DURHAM-CHAPEL HILL CARRBORO MPO ó TRIANGLE TRANSIT AUTHORITY
TRIANGLE J COUNCIL OF GOVERNMENTS

Chapel Hill-Durham Transit Corridor

SW Durham Alignment Evaluation

NOVEMBER 1, 2005

FINAL DRAFT

Introduction

Successful high-quality transit service linking Chapel Hill with Durham requires protecting a feasible alignment, choosing a specific vehicle technology, ensuring transit-compatible land use and securing funding to provide the service. This evaluation of a section of the corridor is part of a larger analysis of the alignment first developed through the US 15-501 Major Investment Study (MIS) completed in 2001.

The technical team and project participants evaluated alternatives for the alignment in the vicinity of the new Creekside Elementary School in SW Durham County, shown on the map accompanying this report.

The evaluation addressed cost, community/environmental, operational and ridership impacts of the potential alignments at a sketch level of detail similar to that contained in the US 15-501 MIS Phase II Report.

This evaluation is designed to serve as a model for any future proposals to adjust the alignment.

Based on the information in this report, the Durham-Chapel Hill-Carrboro MPO is encouraged to endorse a preferred alignment for right-of-way protection.

Bus Rapid Transit is one technology option for the Chapel Hilló Durham Transit Corridor

Reasons for the Evaluation

1. Construction of the school has resulted in a slight shift of the alignment on the school site, and of the station proposed on the site.
2. Land use in the area of the proposed station has been at a lower intensity than assumed in the MIS.
3. The new Durham Comprehensive Plan proposes more intense development south of the school site, with the potential for more ridership if a station is located there.

Chapel Hill-Durham Transit Corridor Documents

Several plans and studies relate to the corridor, including this report on the alignment in SW Durham County. For a better understanding of the corridor, readers may want to refer to the following existing or forthcoming reports:

- *2030 Durham-Chapel Hill-Carrboro Long Range Transportation Plan (LRTP)* ó The LRTP, updated periodically, is referred to as a ìsystem levelî plan, and establishes the general location of new facilities, but need not specify their precise alignments.
- *US 15-501 Major Investment Study (MIS)* ó Phase I (1998) and Phase II (2001) of the MIS led to the selection of a preferred transit alignment.
- *Chapel Hill-Durham Transit Corridor: US15-501 Corridor Alignment Analysis* Prepared in 2004, the analysis demonstrated that a technically feasible alignment has been protected, and included recommendations for next steps, including this SW Durham evaluation.
- *SW Durham Collector Street Plan* ó The plan, to be completed in the next year, will detail the street system in the area covered by this evaluation.

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Alignment Decisions

Several organizations have roles to play in adopting, protecting, and acquiring a transit alignment Right-of-Way (ROW). This section summarizes important decisions that are made along the way.

Step 1: Adopt a Transit Corridor. At the most general level, the Durham-Chapel Hill-Carrboro Metropolitan Planning Organization (DCHC MPO), the official regional transportation planning organization, is responsible for adopting transit corridors through its Long Range Transportation Plan (LRTP). The DCHC MPO is made up of all the local governments in Durham and Orange Counties, plus Chatham County government. By adopting an LRTP, the region indicates a general corridor in which a new alignment would run, a year by which the transit service is expected to operate, that funding will be available to build and operate the service, and that the service would contribute to meeting air quality standards. The most recent fiscally-constrained LRTP demonstrating air quality conformity was adopted by the DCHC MPO on April 13, 2005 and indicates the Chapel Hill-Durham transit line would begin operation before 2020.

This general level of corridor identification is further supported by the Triangle Transit Authority (TTA) Regional Transit Plan, first adopted in 1995, which shows the Chapel Hill-Durham Transit Corridor as part of the Planís Phase II.

Step 2: Determine a Preferred Alignment. A specific preferred alignment between Duke and UNC was determined by the DCHC MPO, Durham City, Durham County and the Town of Chapel Hill through the 15-501 Major Investment Study (MIS). This evaluation report addresses this step in the process and is designed to help the MPO and local governments decide what alignment is preferred in SW Durham.

Step 3: Protect the Preferred Alignment Right-of-Way. Actual preservation of the right-of-way is the responsibility of local governments with land use authority. Durham City, Durham County and the Town of Chapel Hill can require that the preferred alignment ROW be either reserved or dedicated as a condition of new development.

Step 4: Conduct an Environmental Impact Statement (EIS) and Reach Agreement on the Final Right-of-Way. A locally preferred alignment, even one that is being preserved through the development review and approval process, is not the last word on final alignment location. Projects like the Chapel Hill-Durham Transit Corridor must undergo a federal EIS process, where a range of alternatives must be evaluated and the ìleast environmentally damaging practicable alternativeî must be selected. Only when federal resource agencies have approved the EIS can the project be built.

Description of the Options

Alignments

Alignment options are divided into 3 types: A, B, and C. A map is included in this report, showing these alignment options. Table 1 summarizes the characteristics of each alignment. Alignment A is the MIS alignment, as modified by construction of the school. It has been shifted slightly east from when the school was approved, and includes a station at Ephesus Church Road and the northeast corner of the school site ó this station is referred to as the ìnorthî station; the MIS located the station where the school building is today.

All A and B options assume a 120-foot right-of-way (ROW), 60 feet for the transit corridor and 60 feet for a parallel SW Durham Drive, which has been on regional road plans for a number of years. Future road plans in the area may consider separating the transitway and roadway in some locations, but development in the area should minimize corridor crossings. All of the B alignments are the same as the A alignment north of Ephesus Church Road. The C alignments differ from the A and B alignments in that C alignments include only a transit corridor, not a new road corridor as well. In addition, some of the C alignments would shift the location of the portion of the transit corridor north of Ephesus Church Road.

The B alignments remain entirely on school property to the school siteís southern boundary before diverging south of the school as they approach 3 existing ponds; B1 and B2 pass to the east of the ponds; B3 runs between the ponds.

The C options reflect ideas generated by citizens attending February 8 and May 23 community meetings on the corridor. Unlike the A and B alternatives, the C alignments include only the 60-foot wide transit corridor, not a parallel 60-foot wide SW Durham Drive right-of-way. The C options assume that the collector street plan for this area that is scheduled for completion during 2005-2006 would determine the nature and location of roads in this area. Another important difference is that while all of the B alignments do not propose any changes north of Ephesus Church Road compared to the A alignment, two of the C alignments would affect properties differently north of Ephesus Church Road.

The C1 alignment is designed to match the alignment recommended by the participants in a November 2002 design workshop that looked at development and transportation in this portion of SW Durham County. Alternatives C2, C3 and C4 are designed to take advantage of existing transportation corridors by locating the alignments adjacent to existing roads: Farrington Road for C2 and I-40 for C3 and C4.

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Table 1. Characteristics of the Alignments

	Alignment Change North of Ephesus Church?	New 60í Road and 60í Transit Corridor?	Potential for Southern Station?	West of, East of, or Between Ponds?	Adjacent to Existing Road?
A	Original alignment; no change	Yes	No	West	No
B1	No	Yes	Yes	East	No
B2	No	Yes	Yes	East	No
B3	No	Yes	Yes	Between	No
C1	No	Transit Only	Yes	East	No
C2	Yes	Transit Only	Yes	East	Farrington
C3	Yes	Transit Only	Yes	East	I-40
C4	Yes	Transit Only	Yes	East	I-40

Stations

Each of the B and C alignments is assumed to have up to two stations in the study area: a north station and a south station. Possible locations for these stations are shown on the accompanying map. The original MIS included only a north station; one of the main reasons to look at alignment alternatives is to evaluate the addition of a south station to match the land use in the new Durham Comprehensive Plan.

It is important to note that the selection of a preferred alignment does not guarantee the selection or protection of specific transit station sites; these tasks are the responsibility of local governments through development review.

The number of stations located in this area, their exact location, and their characteristics (e.g. park-and-ride lots or bus transfer shelters), would be determined through the environmental impact statement process and development approvals.

Light Rail Transit is one technology option for the Chapel Hilló Durham Transit Corridor

Evaluation

The MIS Phase II report examined 3 alignments in this area; including Alignment A (before the school site realignment), which was selected. One of the other two alignments was similar to Alignment B3, crossing between two of the ponds, rather than curving east of them. The MIS report concluded that ìthe three alignments had relatively equal environmental and community impacts, [but] the study team felt that [the selected Alignment] had better potential for ridership in addition to following a previously established transportation corridorî (page VI-4).

In looking at these alignments, the MIS report addressed the following criteria: residential and business relocations, wetlands, stream crossings, street crossings, existing development impact, future land use plan, ridership potential and future transportation plan consistency. In addition to these MIS criteria, this evaluation addresses the issues of operational considerations and cost, and station access.

Residential and Business Relocations. Based on aerial photography, it appears that Alignment A would not require any relocations, although a field check of property on the west side of George King Road may be needed to verify this. Alignments B1 and B2 appear to affect one house and pass close to others, although they are on parcels that might be redeveloped to higher density development under the Durham Comprehensive Plan (see discussion below). A field check of an additional property on the west side of George King Road may also be needed. Alignment B3 would affect one house located just north of a farm pond. Alignments C1 and C2 would affect the same house as Alignments B1 and B2, plus at least three more houses fronting on Farrington Road, depending on the design of the joint road/transit corridor along this segment. C2 has the potential to affect additional properties fronting on Farrington Road. It appears that Alignments C3 and C4 can be designed to avoid any structures, although each would likely pass close to some homes located along Crescent Drive and Wendell Road.

Wetlands. The MIS report identified six wetlands in the affected area ó five constructed farm ponds shown on the accompanying maps and a sixth pond which has since been drained. Wetlands could also be expected to influence the design of any stream crossings (see next section). All alignments except B3 avoid the five existing ponds by either passing to the east or west of them. The most significant wetland issues for the whole corridor are unaffected by the alignments in this section of the corridor: the crossings of Army Corps of Engineers land to the southwest of this area and New Hope Creek to the northeast of this area.

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Wetlands and associated stream crossings (see next section) present one of the more difficult challenges in selecting an alignment that will meet the criteria of being the ìleast environmentally damaging practicable alternative,î as required in a future Environmental Impact Statement (EIS) for the corridor. [ìPracticableî means ìavailable and capable of being done after taking into consideration cost, existing technology, and logistics in light of overall project purposes.î] Although the farm ponds in this area were built by landowners, many, if not most would likely include areas classified as wetlands and other ìjurisdictional watersî subject to regulation by the U.S. Army Corps of Engineers (USACOE).

Although a detailed examination of all the wetlands and water quality rules and permitting issues are beyond the scope of this evaluation, a few general points bear consideration in selecting a locally preferred alignment for the purposes of right-of-way protection.

In determining the least environmentally damaging practicable alternative and securing permits allowing construction, the following steps must be followed, in order:

- avoid all impacts that can be avoided,
- minimize all impacts that can not be avoided,
- provide mitigation for all impacts, even minimal ones.

What constitutes the least environmentally damaging practicable alternative and which impacts can be avoided, which can be minimized and what mitigation is required are questions that are answered through consultation and negotiation among local communities and state and federal resource agencies through the environmental impact statement process.

In summary, none of the alignments can be guaranteed to receive approval through the environmental impact statement process, nor can any alignments be ruled out; the greater the effect on wetlands and stream crossings compared to other feasible alternatives, the more difficult it may be for an alignment to be selected as the ìleast environmentally damaging practicable alternative.î

Stream Crossings. Most streams in this area, as identified on (USGS) stream coverages, are small perennial (always flowing) or intermittent (sometimes dry) streams influenced by the constructed farm ponds which they drain. Alignment A has no stream crossings. Alignment B1 crosses two small streams whose headwaters are the constructed farm ponds. Alignment B2 crosses these same streams, and may cross another minor stream. Alignment B3 crosses the same streams as B2 plus an additional stream at the location of a pond. Alignments C1 and C2 cross the same streams as Alignment B1. Alignment C3 crosses the same streams as Alignments B1, C1 and C2, plus an additional stream draining the farm pond off Wendell Road. Alignment C4 is similar to C3, but avoids this latter stream. As with wetlands, the most significant stream crossing issues for the whole corridor are unaffected by the alignments in this section: the crossings of Army Corps of Engineers land to the southwest and New Hope Creek to the northeast of this area.

Street Crossings. Alignments A, B1, B2, B3, C1 and C2 would cross a single existing road south of Ephesus Church Road: George King Road. Alignments C3 and C4 would also cross George King Road and would need to cross Farrington Road and Crescent Drive, and the ROW for Wendell Road. As this area develops, collector streets will need to be created to serve this area, which may lead to additional street crossings. A collector street planning effort is scheduled to begin shortly and will need to consider the transit corridor.

Existing Development Impact. Relative effects on existing development will be influenced by whether the existing pattern of scattered homes on large parcels remains or is redeveloped, as indicated in Durhamís Comprehensive Plan. Alignment A passes through large parcels to the west of George King Road while Alignments B1 and B2 pass through large parcels to the west of Farrington Road. Alignments B3, C1 and C2 mostly affect larger parcels, but have the potential to impact some existing homes on smaller lots which might only be redevelopable if combined with adjacent parcels. Alignment C2 and, to a lesser extent, C1, could make access to parcels along Farrington Road difficult; the degree of access difficulty would partly depend on the design of the transit corridor. Alignments C3 and C4 would pass close to existing homes along Crescent Drive and Wendell Road. Alignment A would pass 300 feet to the east of The Oaks, the closest existing smaller-lot subdivision to the alignments.

Future Land Use Plan. Durhamís Comprehensive Plan identifies the area around both a northern station and a southern station as Transit Support Areas in the countyís Suburban Tier. These are two of six such areas in the plan. The others are also along planned transit corridors, both the 15-501 corridor and the NC54/I-40 corridor. These areas are designed to ìallow the application of the Compact Neighborhood Support Area standards Ö to encourage development supportive of transitî (page 2-10).

Alignment A could not serve the southern station area identified in the Comprehensive Plan. Alignment C3 would serve a southern station area closest to the location in the Plan. All of the other B and C alignments can serve a southern station area; Alignment B3 would likely require a station location

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slightly to the north and/or west of a station served by B1, B2, C1 and C2.

Alignments A, B1, B2, B3 and C1 could serve a northern station located at the edge of the Creekside School site and Ephesus Church Road. Alignment C2 would require a location along Farrington Road, while Alignments C3 and C4 would require any northern station to be located adjacent to I-40, perhaps at the Farrington Road bridge. The analysis addresses both a northern and a southern station; one or both may be selected.

Future Transportation Plan Consistency. The A and B alignments have been designed to accommodate both the transit corridor and the parallel SW Durham Drive, which will link to Meadowmont Lane. Alignment A is the original alignment of SW Durham Drive. The C alignments would require that the future road network in this area be redefined by the forthcoming collector street study. All of the B and C alignments can likely accommodate any of the previously studied alignments for the NC54/I-40 transit corridor, which would link to the 15-501 corridor either at Meadowmont or the southern station. Careful attention would need to be paid to the configuration of the southern station under Alignment B3 for this connection, since B3 is the westernmost of the B and C alignments. Alignment A could not accommodate the NC54/I-40 alignment that links to the southern station.

Ridership Potential. Durham City staff prepared an analysis of ridership potential based on housing and employment projections under eight land use/alignment scenarios for 2030, shown in Table 2:

- Alignment A with the land use from the MPO Long Range Transportation Plan (LRTP),
- Alignment A with land use near the Northern Station from the Durham Comprehensive Plan,
- Alignments B1/B2/B3/C1 with land use near the Northern and Southern stations from the Comprehensive Plan,
- Alignments B1/B2/B3/C1 with land use near the Northern Station from the Comprehensive Plan and land use near the Southern Station based on Transit Core and Transit Support Areas in the Comprehensive Plan,
- Alignment C2 with land use near the Northern and Southern stations from the Comprehensive Plan,
- Alignment C2 with land use near the Northern Station from the Comprehensive Plan and land use near the Southern Station based on Transit Core and Transit Support Areas in the Comprehensive Plan,
- Alignments C3/C4 with land use near the Northern and Southern stations from the Comprehensive Plan,
- Alignments C3/C4 with land use near the Northern Station from the Comprehensive Plan and land use near the Southern Station based on Transit Core and Transit Support Areas in the Comprehensive Plan.

Table 2. Population, Household & Employment Sources

Area	Alignment/Land Use/Stations Scenario							
	Scenario 1 Alternative A LRTP	*Scenario 2* Alternative A Comp Plan	*Scenario 3* Alternative B1/B2/B3/C1 Comp Plan	*Scenario 4* Alternative B1/B2/B3/C1 Comp Plan TOD	*Scenario 5* Alternative C2 Comp Plan	*Scenario 6* Alternative C2 Comp Plan TOD	*Scenario 7* Alternative C3/C4 Comp Plan	*Scenario 8* Alternative C3/C4 Comp Plan TOD
Chapel Hill Planning Area	LRTP	LRTP	LRTP	LRTP	LRTP	LRTP	LRTP	LRTP
Remainder of Northern Area	LRTP	Comp Plan	Comp Plan	Comp Plan	Comp Plan	Comp Plan	Comp Plan	Comp Plan
South Station Core Area (1/4 mile)	LRTP	LRTP	Comp Plan	Comp Plan Transit Core	Comp Plan	Comp Plan Transit Core	Comp Plan	Comp Plan Transit Core
South Station Support Area (1/4 - 1/2 mile)	LRTP	LRTP	Comp Plan	Comp Plan Transit Support	Comp Plan	Comp Plan Transit Support	Comp Plan	Comp Plan Transit Support
Remainder of Southern Area	LRTP	LRTP	Comp Plan	Comp Plan	Comp Plan	Comp Plan	Comp Plan	Comp Plan

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The analysis computed a range of estimates for population, households and employment within 1/4 and 1/2 mile of transit stations for each scenario. Tables 3 and 4 show population and employment results for the mid-range estimate for individual stations and for a two-station alternative, if selected.

The addition of the South Station with the B and C alignments would significantly increase the population and jobs within 1/2 mile of a transit station in SW Durham, especially if the area around the South Station is developed in a transit-oriented pattern as allowed in the Comprehensive Plan.

The C3 alignment would result in the highest estimates because its southern station is located closer to the center of the Transit Support Area of the Durham Comprehensive Plan. For the ridership potential to be realized, it will be critical for the land use to be at the intensities in the Comprehensive Plan and for project designs to meet the Triangle Transit Authorityís *Station Area Development Guidelines*. For a description of the method and more detailed results, see the accompanying report, *Phase II Transit Corridor SW Durham Development Scenario Analysis.*

Table 3. Station Area Development ó A and B and C1 Alignments

Station Area	***Alignment/Land Use/Stations Scenario***											
	#1ó Alignment A LRTP			#2ó Alignment A Comp Plan (north only)			#3 Alignment B1/B2/B3/C1 Comp Plan			#4 Alignment B1/B2/B3/C1 Comp Plan TOD		
	Pop.	DUs	Jobs	Pop.	DUs	Jobs	Pop.	DUs	Jobs	Pop.	DUs	Jobs
North Station Core (1/4 mile)	240	110	150	710	330	700	720	330	700	710	330	700
North Station Core & Support Area (1/2 mile)	1,090	510	250	1,890	880	920	1,950	930	860	2,010	930	860
South Station Core Area (1/4 mile)	ó	ó	ó	ó	ó	ó	1,420	640	10	6,060	2,830	550
South Station Core & Support Area (1/2 mile)	ó	ó	ó	ó	ó	ó	4,540	2,090	540	10,160	4,720	1,440
Total for Both Station Areas (within 1/2 mile)*	1,090	510	250	1,890	880	920	6,080	2,830	1,400	11,740	5,450	2,300

Table 4. Station Area Development ó C2 and C3 Alignments

Station Area	***Alignment/Land Use/Stations Scenario***											
	#5 Alignment C2 Comp Plan			#6 Alignment C2 Comp Plan TOD			#7 Alignment C3/C4** Comp Plan			#8 Alignment C3/C4** Comp Plan TOD		
	Pop.	DUs	Jobs	Pop.	DUs	Jobs	Pop.	DUs	Jobs	Pop.	DUs	Jobs
North Station Core (1/4 mile)	710	330	280	700	330	280	430	210	120	450	210	120
North Station Core & Support Area (1/2 mile)	1,800	840	860	1,810	840	860	1,250	570	850	1,220	570	850
South Station Core Area (1/4 mile)	1,360	640	10	6,070	2,830	550	2,660	1,230	140	9,000	4,190	880
South Station Core & Support Area (1/2 mile)	4,550	2,090	540	10,170	4,720	1,440	4,180	1,940	720	11,830	5,490	1,710
Total for Both Station Areas (within 1/2 mile)*	5,950	2,760	1,390	11,610	5,390	2,300	5,410	2,500	1,580	13,050	6,060	2,560

* 1/2 mile radii from stations overlap ó total is not the sum of individual station totals. ** C4 slightly lower than C3 for south station location.

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Operational Considerations & Cost. The Triangle Transit Authority conducted a sketch-level analysis of the alignments including cost and general operational considerations. The analysis concluded that any of the alignments is feasible.

Alignment A would cost the least and have the best operational characteristics since it is shorter, has fewer curves, has only one station, follows a ridgeline, and crosses no streams.

Table 5 summarizes cost issues associated with each path. Much of the additional costs of the B and C alignments over A are due to their longer routes. An additional $2-$3 million is due to the additional station and the remainder is due to stream crossings at $500,000 to $1 million per crossing and road crossings at $200,000 to $300,000 per occurrence. Estimates are based on light rail transit costs; bus rapid transit (BRT) costs might be different depending on the design characteristics of a BRT Alternative. Estimates assume equal per-acre land costs; alignments C3 and C4 in Durhamís major transportation corridor buffer may have lower per-acre costs.

Costs should be placed in context to the overall project cost. Using the same unit cost ranges for the full 14-mile, 13-station MIS alignment result in a cost range of $300-600 million. The B, C1 and C2 alignments would increase overall costs 1% to 3%. Alignment C3 would increase costs by about 5%, while Alignment C4 would increase costs by about 4%.

Operational considerations are similar to the cost issues in that additional length brings about additional maintenance and longer travel times. Additional stations add ridership (typically) but also bring about additional maintenance activities. Additional grade crossings or drainage structures/ bridges bring about additional maintenance requirements and future replacement. The additional curvature of the B and C alignments are not considered significant for light rail or BRT; however, the potential for some ìwheel squealî due to radii in the range of 300-400í is possible for light rail. Short noise deflectors as high as the wheels or other mitigation may be required depending upon adjacent development. In addition, travel time is increased both by additional length and reduced speed for curvature.

None of the alignments appear to have fatal flaws from an operational perspective. The B and C alignments may be slightly less desirable due to the additional drainageway crossings and the smaller radii curvature.

For more detail and important caveats on costs and operational issues, see the accompanying memo from the Triangle Transit Authority, *Cost and Operational Considerations: 15-501 Transit Corridor Alignment in SW Durham.*

Table 5. Alignment Cost Issues Summary

Cost Issue	Alignment A	Alignment B1	Alignment B2	Alignment B3	Alignment C1	Alignment C2	Alignment C3	Alignment C4
Alignment length (feet)	Base Case	900í additional	1,150í additional	250í additional	950í additional	600í additional	3,000í additional	2,200í additional
Bridge/ drainage requirements	None anticipated	2 stream crossings	3 stream crossings ñ one appears minor	4 stream crossings ñ one appears minor	2 stream crossings	2 stream crossings	3 stream crossings	2 stream crossings
Vertical Profile	Alignment mostly follows ridge line thereby minimizing cut/fill	Alignment has more topographical change than A, requiring more cut/fill	Alignment has more topographical change than A, requiring more cut/fill	Alignment has more topographical change than A, requiring more cut/fill	Alignment has more topographical change than A, requiring more cut/fill	Alignment has more topographical change than A, requiring more cut/fill	Alignment has more topographical change than A, requiring more cut/fill	Alignment has more topographical change than A, requiring more cut/fill
Road Crossing Issues	2 roadway crossings	2 roadway crossings with one crossing near a stream	2 roadway crossings with one crossing near a stream	2 roadway crossings with one crossing near a stream	2 roadway crossings with one crossing near a stream	2 roadway crossings with one crossing near a stream	4 roadway crossings with one crossing near a stream	4 roadway crossings with one crossing near a stream
Stations	1	Potentially 2	Potentially 2	Potentially 2	Potentially 2	Potentially 2	Potentially 2	Potentially 2
Rough Order of Magnitude of cost (light rail option)	Base Case ($300 to $600 million for corridor)	$6 to 12 million increase (+2%)	$7 to 14 million increase (+2 to 3%)	$4 to 8 million increase (+1 to 2%)	$7 to 12 million increase (+2 to 3%)	$5 to 10 million increase (+1 to 2%)	$15 to 29 million increase (+5%)	$12 to 22 million increase (+4%)

Station Access. Riders access transit in three principal ways: (1) by walking or bicycling, (2) by driving or being driven, or (3) by taking a bus. This station access information applies to access to both the northern station envisioned in the MIS and the possible second, southern station, as envisioned by the Durham Comprehensive Plan.

Walking/Bicycling. Although the amount of development in close proximity to the station (see above) is the best measure of walk and bike access, design considerations such as sidewalks, bike lanes, direct and connected walking and cycling routes, and secure bicycle parking play a role as well. Bicycle parking will be addressed at the station design stage.

Park and Ride/Kiss and Ride. The MIS Phase II Report does not contain information on station parking, other than to classify stations as either ìwalkingî or ìparkingî stations (Table E in Appendix F). The northern Ephesus Church station is identified as a parking station. Similarly, the 2030 Long Range Transportation Plan does not specifically address parking at the station. There is a trade-off between land used for parking lots and land used for housing and/or jobs, although parking lots can be an interim use for more intense infill development at a later date. Park/ride lots can attract additional traffic to a station from a wider area, which can be useful as a supplement to transit-oriented development, but is not a substitute for it. There will be park-and-ride at locations along the full corridor, but the precise locations and amounts will be determined in the more detailed corridor planning and environmental analysis that would come later.

Bus Service. The MIS Phase II Report shows bus routes serving the proposed stations (Appendix E. Rail/Busway Service Plans). This service plan shows stations being served by existing DATA and TTA bus routes, by both existing and future Chapel Hill Transit Routes, and by one route whose operator is not specified. The northern Ephesus Church station is shown being served by existing Chapel Hill Transit routes F and G and by a new CH12 route that would also serve the Meadowmont and Gateway stations. The other route in the MIS serving Ephesus Church is labeled ìXî and would also serve the Meadowmont and Mt. Moriah stations. The 2030 Long Range Transportation Plan (LRTP) shows similar service to the northern station. The 2030 LRTP includes Chapel Hill Transit feeder buses serving the Gateway and Meadowmont stations, but does not include new feeder bus service to 15-501 transit corridor stations in Durham County.

An additional southern station under the B and C alignments would present service planners with a range of choices: (1) bus service can be re-routed from the northern station, (2) buses serving the northern station can also serve the southern station, or (3) additional feeder bus networks, like those proposed for the Gateway or Meadowmont stations, can be provided.

If feeder bus networks are added to either or both possible stations, rough estimates of capital costs associated with bus purchases might be on the order of $400,000 per network and annual operating costs might be on the order of $400,000 per network, based on the estimates for the Gateway Station feeder bus service in the 2030 LRTP.

Summary & Conclusions

Table 6 summarizes major ridership, cost, operational, land use and environment and community impacts associated with each alignment. The scale of the community/neighborhood impacts for each alignment would be similar, but different alignments would affect different homes and parcels.

Alignment A would cost the least and have slightly better operational and environmental/community impacts than the B and C options, but would be less supportive of land use plans, have lower ridership potential, and preclude one of the I-40/ NC 54 transit corridor alignment options.

The B alignments would have higher ridership potential and be more consistent with land use plans, but would cost more than Alignment A due to an additional station, stream crossings and longer distance. For these same reasons and due to more curves, they would have slightly worse operational characteristics than Alignment A.

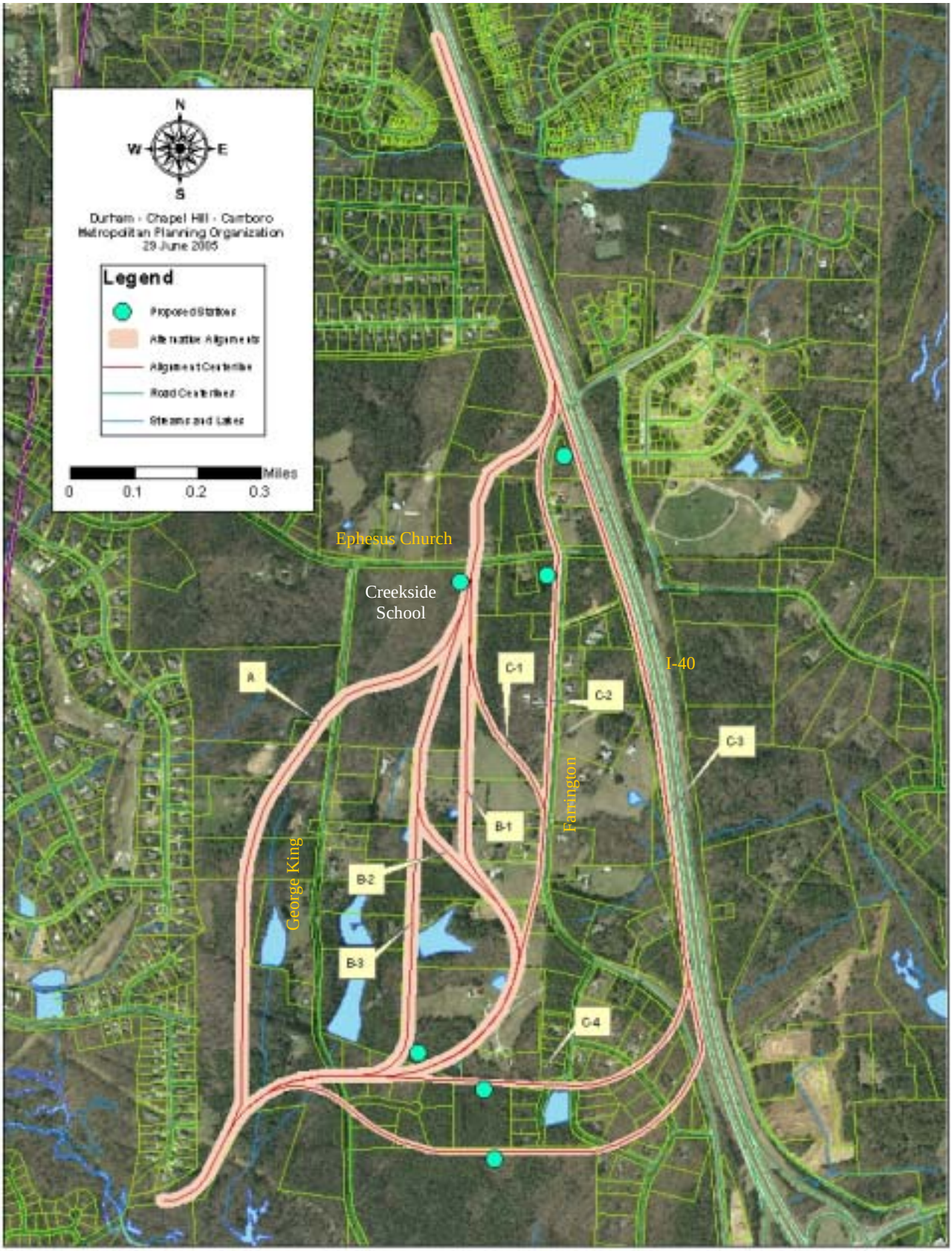
Alignment B2 would have similar ridership potential and land use benefits as B1, but would have slightly higher costs and environmental/community impacts and would be slightly worse operationally due to a greater length and more curvature. Alignment B3 would have lower costs than B1 or B2, but would add one more stream crossing and require the southern station to be located either north or west of the B1/ B2 location because of the alignmentís curve.

The C1 alignment would be similar to B1 in terms of cost and other technical aspects. C2 would cost slightly less, but could affect access to parcels from Farrington Road, depending on the transitway design. C3 would cost the most, principally because of its length, but could provide the highest ridership potential if the compact development envisioned in the Durham Comprehensive Plan is realized. C4 is similar to C3, but with somewhat lower costs due a shorter length and one less stream crossing. [Note: if per-acre land costs are less for C3 and C4 compared to other alternatives because some of the land is in Durhamís transportation buffer, costs could drop.]

Table 6. Summary of Issues

Alignment *(issue leader)*	**Ridership Potential**	**Cost**	**Environment and Community Impacts**	**Land Use and Transportation Plans**	**Operational Considerations**
Alignment A • *cost* • *environment & community* • *operational conditions*	Lowest: 1,300 to 2,800 population and jobs within 1/2 mile of station	Lowest Ballpark cost estimate for entire corridor is $300-$600 million for light rail alternative	All alignments roughly equal; Alignment A slightly better than B and C alignments due to no stream crossings, wetlands impacts or homes affected	Least supportive: would not serve Transit Support Area in Durham Comprehensive Plan and precludes one I-40/NC 54 transit corridor alignment option	All alignments are feasible; Alignment A slightly better than B and C options due to fewest curves and shortest distance
Alignment B1	High: 7,500 to 14,000 population and jobs within 1/2 mile of stations	Higher: rough estimate of $6 to 12 million increase in $300-600 million cost for alignment and stations	All alignments are roughly equal; B1 has fewer stream crossings (2) than other B options	Supportive: serves Transit Support Area in Durham Comprehensive Plan and preserves all alignment options for the I-40/NC 54 transit corridor	All alignments are feasible; Alignment B1 slightly better than B2 due to gentler curves and shorter distance
Alignment B2	High: 7,500 to 14,000 population and jobs within 1/2 mile of stations	Higher: rough estimate of $7 to 14 million increase in $300-600 million cost for alignment and stations	All alignments are roughly equal; Alignment B2 slightly worse than B1 due to 3 stream crossings	Supportive: serves Transit Support Area in Durham Comprehensive Plan and preserves all alignment options for the I-40/NC 54 transit corridor	All alignments are feasible; Alignment B2 slightly worse than B1 due to sharper curves and longer distance
Alignment B3	High: 7,500 to 14,000 population and jobs within 1/2 mile of stations	Higher: rough estimate of $4 to 8 million increase in $300-600 million cost for alignment and stations	All alignments are roughly equal; Alignment B3 slightly worse than B2 and B1 due to 4 stream crossings and wetland impacts	Supportive: serves Transit Support Area in Durham Comprehensive Plan and preserves all alignment options for the I-40/NC 54 transit corridor; slight shift in southern station location	All alignments are feasible; Alignment B3 shorter than B1 and B2 but requires one sharp curve
Alignment C1	High: 7,500 to 14,000 population and jobs within 1/2 mile of stations	Higher: rough estimate of $7 to 12 million increase in $300-600 million cost for alignment and stations	All alignments are roughly equal; Alignment C1 similar to B1 on streams and wetlands; could affect access to lots along Farrington Road	Supportive: serves Transit Support Area in Durham Comprehensive Plan and preserves all alignment options for the I-40/NC 54 transit corridor; does not include SW Durham Drive	All alignments are feasible; Alignment C1 similar to B1 in operational characteristics
Alignment C2	High: 7,300 to 13,900 population and jobs within 1/2 mile of stations	Higher: rough estimate of $5 to 10 million increase in $300-600 million cost for alignment and stations	All alignments are roughly equal; Alignment C2 similar to C1 on streams and wetlands; could affect access to lots along Farrington Road	Supportive: serves Transit Support Area in Durham Comprehensive Plan and preserves all alignment options for the I-40/NC 54 transit corridor; does not include SW Durham Drive	All alignments are feasible; Alignment C2 shorter than C1 and with fewer curves
Alignment C3 • *ridership potential* • *transportation & land use plans*	Potentially Highest: 7,000 to 15,600 population and jobs within 1/2 mile of stations	Highest: rough estimate of $15 to 29 million increase in $300-600 million cost for alignment and stations	All alignments are roughly equal; Alignment C3 crosses 3 streams and could pass close to homes along Crescent Drive and Wendell Road	Most Supportive: serves Transit Support Area in Durham Comprehensive Plan and preserves all options for the I-40/NC 54 transit corridor; does not include SW Durham Drive	All alignments are feasible; Alignment C3 is longest
Alignment C4	Second Highest: up to 7,000 to 15,600 population and jobs within 1/2 mile of stations	Second Highest: rough estimate of $12 to 22 million increase in $300-600 million cost for alignment and stations	All alignments are roughly equal; Alignment C4 crosses 2 streams and could pass close to homes along Crescent Drive and Wendell Road	Supportive: serves Transit Support Area in Durham Comprehensive Plan and preserves all alignment options for the I-40/NC 54 transit corridor; does not include SW Durham Drive	All alignments are feasible; Alignment C4 is shorter than C3

SW Durham Alignment Options Evaluation ó Alternatives Map



SW Durham Alignment Options Evaluation

Acronyms

BRT: Bus Rapid Transit, a bus-based transit system operating on a roadway or section of pavement reserved just for buses.

CHT: Chapel Hill Transit, the local transit system serving Chapel Hill and Carrboro.

COG: Council of Governments, an advisory planning group made up of elected officials from member governments.

DATA: Durham Area Transit Authority, the local transit system serving Durham

DCHC MPO: Durham-Chapel Hill-Carrboro Metropolitan Planning Organization, the regional transportation planning and decision-making body composed of elected officials from Carrboro, Chapel Hill, Chatham County, Durham City, Durham County, Hillsborough and Orange County and a board member from the North Carolina Department of Transportation.

EIS: Environmental Impact Statement, a document developed through a cooperative process that identifies the impacts associated with the development of a project, and mitigation measures designed to address the impacts.

LRT: Light Rail Transit, a type of transit technology operating on rails, either within an existing street or within a right-of-way reserved just for rail vehicles.

LRTP: Long Range Transportation Plan, the official plan of a Metropolitan Planning Organization identifying new highway, transit, pedestrian/bicycle and other transportation investments planned for a period of at least 20 years. A project must be in an LRTP found to conform to air quality standards before it can be built.

MIS: Major Investment Study, a transportation study leading to a preferred alternative for a major highway or transit corridor.

MPO: Metropolitan Planning Organization, a regional transportation planning and decision-making body composed of local elected officials and board members of the North Carolina Department of Transportation.

NCDOT: North Carolina Department of Transportation, state agency responsible for transportation facilities and services.

ROW: Right-of-Way, the land on which a road or transit facility is constructed.

TIP: Transportation Improvement Program, the 7-year list of projects assigned funding for feasibility studies, planning, design, right-of-way acquisition and construction. The TIP is a subset of the LRTP. A project must be in a TIP before it can be built.

TJCOG: Triangle J Council of Governments, the advisory planning group for the Research Triangle Region made up of elected officials from Chatham, Durham, Johnston, Lee, Moore, Orange and Wake Counties.

TTA: Triangle Transit Authority, the regional transit agency providing bus service between cities and planning for a rail line to link Durham with Raleigh; it is assumed that TTA would operate service in the Chapel Hill-Durham Transit Corridor.

USACOE: United States Army Corps of Engineers, responsible for wetlands permits.

USGS: United States Geological Survey, maps perennial and intermittent streams.

Documents Related to the Chapel Hill-Durham Transit Corridor

2030 Long Range Transportation Plan, Durham-Chapel Hill-Carrboro Metropolitan Planning Organization (2005).

US 15-501 Major Investment Study, Phase I Report, HNTB North Carolina (1998).

US 15-501 Major Investment Study, Phase II Report, HNTB North Carolina (2001).

Chapel Hill-Durham Transit Corridor: US 15-501 Corridor Alignment Analysis, Triangle J Council of Governments (2004).

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Phase II Transit Corridor SW Durham Development Scenario Analysis, Durham Transportation Division (2005).

15-501 Transit Corridor; Alignment in SW Durham, Triangle Transit Authority (2005).

Durham Comprehensive Plan, Durham City/County Planning Department (2005).

Station Area Development Guidelines, Triangle Transit Authority (1997).