FINAL ENVIRONMENTAL IMPACT STATEMENT (FEIS) HIGHLAND CREEK PLANNED DEVELOPMENT DISTRICT TOWN OF BRUNSWICK, RENSSELAER COUNTY, NEW YORK

LEAD AGENCY:

THE TOWN BOARD FOR THE TOWN OF BRUNSWICK
308 TOWN OFFICE ROAD
BRUNSWICK, NY 13041

LEAD AGENCY CONTACT:

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35 MELLON AVENUE
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PROJECT SPONSOR:

LANDMARK DEVELOPMENT GROUP, LLC
16 PETRA LANE
ALBANY, NY 12205

PREPARED BY:

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DATE OF FEIS ACCEPTANCE:

April 13, 2006

APPENDIX C

TRAFFIC-RELATED RESPONSES PREPARED BY CREIGHTON MANNING ENGINEERING

CREIGHTON MANNING ENGINEERING, LLP

17 COMPUTER DRIVE WEST ❖ ALBANY, NY 12205
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Memo

To: Ivan Zdrahal

From: Tom Johnson/Ken Wersted

CC: Lee Rosen, Bob Marini Jr.

Date: March 22, 2006

Re: Response to comments

Project: Highland Creek, 05-054

Comment:

1. The Town needs a Transportation Commission and transportation plan.

Transcript reference: Fleishman, 11/28/05, page 47

Response: 1. Comment noted.

Comment:

1. The traffic study is based on a fifteen minute observation of the intersections.

Transcript reference: Meehan, 11/28/05, page 52

Response: 1. The traffic study documents the traffic volumes in 15-minute intervals for the 2 hours that encompass the AM peak hour and the PM peak hour of a typical work day. These time periods generally represent the highest traffic conditions of the adjacent street network and the project site and thus represent a worst case analysis.

Comment:

1. 190 cars for 190 homes and one car for each apartment are not realistic.
2. On Thanksgiving eve after Hoosick Street was done, traffic was backed up all the way to Burdett Avenue.

Transcript reference: Fostering, 11/28/05, page 55

Response: 1. The following table illustrates the trend in the national average number of vehicles per household according to the Bureau of Transportation Statistics.

Year	Vehicles per household
1977	1.59
1983	1.68
1990	1.77
1995	1.78
2001	1.90

Source: *Transportation Statistics Annual Report 2000,* and *Highlights of the 2001 National Household Travel Survey*, Bureau of Transportation Statistics.

Additionally, based on Census 2000 data, the average number of vehicles per household for Rensselaer County is 1.60 vehicles. Based on this average, the resident population of Highland Creek would own approximately 304 vehicles. Recognizing that no single household will own a fraction of a vehicle, some households will have one vehicle, while others will have two or more.

However, not all of these vehicles will be driven at the same time. Based on approximately 350 studies of similar types of developments complied by the Institute of Transportation Engineers and used as the industry standard, approximately 115 trips (a vehicle entering or exiting the development) would be generated during the morning peak hour and 143 trips during the afternoon peak hour for the proposed Highland Creek development. These peak hours typically represent the two highest hours of traffic flows from the project site and are considered the worst-case periods.

2. Improvements constructed on any particular roadway are generally not designed to handle extraordinary traffic conditions such as holiday travel. As discussed by the American Association of State Highway and Transportation Officials, it is unfeasible to design for these conditions due to the cost of the infrastructure and impacts to adjacent property owners simply to accommodate traffic conditions with few occurrences.

Comment:

1. If there is no guarantee that the project will be filled by empty-nesters then the traffic study is flawed.
2. Further study is needed if the empty nester projections are not met.

Transcript reference: Fivel, 11/28/05, page 65

Response: 1. The traffic study is based on the assumption that the project will be occupied by average homeowners, most of which will commute to work each weekday. If the project is filled with predominately empty-nesters, then the study offers a worst-case condition in that a majority of the residents will not be commuting to work

each day.

2. No further study is needed from a traffic perspective as the results included in the traffic study include worst-case conditions.

Comment:

1. Cut-through traffic on Liberty and Farrell and the impact on back roads.

Transcript reference: Schmidt, 11/28/05, page 78

Response: 1. The development of Highland Creek will have no significant effect on the traffic patterns on Liberty Road and Farrell Road.

Comment:

1. The traffic study doesn't address the additional vehicles from deliveries, professional services, and visitors.

Transcript reference: Meskoskey, 11/28/05, page 81

Response: 1. The data used to estimate the trip generation of the proposed project includes all traffic to be generated by the development.

Comment:

1. McChesney Avenue Extension will turn into Central Avenue.

Transcript reference: Bologer, 11/28/05, page 106

Response: The potential for McChesney Avenue Extension to be developed as intensely as Central Avenue is dependant on the existing and future land use zoning along the road. The proposed project will not create a "Central Avenue" setting.

Comment:

1. Traffic light infrastructure.
2. Construction vehicle impacts.
3. Number of household vehicles.
4. Hoosick Street, and Route 2 corridors.

Transcript reference: Tom Wagner, 12/29/05, page 18

Response: 1. No impacts are expected to occur on the traffic light infrastructure. If road widening was determined to be needed at a signalized intersection, vehicle detectors and signal pole locations would have to be reviewed for adequacy and possible replacement. However, no roadway widening is needed.

2. The construction traffic will most likely access the site over McChesney Avenue and McChesney Avenue Extension. These roads do not have a weight limit posted, therefore it is not anticipated that any damage will occur from construction traffic which must comply with allowable gross vehicle weight limits

for each respective type of vehicle. However, should there be any damage to the road(s) due to construction vehicles, it would be repaired by the project sponsor to the satisfaction of the Town.

3. Based on Census 2000 data, the average number of vehicles per household for Rensselaer County is 1.60 vehicles. Based on this average, the resident population of Highland Creek would own approximately 304 vehicles.

The additional traffic generated by the project generally represents 3% to 5% of the directional traffic volumes on Route 7 (Hoosick Street) and Route 2. Traffic volumes generally fluctuate approximately 10% from day to day. Therefore, the additional traffic volume is less than the daily fluctuations and will not have a noticeable impact on the Route 7 and Route 2 corridors.

Comment:

1. Improved elderly services and transportation.

Transcript reference: Hutter, 12/29/05, page 24

Response: It is the Town's discretion as to whether senior services and transportation is a service the Town should provide to its residents.

Comment:

1. Traffic will spill onto roads like Route 7 and Route 2 and Pinewoods Avenue (CR 140).
2. An updated master plan is needed for the town.

Transcript reference: Fleishman, 12/29/05, page 35

Response: 1. Route 7 and Route 2 are classified as Urban Principle Arterials from the intersection of Route 278, west towards Troy. In the hierarchy of roads, local roads are intended to carry local traffic to collector roads such as County roads similar to McChesney Avenue (CR 134). These roads in turn carry drivers onto State roads like Route 7 and Route 2. Therefore, the intended use of State and County roads is expected to accommodate larger amounts of traffic than local roads.

2. Comment noted.

Comment:

1. Brunswick doesn't have a major highway to access the remainder of the Capital District.
2. The improvements to Route 7 are not going to alleviate the traffic caused by these projects.

Transcript reference: Brearton, 12/29/05, page 42

Response: 1. Because of the rural nature of most of Rensselaer County, a highway extending east from I-787 is not necessary. Route 7 between I-787 and I-87 becomes a divided highway with two-lanes in each direction (not including the hill climbing lane in the westbound direction) and carries approximately 65,000 vehicles per day. I-87 consists of three lanes in each direction and carries between 105,000 and 125,000 vehicles per day. Route 7 carries approximately 16,000 vehicles per day between Route 278 and the Town of Brunswick/Troy city line. By this comparison, it is clear that the traffic conditions on Route 7 in Rensselaer County do not warrant a highway.

2. Route 7 and the other surrounding roadways are capable of accommodating the traffic generated by the proposed project.

Comment:

1. Even with the Route 7 improvements, it still takes just as long to get from North Lake Avenue to McChesney Avenue.

Transcript reference: Mendro, 12/29/05, page 47

Response: 1. Comment noted.

Comment:

1. Narrow roads and emergency services access.

Transcript reference: Donna Forester, 12/29/05, page 53

Response: 1. The roads on-site will be built to accommodate emergency service vehicles. Side walks will be provided in the carriage home sections of the project.

Comment:

1. Making roads safe for older drivers.

Transcript reference: Julia MacDonald, 12/29/05, page 55

Response: 1. The posted speed limit on McChesney Avenue Extension is 35 mph. Recognizing that, responsible drivers should be traveling at or near that speed. While not all drivers travel at or near the posted speed limit, increased police patrols of the road would help deter speeding. Additionally, with added development along McChesney Avenue Extension, more vehicles will be turning in and out of side roads, thus lowering the overall operating speed closer to 35 mph in that area.

An important condition to providing safe access to the development for seniors and all residents of the project is providing adequate sight distance from the development's entrance. The existing Bonesteel Road location does not provide

adequate sight distance and hence is being proposed to be relocated to meet the appropriate standards. This will increase the visibility of drivers entering and exiting the development. Old Bonesteel Lane will remain in place and used as emergency access only, should a situation arise where emergency personnel are required within the development and the main entrance is blocked for some reason. It is recommended that this access point be closed to the general public via a break away gate but that can be opened in an emergency.

Comment:

1. Concerned about increased traffic.

Transcript reference: Scanlon, 12/29/05, page 63

Response: The traffic study shows that the project will not result in any significant increases in delays or degradations in levels of service based on the industry standard and NYSDOT accepted analysis procedures.

Comment:

1. Concerned about the sight distance at the site driveway

Transcript reference: Meehan, 12/29/05, page 72

Response: The existing Bonesteel Road location does not provide adequate sight distance and hence is being proposed to be relocated to meet the appropriate standards. This will increase the visibility of drivers entering and exiting the development.

Comment:

1. Cut-through traffic on Hakes Road.

Transcript reference: McIntyre, 12/29/05, page 89

Response: 1. The benefit of Hakes Road as a cut-through relative to residents of Highland Creek is minimal. Hakes Road serves as a connection between Moonlawn Road and Route 2, east of the project site. This would only benefit drivers traveling into eastern Rensselaer County. Very little development or workplace destinations exist to the east resulting in very little projected volume to head in that direction. It is estimated that 5 vehicles or less will be destined for or originate from areas to the east of Moonlawn Road. Therefore, no significant impact is expected to the residents of Hakes Road as a result of this project.

Comment:

1. Increased project related traffic will increase snow removal and emergency response services to traffic accidents during poor weather conditions.

2. What traffic studies have been done to identify the level of traffic and historical volumes that established McChesney Avenue Extension as a safe road for the proposed development?
3. What is the estimated total number of vehicles project residents will possess?
4. An assessment of the site driveway is needed under all road conditions.
5. How will residents be able to safely maneuver in and out of the project and climbing/descending the hills on McChesney Avenue Extension?
6. Public safety studies of the McChesney Avenue Extension/site driveway intersection are needed taking into account the total estimated autos from the project, other projects in the area, traffic along McChesney Avenue Extension, and all weather conditions.
7. The emergency access road should be analyzed using the same safety criteria for the main entrance.

Brunswick Smart Growth, Inc.: 1/20/06 letter, section 2.2

Response: 1. The increase in snow removal services on McChesney Avenue Extension will be no greater with the proposed projects than it is today. The road will continue to be cleared by the Highway Department with or without the project. However, additional snow removal services will be needed to clear roads within the development.

2. A traffic study for the proposed project was completed which documented existing and future traffic volumes on McChesney Avenue Extension. The purpose of the study was to document these conditions and determine the adequacy of the area's transportation network to accommodate the projected traffic flows. The results of the study indicate that adequate capacity is provided and that adequate sight distances will be provided at the site driveway.

3. Based on census data for Rensselaer County, residents of the Highland Creek project would own approximately 304 vehicles.

4. An assessment of the McChesney Avenue Extension/site driveway was completed and contained in the traffic study for the project. The ability of the site driveway intersection to accommodate the project traffic volumes will not change between wet and dry pavement conditions. Under snowy and ice conditions, the intersections ability to process traffic volumes will also remain unchanged. However, it is noted that drivers are generally more cautious, and rightfully so, under these conditions resulting in lower travel speeds. Under these circumstances road capacity is limited by a driver's response to the pavement conditions, hence the common occurrence of longer travel times to destinations during these inclement conditions.

Furthermore, the intersection sight distances at the site driveway exceed the American Association of State Highway and Transportation Officials (AASHTO) standards. The standards for sight distances are based on conditions that encompass older drivers and stopping on wet pavement conditions.

5. Residents will use the McChesney Avenue Extension/site driveway with equal safety as most intersections in the Town and County. Highland Creek residents will also drive on McChesney Avenue Extension just as existing residents and other drivers do today. The presence of hills on McChesney Avenue Extension does not preclude its use as a collector road. It will however, require prudent driving under adverse weather conditions just as any road does regardless of its grade, width, or traffic volume.

6. The traffic study is based on projected peak hour traffic volumes which include existing traffic, other area developments, and the volumes expected to be generated by the Highland Creek project. It is recognized that traffic will be generated at all times of the day, and not just those volumes which occur during the peak hours. However, the industry standard practices of traffic engineering identify that the weekday AM and PM peak hours are the worst case periods of traffic generation for residential developments. By analyzing these peak hours, a worst-case picture is painted for the study area intersections.

Based on the results of the traffic analysis, the study area intersections will operate under very good conditions during the worst traffic conditions typically experienced. Considering that the peak time periods operate under very good conditions, it is reasonable to say that during off-peak hours such as mid-day or overnight the study area intersections and roadways will operate under excellent conditions.

As discussed in the response to BSG 1/20/06 comment #4, weather conditions will generally have no significant effect traffic operations of the study area intersections with the exception of extreme occurrences of rain, snow, or ice.

7. "Old Bonesteel Lane" will serve as the emergency access point to the development. However, it is unlikely to ever be used considering that rarely is there ever an accident that occurs at the main entrance, effectively blocking it, at the same instance a situation occurs within the development requiring emergency assistance. Recognizing that this entrance will rarely be used, analyzing this intersection with the same criterion as the main entrance in not required. Furthermore, the existing residences located immediately adjacent to "Old Bonesteel Lane" generate more traffic than the emergency access will while sharing in the same limited available sight distance in this area of McChesney Avenue Extension.

Comment:

1. The validity of the DEIS count data is questionable due to the Route 7 construction project.
2. The difference in annual average daily traffic volumes on Route 7 should be accounted for between McChesney Avenue and the Brunswick/Troy City line.
3. A comprehensive traffic study should be undertaken for all of Brunswick before any PDD's EIS's are considered final.

4. The traffic study fails to explain why the study area was restricted to only the immediate environs.
5. Why were traffic counts conducted at different times of the year for each study area intersection?
6. Why wasn't traffic sampled throughout the day at all study area intersections?
7. On what basis was 1% background growth assumed?
8. The estimated traffic and trip generation methodology should be provided for each "other development."
9. Why was an access point assumed from Hudson Hills to North Lake Avenue?
10. The Wal-Mart Supercenter and potential development of the major tract of land along McChesney Avenue should be included.
11. The traffic effects of this project would be equivalent to intersection reconstruction and traffic projections and analysis should include 10 and 20 year conditions after completion of the project.
12. ITE references are not readily available to the public and should be included in an appendix.
13. The equivalency of a "carriage home" to a condominium/townhouse was not demonstrated.
14. The trip distribution estimates should be explained.
15. Trip distributions with all traffic going west, and all traffic going east should be analyzed.
16. Scenarios assuming all LUC 210 (Single-Family Detached Housing) should be presented.
17. What road conditions were observed and considered during the sight distance evaluation?
18. Was a sight distance evaluation conducted at the existing Bonesteel Lane? What volume is expected from this intersection?
19. Were increases in traffic and speeds from other projects considered in this analysis?

Brunswick Smart Growth, Inc.: 1/20/06 letter, section 3.2

Response: 1. The construction of Route 7 did not include any lane closures (with perhaps a few exceptions to move construction equipment). Two way travel on Route 7 was always provided.

2. The difference in traffic volumes from one segment to another is dependant on the location of the traffic counter, adjacent land uses, and other connecting roadways. For example, if the traffic counter for the segment of Route 7 between 15th Street and the Troy City line was placed in the middle of this segment, then traffic generated from North Lake Avenue would not be included in the segment from the Troy City line to Route 142. Similarly, if the traffic counter on the Troy City line to Route 142 segment is placed in the middle of this segment, say between Wal-Mart and Betts Lane, then this recorder will not record traffic that is generated from McChesney Avenue or traffic originating in Troy and shopping at Price Chopper or Wal-Mart. Therefore, the difference in the traffic volumes

collected from one segment of Route 7 and another is attributable to the location of the counter, the other connecting roads along the segments, and the land uses along Route 7.

3. Comment noted.

4. Approximately 40 intersections were noted in the BSG letter regarding study area intersections that should be included in a comprehensive Town traffic study. While this expanse of a study area may be applicable for a Town wide study, it is far too large for a project specific study such as that for Highland Creek. Therefore, the study area outlined in the DEIS scoping document was developed and followed.

For over 10 years, it has been NYSDOT's guideline to use a 100 trip threshold increase on an approach as to whether the intersection should be included in the study area.

Clearly, the greatest increase in traffic volume occurs closest to the project site where the traffic originates or is destined for. The results of the traffic study are that the intersections located in the immediate study area operate at very good conditions with low delays and no significant impact from the project. Therefore, the project will have even less impact at intersections outside of this immediate area.

Furthermore, the increase in volumes at the Route 7/McChesney Avenue approach is approximately 50 vehicles on the northbound approach during the AM peak hour and 50 vehicles on the eastbound Route 7 approach during the PM peak hour and do not exceed the 100 trip guideline. Based on the above, the intersections included in the DEIS and scoping document are considered adequate.

5. Traffic counts conducted in February 2005 were part of the Hudson Hills project. Because the study area for both projects overlapped, this existing count data was used. Traffic counts in June 2005 were completed for the rest of the initial study area. Later that summer, the DEIS scoping document was completed and added the intersection of Route 2 and Moonlawn Road, which was counted in August.

6. The industry standard for studying the impacts of a residential development include the AM and PM peak hours as the off-peak hours generally result in very little traffic being generated from the project site. Also see response to BSG 1/20/06 section 2.2 comment #6.

7. Growth rates in the area of the project varied from positive growth to negative growth, the average of which indicated a trend of no change (0%) in traffic volumes. The assumption of no growth is usually reserved to areas that show consistent decreases in traffic volumes. Since this is not the case for the study area, a positive growth rate of 1% was used assuming that growth would occur

regardless of trend indicated by the historical data. Furthermore, a 1% growth rate is consistent with NYSDOT's Route 7 Reconstruction design report.

8. The trip generation calculations of the "other developments" are included as Attachment A. These volumes were adjusted for pass-by trips and assigned to the adjacent transportation network.

9. An access point to North Lake Avenue was assumed because the Hudson Hills project proposed this access point at the time the Highland Creek study was being prepared. According to the transcripts of the January 17, 2006 public hearing, the project has since been reduced from over 1,100 units to 668 units with a single access point to Betts Lane.

10. The inclusion of other projects that have yet to be approved or proposed can over estimate the potential impacts associated with those projects as well as from the proposed development. Inclusion of other projects into the analysis was discussed with the Town. As a compromise, some of these potential but not approved projects have been included in the Highland Creek analysis.

11. Traffic studies for residential projects like Highland Creek are not the same as the traffic studies conducted for intersection and roadway reconstruction projects. Traffic studies for project specific developments are only required to analyze the impacts at the time of full build-out. Roadway reconstruction projects are required to study up to 20 years beyond the estimated time of completion (ETC) and up to 30 years after ETC for bridges to ensure that the design will accommodate traffic volumes through the effective life of the designs.

12. ITE trip generation references are included under Attachment B for the proposed single family and carriage homes.

13. Carriage homes describe a home that is smaller than your average single-family home. While the proposed carriage homes will be separated from each adjoining carriage home and have a separate driveway, the trip generation is expected to be similar to condominium/townhouse by virtue of its size and expected occupancy. The carriage homes, like townhouses, are expected to appeal to the families or buyers looking for a smaller home and property. These may include first-time buyers, single, or married couples with few or no children, or mature adults looking to downsize from their current home. It is unlikely that families with several children or large households will find that a carriage home or townhouse meets their needs like a full-size typical single-family home would.

ITE's *Trip Generation* does not differentiate between single-family homes and smaller but separate carriage style homes. It does note that single-family homes (LUC 210) are the largest trip generator of all the residential units because they are the largest in size, have the most residents per household, and the most vehicles per unit. It is the responsibility of the traffic engineer to consider these differences and choose a logical methodology to determine the most appropriate estimation of traffic. Considering the differences between single-family and

carriage homes, it is CME's professional opinion that the carriage homes will generate traffic more similarly to a traditional townhouse than a typical single-family home.

14. A review of the existing travel patterns and the location of major centers of employment were reviewed in the determination of the trip distribution. The traffic volumes during the AM peak hour on McChesney Avenue Extension heading towards Route 7 have a high percentage of left turns onto McChesney Avenue, which then primarily turn left onto Route 7 heading for Troy. Very little traffic turns right at McChesney Avenue or on Route 7 to head east in the morning. The same is true at the intersection of McChesney Avenue Extension and Moonlawn Road. Most traffic turns right onto Moonlawn Road and right onto Route 2 heading west into Troy. Very little traffic turns left to head east on Route 2. Considering that most employment opportunities in the Capital District are west of Brunswick, it is logical that 85% of the site development traffic will head west on Route 7 and Route 2.

15. Most (85%) of the traffic from the proposed project is projected to head west. Assigning all the traffic to and from the west would only add 14 additional vehicles exiting during the AM peak hour with 4 vehicles entering, and 14 additional vehicles entering from the west during the PM peak hour with 8 vehicles exiting. This minor change will not change the results of the study.

Assigning all of the traffic to the east is not logical as this is not a realistic condition that can be expected to occur.

16. The change in trip generation if the site were developed as 190 single-family homes would include 27 additional trips during the AM peak hour (8 trips entering and 19 trips exiting); while the PM peak hour would increase by 48 trips (30 trips entering and 18 trips exiting). These changes would equate to a 15 trip increase at the Route 7/McChesney Avenue intersection and a 9 trip increase at the Route 2/Moonlawn Road intersection. These increases are minor, equaling a 1 trip increase every 4 to 6 minutes, will not change the results or conclusions of the analysis.

17. The sight distance evaluation was originally conducted in June of 2005 and later updated in September. The traffic recorder collected volume and speed data at the site driveway for a period of approximately 53 hours during the first of June 2005. The roadway conditions were dry. The speed data generally indicates that the 85th percentile speed during the AM and PM peaks was in the upper 40 mph zone, while off-peak daytime speeds were closer to the mid 40-mph zone. Therefore, the sight distance analysis was compared to the recommended standards for a 50 mph design speed as prescribed by the American Association of State Highway and Transportation Officials.

These standards are based on a driver's height of eye, the height of an approaching vehicle, perception and reaction time, a vehicle and driver's capable deceleration rates, and the coefficient of friction between the vehicle's tire and the

pavement under wet conditions.

18. A sight distance evaluation was not conducted for the existing Bonesteel Lane intersection. However, from a field visit it is clear that sight distance limitations exist at this location, thus the proposal to relocate Bonesteel Lane to provide adequate sight distances for use as the main site driveway. No site generated traffic is expected to use "Old Bonesteel Lane because it limited to emergency use only, and only in conditions where the main entrance is blocked.

19. Increases in traffic were considered along McChesney Avenue Extension at the site driveway from other projects. However, speeds are expected to remain consistent with existing observations.

F:\Projects\05-054d\Commentresponse01.doc

Attachment A

CME
CREIGHTON MANNING ENGINEERING, L.L.P.

JOB 04-142d
SHEET NO. _____ OF _____
CALCULATED BY FBW DATE 2/8/2005
CHECKED BY _____ DATE _____
SCALE Trip Generation

Hudson Hills Phase I/II

Phase 1									
LUC - 220 - Apartment							Entering	Exiting	Total
Dwelling Units, Weekday, AM peak hour of Adjacent Street Traffic, page 307									
324	Units	20%	enter	80%	exit				
Ave Rate:	0.51	Trips/unit	T=	165	Trips		33	132	165
Fitted Curve		T=0.49(X)+3.73							
X=	324		T=	162	Trips		32	130	162
Dwelling Units, Weekday, PM peak hour of Adjacent Street Traffic, page 308									
324	Units	65%	enter	35%	exit				
Ave Rate:	0.62	Trips/unit	T=	201	Trips		131	70	201
Fitted Curve		T=0.55(X)+17.65							
X=	324		T=	196	Trips		127	69	196
Phase 2									
LUC - 220 - Apartment							Entering	Exiting	Total
Dwelling Units, Weekday, AM peak hour of Adjacent Street Traffic, page 307									
344	Units	20%	enter	80%	exit				
Ave Rate:	0.51	Trips/unit	T=	175	Trips		35	140	175
Fitted Curve		T=0.49(X)+3.73							
X=	344		T=	172	Trips		34	138	172
Dwelling Units, Weekday, PM peak hour of Adjacent Street Traffic, page 308									
344	Units	65%	enter	35%	exit				
Ave Rate:	0.62	Trips/unit	T=	213	Trips		138	75	213
Fitted Curve		T=0.55(X)+17.65							
X=	344		T=	207	Trips		135	72	207
Phase 3/4									
LUC - 220 - Apartment							Entering	Exiting	Total
Dwelling Units, Weekday, AM peak hour of Adjacent Street Traffic, page 307									
448	Units	20%	enter	80%	exit				
Ave Rate:	0.51	Trips/unit	T=	228	Trips		46	182	228
Fitted Curve		T=0.49(X)+3.73							
X=	448		T=	223	Trips		45	178	223
Dwelling Units, Weekday, PM peak hour of Adjacent Street Traffic, page 308									
448	Units	65%	enter	35%	exit				
Ave Rate:	0.62	Trips/unit	T=	278	Trips		181	97	278
Fitted Curve		T=0.55(X)+17.65							
X=	448		T=	264	Trips		172	92	264
						AM	111	[illegible]	557
						PM	434	2[illegible]	[illegible]

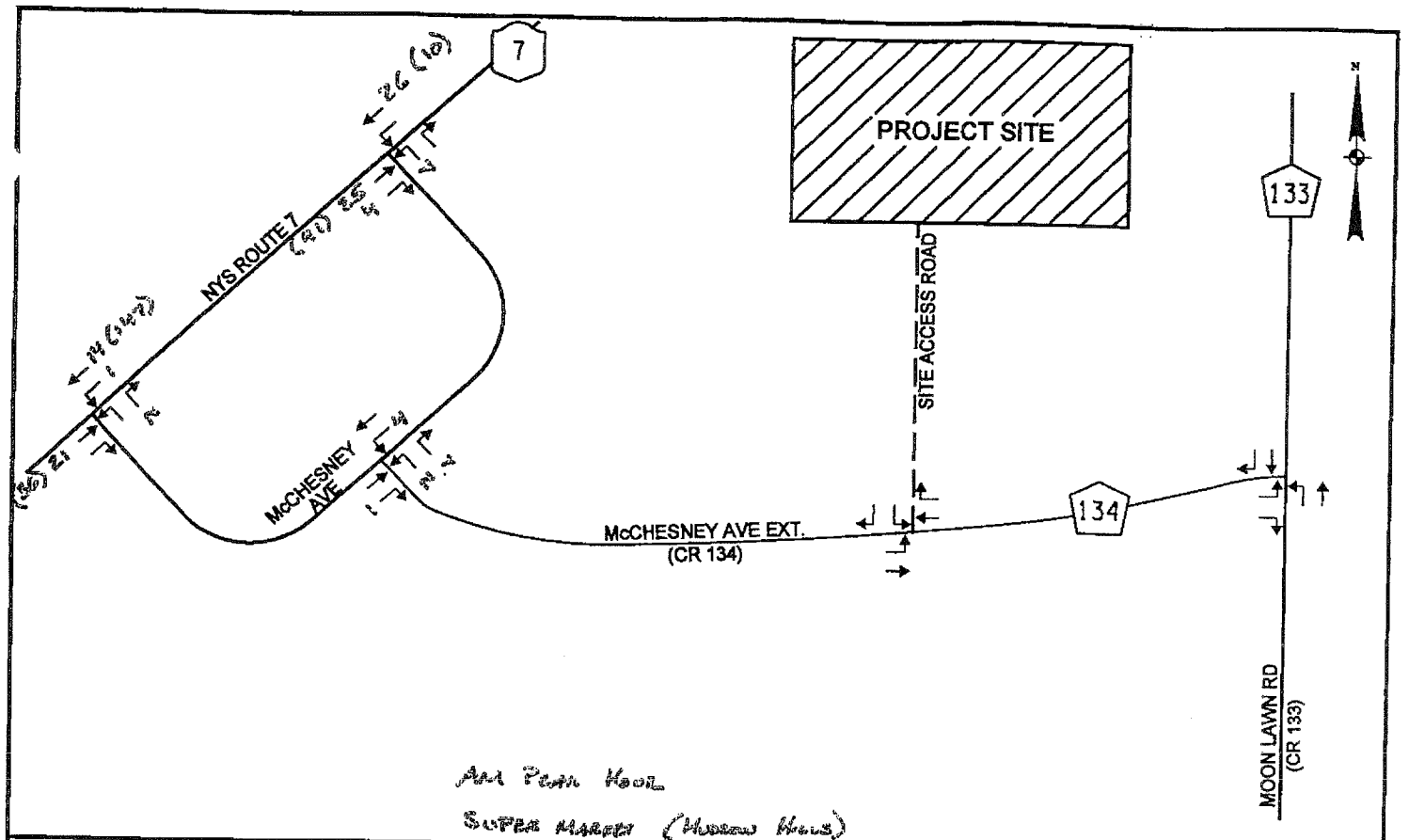
MMM 8/16/05

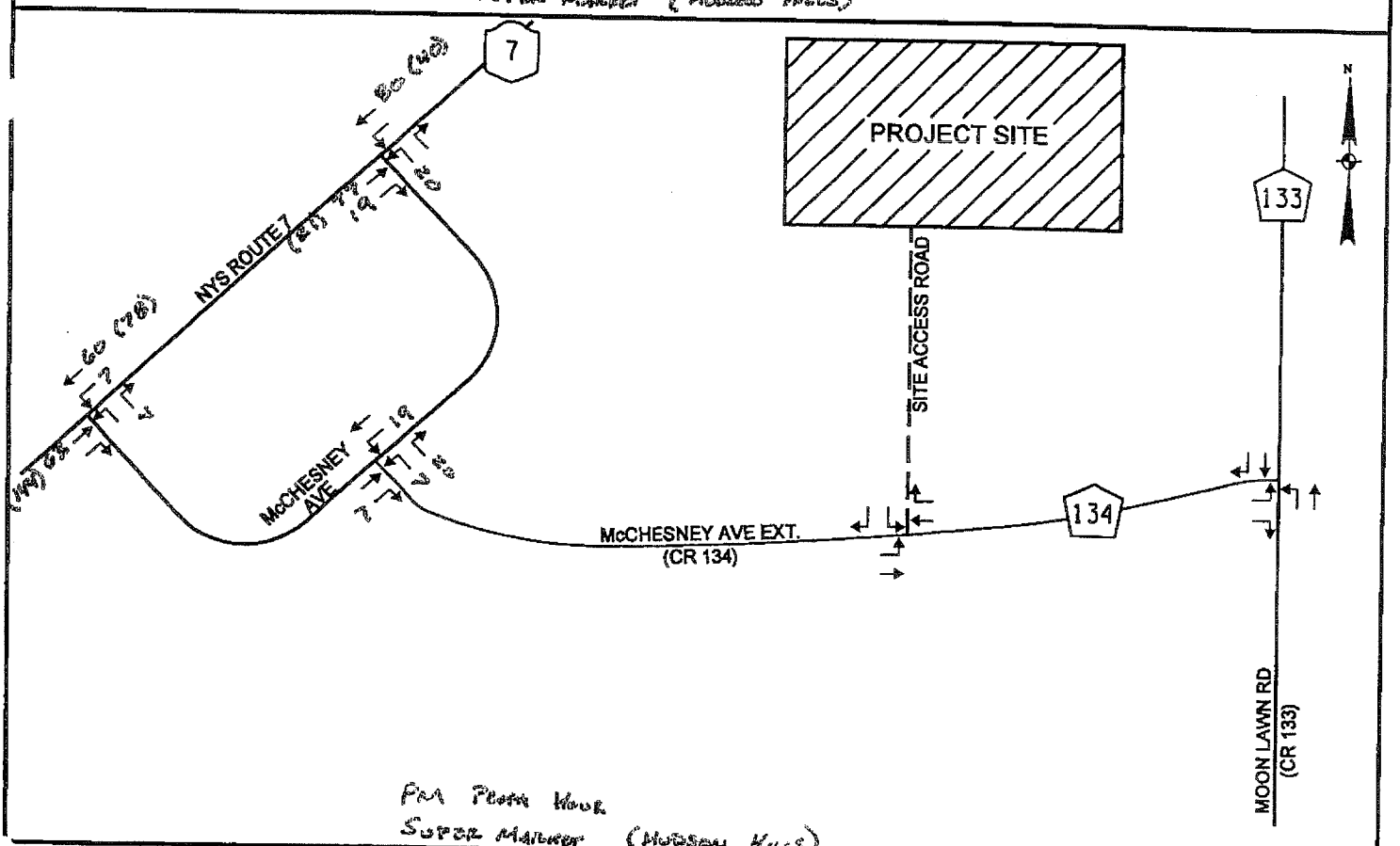
CREIGHTON MANNING ENGINEERING, L.L.P.

JOB 04-142d
SHEET NO. _____ OF _____
CALCULATED BY FBW DATE 3/1/2005
CHECKED BY AMM DATE 3/3/05
SCALE Trip Generation

LUC - 230 - Residential Condominium/Townhouse							Entering	Exiting	Total	
Dwelling Units, Weekday, AM peak hour of Adjacent Street Traffic, page 368										
206	Units	17%	enter	83%	exit					
Ave Rate:	0.44	Trips/unit	T=	91	Trips		15	76	91	
Fitted Curve		LN(T)=0.80LN(X)+0.26								
X=	206		T=	92	Trips		16	76	92	←
Dwelling Units, Weekday, PM peak hour of Adjacent Street Traffic, page 369										
206	Units	67%	enter	33%	exit					
Ave Rate:	0.52	Trips/unit	T=	107	Trips		72	35	107	
Fitted Curve		LN(T)=0.62LN(X)+0.32								
X=	206		T=	109	Trips		73	36	109	←
LUC - 850 - Supermarket							Entering	Exiting	Total	
1000 SF Gross Floor Area, Weekday, AM peak hour of Adjacent Street Traffic, page 1525										
33.25	Units	61%	enter	39%	exit					
Ave Rate:	3.25	Trips/unit	T=	108	Trips		66	42	108	←
Fitted Curve		LN(T)=1.70LN(X)-1.42								
X=	33.25		T=	93	Trips		57	36	93	
1000 SF Gross Floor Area, Weekday, PM peak hour of Adjacent Street Traffic, page 1526										
33.25	Units	51%	enter	49%	exit					
Ave Rate:	10.45	Trips/unit	T=	347	Trips		177	170	347	
Fitted Curve		LN(T)=0.79LN(X)+3.20								
X=	33.25		T=	391	Trips		199	192	391	←
LUC - 820 - Shopping Center							Entering	Exiting	Total	
1000 SF Gross Leasable Area, Weekday, AM peak hour of A.S.T., page 1452										
203.826	KSF	61%	enter	39%	exit					
Ave Rate:	1.03	Trips/unit	T=	210	Trips		128	82	210	
Fitted Curve		Ln(T)=0.60Ln(X)+2.29								
X=	203.826		T=	240	Trips		146	94	240	
1000 SF Gross Leasable Area, Weekday, PM peak hour of A.S.T., page 1453										
203.826	KSF	48%	enter	52%	exit					
Ave Rate:	3.75	Trips/unit	T=	764	Trips		367	397	764	
Fitted Curve		Ln(T)=0.66Ln(X)+3.40								
X=	203.826		T=	1002	Trips		481	521	1002	

Supermarket





OTHER DEVELOPMENTS

TRAFFIC VOLUMES

HIGHLAND CREEK PDD
TOWN OF BRUNSWICK, NEW YORK

CME
CREIGHTON MANNING ENGINEERING, L.L.P.
17 COMPUTER DRIVE WEST, ALBANY, NY 12205

PROJECT: 05-054d	DATE: 5/04	FIGURE: XXXX

f:\Projects\05-054\
DGN\FIGS.DGN

Attachment B

TRIP GENERATION

7th Edition • Volume 2 of 3

Institute of Transportation Engineers

Land Use: 210
Single-Family Detached Housing

Description

Single-family detached housing includes all single-family detached homes on individual lots. A typical site surveyed is a suburban subdivision.

Additional Data

The number of vehicles and residents have a high correlation with average weekday vehicle trip ends. The use of these variables is limited, however, because the numbers of vehicles and residents was often difficult to obtain or predict. The number of dwelling units is generally used as the independent variable of choice because it is usually readily available, easy to project and has a high correlation with average weekday vehicle trip ends.

This land use included data from a wide variety of units with different sizes, price ranges, locations and ages. Consequently, there was a wide variation in trips generated within this category. As expected, dwelling units that were larger in size, more expensive, or farther away from the central business district (CBD) had a higher rate of trip generation per unit than those smaller in size, less expensive, or closer to the CBD. Other factors, such as geographic location and type of adjacent and nearby development, may also have had an effect on the site trip generation.

Single-family detached units had the highest trip generation rate per dwelling unit of all residential uses, because they were the largest units in size and had more residents and more vehicles per unit than other residential land uses; they were generally located farther away from shopping centers, employment areas and other trip attractors than other residential land uses; and they generally had fewer alternate modes of transportation available, because they were typically not as concentrated as other residential land uses.

The peak hour of the generator typically coincided with the peak hour of the adjacent street traffic.

The sites were surveyed from the late 1960s to the 2000s throughout the United States and Canada.

Source Numbers

1, 4, 5, 6, 7, 8, 11, 12, 13, 14, 16, 19, 20, 21, 26, 34, 35, 36, 38, 40, 71, 72, 84, 91, 98, 100, 105, 108, 110, 114, 117, 119, 157, 167, 177, 187, 192, 207, 211, 246, 275, 283, 293, 300, 319, 320, 357, 384, 435, 550, 552, 579

Single-Family Detached Housing
(210)

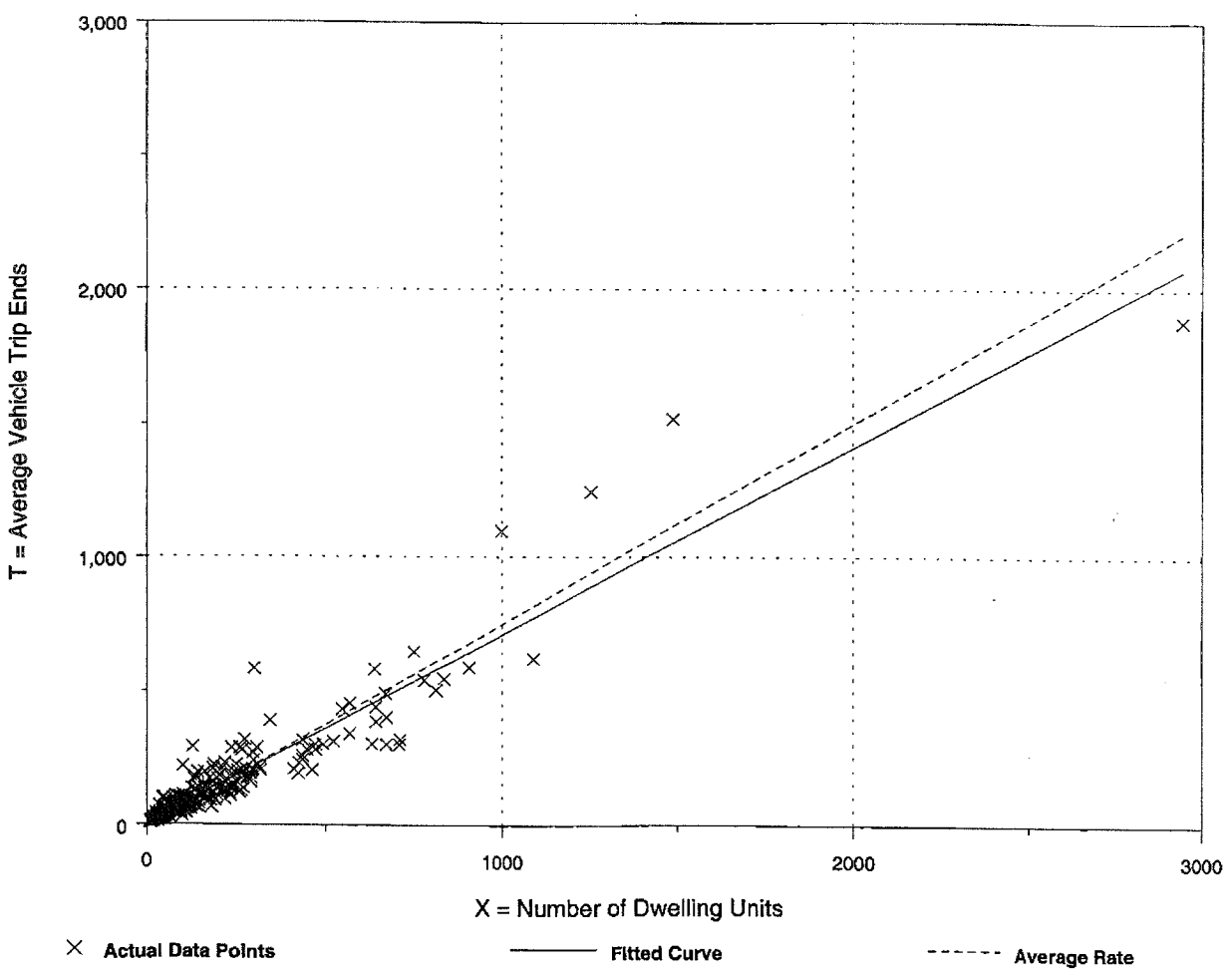
Average Vehicle Trip Ends vs: Dwelling Units
On a: Weekday,
Peak Hour of Adjacent Street Traffic,
One Hour Between 7 and 9 a.m.

Number of Studies: 274
Avg. Number of Dwelling Units: 201
Directional Distribution: 25% entering, 75% exiting

Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.75	0.33 - 2.27	0.90

Data Plot and Equation



Fitted Curve Equation: T = 0.70(X) + 9.43

R^2 = 0.89

Single-Family Detached Housing
(210)

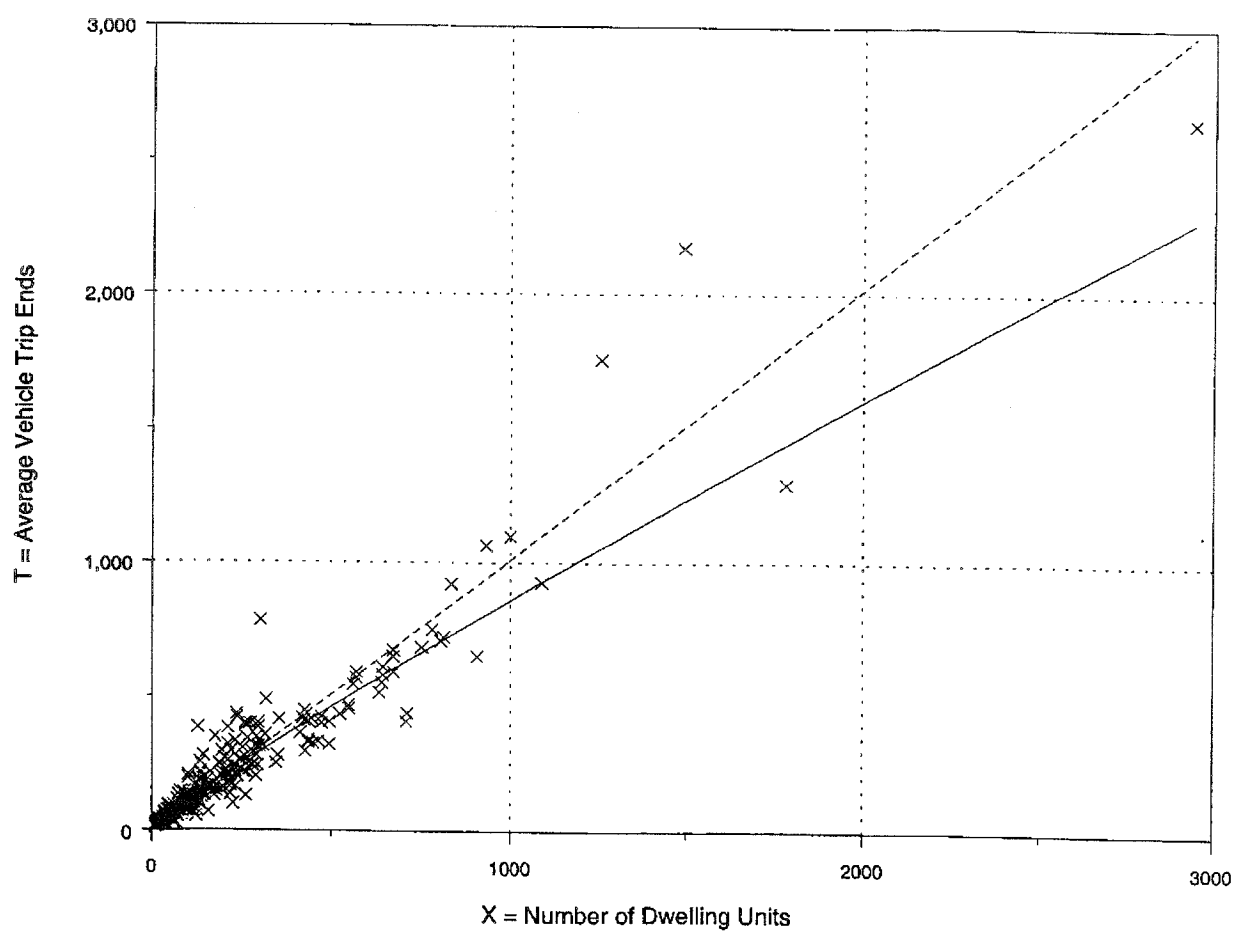
Average Vehicle Trip Ends vs: Dwelling Units
On a: Weekday,
Peak Hour of Adjacent Street Traffic,
One Hour Between 4 and 6 p.m.

Number of Studies: 302
Avg. Number of Dwelling Units: 214
Directional Distribution: 63% entering, 37% exiting

Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
1.01	0.42 - 2.98	1.05

Data Plot and Equation



Fitted Curve Equation: Ln(T) = 0.90 Ln(X) + 0.53

R^2 = 0.91

Land Use: 230
Residential Condominium/Townhouse

Description

Residential condominiums/townhouses are defined as ownership units that have at least one other owned unit within the same building structure. **Both condominiums and townhouses are included in this land use.** The studies in this land use did not identify whether the condominiums/townhouses were low-rise or high-rise. Low-rise residential condominium/townhouse (Land Use 231), high-rise residential condominium/townhouse (Land Use 232) and luxury condominium/townhouse (Land Use 233) are related land uses.

Additional Data

The number of vehicles and the number of residents had a high correlation with average weekday vehicle trip ends. The use of these variables was limited, however, because the number of vehicles and residents was often difficult to obtain or predict. The number of dwelling units was generally used as the independent variable of choice because it is usually readily available, easy to project and had a high correlation with average weekday vehicle trip ends.

The peak hour of the generator typically coincided with the peak hour of the adjacent street traffic.

The sites were surveyed from the mid-1970s to the 2000s throughout the United States and Canada.

Source Numbers

4, 92, 94, 95, 97, 100, 105, 106, 114, 168, 186, 204, 237, 253, 293, 319, 320, 321, 390, 412, 418, 561, 562, 583

Residential Condominium/Townhouse
(230)

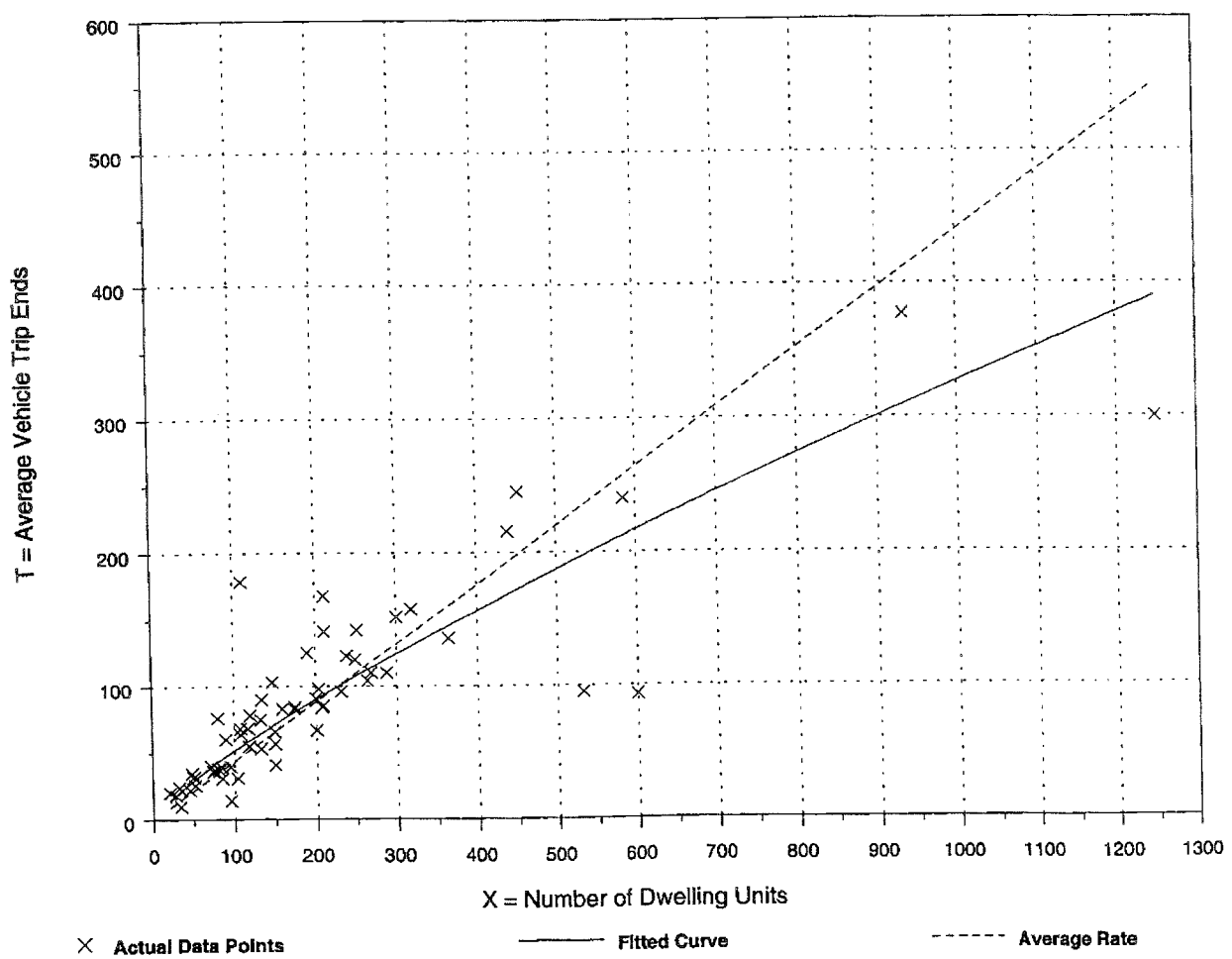
Average Vehicle Trip Ends vs: Dwelling Units
On a: Weekday,
Peak Hour of Adjacent Street Traffic,
One Hour Between 7 and 9 a.m.

Number of Studies: 59
Avg. Number of Dwelling Units: 213
Directional Distribution: 17% entering, 83% exiting

Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.44	0.15 - 1.61	0.69

Data Plot and Equation



Fitted Curve Equation: Ln(T) = 0.80 Ln(X) + 0.26

R^2 = 0.76

Residential Condominium/Townhouse
(230)

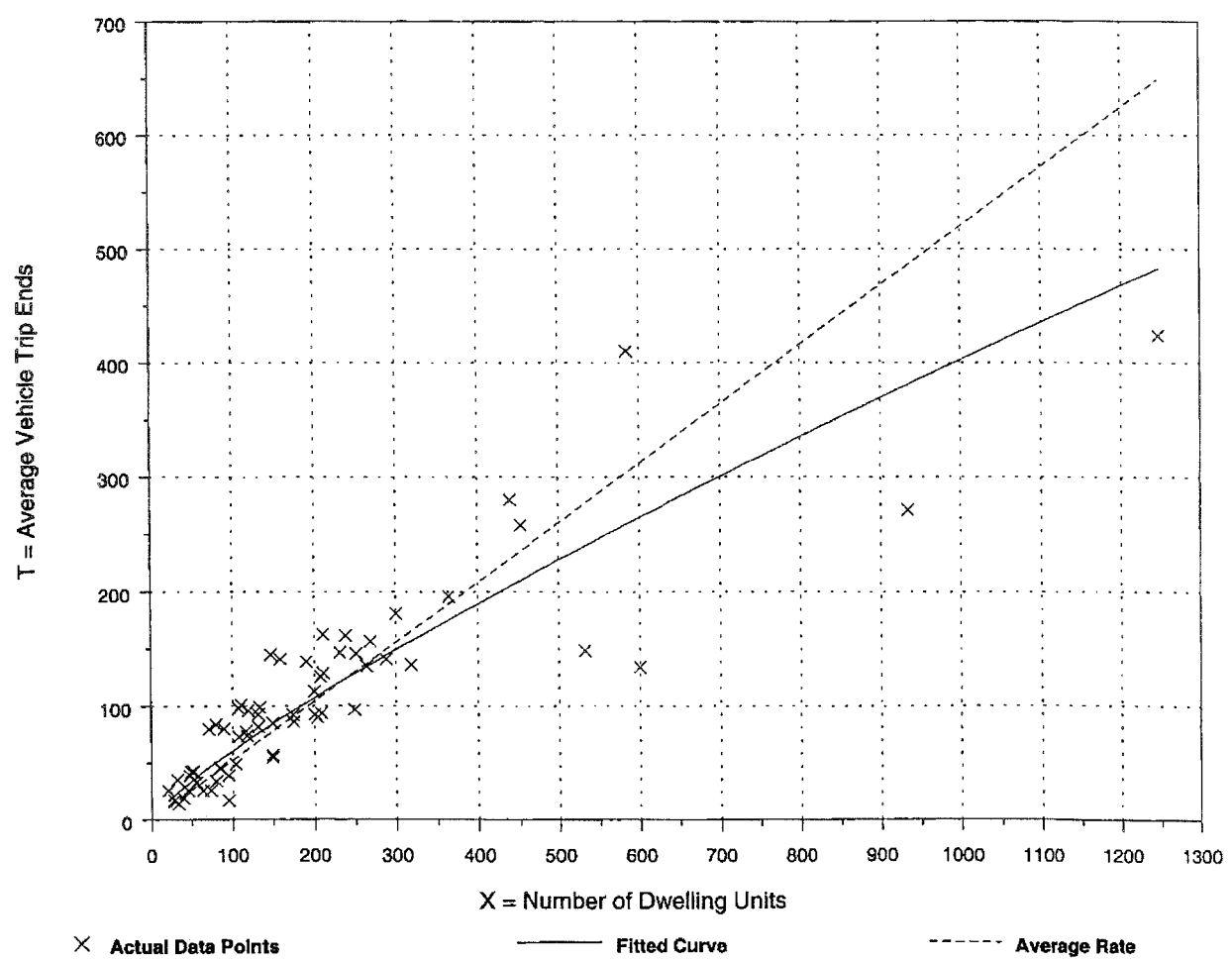
Average Vehicle Trip Ends vs: Dwelling Units
On a: Weekday,
Peak Hour of Adjacent Street Traffic,
One Hour Between 4 and 6 p.m.

Number of Studies: 62
Avg. Number of Dwelling Units: 205
Directional Distribution: 67% entering, 33% exiting

Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.52	0.18 - 1.24	0.75

Data Plot and Equation



Fitted Curve Equation: Ln(T) = 0.82 Ln(X) + 0.32 $R^2 = 0.80$

CREIGHTON MANNING ENGINEERING, L.L.P.

JOB 05-054d
SHEET NO. ____ OF ____
CALCULATED BY EBW DATE 6/17/2005
CHECKED BY KW DATE 6/24/05
SCALE Trip Generation

SINGLE FAMILY

LUC - 210 - Single-Family Detached Housing						Entering	Exiting	Total	
Dwelling Units, Weekday, AM peak hour of Adjacent Street Traffic, page 270									
61	Units	25%	enter	75%	exit				
Ave Rate:	0.75	Trips/unit	T=	46	Trips	12	35	47	
Fitted Curve		T=0.70(X)+9.43							
X=	61		T=	52	Trips	13	39	52	←
Dwelling Units, Weekday, PM peak hour of Adjacent Street Traffic, page 271									
61	Units	63%	enter	37%	exit				
Ave Rate:	1.01	Trips/unit	T=	62	Trips	39	23	62	
Fitted Curve		LN(T)=0.90LN(X)+0.53							
X=	61		T=	69	Trips	43	26	69	←

CARRIAGE HOMES

LUC - 230 - Residential Condominium/Townhouse						Entering	Exiting	Total	
Dwelling Units, Weekday, AM peak hour of Adjacent Street Traffic, page 368									
129	Units	17%	enter	83%	exit				
Ave Rate:	0.44	Trips/unit	T=	57	Trips	10	47	57	
Fitted Curve		LN(T)=0.80LN(X)+0.26							
X=	129		T=	63	Trips	11	52	63	←
Dwelling Units, Weekday, PM peak hour of Adjacent Street Traffic, page 369									
129	Units	67%	enter	33%	exit				
Ave Rate:	0.52	Trips/unit	T=	67	Trips	45	22	67	
Fitted Curve		LN(T)=0.82LN(X)+0.32							
X=	129		T=	74	Trips	50	24	74	←

AM	24	91	115
PM	93	50	143