

▶ **FILE #:** 9-B-13-UR

AGENDA ITEM #: 43

AGENDA DATE: 9/12/2013

▶ **APPLICANT:** HUBER PROPERTIES / CLEAR WATER PARTNERS, LLC

OWNER(S): Clear Water Partners, LLC.

TAX ID NUMBER: 144 018 & 020

JURISDICTION: County Commission District 5

▶ **LOCATION:** Northeast and southwest sides of Emory Church Rd. and I-140, north of Henderson Ln.

▶ **APPX. SIZE OF TRACT:** 111.86 acres

SECTOR PLAN: Southwest County

GROWTH POLICY PLAN: Planned Growth Area & Urban Growth Area

ACCESSIBILITY: Access is via Emory Church Rd., a minor collector street with a 21' pavement width within a 50' right-of-way.

UTILITIES: Water Source: First Knox Utility District

Sewer Source: First Knox Utility District

WATERSHED: Sinking Creek

▶ **ZONING:** PR (Planned Residential) pending, A (Agricultural) & F (Floodway)

▶ **EXISTING LAND USE:** Vacant land

▶ **PROPOSED USE:** Multi-dwelling development and marina

4.96 du/ac

HISTORY OF ZONING: Rezoning of the majority of the property to PR (Planned Residential) at a density of up to 5 du/ac is presently before the Planning Commission (9-A-13-RZ)

SURROUNDING LAND USE AND ZONING: North: Residential development / PR (Planned Residential) and A (Agricultural)

South: Residential development and a church / PR (Planned Residential), RP-1 (Planned Residential) and A (Agricultural)

East: Residential development and vacant land / PR (Planned Residential) and A (Agricultural)

West: Vacant land and lake / A (Agricultural) & F (Floodway)

NEIGHBORHOOD CONTEXT: This area has developed with rural and low density residential uses under A (Agricultural), PR (Planned Residential) and RA (Low Density Residential) zoning.

STAFF RECOMMENDATION:

▶ **APPROVE the development plan for a marina with up to 75 dock slips and 233 dry storage stalls, three detached residential lots and a multi-dwelling development with up to 328 apartment units, subject to 18 conditions.**

1. Obtaining approval from Knox County Commission for the rezoning of the property to PR (Planned Residential) at a density of up to 5 du/ac.

2. Connecting the development to sanitary sewer, as well as meeting other applicable requirements of the Knox County Health Department.
3. Provision of street names which are consistent with the Uniform Street Naming and Addressing system Ordinance (Ord. 91-1-102).
4. The 500' sight distance easement through the curve of Emory Church Rd., as identified on sheet C3.2 for the North Boat Yard, shall be maintained and kept clear of any obstructions to the line of sight through the curve.
5. Installing all landscaping, as shown on the landscape plan, within six months of issuance of occupancy permits for the project, and posting a bond with the Knox County Department of Engineering and Public Works, to guarantee such installation. Landscaping shall not interfere with sight visibility requirements at street and driveway intersections.
6. Obtaining the variances for the reduction in the parking stall size and allowing the use of gravel for the required parking for the dry storage stalls from the Knox County Board of Zoning Appeals.
7. Contributing 50% of the cost for the design, right-of-way acquisition and construction of the additional storage needed for the southbound right turn lane on Emory Church Road as identified in the Traffic Impact Study for Westland Cove prepared by Ajax Engineering. This work will be done as part of the initial phase of the Westland Cove project.
8. Providing a 5 year bond for 50% of the design, right-of-way acquisition and construction of a traffic signal at the intersection of Westland Drive and Emory Church Road. The Knox County Department of Engineering and Public Works will provide the follow up studies to confirm the need for a traffic signal once the Tennessee Department of Transportation's (TDOT) construction of the improvements at the Westland Drive/Pellissippi Parkway interchange are completed.
9. Providing a 5 year bond for 100% the design, right-of-way acquisition and construction of the additional storage needed for the eastbound left turn from Westland Drive as identified in the Traffic Impact Study for Westland Cove prepared by Ajax Engineering. The Knox County Department of Engineering and Public Works will provide the follow up studies to confirm the need for the amount of the additional storage once TDOT's construction of the improvements at the Westland Drive/Pellissippi Parkway interchange are completed.
10. Installation of pedestrian activated flashers (4 in all) at the two proposed crosswalks on Emory Church Road. Appropriate Manual on Uniform Traffic Control Devices (MUTCD) signage will be required as part of the design plan.
11. Meeting all applicable requirements of the Knox County Department of Engineering and Public Works.
12. Meeting all applicable requirements of the Knox County Fire Marshal.
13. Meeting all requirements and obtaining all required permits from the Tennessee Valley Authority and other Federal or State agencies for the marina development.
14. Fuel dispensing is not approved for this marina site.
15. Prior to any clearing or grading for the west apartments, a tree survey shall be completed for the southern boundary of the property for a depth of 35', starting at the southwest corner and extending 520' to the east. The survey shall identify all trees with an 8" or larger diameter at breast height, also identifying the extent of the tree canopy for those trees. The survey shall be submitted to Planning Commission staff for their approval of the final grading limits along that property line.
16. Placing the areas within the west and east apartment sites that are identified as undisturbed areas (approximately 17.4 acres) into conservation easements. The easement documents shall be presented to Planning Commission staff for approval as to form and content prior to recording with the Knox County Register of Deeds. The easement documents shall be recorded prior to any occupancy permit being issued for the apartments. (Recommended condition of the PR rezoning application, 9-A-13-RZ.)
17. Working with the Knox County Parks and Recreation Department on providing a greenway easement for public access across the tract on the west of Pellissippi Parkway on the south side of the cove. (Recommended condition of the PR rezoning application, 9-A-13-RZ.) This tract (approximately 16.3 acres) shall remain undisturbed until such time as a use on review approval is granted for a specific use under available density.
18. Meeting all applicable requirements of the Knox County Zoning Ordinance.

With the conditions noted, this plan meets the requirements for approval in the PR (Planned Residential), A (Agricultural) & F (Floodway) zones and the other criteria for approval of a Use on Review.

COMMENTS:

The applicant is requesting approval from the Planning Commission for a marina and a residential development on approximately 100 acres that is located on both sides of Emory Church Road north of Westland Dr.

MARINA DEVELOPMENT:

The proposed marina development is located on the west and east side of Emory Church Road on the north side of a cove of Fort Loudon Lake.

West Side: The western portion of the marina site is zoned A (Agricultural) which allows consideration of marinas through the use on review procedures. The access drive for the west side is located just north of the Tennessee Valley Authority's (TVA) 820 contour flowage easement. This location will provide 500' of sight distance to the north along Emory Church Road.

This side will provide the access to the lake with six boat ramps with three boarding docks. There will be 75 covered dock slips located on the north and south side of the cove. A pedestrian bridge is proposed to provide access to the southern slips. The site will also include 141 dry storage stalls with 91 of the stalls being covered. The marina office and restrooms will be located near the entrance.

The applicant is requesting variances for a reduction in the parking stall size and allowing the use of gravel for the required parking for the dry storage stalls from the Knox County Board of Zoning Appeals.

East Side: The eastern portion of the marina site is a part of the tract that is under consideration for the rezoning to PR (Planned Residential). The PR district allows consideration of a marina (commercial use). One acre of commercial use is allowed for each 100 residential units proposed for the development. The 2.96 acres utilized for the marina use cannot be used for residential density calculations. The access drive for the east side is located at the northwest corner of the site at a location that provides maximum sight distance in both directions along Emory Church Road. A total of 92 dry storage stalls with 74 of the stalls being covered are proposed for the eastern site.

APARTMENT DEVELOPMENT:

The proposed apartment development is located on both the west and east sides of Emory Church Road and on the south side of a cove of Fort Loudon Lake.

West Side: The western apartment development includes a total of 76 apartment units located in three buildings. There will be 24 one bedroom apartments and 52 two bedroom apartments. Two of the buildings will be three stories with the third building being three stories on one side and four stories on the down-hill side. The apartments are being located on the site to reduce the impact on the areas with the steeper slopes. Approximately 5.9 acres will remain undisturbed on the west side and are recommended to be included within conservation easements. Sidewalks will connect the western units to the amenity area on the eastern side. A greenway trail is also being provided.

East Side: The eastern apartment development includes a total of 252 apartment units located in nine buildings. There will be 84 one bedroom apartments, 126 two bedroom apartments and 42 three bedroom units. All nine of the buildings will be three stories on one side and four stories on the down-hill side. The apartments are being located on the site to reduce the impact on the areas with the steeper slopes and to increase the setbacks from the adjacent residential property. Approximately 11.5 acres will remain undisturbed on the east side and is recommended to be included within a conservation easement. Sidewalks are being provided throughout the development with a greenway trail down to the lake. A clubhouse and pool area will be located near the entrance. The east side apartments will be gated.

PROPERTY WEST OF PELLISSIPPI PARKWAY:

The applicants proposal for the property located west of Pellissippi Parkway includes two detached residential lots with frontage on Emory Church Road. The property on the south side of the cove has access only by water and will remain undisturbed under this application (Approximately 16.3 acres.) Staff has made a recommendation that the applicant work with the Knox County Parks and Recreation Department on providing a greenway easement for public access across the tract to allow for a connection between the proposed Concord Park Greenway and the proposed Pellissippi/I-140 Greenway as identified in the "Knoxville-Knox County Park, Recreation and Greenways Plan". The southern tract shall remain undisturbed until such time as a use on review approval is granted for a specific use under available density.

TRAFFIC IMPACT STUDY:

A Traffic Impact Study (TIS) for Westland Cove was prepared by Ajax Engineering, LLC and a September

2013 revised study has been reviewed by Planning Commission and Knox County Department of Engineering and Public Works Staff. The TIS evaluated the development intersections on Emory Church Rd and the intersections of Emory Church Road and Fox Road, and Emory Church Road and Westland Drive. A copy of the Study's Conclusions and Recommendations is attached. Staff has identified the applicant's share of needed traffic improvements in recommended conditions 7 - 10 above. The Tennessee Department of Transportation has scheduled improvements at the Westland Drive/Pellissippi Parkway interchange which includes additional turn lanes and traffic signals at the ramp intersections. Improvements should begin in Spring, 2014.

EFFECT OF THE PROPOSAL ON THE SUBJECT PROPERTY, SURROUNDING PROPERTY AND THE COMMUNITY AS A WHOLE

1. Public water is available to serve the site. Sanitary sewer is available in the area, but may need to be extended to serve the development.
2. While by appearance an apartment complex is high density, the clustering of the residential development on the site allows for the protection of the steeper portions of the site. The overall density for the development falls within low density category.
3. The clustering of the residential density on the site allows for preservation of approximately 17.4 acres within the apartment development that accounts for 26.1% of the proposed PR property above the 820 contour. When you add in the 16.3 acres west of Pellissippi Parkway, 50.5% of the PR property will be undisturbed.
4. While the PR district has a 35' peripheral setback, the closest building to adjoining residential lots is setback 150' further reducing the impact on adjoining development. The proposed development plan proposes significant areas of land adjacent to other residences to be left undisturbed, which will provide sufficient buffering from neighboring uses.

CONFORMITY OF THE PROPOSAL TO CRITERIA ESTABLISHED BY THE KNOX COUNTY ZONING ORDINANCE

1. With the recommended conditions, the proposed marina and apartment development is consistent with all relevant requirements of the PR and A zoning districts, as well as other criteria for approval of a use on review
2. The development is consistent with the following general standards for uses permitted on review: The proposal is consistent with the adopted plans and policies of the General Plan and Sector Plan. The use is in harmony with the general purpose and intent of the Zoning Ordinance. The use will not significantly injure the value of adjacent property.

CONFORMITY OF THE PROPOSAL TO ADOPTED MPC PLANS

1. The Southwest County Sector Plan proposes low density residential development with slope protection for this site. The proposed development with the recommended conditions will be in conformity with the Sector Plan.
2. This site is located within the Planned Growth Area on the Knoxville-Knox County-Farragut Growth Policy Plan map.

ESTIMATED TRAFFIC IMPACT 2817 (average daily vehicle trips)

Average Daily Vehicle Trips are computed using national average trip rates reported in the latest edition of "Trip Generation," published by the Institute of Transportation Engineers. Average Daily Vehicle Trips represent the total number of trips that a particular land use can be expected to generate during a 24-hour day (Monday through Friday), with a "trip" counted each time a vehicle enters or exits a proposed development.

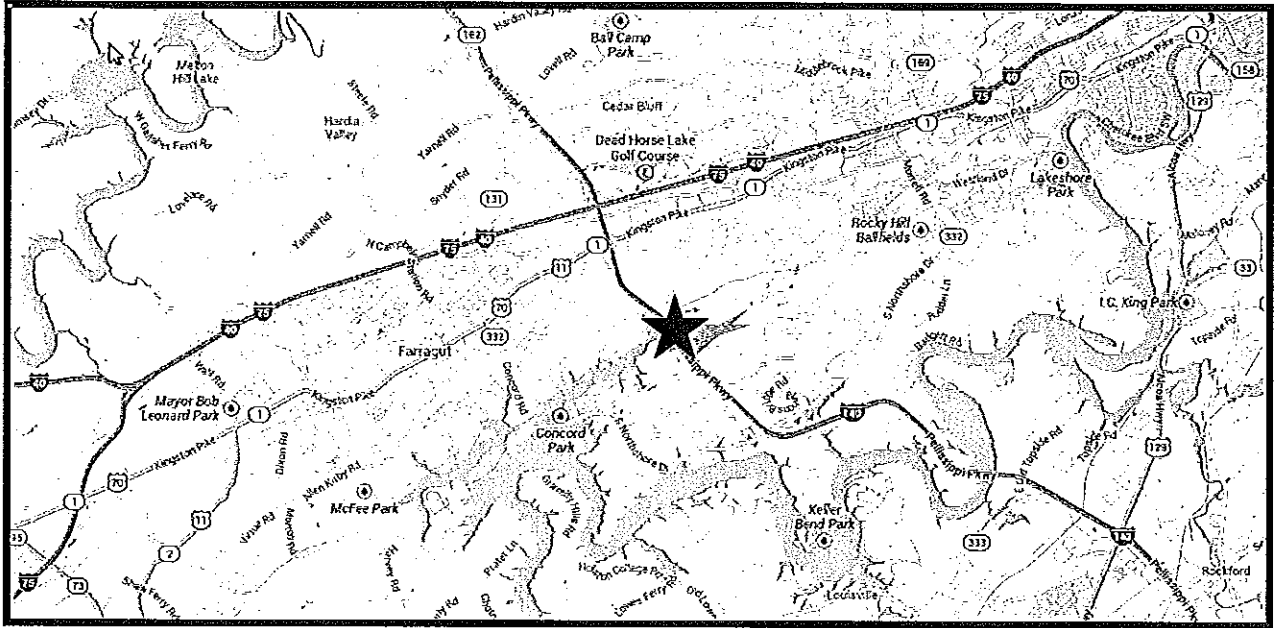
ESTIMATED STUDENT YIELD: 52 (public and private school children, ages 5-18 years)

Schools affected by this proposal: A. L. Lotts Elementary, West Valley Middle, and Bearden High.

- School-age population (ages 5–18) is estimated by MPC using data from a variety of sources.
- While most children will attend public schools, the estimate includes population that may be home-schooled, attend private schools at various stages of enrollment, or drop out of the public system.
- Students are assigned to schools based on current attendance zones as determined by Knox County Schools. Zone boundaries are subject to change.
- Estimates presume full build-out of the proposed development. Build-out is subject to market forces, and timing varies widely from proposal to proposal.
- Student yields from new development do not reflect a net addition of children in schools. Additions occur incrementally over the build-out period. New students may replace current population that ages through the system or moves from the attendance zone.
- School capacities are subject to change by Knox County Schools through building additions, curriculum or scheduling changes, or amendments to attendance zone boundaries.

MPC's approval or denial of this request is final, unless the action is appealed to the Knox County Board of Zoning Appeals. The date of the Knox County Board of Zoning Appeals hearing will depend on when the appeal application is filed. Appellants have 30 days to appeal an MPC decision in the County.

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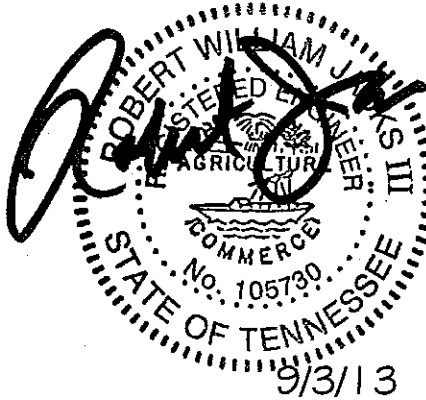


TRAFFIC IMPACT STUDY
WESTLAND COVE
KNOX COUNTY, TENNESSEE

-Prepared For-

Clear Water Partners, LLC
 213 Fox Road
 Knoxville, TN 37922

-Prepared By-



September 2013

SPOT SPEED STUDY

As a further investigation of the study area, three spot speed studies were conducted. Two of the spot speed studies were conducted on Emory Church Road to sample and tabulate the existing motoring speeds along the road in the vicinity of the proposed development. Of these two measurements, one spot speed study was conducted near the proposed intersection where the apartment complex driveways intersect Emory Church Road and the other was conducted near the proposed marina intersection on the east side prior to the horizontal curve to the south. The results of the study indicate that the majority of the traffic along Emory Church Road travels at a much greater speed than the posted speed limit. The posted speed limit for Emory Church Road is 30 mph. The results of the spot speed study indicate that the observed 85th percentile speed was nearly 49 mph near the apartment complex intersection and 43 mph near the marina intersection.

Based on observation it appears that motorists perceive Emory Church Road as an isolated "back road" with little impetus to observe the posted speed limit due to the lack of development, driveways, or sense of speed enforcement.

The other spot speed study was conducted along Westland Drive in the vicinity of the intersection with Emory Church Road. The results indicated that the observed 85th percentile speed was approximately 47 mph. The posted speed limit for Westland Drive is 40 mph. All of the field observations are provided in Appendix F.

TRAFFIC SIGNALIZATION WARRANTS

The Manual on Uniform Traffic Control Devices – 2009 Edition (MUTCD) presents 9 different warrants that have been developed by the traffic engineering profession as a means to determine whether or not a traffic signal is warranted. These warrants cover a broad range of minimum elements required to indicate whether a traffic signal is justified for any particular location. These elements exist of traffic volumes, pedestrian volumes, accident history, and other factors. The MUTCD explicitly states that a traffic control signal should not be installed unless one or more of the signal warrants in the manual are met. However, the satisfaction of a warrant does not entirely in itself justify the need for a traffic signal. Sometimes further engineering studies and judgments also need to be applied before justifying the need for a traffic signal to be installed. These extraneous studies are a very important step in insuring that an

installation of a traffic signal will not actually bring about degradations in safety and efficiencies.

Although the MUTCD provides 9 different warrants, only three of these are potentially applicable in this case for the intersection of Westland Drive and Emory Church Road. These three warrants are as follows:

Warrant 1, Eight-Hour Vehicular Volume

Warrant 1 is comprised of 2 conditions – A and B. The Minimum Vehicular Volume, Condition A, is intended for application where the volume of intersecting traffic is the principal reason for consideration of signal installation. The Interruption of Continuous Traffic, Condition B, is intended for application at locations where Condition A is not satisfied and where the traffic volume on a major street is so heavy that traffic on a minor intersecting street suffers excessive delay or conflict in entering or crossing the major street.

Warrant 2, Four-Hour Vehicular Volume

The Four-Hour Vehicular Volume signal warrant conditions are intended to be applied where the volume of intersecting traffic is the principal reason to consider installing a traffic control signal.

Warrant 3, Peak Hour

The Peak Hour signal warrant is intended for use at a location where traffic conditions are such that for a minimum of 1 hour of an average day, the minor-street traffic suffers undue delay when entering or crossing the major street.

The intersection of Westland Drive and Emory Church Road was evaluated for possible justification for a traffic signal based on the MUTCD Warrants listed above. Emory Church Road was used as the minor side street for the warrant analysis and Westland Drive was the major street. Based on the existing traffic volumes at the intersection in the analysis, it appears that this intersection currently warrants signalization. The intersection meets Warrant #2, Four-Hour Vehicular Volume based on the current posted speed limit. The posted speed limit on Westland Drive is 40 mph; however, it was measured that the 85th percentile speed exceeds 40 mph (47 mph) which also allows this intersection to meet Warrant #1, Condition B. Analyzing the intersection during the background conditions also results in the same signalization warrants.

The results of the traffic signal warrant assessments are located in Appendix G and Table 7 lists the results.

**TABLE 7
TRAFFIC SIGNAL WARRANT SUMMARY**

Intersection	Volume Warrant - Required Number of Hours Satisfied				
	#1A (8 hour)	#1B (8 hour)	Comb. (8 hour)	#2 (4 hour)	#3 (Peak Hour)
EXISTING - 40 mph speed (100% FACTOR) Westland Drive at Emory Church Road	NO	NO	NO	YES	NO
EXISTING - 47 mph speed (70% FACTOR) Westland Drive at Emory Church Road	NO	YES	NO	YES	NO
BACKGROUND - 40 mph speed (100% FACTOR) Westland Drive at Emory Church Road	NO	NO	NO	YES	NO
BACKGROUND - 47 mph speed (70% FACTOR) Westland Drive at Emory Church Road	NO	YES	NO	YES	NO

EVALUATION OF TURN LANE WARRANTS

The proposed unsignalized intersections located along Emory Church Road for the boat livery/marina and the apartment complexes were evaluated for the need for separate left turn and right turn lanes. Utilizing the Knox County policy for turn lane requirements, it was determined that none of the three proposed intersections warrant separate left or right turn lanes on Emory Church Road. The Access Control and Driveway Design Policy with turn lane warrants relate volume thresholds based on prevailing speeds for two-lane roadways. The speed classification that was chosen for this evaluation was based on the spot speed study that was performed and showed that the 85th percentile speed was approximately 49 mph. Therefore, the evaluation used the Knox County classification for speeds of 46 to 55 mph and the calculated projected volumes. The Knox County evaluation worksheets are contained in Appendix D.

CONCLUSIONS AND RECOMMENDATIONS

The analyses presented in this study of the proposed new Westland Cove indicate that the traffic generated by this development in tandem with existing and future traffic will operate adversely at the intersection of Westland Drive and Emory Church Road. This intersection has been calculated to operate at failure for the southbound and northbound approaches currently, in the future (background conditions), and when the new development has begun operations if no roadway improvements are made.

The following is a presentation of recommendations of what has been concluded as a means to mitigate the impacts of the overall development with the surrounding road system while achieving an acceptable level of traffic flow, safety, and cost.

- 1) **Fox Road at Emory Church Road:** From the capacity calculations, it has been shown that southbound left turns could operate at LOS D during the AM peak hours once the development becomes operational. It should be noted that this could potentially occur in 2015 even without the new development being constructed as shown in the earlier background discussion. **It does not appear that new separate southbound left and right turn lanes should be constructed.** Since this southbound approach is operating under yield control to avoid vehicles stopping unnecessarily on the railroad tracks, the concern is that allowing two turn lanes on this approach would interfere with sight distance and could cause operational problems near this railroad line. Overall, the small benefit it would provide in vehicle delay reduction as compared to the larger issues involved with adding a turn lane at this intersection with the railroad system do not seem warranted.
- 2) **Emory Church Road:** The current plans show a crosswalk across Emory Church Road at the apartment complex intersection and at the marina. It is not known at this point whether this will be allowed by the reviewing agencies. Special care should be applied if allowed. If crosswalks are allowed, **it is recommended that a series of warning signs be constructed along the roadway.** The posted speed limit on Emory Church Road is 30 mph but has been shown to operate at much higher speeds. If crosswalks are allowed specific signage should be installed and sidewalks must be present on both sides of the road. Adequate stopping sight distance must be available in both directions. Based on a posted 30 mph speed, the recommended stopping sight distance is approximately 200

feet for level conditions. However, based on the observed operating speeds along Emory Church Road, a stopping sight distance of 425 feet would be required.

- 2a) The ladder crosswalk design, consisting of two transverse lines parallel to one another together with longitudinal lines parallel to traffic flow, should be used so that the visibility of the crosswalk is maximized.
- 2b) The crosswalk width of the crosswalk should be 10 feet, solid white in color and the lines should have a width of 12 inches. The longitudinal lines should be spaced 3 feet apart.
- 2c) Pedestrian in crosswalk signs (W11A-2) with downward arrow plaque (W16-7p) should be installed at each end of the crosswalk location. The signs should be placed in advance of the crosswalk adjacent to the travel lane and facing the driver. Advanced pedestrian warning signs (W11-2) should be installed at a minimum distance of 150 feet but not exceeding 500 feet in advance of the crosswalk in either direction. Advanced warning signs should be accompanied by supplemental plaques with the legend "AHEAD" (W16-9p). See Figure 11 at the end of this report for illustration of recommended signage.

3) **New Driveway Entrances along Emory Church Road:** The current site plan does not show separate lanes for left and right turns out of any of the development entrance points. From the capacity studies it does not appear that they are warranted. Neither does it appear that separate left or right turn lanes into the driveway entrances are warranted based on the examination shown earlier of the turning and opposing volumes.

- 3a) All of the new roadway connections with Emory Church Road should be constructed with a Stop Sign (R1-1).
- 3b) Sight distance at the new intersections must not be impacted by new signage or landscaping. Sight distance at the marina should not be interfered with due to parked vehicles or watercraft at the marina parking ground. Currently there is significant wood and brush growth along this road corridor that would need to be removed to achieve the proper distances.
 - Based on a posted 30 mph speed, the recommended stopping sight distance is approximately 200 feet for level conditions and the corner sight distance requirement is 300 feet. However, taking into account the spot speed study results, there is concern that greater lengths should be provided due to the observed high speeds. Based on the higher observed operating speeds along

Emory Church Road, a stopping sight distance of 425 feet would be required. The road layout designer should insure that these sight distance lengths are met, maximized, and they should be labeled on the plans.

- Any design elements that would not impact sight distance, but could be designed such that would lend to a reduction of speeds due to a perceived narrowing of the road template along Emory Church Road should be encouraged. All potential “narrowing” design elements should take into account pedestrians and possible bicycle traffic.
- It is recommended that there be further monitoring of this road area once the development is operational if excessive speeds and conflicts are observed. The developer should work with the Knox County Engineering Department to investigate traffic calming/speed reduction strategies or greater speed enforcement.

3c) All road grade and intersection elements internally and externally should be designed to AASHTO and Knox County Engineering specifications and guidelines to insure proper operation.


- 4) Westland Drive/AL Lotts Elementary School: Prior to the commencement of the study, some concerns were discussed by the reviewing agencies in regards to the operation of the Westland Drive/ Emory Church Road intersection during the afternoon school dismissal at AL Lotts Elementary school. It has been suggested that during school dismissal at 2:45 PM, traffic queues have formed all the way from the school to the intersection in question (a distance of approximately 2,300 feet). All of the eastbound approaches along Westland Drive at other intersections in between the school and Emory Church Road are marked with “Do Not Block Intersection” (R10-7) signs which suggests past queuing problems. However, during the several days of current traffic counts for this study, no queuing problems were observed at the intersection of Westland Drive and Emory Church Road. For the most part, the queue line observed for the school dismissal never went much further than Cloverhill Lane which is approximately 1,200 feet from the Westland Drive and Emory Church Road intersection. This queue did not seem to affect operations at the studied intersection in any aspect during the traffic counts.

The school dismissal on Westland Drive in front of AL Lotts Elementary is assisted by Knox County Deputies. The queue on the eastbound side of the school along Westland

Drive was observed starting before the official school dismissal and was completely dissipated off of the street by 3:10. For the eastbound queue along Westland Drive, all of the waiting vehicles were observed parked to the far edge of the pavement along the curb which allowed thru vehicles to proceed cautiously through the school zone.

- 5) **Westland Drive at Emory Church Road:** From the capacity calculations, it has been shown that the southbound and northbound approaches at this intersection are at failure during the AM peak hour currently and projected to be at failure when the proposed development is operational. The existing and background volumes meet Warrant #2 volume thresholds for a traffic signal based on the posted speed of 40 mph, and they also meet Warrants #1, Condition B and Warrant #2 based on the observed speeds. The posted speed limit on Westland Drive is 40 mph but the spot speed study indicated speeds of approximately 47 mph. It is recommended that this intersection be **signalized**. A preliminary optimized signalization timing plan has been applied to this intersection and is based on a 90 second cycle length for the AM and PM peak hours. These preliminary signalization results for the intersection of Westland Drive and Emory Church Road are shown in Table 8 and the calculations are found in Appendix B.

TABLE 8
2015 PEAK HOUR LEVEL OF SERVICE - PROJECTED WITH SIGNALIZATION

INTERSECTION	TRAFFIC CONTROL	TURNING MOVEMENT	LEVEL OF SERVICE	
			AM PEAK	PM PEAK
Westland Drive and Emory Church Road	Signalized 	Eastbound Left	E	E
		Eastbound Thru	A	A
		Westbound Left	A	A
		Westbound Thru	B	B
		Northbound Left/Thru/Right	C	B
		Southbound Left/Thru	D	C
		Southbound Right	D	C
		Eastbound Approach	C	B
		Westbound Approach	B	B
		Northbound Approach	C	B
		Southbound Approach	D	C

Furthermore, based on nomographs from ITE's publication, Transportation and Land Development, it is recommended that the southbound approach left/thru lane on Emory Church Road be extended to accommodate the increased future traffic. The current southbound left/thru shared turn lane storage length is approximately 65 feet in length (excluding taper). With signalization, the needed storage length has been estimated from a "Nomograph for Single-Lane Left Turn Storage at Signalized Intersections" and Synchro software calculations. Based on a presumed 90 second cycle length, the storage length needs to be a minimum of 230 feet.

Additionally, it is also recommended that the eastbound approach left turn lane on Westland Drive be extended as well. The current eastbound storage length is approximately 100 feet (not including taper). Using the above method estimations, it has been calculated that the eastbound left turn lane storage length should be approximately 280 feet in length based on a signalized intersection with a presumed 90 second cycle length.

The storage lengths are shown in Table 9 and the calculations are shown in Appendix B (Synchro) and in Appendix H (Nomograph).

**TABLE 9
TURN LANE STORAGE SUMMARY
2015 Combined Projected Conditions**

Intersection Name/Turn Lane	Turn Volume (vph) *	Existing Storage Length (ft)	Synchro 50% Queue (ft)	Synchro 95% Queue (ft)	Nomograph (See Appendix) Storage Length (ft)
Westland Drive at Emory Church Road SIGNALIZED (100 sec cycle length)					
Eastbound Left Turn	205	100	88	279	250
Southbound Left/Thru	168	65	116	228	220

* Queues and turn volumes are taken from worst case scenario for each individual turn movement

In closing, it is believed that the intersection of Westland Drive and Emory Church Drive should be signalized based on traffic signal warrant analysis and based on the LOS for the existing, background, and projected conditions. With the addition of the new development, it is not recommended that this intersection remain unsignalized due to the LOS F conditions and the significant queuing problems that would result.

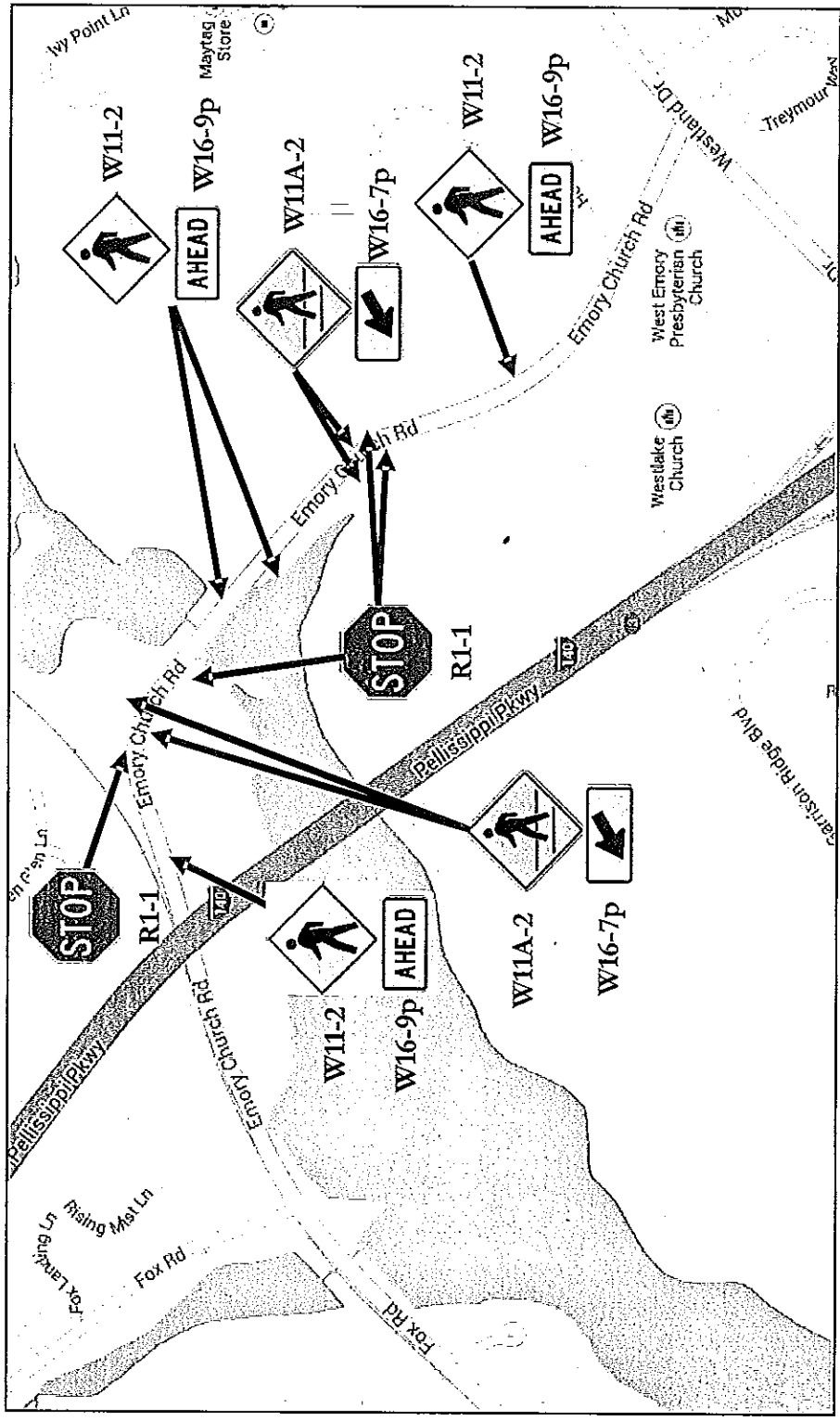


Figure 11
Recommended Signage Map