

Section Three:
BENEFITS ANALYSIS

“Without question, bicycling is an efficient, economical and environmentally sound form of transportation and recreation. Bicycling is a great activity for families, recreational riders and commuters.”

PRESIDENT BILL CLINTON, Bicycling magazine, 1992



Ludlam Trail at Bird Road (SW 40th St.) looking north

Section Three BENEFITS ANALYSIS

3.1 SOCIAL BENEFITS

Social benefits are those in which improve the daily quality of life for area residents. The development of Ludlam Trail has the potential to provide many social benefits for the community, however, not all are quantifiable by calculations. Three benefits which further the stated goals of community and are quantifiable based on readily available data include the following:

- Destination Accessibility
- Health and Wellness

Each of the above benefits will be estimated for the Ludlam Trail Study Area and will show the direct benefits to the community based on the development of the trail.

NETWORK A: BIKING BEFORE LUDLAM TRAIL

Network A is a model of the existing bicycle conditions around Ludlam Trail. When running the physical GIS analysis, the existing roadway network was used, excluding the arterial roadways that did not have bicycle lanes. These arterials were included in the network as barriers to bicycle travel unless they have a crosswalk in place. Sidewalks were also not considered appropriate for biking routes.

3.1 SOCIAL BENEFITS

Social sustainability is related to the long-term social health of a community particularly in terms of equality, connectivity, and improvements to daily quality of life for residents. Although the development of Ludlam Trail will promote healthy lifestyles, improve public safety, enhance educational opportunities, improve accessibility and help preserve the area’s history and culture as shown in the previous section, not all of these benefits can be quantified. The two that can be most readily measured are improvements in accessibility and healthy lifestyles. AECOM quantified the social benefits of Ludlam Trail with the following analyses:

- Destination Accessibility - Increase in accessibility to schools and parks.
- Health and Wellness - Measurement of increased physical activity expressed in calories burned and community-wide savings in direct medical costs.

3.1.1 DESTINATION ACCESSIBILITY

Improving access to community facilities for area residents is a primary goal of Ludlam Trail. This sections assesses the improved access to such facilities that will result from constructing the trail.

METHODOLOGY

The first step in determining accessibility benefits was to model existing and future transportation networks. A total of five networks were developed. Maps of each network can be found on pages 42 through 44 of the study.

Bicycle Analysis Networks - Networks A, B, and C

These networks were developed to measure the impact from the development of the trail on residents living within two (2) miles or a ten (10) minute bike ride of specific destinations, such; transit stations; parks or schools.

- Network A: Biking before Ludlam Trail is developed
- Network B: Biking after Ludlam Trail is developed
- Network C: Biking after Ludlam Trail and proposed bike facilities has been fully implemented

To quantify any improvements to area accessibility for cyclists as a direct result from the development of Ludlam Trail, AECOM calculated the difference between the results of Network A and Network B. The third network (Network C) is shown to document regional accessibility improvements once a full bicycle and pedestrian network is implemented per the Miami-Dade County Bike and Pedestrian Plan Update and City of Miami Bicycle Plan. Each network is based on GIS data for existing roadways within Miami-Dade County.

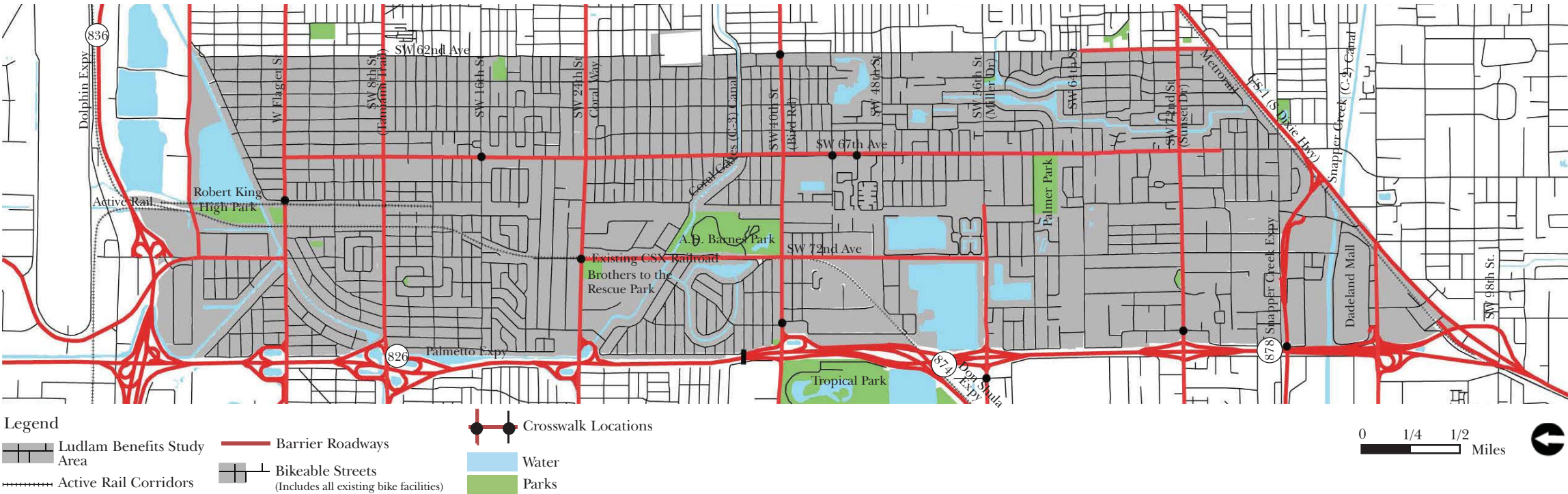
Walking Analysis Networks - Networks D and E

These two networks were developed to measure the impact of the trail on residents living with a ten (10) minute walk (1/2 mile) of specific destinations.

- Network D: Walking **before** Ludlam Trail is developed
- Network E: Walking **after** Ludlam Trail is developed

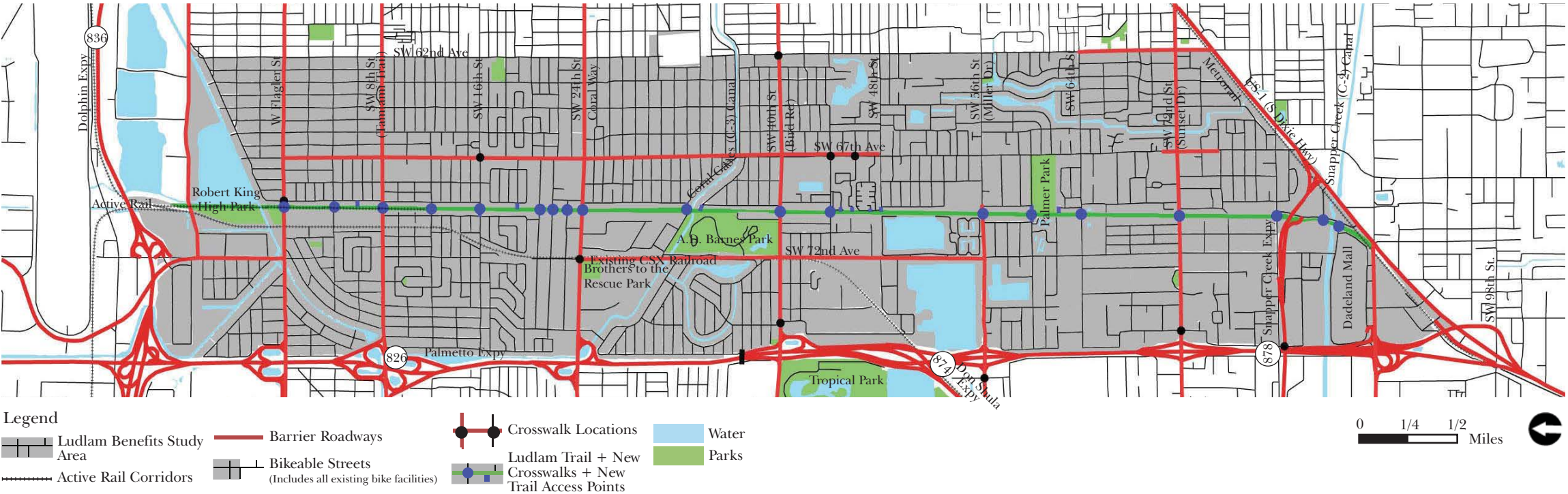
To quantify improvements to area accessibility for walking as a direct result from the development of Ludlam Trail, AECOM calculated the difference between the results of Network D and Network E.

NETWORK A: BIKING BEFORE LUDLAM TRAIL

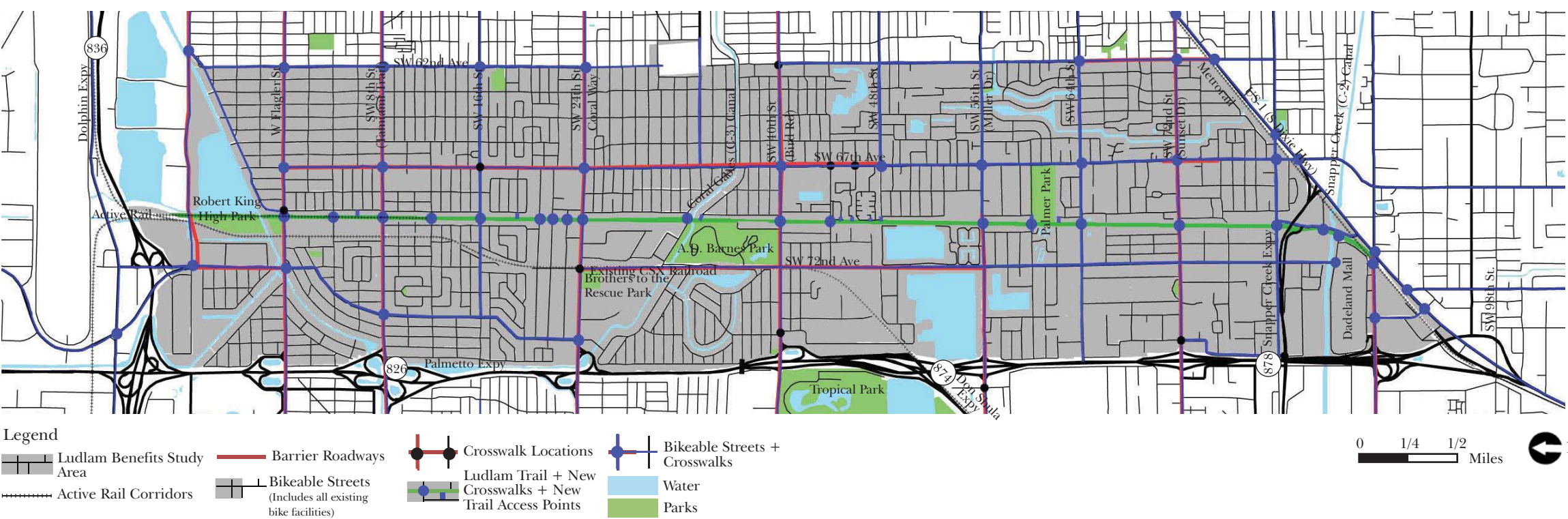


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NETWORK B: BIKING AFTER LUDLAM TRAIL



NETWORK C: AFTER LUDLAM TRAIL + PROPOSED BIKE FACILITIES



NETWORK B: BIKING AFTER LUDLAM TRAIL

Network B examines anticipated conditions after Ludlam Trail is constructed. When completing the GIS analysis, the roadway network is the same as in Network A except that Ludlam Trail now provides a north-south connection and additional east-west connections at what are now dead-ends. These proposed completed connections are located at: SW 6th Avenue, SW 19th Street, SW 22nd Street, SW 23rd Street, A.D. “Doug” Barnes Park, SW 44th Street, SW 48th Street, SW 53rd Street, SW 66th Street, and SW 76th Street.

NETWORK C: AFTER LUDLAM TRAIL + PROPOSED BIKE FACILITIES

Network C represents the ultimate implementation of the Miami-Dade County Bike and Pedestrian Plan and the City of Miami Bike Plan. The roadway network used in the analysis is identical to that of Networks A and B, but now has bicycle lanes along W. Flagler Street, SW 8th Street (Tamiami Trail), SW 16th Street, SW 24th Street (Coral Way), SW 40th Street (Bird Road), SW 56th Street (Miller Drive), SW 64th Street, SW 72nd Street (Sunset Drive), and SW 80th Street.



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NETWORK D: WALKING BEFORE LUDLAM TRAIL

Network D models the existing sidewalk network around Ludlam Trail. This Network counts arterial roadways as barriers that cannot be crossed unless there is a crosswalk in place.

NETWORK D: BEFORE LUDLAM TRAIL



NETWORK E: WALKING AFTER LUDLAM TRAIL

Network E models anticipated walking conditions after Ludlam Trail is constructed. When running the GIS analysis, the sidewalk network is the same as in Network D except Ludlam Trail now provides a north-south connection and additional east-west connections where dead-ends currently exist.

NETWORK E: AFTER LUDLAM TRAIL



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DESTINATION ACCESSIBILITY (CONTINUED)

SCHOOLS

Ludlam Trail has the potential to help students reach public and private schools safer and easier by walking or biking on the Ludlam Trail. Ultimately this will reduce vehicle trips. There are six schools within the Ludlam Trail Study Area that will potentially benefit from the development of the Ludlam Trail by providing a safe route to school for student. Base attendance figures for each school follows:

- Coral Terrace Elementary School. Current enrollment is 549 students.
- South Miami Elementary School (K-8). Current enrollment is 859 students.
- Ludlam Elementary School. Current enrollment is 448 students.
- West Miami Middle School. Current enrollment is 1,113 students.
- South Miami Middle School. Current enrollment is 1,027 students.
- South Miami Senior High School. Current enrollment is 2,308 students.

Detailed information for mode share was not available for each school within the Study Area, however, comparable schools were identified within Miami-Dade County with safe routes to schools applications with estimated mode share data. The travel characteristics for each of these types of schools are different (some students can drive, some cannot), so the analytical methodology accounted for these differences.

METHODOLOGY – BICYCLING AND WALKING (2 MILES)

The first step was to determine the number of children who will benefit from new access to a safe route to school. Using the boundary of each school’s attendance area, the population of kids ages 5-17 that live within the attendance area was calculated using Census Block data from 2000.

The Miami-Dade County Public Schools requires all students within two (2) miles of their respective school to provide their own mode of transportation. This two mile requirement will be used for each school to compute in GIS Network Analyst using the networks for Networks A, B, and C. Once each service area was established for each network, the population of children 5-17 that lived both within the attendance area and within a two (2) mile bike or walking trip of each school was calculated (Table A).

When these populations were calculated based on GIS information, it was discovered that far more children live within the attendance area than are actually enrolled in the schools. This is attributed to children attending private school outside of the Ludlam Trail Study Area or being home schooled. To account for this discrepancy in the analysis, the team calculated the difference of children within the total attendance area versus those within the attendance area and within 2 mile as a percentage. This percentage was then applied to actual enrollment numbers to determine the number of currently enrolled students who live within two miles of the school.

Table A: Students Within a Two-Mile Trip to School

Network	A	B	# Students who gained access by Ludlam Trail	C	# Students who gained access from network
Coral Terrace ES	428	451	23	451	0
South Miami ES	659	702	43	702	0
Ludlam ES	118	134	16	134	0
West Miami MS	412	472	60	497	25
South Miami MS	593	637	44	637	0
South Miami HS	485	560	75	560	0
Total	2,695	2,956	261	2,981	25

Source: Miami-Dade County and US Census (2000)

SUMMARY OF FINDINGS

With the construction of Ludlam Trail, approximately 261 additional students will be able to access their school via a safe bicycle or walking route. With the completion of all bicycle lanes associated with the Miami-Dade County Bike and Pedestrian Plan Update, approximately twenty-five (25) additional students will gain access.

PARKS

The Ludlam Trail Study Area is rich in park resources. With the construction of the trail, there is the potential for improved access to both community and neighborhood-level park facilities.

METHODOLOGY – BICYCLING (2 MILES)

There are four community-level parks within the Study Area, A.D. “Doug” Barnes Park, Brothers to the Rescue Park, Palmer Park (City of South Miami) and Robert King High Park (City of Miami). These parks are meant to serve a broad community of residents and are regionally significant either for their natural resources or single use sports recreation programming. Residents are expected to travel up to two (2) miles by bicycle or one half (1/2) mile by foot to access each park.

First, the population within a two-mile trip of either A.D. “Doug” Barnes Park, Brothers to the Rescue Park, Palmer Park (City of South Miami) and Robert King High Park (City of Miami) was calculated using Networks A, B, and C to determine the benefit of access for cyclists. The number of people who gain access to these four parks based on the development of Ludlam Trail was calculated as the difference in the population between Network A and Network B.

Table B: Residents Within a Two-Mile Bicycle Ride to a Community Park

Network	A	B	# Residents who gained access by Ludlam Trail	C	# Residents who gained access by network
Residents within a 2-Mile Bicycle Ride	29,873	36,262	6,389	37,545	1,283

Source: Miami-Dade County and US Census (2000)

SUMMARY OF FINDINGS

With the construction of Ludlam Trail, an estimated 6,389 residents will gain bicycle access to A.D. “Doug” Barnes Park, Brothers to the Rescue Park, Palmer Park (City of South Miami) and Robert King High Park (City of Miami).

METHODOLOGY – WALKING (1/2 MILE)

The population within a 1/2 mile of the parks in the Ludlam Trail Study Area was calculated using the two different walking networks (D and E) in GIS. The number of people who gain access to these parks within a mile of their homes was calculated as the difference in the population between Networks D and E.

Table C: Residents Within a 1/2 Mile Walk of a Park

Network	D	E	# Residents who gained access
Residents within 1/2 mile walk	5,669	6,361	692

Source: Miami-Dade County and US Census (2000)

SUMMARY OF FINDINGS

With the development of Ludlam Trail, an estimated 692 residents will gain walking access to parks located along and near the trail.

3.1.1 DESTINATION ACCESSIBILITY SUMMARY OF FINDINGS

Based on the methodology discussed to the left, it is estimated that the development of Ludlam Trail would enhance overall accessibility to schools, parks, transit stations, and bus stops for as many as 30,550 people living within two (2) miles of Ludlam Trail.

The table below identifies increased accessibility for cyclist per destination based on the development of Ludlam Trail:

Destinations	Additional Residents with Access
Schools – (2 miles)	261
Parks – (1 mile)	6,389
Transit Stations – (1 mile)	23,900
Total Residents Gaining Access	30,550

The following table identifies increased accessibility for walking to the following destinations:

Destinations	Additional Residents with Access
Schools – (2 mile)	261
Parks – (1/2 mile)	692
Transit Stations – (1/2 mile)	0
Bus Stops – (1/2 mile)	186
Total Residents Gaining Access	1,139



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The North Dadeland Metrorail Station, by connecting with the Ludlam Trail, will provide area residents with the opportunity to use mass transit, therefore reducing the need for vehicles



A.D. Barnes Park will be directly connected to the Ludlam Trail, offering area residents access to the park by walking, cycling or skating.

TRANSIT STATIONS

There are two transit stations within the Ludlam Trail Walkable Area. These include the existing Dadeland North Metrorail station located at SW 85 St. and SW 70th Ave. and the proposed Orange Line Metrorail station planned near NW 7th St. At the time of this study, the anticipated construction date for the new transit station is 2016, with operations beginning in 2018.

METHODOLOGY – BICYCLING (2 MILES)

Using the three networks in GIS, two mile service areas were computed from both transit stations. The difference between Network A and Network B is the number of residents who gained bicycle access to the Dadeland North Metrorail and the proposed Orange Line Metrorail transit stations via the Ludlam Trail.

Table D: Residents Within a Two Mile Bike Ride of a Transit Station

Network	A	B	# residents who gained access by Ludlam Trail	C	# residents who gained access by Network
Residents within 2 mile bicycle trip	14	23,914	23,900	34,538	10,638

Source: Miami-Dade County and US Census (2000)

SUMMARY OF FINDINGS

With the development of Ludlam Trail approximately 23,900 area residents will gain access to transit stations. With the implementation of the Miami-Dade County Bike and Pedestrian Plan Update, 10,638 additional residents gain bicycle access to the Dadeland North Metrorail and the proposed Orange Line Metrorail transit stations.

METHODOLOGY – WALKING (1/2 MILE)

Using the two walking networks in GIS Network Analyst, 1/2 mile or ten (10) minute walking service areas were computed for both transit stations. The difference between Network D and Network E is the number of residents who gained bicycle access to the Dadeland North Metrorail and the proposed Orange Line Metrorail transit stations.

Table E: Residents Within a 1/2 Mile Walk of a Transit Station

Network	D	E	# residents who gained access by Ludlam Trail
Residents within 1/2 mile walk	43	43	0

Source: Miami-Dade County and US Census (2000)

SUMMARY OF FINDINGS

Through the development of Ludlam Trail no residents would gain walking access to the Dadeland North Metrorail and the proposed Orange Line Metrorail transit stations. This is likely due to the large block sizes located around the transit stations and the distance of the transit stations from the nearest residential areas. The important finding, however, is that 23,900 people will now be able to cycle to either of the transit stations.

BUS STOPS

Convenience is a key element in encouraging mass transit use as stated earlier in the study. Most people will not use bus transit if a stop is more than a half (1/2) mile for a 10 minute walk from their home. For this estimate a half 1/2 mile service area was mapped for each bus stop.

METHODOLOGY – WALKING (1/2 MILE)

Using the two walk networks in GIS, 1/2 mile service areas were computed from all the bus stop within the Ludlam Trail Walkable Area. The difference between Network D and Network E is the number of residents who gained walking access to bus stops.

Table F: Residents Within a 1/2 Mile Walk of a Bus Stop

Network	D	E	# residents who gained access by Ludlam Trail
Residents within 1/2 mile walk	48,412	48,598	186

Source: Miami-Dade County and US Census (2000)

SUMMARY OF FINDINGS

With the development of Ludlam Trail, 186 residents gain walking access to bus stops within the 1/2 mile Walkable Area.

DESTINATION ACCESSIBILITY SUMMARY

The development of Ludlam Trail will have a significant impact on area accessibility and improving the daily lives of thousands of area residents. When all destination types are combined, the Ludlam Trail will provide a safe route to bike two (2) miles or ten (10) minutes to work, school or a park for approximately 30,5500 residents while approximately 1,139 residents will be able to walk a half mile (1/2) or ten (10) minutes to the same destinations.

3.1.2 HEALTH & WELLNESS

DIRECT MEDICAL CARE SAVINGS

METHODOLOGY

For the health and wellness analysis, AECOM used a low scenario and a high scenario. The low scenario is based on data from the 2006 Community Health Survey which states that 40.7% of residents in the study area will use the trail in a given year. The high scenario is based on data from the 2006 Community Health Survey which states that 54.3% of Miami-Dade County residents use parks and open spaces in a given year. The high scenario is based on this data because the presence of the Ludlam Trail and open space associated with the trail and parks connected by it may in fact increase the amount of area residents using a trail in a given year.

The first step in this process is to estimate the number of residents who will use the trail. There are approximately 52,680 residents within the Study Area as stated in section 1.4 of the study. For the low scenario the population was multiplied by 40.7% while for the high scenario the population figure is calculated by 54.3%. This estimate will not attempt to calculate potential trail users from outside the Walkable Area that may receive direct medical care savings by exercising on Ludlam Trail.

Next, the planning team sought ways to exact the fitness benefits that stem directly from the development of Ludlam Trail. Very few studies have looked at the exact fitness benefits in a community before a trail existed and after. In order to determine the fitness benefits directly associated from the Ludlam Trail a study conducted by West Virginia University School of Medicine, Department of Human Performance and Exercise Science in 2004 was used for comparison. The study documented that 23% of trail users were “new exercisers”. Therefore, based on the previous study approximately 23% of Ludlam Trail users are likely to be “new exercisers.”

The next measure will take into account the percent increase in physical activity since using the trail. All trail users’ exercise levels will not increase by 100% because of Ludlam Trail. The same study conducted in West Virginia took this into account, and asked the following question:

“Since using the trail, approximately how much has your exercise level increased?”

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Table G: Response

	0-25%	26-50%	51-75%	76-100%	> 100%
Exerciser	9.5	20.2	17.9	42.9	9.5
Active	56.8	30.1	8.7	3.1	1.3

Source: West Virginia University School of Medicine, Department of Human Performance and Exercise Science (2004)

These percentages were then applied to the estimated number of new exercisers and habitually active or regular exercisers users on Ludlam Trail.

The Center for Disease Control (CDC) estimates that lack of physical activity costs approximately \$615 per year in direct medical expenses per person. This average annual cost was then applied to both categories of exerciser.

LOW SCENARIO

There are approximately 52,680 residents in the Study Area, of which approximately 21,440 use trails annually based on the 2006 Community Health Survey. Of the 21,440 trail uses approximately 23% are new exercisers or 4,931 people. Habitual exercisers or regular exercisers account for 16,509 trail users.

Table H: Increased Level of Exercise Due to Ludlam Trail by Exerciser Type

	0-25% increase	26-50% increase	51-75% increase	76-100% increase	>100% increase
	% type total	% type total	% type total	% type total	% type total
New Exerciser	9.50% 468	20.20% 996	17.90% 883	42.90% 2,115	9.50% 468
Habitually Active	56.80% 9,377	30.10% 4,969	8.70% 1,436	3.10% 512	1.30% 215

Source: West Virginia University School of Medicine, Department of Human Performance and Exercise Science (2004) and US Census Data (2000)

Table I: Savings from Increased Level of Exercise Due to Ludlam Trail

Level of Increase	0% - 24%	25% - 49%	50% - 74%	75% - 99%	>100%
Prorated Cost	\$0.00	\$153.75	\$307.50	\$461.25	\$615.00
Total by Level of Exercise	\$0	\$153,145	\$271,415	\$975,728	\$288,094
TOTAL Low Scenario Direct Medical Cost Savings					\$1,688,381

Source: West Virginia University School of Medicine, Department of Human Performance and Exercise Science (2004) and US Census Data (2000)

HIGH SCENARIO

There are approximately 52,680 residents in the Study Area, of which approximately 28,605 use parks annually based on the 2006 Community Health Survey. Of the 28,605 trail uses approximately 23% are new exercisers or 6,579 people. Habitual exercisers or regular exercisers account for 22,026 trail users. This scenario takes into account an increase in area residents exercise because of the presence of Ludlam Trail and the open spaces and parks which are accessible through the trail.

Table J: Increased Level of Exercise Due to Ludlam Trail by Exerciser Type

	0-25% increase	26-50% increase	51-75% increase	76-100% increase	>100% increase
	% type total	% type total	% type total	% type total	% type total
New Exerciser	9.50% 625	20.20% 1329	17.90% 1178	42.90% 2822	9.50% 625
Habitually Active	56.80% 12,511	30.10% 6,630	8.70% 1,916	3.10% 682.8	1.30% 286

Source: West Virginia University School of Medicine, Department of Human Performance and Exercise Science (2004) and US Census Data (2000)

Table K: Savings from Increased Level of Exercise Due to Ludlam Trail

Level of Increase	0% - 24%	25% - 49%	50% - 74%	75% - 99%	>100%
Prorated Cost	\$0.00	\$153.75	\$307.50	\$461.25	\$615.00
Total by Level of Exercise	\$0	\$204,327	\$362,125	\$1,301,828	\$384,378
TOTAL Low Scenario Direct Medical Cost Savings					\$2,252,658

Source: West Virginia University School of Medicine, Department of Human Performance and Exercise Science (2004) and US Census Data (2000)

SUMMARY OF FINDINGS

The estimated direct personal medical expenses that will be saved due to new exercisers using Ludlam Trail based on the low scenario is \$1.68 million annually while the high scenario provides savings of \$2.25 million annually. These estimates do not include any direct medical expenses that will be potentially saved by those who are already active and use the existing trails and parks for exercise.

CALORIES BURNED

METHODOLOGY:

In order to calculate an estimate of calories (kilocalories) burned by residents exercising on Ludlam Trail, two factors needed to first be quantified: the average amount of time spent exercising on Ludlam Trail and the type of exercise.

A study of six urban trail completed by the Eppley Institute of Parks and Public Land at the University of Indiana was referenced to estimate the frequency of trail use. Users reported on average spending between one hundred (100) and two hundred (200) minutes exercising on the trail per week. The trail in the most urban area of the study, Monon Trail, had an average time of 180 minutes per week. For Ludlam Trail, two durations of trail use scenarios: low duration of one hundred (100) minutes and a high duration of two hundred (200) minutes per week and a per week spent exercising on the trail.

Common methods of exercise on trails do not burn the same amount of calories. In order to address this the same study completed by the University of Indiana was referenced to estimate how much of each types of exercise will occur on Ludlam Trail. The Monon Trail, as documented in the trail exercise study serves as a comparable to Ludlam Trail do to its similar length, urban context, and climatic constraints (both have three-four months of extreme climate that will likely deter some trail usage). Based on the types of exercise recorded on Monon Trail, the estimated exercise types and their comparable frequency on Ludlam Trail are:

- Walking – 51% of all exercise on Ludlam Trail
- Bicycling – 21% of all exercise on Ludlam Trail
- Jogging – 18% of all exercise on Ludlam Trail
- Skating/other – 10% of all exercise on Ludlam Trail

A Department of Health and Family Services study from the State of Wisconsin reported the following number of calories burned per these four exercise methods; at the low end of the range is the calories per hour burned by a 130 pound-person, while the high end of the range is calories burned by a 190 pound-person. Numbers in parentheses indicate the average of these two amounts of calories burned:

Type of Exercise	Calories per hour
Walking	207 - 302 (255)
Bike Riding (less than 10 mph)	236 - 345 (291)
Jogging	413 - 604 (509)
Skating	403 - 604 (503)

3.1.2 HEALTH AND FITNESS - DIRECT MEDICAL COST SAVINGS SUMMARY OF FINDINGS

The estimated direct personal medical expenses that will be saved due to new exercisers using Ludlam Trail is between \$1.68 million and \$2.25 million annually. These estimates do not include any direct medical expenses that will be potentially saved by those who are already active and use the existing trails and parks for exercise.



The Seminole-Wekiva trail, shown above,allows area residents to exercise, leading to healthier lifestyle with reduced medical costs.



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3.1.3 HEALTH AND FITNESS - CALORIES BURNED SUMMARY OF FINDINGS

Based on the analyses to the left, residents within the Ludlam Trail Study Area can expect to lose or keep off between 32,664 and 109,939 pounds of weight annually by burning between 2.19 million and 7.39 million calories (kilocalories) weekly while exercising on Ludlam Trail.



The Seminole-Wekiva trail, shown above, offers a safe choice for area residents to exercise.

For the purposes of this analysis, skating and “other exercise” are grouped together. Because “other exercise” is not defined, 300 calories per hour is assigned to this exercise type. These estimates were then applied to the two duration scenarios to provide an average amount of calories each user would burn. This estimate does not assume that every user will spend 51% of their time walking, and 21% bicycling. Instead the estimates are for the entire population of trail users these percentages would reflect the proportion of time all users as a composite would spend on the trail.

Table L: Calories Burned Per Week by Exercise Type

Average Time on trail/week	100 min (Low Duration)	200 min (High Duration)
Walking Time	51 min	102 min
Walking Calories (255/hr)	217	434
Bicycling Time	21 min	42 min
Bicycling Time Calories (291/hr)	102	204
Jogging Time	18 min	36 min
Jogging Time Calories (509/hr)	153	306
Skating/ Other Time	10 min	20 min
Skating/ Other Time Calories (300/hr)	50	100
TOTAL CALORIES BURNED	522	1044

Source: University of Indiana, Eppley Institute of Parks and Public Land (2007) and the State of Wisconsin Department of Health and Family Services

METHODOLOGY

High and low population figures from the previous section (3.1.3) are used for both scenarios to determine a range of calories burned by exercising on Ludlam Trail. The four calculations include the following:

- 1. Low Population (21,440) – High Duration (200 min.)
- 2. Low Population (21,440) – Low Duration (100 min.)
- 2. High Population (28,005) – High Duration (200 min.)
- 4. High Population (28,005) – Low Duration (100 min.)

The next step applied the population figures used for the previous section (3.1.3) to the calories burned for each duration of exercise Based on the level of exercise for each person the total calories burned by increased exercise and duration on Ludlam Trail is as follows:

Table M: Calories burned by increased exercise and duration of exercise on Ludlam Trail

	0%	25%	50%	75%	100%
Calories for LOW DURATION (100 Min)	0	131	261	392	522
Calories for HIGH DURATION (200 Min)	0	262	522	784	1044

Source: West Virginia University School of Medicine, Department of Human Performance and Exercise Science (2004) and US Census Data (2000)

To translate the amount of calories burned into pounds of fat lost, these numbers were then divided by 3,500, the amount of calories it takes to burn one pound. This number is then multiplied by 52 to get the annual amount of pounds lost or kept off per year per scenario.

LOW USER POPULATION SCENARIO

Table N: Trail User Increase in Exercise Due to Ludlam Trail

	0-25% increase		26-50% increase		51-75% increase		76-100% increase		>100% increase	
	% type	total	% type	total	% type	total	% type	total	% type	total
New Exerciser	9.50%	468	20.20%	996	17.90%	883	42.90%	2,115	9.50%	468
Habitually Active	56.80%	9,377	30.10%	4,969	8.70%	1,436	3.10%	512	1.30%	215
Total Users		9,846		5,965		2,319		2,627		683

Source: West Virginia University School of Medicine, Department of Human Performance and Exercise Science (2004) and US Census Data (2000)

Table O: Scenario 1 (low user/high duration): Calories Burned and Weight Loss Directly Attributed to Ludlam Trail

	0%	25%	50%	75%	100%	TOTAL
Users	9,846	5,965	2,319	2,627	683	21,440
Calories burned per person/ week	0	262	522	784	1,044	2,612
Calories burned per week	0	1,562,901	1,210,483	2,059,708	713,117	5,546,208
Pounds per week	0	447	346	588	204	1585
Pounds per year	0	23,220	17,984	30,601	10,595	82,401

Source: West Virginia University School of Medicine, Department of Human Performance and Exercise Science (2004) and US Census Data (2000)

Table P: Scenario 2 (low user/low duration): Calories Burned and Weight Loss Directly Attributed to Ludlam Trail

	0%	25%	50%	75%	100%	TOTAL
Users	9,846	5,965	2,319	2,627	683	21,440
Calories burned per person/ week	0	131	261	392	522	1,306
Calories burned per week	0	781,451	605,241	1,029,854	356,558	2,198,510
Pounds per week	0	223	173	294	102	628
Pounds per year	0	11,610	8,992	15,301	5,297	32,664

Source: West Virginia University School of Medicine, Department of Human Performance and Exercise Science (2004) and US Census Data (2000)

The low population scenario estimates that between 5.5 million and 2.19 million calories per week or between 82,401 and 32,664 pounds of weight per year could be lost or kept off by exercisers using Ludlam Trail.

HIGH USER POPULATION SCENARIOS

Table Q: Trail User Increase in Exercise Due to Ludlam Trail

	0-25% increase		26-50% increase		51-75% increase		76-100% increase		>100% increase	
	% type	total	% type	total	% type	total	% type	total	% type	total
New Exerciser	9.50%	625	20.20%	1329	17.90%	1178	42.90%	2822	9.50%	625
Habitually Active	56.80%	12,511	30.10%	6,630	8.70%	1,916	3.10%	683	1.30%	286
Total Users		13,136		7,959		3,094		3,505		911

Source: West Virginia University School of Medicine, Department of Human Performance and Exercise Science (2004) and US Census Data (2000)

Section Three BENEFITS ANALYSIS

Table R: Scenario 3 (high user/high duration): Calories Burned and Weight Loss Directly Attributed to Ludlam Trail

	0%	25%	50%	75%	100%	TOTAL
Users	13,136	7,959	3,094	3,505	911	28,605
Calories burned per person/ week	0	262	522	784	1,044	2,612
Calories burned per week	0	2,085,201	1,615,017	2,748,074	951,442	7,399,735
Pounds per week	0	596	461	785	272	2114
Pounds per year	0	30,980	23,995	40,829	14,136	109,939

Source: West Virginia University School of Medicine, Department of Human Performance and Exercise Science (2004) and US Census Data (2000)

Table S: Scenario 4 (high user/low duration): Calories Burned and Weight Loss Directly Attributed to Ludlam Trail

	0%	25%	50%	75%	100%	TOTAL
Users	13,136	7,959	3,094	3,505	911	28,605
Calories burned per person/ week	0	131	261	392	522	1,306
Calories burned per week	0	1,042,601	807,509	1,374,037	475,721	3,699,868
Pounds per week	0	298	231	393	136	1057
Pounds per year	0	15,490	11,997	20,414	7,068	54,969

Source: West Virginia University School of Medicine, Department of Human Performance and Exercise Science (2004) and US Census Data (2000)

SUMMARY OF FINDINGS

Residents within the Ludlam Trail Study Area stand to lose or keep off between 32,664 and 109,939 pounds of weight annually by burning between 2.19 million and 7.39 million calories each week while exercising on the Ludlam Trail. This estimate includes regular exercisers that may use Ludlam Trail because of its convenience and connections to various parks and open spaces and new exercisers that may begin to exercise due to the convenience of the Ludlam Trail.

3.2 ENVIRONMENTAL BENEFITS

GENERAL ENVIRONMENTAL BENEFITS

The landscape within the Ludlam Trail corridor has been completely altered from its historical condition, and virtually all native plants in the corridor have been displaced by exotic species. The community structure that would have existed in natural communities such as pine Rockland, tropical hardwood hammock, wet prairie, or forested wetland slough no longer exist. Nevertheless the potential for use of the site by some highly mobile and urban-adapted species of birds remains high. A focused, native species landscape plan could restore some of the plant diversity to the upland communities that were historically present in the corridor.

Currently, habitat and development types adjacent to the corridor generally vary from canopied in parks and older, less dense residential areas to treeless urban areas associated with commercial, industrial, and dense residential. The potential for restoration of native plants, and the ability to attract a more diverse array of native wildlife is significant. The value of this restoration could be further enhanced by encompassing similar approaches on the adjacent to parks and open water bodies that occur in various locations along the corridor. Suggested native plants to consider (based on availability and price) within these two historical communities include:

- Tropical Hardwood Hammock**
Gumbo limbo (*Bursera simaruba*)
Pigeon plum (*Coccoloba diversifolia*)
Wild tamarind (*Lysiloma latisiliqua*)
Live oak (*Quercus virginiana*) (a significant species in historical hammocks)
Mastic (*Mastichodendron foetidissimum*)
Willow busic (*Bumelia salicifolia*)
Cabbage palm (*Sabal palmetto*)
Lancewood (*Necandra coriacea*)
Inkwood (*Exothea paniculata*)
White stopper (*Eugenia axillaris*)
Marlberry (*Ardisia escallonoides*)
Red mulberry (*Morus rubra*)
Satinleaf (*Chrysophyllum oliviforme*)
Myrsine (*Myrsine guianensis*)
Wild coffee (*Psychotria nervosa*, *P. sulzneri*)
Rough velvetseed (*Guettarda scabra*)
Snowberry (*Chiococca alba*)
Boston fern (*Nephrolepis exaltata*)

Sword fern (*N. biserrata*)
Thelypteris kunthii

- Pine Rockland (a system reliant on fire)**
South Florida slash pine (*Pinus elliottii* var. *densa*)
Willow busic
Coco plum (*Chrysobalanus icaco*)
Wax myrtle (*Myrica cerifera*)
Cabbage palm
Coontie
Saw palmetto (*Serenoa repens*)
Red bay (*Persea borbonia*)
Locust berry (*Byrsonima lucida*)
Pineland croton (*Croton linearis*)
Wild sage (*Lantana involucrata*)
And a large number of herbaceous understory species

With a focus on native canopy and understory restoration, there is the potential for attracting numerous native species of birds that breed in south Florida, and dozens of birds that migrate through each year. The vision, established by the Ludlam Trail Design Guidelines and Standards report, calls for a landscape that ultimately represents a mature native upland of at least two historical communities, with native species of birds, butterflies and other invertebrates in the linear corridor and the adjacent open spaces of parks and canopied residential.

The seventy-two (72) acre corridor could set the framework framework for restoration on hundreds of acres of previously disturbed lands in south Florida. Ancillary benefits of this restoration are water quality improvement through upland overflow treatment of runoff; reducing heat island effects through shading over the seventy-two (72) acre corridor; and air quality benefits of a stable, low maintenance native landscape.

QUANTIFYING ENVIRONMENTAL BENEFITS

Because Ludlam Trail is located in a highly urbanized, developed region of Miami-Dade County, environmental benefits are limited and full restoration of the historical ecological communities may not be appropriate given the level of disturbance within the corridor and limitation of surrounding developments such as the need to conduct prescribed burns within Pine Rockland communities. With a focus on providing tree canopy and native or select non-native plant species many positive impacts may be realized by the community. Following are four environmental benefits which are community wide in impact and are directly linked to the development of Ludlam Trail.

3.2 ENVIRONMENTAL BENEFITS

Environmental benefits are those in which reduce human impacts upon the natural world while improving the daily quality of life for area residents. The development of Ludlam Trail has the potential to provide many environmental benefits for the community, however, not all are quantifiable by calculations. Three benefits which further the stated goals of the community and are quantifiable based on readily available data include the following:

- **Reduced Vehicle Daily Trips (VDTs)**
- **Emissions Reduction**
- **Tree Canopy Benefits**
- **Carbon Sequestration**

Each of the above benefits will be estimated for the Ludlam Trail Study Area and will show the direct benefits to the community based on the development of the trail.



Section Three BENEFITS ANALYSIS



- **Vehicle Daily Trip Reduction:** The reduction vehicle daily trips (VDTs) by residents using the trail instead of private motorized vehicles will lead to a reduction in miles driven and motorized vehicle emissions
- **Emissions Reduction:** The reduction of hydrocarbons, carbon monoxide, oxides of nitrogen, and carbon dioxide due to decreased vehicle trips
- **Tree Canopy Benefits:** The amount of oxygen generated, additional carbon dioxide stored, and noise reduction from the additional trees planted along Ludlam Trail
- **Carbon Sequestration:** The potential for carbon storage within the trail corridor

The above four benefits will be quantified in the following sections and will include only direct impacts from the Ludlam Trail. Additional environmental and social benefits can be obtained by involving the surrounding communities in planting trees and shrubs along the trail. Benefits associated with this would be lower cost of landscape and most importantly, greater community support of the project.



Open space along the Ludlam Trail corridor full of educational and environmental opportunities

3.2.1 VEHICLE TRIP REDUCTION

Anytime new bicycle and pedestrian infrastructure is added to a city, it is hoped that the convenience of these facilities will reduce the number of vehicle trips taken by area residents. Not only does driving harm public health through denigrated air quality, driving trips may represent missed opportunities for more active transportation trips that can improve the health of individuals. The growth of vehicle miles in our cities has also contributed to an unsustainable model of continual road widening and construction of parking facilities that has eroded the urban fabric and, in many ways, harmed our quality of life. To measure the reduction of vehicle trips linked to the development of Ludlam Trail, four destination types were tested: transit stations, schools, parks, and miscellaneous errands. These four types of destinations represent most of the daily vehicle trips taken.

TRANSIT STATIONS

One of the ways Ludlam Trail will take vehicle trips off the road is by making Miami-Dade County’s past investments in transit more accessible. By bringing more people within a convenient walking and biking distance of rail transit, the choice to use transit becomes practical for more people. Data from across the U.S. has clearly demonstrated that when viable, convenient transit options are provided, many people will utilize these options.

METHODOLOGY - BICYCLING (2 MILES)

Ludlam Trail will bring more residents within a two (2) mile or ten (10) minute bicycle ride of transit. According to the United States Census in 2000, 5.3% of the population who live within two miles of the Dadeland North Metrorail Station and the proposed Orange Line NW 7th St. Metrorail Station use transit. To capture this potential increase in ridership with Ludlam Trail, AECOM looked at two comparables within Miami-Dade County; Miami Beach with a transit mode share of 8.3% and the Coconut Grove area of Miami with a 12.2% transit mode share. These two comparable areas will serve as the medium and high range for improvements while the current mode share of 5.3% will serve as the baseline level.

All commuters that bike or walk to transit will not use Ludlam Trail as their route. To account for this, the number of transit users within two miles of each transit station will be applied to the average percent of Miami-Dade County residents that use trails in a given year as stated in the 2006 Community Health Survey. This survey, prepared by Professional Research Consultants on behalf

of the Miami-Dade County Health Department, identifies that on average 40.7% of all County residents use a trail in a given year. This number may increase once Ludlam Trail is completed, however, it serves as a baseline for the Study Area for existing conditions. Formulas for each calculation are as follows:

Formulas:

Population that Uses Transit Pre-Trail
[Population within 2 miles of transit] x [percent of population that used transit per 2000 Census data]

Population that will use Transit Post-Trail (Low)
[Population within 2 miles of transit] x [percent of population that uses transit in baseline (5.3%)] x [2006 Community Survey data of trail users (40.7%)]

Population that will use Transit Post-Trail (Medium)
[Population within 2 miles of transit] x [percent of population that uses transit in medium (8.3%) comparable] x [2006 Community Survey data of trail users (40.7%)]

Population that will use Transit Post-Trail (High)
[Population within 2 miles of transit] x [percent of population that uses transit in high (12.2%) comparable] x [2006 Community Survey data of trail users (40.7%)]

Vehicle Trips Reduced Post Trail Development
[[[Population that Uses Transit Post-Trail (for each scenario)] – [Population that Uses Transit Pre-Trail]] x [2(Trip to and from transit station)]] x [255 (workdays per year)]

SUMMARY OF FINDINGS

Table T: Vehicle Trip Reduction To Transit for Networks A and B

Network	A	B - Low	B - Med	B - High
Pop. Within 2 mi. Bike Ride of Transit Stations	14	23,900	23,900	23,900
% Pop. that Uses Transit	5.30%	5.30%	8.30%	12.20%
Pop. that Uses Transit	0	1,267	1,984	2,916
Pop. that Uses Trails 40.7%	0	516	807	1,187
Vehicle Trips Reduced per Year	0	262,929	411,757	605,233

Source: Miami-Dade County and US Census (2000)

Section Three BENEFITS ANALYSIS

Access to transit stations gained through the development of Ludlam Trail has been estimated at 23,900 in the previous section. Out of that population, 516 people on the low end and 1,187 people on the high end, would potentially use Ludlam Trail to access a transit station instead of drive a personal vehicle. A baseline reduction to vehicle trips (VDTs), when applied to an entire year, is an estimated 262,929 trips. If comparable conditions are applied and an increase in population uses transit to commute to work as many as 605,253 vehicles trips could be reduced by using Ludlam Trail.

METHODOLOGY - WALKING (1/2 MILE)

The methodology used to identify the number of vehicles trips that would be reduced due to increased access to the two transit stations for residents living within a half (1/2) mile walking distance from the stations is similar to that used for the two (2) mile biking distance. Formulas for each calculation are as follows:

Formulas:

Population that Uses Transit Pre-Trail -
[Population within 1/2 mile of transit] X [percent of population that used transit per 2000 Census data]

Population that will use Transit Post-Trail (Low)
[Population within 1/2 miles of transit] x [percent of population that uses transit in baseline (5.3%)] x [2006 Community Survey data of trail users (40.7%)]

Population that will use Transit Post-Trail (Medium)
[Population within 1/2 miles of transit] x [percent of population that uses transit in medium (8.3%) comparable] x [2006 Community Survey data of trail users (40.7%)]

Population that will use Transit Post-Trail (High)
[Population within 1/2 miles of transit] x [percent of population that uses transit in high (12.2%) comparable] x [2006 Community Survey data of trail users (40.7%)]

Vehicle Trips Reduced Post Trail Development [[Population that Uses Transit Post-Trail (for each scenario)] – [Population that Uses Transit Pre-Trail]] x [2(Trip to and from transit station)]] x [255 (workdays per year)]

SUMMARY OF FINDINGS

Table U: Vehicle Trip Reduction to Transit: Networks D, E

Network	D	E - Low	E - Med	E - High
Pop. Within 1/2 mi. of Transit Stations	43	43	43	43
% Pop. that Uses Transit	5.3%	5.3%	8.3%	12.2%
Pop. that Uses Transit	2	2	3	5
Vehicle Trips Reduced per Year	1,020	1,020	1,530	2,550

Source: Miami-Dade County and US Census (2000)

The population within a half (1/2) mile access of the transit stations pre-trail and post-trail development remains at 43. This low number is contributed to the large block sizes located around each transit station and that each transit station is located a considerable distance from the nearest residential areas.

The convenience of the trail however, may encourage a modal shift from vehicular use to transit use, raising the percentage of the population that uses transit from 5.3% to somewhere in between 8.3% and 12.2 % as identified in the pervious calculations for estimating vehicle trip reductions for transit based on bicycle use. Vehicle trips reduced for residents living within a half (1/2) mile walk from a transit station by using Ludlam Trail were calculated using these percentages.

Out of the 43 residents that are within a half (1/2) mile walking distance of the transit stations, between three (3) and five (5) people would potentially ride transit which would be an increase of between one (1) and three (3) persons. These estimates suggest that if the number of people using transit increase due to the convenience of Ludlam Trail, between 510 and 1,530 vehicle trips would be reduced.

SCHOOLS

Currently, Miami-Dade County School Board policy mandates that only children who live more than two miles from their respective school will receive school bus service. Within two miles students are responsible for providing their own mode of transportation to school. More times than not, the mode of transportation selected is by private vehicle. With the development of Ludlam Trail, many students will gain access to their schools via a safe and direct route on the Ludlam Trail. There may also be an increase in the amount of students who typically walk or bike to school because of the convenience factor of the Ludlam Trail. This section will estimate the vehicles trips reduced.

METHODOLOGY

Using the same student population figures determined in the Destination Accessibility analysis, AECOM has estimated the number of vehicle trips as follows:

Network A: Represents the current conditions without Ludlam Trail. Based on previous Safe Routes to Schools applications completed in the Miami-Dade County area, an estimated forty (40%) percent of students within two (2) miles of each school arrive by personal vehicle.

Network B: With Ludlam Trail completed, a Safe Route to School program can be administered for each school near the corridor. Based on previous Safe Routes to Schools applications completed in the Miami-Dade County area, after a Safe Route to school was implemented there was an estimated fifty (50%) percent drop in the amount of students within two (2) miles of each school arriving by personal vehicle. This means a potential twenty (20%) percent mode share shift to either biking or walking to school. This estimate will be applied to each school’s attendance figures.

Network C: This model uses the same estimates as Network B, but now contains proposed on-street bicycle lanes per the Miami-Dade County Bike and Pedestrian Plan Update. However, in calculating the difference between Networks B and C, the elementary schools’ vehicle trips remain unchanged. This is because Elementary School students are highly unlikely to reach schools via on-street bicycle lanes due to safety concerns.

The number of vehicle trips calculated above were then refined in two ways. The first refinement accounts for the fact that not all of the students traveling to school by private vehicle would arrive separately and that some students would be part of carpools or would most likely be from the same household. Based on previous Safe Routes to Schools applications, carpools/family trips would reduce the vehicle trips to 75% of the total. The second refinement is to multiply by two to account for each trip to and from school and then multiplied by 189, or the number of school days in a typical year for the total vehicle trip count. The tables for each network follow.

SUMMARY OF FINDINGS

The estimated vehicles trip reduction linked to the development of Ludlam Trail is 136,080 trips while the complete implementation of the Miami-Dade County Bike and Pedestrian Plan Update would reduce an additional 1,890 trips within the Ludlam Trail Study Area.



The above image, taken at the proposed Ludlam Trail and SW 56th St. (Miller Drive) shows how many people become new cyclist for recreation, errand running, or commuting.



The Seminole-Wekiva Trail provides direct connections to area retail and dining businesses.



Section Three BENEFITS ANALYSIS



The West Orange Trail provides area residents with access to schools and in the above picture, direct access to a library.



Offering easy and accessible choices for residents to travel to area amenities is key to a successful trail.

Table V: Network A - Vehicle Trip Baseline Estimate

School	A. Est. 2000 pop aged 5-17 within catchment	B. Est. 2000 pop aged 5-17 within catchment and 2 mi.	C. Est. % of students within catchment and 2 mi. (B/A)	D. Actual enrollment	E. Est. # enrolled students within 2 mi. (C*D)	F. Est.# of students in private vehicle (E*.4)*.75	G. Est # of vehicle trips (F*2)*189
Coral Terrace ES	1,658	1,293	78.00%	549	428	128	48,551
S. Miami ES	1,473	1,130	76.70%	859	659	198	74,728
Ludlam ES	1,773	468	26.40%	448	118	35	13,410
W. Miami MS	8,492	3,087	36.40%	1,133	412	124	46,706
S. Miami MS	4,421	2,553	57.70%	1,027	593	178	67,253
S. Miami HS	12,657	2,662	21.00%	2,308	485	146	55,046
TOTAL Baseline of Current Vehicle Trips to Schools							305,694

Source: Miami-Dade County and US Census (2000)

Table W: Network B - Vehicle Trip Reduction by Ludlam Trail

School	A. Est. 2000 pop aged 5-17 within catchment	B. Est. 2000 pop aged 5-17 within catchment AND 2 mi.	C. Est. % of kids within catchment AND 2 mile (B/A)	D. Actual enrollment	E. Est. # students within 2 miles (C*D)	F. Est.# of students in private vehicle (E*.2)*.75	G. Est # of vehicle trips reduced (F*2)*189
Coral Terrace ES	1,658	1,361	82%	549	451	68	22,680
S. Miami ES	1,473	1,204	82%	859	702	105	35,154
Ludlam ES	1,773	532	30%	448	134	20	5,670
W. Miami MS	8,492	3,536	41.60%	1,133	472	75	18,522
S. Miami MS	4,421	2,743	62.00%	1,027	637	96	30,996
S. Miami HS	12,657	3,073	24.30%	2,308	560	85	23,058
TOTAL Vehicle Trip Reduced by Ludlam Trail							136,080

Source: Miami-Dade County and US Census (2000)

Table X: Network C - Vehicle Trip Reduction by Network

School	A. Est. 2000 pop aged 5-17 within catchment	B. Est. 2000 pop aged 5-17 within catchment AND 2 mi.	C. Est. % of kids within catchment AND 2 mile (B/A)	D. Actual enrollment	E. Est. # students within 2 miles (C*D)	F. Est.# of students in private vehicle (E*.2)*.75	G. Est # of vehicle trips reduced beyond Ludlam Trail(F*2)*189
Coral Terrace ES	1,658	1,361	82%	549	451	68	0
S. Miami ES	1,473	1,204	82%	859	702	105	0
Ludlam ES	1,773	532	30%	448	134	20	0
W. Miami MS	8,492	3,728	43.90%	1,133	497	71	1,512
S. Miami MS	4,421	2,741	62.00%	1,027	637	96	0
S. Miami HS	12,657	3,073	24.30%	2,308	560	84	378
TOTAL Vehicle Trips Reduced by full network beyond Ludlam Trail							1,890

Source: Miami-Dade County and US Census (2000)

Formulas:

Student Population that uses Private Vehicles to access Schools Pre-Trail

[[Student Population within 2 miles of transit] x [percent of population that uses private vehicles (40%)] x [Carpools and family trips refinement (75%)] x [2 trips per day] x [189 school days]]

Student Population that uses Private Vehicles to access Schools Post-Trail

[[Student Population within 2 miles of transit] x [percent of population that uses private vehicles (20%)] x [Carpools and family trips refinement (75%)] x [2 trips per day] x [189 school days]]

Vehicle Trips Reduced Post Trail Development [[Student Population that uses Private Vehicles Post-Trail] – [Population that use Private Vehicles Pre-Trail]]

PARKS

The 2006 Community Health Survey, prepared by Professional Research Consultants on behalf of the Miami-Dade County Health Department, found that 54.3% of all Miami-Dade County residents visited a park, community center or recreation center in the last year, with mean number of annual visits of 25. The Ludlam Trail corridor directly connects to three parks and a fourth park is with a few hundred feet of the corridor. If a greater number of these trips were accomplished by walking or bicycle, significant vehicle reductions would be realized. The following formula will estimate the reduction in vehicle trips associated with the presence of Ludlam Trail.

METHODOLOGY - BICYCLING (2 MILES)

The population within a two (2) mile or ten (10) minute bike ride of A.D. “Doug” Barnes Park, Brothers to the Rescue Park, Palmer Park (City of South Miami), and Robert King High Park (City of Miami) was calculated in Destination Accessibility in section 3.1.1 of the study. For Networks A, B, and C, the population was then multiplied by 54.3%, which is the percentage of Miami-Dade County residents who reported using parks in 2006. These figures were then multiplied by 25 (the mean number of visits to a park annually according to the same survey). United States Census data from 2000 documents an 1.6% bicycle and walking modal split for adults traveling to work within the Ludlam Trail Study Area. This modal split estimate is the most comprehensive for travel within the Study Area and will be used in estimating vehicle trip reductions in this section.

Formulas:

Vehicle Trips Reduced Pre and Post Trail Development

[Population within 2 miles of parks] x [percent of population that used parks per 2006 Community Health Survey] x [percent of population who bike or walk based on 2000 Census data] x [mean annual visit per year (25 visits) x 2 trips (to and from park)]

Vehicle Trips Reduced Post Trail Development

[Network B vehicle trips reduced post development - Network A vehicle trips reduced pre-development]

Vehicle Trips Reduced Post Network Implementation

[Network C vehicle trips reduced post network implementation - Network B vehicle trips post trail development]

Section Three BENEFITS ANALYSIS

SUMMARY OF FINDINGS

With the development of Ludlam Trail approximately 2,773 vehicles trips would be reduced based on an increase in accessibility for area residents. With the complete implementation of the Miami-Dade County Bike and Pedestrian Plan Update an additional 557 vehicle trips would be reduced.

Table Y: Vehicle Trip Reduction by Biking on Ludlam Trail

Network	A	B	Vehicle Trips Reduced by Ludlam Trail	C	Vehicle Trips Reduced by Network
A. Population within 2 Mile Bike Ride	29,873	36,262	6,389	37,545	1,283
B. Estimated users within Population (A*54.3%)	16,224	19,690	3,466	20,387	697
C. Estimated users who walk or bike (B*1.6%)	260	315	55	326	11
D. Estimated vehicle trips reduced per year (C*2*25)	12,979	15,752	2,773	16,310	557

Source: Miami-Dade County and US Census (2000)

METHODOLOGY - WALKING (1/2 MILE)

In order to determine potential vehicle trip reductions the surrounding community could expect from people walking on Ludlam Trail to access A.D. “Doug” Barnes Park, Brothers to the Rescue Park, Palmer Park (City of South Miami), and Robert King High Park (City of Miami) a similar approach to estimating trips reduced by biking on Ludlam was used.

Formulas:

Vehicle Trips Reduced Pre and Post Trail Development
[Population within 1/2 mile of parks] x [percent of population that used parks per 2006 Community Health Survey] x [percent of population who walk based on 2000 Census data] x [mean annual visit per year (25 visits) x 2 trips (to and from park)]

Vehicle Trips Reduced Post Trail Development
[Network E vehicle trips reduced post development - Network D vehicle trips reduced pre-development]

SUMMARY OF FINDINGS

With the development of Ludlam Trail approximately 554 vehicles trips would be reduced based on an increase in accessibility for area residents to walk to nearby parks.

Table Z: Vehicle Trips Reduced by Walking on Ludlam Trail

Network	A. Pop. within ½ mile walk	B. Estimated users within Pop. (A*54.3%)	C. Estimated users who walk (B*1.6%)	D. Estimated vehicle trips reduced per year (C*2*25)
Network A (Before Ludlam)	10,441	5,669	91	4,536
Network B (After Ludlam)	11,716	6,362	102	5,089
Total Vehicle Trips Reduced				554

Source: Miami-Dade County and US Census (2000)

MISCELLANEOUS ERRANDS

While transportation systems are often designed with commute trips occurring in the peak hour as a focus, these trips represent only a fraction of the travel that most of people engage in each day. A National Household Travel Survey (NHTS) conducted in 1995 in collaboration with the Federal Highway Administration and the New York Times found that approximately 70% of all household trips occur within three (3) miles of one’s residence. The study grouped these trips into eight categories and identified the percentage of trips by trip type that occur within these three (3) miles. The categories included; work (18.0%); work related (2.6%); shopping (20.2%); doctor and dentist (1.5%); family and personal (24.2%); church and school (8.8%); social and recreational (24.5%); and other (0.2%).

The development of the Ludlam Trail will provide residents with an alternative mode by which to complete some of these trips. For example, the presence of the shared-use trail may encourage neighborhood youth to use the trail to bike or walk to a friend’s house as opposed to having a parent drive them. Similarly, the presence of the trail may encourage a family member to bike or walk to the neighborhood convenience store for water or milk as opposed to driving.

METHODOLOGY

Trip types that were identified as miscellaneous errands include doctor and dentist, family and personal and social recreational trips. Work, work related and school trips were quantified previously using an alternate methodology while trips under the

shopping, church and other trip categories were not considered in this methodology due to the low probability that the trail would reduce vehicle trips associated with these categories.

The vehicle trips (VTDs) for the Ludlam Trail Walkable Area is estimated to be 192,305 trips based on Institute for Transportation Engineering (ITE) standards for residential units and square footage totals for office, retail and industrial uses obtained during the Baseline Economic Assessment in section 1.5 of this study. The percentages identified in the NHTS survey were applied to VTD estimate to quantify the number of daily trips that would be produced by each category. Next, the percentage of trips that the trail would capture were identified and applied to the number of daily trips generated per the pertinent categories.

Formulas:

Vehicle Trips Reduced Post Trail Development
[vehicle trips by type] x [percent of population who bike or walk based on 2000 Census data] x [percent of population that used trails per 2006 Community Health Survey] x [365 days per year x 2 trips (to and from destination)]

SUMMARY OF FINDINGS

An estimated 458,918 vehicle trips for miscellaneous errands would be reduced per year by people either walking or biking on the Ludlam Trail to their destination.

Table AA: Vehicle Trips Reduced for Miscellaneous Errands

Trip Type	% By Trip Type	VTD By Trip Type	% Trips by Walking or Biking	VTD Reduced	% who use trails (40.7%)	Vehicle Trips Reduced Per Year
Work	18.00%	34,615	-	-	-	-
Work Related	2.60%	5,000	-	-	-	-
Shopping	20.20%	38,846	-	-	-	-
Doctors & Dentist	1.50%	2,885	1.60%	46	19	13,715
Family & Personal	24.20%	46,538	1.60%	745	303	221,230
Church & School	8.80%	16,923	-	-	-	-
Social & Rec.	24.50%	47,115	1.60%	754	307	223,973
Other	0.20%	385	-	-	-	-
Total Vehicle Trips Reduced						458,918

Source: Miami-Dade County and US Census (2000)

3.2.1 VEHICLE TRIP REDUCTION SUMMARY OF FINDINGS

Based on the methodology discussed in section 3.1.2 of the study, it is estimated that the development of Ludlam Trail would improve mobility for walking and biking to schools, parks, transit stations, and miscellaneous errands and reduce vehicle trips (VTDs) within the Ludlam Trail Study Area by the following amounts per category:

Destinations	VTDs Reduced
Transit Stations – (2 mile)	262,929
Schools – (2 miles)	136,080
Parks – (2 mile)	2,773
Miscellaneous Errands	458,918
Total Vehicle Trips (VTDs) Reduced	860,700



Section Three BENEFITS ANALYSIS

3.2 ENVIRONMENTAL BENEFITS SUMMARY OF FINDINGS

Based on the analyses to the left, residents within the Ludlam Trail Study Area can expect to see the following environmental benefits:

- Reduction of 860,700 vehicle miles driven resulting in 394 fewer tons of carbon dioxide annually
- Consumption of 36,625 fewer gallons of fuel or the equivalent of over four tanker trucks annually
- Savings of over \$101,450 in fuel costs annually
- Over \$170 million in pollution control savings over a fifty year period
- Carbon sequestration of over 5,250 tons from new canopy tress and between 3,120 and 4,200 tons from newly vegetated spaces



The Seminole-Wekiva Trail located in Seminole County, Florida offers many environmental benefits such as additional tree canopy, above picture, carbon sequestration and vehicle trip reduction.

3.2.1 VEHICLE TRIP REDUCTION

The reduction of vehicle daily trips (VDTs) was analyzed in section 3.1.2 of the study and will be used for calculating the emissions reduction expected from the development of Ludlam Trail. If each trip reduced represents on average one vehicle mile to a destination and back within the Walkable Area, then over a one year period, 860,700 vehicle miles would be reduced. For the average passenger car this represents the reduction in emission pollutions for the following components:

- Hydrocarbons: $((2.8\text{g/mi} \times 860,700 \text{ mi}) / 454\text{g}) = 5,308 \text{ lb. of hydrocarbons reduced annually}$
- Carbon Monoxide: $((20.9\text{g/mi} \times 860,700 \text{ mi.}) / 454\text{g}) = 39,622 \text{ lb. of carbon monoxide reduced annually}$
- Oxides of Nitrogen: $((1.39\text{g/mi} \times 860,700 \text{ mi.}) / 454\text{g}) = 2,635 \text{ lb. of oxides of nitrogen reduced annually}$
- Carbon Dioxide: $(0.916 \text{ lb./mi.} \times 860,700) = 788,401 \text{ lb. of carbon dioxide or 394 tons reduced annually}$

All figures are based on averages only. Source: US Environmental Protection Agency, April, 2000; Emission Facts

Using the same 860,700 VTD figure an estimated fuel savings can be calculated. Using the Cafe (Corporate Average Fuel Economy) figure from 2010 of an average vehicle fuel economy rate of 23.5 MPG, the development of Ludlam Trail would save the consumption of over 36,625 gallons or the equivalent of approximately four (4) tanker trucks of fuel annually.

Applying the average fuel price for the first half of 2010 (U.S. Energy Information Administration) of \$2.77 per gallon, the Miami-Dade community would save over \$101,450 in fuel costs annually.

SUMMARY OF FINDINGS

Through the decrease of vehicle miles traveled by improving mobility and connectivity, Ludlam Trail will reduce thousands of pounds of hydrocarbons, carbon monoxide, and oxides of nitrogen, and 394 tons of carbon dioxide annually. It will also save 36,625 gallons or four (4) tanker trucks of fuel annually representing a savings of over \$101,000 each year.

3.2.2 TREE CANOPY BENEFITS

The Ludlam Trail Design Guidelines and Standards Study calls for the planting of approximately 1,050 shade trees. The United States Forest Service has estimated that over a 50-year lifespan, a typical shade tree can generate \$31,250 worth of oxygen, \$62,000 worth of air pollution control, recycles \$37,500 worth of water, and controls \$31,250 worth of soil erosion. Applied to the 1,050 new shade trees this represents a total impact of:

- Oxygen Value = \$32,812,500
- Air Pollution Control Value = \$65,100,000
- Recycled Water Value = \$39,375,000
- Soil Erosion Control Value = \$32,812,500

Total economic value of new tree canopy = \$170.1 million

Additionally, the Trust for Public Land documented in 1993 that a single mature tree can produce enough oxygen to support two humans. This would translate into the trees along Ludlam Trail providing enough oxygen for 2,100 people.

The United States Forest Service states that a single shade tree can store over 10,000 lb.. of carbon dioxide over an average lifespan. When applied to Ludlam Trail, this means:

Formula:

1050 trees x 10,000 lb.. each = 10.5 million lb.. or 5,250 tons of carbon dioxide sequestered

The tree canopy also provides a reduction in urban noise. A United States Department of Energy study reported that a 100’ buffer of trees can absorb 7dlb of urban noise or approximately fifty (50%) percent as much as a solid wall.

SUMMARY OF FINDINGS

The additional tree canopy provided by the development of Ludlam Trail will provide the community over \$170 million worth of environmental benefits over the next fifty (50) years. Oxygen for 2,100 persons will be provided by the increase in tree canopy and over 5,250 tons of carbon dioxide will be sequestered by canopy trees while providing a quieter environment for adjacent residents.

3.2.3 CARBON SEQUESTRATION

In addition to the 5,250 tons of carbon sequestration provide by the new tree canopy as estimated in the previous section, the open spaces within the Ludlam Trail corridor and adjacent to corridor in parks provide additional sequestration. In order to estimate the potential for sequestering carbon in open spaces, the carbon calculator on the “Carbon Trading: A primer for landowners” web page of the University of Georgia Warnell School of Forestry and Natural Resource’s website. This online calculator is a collaborative effort between the school and the National Commission on Science for Sustainable Forestry (NCSSF).

The online calculator provides data for each region of the country with specific calculations for various ‘stand types.’ Two types of stand apply to the Ludlam Trail corridor; Longleaf Slash Pine of the Pine Rockland community; and the Oak, Gum and Cypress stand of the Tropical Hardwood Hammock community. Because two stand types could be used throughout the corridor two separate scenarios will be developed.

The next step is to identify whether the project is reforestation or regrowth of a forest stand following a clearcut harvest; or afforestation which is growth of a forest on land that was not presently forest and has not for over ten (10) years. The Ludlam Trail corridor falls into the afforestation category, which will be used in this estimation. Management type is determined next by selecting either high intensity which requires genetically improved stock, fertilization and thinning, or low intensity which requires no additional inputs. For Ludlam Trail low intensity management was selected for both scenarios.

The last step is to select the age of the stand. For Ludlam Trail a twenty-five year old stand was selected to estimate the carbon sequestration of the corridor twenty-five years after development.

Soil organic carbon would exist under almost any alternative, and while the carbon sequestered in the understory and in living or dead trees might not be available on an urban site. The carbon that could be sequestered in a 25 year old forest for slash pine would be 52 tons per acre (127.5 tonnes/ha), or seventy (70) tons per acre (174 tonnes/ha). These estimates are then applied to the overall corridor open space which totals approximately sixty acres.

SUMMARY OF FINDINGS

Once the native habitat is restored as appropriate, the Ludlam Trail corridor will potentially have the capacity to sequester between 3,120 and 4,200 tons of carbon dioxide.

Section Three BENEFITS ANALYSIS

3.3 ECONOMIC BENEFITS

Economic sustainability can be measured in a number of ways, but generally is defined as the ability of an economy to maintain a healthy level of activity and development for many generations.

QUANTIFYING ECONOMIC BENEFITS

Of the three types of benefits discussed, economic benefits are perhaps the easiest to quantify. In order to focus the analysis, the following benefits were selected to be quantified through readily available data:

- Potential property value benefit
- Potential net new property taxes
- Potential retail sales from the spending of trail users
- Potential retail space, sales taxes, and employees supported by this spending

The methodology for determining each of these benefits, and their corresponding results are in the sections below. The short-term benefits from the construction period were also evaluated and are as follows:

CONSTRUCTION PERIOD

The Ludlam Trail could be expected to generate and support employment, both in its construction, and from the uses around it. AECOM first analyzed the impacts of the construction of the trail.

Construction employment is directly related to the cost of construction, which according to the Miami-Dade County Park and Recreation Department, is estimated to be \$54.7 million. This total includes both labor, materials, hard costs, and soft costs for construction of the trail. Industry averages suggest that approximately 40 percent of a project’s total construction cost can be attributable to labor. Using this estimate, labor costs for the Ludlam Trail would total approximately \$21.9 million.

- Estimated construction cost: \$54,656,000
- Estimated material costs: \$32,794,000 or 60% of construction cost
- Estimated wages: \$21,862,000 or 40% of construction cost

In order to determine the number of employees this would support, AECOM divided the total wages by the average annual wage for Construction employment in Miami-Dade County, which

is approximately \$45,000. This results in 485.83 “person years” of employment. This means that if the project took one year, the project would support approximately 486 jobs. If it takes ten years, it would support 48 jobs per year.

- Estimated construction wages: \$21,862,000
- Average Miami-Dade Construction Wage: \$45,000
- Person years of Construction Employment: 486

Miami-Dade construction wage is based on the average quarterly wages by industry, Quarter Census of Employment and Wages, Third Quarter 2009, Labor Market Statistics, Florida Agency for Workforce Innovation, 2009.

The construction of Ludlam Trail would not generate sales tax revenue for materials as public works projects are exempted from tax. The contractor must receive a purchase order and a copy of an exemption certificate from Miami-Dade County before shipment or delivery in order to be tax exempted. If the contractor fails to obtain an exemption certificate, then Miami-Dade County and the State of Florida would receive tax revenue from the construction of Ludlam Trail.

3.3.1 PROPERTY VALUES

METHODOLOGY

AECOM’s methodology for analyzing the economic benefits to property values resulting from the development of the Ludlam Trail was primarily based upon the analysis of two comparables: the Fred Marquis Pinellas Trail in Pinellas County, Florida and the Springwater Trail in Portland, Oregon. Both trails are located in generally urban areas and have well documented baseline information to assess the impact the development of each trail has had on various economic indicators within 1/2 miles of the trail.

The analysis in this study was limited to quantitative data that was readily available from Miami-Dade County, Pinellas County and Portland METRO. AECOM relied on property tax assessor parcel and value data, demographic data from the U.S. Census and ESRI, and commercial real estate performance data from Costar Property.

COMPARABLES

The half-mile Walkable Area around the proposed Ludlam Trail corridor has approximately 32,152 residents in 12,106 households. The Pinellas and Springwater Trails’ Areas of Influence cover more land area, twenty-nine (29) and eighteen (18) square miles respectively, versus five (5) square miles in the Ludlam Trail Walkable Area. Therefore, the Ludlam Trail Walkable Area is actually much denser, with nearly 6,700 persons per square mile. Both of the comparables’ Areas of Influence are nearly half as dense. It is important to note, however, that there are likely pockets of denser areas along the length of these comparable trails. Both comparable trail Areas of Influence have become denser with time. In contrast, the Ludlam Trail Walkable Area has grown slightly less dense.

FRED E. MARQUIS PINELLAS TRAIL

The Fred E. Marquis Pinellas County trail was first opened in 1990 with an initial five (5) mile section, developed on a former railroad right-of-way by Pinellas County. The trail was partially funded by a voter-approved referendum called the “Penny-for-Pinellas” sales tax. The trail connects many populated areas of the County, including St. Petersburg, Seminole City, Largo, and Tarpon Springs. The most recent section to be developed is the downtown St. Petersburg extension, sponsored by Progress Energy. In all, the trail covers approximately thirty-five (35) miles, and receives approximately 1.1 million users annually. The trail travels through commercial, industrial, and residential areas.

The Pinellas Trail Walkable Area had parcels worth \$3.52 billion in 1989, comprising 10.7 percent of Pinellas County’s total property value. This increased to \$10.09 billion by 2010. The compound annual growth rate (CAGR) of the Trail Walkable Area was 5.14 percent from 1989 to 2010, 0.32 percent higher than that of the County. In general, the Pinellas Trail Walkable Area has had a higher growth rate and has steadily increased its share of the value of the County.

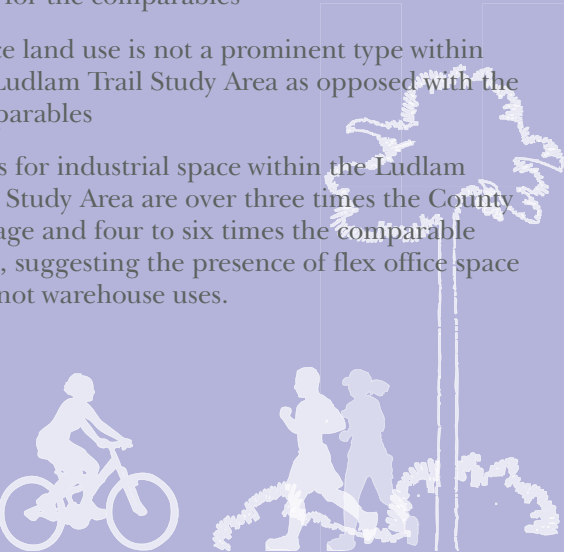
SPRINGWATER TRAIL

The land that comprises the multi-use Springwater Trail originally held a rail line that carried passenger trains from 1903 to 1958. The City of Portland acquired the majority of the right of way for the trail in 1990, and the first section was originally completed in 1996. The most recent section completed, which is closest to downtown Portland and called “Springwater on the Willamette,” was developed in 2005. At completion, the trail will

3.3.1 PROPERTY VALUES - COMPARABLE RESEARCH SUMMARY OF FINDINGS

Based on the analyses to the right, key finding from the comparables trail research include the following:

- The Ludlam Trail Walkable Area contains on average twice the density of the comparable trails
- The comparable trail Walkable Areas household income levels grew at a faster rate than the Ludlam Trail Walkable Area (between 20 - 42% faster)
- Household incomes above \$75,000 annually grew at a faster rate for the Walkable Area of each comparable than surrounding areas
- Property values for the two comparables experienced an annual premium of between 0.32 and 0.73 percent more than surrounding parcels located greater than 1/2 mile from a public access point to the trail
- Rental rates, absorption, and vacancy appeared to fluctuate more erratically than in the comparative areas
- Retail square footage within the Ludlam Trail Study Area is a more dominate land use type than for the comparables
- Office land use is not a prominent type within the Ludlam Trail Study Area as opposed with the comparables
- Rates for industrial space within the Ludlam Trail Study Area are over three times the County average and four to six times the comparable rates, suggesting the presence of flex office space and not warehouse uses.



Section Three BENEFITS ANALYSIS



The Fred E. Marquis Pinellas Trail, above, has been the catalyst for millions in new downtown developments in Dunedin, FL.



The Springwater Trail in Portland, Oregon, above, offers recreation activities for residents but has also increased property values for nearby parcels.

Table AA: Fred E. Marquis Pinellas Trail and Trail Walkable Area



cover 21 miles. It is mostly complete and currently extends from just outside the Portland downtown area to beyond the town of Gresham.

The trail both connects to a larger trail system throughout Portland as well as comprises a significant portion of the 40-mile loop, a greenway that extends around the City. It was inspired by the plan developed by Frederick Law Olmsted in 1903 of a greenway to connect a string of parks throughout the city. Portland is known for its general image or “brand” of being pedestrian and bicycle friendly and as a place for lovers of outdoor activities, and the trail reinforces that, weaving through both city streets and park areas. Though the trail’s adjacent properties are of varying land use types, the trail is mostly separated from streets, aside from one small section.

AECOM used assessor’s parcel data from the Portland METRO Area and Pinellas County and then used ArcView GIS to select those parcels within the Springwater and Pinellas Trail Areas of Influence, respectively. From there, to compare values, for the Portland METRO Data, AECOM used assessor’s data from 1996, 2000, 2006, and 2010. After formatting the data to be compatible with the shapefile, this data was then joined to the Springwater Trail Walkable Area parcels to identify a

change in value. For the Pinellas Trail Walkable Area, AECOM acquired data for 1989 and 2000-2010. The value data was presented separately from any geographic identifiers other than a parcel code (disaggregated into its components). The data was then formatted to be compatible with the shapefile’s database, and each year’s value was added to the Pinellas Trail Walkable Area parcels.

Table BB: Springwater Trail and Trail Walkable Area



Table CC: Changes in Property Values of Pinellas Trail Area versus Pinellas County, FL

(In \$Billions)	1989	2000	2005	2010	1989-2010 Change
Pinellas Trail Influence Area Total Value	\$3.52	\$5.39	\$9.57	\$10.09	\$7
Pinellas County Total Value	\$32.91	\$47.86	\$87.86	\$88.49	\$56
Trail Area Share of Value	10.70%	11.27%	10.89%	11.40%	0.70%
	CAGR (1989-2000)		CAGR (2000-2010)		CAGR (1989-2010)
Pinellas Trail Influence Area Total Value	3.96%		6.46%		5.14%
Pinellas County Total Value	3.46%		6.34%		4.82%
Difference in Annual Rate of Growth	0.49%		0.12%		0.32%

Source: Pinellas County Property Assessors Office, 1989, 2000, 2005, and 2010; AECOM, 2010.

Table DD: Changes in Property Values of Springwater Trail Area versus Portland 3-County METRO Area

(In \$Billions)	1996	2000	2006	2010	1996-2010 Change
Springwater Trail Walkable Area Total Value	\$2.99	\$3.99	\$5.85	\$7.92	\$5
Portland METRO Total Value	\$84.96	\$117.34	\$165.55	\$204.26	\$119
Trail Area Share of Value	3.52%	3.40%	3.53%	3.88%	0.35%
	CAGR (1996-2006)		CAGR (2000-2010)		CAGR (1996-2010)
Springwater Trail Walkable Area Total Value	6.92%		7.08%		7.19%
Portland METRO Total Value	6.90%		5.70%		6.47%
Difference in Annual Rate of Growth	0.02%		1.38%		0.73%

Portland Metro RLIS taxlot data, 1996, 2000, 2006, 2010; AECOM, 2010.

Section Three **BENEFITS ANALYSIS**

In total, the parcels in the Springwater Trail Walkable Area were worth \$2.99 billion in 1996, representing 3.52% of the comparative area’s value of \$84.96 billion. The value of the Trail’s Walkable Area climbed to \$7.92 billion in 2010, having an increased share of the three-county METRO area (3.88 percent). Overall, the Trail Walkable Area had a compound annual growth rate (CAGR) of 7.19% from 1996 to 2010, which was 0.73 percent higher than the METRO counties’ rate. The majority of this change happened in the 2006 to 2010 period, when the CAGR was 7.87 %, which is 2.47% percent above that of the comparative area.

SUMMARY OF FINDINGS

From these two comparables, it would appear that properties in the Ludlam Trail Walkable Area could expect some increase in property values above and beyond what the surrounding area is experiencing. Because of the experience of the Springwater and Pinellas Trail Walkable Areas, AECOM will use an annual premium of between 0.32% and 0.73% as benchmarks for possible property value premiums.

LUDLAM TRAIL WALKABLE AREA PROPERTY VALUES

To determine the potential property value benefit, it was necessary to arrive at a factor to apply to existing values that represented a premium above and beyond the area’s normal appreciation.

As stated in the comparable trails section, a half (1/2) mile or ten (10) minute walking distance is considered to be the area that would see any potential benefits. This is because it is these properties that have the greatest access to the trail. At the lowest possible scenario, the impact of the trail would be a zero net gain. It is reasonable to assume that the trail would not have a negative impact on the surrounding property values based on the existing conditions in the vacant rail corridor (in other words, a trail would be an improvement), and the reportedly positive reception by local homeowners. This potential “no-gain” scenario is not shown in the analysis tables.

For the possible benefits, AECOM applied a range of potential net new impacts in the form of an annual premium increase, derived from the overall premiums seen on the total property value of the comparable trail Walkable Area, which as presented in the comparable trail section above, ranged from 0.3 to 0.7 percent above the comparative area appreciation rate. Again, this is net new. In other words, it does not reflect the total appreciation of a given parcel but the potential impact the trail could have.

The increases in property values would manifest themselves in a variety of ways: increased sales prices on houses, increased density, increased productivity (i.e. higher rents) of rental commercial property, or intensification of use to a higher value use (from a storage yard, for example, to flex or office space). These are all dependent upon market conditions, however, in addition to the existence of the trail.

AECOM increased the existing values of property in the Ludlam Trail Walkable Area by these percentages for a 10-year time period, rather than for the entire 25-year time period being examined. This was done to aim to have a plausible and conservative estimate. It is inconclusive from the comparables research what the exact timing of any premiums would be, and because of the ongoing trail improvements and expansions the trail comparables were experiencing during the assessment periods examined in this study, using a 10-year time frame is most reasonable. Annual averages, however, are given assuming a 25-year time period (in other words, the premium is seen for a 10-year period, but the total benefit is divided by 25 years).

The annual premium in property values over the ten-year period would result in a total premium over existing values of between 3 and 7 percent, as shown in Table EE. Averaged out over a 25-year period, this changes the annual effective premium in property values to be between 0.12 and 0.27 percent.

SUMMARY OF FINDINGS

Over a period of 25 years, the presence of Ludlam Trail is expected to increase property values within the Walkable Area between \$121 million and \$282 million.

Table EE: Total 25-Year Incremental Value and Percent Change in Ludlam Trail Walkable Area

Total Incremental Value	0.32%	Median	0.73%
Miami	\$10,053,332	\$16,708,210	\$23,636,089
Pinecrest	\$4,588,908	\$7,626,570	\$10,664,232
South Miami	\$6,957,523	\$11,563,108	\$16,168,694
West Miami	\$4,520,731	\$7,513,264	\$10,505,796
Uninc. Miami-Dade County	\$95,366,273	\$158,494,699	\$221,623,125
Total Incremental Value	\$121,486,767	\$201,905,852	\$282,324,937
Total % Change			
Miami	3.13%	5.20%	7.26%
Pinecrest	3.21%	5.34%	7.47%
South Miami	2.99%	4.98%	6.96%
West Miami	3.08%	5.12%	7.16%
Uninc. Miami-Dade County	2.91%	4.83%	6.75%
Total Incremental Tax	2.94%	4.89%	6.84%
Nominal Annual % Change (Applied over a 10-year Period)			
Miami	0.32%	0.53%	0.73%
Pinecrest	0.32%	0.53%	0.73%
South Miami	0.32%	0.53%	0.73%
West Miami	0.32%	0.53%	0.73%
Uninc. Miami-Dade County	0.32%	0.53%	0.73%
Total	0.32%	0.53%	0.73%
Effective Annual % Change (At the End of 25 Years)			
Miami	0.12%	0.20%	0.28%
Pinecrest	0.13%	0.21%	0.29%
South Miami	0.12%	0.19%	0.27%
West Miami	0.12%	0.20%	0.28%
Uninc. Miami-Dade County	0.11%	0.19%	0.26%
Total	0.12%	0.19%	0.27%

Source: Miami-Dade County

3.3.1 PROPERTY VALUES SUMMARY OF FINDINGS

Based on the analysis of comparable trails from across the country, the presence of Ludlam Trail will increase property values within the Walkable Area at a pace of 0.32% to 0.73% faster than other properties throughout Miami-Dade County. This translates into a total property value increase over a twenty-five (25) period of between \$121 million and \$282 million.



The Fred E. Marquis Pinellas Trail, above, has increased property values for nearby residential property owners by offering park-like amenities.



Section Three **BENEFITS ANALYSIS**

3.3.3 RETAIL SALES AND EMPLOYMENT SUMMARY OF FINDINGS

The development of Ludlam Trail will create between \$3.19 million and \$8 million annually in trail related expenditures leading to \$223,300 to \$560,000 in local and state sales tax revenue. This increase in trail related expenditures will support between 10,500 and 26,500 square feet of additional retail space and 27 to 68 new jobs.



Example of a new business being constructed adjacent to the Ludlam Trail corridor at SW 40th St. (Bird Road)



Example of a underutilized parcel adjacent to the Ludlam Trail corridor with potential to provide the area with new retail, office and residential opportunities and new tax revenues. Located at West Flagler St.

3.3.2 PROPERTY TAXES

The existing property values were separated by taxing jurisdiction to calculate tax, and the applicable millage rate was applied. This resulted in the following values and property tax. Because the values and tax millage rates differ by jurisdiction, the distribution of these taxes would be for various purposes. (Note: Full analysis is provided separate from the body of the report in the Appendix E.)

Currently, FEC is not being assessed property tax on the corridor due to the corridor’s exemption status as a railroad, however, the abandonment of a segment of the corridor by FEC in 2005 may mean FEC will be assessed property taxes for only the abandoned segment in the future. The current tax assessment status is used for this report which provides \$0 in property tax revenue to all taxing jurisdictions within the Study Area.

Table FF: Net New Property Values and Property Tax in Ludlam Trail Walkable Area

Total Incremental Value	0.32%	Median	0.73%
Miami	\$402,133	\$668,328	\$934,524
Pinecrest	\$183,556	\$305,063	\$426,569
South Miami	\$278,301	\$462,524	\$646,748
West Miami	\$180,829	\$300,531	\$420,232
Uninc. Miami-Dade County	\$3,814,651	\$6,339,788	\$8,864,925
Total Incremental Value	\$4,859,470	\$8,076,234	\$11,292,998
Total Incremental Tax			
Miami	\$9,246	\$15,366	\$21,487
Pinecrest	\$3,522	\$5,853	\$8,184
South Miami	\$6,136	\$10,198	\$14,259
West Miami	\$4,349	\$7,228	\$10,107
Uninc. Miami-Dade County	\$75,643	\$125,715	\$175,788
Total Incremental Tax	\$98,896	\$164,360	\$229,825
Total Incremental Value (25 years)			
Miami	\$10,053,332	\$16,708,210	\$23,363,089
Pinecrest	\$4,588,908	\$7,626,570	\$10,664,232
South Miami	\$6,957,523	\$11,563,108	\$16,168,694
West Miami	\$4,520,731	\$7,513,264	\$10,505,796
Uninc. Miami-Dade County	\$95,366,273	\$158,494,699	\$221,623,125
Total	\$121,486,767	\$201,905,851	\$282,324,936
Total Incremental Tax (25 years)			
Miami	\$231,147	\$384,157	\$537,166
Pinecrest	\$88,038	\$146,315	\$204,592
South Miami	\$153,399	\$254,942	\$356,486
West Miami	\$108,731	\$180,706	\$252,681
Uninc. Miami-Dade County	\$1,891,072	\$3,142,882	\$4,394,691
Total	\$2,472,387	\$4,109,002	\$5,745,616

Source: Miami-Dade County

SUMMARY OF FINDINGS

The analysis found that the trail could raise assessed property values annually on average by between \$4.8 and \$11.2 million in Miami-Dade County, bringing between \$98,000 and \$229,000 in net new property taxes annually. Jurisdictional millage rates are listed in Table 39 on page 91 of this report.

3.3.3 RETAIL SALES

The trail could have a positive ongoing impact on retail sales from the potential spending of trail users, on an ongoing basis buying things while using the trail. To determine the retail square footage supported by trail users, an estimate of 860,700 trail users based on the vehicle trip reduction estimates as part of section 3.1.2 of the study.

The Trail User Surveys and Economic Impact: A comparison of Trail User Expenditures report completed by Rails-to-Trails Conservancy in 2009 documented trail user’s expenditures for fourteen suburban and urban trails in the Northeast. The lowest trail expenditure documented was \$3.71 while the average per person expenditure document for urban trails with annual users counts above 350,000 was for \$9.30. These two figures will serve as the low and high estimates for Ludlam Trail user expenditures.

Using these per user amounts, the total sales generated by trail users on Ludlam would be between \$3.19 million and \$8 million annually. Using an average retail productivity rate (expressed as sales per square foot) of \$300, which is a nationwide average of competitive space, these sales would support between 10,500 and 26,500 square feet, as shown in the table below.

- Estimated retails range between \$3.19 million and \$8 million annually
- Increase in retail sales would support between 10,500 and 26,500 square feet of additional retail space

3.3.4 SALES TAXES

Miami-Dade County collects one (1%) percent local option sales tax from merchants. The remainder of the sales tax goes to the State of Florida. Some trail related retail spending may be already accounted for by local merchants or may be made outside of the Ludlam Trail Walkable Area. Trail related sales, however, will generate between \$31,900 and \$80,000 annually in sales tax for Miami-Dade County.

The state of Florida’s sales tax rate is currently at six (6%) percent. When applied to the trail related retail sales the state of Florida will receive between \$191,400 and \$480,000 in sales tax revenue annually.

3.3.5 RETAIL EMPLOYMENT

To estimate the number of retail employees supported by these sales, the sales were divided by an average sales per employee of \$118,000, derived from select store categories in the 2007 U.S. Economic Census. This suggests that retail sales made to trail users would support 27 to 68 retail employees.

Source information from U.S. Bureau of the Census, 2007 Economic Census for the following types of stores; clothing and accessories; electronics; food and beverage; health and personal care; sporting goods and hobbies; general merchandise; miscellaneous stores; full service restaurants; and limited service restaurants.

SUMMARY OF FINDINGS

The development of Ludlam Trail will create between \$3.19 million and \$8 million annually in trail related expenditures leading to \$31,900 to \$80,000 in sales tax revenue. This increase in trail related expenditures will support between 10,500 and 26,500 square feet of additional retail space and 27 to 68 new jobs.

Section Three **BENEFITS ANALYSIS**

3.4 SUMMARY OF BENEFITS
SOCIAL BENEFITS

DESTINATION ACCESSIBILITY

The development of Ludlam Trail will enhance overall accessibility to schools, parks, transit stations, and bus stops for as many as 30,550 people living within two (2) miles of Ludlam Trail.

Analysis of existing and post Ludlam Trail destination accessibility has identify the following key findings:

- 261 students will gain access to area schools
- 6,389 residents will gain access to parks
- 186 residents will gain access to bus stops
- 23,900 residents will gain access to transit stations

HEALTH AND WELLNESS

The development of Ludlam Trail will save the community between \$1.68 million and \$2.25 million annually in direct medical costs related to lack of physical exercise while leading to approximately 4,931 to 6,579 area residents becoming new exercisers. Residents within the Ludlam Trail Study Area can expect to lose or keep off between 32,664 and 109,939 pounds of weight annually by burning between 2.19 million and 7.39 million calories (kilocalories) per week while exercising on Ludlam Trail.

ENVIRONMENTAL BENEFITS

VEHICLE TRIP REDUCTION

Through the development of Ludlam Trail, improvement will be made in mobility for walking and biking to schools, parks, transit stations, and miscellaneous errands leading to reduced vehicle daily trips (VDTs) within the Ludlam Trail Study Area by the following amounts per category, per year:

- 262,929 trips to transit stations
- 136,080 trips to area schools
- 2,773 trips to parks
- 458,918 trips for miscellaneous errands

A total reduction of approximately 860,700 vehicle daily trips (VDTs) from enhanced mobility and connectivity may be realized by community from the development of Ludlam Trail.

VEHICLE EMISSIONS

With the reduction of approximately 860,700 vehicle trips the following vehicle emissions will be reduced annually:

- 5,308 fewer lb. of hydrocarbons
- 39,622 fewer lb. of carbon monoxide
- 2,635 fewer lb. of oxides of nitrogen
- 394 fewer tons of carbon dioxide

The reduction in vehicle trips translates into an annual savings in fuel consumption of approximately 36,625 gallons or the equivalent of four (4) tanker trucks. Community-wide fuel savings equals approximately \$101,450 a year.

TREE CANOPY

New tree canopy plantings associated with Ludlam Trail amenities will provide the surrounding community with over \$170 million in pollution control savings over the life span of a typical urban tree (fifty years). This breaks-down into the following pollution control savings:

- \$32.8 million in fresh oxygen
- \$65.1 million in air pollution control
- \$39.4 million in recycled water
- \$32.8 million in soil erosion control

In addition, the planting of approximately 1,050 new canopy trees associated with Ludlam Trail amenities will create clean oxygen for over 2,100 humans.

CARBON SEQUESTRATION

Based on a University of Georgia Warnell School of Forestry and Natural Resource carbon sequestration calculator, Ludlam Trail will provide for the sequestration of between 3,120 and 4,200 tons of carbon within twenty-five years. In addition, the planting of approximately 1,050 canopy trees associated with trail amenities will provide the sequestration of 5,250 tons of carbon over a fifty (50) year life span.

ECONOMIC BENEFITS

PROPERTY VALUES

Based on an analysis of comparable trails from across the country, the presence of Ludlam Trail will increase properties value within the Walkable Area, or properties within 1/2 mile of a proposed public access point to the trail, at an annual pace of 0.32% to 0.73% faster than other properties throughout Miami-Dade County. This translates into a total property value increase over a twenty-five (25) period of between \$121 million and \$282 million.

PROPERTY TAXES

Based on increased property values within the Ludlam Trail Walkable Area, Miami-Dade County and surrounding jurisdictions will receive between \$98,000 and \$229,000 annually in additional property tax revenues. When compiled over a twenty-five (25) year period, between \$2.47 million and \$5.74 million in additional property tax revenue will be realized.

RETAIL SALES

Retail expenditures related to the Ludlam Trail are expected to be between \$3.19 million and \$8 million annually based on research of trail related expenditures from fourteen comparable suburban and urban trails conducted by Rails-to-Trails Conservancy in 2009. Retail expenditures related to Ludlam Trail will support between 10,500 and 26,500 additional square feet of retail space.

RETAIL SALES TAX

Miami-Dade County will receive between \$31,900 and \$80,000 in sales tax from trail related expenditures while the State of Florida will receive between \$191,400 and \$480,000 annually in sales tax.

RETAIL EMPLOYMENT

Ludlam Trail related retail expenditures will support between 27 and 68 new jobs within Miami-Dade County.



Winter Garden, Florida (West Orange Trail)



Dunedin, Florida (Fred E. Marquis Pinellas Trail)



Dunedin, Florida (Fred E. Marquis Pnellas Trail)

