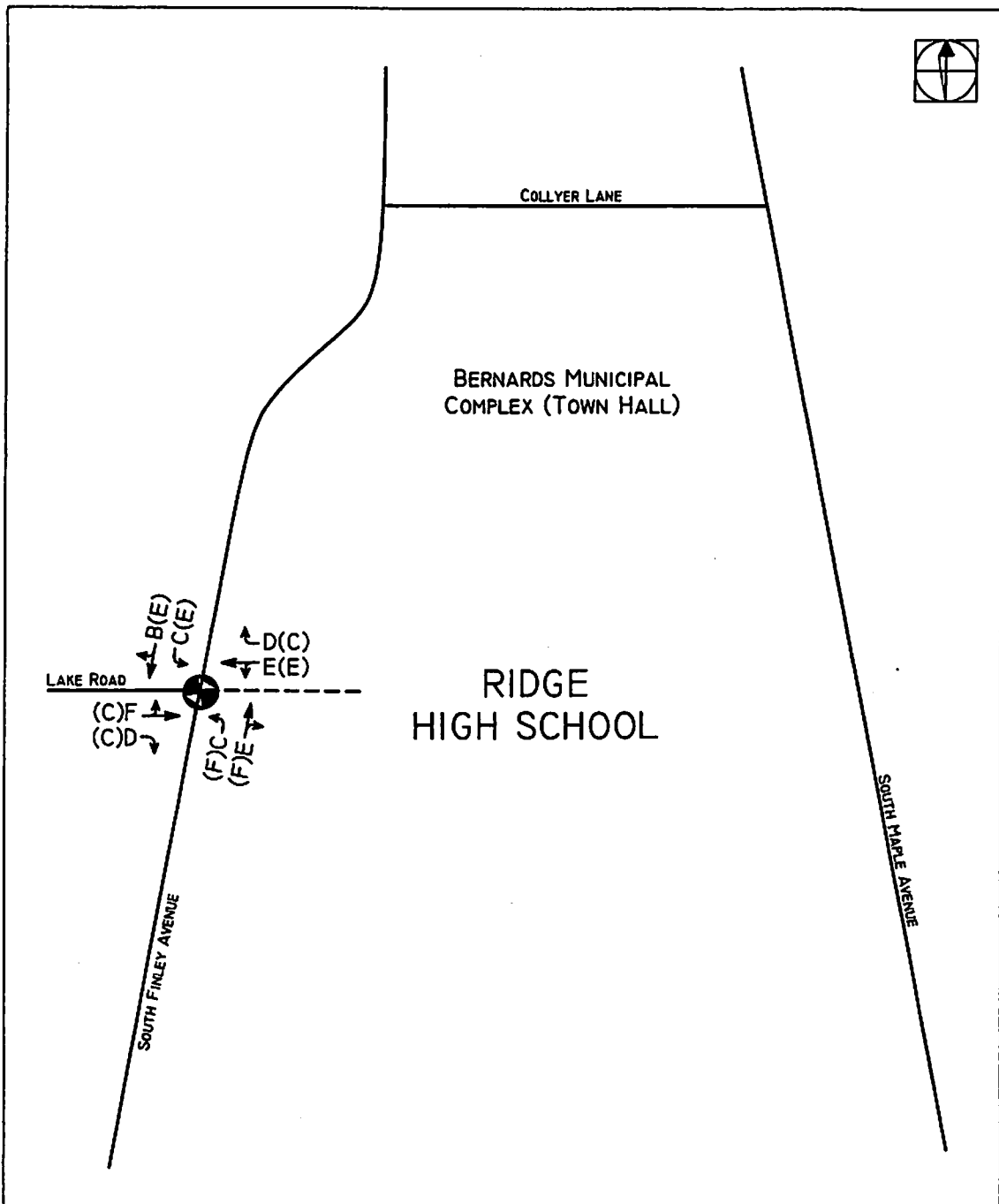


RIDGE HIGH SCHOOL
 TOWNSHIP OF BERNARDS
 SOMERSET COUNTY, NEW JERSEY

FIGURE G



FUTURE TRAFFIC VOLUMES
 EVENING PEAK HOUR
 (ASSUMED 35% ENROLLMENT INCREASE)

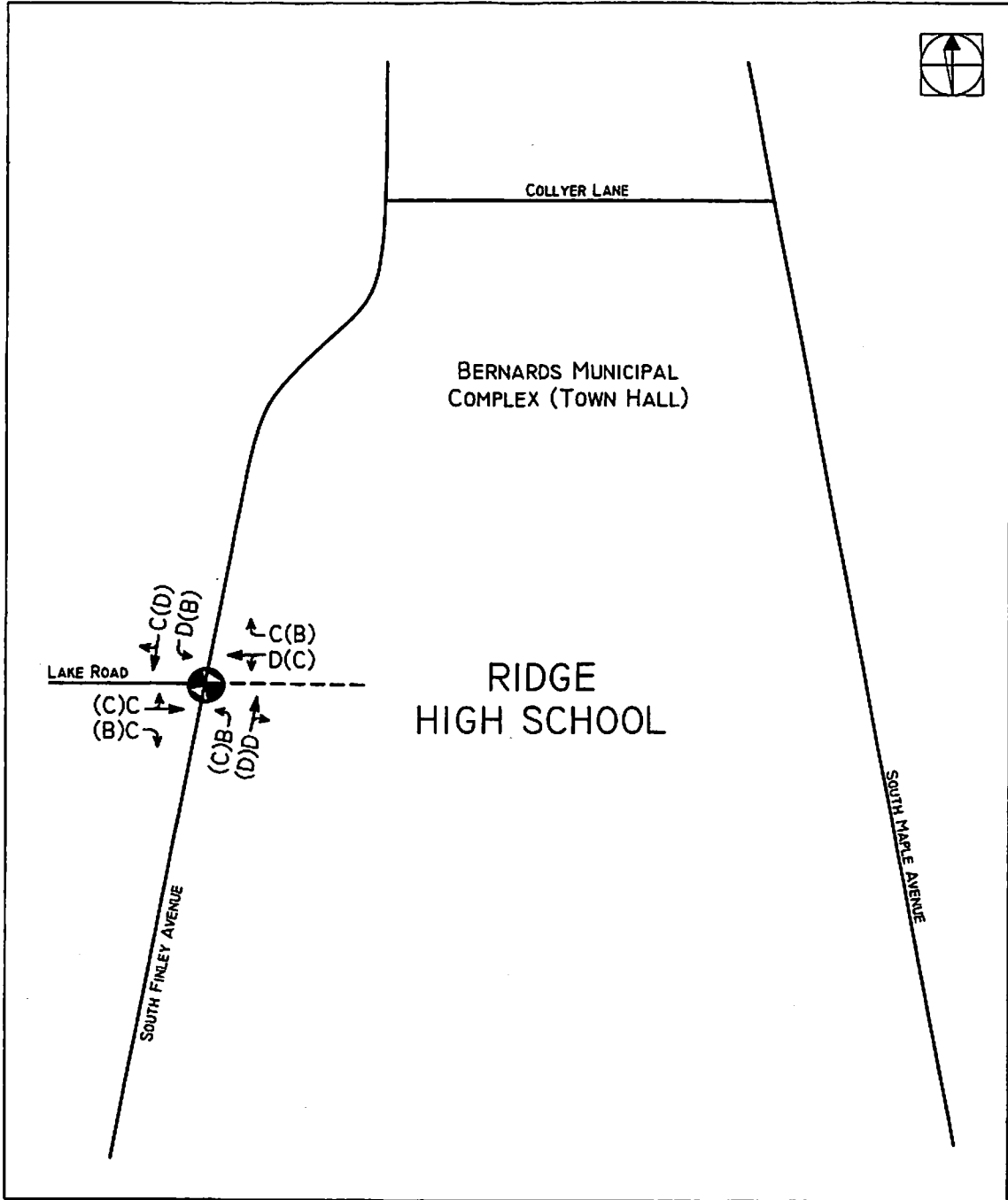


RIDGE HIGH SCHOOL
 TOWNSHIP OF BERNARDS
 SOMERSET COUNTY, NEW JERSEY

FIGURE H



FUTURE LEVELS OF SERVICE
 MORNING (EVENING) PEAK HOURS



RIDGE HIGH SCHOOL
 TOWNSHIP OF BERNARDS
 SOMERSET COUNTY, NEW JERSEY

FIGURE I

FUTURE LEVELS OF SERVICE
 WITH TIMING AND PHASING MITIGATION
 MORNING (EVENING) PEAK HOURS

