Coolidge Crossing

A Trask Development Community in Sherborn, MA

Comprehensive Permit Application

Town of Sherborn, MA

Developed by:

Trask

30 Turnpike Road, Suite #8
Southborough, MA 01772
(O) 508-485-0077 (F) 508-485-4879

Town of Sherborn, Massachusetts

ZONING BOARD OF APPEALS

PREMISES AFFECTED: a parcel of land located at 104 Coolidge Street across from Sweet Meadow Farm in Sherborn, MA as shown in the Comprehensive Permit application.

APPLICATION FOR A COMPREHENSIVE PERMIT

UNDER MASSACHUSETTS GENERAL LAW CHAPTER 40B, SECTION 20-23

The Gray Road LLC (hereinafter "the Applicant") hereby applies to the Board of Appeals of the Town of Sherborn, Massachusetts, pursuant to General Laws, Chapter 40B, Section 20-23, as amended, for the issuance of a Comprehensive Permit authorizing the Applicant to develop eighty eight (88) condominium units on land located at Coolidge Street (said parcel being more specifically identified by the Assessor's Office as Map 5 Lot 32 & 48A in Sherborn, Massachusetts. The Applicant and the proposed development are more particularly described in the exhibits hereto annexed and submitted simultaneously herewith, all of which are incorporated herein by reference and constitute the documents required to be submitted under the regulations for filing a 40B application by the Massachusetts Department of Housing and Community Development (760 CMR 56.00).

Gray Road LLC

By: _____

Benjamin T. Stevens
Manager

Coolidge Crossing
A Trask Development Community in Sherborn, MA

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Coolidge Crossing Comprehensive Permit Application

SECTION 1: SUMMARY INFORMATION FOR COMPREHENSIVE PERMIT

SUMMARY INFORMATION FOR COMPREHENSIVE PERMIT APPLICATION

Date Filed: 11/17/16

PART I APPLICANT INFORMATION

Applicant Name: Gray Road LLC, Benjamin T. Stevens, Manager & Sole Member

Applicant Address: 30 Turnpike Road, Suite #8, Southborough, MA 01772

Applicant Phone Number: 508-485-0077 Email Address: benstevens@traskdevelopment.com

PART II OWNER INFORMATION

Owners Names : Melchiorri Realty Trust: Kathleen S. Bacon, Patricia R. Westhaver, Rocky A. Melchiorri, Michael J. Melchiorri

Owner Address: 11 Watson Street, Natick, MA

PART III PROPERTY INFORMATION

Address : 104 Coolidge Street

Assessors Map Number: Map 5 Lot 32 & 48A Lot Size: 20.02 Frontage: 150'

Zoning District: Residential District B (Single Family Housing)

Applicant:: Gray Road LLC Title: Manager

By: _____
Benjamin T. Stevens

SECTION 2: PROJECT DESCRIPTION

Coolidge Crossing
A Trask Development Community in Sherborn, MA

Project Description

Coolidge Crossing will consist of Eighty-Eight (88) townhouse condominium units yielding 22 affordable units and 66 market rate units. All units will have three (3) bedrooms. The units will average approximately 2,500 sf. Garages will be front facing with all units having one double garage door (2-car garage). Each unit will have exclusive driveway parking for additional vehicles. In addition, sixty-two parking spaces will be provided for guest parking. All the units will be served by private wells and a waste water treatment system approved by the Ma DEP under a ground water discharge permit. Natural gas and electricity will be provided by NStar. The majority of the development will be in the wooded area set back from Coolidge Street approximately 800'. There will be a small club house (2000 sf footprint) to be used as an office, gathering area, and a fitness gym.

The stylized-New England architectural design will feature two, three and four unit townhouse buildings designed to complement the size and massing of other homes built in the area. The buildings will be completed with roof line details, façade details, color shifts, and overhangs to lessen the overall building height and size impact. The roof lines are based upon a single level or cape style that has gables and dormers added to visually downplay the roof lines. The units will be constructed with covered entranceways, detailed raised panel garage doors with glass lites and extensive exterior trim and moldings. The exterior of the buildings will be constructed using Hardi-plank pre-colored cementitious boards with Azek-style trim. Both products are earth friendly and made of recycled materials that need little to no maintenance over time. Each unit will have either a deck using Trek-style materials or a concrete paver patio depending upon site grading conditions. All the homes will be constructed to Energy Star standards. The units that are proposed are very similar to the Developer's recently completed Chapter 40B townhouse condominium development in Sudbury; Landham Crossing (www.landhamcrossing.com). Photographs of the Landham Crossing buildings are included in Section 10 of this Comprehensive Permit Application. Preliminary architectural elevations and floor plans for Coolidge Crossing have been included in Section 10 of this Comprehensive Permit Application.

All of the buildings will front the new roadway system and not Coolidge Street, due to the depth of the proposed project area; it is unlikely that the units will be visible from Coolidge Street or Meadowbrook Road. Existing tree lines and no disturb areas along the aqueduct (Meadowbrook), Rockland Street yards, and Coolidge Street will be maintained, existing trees along 102 and 108 Coolidge will remain, or new planting areas will be created to buffer along the new access roadway. The closest structure to any existing houses on Meadowbrook Road homes are approximately 200' away. Typical space between existing homes on Meadowbrook is 100-150'. The proposed units will be 500'-1000' from the existing houses along Coolidge Street.

The project includes open spaces and rain gardens throughout the site, along with walking trails. These walking trails could be linked with the Peters Hill trail system if possible. The site contains a sidewalk on one side of the roadway system, along with a playground area, and bus stop at Coolidge Street.

It is assumed that the entire project; roadway, sidewalks drainage, parking areas, lighting, and landscaping will remain private and shall not require maintenance services from the Town of Sherborn.

Drinking water is proposed to be through a private well system, with final testing protocol to be determined through the Comprehensive Permit approval. Final documentation as needed will be submitted to Ma DEP to confirm the status as private wells.

A pressurized water system for fire protection will be completed through the site with the system being maintained by the association. The final location for these hydrants are subject to approval by the Sherborn Fire Department.

For septic disposal, the applicant is currently pursuing a Ma DEP waste water discharge permit for a waste water treatment plant, this application will be through the State DEP and not the local Board of Health.

Gas and electric are available to the site and will be brought in underground, street lighting and sidewalks will be added throughout the project.

ABUTTERS LIST

NAME OF PETITIONER: Trask Development
DATE: 11/9/16
THE FOLLOWING PERSONS AND/OR BOARDS ARE "PARTIES IN INTEREST" UNDER CHAPTER 40A, SECTION 11, OF THE GENERAL LAWS OF THE COMMONWEALTH OF MASSACHUSETTS AND SHOULD BE NOTIFIED BY CERTIFIED MAIL OF THE PUBLIC HEARING TO BE HELD AT THE REQUEST OF THE PETITIONER NAMED ABOVE:
Abutters within 300 ft. of Map 5, Lot 32, Address: Meadowbrook Road, Sherborn, MA 01770 & Map 5, Lot 48A, Address: 102 Coolidge Street, Sherborn, MA 01770

abutters_	abutters_owner1	abutters_owner2	abutters_owner3	abutters_address	abutters_town	abutt	abutters_	abutters_location
5 0 10A	MDC AQUEDUCT			C/O TOWN HALL	SHERBORN	MA	01770	COOLIDGE ST
5 0 18	MELCHIORRI SILVANO A., TRUSTEE	MELCHIORRI LILLIAN E., TRUSTEE		32 UNION STREET	NATICK	MA	01760	MEADOWBROOK RD
5 0 19	MELCHIORRI SILVANO A., TRUSTEE	MELCHIORRI LILLIAN E., TRUSTEE		32 UNION STREET	NATICK	MA	01760	MEADOWBROOK RD
5 0 20	MELCHIORRI SILVANO A., TRUSTEE	MELCHIORRI LILLIAN E., TRUSTEE		32 UNION STREET	NATICK	MA	01760	MEADOWBROOK RD
5 0 21	MELCHIORRI SILVANO A., TRUSTEE	MELCHIORRI LILLIAN E., TRUSTEE		32 UNION STREET	NATICK	MA	01760	MEADOWBROOK RD
5 0 22	KNAPP MARK A.	KNAPP KATHY ANN S.		2 MEADOWBROOK RD	SHERBORN	MA	01770	2 MEADOWBROOK RD
5 0 23	CANDELLA JOANNE, TRUSTEE			6 MEADOWBROOK ROAD	SHERBORN	MA	01770	6 MEADOWBROOK RD
5 0 25	MICHAUD PATRICIA A.	MICHAUD ALBERT		12 MEADOWBROOK	SHERBORN	MA	01770	12 MEADOWBROOK RD
5 0 26	KOVALEV MIKHAIL M. & NINA	KOVALEV TIMUR & MIKHAIL		14 MEADOWBROOK RD	SHERBORN	MA	01770	14 MEADOWBROOK RD
5 0 27	LEVINE PAULA Z. TRUSTEE			18 MEADOWBROOK RD	SHERBORN	MA	01770	18 MEADOWBROOK RD
5 0 28	HE, JINGLIN	TIAN, XINYING		22 MEADOWBROOK RD	SHERBORN	MA	01770	22 MEADOWBROOK RD
5 0 29	YIP PEARL W.			28 MEADOWBROOK RD	SHERBORN	MA	01770	28 MEADOWBROOK RD
5 0 30	KNAPP, JR. JOHN A.	KNAPP KATHERINE M.		32 MEADOWBROOK RD	SHERBORN	MA	01770	32 MEADOWBROOK RD
5 0 31	BOTELHO ROBERT J.	BOTELHO DEBORAH J.		38 MEADOWBROOK RD	SHERBORN	MA	01770	38 MEADOWBROOK RD
5 0 32	MELCHIORRI SILVANO A., TRUSTEE	MELCHIORRI LILLIAN E., TRUSTEE		32 UNION STREET	NATICK	MA	01760	MEADOWBROOK RD
5 0 43A	BADEAU, TRUSTEE ROGER R.	BADEAU, TRUSTEE SUSAN P.		112 COOLIDGE STREET	SHERBORN	MA	01770	112 COOLIDGE ST
5 0 46	SANCLEMENTS JUDITH A.			115 COOLIDGE STREET	SHERBORN	MA	01770	115 COOLIDGE ST
5 0 47	KNAPP, JR. JOHN A.	KNAPP KATHERINE M.		32 MEADOWBROOK ROAD	SHERBORN	MA	01770	111 COOLIDGE ST
5 0 48	OUELLETTE ALAN R.	OUELLETTE JUNE		108 COOLIDGE P. O. BOX 377	SHERBORN	MA	01770	108 COOLIDGE ST
5 0 48A	BACON KATHLEEN S.	WESTHAVER PATRICIA R	MELCHIORRI ROCKY A. & MICHAEL J.	11 WATSON STREET	NATICK	MA	01760	COOLIDGE ST
5 0 49	HORIGAN KATHLEEN A.	DYE DAVID L.		102 COOLIDGE ST	SHERBORN	MA	01770	102 COOLIDGE ST
5 0 50	TETI NANCY, TRUSTEE			99 COOLIDGE ST PO BOX 218	SHERBORN	MA	01770	99 COOLIDGE ST
5 0 52	BERNARDI JOHN C.	BERNARDI CATHY A.		94 COOLIDGE ST	SHERBORN	MA	01770	94 COOLIDGE ST
5 0 53	MELCHIORRI SILVANO A., TRUSTEE	MELCHIORRI LILLIAN E., TRUSTEE		32 UNION STREET	NATICK	MA	01760	COOLIDGE ST
5 0 54	PADDOCK AARON	PADDOCK ADA HAU		86 COOLIDGE ST	SHERBORN	MA	01770	86 COOLIDGE ST
5 0 55	COOLIDGE CROSSING, LLC	C/O TRASK INC.		30 TURNPIKE ROAD	SOUTHBOROUGH	MA	01772	84 COOLIDGE ST
10 0 5	DOWSE ALEX P	DOWSE JONATHAN H		100 NO MAIN STREET	SHERBORN	MA	01770	ROCKWOOD ST
5 0 56D	MYERS HARGRAVE JOHN	MYERS HARGRAVE JADE		49 ROCKWOOD ST PB 1217	SHERBORN	MA	01770	49 ROCKWOOD ST

SIGNED: AMY DAVIDSON FOR THE SHERBORN BOARD OF ASSESSORS

SECTION 3: PROJECT ELIGIBILITY LETTER, MASSHOUSING

MassHousing

Massachusetts Housing Finance Agency
One Beacon Street, Boston, MA 02108

Tel: 617.854.1000 | Fax: 617.854.1091
Vp: 866.758.1435 | www.masshousing.com

September 29, 2016

Benjamin T. Stevens, Manager
Trask, Inc.
30 Turnpike Road, Suite 8
Southborough, MA 01772

RE: Coolidge Crossing, Sherborn, MA
Site Approval
MH ID No. 826

Dear Mr. Stevens:

This letter is in response to your application as "Applicant" for a determination of Project Eligibility ("Site Approval") pursuant to Massachusetts General Laws Chapter 40B ("Chapter 40B"), 760 CMR 56.00 (the "Regulations") and the Comprehensive Permit Guidelines issued by the Department of Housing and Community Development ("DHCD") (the "Guidelines" and, collectively with Chapter 40B and the Regulations, the "Comprehensive Permit Rules"), under the New England Fund ("NEF") Program ("the Program") of the Federal Home Loan Bank of Boston ("FHLBB").

You have proposed to build 88 homeownership units (the "Project") on approximately 20.2 acres of land located at 104 Coolidge Street (the "Site") in Sherborn, MA (the "Municipality").

In accordance with the Comprehensive Permit Rules, this letter is intended to be a written determination of Project Eligibility ("Site Approval") by MassHousing acting as Subsidizing Agency under the Guidelines, including Part V thereof, "Housing Programs in Which Funding Is Provided by Other Than a State Agency."

MassHousing has performed an on-site inspection of the Site, which local boards and officials were invited to attend, and has reviewed the pertinent information for the Project submitted by the Applicant, the Municipality and others in accordance with the Comprehensive Permit Rules. The Municipality was given a thirty (30) day period, in which to review the Site Approval application and submit comments to MassHousing. Based on MassHousing's consideration of comments received from the Municipality, and its site and design review, the following issues should be addressed in your application to Sherborn Zoning Board of Appeals ("ZBA") for a Comprehensive Permit and fully explored in the public hearing process prior to submission of your application for final approval under the Program:

Charles D. Baker, *Governor* | Karyn E. Polito, *Lt. Governor* | Michael J. Dirrane, *Chairman* | Ping Yin Chai, *Vice Chair* | Timothy C. Sullivan, *Executive Director* | Karen E. Kelleher, *Deputy Director* | Thomas R. Gleason, *Executive Director Emeritus*

Municipal Comments

- The Municipality is concerned about the impact the proposed wells may have on the existing chemical contamination from the General Chemical site located in Framingham. According to the Town, the drawdown from the proposed wells could facilitate the flow of underground water toward the Site, resulting in migration of those chemicals into the proposed wells, as well as the existing wells in the neighborhood. The Municipality suggests that the Applicant contract with a consultant to explore the feasibility of a connection to the Natick municipal water system, including both physical feasibility and the implications of any inter-municipal agreement that might be required for such a connection to be considered by the Towns of Sherborn and Natick. The municipality has confirmed with the Town of Natick that discussions related to this proposal have already commenced.

- The Municipality believes that detention basins will need to be designed to ensure their ability to uptake pollutants and limit the release of potential contaminants into surrounding resource areas and groundwater.

- The Municipality requests that the Town of Natick be consulted regarding any stormwater discharges that are hydraulically linked to wetland resource areas in Natick.

- The Municipality believes that an additional wetland resource area, located north of the western access point to the Site is not shown on the Applicant's plan. This potential resource area appears to be in an area where its buffer zone would be impacted by the proposed development.

- The Municipality is concerned that the development of the Site will result in removal of mature upland forest, home to numerous native species of flora and fauna. Also, the Municipality believes that the Site is bordered to the south by a transmission line easement, which functions as a wildlife habitat corridor.

- The Municipality is concerned about the supply of drinking water to the Site coming exclusively from groundwater due to the Town's total dependence on groundwater for private drinking water wells and the large and relatively concentrated water demands from a project of the scale of the proposed development.

- The Municipality is concerned with the Applicant's plans to treat each well as a private water supply, rather than installing a public water supply. The Municipality requests that the water supply be regulated as a public water supply, or in the alternative that the Project adhere to the Sherborn Board of Health's management of water supply sampling and analysis. Further, the Municipality believes that the proposed dense cluster of water supply wells will require extended simultaneous pump testing to demonstrate whether the water supply volume needed for the project's future residents can be met.

- The Municipality is concerned that the density of discharge from this relatively large waste water treatment system poses risks to the project's on-site water supply wells of neighboring properties that are also in proximity to the soil absorption system.

- The Municipality believes rental apartments would help diversify Sherborn's current housing stock to serve multiple generations and economic levels. The Municipality further believes that there is a stronger need for 2-bedroom units in Sherborn, both for older residents who wish to downsize and young people just moving into town and suggests that the Applicant revise the proposed unit mix to include 2-bedroom units.

- The Municipality has other general concerns including the demands emergency services, project density, topographical limitations, and impact on traffic and infrastructure (roads, water, sewer).

Community Comments

In addition to the comments from town officials, MassHousing received several letters and signed petitions from area residents, all of which expressed opposition to the proposed development. While letters from members of the community basically echoed the concerns identified by the local officials, the letters received are summarized below:

- Area residents contend that the Site is approximately 2.5 miles from the original site of the General Chemical spill and there is concern regarding potential groundwater contamination.

- Area residents expressed concerned that the proposed development will deplete the groundwater supply.

- Area residents are concerned that the Applicant has misrepresented the topography of the Site and that the potential for harmful runoff and groundwater contamination is high.

- Area residents believe the proposed buildings are significantly out of scale within the context of the existing residential neighborhood.

- Area residents are concerned with the Project's potential impact on traffic during peak hours on Coolidge Street. The community believes that the proposed access on Coolidge Street poses a safety issue due to the frequency of accidents on this portion of the road.

- Area residents are also concerned about the proposed access off of Meadowbrook Road and believe it will have a significant safety impact on the neighborhood. Further, the community is concerned with the lack of existing sidewalk and street lighting on Meadowbrook Road. Area residents are concerned about the lack of sidewalks proposed due to the Project's proximity to the Commuter Rail stop.

- Area residents believe there is an intermittent stream running through the property that flows into Lake Cochituate which would be contaminated as a result of the Project.

Comments Outside of the Findings
While Comprehensive Permit Rules require MassHousing, acting as Subsidizing Agency under the Guidelines, to "accept written comments from Local Boards and other interested parties" and to "consider any such comments prior to issuing a determination of Project Eligibility, "they also limit MassHousing to specific findings outlined in 760 CMR 56.04(1) and (4). The following comments submitted to MassHousing identified issues that are not within the scope of our review:

- The Municipality is concerned about possible impacts on classroom size and on the quality of the Dover-Sherborn Regional School District.

- The Municipality was informed that the Applicant submitted a 40B application for a separate 84-unit rental development to Massachusetts Housing Partnership (MHP) on an abutting parcel of land and points out that the total number of units for both projects, if they were to be considered together as one project, would surpass the "large project" review as defined by the Comprehensive Permit Rules. In a letter dated September 29, 2016, the application for the aforementioned rental development was withdrawn from MHP without prejudice.

MassHousing Determination
MassHousing staff has determined that the Project appears generally eligible under the requirements of the Program, subject to final review of eligibility and to Final Approval. As a result of our review, we have made the findings as required pursuant to 760 CMR 56.04(1) and (4). Each such finding, with supporting reasoning, is set forth in further detail on Attachment 1 hereto.

Based on MassHousing's site and design review, and in light of feedback received from the Municipality, the following issues should be addressed prior to the submittal of your application for a Comprehensive Permit from the ZBA, and you should be prepared to explore them more fully in the local hearing process:

- Development of this Site will require compliance with all state and federal environmental laws, regulations and standards applicable to existing conditions and to the proposed use relating to floodplain management, wetland protection, river and wildlife conservation, water quality, stormwater management, wastewater treatment, and hazardous waste safety. The Applicant should expect that the Municipality will require evidence of such compliance prior to the issuance of a building permit for the Project.

- The Applicant should be prepared to provide sufficient data to assess the Project's potential traffic impacts on area roadways including traffic volumes, crash rates, and the safety and level of service (LOS) at the site entrances and area intersections.

- The Applicant should be prepared to address Municipal concerns relative to the size, scale and density of the Project and its impact on the character of the surrounding neighborhood, and to fully describe the proposed measures to address and mitigate these concerns.

- The Applicant should be prepared to provide detailed information relative to proposed water and sewer use, potential impacts on existing capacity, and appropriate mitigation.

- The Applicant should meet with local public safety officials relative to the adequacy of emergency access and the safety of pedestrian access throughout the Site.

This approval is expressly limited to the development of no more than eighty-eight (88) homeownership units under the terms of the Program, with not less than twenty-two (22) of such units restricted as affordable homeownership units for low and moderate income persons or families as required under the terms of the Guidelines. It is not a commitment or guarantee of NEF financing and does not constitute a site plan or building design approval. Should you consider, prior to obtaining a Comprehensive Permit, the use of any other housing subsidy program, the construction of additional units or a reduction in the size of the Site, you may be required to submit a new Site Approval application for review by MassHousing. Should you consider a change in tenure type or a change in building type or height, you may be required to submit a new Site Approval application for review by MassHousing.

For guidance on the Comprehensive Permit review process, you are advised to consult the Guidelines. Further, we urge you to review carefully with legal counsel the M.G.L. c.40B Comprehensive Permit Regulations and 760 CMR 56.00.

This approval will be effective for a period of two (2) years from the date of this letter. Should the Applicant not apply for a Comprehensive Permit within this period or should MassHousing not extend the effective period of this letter in writing, this letter shall be considered to have expired and no longer be in effect. In addition, the Applicant is required to notify MassHousing at the following times throughout this two year period: (1) when the Applicant applies to the local ZBA for a Comprehensive Permit, (2) when the ZBA issues a decision and (3) if applicable, when any appeals are filed.

Should a comprehensive permit be issued, please note that prior to (i) commencement of construction of the Project or (ii) issuance of a building permit, the Applicant is required to submit to MassHousing a request for Final Approval of the Project (as it may have been amended) in accordance with the Comprehensive Permit Rules (see especially 760 CMR 56.04(07) and the Guidelines including, without limitation, Part III thereof concerning Affirmative Fair Housing Marketing and Resident Selection). Final Approval will not be issued unless MassHousing is able to make the same findings at the time of issuing Final Approval as required at Site Approval.

Please note that MassHousing may not issue Final Approval if the Comprehensive Permit contains any conditions that are inconsistent with the regulatory requirements of the New England Fund Program of the FHLBB, for which MassHousing serves as Subsidizing Agency, as reflected in the applicable regulatory documents. In the interest of providing for an efficient review process and in order to avoid the potential lapse of certain appeal rights, the Applicant may wish to submit a "final draft" of the Comprehensive Permit to MassHousing for review. Applicants who avail themselves of this opportunity may avoid significant procedural delays that can result from the need to seek modification of the Comprehensive Permit after its initial issuance.

If you have any questions concerning this letter, please contact Jessica L. Malcolm at (617) 854-1201.

Sincerely,

Timothy C. Sullivan
Executive Director

cc: Ms. Chrystal Kornegay, Undersecretary, DHCD
Michael S. Giaimo, Chairman, Board of Selectmen
David Williams, Town Administrator
Alan Rubenstein, Chairman, Zoning Board of Appeals

Attachment 1.

760 CMR 56.04 Project Eligibility: Other Responsibilities of Subsidizing Agency
Section (4) Findings and Determinations

Coolidge Crossing, Sherborn, MA #826

After the close of a 30-day review period and extension, if any, MassHousing hereby makes the following findings, based upon its review of the application, and taking into account information received during the site visit and from written comments:

(a) that the proposed Project appears generally eligible under the requirements of the housing subsidy program, subject to final approval under 760 CMR 56.04(7);

MassHousing finds that the Project is eligible under the NEF housing subsidy program and at least 25% of the units will be available to households earning at or below 80% of the Area Median Income, adjusted for household size, as published by the U.S. Department of Housing and Urban Development ("HUD"). The most recent HUD income limits indicate that 80% of the current median income for a four-person household in Sherborn is $73,050.

(b) that the site of the proposed Project is generally appropriate for residential development, taking into consideration information provided by the Municipality or other parties regarding municipal actions previously taken to meet affordable housing needs, such as inclusionary zoning, multifamily districts adopted under c.40A, and overlay districts adopted under c.40R, (such finding, with supporting reasoning, to be set forth in reasonable detail);

Based on MassHousing staff's site inspection, internal discussions, and a thorough review of the application, MassHousing finds that the Site is suitable for residential use and development and that such use would be compatible with surrounding uses.

Sherborn does not have a DHCD Certified Housing Production Plan. According to DHCD's Chapter 40B Subsidized Housing Inventory (SHI), updated through June, 2016, Sherborn has 104 Subsidized Housing Inventory (SHI) units (7.03% of its housing inventory), which is 44 SHI units shy of the 10% SHI threshold.

(c) that the conceptual project design is generally appropriate for the site on which it is located, taking into consideration factors that may include proposed use, conceptual site plan and building massing, topography, environmental resources, and integration into existing development patterns (such finding, with supporting reasoning, to be set forth in reasonable detail);

In summary, based on evaluation of the site plan using the following criteria, MassHousing finds that the proposed conceptual project design is generally appropriate for the Site. The following plan review findings are made in response to the conceptual plan submitted to MassHousing.

Relationship to adjacent streets/Integration into existing development patterns
Coolidge Crossing is located at 104 Coolidge Street in Sherborn, MA on a 20.2 acre site currently zoned Residential District A [1-acre minimum lot size]. The buildings at Coolidge Crossing will be

set back over 700' from Coolidge Street and approximately 400' back from Meadowbrook Road. The scale of the proposed housing is reasonable given the proposed setback. Further, the proposed units will be at least 220' from abutters.

The Project's primary access is from Coolidge Street with secondary access at the rear of the Site from Gray Road [off of Meadowbrook Road]. There appears to be adequate lines of sight for vehicles entering and exiting the proposed Site. The Applicant is open to discussion with the Sherborn Fire Department regarding the access from Gray Road and states that it can be designated as emergency only or open to resident access.

The Project is located approximately 1/3 of a mile away from the Natick Town Line, has direct access to Routes 135 and 27 and within a three (3) mile radius there is access to public transportation, food shopping centers, the Natick Collection, Police and Fire Stations, Town Hall, and a wild life sanctuary.

Relationship to Adjacent Building Typology (Including building massing, site arrangement, and architectural details):
The neighborhood surrounding the Site combines an architectural mix from split levels to ranches and colonials to farmhouse styles. An active horse stable and farm stand are located directly across the street. The proposed residential structures will reflect a New England architectural design featuring three (3) and four (4) unit townhouse buildings designed to complement the architectural features, size, and massing of other homes built in the area. They will include roofline details, façade details, color shifts, and overhangs to lessen the overall perception of the building's height and impact of the project's massing. The roof lines are based upon a cape style that has gables and dormers added to provide visual interest along the roof lines. The units will be constructed with covered entranceways, detailed Carriage House style garage doors with glass-lites and extensive exterior trim and moldings. The exterior of the buildings will be constructed using hardi-plank pre-colored cementitious boards with Azek-style trim. Each unit will have a deck using Trek-style materials or a concrete paver patio depending upon site grading conditions.

Density
The Developer intends to build 88 homes on 20.2 acres, of which 19.33 are buildable acres. The resulting density is 4.55 units per buildable acre.

Conceptual Site Plan
The proposed main access to the Site will be a tree-lined road extending approximately 700 feet from Coolidge Street to the primary residential development. A management office and meeting room will be located at the end of the access road and adjacent to the proposed housing. The neighborhood will consist of 88, three (3) and four (4) unit, three (3) bedroom townhouse buildings, clustered together to create a village-style community. The units will average 2,500 sq. ft. and will have exclusive use driveway parking. End units will have 2-car garages and middle units will have 1-car garages. The buildings have been sited to maximize backyard privacy. The Site includes .87 acres of wetlands located at the rear of the Site. Secondary access will be available at the rear of the Site from Gray Road.

Topography
The subject property is rolling with the higher elevations in the center of the property. The Site's topography is such that little imported or exported fill should be required to complete the site infrastructure.

Environmental Resources
The subject property is primarily open land including a lawn in the area closest to Coolidge Street, with surrounding wooded areas and thick foliage. The site includes approximately .87 acres of wetlands. The proposal will need to comply with the Wetlands Protection Act. According to the Applicant, a suitable area for a large common septic system on the Site has been located and recently tested and the soils are acceptable for both septic and subsurface recharge drainage systems.

All units will be served by private wells and a private waste water treatment plant given that there is no public water or sewer service in the Town of Sherborn. Natural gas and electricity will be provided by Eversource.

(d) that the proposed Project appears financially feasible within the housing market in which it will be situated (based on comparable rentals or sales figures);

The Project appears financially feasible based on a comparable sales letter submitted by Scott Adamson, GRI, SRES of Coldwell Banker.

(e) that an initial pro forma has been reviewed, including a land valuation determination consistent with the Department's Guidelines, and the Project appears financially feasible and consistent with the Department's Guidelines for Cost Examination and Limitations on Profits and Distributions (if applicable) on the basis of estimated development costs;

The initial pro-forma has been reviewed for the proposed residential use and the Project appears financially feasible with a projected profit margin of 13.93%. In addition, a third party appraisal commissioned by MassHousing has determined that the "As-Is" land value for the Site of the Proposed Project is $2,340,000.

(f) that the Applicant is a public agency, a non-profit organization, or a Limited Dividend Organization, and it meets the general eligibility standards of the housing program; and

MassHousing finds that the Applicant must be organized as a Limited Dividend Organization. MassHousing sees no reason this requirement could not be met given information reviewed to date. The Applicant meets the general eligibility standards of the NEF housing subsidy program, and has executed an Acknowledgement of Obligations to restrict their profits in accordance with the applicable limited dividend provision.

(g) that the Applicant controls the site, based on evidence that the Applicant or a related entity owns the site, or holds an option or contract to acquire such interest in the site, or has such other interest in the site as is deemed by the Subsidizing Agency to be sufficient to control the site.

Trask, Inc., a related entity to the Applicant, controls the entire 20.2 acre Site under a Purchase and Sale Agreement with an expiration date of September 1, 2017.

SECTION 4: EVIDENCE OF SITE CONTROL

New Agreement 8-10-15

STANDARD FORM
PURCHASE AND SALE AGREEMENT

From the Office of
Burke & Burke
5 Washington Street
Sherborn, MA 01770

1. PARTIES AND MAILING ADDRESSES

This day of August, 2015, **Melchiorri Realty Trust, Kathleen S. Bacon, Patricia R. Westhaver, Rocky A. Melchiorri, and Michael J. Melchiorri**, all of 11 Watson Street, Natick, Massachusetts hereinafter called the SELLER, agrees to SELL and **Trask, Inc.**, a Massachusetts corporation of 30 Turnpike Road, Suite 8, Southborough, MA 01772, hereinafter called the BUYER or PURCHASER, agrees to BUY, upon the terms hereinafter set forth, the following described premises:

2. DESCRIPTION

Those certain vacant parcels of land, located in Sherborn, Middlesex County, Massachusetts and being located on the northerly side of Coolidge Street in said Sherborn and being more particularly described as follows; Parcels 2 and 3 in a Deed recorded in Middlesex South District Registry of Deeds in Book 42839, Page 471, and Lot 2A as described in Deed recorded with said Deeds in Book 64760, Page 28.

3. BUILDINGS, STRUCTURES, IMPROVEMENTS, FIXTURES

NONE – VACANT LAND.

4. TITLE DEED

Said premises are to be conveyed by a good and sufficient quitclaim deed running to the BUYER, or to the nominee designated by the BUYER by written notice to the SELLER at least seven 7 days before the deed is to be delivered as herein provided, and said deed shall convey a good and clear record and marketable title thereto, free from encumbrances, except

(a) Provisions of existing building and zoning laws;
(b) Such taxes for the then current year as not due and payable on the date of the delivery of such deed;
(c) Easements, restrictions and reservations of record, if any, so long as the same do not prohibit or materially interfere with the purchasers development of the premises

5. PLANS

If said deed refers to a plan necessary to be recorded therewith the SELLER shall deliver such plan with the deed in form adequate for recording or registration.

6. REGISTERED TITLE

N/A

7. PURCHASE PRICE

The agreed purchase price for said premises is ONE MILLION, EIGHT HUNDRED THOUSAND ($1,800,000.00) DOLLARS , of which

$ 50,000.00 have been paid as a deposit this day and
$ 1,750,000.00 are to be paid at the time of delivery of the deed in cash, or by certified, Cashier's, treasurer's, Attorney's IOLTA check or bank check(s).

$_____
$ 1,800.000.00 TOTAL

8. TIME FOR PERFORMANCE DELIVERY OF DEED

The delivery of the Deed hereunder shall take place at Noon, on the 1st day of September, 2017, subject to the provisions of Addendum A to this agreement, at the Middlesex South District Registry of Deeds, or, at the Buyer's option, as the office of the Buyer's attorney. Time is of the essence hereof.

9. POSSESSION AND CONDITION OF PREMISE

Full possession of said premises free of all tenants and occupants, except as herein provided, is to be delivered at the time of the delivery of the deed, said premises to be then (a) in the same condition as they now are, reasonable use and wear thereof excepted, and (b) not in violation of said building and zoning laws, and (c) in compliance with provisions of any instrument referred to in clause 4 hereof. The BUYER shall be entitled personally to inspect said premises prior to the delivery of the deed in order to determine whether the condition thereof complies with the terms of this clause.

10. EXTENSION TO PERFECT TITLE OR MAKE PREMISES CONFORM

If the SELLER shall be unable to give title or to make conveyance, or to deliver possession of the premises, all as herein stipulated, or if at the time of the deed the premises do not conform with the provisions hereof, then the SELLER shall use reasonable efforts to remove any defects in title, or to deliver possession as provided herein, or to make the said premises conform to the provisions hereof, as the case may be, time for performance hereof shall be extended for a period of thirty **(30)** days.

11. FAILURE TO PERFECT TITLE OR MAKE PREMISES CONFORM, etc.

If at the expiration of the extended time the SELLER shall have failed so to remove any defects in title, deliver possession, or make the premises conform, as the case may be, all as herein agreed, or if at any time during the period of this agreement or any extension thereof, the holder of a mortgage on said premises shall refuse to permit the insurance proceeds, if any, to be used for such purposes, then any payments made under this agreement shall be forthwith refunded and all other obligations of the parties hereto shall cease and this agreement shall be void without recourse to the parties hereto.

12. BUYER's ELECTION TO ACCEPT TITLE

The BUYER shall have the election, at either the original or any extended time for performance, to accept such title as the SELLER can deliver to the said premises in their then condition and to pay therefore the purchase price without deduction, in which case te SELLER shall convey such title.

13. ACCEPTANCE OF DEED

The acceptance of a deed by the BUYER or his nominee as the case may be, shall be deemed to be a full performance and discharge of every agreement and obligation herein contained or expressed, except such as are, by the terms hereof, to be performed after the delivery of said deed.

14. USE OF MONEY TO CLEAR TITLE

To enable the SELLER to make conveyance as herein provided, the SELLER may, at the time of delivery of the deed, use the purchase money or any portion thereof to clear the title of any or all encumbrances or interests, provided that all instruments so procured are recorded simultaneously with the delivery of said deed.

15. INSURANCE

Until the delivery of the deed, the SELLER shall maintain existing insurance on said premises, if any.

16. ADJUSTMENTS

Real estate taxes for the then current fiscal year, shall be apportioned, as of the day of performance of this agreement and the net amount thereof shall be added to or deducted from, as the case may be, the purchase price payable by the BUYER at the time of delivery of the deed.

17. ADJUSTMENT OF UNASSESSED AND ABATED TAXES

If the amount of said taxes is not known at the time of the delivery of the deed, they shall be apportioned on the basis of the taxes assessed for the preceding fiscal year, with a reapportionment as soon as the new tax rate and valuation can be ascertained; and, if the taxes, which are to be apportioned shall thereafter be reduced by abatement, the amount of such abatement, less the reasonable cost of obtaining the same, shall be apportioned between the parties, provided that neither party shall be obligated to institute or prosecute proceedings for an abatement unless herein otherwise agreed.

18. BROKER'S FEE

THERE IS NO BROKER IN THIS TRANSACTION

19. BROKER(S) WARRANTY

THERE IS NO BROKER IN THIS TRANSACTION

20. DEPOSIT

All deposits made hereunder shall be held in escrow by **John P. Burke, Esq.** as escrow agent subject to the terms of this agreement and shall be duly accounted for at the time for performance of this agreement. In the event of any disagreement between the parties, the escrow agent may retain all deposits made under this agreement pending instruction mutually given by the SELLER and the BUYER, to be held in a non-interest bearing account.

21. BUYER'S DEFAULT; DAMAGES

If the BUYER shall fail to fulfill the BUYER'S agreements herein, all deposits made hereunder by the BUYER shall be retained by the SELLER as liquidated damages and this shall be the SELLER's sole and exclusive remedy, at law or in equity, for any default by the BUYER under this agreement.

22. RELEASE BY HUSBAND OR WIFE

The SELLERS' spouses hereby agree to join in said deed and to release and convey all statutory and other rights and interests in said premises.

23. BROKER AS PARTY

THERE IS NO BROKER IN THIS TRANSACTION

24. LIABILITY OF TRUSTEE, SHAREHOLDER, BENEFICIARY, etc.

If the SELLER or BUYER executes this agreement in a representative or fiduciary capacity, only the principal or the estate represented shall be bound, and neither the SELLER or BUYER so executing, nor any shareholder or beneficiary of any trust, shall be personally liable for any obligation, express or implied, hereunder.

25. WARRANTIES AND REPRESENTATIONS

The BUYER acknowledges that the BUYER has not been influenced to enter into this transaction nor has he relied upon any warranties or representations not set forth or incorporated in this agreement or previously made in writing, except for the following additional warranties and representations, if any, made by either the SELLER or the Broker(s): **none**

26. MORTGAGE CONTINGENCY CLAUSE

THIS TRANSACTION IS NOT SUBJECT TO A FINANCING CONTINGENCY

27. CONSTRUCTION OF AGREEMENT

This instrument, executed in multiple counterparts, is to be construed as a Massachusetts contract, is to take effect as a sealed instrument, sets forth the entire contract between the parties, is binding upon and enures to the benefit of the parties hereto and their respective heirs, devisees, executors, administrators, successors and assigns, and may be canceled, modified or amended only by a written instrument executed by both the SELLER and the BUYER. If two or more persons are named herein as BUYER their obligations hereunder shall be joint and several. The captions and marginal notes are used only as a matter or convenience and are not to be considered a part of this agreement or to be used in determining the intent of the parties to it.

28. ADDITIONAL PROVISIONS

SEE ADDENDUM ATTACHED HERETO AND INCORPORATED HEREIN BY REFERENCE.

Melchiorri Realty Trust by:

Kathleen S. Bacon, Seller

Patricia R. Westhaver, Seller

Rocky A. Melchiorri, Seller

Michael J. Melchiorri, Seller

BUYER - Trask, Inc. by Benjamin Stevens

ADDENDUM A

Seller: Melchiorri Realty Trust et al

Buyer: Trask, Inc.

Property: Coolidge Street, Sherborn, MA

1. The Buyer's obligations hereunder, are contingent upon the Buyer obtaining all necessary Approvals for a "Chapter 40B" project consisting of no less than 44, two-bedroom units ("Project") from the Zoning Board of Appeals of the Town of Sherborn and all required permits from the Sherborn Board of Health for the installation of wells and septic systems to service the Project, together with final State approval for the project, and all applicable appeal periods therefrom having expired, with no pending appeals ("Approvals").

2. The date for delivery of the deed (closing date) shall occur 30 days following the receipt of all Approvals and all applicable appeal periods therefrom have been expired, but no later than September 1, 2017. In the event that on the date for delivery of the Deed, said Approvals have not been obtained, the appeal periods therefrom have not expired or any of said Approvals have been appealed to a court of competent jurisdiction or a state agency of a competent jurisdiction, then, the date for delivery hereunder shall be extended to a date that is 30 days following the issuance of all final Approvals and appeals therefrom having expired or been otherwise terminated, but in no event shall said date be no later than September 1, 2018. It will be the Buyer's obligation to diligently and promptly pursue any and all appeals, which shall be done by the Buyer at the Buyer's sole cost and expense. In the event that on September 1, 2018, all Approvals have not been obtained, then this agreement shall be null and void and without recourse to either party hereto and all deposits made hereunder shall be retained by the Seller.

3. The initial deposit hereunder of $50,000 shall be turned over to the Seller and shall be non-refundable upon at such time as the Commonwealth of Massachusetts shall issue the Site Eligibility letter for the project. In the event that the Site Eligibility Letter has not issued by March 31, 2016, then, at Seller's option, this agreement may be terminated by the Seller, and whereupon, all deposits made hereunder shall be refunded. In the event that the date for delivery of deed is extended beyond September 1, 2017, then, the Buyer shall pay to the Seller additional deposits of $2,000 per month, each month in advance, for every month thereafter that this transaction is extended up to the date of September 1, 2018. Any sums paid so paid shall be credited to the purchase price in the event that the transaction closes, otherwise all said additional deposits shall be non-refundable.

4. Buyer agrees to provide Seller copies of all engineering data and plans which the Buyer develops in the process of obtaining the necessary approvals which materials shall be available for the Seller's use, in the event that the Buyer does not purchase the premises

5. Any and all access easements or rights of way outside of the premises herein described, required for the Buyer's Project, shall be the responsibility of the Buyer to acquire.

Melchiorri Realty Trust, Seller by:

Kathleen S. Bacon, Seller

Patricia R. Westhaver, Seller

Rocky A. Melchiorri, Seller

Michael J. Melchiorri, Seller

BUYER- Trask, Inc. by Benjamin Stevens

SECTION 5: LIMITED DIVIDEND ENTITY STATUS

LIMITED DIVIDEND ENTITY STATUS

The Applicant, Gray Road LLC, has a Purchase and Sale Agreement to purchase the subject property. The Applicant is a Massachusetts Domestic Limited Liability Company. Benjamin T. Stevens is the Manager of Gray Road LLC. The ownership entity for the proposed development will be Gray Road LLC.
Gray Road LLC will enter into a Regulatory Agreement with MassHousing and agree to comply with all applicable MassHousing limited dividend requirements for Chapter 40B ownership developments.

SECTION 6: DEVELOPMENT TEAM INFORMATION

Coolidge Crossing
A Trask Development Community in Sherborn, MA

The Applicant:

Gray Road LLC
Benjamin Stevens; Manager
30 Turnpike Road, Suite #8
Southborough, MA 01772
(O) 508-485-0077
(F) 508-485-4879
(E) benstevens@traskdevelopment.com

Architect:

Reeves Design Associates
Lawrence Reeves; Architect
22 Union Avenue, Suite #6
Sudbury, MA 01776
(O) 978-443-4966
(F) 978-443-4936
(E) lzreeves@hotmail.com

Counsel:

Blatman, Bobrowski, Mead & Talerman, LLC
Paul Haverty
9 Damonmill Square, Suite 4A4
Concord, MA 01742
(O) 978-371-2226
(F) 978-371-2296
(E) paul@bbmatlaw.com

Engineer:

Bruce Saluk & Associates
Bruce Saluk; Civil Engineer
220 Boylston Street
Marlborough, MA 01752
(O) 508-485-1662
(F) 508-481-9929
(E) bruce@salukassoc.com

Landscape Architect:

Hawk Design, Inc.
Bart Lipinski, Project Manager
P.O. Box 1309
Sandwich, MA 02563
(O) 508-833-8800
(F) 774-413-9841
(E) bart@hawkdesigninc.com

Traffic Consultant:

MDM Transportation Consultants
288 Lord Road, Suite 280
Marlborough, MA 01752
(O) 508-303-0370
(F) 508-303-0371
(E) info@mdmtrans.com

Wetland Scientist:

Creative Land & Water Engineering, LLC
Environmental Science & Engineering
Desheng Wang; Wetland Scientist
P.O. Box 584
Southborough, MA 01772
(O) 508-281-4370
(E) desheng@creative-land-water-eng.com

40B Consultant:

EHM/Real Estate Advisor
Edward H. Marchant; Consultant
9 Rawson Road
Brookline, MA 02445
(O) 617-739-2543
(F) 617-739-9234
(E) emarchant@msn.com

Hydrogeologist:

Northeast Geoscience, Inc.
Joel Frisch
97 Walnut Street
Clinton, MA 01510
(O) 978-365-9045
(F) 978-365-9378
(C) 978-660-2896
(E) jfrisch@ngeo.net

BENJAMIN T. STEVENS

4 BAYPATH LANE | SOUTHBOROUGH, MASSACHUSETTS 01772
(O) 508-485-0077 | (F) 508-485-4879 | (E) benstevens@traskdevelopment.com

SUMMARY

LAND DEVELOPMENT & CONSTRUCTION MANAGEMENT PROFESSIONAL with experience working in a fast-paced environment that required effective organizational, technical and interpersonal skills. Ability to work collaboratively and cross-functionally through multiple project scopes and program types. Proven project execution capabilities with a strong sense of ownership and attention to detail. Attained in-depth knowledge and experience in local & state permitting procedures and regulations. Demonstrated ability to prioritize workload and work within tight deadlines.

EXPERIENCE

TRASK, INC. *Southborough, MA* 1994-Present

Founded in 1993 as a Custom Home Builder, Trask, Inc., has evolved into a full-service, residential developer of single family homes, townhomes, duplexes and condominiums.

President and Owner

- Specialized in the development of high-quality, high-end home products in the Metro-West Massachusetts territory. Trask development has built over 280 homes in this area ranging from townhouses to single family homes, duplexes, and apartment buildings.
- Maintained site development division of Trask that manages all phases of construction process that including site selections & testing, vegetation and surface soil removal, locating and surveying roads and property lines, preparing ingress road and work area utilities, and completing final grade and land evaluations.
- Committed to creating unique & aesthetically appealing homes and developments that have character and add quality to the towns where constructed.
- Dedicated to working with local officials, neighbors and project abutters to minimize development impacts to the surrounding properties.
- Built a strong foundation with professional contractors and the most qualified craftsmen to ensure the highest quality finished product.
- Hired project managers with land development and site preparation experience to assure the finest quality product is built and delivered in a timely fashion with minimal offsite disruption.
- Managed the design, development and financing of High-end Single Family residential properties that include:
  - **Hunters Hill**, *Natick, Massachusetts*; 24 Single-Family High End Homes
  - **Covered Bridge Lane**, *Wayland, Massachusetts*, 14 Single-Family High End Homes
  - **Parmenter Meadows,** *Southborough, Massachusetts*, 7 Single-Family High End Homes
  - **Villages at Pond Street,** *Natick, Massachusetts,* 9 Single-Family High End Townhouses
- Developed and managed the design and construction of Mass Chapter 40B developments that include:
  - **Meeting House Farm**, *Southborough, Massachusetts*, 29 units For Sale Housing
  - **The Villages at Old County,** *Sudbury, Massachusetts*; 37 units For Sale Housing
  - **Landham Crossing**, *Sudbury, Massachusetts*, 31 units For Sale Housing
  - **Ashland Woods**, *Ashland, Massachusetts*, 60 units For Rent Housing

(O) 508-485-0077 | (F) 508-485-4879 | (E) BENSTEVENS@TRASKDEVELOPMENT.COM

PERSONAL LICENSES/PROFESSIONAL AFFILIATIONS

- Licensed Massachusetts Builder
- Licensed Septic Installer, Wayland, Southborough, Sudbury
- Licensed Drain Layer, Natick, Westborough

- Member Builders and Remodelers Association of Greater Boston
- Member National Home Builder's Association

AWARDS / PUBLICATIONS / ACKNOWLEDGEMENTS

- 2009 Greater Boston Builder/Architect Magazine, Builder of the Month; "A Passion to Do it Right."
- 2009 Greater Boston Builder/Architect Magazine, Builder of the Month; "The Villages at Old County Road."
- 2014 BRAGB Gold Prism Award Winner, "Best Affordable Community," Landham Crossing
- 2014 BRAGB Silver Prism Award Winner, "Best Attached Home Over 1,800 Sq. Ft.," Landham Crossing

EDUCATION

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HARVARD UNIVERSITY, *Cambridge, MA* 1988.
BS, Applied Mathematics Concentration in Economics

HARVARD UNIVERSITY GRADUATE SCHOOL OF DESIGN, *Cambridge MA,*
Architecture & Construction Management.

SECTION 7: EXISTING SITE CONDITIONS

Coolidge Crossing
A Trask Development Community in Sherborn, MA

EXISTING SITE CONDITIONS

The 20.02 acre site known as 104 Coolidge Street is a mostly wooded, small knoll located between Gray Road (off MeadowBrook Road) and Coolidge Street.

The site was previously an approved residential subdivision that has since expired, some site work was done to rough grade in a roadway at some point in the past.

Access to the site will primarily be from Coolidge Street, with secondary access available through Gray Road, and or the applicant's existing 16 acre site at 84 Coolidge Street. Final traffic access and configuration will be determined through discussions with traffic engineer and town public safety departments.

The project is bordered by The Sudbury Aqueduct to the West, Sassamon Trace Golf Course (Natick) and 49 Rockland Street to the North, the applicant's site at 84 Coolidge to the East, and 86, 102, and 108 Coolidge to the South.

The site is primarily a wooded area rising up a small knoll, elevation changes on the site are gradual, with an approximately 20' rise in elevation from Coolidge Street to the highest spot on the site post construction. There should be minimal requirement for either import or export of materials as the site has been designed to fill balanced, post construction. Field testing has been done throughout the site, no ledge was encountered and it is assumed at this point that there is no ledge concerns.

Materials on site range from excellent drainage sand (especially near aqueduct) with more tilly soils throughout the site. A small wetlands area is located at the northwest corner of the site, and there appears to be wetlands offsite nearby on both 86 and 104 Coolidge.

The site is less than 1 mile to shopping in Natick on Speen Street, less than 1 mile to the Framingham/Sherborn border, less than 1.5 miles to the West Natick T stop, and approximately 1.5 miles from downtown Sherborn. Traffic patterns are anticipated to leave the site generally to the north, for shopping, Mass Pike access, MBTA access, and the Natick Mall/Route 9 shopping corridor.

Coolidge Crossing

A Trask Development Community in Sherborn, MA

Sweet Meadow Farm 111 Coolidge Street, Sherborn, MA 01770 [Located directly to the west from Coolidge Crossing]
Grain & Farm Stand, Horse Back Riding & Children's Programs

Southerly view from driveway entrance to Coolidge Crossing.

Northerly view from driveway entrance to Coolidge Crossing.

Coolidge Crossing

A Trask Development Community in Sherborn, MA

Southwesterly view from Grey Road off of Meadowbrook Road.

View of wooded area off of Grey Road

Northwesterly View from the beginning of Meadowbrook road. Closest cross street to Coolidge Crossings Driveway.

Southwesterly View from the beginning of Meadowbrook Road.

Coolidge Crossing

A Trask Development Community in Sherborn, MA

Neighbor situated next door, to the North of the Coolidge Crossing entrance.

Neighbor situated next door, to the South of the Coolidge Crossing entrance

Easterly view of 104 Coolidge Street, approximately 100 yards into the property.

Wooded area of 104 Coolidge Street, about 250 yards onto property..

NGI

NORTHEAST GEOSCIENCE INC

Water Supply and Environmental Consulting

November 16, 2016

Mr. Ben Stevens
Trask, Inc.
30 Turnpike Road
Southborough, MA 01772

Re: Semi-Private Water Supply Development Plan
Coolidge Crossing
Sherborn, Massachusetts

Dear Mr. Stevens:

As requested, Northeast Geoscience, Inc. (NGI) has prepared the following plan for the installation and testing of a series of domestic water supply wells for a proposed condominium development located off Coolidge Street in Sherborn, Massachusetts. The development consists of a total of 88 units with up to three bedrooms per unit on a commonly owned lot. The 88 units include 20 four-unit buildings, 2 three-unit buildings and 1 two-unit building. Since each of the wells will serve fewer than 25 people per day for more than 60 days per year (4 units/well x 3 bedrooms/unit x 2 people per bedroom = 24 people/well) the wells do not meet the standard threshold for a public water supply. However, in cases where two or more wells are located on a commonly owned property, that individually may serve less than 25 people, but collectively serve more than 25 people for more than 60 days of the year, the Massachusetts Department of Environmental Protection (MassDEP) reserves the right to evaluate and determine whether the wells should not be regulated as a Public Water System, taking into account the risk to public health (see 310 CMR 22.02). The proposed development has been designed assuming that MassDEP will characterize the proposed wells as private water supply wells. Since each of the proposed wells will serve multiple units they will be classified by the Town of Sherborn Board of Health Regulations as semi-public water supply wells (see Board of Health Regulations Section 2.4 - Semi-Public Water Supply) and will be installed, tested and designed with the intent of meeting the local water supply regulations.

WELL YIELDS

According to the Town of Sherborn Board of Health Regulations section 11.1- WELL YIELD, *"There shall be a minimum yield of 300 gallons per bedroom per day..." and that "...System capacity for "semi-public" water supplies must be adequate to meet the projected needs."* Based on this approach, the daily demand for each of the proposed building types was estimated as follows:

4 units x 3 br/unit x 300 gpd/br = 3,600 gpd ÷ 1,440 min/day = 2.5 gpm
3 units x 3 br/unit x 300 gpd/br = 2,700 gpd ÷ 1,440 min/day = 1.9 gpm
2 units x 3 br/unit x 300 gpd/br = 1,800 gpd ÷ 1,440 min/day = 1.3 gpm

For comparison, minimum well yields for public water supply wells are based on the Title 5 flow rates. For residential use Title 5 requires 110 gpd/bedroom. Since the proposed minimum well yields are based on 300 gpd/bedroom, the system capacity for the proposed semi-public water supply wells is adequate to meet the projected needs.

Well Construction

For each proposed well a 10-inch diameter boring will be advanced by mud-rotary through the overburden to a minimum of 6 feet into competent bedrock. A six-inch diameter steel well casing will be pressure-grouted in place and allowed to cure overnight. The following day the well will be extended via air-rotary drilling until sufficient water-bearing fractures are encountered to meet the water supply needs of each building. It is expected that the wells will be drilled to a depth of at least 350 feet to maximum casing storage. Where water bearing fractures are encountered air-lift rating tests will be conducted to estimate the cumulative well yield. The well casings will extend a minimum of 18-inches above the finished grade and will be outfitted with a watertight cap. Each well will also be outfitted with a pit-less adaptor set a minimum of four feet below finished grade. A four-foot diameter apron will be constructed around the well heads sloping away at a maximum of eight horizontal to one vertical in all directions to the finished grade, as required under Board of Health Regulation 5.0 – WELL PROTECTION.

Yield Testing

As required under Board of Health Regulation 12.0 – TESTS, following completion of each well a submersible pump will be installed capable of producing a flow rate of at least twice the required well yield. The wells will be pumped to waste with the faucet open for a four-hour constant pumping period. In the event that wells are exhausted during the initial four-hour pump testing period, the faucet will be regulated after suitable well recovery of not more than 30 minutes in order to allow pumping at a constant rate for an additional four hours at a constant water level drawdown to determine yield. Water level recovery at the end of the pumping tests to within ninety-five percent of the original static water levels within a twenty-four hour period will be required to prove well yields. During each individual pumping test water level monitoring of the adjacent wells installed at the site will be conducted in order to estimate well interference.

Water Quality Testing

As required under Board of Health Regulation 17.2 and prior to termination of the pumping tests, water samples will be collected and submitted to a Massachusetts Certified Laboratory for analysis for the following drinking water parameters: total coliform bacteria, Volatile Organic Compounds (VOC's) by EPA Method 524.2, pH, color, odor, iron, turbidity, manganese, ammonia nitrogen, nitrite nitrogen, nitrate nitrogen, alkalinity, total hardness, sodium, chlorides, lead and arsenic. Follow-up testing for the same suite of parameters will be required prior to unit occupancy.

Long-Term Water Quality Testing

Biennial samples will be collected from each well and analyzed for total coliform bacteria, volatile organic compounds, arsenic, lead and nitrate. The laboratory reports will be submitted to the Board of Health and the results will be summarized on a table for comparison with previous sampling events, in order to help identify water quality trends.

Auxiliary Power

As required under Board of Health Regulation Section 13.0, auxiliary power will be provided.

If you have any questions or require additional information, please do not hesitate to contact me.

Sincerely,
NORTHEAST GEOSCIENCE, INC.

Joel Frisch
Hydrogeologist

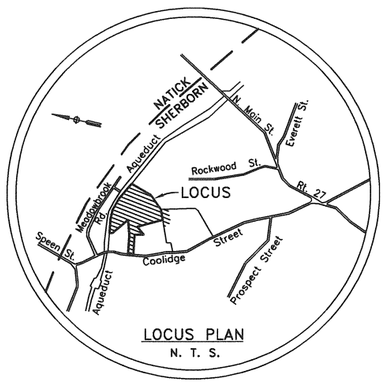
SECTION 8: PRELIMINARY SITE DEVELOPMENT PLANS

COOLIDGE CROSSING

COOLIDGE STREET

SHERBORN, MA

DEVELOPER/APPLICANT:	COOLIDGE CROSSING LLC 30 TURNPIKE ROAD SOUTHBOROUGH, MA 01772 TEL: (508) 485-0077 FAX: (508) 485-4879
ARCHITECT:	REEVES DESIGN ASSOCIATES 79 HIGHLAND STREET MARLBOROUGH, MA 01752 TEL & FAX: (508) 460-0144
ENGINEER/LAND SURVEYOR:	BRUCE SALUK & ASSOC., INC. CIVIL ENGINEERING & LAND SURVEYING 576 BOSTON POST ROAD EAST MARLBOROUGH, MA 01752 TEL: (508) 485-1662 FAX: (508) 481-9929
TRAFFIC ENGINEER:	MDM TRANSPORTATION CONSULTANTS 28 LORD RD., SUITE 280 MARLBOROUGH, MA 01752 TEL: (508) 303-0370 FAX: (508) 303-0371
ECOLOGICAL & WATER CONSULTANT:	CREATIVE LAND & WATER ENGINEERING, LLC P.O. BOX 584 SOUTHBOROUGH, MA 01772 TEL: 774-454-0266
LANDSCAPE ARCHITECT:	HAWK DESIGN, INC P.O. BOX 1309 SANDWICH, MA 02563 TEL: (508) 833-8800 FAX: (774) 413-9841
WATER SUPPLY SERVICES	NORTHEAST GEOSCIENCE, INC. 97 WALNUT STREET P.O. BOX 655 CLINTON, MA 01510 TEL: (978) 365-9045 FAX: (978) 365-9378



LOCUS PLAN
N. T. S.

SHEET INDEX		DATE	REVISION DATE
C0	COVER SHEET	3-24-16	11-4-16
EX	EXISTING CONDITIONS PLAN	3-24-16	11-4-16
C1	LAYOUT PLAN	3-24-16	11-4-16
C2	GRADING PLAN	3-24-16	11-4-16
C3	DRAINAGE & UTILITY PLAN	3-24-16	11-4-16
C4	SEWER & WATER PLAN	3-24-16	11-4-16

NOTES:

1) THE LAND SHOWN IS A 20.2 Ac.± PARCEL LISTED AS SHERBORN ASSESSOR LOTS 32 & 48A ON MAP 5 AND IS LOCATED IN THE RESIDENCE 'A' ZONE, AND IS NOT LOCATED IN A FEMA SPECIAL FLOOD HAZARD AREA ACCORDING TO FEMA F.I.R.M. MAPS #25017C0519F & #25017538F, DATED JULY 7, 2014.

2) VERTICAL DATUM IS NAVD88 AND HORIZONTAL DATUM IS MAINLAND STATE PLANE COORDINATE SYSTEM NAD83(2011).

2) THE WETLAND RESOURCE LINE SHOWN WAS DELINEATED BY DESHENG WANG, Ph.D., P.E., C.W.S., CREATIVE LAND & WATER ENGINEERING LLC, SOUTHBOROUGH, MA.

3.) PLAN REFERENCES:
DEEDS:
BOOK 64760 PAGE 28
BOOK 42839 PAGE 271
PLANS:
1475 OF 1967
5 OF 2015
1455 OF 1955
330 OF 1991
998 OF 1985
1028 OF 1967
COMMONWEALTH OF MASSACHUSETTS METROPOLITAN WATER WORKS-SUDBURY AQUEDUCT LAND PLANS

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PREPARED BY:
BRUCE SALUK & ASSOC., INC.
CIVIL ENGINEERING & LAND SURVEYING
576 BOSTON POST ROAD EAST
MARLBOROUGH, MA 01752

EXISTING CONDITIONS PLAN
-COOLIDGE CROSSING-
COOLIDGE STREET
SHERBORN,MA

BRUCE M. SALUK No. 35415 REGISTERED PROFESSIONAL ENGINEER

PREPARED FOR:
COOLIDGE CROSSING LLC
30 TURNPIKE RD
SOUTHBOROUGH,MA 01772

DATE: MARCH 24, 2016

EX

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MASS. COORD SYSTEM (NAD83)

MEADOWBROOK ROAD

GRAY RD.

N/F ROBERT & DEBORAH BOTTINO #38 MEADOWBROOK RD.

N/F JOHN & KETHRINE TWOMEY #32 MEADOWBROOK RD.

#28 MEADOWBROOK RD.

#22 MEADOWBROOK RD.

#18 MEADOWBROOK RD.

#14 MEADOWBROOK RD.

#12 MEADOWBROOK RD.

#6 MEADOWBROOK RD.

#2 MEADOWBROOK RD.

SUDBURY AQUEDUCT MWRA

WETLANDS

LOT AREA =20.2± Ac.

ALEX & JONATHAN ZOPPEL SASSAMON TRACE GOLF CLUB

N/F JOHN & JADE MYERS #49 ROCKLAND ST

N/F COOLIDGE CROSSING LLC

LOT AREA =15.39 Ac.

N/F JAMES & KRISTINE FRISCINO #86 COOLIDGE ST

WETLANDS

N/F ALAN & JUNE OUELLETTE #108

N/F ROGER R. BADEAU, TRUSTEE #112 COOLIDGE ST.

N/F KATHLEEN A. HORRIGAN DAVID L. DYE #102

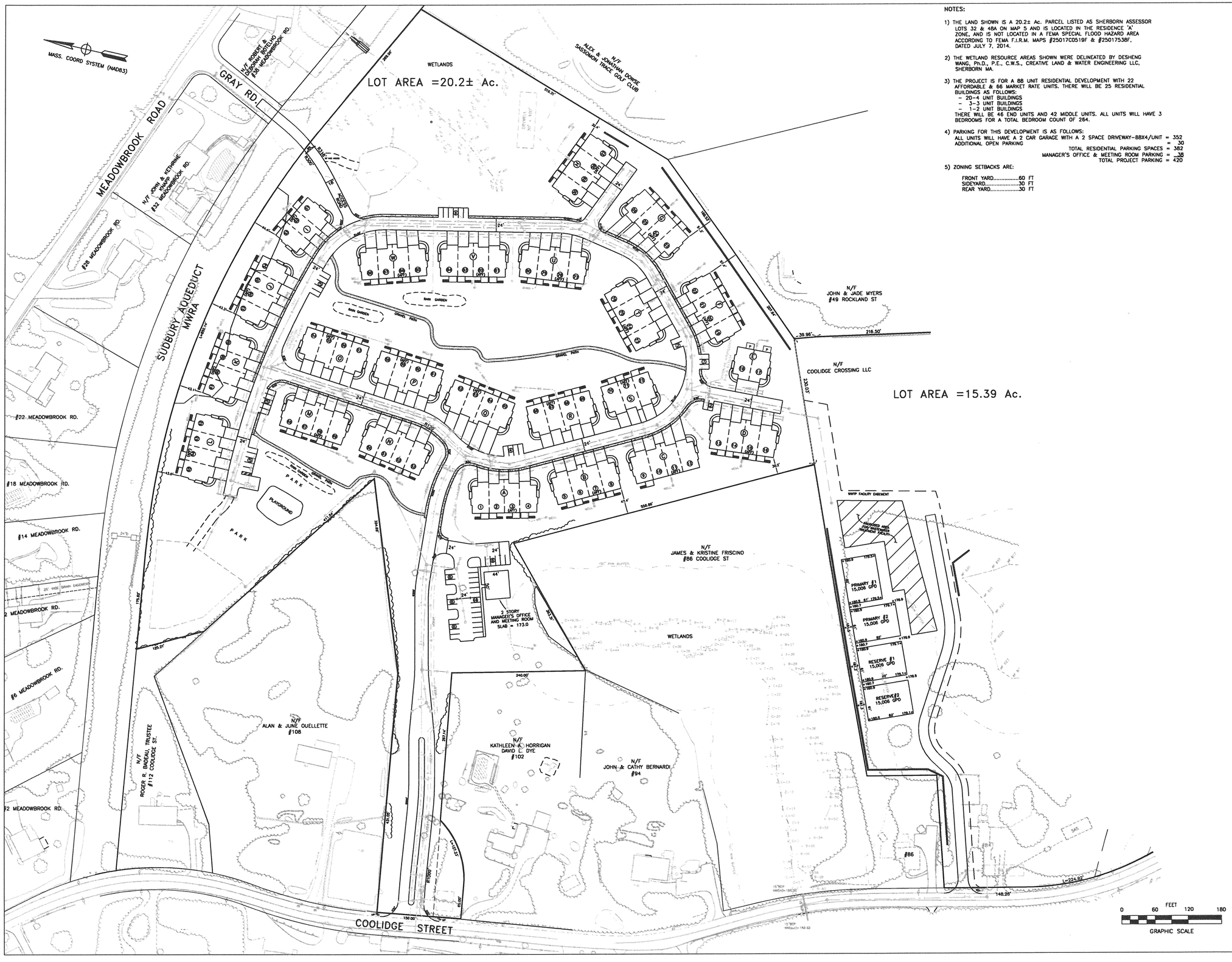
N/F JOHN & CATHY BERNARDI #94

#86

COOLIDGE STREET

0 60 120 180 FEET

GRAPHIC SCALE



NOTES:

1) THE LAND SHOWN IS A 20.2± Ac. PARCEL LISTED AS SHERBORN ASSESSOR LOTS 32 & 48A ON MAP 5 AND IS LOCATED IN THE RESIDENCE 'A' ZONE, AND IS NOT LOCATED IN A FEMA SPECIAL FLOOD HAZARD AREA ACCORDING TO FEMA F.I.R.M. MAPS #25017C0519F & #25017538F, DATED JULY 7, 2014.

2) THE WETLAND RESOURCE AREAS SHOWN WERE DELINEATED BY DESHENG WANG, Ph.D., P.E., C.W.S., CREATIVE LAND & WATER ENGINEERING LLC, SHERBORN MA.

3) THE PROJECT IS FOR A 88 UNIT RESIDENTIAL DEVELOPMENT WITH 22 AFFORDABLE & 66 MARKET RATE UNITS. THERE WILL BE 25 RESIDENTIAL BUILDINGS AS FOLLOWS:
- 20-4 UNIT BUILDINGS
- 3-3 UNIT BUILDINGS
- 1-2 UNIT BUILDINGS

THERE WILL BE 46 END UNITS AND 42 MIDDLE UNITS. ALL UNITS WILL HAVE 3 BEDROOMS FOR A TOTAL BEDROOM COUNT OF 264.

4) PARKING FOR THIS DEVELOPMENT IS AS FOLLOWS:

ALL UNITS WILL HAVE A 2 CAR GARAGE WITH A 2 SPACE DRIVEWAY-88X4/UNIT =	352
ADDITIONAL OPEN PARKING =	30
TOTAL RESIDENTIAL PARKING SPACES =	382
MANAGER'S OFFICE & MEETING ROOM PARKING =	38
TOTAL PROJECT PARKING =	420

5) ZONING SETBACKS ARE:

FRONT YARD	60 FT
SIDEYARD	30 FT
REAR YARD	30 FT

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MARLBOROUGH, MA 01752

PRELIMINARY LAYOUT PLAN

-COOLIDGE CROSSING-
COOLIDGE STREET
SHERBORN,MA

PREPARED FOR:
COOLIDGE CROSSING LLC
30 TURNPIKE RD
SOUTHBOROUGH,MA 01772

DATE: MARCH 24, 2016

C1

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GRADING & EROSION CONTROL NOTES:

1.) These notes shall be used together with the "Construction Pollution Prevention & Erosion/Sedimentation Control Plan" included as Appendix "C" of the Storm Water Management Report.

2.) Prior to commencing work, the contractor shall familiarize himself with the soil types on the site, and provide the appropriate erosion control measures, as outlined on this plan and Sherborn Conservation Commission order of conditions. The contractor shall be responsible for providing erosion and temporary storm runoff control measures that includes siltation fence, strawbales, dams, ditches, temporary sediment basins, etc. as necessary to contain soil and excess runoff on the site. The Conservation Commissions order of conditions and Stormwater Pollution Prevention plan (see note 7) shall be posted in the construction trailer and issued, by the construction manager to the earthwork subcontractor and other construction personnel as necessary to achieve compliance. The general sequence of erosion control measures shall be as follows:

a) Install all siltation fencing and staked strawbales, as shown on the plan.

b) Construct a sedimentation trap at the proposed center island with a bottom elevation that is 1.5 FT(minimum) above the proposed bottom elevation for the future stormwater detention basin. Construct other temporary sedimentation trap(s) where required at the beginning stage of earthwork. Retain storm water within the trap(s), and filter the water using Silt bags, or other approved means prior to discharge. Periodically remove sediment at the bottom of the silt traps to allow for natural infiltration. Bypass clear water around the sedimentation traps as required to maximize filtration performance.

c) Construct traffic berm at the site entrance consisting of a 3/4"–3" crushed stone 12" depth by 100' long times the width of the traveled construction access road. The stone shall project above grade to form a berm barrier that prevents sediment from washing into the road and abutting properties. Replace the stone periodically when the stone voids are 75% full of sediment.

3.) Siltation fencing and staked strawbales shall be installed prior to commencing work, and shall be maintained throughout the course of construction until vegetation is fully established.

4.) Siltation fence shall be located where shown. Acceptable products for siltation fence is Mirafi, Inc, Charlotte, NC, Model 100x, or equal.

5.) Additional erosion control shall conform to the Sherborn Conservation Commission requirements as stated in the Order of Conditions. Silt sacks are required at all CB's (See detail).

6.) All stock pile areas shall not exceed 10 ft in height, otherwise safety fencing shall be installed around stock pile areas. Surround stockpile area with straw bales & siltation fence.

7.) An EPA NPDES stormwater permit is required. The contractor shall be responsible to follow the erosion control inspection and documentation specified in the Stormwater Pollution Prevention Plan that will be prepared, as required by the EPA regulations. The contractor shall document inspection using the inspection forms provided in the SWPPP.

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PREPARED BY:
BRUCE SALUK & ASSOC., INC.
CIVIL ENGINEERING & LAND SURVEYING
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MARLBOROUGH, MA 01752

GRADING PLAN

–COOLIDGE CROSSING–

COOLIDGE STREET
SHERBORN, MA

PREPARED FOR:
COOLIDGE CROSSING LLC
30 TURNPIKE RD
SOUTHBOROUGH, MA 01772

DATE: MARCH 24, 2016

C2

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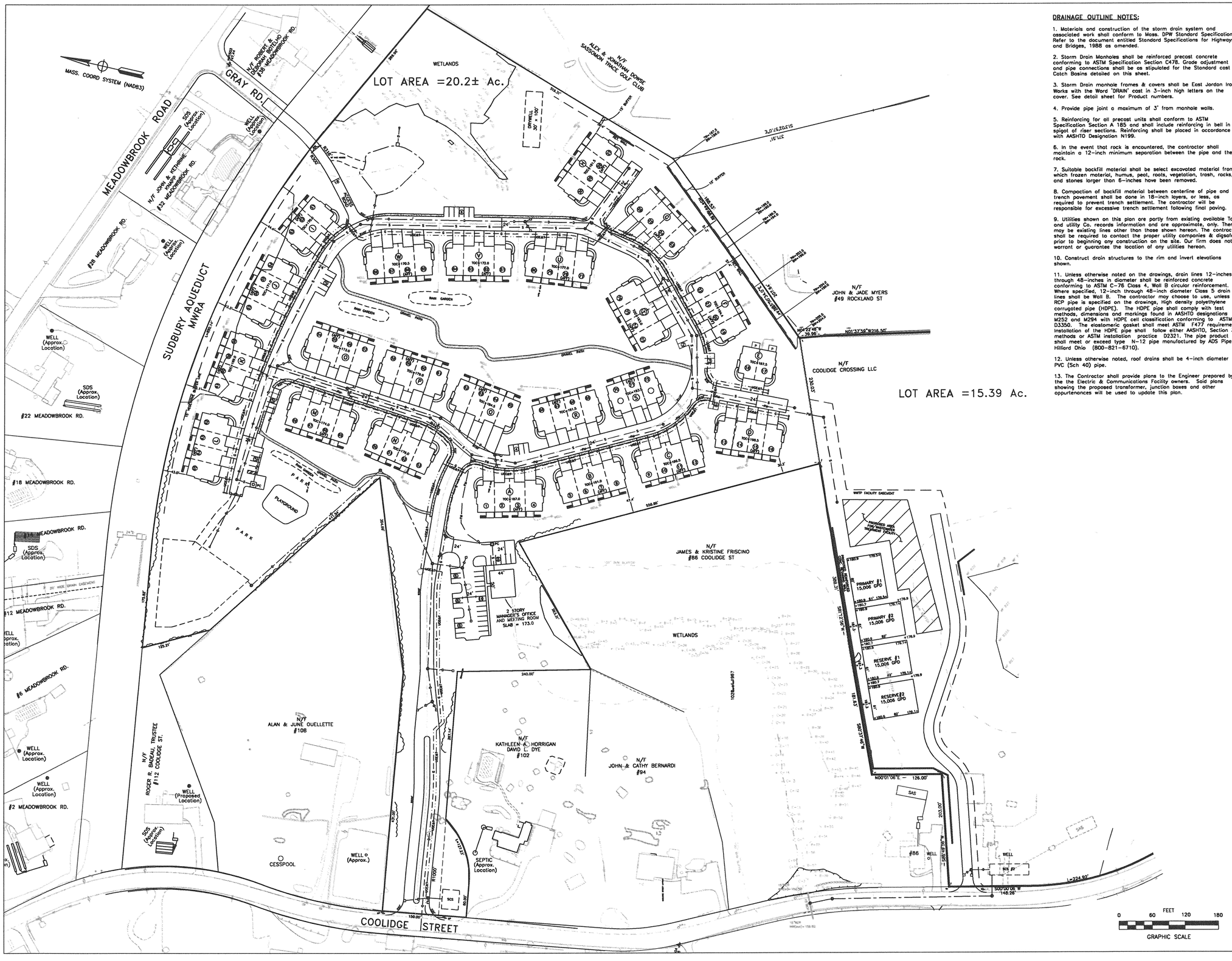

DRAINAGE OUTLINE NOTES:

1. Materials and construction of the storm drain system and associated work shall conform to Mass. DPW Standard Specifications. Refer to the document entitled Standard Specifications for Highways and Bridges, 1988 as amended.

2. Storm Drain Manholes shall be reinforced precast concrete conforming to ASTM Specification Section C478. Grade adjustment and pipe connections shall be as stipulated for the Standard cast Catch Basins detailed on this sheet.

3. Storm Drain manhole frames & covers shall be East Jordan Iron Works with the Word 'DRAIN' cast in 3-inch high letters on the cover. See detail sheet for Product numbers.

4. Provide pipe joint a maximum of 3' from manhole walls.

5. Reinforcing for all precast units shall conform to ASTM Specification Section A 185 and shall include reinforcing in bell in spigot of riser sections. Reinforcing shall be placed in accordance with AASHTO Designation N199.

6. In the event that rock is encountered, the contractor shall maintain a 12-inch minimum separation between the pipe and the rock.

7. Suitable backfill material shall be select excavated material from which frozen material, humus, peat, roots, vegetation, trash, rocks, and stones larger than 6-inches have been removed.

8. Compaction of backfill material between centerline of pipe and trench pavement shall be done in 18-inch layers, or less, as required to prevent trench settlement. The contractor will be responsible for excessive trench settlement following final paving.

9. Utilities shown on this plan are partly from existing available Town and utility Co. records information and are approximate, only. There may be existing lines other than those shown hereon. The contractor shall be required to contact the proper utility companies & digsafe prior to beginning any construction on the site. Our firm does not warrant or guarantee the location of any utilities hereon.

10. Construct drain structures to the rim and invert elevations shown.

11. Unless otherwise noted on the drawings, drain lines 12-inches through 48-inches in diameter shall be reinforced concrete conforming to ASTM C-76 Class 4, Wall B circular reinforcement. Where specified, 12-inch through 48-inch diameter Class 5 drain lines shall be Wall B. The contractor may choose to use, unless RCP pipe is specified on the drawings, High density polyethylene corrugated pipe (HDPE). The HDPE pipe shall comply with test methods, dimensions and markings found in AASHTO designations M252 and M294 with HDPE cell classification conforming to ASTM D3350. The elastomeric gasket shall meet ASTM F477 requirements. Installation of the HDPE pipe shall follow either AASHTO, Section 30 methods or ASTM installation practice D2321. The pipe product shall meet or exceed type N-12 pipe manufactured by ADS Pipe, Hilliard Ohio (800-821-6710).

12. Unless otherwise noted, roof drains shall be 4-inch diameter PVC (Sch 40) pipe.

13. The Contractor shall provide plans to the Engineer prepared by the the Electric & Communications Facility owners. Said plans showing the proposed transformer, junction boxes and other appurtenances will be used to update this plan.

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PREPARED BY:
BRUCE SALUK & ASSOC., INC.
CIVIL ENGINEERING & LAND SURVEYING
576 BOSTON POST ROAD EAST
MARLBOROUGH, MA 01752

DRAINAGE & UTILITY PLAN
-COOLIDGE CROSSING-
COOLIDGE STREET
SHERBORN, MA

PREPARED FOR:
COOLIDGE CROSSING LLC
30 TURNPIKE RD
SOUTHBOROUGH, MA 01772

DATE: MARCH 24, 2016

C3

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SEWER SYSTEM NOTES:

1.) *Materials and construction of the sewer system and associated work shall conform to Mass. DPW Standard Specifications. Refer to the document entitled Standard Specifications for Highways and Bridges, 1988 as amended.*

2.) *Sanitary Sewer Manholes shall be reinforced pre cast concrete conforming to ASTM Specification Section C478-70T.*

3.) *Provide pipe joint a maximum of 3' from manhole walls.*

4.) *Reinforcing for all pre cast units shall conform to ASTM Specification Section A 185 and shall include reinforcing in bell in spigot of riser sections. Reinforcing shall be placed in accordance with AASHTO Designation M199.*

5.) *In the event that rock is encountered, the contractor shall maintain a 12-inch minimum separation between the*

6.) *Suitable backfill material shall be select excavated material from which frozen material, humus, peat, roots, vegetation, trash, rocks, and stones larger than 6-inches have been removed and meeting with backfill materials specified on*

7.) *Compaction of backfill material between centerline of pipe and trench pavement shall meet the requirements specified in Mass. DPW Standard Specifications.*

8.) *Utilities shown on this plan are partly from existing municipal and utility Co. records information and are approximate, only. There may be existing lines other than those shown hereon. The contractor shall be required to contact the proper utility companies & dig-safe prior to beginning any construction on the site. Our firm does not warrant or guarantee the location of any utilities hereon.*

9.) The 6-inch and 8-inch diameter gravity sewer main shall be PVC conforming to ASTM designation D3034-SDR-35, Type PSM. Joints shall be elastomeric complying with ASTM D3212 using elastomeric seals conforming to ASTM F477. The fittings and accessories shall be manufactured and furnished by the pipe manufacturer, and have bell and spigot connections identical to that of the pipe. Sewer main and house lateral pipes shall be 8-inch and 6-inch diameter, respectively. Lay building unit connections straight and at a continuous slope. The Town Board of Health requires a long sweep fitting to be used where building service connects to the 8" main. Provide 45° long radius sweep bends at the sewer connections to the 8"main using fitting part # 63605 by Multifittings.com, or equal.

10.) The sewer force main shall be PVC SDR26 pressure pipe rated for 160 psi; Iron Pipe Size (IPS) conforming to ASTM D2241 for plain-end-pipe and ASTM D 2672 for belled-end pipe. PVC pipe shall be manufactured from virgin rigid PVC compounds with a Cell Class of 12454 as identified in ASTM D 1784.

11.) Where sewer and water lines cross, install the sewer below the water service and provide 18" minimum separation between the pipe outside diameters. Provide 1 full length of sewer pipe centered at the crossing. The full length of sewer pipe shall be SDR-26, Specification ASTM D2241 with a 160 PSI rating. Connect the the SDR 35 & SDR 26 pipes using pressure rated adaptors bt Fernco, or approved equal.

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MARLBOROUGH, MA 01752

SEWER & WATER PLAN

-COOLIDGE CROSSING-
COOLIDGE STREET
SHERBORN, MA

PREPARED FOR:
COOLIDGE CROSSING LLC
30 TURNPIKE RD
SOUTHBOROUGH, MA 01772

DATE: MARCH 24, 2016

C4

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SECTION 9: PRELIMINARY ARCHITECTURAL PLANS

COOLIDGE CROSSING - 3-PLEX TOWNHOME CONCEPT FRONT ELEVATION

REEVES DESIGN ASSOCIATES

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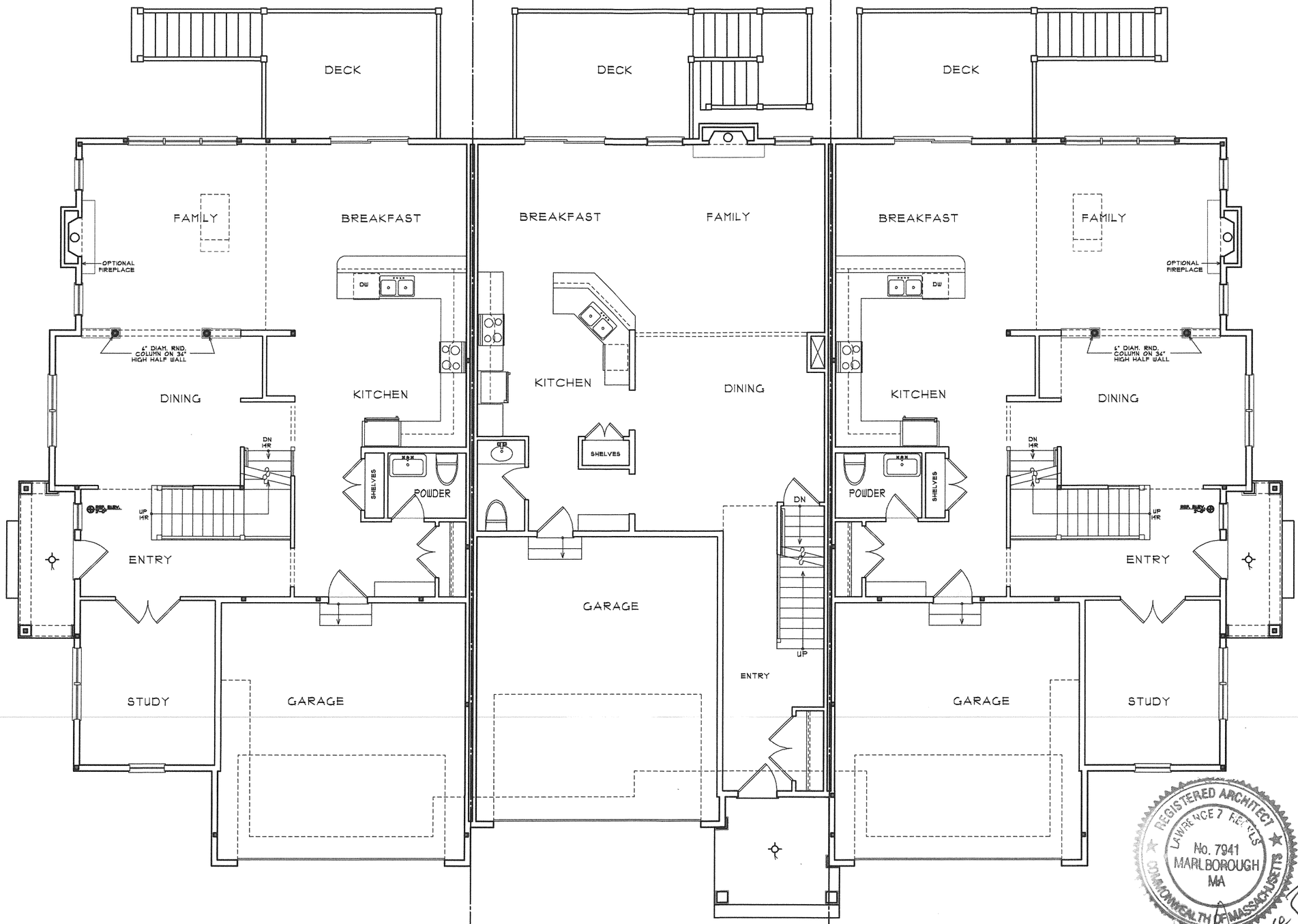
0 1 2 4 8 16

TRASK INCORPORATED - DEVELOPER

REGISTERED ARCHITECT
LAWRENCE J. REEVES
No. 7941
MARLBOROUGH
MA
COMMONWEALTH OF MASSACHUSETTS



UNIT "C" OPP.

UNIT "D4"

UNIT "C"

MAIN FLOOR PLAN

COOLIDGE CROSSING - 3-PLEX TOWNHOME CONCEPT

TRASK DEVELOPMENT CORP. - OWNER

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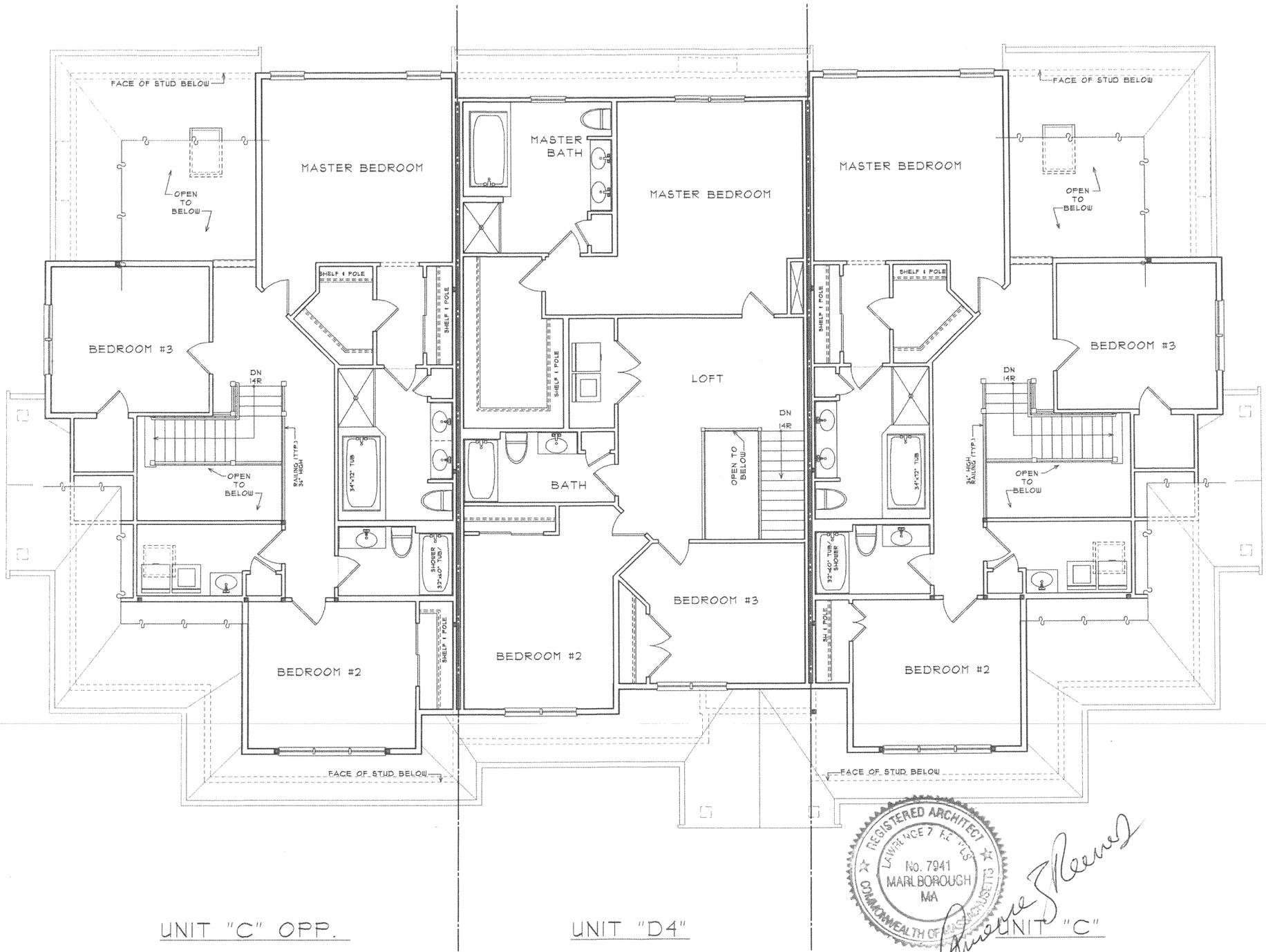
REEVES DESIGN ASSOCIATES - ARCHITECT

0 1 2 4 8 16

REGISTERED ARCHITECT
LAWRENCE F. REEVES
No. 7941
MARLBOROUGH
MA
COMMONWEALTH OF MASSACHUSETTS



REGISTERED ARCHITECT
LAWRENCE T. REEVES
No. 7941
MARLBOROUGH
MA
COMMONWEALTH OF MASSACHUSETTS

UPPER FLOOR PLAN

COOLIDGE CROSSING - 3-PLEX TOWNHOME CONCEPT

TRASK DEVELOPMENT CORP. - OWNER

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REEVES DESIGN ASSOCIATES - ARCHITECT

0 1 2 4 8 16

COOLIDGE CROSSING - 4-PLEX TOWNHOME CONCEPT FRONT ELEVATION

REEVES DESIGN ASSOCIATES

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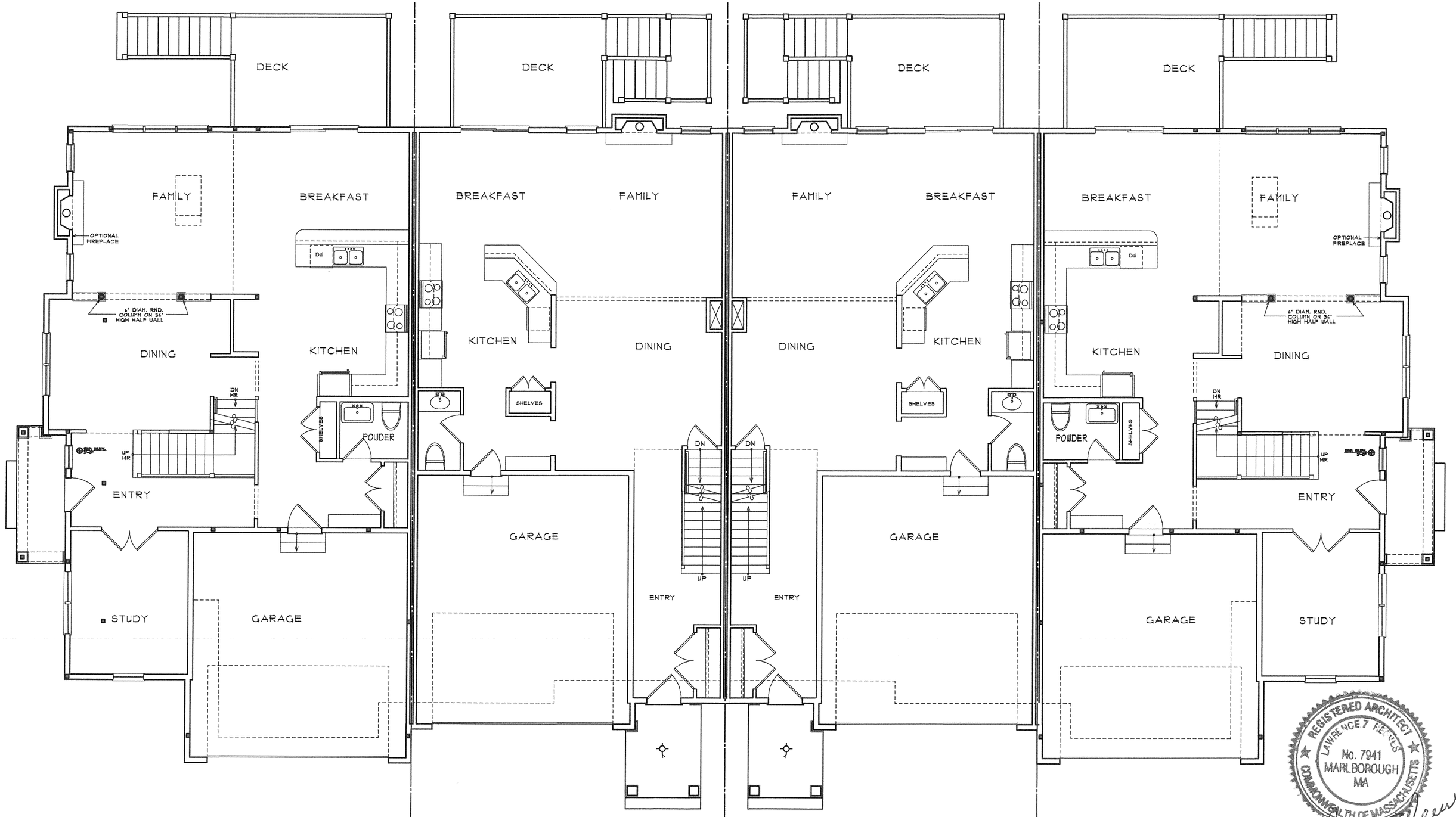
0 1 2 4 8 16

TRASK INCORPORATED - DEVELOPER

REGISTERED ARCHITECT
LAWRENCE 7 REEVES
No. 7941
MARLBOROUGH
MA
COMMONWEALTH OF MASSACHUSETTS



UNIT "C" OPP. | UNIT "D4" OPP. | UNIT "D4" | UNIT "C"

MAIN FLOOR PLAN
COOLIDGE CROSSING - 4-PLEX TOWNHOME CONCEPT

TRASK DEVELOPMENT CORP. - OWNER

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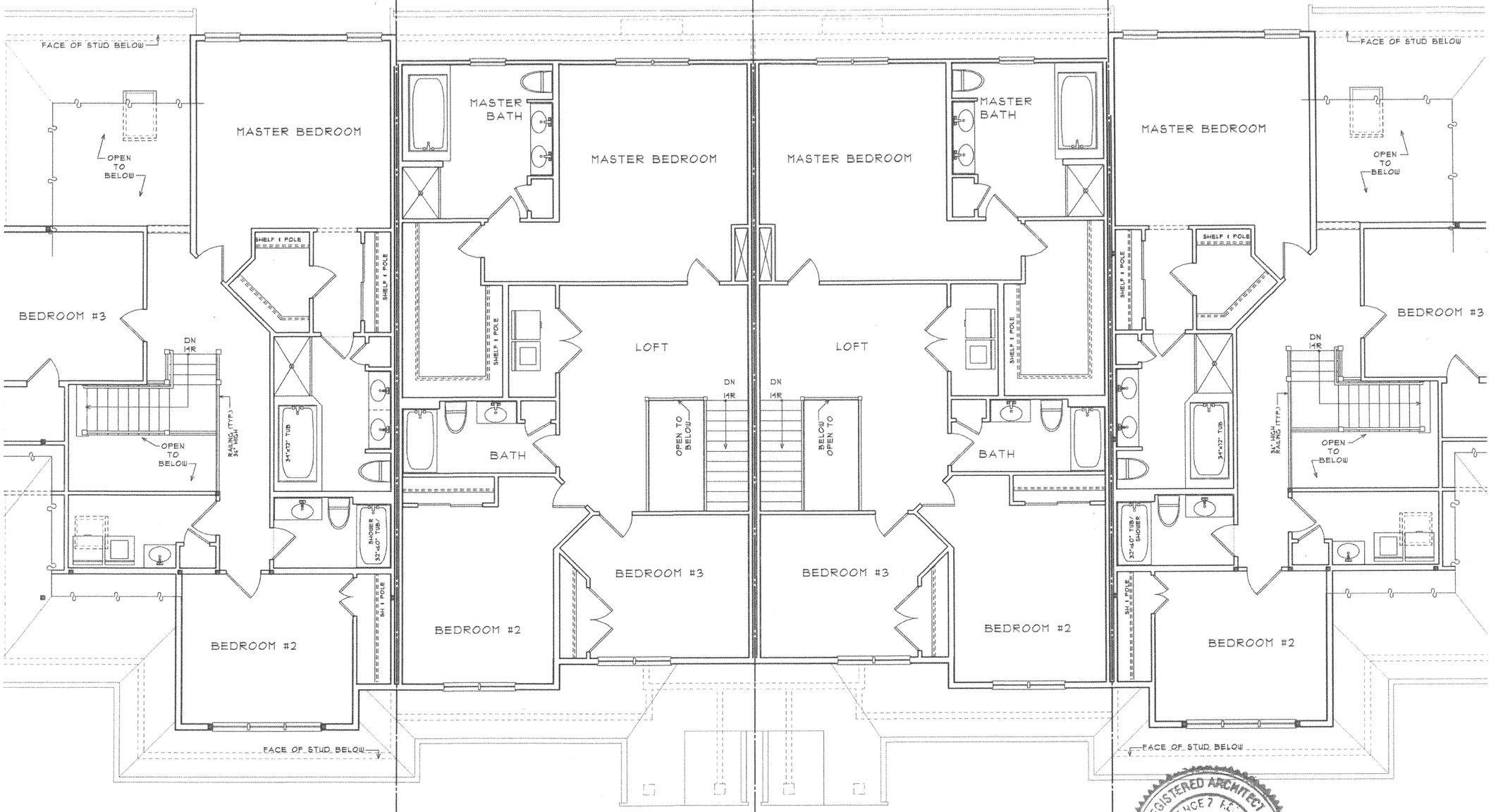
REEVES DESIGN ASSOCIATES - ARCHITECT

0 1 2 4 8 16

REGISTERED ARCHITECT
LAWRENCE 7 REEVES
No. 7941
MARLBOROUGH
MA
COMMONWEALTH OF MASSACHUSETTS



UPPER FLOOR PLAN
COOLIDGE CROSSING - 4-PLEX TOWNHOME CONCEPT

TRASK DEVELOPMENT CORP. - OWNER

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REEVES DESIGN ASSOCIATES - ARCHITECT

0 1 2 4 8 16

REGISTERED ARCHITECT
LAWRENCE F. REEVES
No. 7941
MARLBOROUGH
MA
COMMONWEALTH OF MASSACHUSETTS

Coolidge Crossing

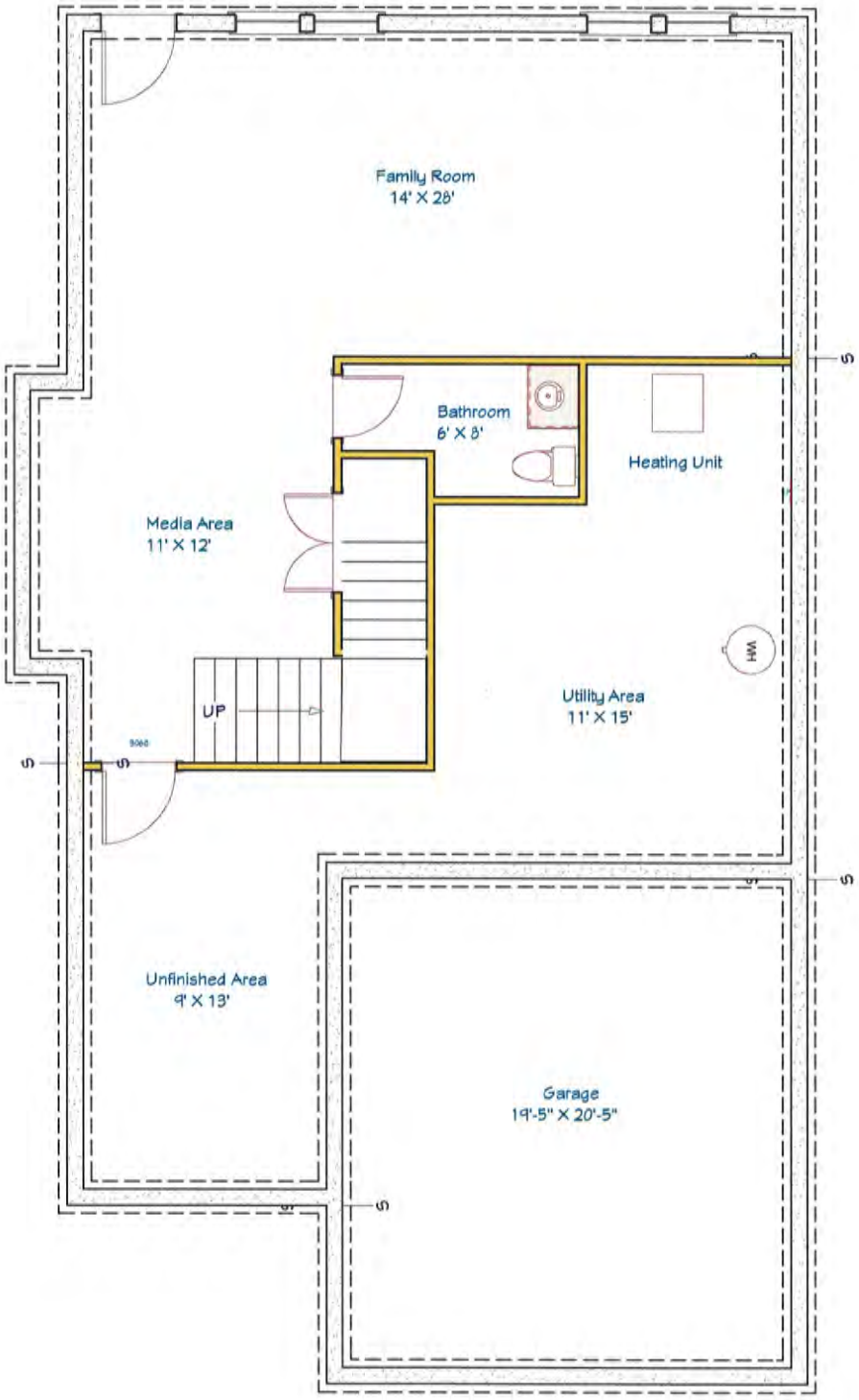
A Trask Development Community in Sherborn, MA

Kirkland 3-Bedroom

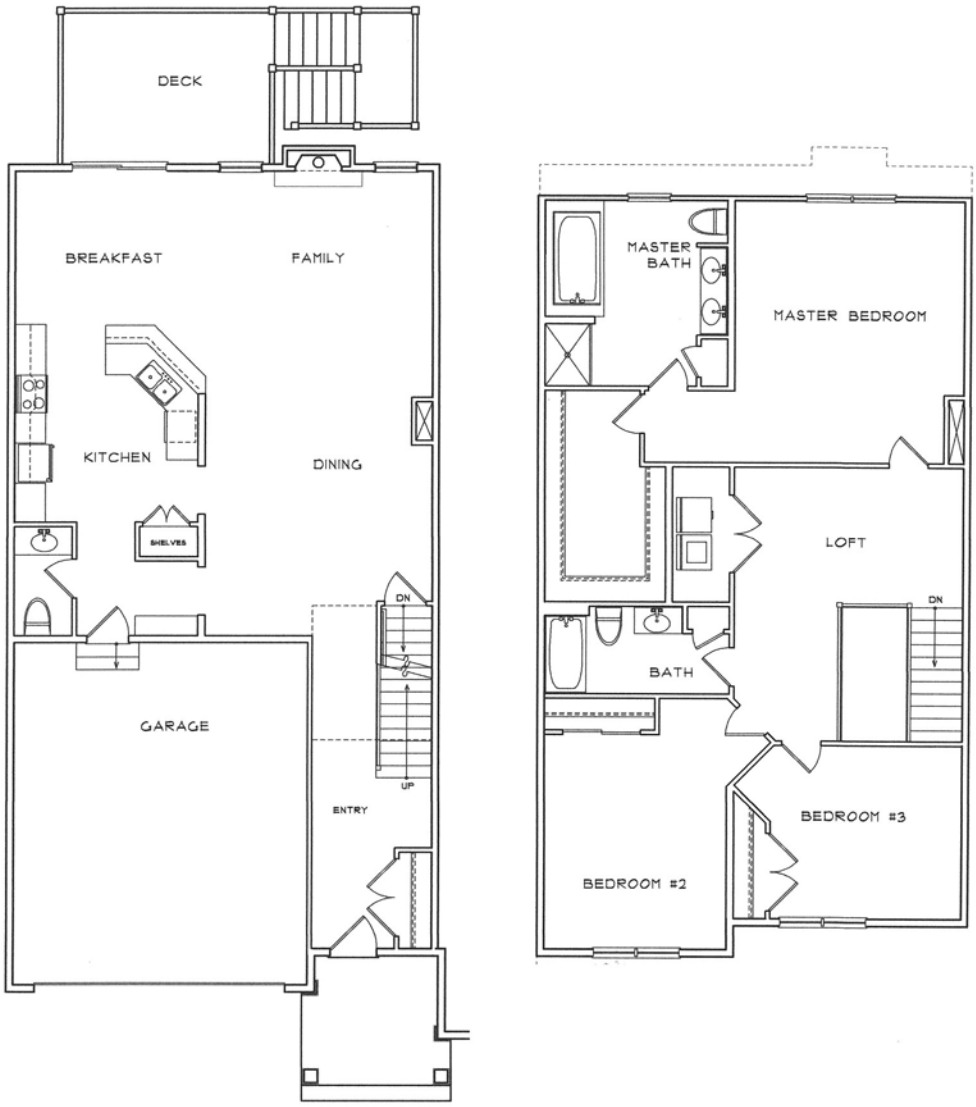
FIRST FLOOR PLAN

SECOND FLOOR PLAN

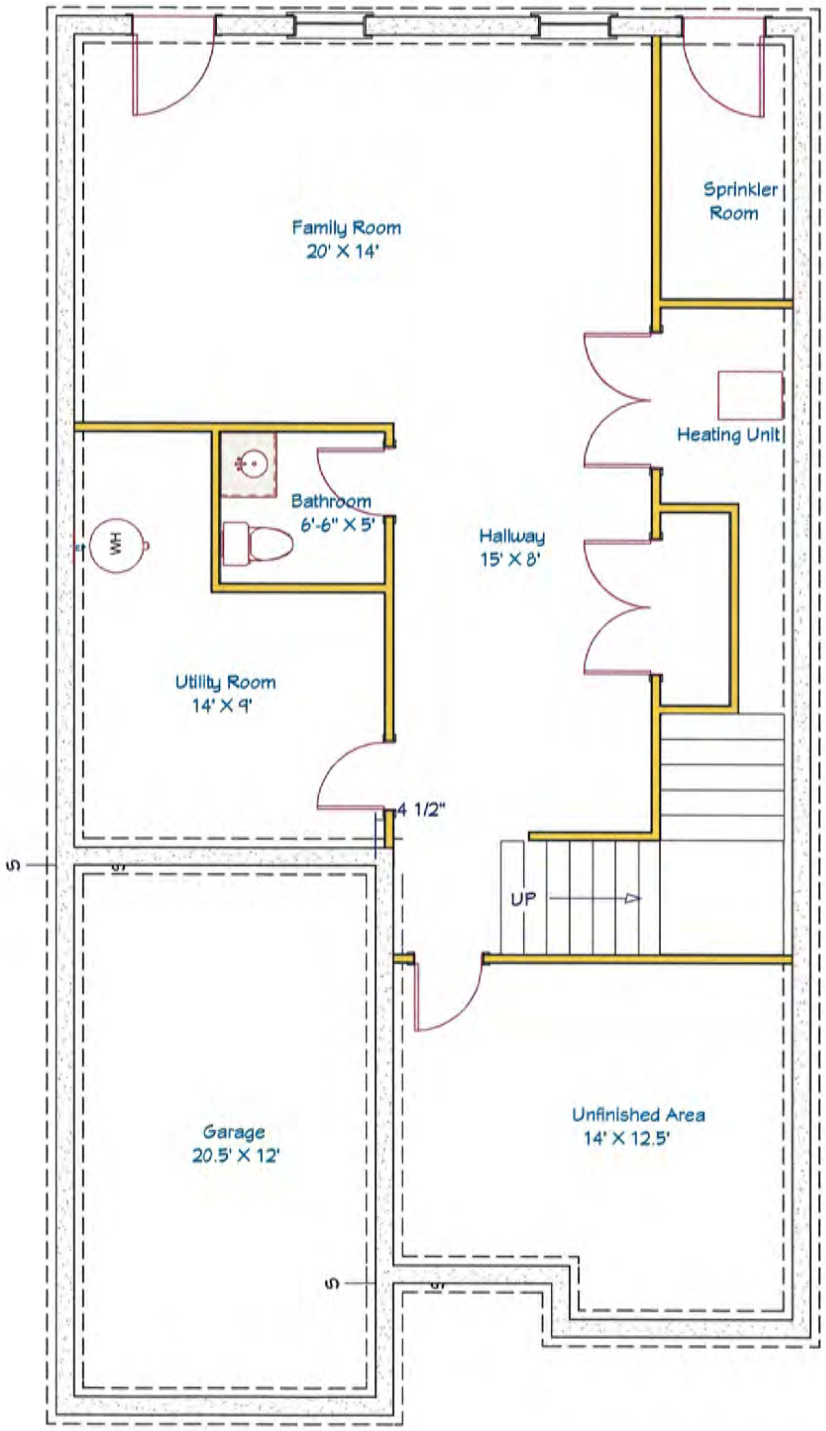
Kirkland Optional Basement Layout



Adams 3-Bedroom



Adams Optional Basement Layout



SECTION 10: TABULATION OF PROPOSED BUILDINGS

Coolidge Crossing
A Trask Development Community in Sherborn, MA

COOLIDGE CROSSING: Tabulation of Proposed Buildings
by Type, Size, Square Footage and Ground Coverage

Building Type	Building Height (Stories)	Gross Square Footage
Townhouse Condominium Buildings [not including garage, basement, attic and deck spaces] There are twenty three (23) Buildings: Twenty [20] Buildings have four [4] units Two [2] Buildings have three [3] units One [1] Building will have two [2] units	 2 Stories 2 Stories	 220,000 Sq. Ft.

COOLIDGE CROSSING: Summary of Ground Coverage, Site Area (Acres) 20.02±

Use	Ground Coverage (Gross Sq. Ft.)	%age of Site Occupied
Proposed Townhouse Buildings	3.37 Acres	17%
Surface Parking and other Paved Surfaces	3.51 Acres	17%
Open Space	13.14 Acres	66%

NOTE: All Gross Square Feet [GSF] estimates for proposed are approximate and based upon Preliminary Plans.

SECTION 11: REQUESTED WAIVERS

Requested Waivers (Exceptions)

I. Dimensional Requirements and Signage

Category	Underlying Zoning Requirement	Proposed	Waiver Required
Use	Residential A (Single Family)	Multi-Family	Yes
Lot Area	1 Acre Minimum	20.02± Acres	No
Lot Frontage	150’	150’	No
Minimum Lot Width	50’	100’	No
Front Yard Setback	60’	500±’	No
Side Yard Setback	30’	30±’	No
Rear Yard Setback	30’	30’	No
Maximum Height - Stories	2.5 stories	2.5	No
Maximum Height - Feet	35’	38’	Yes
Permanent Entrance Sign	Allowed - 30’ Maximum **(No Illumination)**	12 Square Ft. Proposed - **(Illuminated)**	Yes
Temporary Marketing Sign	Allowed - Special Permit	Per Regulations (3 Years)	To be approved as part of Comprehensive Permit

II. TOWN OF SHERBORN-BOARD OF HEALTH REGULATIONS/REQUIREMENTS

A. SEWAGE DISPOSAL

The applicant requests a waiver from the section in its entirety, the waste water collection/ treatment system will be permitted at the State level, no further local permitting will be required.

B. DOMESTIC WATER

The applicant request a waiver from this section in its entirety.

The applicant will provide a reasonable well installation and testing protocol for review to the Sherborn Zoning Board. Issuance of the Comprehensive permit shall constitute permits and approval for the private wells. Final approval of these private wells shall be completed after the Comprehensive permit has been issued and approval has been obtained from Ma DEP Drinking Water Program.

The proposed private well locations on the submittal meet all local requirements for separation to property lines, roadways, buildings and septic disposal areas, and other private wells. No waiver is required on locations.

III. PUBLIC AND ENVIRONMENTAL HEALTH REVIEW REGULATIONS AND STANDARDS FOR OTHER THAN A SINGLE FAMILY DWELLING ON A SINGLE LOT

The applicant request a waiver from this section in its entirety

The applicant shall, as part of the Comprehensive Permit Application, submit a full site plan included all drainage and run off requirements as per Ma DEP Storm water standards. The applicant will also be preparing and submitting a hydrogeological report to Ma DEP for the proposed waste water treatment plant, these submittals will complete the requirements of this section. Review and approval by a third party engineer (for storm water) and Ma Dep (for waste water) will meet the requirements.

IV. TOWN OF SHERBORN WETLAND BYLAW

A. Project is requesting a waiver from Sherborn Wetlands Bylaw.

B. Project will file for a Notice of Intent for any proposed work within 100' of a resource area under M.G.L. 310 CMR 10.00 "Wetland Protection" All applicable standards will be adhered to in the permitting process.

C. There is approximately 0.87 acres of resource areas (bordering vegetated wetlands) located in the northeast corner of the site, and there are some offsite resource areas that work will be proposed in the buffer zones to those areas.

D. There is no proposed disturbance, temporary or permanent alteration of a resource area, and the project does not involve any building structures being built within the 50' buffer zone to a resource area. All work within the 50' buffer zone is related to roadway access grading, and storm water management only.

SECTION 12: TRAFFIC IMPACT STATEMENT

MDM TRANSPORTATION CONSULTANTS, INC.
Planners & Engineers

PRINCIPALS
Robert J. Michaud, P.E.
Ronald D. Desrosiers, P.E., PTOE
Daniel J. Mills, P.E., PTOE

MEMORANDUM

DATE: May 25, 2016

TO: Mr. Ben Stevens
Trask Development
30 Turnpike Road, Suite 8
Southborough, MA 01772

FROM: Robert J. Michaud, P.E. – Managing Principal
Daniel A. Dumais, P.E. – Senior Transportation Engineer

RE: **Proposed Coolidge Crossing (40B) Residential Development**
84 Coolidge Street – Sherborn, Massachusetts

MDM Transportation Consultants, Inc. (MDM) has conducted a Traffic Impact Assessment (TIA) with respect to the 40B residential development to be located at 84 Coolidge Street in Sherborn, Massachusetts. The location of the site relative to adjacent roadways is shown in **Figure 1**. This memorandum describes existing (baseline) traffic volumes along Coolidge Street, summarizes observed speed data characteristics along Coolidge Street adjacent to the Site, summarizes trip generation characteristics of the proposed development, evaluates sight lines for the proposed site driveway intersection with Coolidge Street and quantifies operational traffic impacts of the Site development.

Key findings of the assessment are as follows:

- *Baseline Traffic Volumes.* The weekday daily traffic volume on Coolidge Street adjacent to the Site is approximately 10,363 vehicles per day (vpd) on a weekday with travel patterns highly directional northbound during the weekday morning peak hour and highly direction southbound during the weekday evening peak hour which is consistent with commuter traffic relative to major travel routes in the area. Peak hour traffic flow on Coolidge Street ranges from approximately 852 vehicles per hour (vph) during the weekday morning peak hour to 851 vph during the weekday evening peak hour representing 8 percent of daily traffic flow.

- *Measured Travel Speeds.* The 85th percentile travel speed was observed to be 41 mph for both the northbound and southbound travel direction which are slightly higher but consistent with the posted (regulatory) speed limit of 35 mph on Coolidge Street in the study area. The sight line requirement criteria set by the American Association of State Highway and Transportation Officials (AASHTO) based on the regulatory (posted) and observed 85th percentile travel speeds was utilized in this assessment.

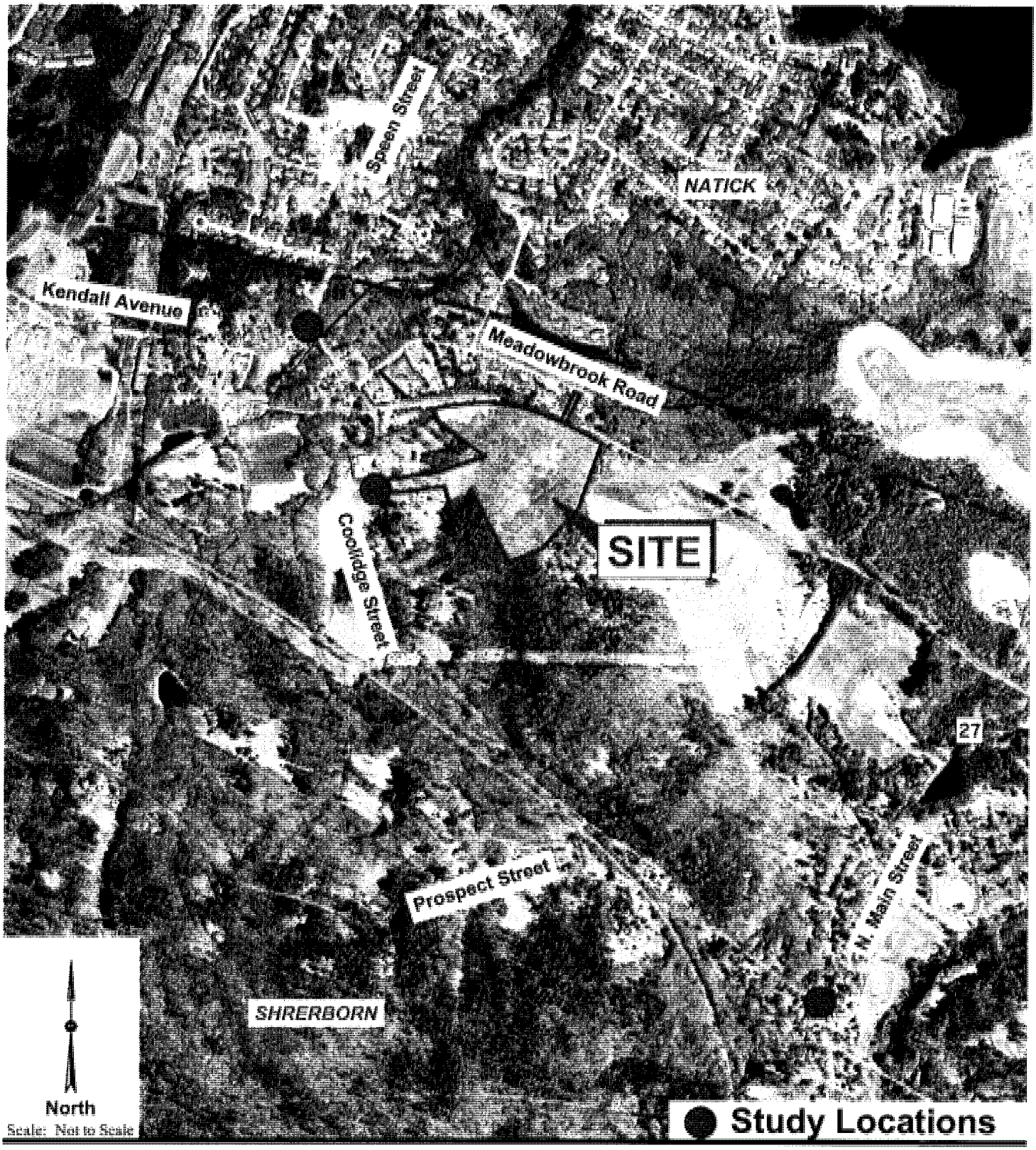


Figure 1

Site Location

MDM TRANSPORTATION CONSULTANTS, INC.
Planners & Engineers

Date: May 2016
Dwg No. 875 TIAS.dwg
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- *Adequate Sight Lines.* With clearing, removal of two trees and a segment of rock wall within the existing right-of-way and minor grading associated with the construction the subdivision roadway, the available sight lines looking north and south onto Coolidge Street will exceed the recommended sight line requirements from AASHTO for the posted speed limit and observed travel speeds.

- *Trip-Generation.* The proposed development is estimated to generate approximately 47 vehicle trips during the weekday morning peak hour and 54 vehicle trips during the weekday evening peak hour. On a daily basis, the development is estimated to generate approximately 576 vehicle trips on a weekday with 50 percent entering and exiting.

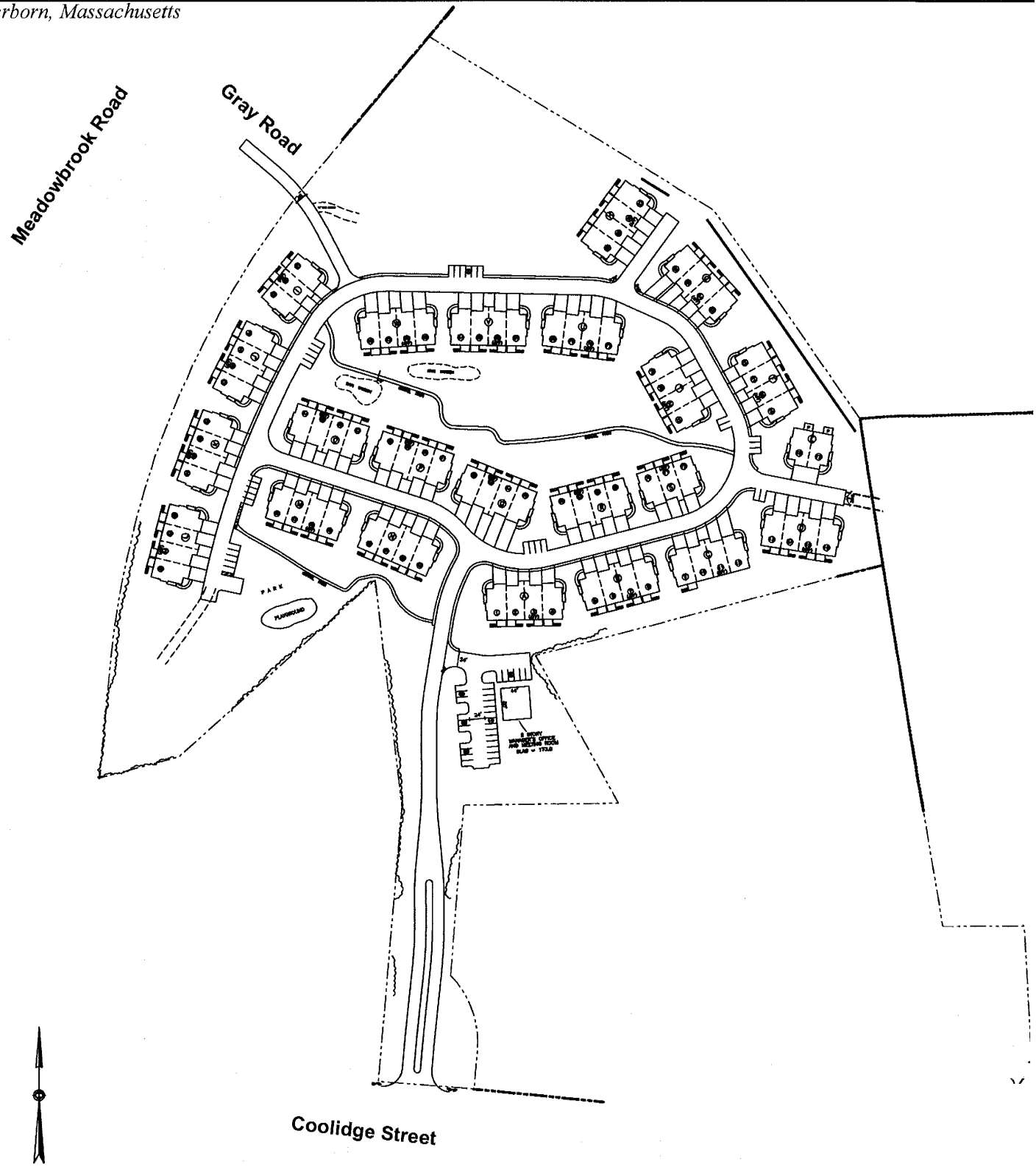
- *Adequate Roadway Capacity.* The proposed development is not expected to materially impact study area intersections and will not result in any material changes in traffic operations in the study area between future No-Build and Build conditions.

In summary, adequate capacity is available under future Build conditions on Coolidge Street to accommodate the proposed residential use. The project is not projected to significantly change any reported operating levels compared to future No-Build conditions. Proposed access improvements will provide ample capacity to accommodate site-generated traffic while also enhancing safety and capacity.

Project Description

The project site is an approximate 20.8-acre tract of land located at 84 Coolidge Street in Sherborn, Massachusetts. The site is currently comprised of an undeveloped parcel of land.

The projects include the construction of 88 residential townhouse units. Parking will be supported within individual unit driveways as well as 63± additional parking spaces spread throughout the site and near the ancillary manager's office/meeting room building. A single full-access/egress driveway is proposed along Coolidge Street with an emergency access/egress driveway provided via Gray Road. The preliminary site layout prepared by Bruce Saluk and Associates, Inc. is presented in **Figure 2.**



Scale: Not to Scale

Site Plan Source: Bruce Saluk & Associates, Inc.

Figure 2

Preliminary Site Layout

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Planners & Engineers

Date: October 2016
Dwg No. 875 Figure 2-Autoturn (10-24-2016).dwg
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STUDY AREA

This TIA evaluates transportation characteristics of roadways and intersections that provide a primary means of access to the site, and that are likely to sustain a measurable level of traffic impact from the development. The study area includes the following intersections, which are also identified in **Figure 1**:

- Route 16 at Maple Street (Unsignalized)
- Western Avenue at Maple Street (Unsignalized)
- Maple Street at Proposed Site Driveway (Unsignalized)

EXISTING TRAFFIC & SAFETY CHARACTERISTICS

An overview of existing roadway conditions, traffic volumes and safety characteristics is provided below.

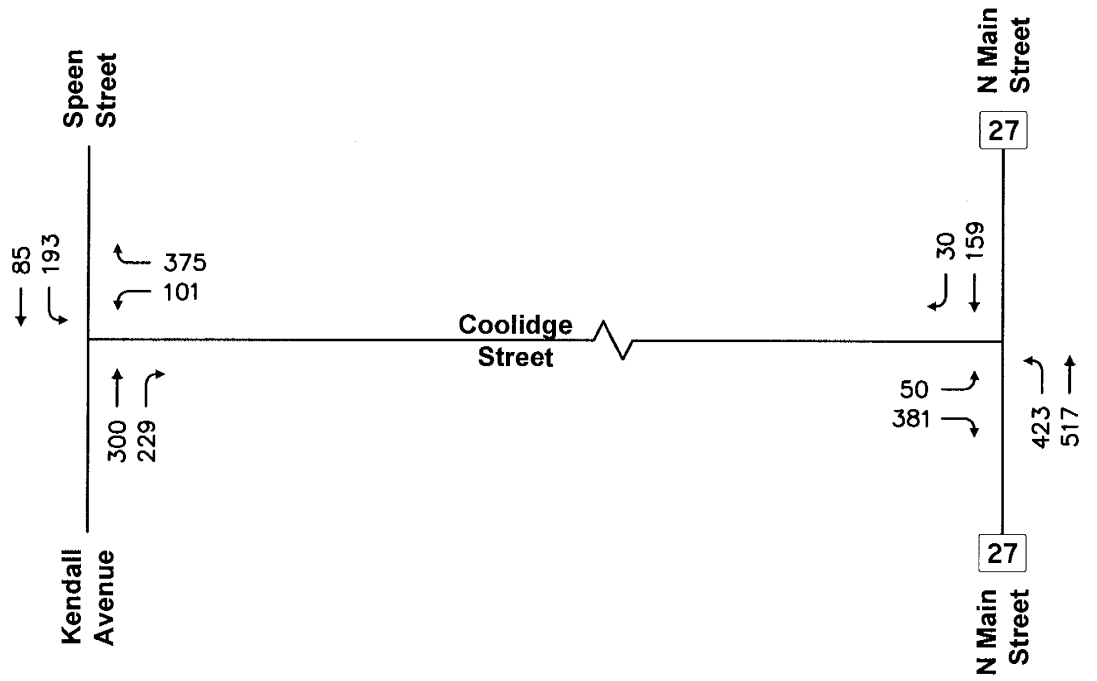
Coolidge Street

Coolidge Street is a two-lane roadway under local (Town) jurisdiction and is classified by the Massachusetts Department of Transportation (MassDOT) as an Urban Minor Arterial roadway. The roadway is generally straight within the study area with a gentle vertical curve adjacent to the Site. Pavement markings include a double yellow centerline and single white edge lines. There are no sidewalks provided along Coolidge Street in the study area. The posted speed limit in the Site vicinity is 35 miles per hour (mph) in both the northbound and southbound travel directions. Land uses along Coolidge Street include residential homes and the Sweet Meadow Farm.

Baseline Traffic Data

Traffic volume data was collected at the study area intersections during the weekday morning (7:00 AM - 9:00 AM) and weekday evening (4:00 PM – 6:00 PM) periods to coincide with peak traffic activity of the adjacent streets. Traffic data used in this evaluation was collected in May 2016. Review of MassDOT permanent count station data indicates that May is a slightly above average traffic month; however, no seasonal adjustment of the data was used to remain conservative. Permanent count station data is provided in the **Attachments**. The resulting existing weekday morning and weekday evening peak-hour traffic volumes for the study intersections are depicted in **Figure 3**.

Daily traffic volumes along Coolidge Street in the site vicinity were obtained using a radar-based automatic traffic recorder (ATR). The results of the counts are summarized in **Table 1**, and are discussed below.



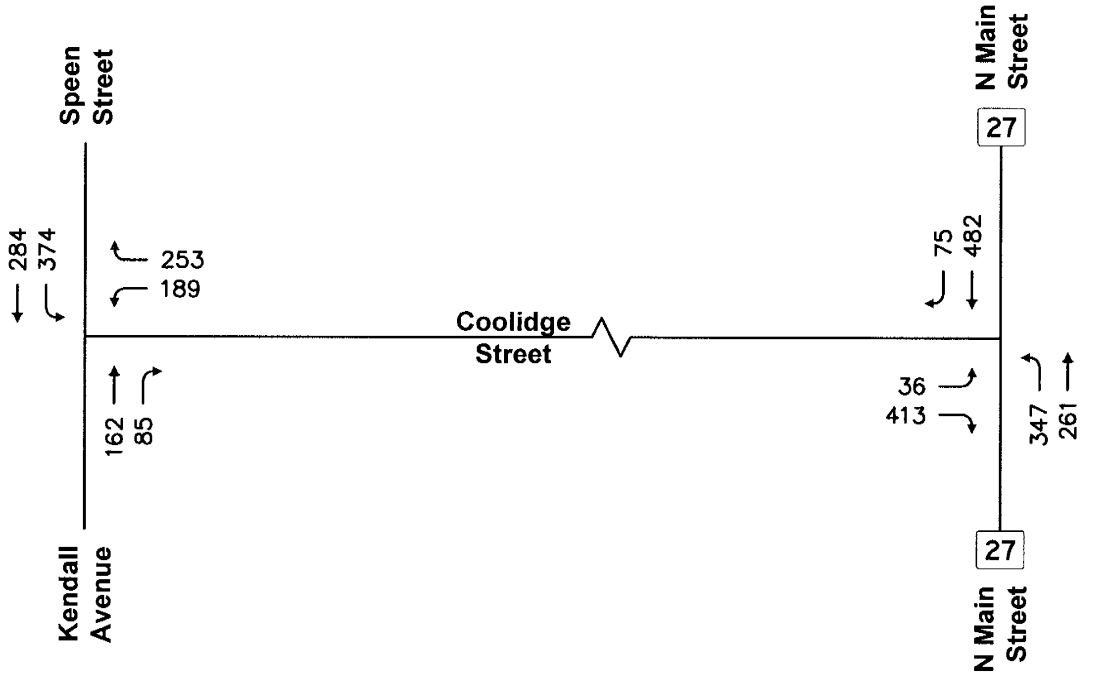


Figure 3

MDM TRANSPORTATION CONSULTANTS, INC.
Planners & Engineers

Baseline Condition
Peak Hour Traffic Volumes

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TABLE 1
EXISTING TRAFFIC VOLUME SUMMARY
COOLIDGE STREET ADJACENT TO SITE

Time Period	Daily Volume (vpd)[1]	Percent Daily Traffic[2]	Peak Hour Volume (vph)[3]	Peak Flow Direction[4]	Peak Hour Directional Volume (vph)
Weekday Morning Peak Hour	10,360	8%	850	56% NB	474
Weekday Evening Peak Hour	10,360	8%	850	59% SB	499

[1]Two-way daily traffic expressed in vehicles per day without seasonal adjustment.
[2]The percent of daily traffic that occurs during the peak hour.
[3]Two-way peak-hour volume expressed in vehicles per hour.
[4]NB = Northbound, SB = Southbound

As summarized in **Table 1**, The weekday daily traffic volume on Coolidge Street adjacent to the Site is approximately 10,360 vehicles per day (vpd) on a weekday with travel patterns slightly directional northbound during the weekday morning peak hour and direction southbound during the weekday evening peak hour which is consistent with commuter traffic relative to major travel routes in the area. Peak hour traffic flow on Coolidge Street is approximately 850 vehicles per hour (vph) during the weekday morning and weekday evening peak hours representing 8 percent of daily traffic flow.

Measured Travel Speeds

Vehicle speeds were obtained for Coolidge Street adjacent to the Site using a radar recorder device. These measured travel speeds provide a basis for determining sight line requirements at the proposed site driveway. **Table 2** presents a summary of the travel speed data collected for Coolidge Street adjacent to the Site. Collected speed data are provided in the **Attachments**.

TABLE 2
SPEED STUDY RESULTS – COOLIDGE STREET

Travel Direction	Speed Limit[1]	Travel Speed	
		Mean[2]	85th Percentile[3]
Northbound	35	38	41
Southbound	35	37	41

[1]Regulatory (Posted) Speed limit in miles per hour (mph)
[2]Arithmetic mean
[3]The speed at or below which 85 percent of the vehicles are traveling

As summarized in **Table 2**, the 85th percentile travel speed was observed to be 41 mph for the northbound travel direction and 41 mph for the southbound travel direction which are slightly higher but consistent with the posted (regulatory) speed limit of 35 mph on Coolidge Street in the study area. The speed data sets the basis for the sight line review in the subsequent section of this report.

Sight Line Evaluation

An evaluation of sight lines was conducted at the proposed Site Driveway intersection with Coolidge Street to ensure that minimum recommended sight lines are available. The evaluation documents existing sight lines for vehicles as they relate to recommended guidelines.

The American Association of State Highway and Transportation Officials' (AASHTO) standards[1] reference two types of sight distance which are relevant at the intersections: stopping sight distance (SSD) and intersection sight distance (ISD). Sight lines for critical vehicle movements at the intersections were compared to minimum SSD and ISD recommendations for the travel speeds in the Site vicinity.

Stopping Sight Distance

Sight distance is the length of roadway visible to the motorist to a fixed object. The minimum sight distance available on a roadway should be sufficiently long enough to enable a below-average operator, traveling at or near a regulatory speed limit, to stop safely before reaching a stationary object in its path, in this case, a vehicle exiting from side street approaches onto Coolidge Street. The SSD criteria are defined by AASHTO based on design and operating speeds, anticipated driver behavior and vehicle performance, as well as physical roadway conditions. SSD includes the length of roadway traveled during the perception and reaction time of a driver to an object, and the distance traveled during brake application on wet, level pavements. Adjustment factors are applied to account for roadway grades.

SSD was estimated in the field using AASHTO standards for driver's eye (3.5 feet) and object height equivalent to the taillight height of a passenger car (2.0 feet) for the northbound and southbound Coolidge Street approaches to the proposed subdivision roadway. **Table 3** presents a summary of the available SSD for the Coolidge Street roadway segments and AASHTO's recommended SSD for the posted (regulatory) speed limit and observed average and 85th percentile travel speeds.

[1] *A policy on Geometric Design of Highways and Streets*, American Association of State Highway and Transportation Officials (AASHTO), 2011.

TABLE 3
STOPPING SIGHT DISTANCE SUMMARY
COOLIDGE STREET APPROACH TO PROPOSED SITE DRIVEWAY

Approach/ Travel Direction	Available Stopping Sight Distance	AASHTO Recommended[1]		
		Regulatory Speed (35 mph)	Average Travel Speed[2]	85th Percentile Travel Speed[3]
Northbound	400+ Feet	246 Feet	305 Feet	325 Feet
Southbound	400+ Feet	246 Feet	290 Feet	340 Feet

[1] Recommended sight distance based on AASHTO, A Policy on Geometric Design of Highways and Streets. Based on driver height of eye of 3.5 feet to object height of 2.0 feet and adjustments for roadway grade.
[2] Average Speed is 38 mph NB and 37 mph SB.
[3] 85th Percentile travel speed is 41mph NB and 41 mph SB

As summarized in **Table 3** analysis results indicate that the existing available sight lines exceed AASHTO's recommended SSD criteria for the proposed subdivision roadway based on the regulatory speed limit and observed travel speeds along Coolidge Street.

Intersection Sight Distance

Clear sight lines provide sufficient sight distance for a stopped driver on a minor-road approach to depart from the intersection and enter or cross the major road. As stated under AASHTO's Intersection Sight Distance (ISD) considerations, "*...If the available sight distance for an entering ...vehicle is at least equal to the appropriate stopping sight distance for the major road, then drivers have sufficient sight distance to avoid collisions...To enhance traffic operations, intersection sight distances that exceed stopping sight distances are desirable along the major road.*" AASHTO's ISD criteria are defined into several "cases". For each of the unsignalized subdivision roadway locations, which is proposed to be under STOP sign control, the ISD in question relates to the ability to turn left or turn right from the proposed driveway at its intersection with Coolidge Street.

Available ISD was estimated in the field using AASHTO standards for driver's eye (3.5 feet), object height (3.5 feet) and decision point (8 feet from the edge of the travel way) for the northbound and southbound directions along Coolidge Street. **Table 4** presents a summary of the available ISD for the departure from the proposed subdivision roadway and AASHTO's minimum recommended ISD.

TABLE 4
INTERSECTION SIGHT DISTANCE SUMMARY
PROPOSED SITE DRIVEWAY DEPARTURE TO COOLIDGE STREET

Approach/ Travel Direction	Available ISD	AASHTO Minimum[1]		AASHTO Ideal[1]
		Posted Speed Limit (35 mph)	85th Percentile Observed Speed[2]	Posted Speed Limit (35 mph)
Looking North	400+ Feet	246 Feet	290 Feet	390 Feet
Looking South	400± Feet	246 Feet	305 Feet	335 Feet

[1]Recommended sight distance based on AASHTO, A Policy on Geometric Design of Highways and Streets. Based on driver height of eye of 3.5 feet and an object height of 3.5 feet and adjustments for roadway grade if required. Minimum value as noted represents SSD per AASHTO guidance.
[2] Average Speed is 38 mph NB and 37 mph SB.
[3] 85th Percentile travel speed is 41 mph NB and SB

The results of the ISD analysis presented in **Table 4** indicate that, with clearing, removal of two trees and a segment of rock wall within the existing right-of-way and minor grading associated with the construction the subdivision roadway, the available sight lines looking north and south onto Coolidge Street will exceed the recommended sight line requirements from AASHTO for the posted speed limit and observed travel speeds. MDM recommends that any new plantings (shrubs, bushes) or physical landscape features to be located within the driveway sight lines should also be maintained at a height of 2 feet or less above the adjacent existing roadway grade to ensure unobstructed lines of sight.

PROJECTED FUTURE TRAFFIC CONDITIONS

Evaluation of the proposed development impacts requires the establishment of a future baseline analysis condition. This section estimates future roadway and traffic conditions with and without the proposed development. For this evaluation, a five-year planning horizon (year 2021) was selected consistent with standard-industry practice.

To determine the impact of site-generated traffic volumes on the roadway network under future conditions, baseline traffic volumes in the study area were projected to a future year condition. Traffic volumes on the roadway network at that time, in the absence of the development (that is, the No-Build condition), includes existing traffic, new traffic due to general background traffic growth, and traffic related to specific developments by others that are currently under review at the local and/or state level. Consideration of these factors resulted in the development of No-Build traffic volumes. Anticipated site-generated traffic volumes were then superimposed upon these No-Build traffic-flow networks to develop future Build conditions.

The following sections provide an overview of future No-Build traffic volumes and projected Build traffic volumes.

Background Growth

Background traffic includes demand generated by other planned developments in the area as well as demand increases caused by external factors. External factors are general increases in traffic not attributable to a specific development and are determined using historical data.

Nearby permanent count station data published by MassDOT indicates a negative (-0.06) growth rate. For purposes of this evaluation, a 0.5 percent growth rate was used (approximately 2.5 percent increase over a 5-year horizon). This growth rate is higher than historic rates, and as such is also expected to account for any small fluctuation in hourly traffic as may occur from time to time in the study area. Background growth rate calculations are provided in the **Attachments.**

Development of future No-Build traffic volumes also considers traffic generated through the study area from other specific area developments. Review of Massachusetts Environmental Policy Act (MEPA) files and correspondence with the Town indicate that there are currently no known permitted and unbuilt projects in the area that would significantly change baseline traffic volume conditions.

2021 No-Build Traffic Volume Networks

In summary, to account for future traffic growth in the study area future No-Build traffic volumes are developed by increasing the Baseline volumes by approximately 2.5 percent (0.5 percent compounded annually over 5 years). The resulting No-Build traffic volumes are displayed in **Figure 4.**

Trip Generation

The trip generation estimates for the proposed development are provided for the weekday morning and weekday evening periods, which correspond to the critical analysis periods for the proposed use and adjacent street traffic flow. New traffic generated by the project was estimated using trip rates published in ITE's *Trip Generation*[2] for Land Use Code (LUC) 230 Residential Condominium/Townhouse. **Table 5** presents the trip-generation estimate for the proposed development based on ITE methodology.

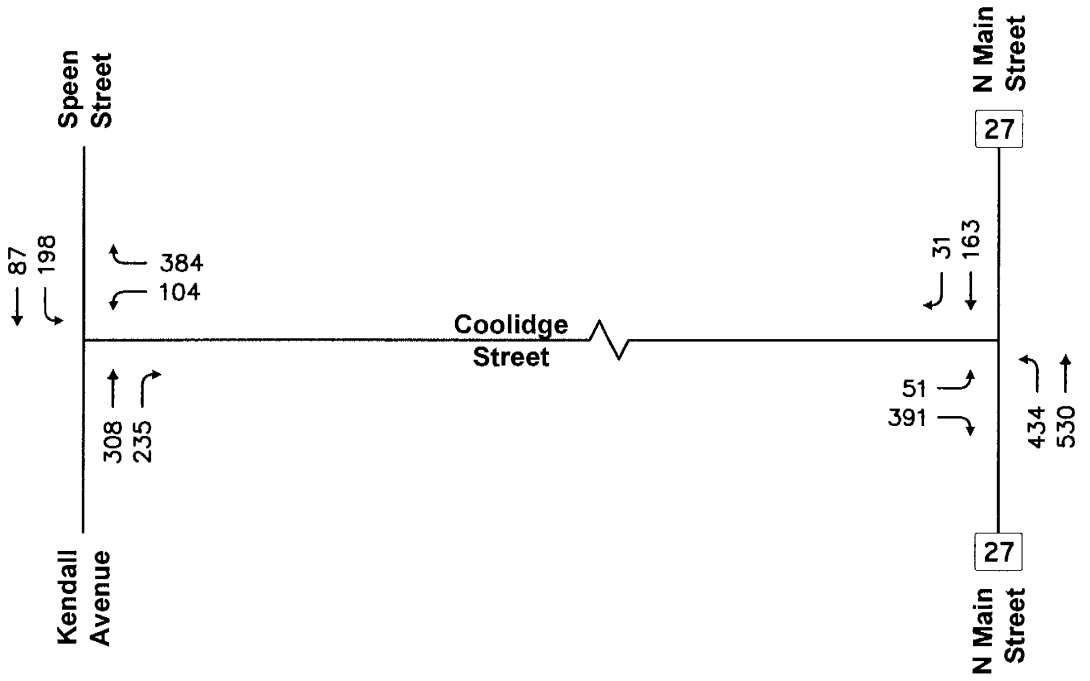
TABLE 5
TRIP-GENERATION SUMMARY

Period/Direction	Site Trips[1]
Weekday Morning Peak Hour:	
Entering	8
Exiting	39
Total	47
Weekday Evening Peak Hour:	
Entering	36
Exiting	18
Total	54
Weekday Daily	576

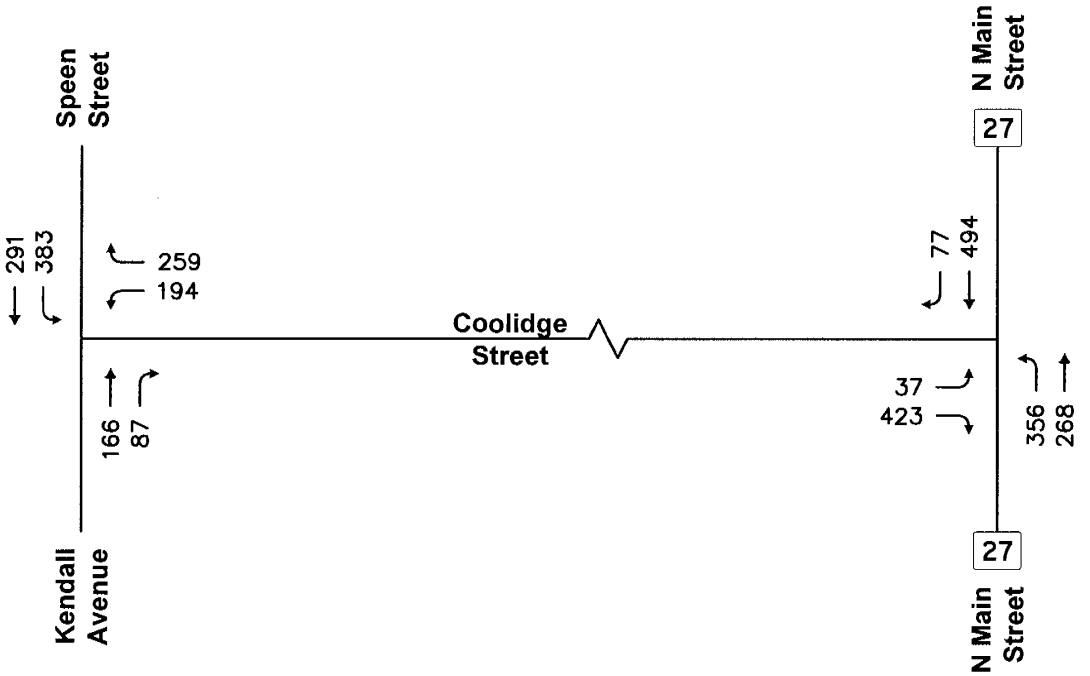
Source: ITE *Trip Generation,* Ninth Edition; 2012.
[1]Based on ITE LUC 230 (Condominium/Townhouse) applied to 88 units.

As summarized in **Table 5,** the development is estimated to generate approximately 47 vehicle trips (8 entering and 39 exiting) during the weekday morning peak hour and 54 vehicle trips (36 entering and 18 exiting) during the weekday evening peak hour. On a daily basis, the development is estimated to generate approximately 576 vehicle trips on a weekday with 50 percent entering and exiting. Trip generation calculations are provided in the **Attachments.**

[2]*Trip Generation,* Ninth Edition; Institute of Transportation Engineers; Washington, DC; 2012.



Weekday Morning Peak Hour



North
Scale: Not to Scale

Weekday Evening Peak Hour

Figure 4

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Planners & Engineers

2021 No-Build Condition
Peak Hour Traffic Volumes

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Trip Distribution

The directional distribution of development-generated trips on the roadway network is a function of a number of variables including local area populations and the efficiency of the roadways leading to the Site. Journey to work census data served as the primary basis for determining the trip distribution pattern for the proposed development. Trip distribution calculations are provided in the **Attachments.**

Development-related trips for the proposed Site are assigned to the roadway network using the ITE trip-generation estimates shown in **Table 5** and the distribution patterns for the Site. Development-related trips at each intersection approach for the weekday morning, and weekday evening peak hours are quantified in **Figure 5.**

2021 Build Traffic Conditions

2021 Build Year condition traffic volumes are derived by adding the incremental traffic increases for the residential units at the Site to the 2021 No-Build conditions. **Figure 6** presents the 2021 Build Year condition traffic-volume networks for the weekday morning and weekday evening peak hours.

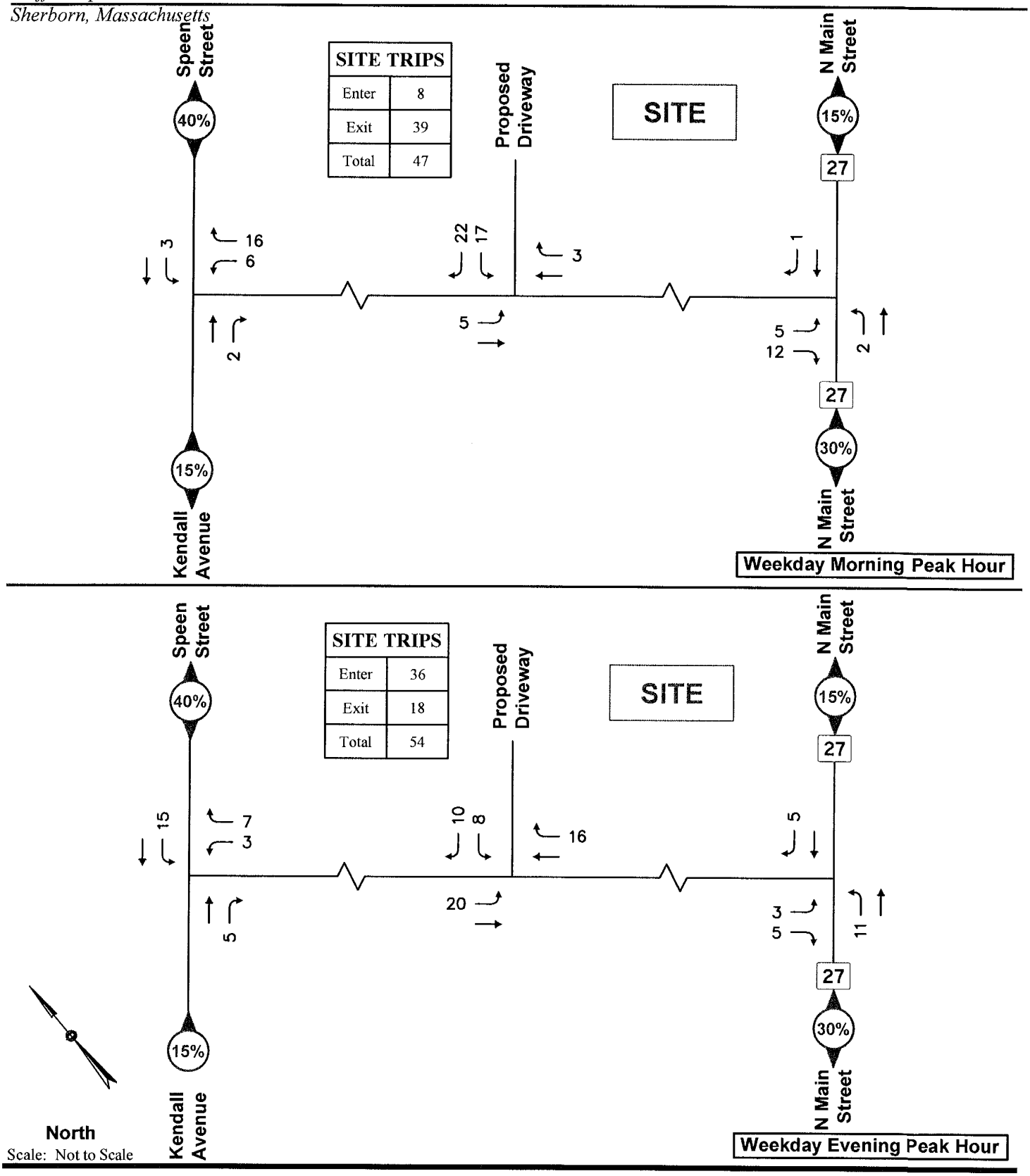

Figure 5

Site Generated Trips
Peak Hour Traffic Volumes

MDM TRANSPORTATION CONSULTANTS, INC.
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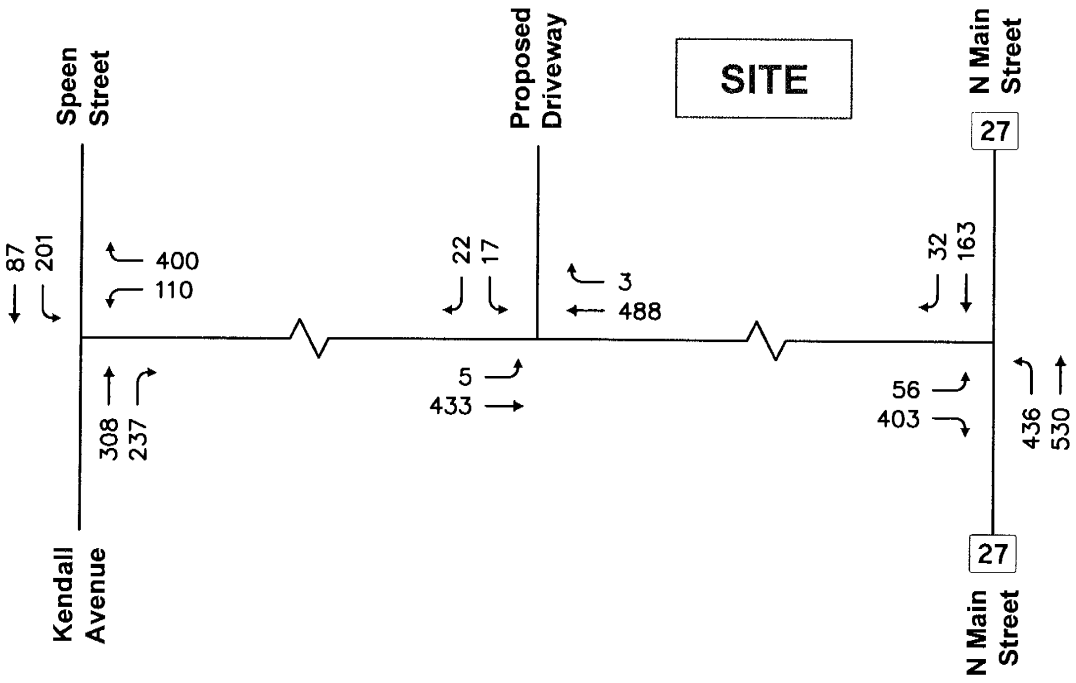

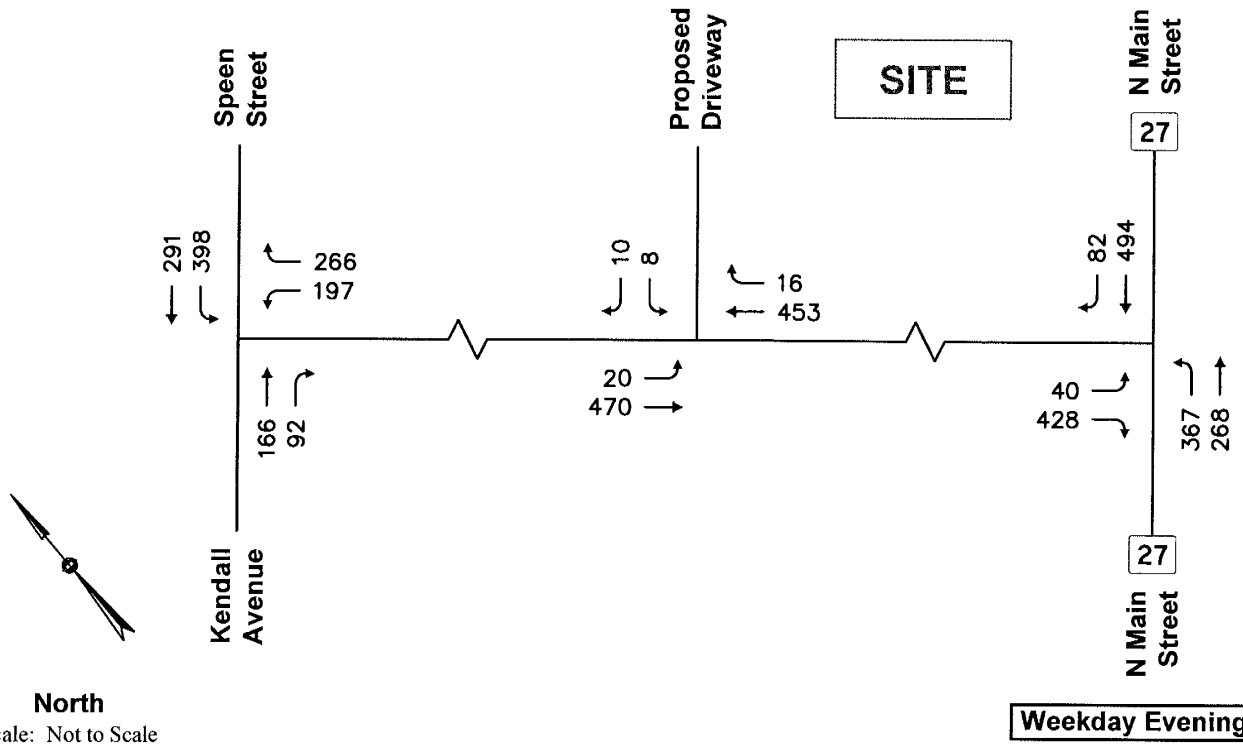

Figure 6

2021 Build Condition
Peak Hour Traffic Volumes

MDM TRANSPORTATION CONSULTANTS, INC.
Planners & Engineers

Date: May 2016
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OPERATIONS ANALYSIS

This section provides an overview of operational analysis methodology, an assessment of driveway operations under Existing (Baseline) and projected future No-Build and Build conditions and a summary of the vehicular queues at the signalized intersections.

Analysis Methodology

Intersection capacity analyses are presented in this section for the Baseline, No-Build, and Build traffic-volume conditions. Capacity analyses, conducted in accordance with EEA/MassDOT guidelines, provide an index of how well the roadway facilities serve the traffic demands placed upon them. The operational results provide the basis for recommended access and roadway improvements in the following section.

Capacity analysis of intersections is developed using the Synchro® computer software, which implements the methods of the 2010 Highway Capacity Manual (HCM). The resulting analysis presents a level-of-service (LOS) designation for individual intersection movements. The LOS is a letter designation that provides a qualitative measure of operating conditions based on several factors including roadway geometry, speeds, ambient traffic volumes, traffic controls, and driver characteristics. Since the LOS of a traffic facility is a function of the traffic flows placed upon it, such a facility may operate at a wide range of LOS, depending on the time of day, day of week, or period of year. A range of six levels of service are defined on the basis of average delay, ranging from LOS A (the least delay) to LOS F (delays greater than 50 seconds for unsignalized movements). The specific control delays and associated LOS designations are presented in the **Attachments**.

Analysis Results

Level-of-Service (LOS) analyses were conducted for the Baseline, No-Build, and Build conditions for the study intersections. The results of the intersection capacity analysis are summarized below in **Table 6** and **Table 7**. Detailed analysis results are presented in the **Attachments**.

TABLE 6
INTERSECTION CAPACITY ANALYSIS RESULTS
WEEKDAY MORNING PEAK HOUR

Period	Approach	Baseline			2021 No-Build			2021 Build		
		v/c[1]	Delay[2]	LOS[3]	v/c	Delay	LOS	v/c	Delay	LOS
Coolidge Street at	Eastbound	0.00	<5	A	0.00	<5	A	0.00	<5	A
Speen Street/	Westbound	0.19	6	A	0.22	7	A	0.22	7	A
Kendall Avenue	NB Left	0.40	27	C	0.53	40	E	0.57	43	E
	NB Right	0.57	16	D	0.69	23	C	0.72	25	C
Coolidge Street at	Eastbound	0.32	<5	A	0.00	<5	A	0.33	<5	A
North Main Street	Westbound	0.00	<5	A	0.00	<5	A	0.00	<5	A
(Route 27)	Southbound	0.81	31	D	0.92	36	E	>1.0	41	E
Coolidge Street at	Westbound	n/a[4]	n/a	n/a	n/a	n/a	n/a	0.11	16	C
Site Driveway	Northbound	n/a	n/a	n/a	n/a	n/a	n/a	0.00	<5	A
	Southbound	n/a	n/a	n/a	n/a	n/a	n/a	0.01	<5	A

[1]Volume-to-capacity ratio
[2]Average control delay per vehicle (in seconds)
[3]Level of service
[4]n/a = not applicable

TABLE 7
INTERSECTION CAPACITY ANALYSIS RESULTS
WEEKDAY EVENING PEAK HOUR

Period	Approach	Baseline			2021 No-Build			2021 Build		
		v/c[1]	Delay[2]	LOS[3]	v/c	Delay	LOS	v/c	Delay	LOS
Coolidge Street at	Eastbound	0.00	<5	A	0.00	<5	A	0.00	<5	A
Speen Street/	Westbound	0.29	5	A	0.30	5	A	0.32	5	A
Kendall Avenue	NB Left	>1.0	>80	F	>1.0	>80	F	>1.0	>80	F
	NB Right	0.32	11	B	0.32	11	B	0.33	12	B
Coolidge Street at	Eastbound	0.36	6	A	0.37	6	A	0.38	<5	A
North Main Street	Westbound	0.00	<5	A	0.00	<5	A	0.00	<5	A
(Route 27)	Southbound	0.78	35	E	0.81	40	E	0.82	43	E
Coolidge Street at	Westbound	n/a[4]	n/a	n/a	n/a	n/a	n/a	0.06	16	C
Site Driveway	Northbound	n/a	n/a	n/a	n/a	n/a	n/a	0.00	<5	A
	Southbound		n/a	n/a	n/a	n/a	n/a	0.02	<5	A

[1]Volume-to-capacity ratio
[2]Average control delay per vehicle (in seconds)
[3]Level of service
[4]n/a = not applicable

As summarized in **Table 6** and **Table 7**:

- *Coolidge Street at Speen Street/Kendall Avenue.* Under future No-Build conditions, left turn movements from Coolidge Street onto Kendall Avenue have been calculated to operate with long delays, specifically during the weekday evening peak hour. Right turn movements from Coolidge Street onto Speen Street will operate below capacity at LOS C or better during the peak hours. As shown, the project will not have a material impact on operations this intersection under Build conditions and will result in three (3) additional left turns (1 vehicle every 20 minutes or less) onto Kendall Avenue during the critical weekday evening peak hour compared to No-Build conditions. Field observations indicate that the delay for the critical left turn movement from Coolidge Street onto Kendall Avenue is somewhat overstated.

- *Coolidge Street at North Main Street (Route 27).* Under future No-Build conditions, the Coolidge Street approach to Route 27 has been calculated to operate with moderate delays (LOS E) or better during the weekday morning and weekday evening peak hours. As shown, the project will have a nominal impact on operations this intersection under Build conditions and will result in an increase in delay of 3 to 4 seconds during the peak hours compared to No-Build conditions which will be imperceptible to the average motorist. Field observations indicate that the delay for the Coolidge Street approach onto Route 27 is somewhat overstated.

- *Coolidge Street at Site Driveway.* Under Build conditions, the proposed Site Driveway approach to Coolidge Street will operate below capacity at LOS C or better during the peak hours.

In summary, the proposed development is not expected to materially impact study area intersections and will not result in any material changes in traffic operations in the study area between future No-Build and Build conditions.

SITE ACCESS/CIRCULATION

An evaluation of the site access and circulation patterns of the site plan prepared by Bruce Saluk and Associates, Inc. has been prepared using AutoTurn® modeling software. Specifically, the evaluation reviewed the maneuvering area to enter, exit, and circulate through the site for the largest anticipated emergency apparatus (Ladder Truck). The AutoTurn® analysis indicates that the Town's ladder truck will have adequate maneuvering area to enter and exit the site via Coolidge Street and Gray Road as well as circulate internally throughout the on-site roadways and parking areas. Supporting AutoTurn® analysis and exhibits are provided in the **Attachments**.

RECOMMENDATIONS AND CONCLUSIONS

MDM finds that travel conditions in the site vicinity along Coolidge Street are generally unconstrained. Trip generation for the development is estimated at approximately 47 vehicle-trips during the weekday morning peak hour and 57 new vehicle-trips during the weekday evening peak hour. Traffic impacts associated with the residential development are not expected to notably affect travel or safety conditions in the site vicinity. However, MDM recommends access-related improvements aimed at enhancing traffic operations and/or travel safety as follows:

- A STOP sign (R1-1) and STOP line pavement markings is recommended on the driveway approach to Coolidge Street. The signs and pavement markings shall be compliant with the Manual on Uniform Traffic Control Devices (MUTCD).

- The proposed driveway approach to Coolidge Street should include minimum corner radii to accommodate standard SU-30 design vehicles and emergency response vehicles. The final driveway grading should include a level landing area on the proposed driveway approach to Coolidge Street to accommodate sight lines and enhance driveway operations.

- Plantings (shrubs, bushes) and structures (walls, fences, etc.) should be maintained at a height of 2 feet or less within the Coolidge Street layout in vicinity of the site driveway to provide unobstructed sight lines. Furthermore, the removal of two trees, a segment of rock wall within the existing right-of-way and selective clearing and grading within the sight line triangles will be completed when the site driveway is constructed.

In summary, adequate capacity is available under future Build conditions on Coolidge Street to accommodate the proposed residential use. The project is not projected to significantly change any reported operating levels compared to future No-Build conditions. Proposed access improvements will provide ample capacity to accommodate site-generated traffic while also enhancing safety and capacity.

Attachments

- □ Traffic Volume Data
- □ Seasonal/Yearly Growth Data
- □ Speed Data
- □ Sight Line Analysis
- □ Trip Generation Data
- □ Trip Distribution Calculations
- □ Capacity Analyses
- □ AutoTurn® Analysis

□ Traffic Volume Data

MDM Transportation Consultants, Inc.

28 Lord Road, Suite 280
Marlborough, MA 01752
508-303-0370
www.mdmtrans.com

Coolidge Street
South of Site Driveway
Sherborn, MA

Site Code: 875

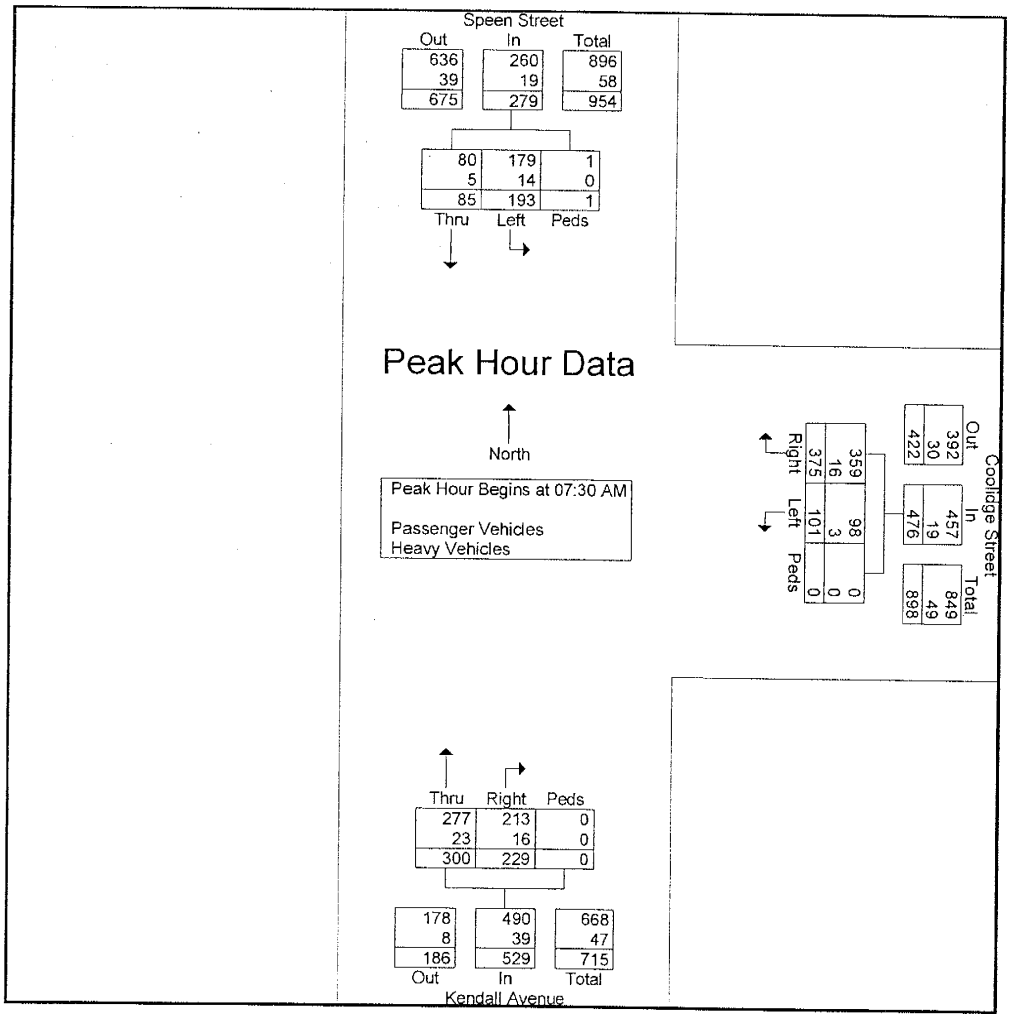
Start Time	04-May-16 Wed	Northbound Morning	Northbound Afternoon	Hour Totals Morning	Hour Totals Afternoon	Southbound Morning	Southbound Afternoon	Hour Totals Morning	Hour Totals Afternoon	Combined Totals Morning	Combined Totals Afternoon
12:00		5	66			6	69				
12:15		0	87			6	86				
12:30		1	65			0	86				
12:45		0	89	6	307	5	84	17	325	23	632
01:00		2	66			6	59				
01:15		1	82			1	79				
01:30		1	74			2	82				
01:45		3	72	7	294	2	69	11	289	18	583
02:00		1	68			2	100				
02:15		0	70			1	99				
02:30		0	96			0	103				
02:45		3	74	4	308	0	99	3	401	7	709
03:00		2	81			1	120				
03:15		5	112			1	99				
03:30		2	93			0	103				
03:45		1	85	10	371	1	111	3	433	13	804
04:00		2	79			3	149				
04:15		3	94			3	119				
04:30		13	94			2	120				
04:45		7	78	25	345	4	94	12	482	37	827
05:00		7	103			4	110				
05:15		23	112			9	109				
05:30		23	82			18	91				
05:45		30	106	83	403	12	109	43	419	126	822
06:00		28	97			37	76				
06:15		52	97			40	99				
06:30		70	72			59	89				
06:45		106	66	256	332	90	77	226	341	482	673
07:00		77	55			81	94				
07:15		90	45			103	78				
07:30		89	49			111	57				
07:45		105	39	361	188	115	81	410	310	771	498
08:00		115	28			94	74				
08:15		129	31			92	57				
08:30		125	20			77	48				
08:45		115	24	484	103	60	31	323	210	807	313
09:00		108	25			58	48				
09:15		106	17			63	53				
09:30		92	30			43	41				
09:45		71	13	377	85	52	27	216	169	593	254
10:00		79	9			40	27				
10:15		73	15			59	28				
10:30		85	11			76	21				
10:45		72	7	309	42	59	19	234	95	543	137
11:00		75	9			59	14				
11:15		85	8			68	19				
11:30		77	8			67	6				
11:45		91	4	328	29	93	8	287	47	615	76
Total		2250	2807			1785	3521			4035	6328
Percent		44.5%	55.5%			33.6%	66.4%			38.9%	61.1%

MDM Transportation Consultants, INC.
28 Lord Road, Suite 280
Marlborough, MA

N/S: Speen Street/Kendall Avenue
E/W: Coolidge Street
Sherborn, MA

File Name : 875 Coolidge at Speen 7-9
Site Code : 875
Start Date : 5/5/2016
Page No : 2

	Speen Street From North				Coolidge Street From East				Kendall Avenue From South				
Start Time	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 07:30 AM													
07:30 AM	**22**	**56**	0	**78**	79	**27**	0	106	**85**	77	0	**162**	**346**
07:45 AM	21	42	0	63	96	25	0	121	53	**97**	0	150	334
08:00 AM	20	47	**1**	68	91	22	0	113	43	59	0	102	283
08:15 AM	22	48	0	70	**109**	27	0	**136**	48	67	0	115	321
Total Volume	85	193	1	279	375	101	0	476	229	300	0	529	1284
% App. Total	30.5	69.2	0.4		78.8	21.2	0		43.3	56.7	0		
PHF	.966	.862	.250	.894	.860	.935	.000	.875	.674	.773	.000	.816	.928
Passenger Vehicles	80	179	1	260	359	98	0	457	213	277	0	490	1207
% Passenger Vehicles	94.1	92.7	100	93.2	95.7	97.0	0	96.0	93.0	92.3	0	92.6	94.0
Heavy Vehicles	5	14	0	19	16	3	0	19	16	23	0	39	77
% Heavy Vehicles	5.9	7.3	0	6.8	4.3	3.0	0	4.0	7.0	7.7	0	7.4	6.0



MDM Transportation Consultants, INC.

28 Lord Road, Suite 280
Marlborough, MA

N/S: Speen Street/Kendall Avenue
T/W: Coolidge Street
Sherborn, MA

File Name : 875 Coolidge at Speen 7-9
Site Code : 875
Start Date : 5/5/2016
Page No : 1

Groups Printed- Passenger Vehicles - Heavy Vehicles

	Speen Street From North				Coolidge Street From East				Kendall Avenue From South				
Start Time	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Int. Total
07:00 AM	29	28	0	57	71	24	0	95	47	82	0	129	281
07:15 AM	19	51	0	70	81	16	0	97	54	80	0	134	301
07:30 AM	22	56	0	78	79	27	0	106	85	77	0	162	346
07:45 AM	21	42	0	63	96	25	0	121	53	97	0	150	334
Total	91	177	0	268	327	92	0	419	239	336	0	575	1262
08:00 AM	20	47	1	68	91	22	0	113	43	59	0	102	283
08:15 AM	22	48	0	70	109	27	0	136	48	67	0	115	321
08:30 AM	27	33	0	60	112	19	0	131	40	54	0	94	285
08:45 AM	15	42	0	57	107	32	0	139	32	60	0	92	288
Total	84	170	1	255	419	100	0	519	163	240	0	403	1177
Grand Total	175	347	1	523	746	192	0	938	402	576	0	978	2439
Apprch %	33.5	66.3	0.2		79.5	20.5	0		41.1	58.9	0		
Total %	7.2	14.2	0	21.4	30.6	7.9	0	38.5	16.5	23.6	0	40.1	
Passenger Vehicles	164	325	1	490	717	186	0	903	377	530	0	907	2300
% Passenger Vehicles	93.7	93.7	100	93.7	96.1	96.9	0	96.3	93.8	92	0	92.7	94.3
Heavy Vehicles	11	22	0	33	29	6	0	35	25	46	0	71	139
% Heavy Vehicles	6.3	6.3	0	6.3	3.9	3.1	0	3.7	6.2	8	0	7.3	5.7

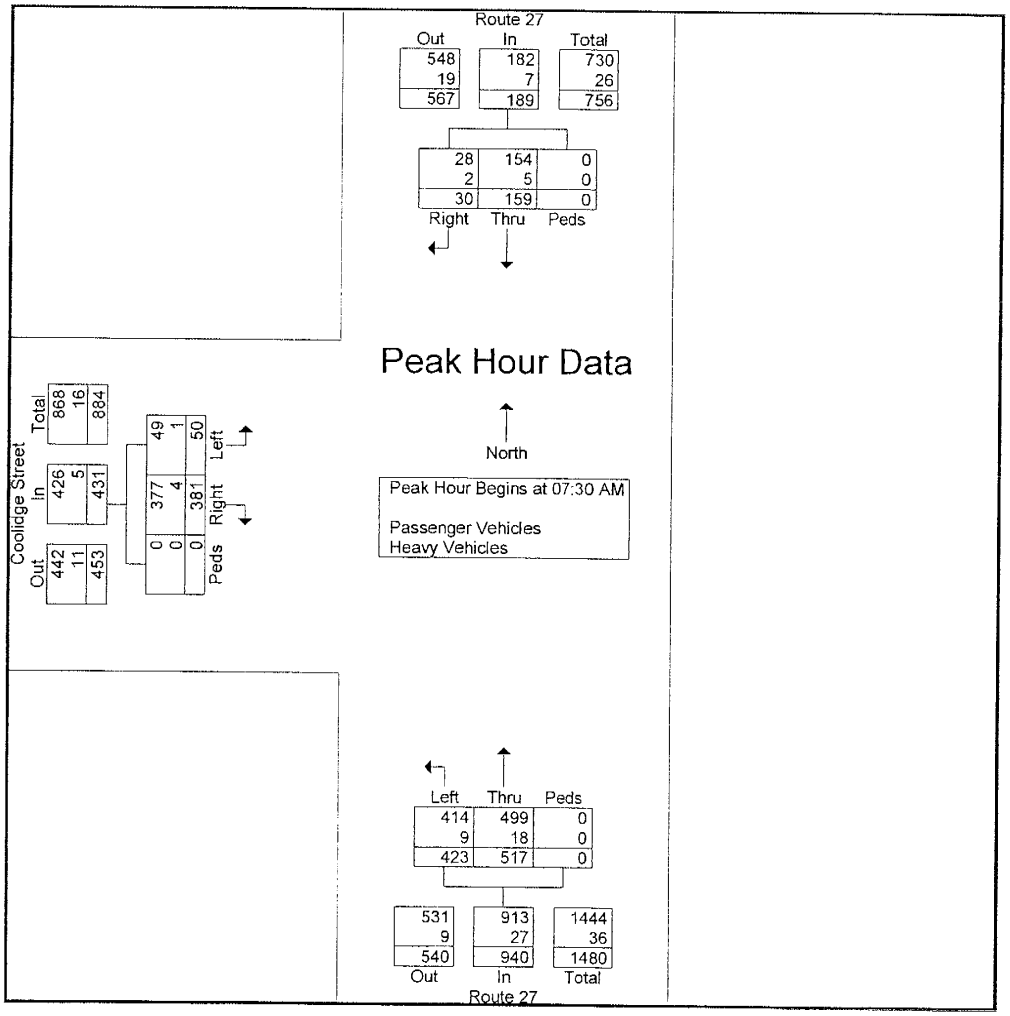
MDM Transportation Consultants, INC.

28 Lord Road, Suite 280
Marlborough, MA

N/S: N Main St (Route 27)
E/W: Coolidge Street
Sherborn, MA

File Name : 875 Coolidge at 27 7-9
Site Code : 875
Start Date : 5/5/2016
Page No : 2

	Route 27 From North				Route 27 From South				Coolidge Street From West				
Start Time	Right	Thru	Peds	App. Total	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 07:30 AM													
07:30 AM	8	39	0	47	128	91	0	219	**127**	**13**	0	**140**	**406**
07:45 AM	3	37	0	40	**134**	107	0	241	82	13	0	95	376
08:00 AM	**12**	33	0	45	123	111	0	234	81	13	0	94	373
08:15 AM	7	**50**	0	**57**	132	**114**	0	**246**	91	11	0	102	405
Total Volume	30	159	0	189	517	423	0	940	381	50	0	431	1560
% App. Total	15.9	84.1	0		55	45	0		88.4	11.6	0		
PHF	.625	.795	.000	.829	.965	.928	.000	.955	.750	.962	.000	.770	.961
Passenger Vehicles	28	154	0	182	499	414	0	913	377	49	0	426	1521
% Passenger Vehicles	93.3	96.9	0	96.3	96.5	97.9	0	97.1	99.0	98.0	0	98.8	97.5
Heavy Vehicles	2	5	0	7	18	9	0	27	4	1	0	5	39
% Heavy Vehicles	6.7	3.1	0	3.7	3.5	2.1	0	2.9	1.0	2.0	0	1.2	2.5



MDM Transportation Consultants, INC.

28 Lord Road, Suite 280
Marlborough, MA

N/S: N Main St (Route 27)
E/W: Coolidge Street
Sherborn, MA

File Name : 875 Coolidge at 27 7-9
Site Code : 875
Start Date : 5/5/2016
Page No : 1

Groups Printed- Passenger Vehicles - Heavy Vehicles

	Route 27 From North				Route 27 From South				Coolidge Street From West				
Start Time	Right	Thru	Peds	App. Total	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Int. Total
07:00 AM	11	50	0	61	129	81	0	210	71	7	0	78	349
07:15 AM	9	57	0	66	132	88	0	220	102	14	0	116	402
07:30 AM	8	39	0	47	128	91	0	219	127	13	0	140	406
07:45 AM	3	37	0	40	134	107	0	241	82	13	0	95	376
Total	31	183	0	214	523	367	0	890	382	47	0	429	1533
08:00 AM	12	33	0	45	123	111	0	234	81	13	0	94	373
08:15 AM	7	50	0	57	132	114	0	246	91	11	0	102	405
08:30 AM	5	56	0	61	122	136	0	258	66	6	0	72	391
08:45 AM	7	35	0	42	125	127	0	252	78	6	0	84	378
Total	31	174	0	205	502	488	0	990	316	36	0	352	1547
Grand Total	62	357	0	419	1025	855	0	1880	698	83	0	781	3080
Apprch %	14.8	85.2	0		54.5	45.5	0		89.4	10.6	0		
Total %	2	11.6	0	13.6	33.3	27.8	0	61	22.7	2.7	0	25.4	
Passenger Vehicles	56	352	0	408	987	840	0	1827	692	81	0	773	3008
% Passenger Vehicles	90.3	98.6	0	97.4	96.3	98.2	0	97.2	99.1	97.6	0	99	97.7
Heavy Vehicles	6	5	0	11	38	15	0	53	6	2	0	8	72
% Heavy Vehicles	9.7	1.4	0	2.6	3.7	1.8	0	2.8	0.9	2.4	0	1	2.3

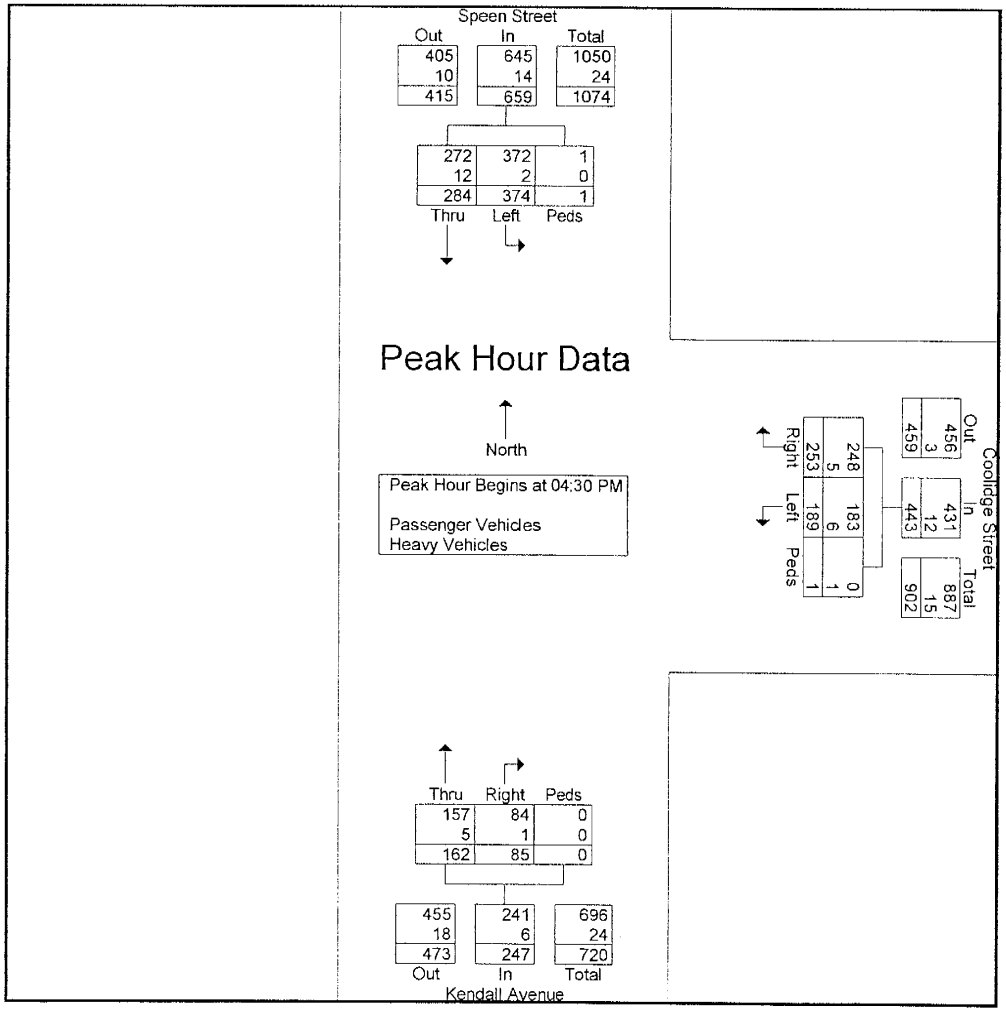
MDM Transportation Consultants, INC.

28 Lord Road, Suite 280
Marlborough, MA

N/S: Speen Street/Kendall Avenue
E/W: Coolidge Street
Sherborn, MA

File Name : 875 Coolidge at Speen 4-6
Site Code : 875
Start Date : 5/5/2016
Page No : 2

	Speen Street From North				Coolidge Street From East				Kendall Avenue From South				
Start Time	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 04:30 PM													
04:30 PM	66	83	0	149	66	**62**	0	**128**	17	41	0	58	335
04:45 PM	67	**117**	0	**184**	61	40	**1**	102	**25**	38	0	63	**349**
05:00 PM	75	79	**1**	155	57	46	0	103	24	**49**	0	**73**	331
05:15 PM	**76**	95	0	171	**69**	41	0	110	19	34	0	53	334
Total Volume	284	374	1	659	253	189	1	443	85	162	0	247	1349
% App. Total	43.1	56.8	0.2		57.1	42.7	0.2		34.4	65.6	0		
PHF	.934	.799	.250	.895	.917	.762	.250	.865	.850	.827	.000	.846	.966
Passenger Vehicles	272	372	1	645	248	183	0	431	84	157	0	241	1317
% Passenger Vehicles	95.8	99.5	100	97.9	98.0	96.8	0	97.3	98.8	96.9	0	97.6	97.6
Heavy Vehicles	12	2	0	14	5	6	1	12	1	5	0	6	32
% Heavy Vehicles	4.2	0.5	0	2.1	2.0	3.2	100	2.7	1.2	3.1	0	2.4	2.4



MDM Transportation Consultants, INC.

28 Lord Road. Suite 280
Marlborough, MA

N/S: Speen Street/Kendall Avenue
E/W: Coolidge Street
Sherborn, MA

File Name : 875 Coolidge at Speen 4-6
Site Code : 875
Start Date : 5/5/2016
Page No : 1

Groups Printed- Passenger Vehicles - Heavy Vehicles

	Speen Street From North				Coolidge Street From East				Kendall Avenue From South				
Start Time	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Int. Total
04:00 PM	73	81	0	154	45	33	0	78	20	40	0	60	292
04:15 PM	57	101	0	158	65	50	0	115	26	31	0	57	330
04:30 PM	66	83	0	149	66	62	0	128	17	41	0	58	335
04:45 PM	67	117	0	184	61	40	1	102	25	38	0	63	349
Total	263	382	0	645	237	185	1	423	88	150	0	238	1306
05:00 PM	75	79	1	155	57	46	0	103	24	49	0	73	331
05:15 PM	76	95	0	171	69	41	0	110	19	34	0	53	334
05:30 PM	62	79	0	141	50	48	0	98	25	48	0	73	312
05:45 PM	63	82	0	145	53	40	0	93	17	30	0	47	285
Total	276	335	1	612	229	175	0	404	85	161	0	246	1262
Grand Total	539	717	1	1257	466	360	1	827	173	311	0	484	2568
Apprch %	42.9	57	0.1		56.3	43.5	0.1		35.7	64.3	0		
Total %	21	27.9	0	48.9	18.1	14	0	32.2	6.7	12.1	0	18.8	
Passenger Vehicles	511	711	1	1223	457	338	0	795	171	302	0	473	2491
% Passenger Vehicles	94.8	99.2	100	97.3	98.1	93.9	0	96.1	98.8	97.1	0	97.7	97
Heavy Vehicles	28	6	0	34	9	22	1	32	2	9	0	11	77
% Heavy Vehicles	5.2	0.8	0	2.7	1.9	6.1	100	3.9	1.2	2.9	0	2.3	3

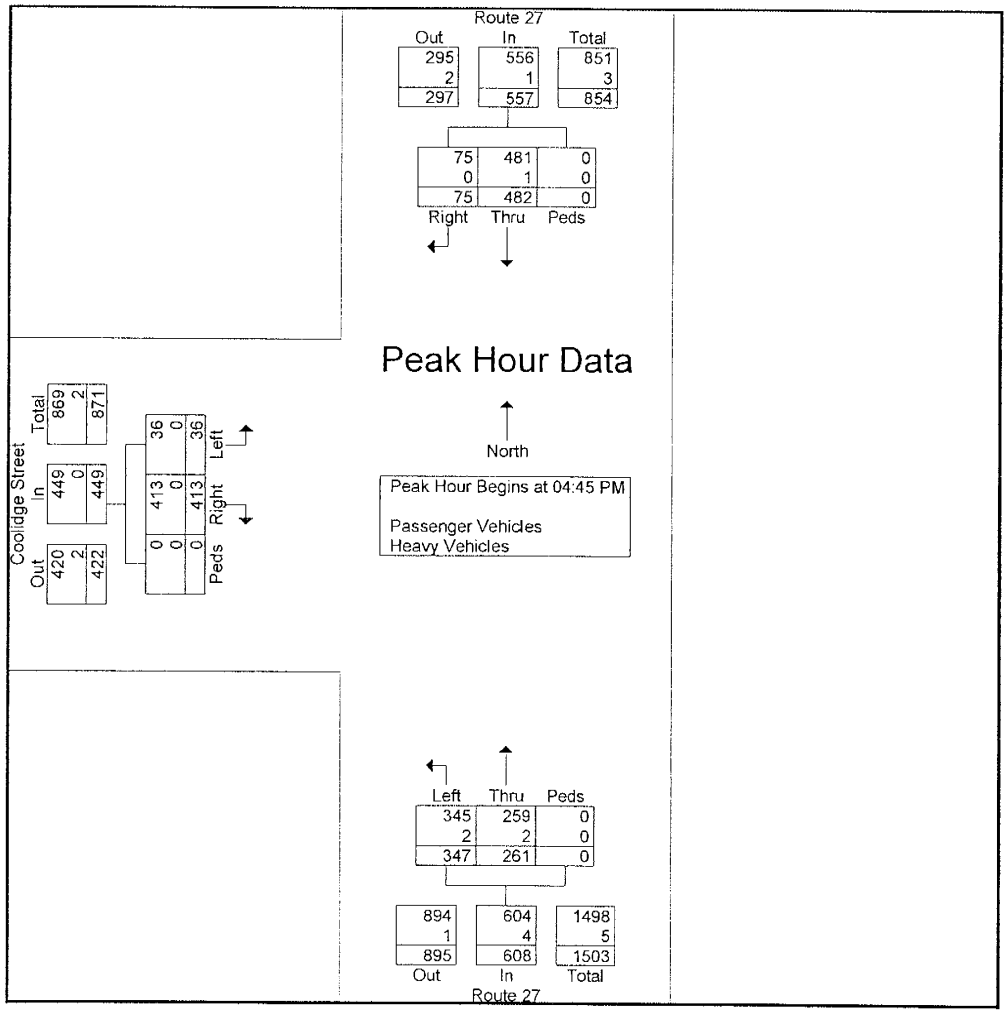
MDM Transportation Consultants, INC.

28 Lord Road, Suite 280
Marlborough, MA

N/S: N Main Street (Route 27)
E/W: Coolidge Street
Sherborn, MA

File Name : 875 Coolidge at 27 4-6
Site Code : 875
Start Date : 5/5/2016
Page No : 2

	Route 27 From North				Route 27 From South				Coolidge Street From West				
Start Time	Right	Thru	Peds	App. Total	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 04:45 PM													
04:45 PM	**21**	**127**	0	**148**	54	**91**	0	145	104	9	0	113	406
05:00 PM	17	115	0	132	**80**	91	0	**171**	105	9	0	114	**417**
05:15 PM	17	123	0	140	62	86	0	148	**107**	**15**	0	**122**	410
05:30 PM	20	117	0	137	65	79	0	144	97	3	0	100	381
Total Volume	75	482	0	557	261	347	0	608	413	36	0	449	1614
% App. Total	13.5	86.5	0		42.9	57.1	0		92	8	0		
PHF	.893	.949	.000	.941	.816	.953	.000	.889	.965	.600	.000	.920	.968
Passenger Vehicles	75	481	0	556	259	345	0	604	413	36	0	449	1609
% Passenger Vehicles	100	99.8	0	99.8	99.2	99.4	0	99.3	100	100	0	100	99.7
Heavy Vehicles	0	1	0	1	2	2	0	4	0	0	0	0	5
% Heavy Vehicles	0	0.2	0	0.2	0.8	0.6	0	0.7	0	0	0	0	0.3



MDM Transportation Consultants, INC.

28 Lord Road. Suite 280
Marlborough, MA

N/S: N Main Street (Route 27)
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Sherborn, MA

File Name : 875 Coolidge at 27 4-6
Site Code : 875
Start Date : 5/5/2016
Page No : 1

Groups Printed- Passenger Vehicles - Heavy Vehicles

	Route 27 From North				Route 27 From South				Coolidge Street From West				
Start Time	Right	Thru	Peds	App. Total	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Int. Total
04:00 PM	13	135	0	148	56	78	0	134	99	3	0	102	384
04:15 PM	13	115	0	128	52	109	0	161	100	6	0	106	395
04:30 PM	18	111	0	129	40	93	0	133	89	6	0	95	357
04:45 PM	21	127	0	148	54	91	0	145	104	9	0	113	406
Total	65	488	0	553	202	371	0	573	392	24	0	416	1542
05:00 PM	17	115	0	132	80	91	0	171	105	9	0	114	417
05:15 PM	17	123	0	140	62	86	0	148	107	15	0	122	410
05:30 PM	20	117	0	137	65	79	0	144	97	3	0	100	381
05:45 PM	8	104	0	112	52	96	0	148	92	8	0	100	360
Total	62	459	0	521	259	352	0	611	401	35	0	436	1568
Grand Total	127	947	0	1074	461	723	0	1184	793	59	0	852	3110
Apprch %	11.8	88.2	0		38.9	61.1	0		93.1	6.9	0		
Total %	4.1	30.5	0	34.5	14.8	23.2	0	38.1	25.5	1.9	0	27.4	
Passenger Vehicles	127	942	0	1069	456	716	0	1172	791	58	0	849	3090
% Passenger Vehicles	100	99.5	0	99.5	98.9	99	0	99	99.7	98.3	0	99.6	99.4
Heavy Vehicles	0	5	0	5	5	7	0	12	2	1	0	3	20
% Heavy Vehicles	0	0.5	0	0.5	1.1	1	0	1	0.3	1.7	0	0.4	0.6

□ Seasonal/Yearly Growth Data

STATION 307 - WESTBOROUGH - RTE.9 - EAST OF NORTHBOROUGH T.L.

YR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
06	44,301	44,854	50,326	51,170	51,729	52,438	48,052	50,270	50,998	50,194	50,043	*50,032*	49,534
	7%	5%	-2%	-4%	-3%	-1%	10%	4%	-4%	1%	-1%	-6%	0%
07	47,505	47,283	49,268	49,136	*50,000*	*52,000*	*53,000*	52,322	49,031	50,571	49,662	47,007	49,732
	-4%	-2%	-3%	1%	1%	-4%	-8%	-7%	-1%	-3%	-4%	-1%	-3%
08	45,614	46,112	47,829	49,816	*50,518*	*49,936*	*48,629*	48,759	48,531	49,009	47,490	46,696	48,245
	-3%	1%	-3%	-2%	-2%	0%	-2%	-3%	-2%	-1%	0%	2%	-1%
09	44,103	46,434	46,455	49,049	*49,474*	*49,934*	*47,638*	47,056	47,762	48,663	47,379	47,564	47,626
	-1%	0%	2%	0%	0%	1%	-1%	1%	1%	1%	2%	2%	1%
11	43,244	46,150	48,016	48,943	*49,781*	*50,525*	*46,812*	48,234	48,825	49,198	49,151	49,888	48,231
	7%	2%	1%	-1%	1%	-1%	3%	4%	0%	2%	2%	-5%	1%
12	46,381	46,883	48,608	48,662	*50,126*	*49,961*	*48,380*	49,941	48,882	50,056	50,015	47,600	48,791
Seasonal Adjustment Factor (to average month)	1.08	1.05	1.01	0.98	0.97	0.96	1.00	0.99	0.99	0.98	0.99	1.01	
												Growth	**-0.40%**

STATION 3180 - MILFORD - RTE.I-495 - AT MEDWAY T.L.

YR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
06	72,492	71,145	76,347	78,305	80,480	85,728	84,957	89,595	83,740	80,518	79,468	76,386	79,930
	-2%	-1%	-4%	-2%	6%	3%	4%	2%	-1%	2%	-2%	-5%	0%
07	70,749	70,432	73,596	76,751	85,024	88,000	88,401	91,080	83,309	82,221	77,941	72,362	79,989
	-2%	-3%	3%	-1%	-7%	-8%	-4%	-5%	-5%	-3%	-5%	-2%	-4%
08	69,200	68,456	76,000	75,934	79,352	81,166	84,701	86,189	78,778	79,645	73,861	70,747	77,002
	-5%	1%	-8%	1%	-1%	-1%	-1%	1%	6%	0%	2%	3%	0%
09	65,444	69,136	69,739	76,913	78,876	80,700	84,000	86,829	83,273	79,419	75,486	73,169	76,915
	3%	-1%	5%	1%	-1%	7%	4%	4%	0%	4%	3%	3%	3%
10	67,428	68,595	73,544	77,906	77,940	*86,167*	87,728	90,295	83,483	82,244	77,516	75,273	79,010
	-3%	2%	1%	-1%	3%	1%	-1%	-4%	1%	-2%	3%	2%	0%
11	*65,217*	69,804	73,992	77,115	80,458	87,344	86,859	87,108	84,288	80,223	*79,773*	76,729	79,076
	8%	2%	1%	1%	2%	0%	-1%	4%	-1%	3%	0%	-2%	1%
12	70,333	71,280	74,372	78,117	81,707	87,015	85,909	90,589	83,100	82,647	*79,570*	*74,989*	79,969
Seasonal Adjustment Factor	1.15	1.13	1.07	1.02	0.98	0.93	0.92	0.89	0.95	0.97	1.02	1.06	
												Growth	**0.03%**

STATION 6125 - BELLINGHAM - RTE.I-495 - AT FRANKLIN T.L.

YR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
06	74,825	72,901	78,382	80,386	82,080	86,982	86,481	90,748	84,958	81,767	80,901	77,982	81,533
	-4%	-1%	-4%	-3%	3%	2%	1%	1%	0%	2%	-2%	-7%	-1%
07	72,153	71,826	75,186	78,376	84,242	88,793	87,242	91,996	85,043	83,370	79,615	72,604	80,871
	-1%	-1%	-3%	-1%	-4%	-6%	-3%	-4%	-5%	-2%	-5%	-1%	-3%
08	71,744	70,760	73,000	77,938	81,066	83,867	84,721	88,163	80,551	81,608	75,924	71,971	78,443
	-6%	1%	-1%	-4%	-7%	0%	6%	2%	6%	-1%	1%	4%	0%
09	67,317	71,174	71,926	74,852	75,774	84,000	89,606	89,969	85,237	81,173	76,814	74,493	78,528
	3%	0%	5%	10%	11%	6%	-1%	3%	0%	4%	3%	0%	4%
10	69,081	70,859	75,603	82,248	83,876	89,208	88,854	92,455	85,654	84,020	79,116	74,625	81,300
	-4%	1%	1%	-4%	-2%	0%	0%	-4%	0%	-1%	2%	6%	-1%
11	66,166	71,765	76,067	78,721	82,611	88,965	88,970	88,945	85,358	83,307	80,382	78,732	80,832
	9%	2%	0%	2%	2%	1%	1%	4%	0%	2%	2%	0%	2%
12	71,975	73,106	76,326	80,040	84,068	89,578	90,207	92,864	85,332	84,818	*81,773*	*78,544*	82,386
Seasonal Adjustment Factor	1.14	1.12	1.07	1.02	0.98	0.92	0.92	0.89	0.95	0.97	1.02	1.07	
												Growth	**0.20%**

Average Seasonal Adjustment Factor (to average month)	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
	1.12	*1.10*	*1.05*	*1.01*	*0.98*	*0.94*	*0.94*	*0.92*	*0.97*	*0.98*	*1.01*	*1.05*

Average Yearly Growth Calculated -0.06%

Yearly Growth Factor Used -0.5%

ITALICS = ESTIMATED DATA

MADT

□ Speed Data

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Sherborn, MA

Site Code: 875

Northbound

Start Time	1 15	16 20	21 25	26 30	31 35	36 40	41 45	46 50	51 55	56 60	61 65	66 70	71 75	76 999	Total	85th Percent	95th Percent
05/04/16	0	0	0	0	2	2	2	0	0	0	0	0	0	0	6	42	44
01:00	0	0	0	2	1	2	2	0	0	0	0	0	0	0	7	42	44
02:00	0	0	0	0	1	1	2	0	0	0	0	0	0	0	4	43	44
03:00	0	0	0	0	0	4	5	0	**1**	0	0	0	0	0	10	44	52
04:00	0	0	0	0	6	7	11	1	0	0	0	0	0	0	25	43	44
05:00	0	1	0	1	5	44	25	6	1	0	0	0	0	0	83	43	47
06:00	0	0	0	1	26	128	98	3	0	0	0	0	0	0	256	43	44
07:00	0	0	0	1	39	208	107	5	1	0	0	0	0	0	361	42	44
08:00	0	0	0	7	81	**262**	**125**	**9**	0	0	0	0	0	0	**484**	42	44
09:00	0	0	2	**13**	**91**	187	78	6	0	0	0	0	0	0	377	41	44
10:00	0	1	1	8	66	152	74	7	0	0	0	0	0	0	309	42	44
11:00	0	**5**	**4**	10	67	178	62	2	0	0	0	0	0	0	328	41	43
12 PM	0	0	3	16	64	155	64	4	**1**	0	0	0	0	0	307	41	44
13:00	0	0	5	**17**	**95**	130	45	2	0	0	0	0	0	0	294	40	43
14:00	**1**	**4**	**6**	6	75	157	56	3	0	0	0	0	0	0	308	41	43
15:00	1	0	1	10	95	191	70	3	0	0	0	0	0	0	371	41	43
16:00	0	0	0	5	83	185	70	2	0	0	0	0	0	0	345	41	43
17:00	0	0	1	2	92	**225**	**76**	**7**	0	0	0	0	0	0	**403**	41	44
18:00	1	0	1	6	83	186	50	5	0	0	0	0	0	0	332	40	43
19:00	0	0	0	0	30	112	41	4	1	0	0	0	0	0	188	42	44
20:00	0	0	0	1	26	62	12	2	0	0	0	0	0	0	103	39	43
21:00	0	0	0	5	26	43	9	2	0	0	0	0	0	0	85	39	43
22:00	0	0	1	1	6	25	9	0	0	0	0	0	0	0	42	41	43
23:00	0	0	1	0	10	9	9	0	0	0	0	0	0	0	29	42	44
Total	3	11	26	112	1070	2655	1102	73	5	0	0	0	0	0	5057		
Percent	0.1%	0.2%	0.5%	2.2%	21.2%	52.5%	21.8%	1.4%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%			
AM Peak		11:00	11:00	09:00	09:00	08:00	08:00	08:00	03:00						08:00		
Vol.		5	4	13	91	262	125	9	1						484		
PM Peak	14:00	14:00	14:00	13:00	13:00	17:00	17:00	17:00	12:00						17:00		
Vol.	1	4	6	17	95	225	76	7	1						403		

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Northbound

Start Time	1 15	16 20	21 25	26 30	31 35	36 40	41 45	46 50	51 55	56 60	61 65	66 70	71 75	76 999	Total	85th Percent	95th Percent
05/05/16	0	0	0	0	3	1	4	2	0	0	0	0	0	0	10	46	48
01:00	0	0	0	1	1	1	0	0	0	0	0	0	0	0	3	37	39
02:00	0	0	0	0	0	3	2	0	0	0	0	0	0	0	5	43	44
03:00	0	0	0	0	0	4	1	1	1	0	0	0	0	0	7	49	53
04:00	0	0	0	0	3	13	12	1	0	0	0	0	0	0	29	43	44
05:00	0	0	0	0	5	39	31	6	0	0	0	0	0	0	81	44	46
06:00	0	0	0	0	20	128	87	5	0	0	0	0	0	0	240	43	44
07:00	0	0	0	**9**	62	193	106	**8**	0	0	0	0	0	0	378	42	44
08:00	0	0	0	1	62	**276**	**142**	8	0	0	0	0	0	0	**489**	42	44
09:00	0	0	**3**	5	79	233	88	7	0	0	0	0	0	0	415	41	44
10:00	0	0	0	5	66	175	71	5	0	0	0	0	0	0	322	41	44
11:00	**1**	0	0	7	**90**	152	54	6	0	0	0	0	0	0	310	41	44
12 PM	0	0	0	2	62	157	58	**8**	0	0	0	0	0	0	287	41	44
13:00	**1**	0	0	1	80	150	62	4	0	0	0	0	0	0	298	41	44
14:00	0	0	**2**	5	83	174	47	3	0	0	0	0	0	0	314	40	43
15:00	0	0	0	4	80	**225**	64	5	**1**	0	0	0	0	0	**379**	41	43
16:00	0	0	0	6	**103**	200	57	7	0	0	0	0	0	0	373	40	43
17:00	1	**2**	0	**14**	80	203	74	5	0	0	0	0	0	0	379	41	44
18:00	0	0	0	4	48	168	**78**	3	0	0	0	0	0	0	301	42	44
19:00	1	0	0	0	37	113	37	1	0	0	0	0	0	0	189	41	43
20:00	0	0	0	3	33	60	20	1	0	0	0	0	0	0	117	40	43
21:00	0	0	0	2	12	52	20	0	0	0	0	0	0	0	86	41	43
22:00	0	0	0	2	9	31	13	0	1	0	0	0	0	0	56	42	44
23:00	0	0	0	0	4	23	10	3	1	0	0	0	0	0	41	43	48
Total	4	2	5	71	1022	2774	1138	89	**4**	0	0	0	0	0	5109		
Percent	0.1%	0.0%	0.1%	1.4%	20.0%	54.3%	22.3%	1.7%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%			
AM Peak	11:00		09:00	07:00	11:00	08:00	08:00	07:00	03:00						08:00		
Vol.	1		3	9	90	276	142	8	1						489		
PM Peak	13:00	17:00	14:00	17:00	16:00	15:00	18:00	12:00	15:00						15:00		
Vol.	1	2	2	14	103	225	78	8	1						379		
Grand Total	7	13	31	183	2092	5429	2240	162	9	0	0	0	0	0	10166		
Percent	0.1%	0.1%	0.3%	1.8%	20.6%	53.4%	22.0%	1.6%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%			

15th Percentile : 33 MPH
50th Percentile : 37 MPH
85th Percentile : 41 MPH
95th Percentile : 44 MPH

Statistics

10 MPH Pace Speed : 36-45 MPH
Number in Pace : 7669
Percent in Pace : 75.4%
Number of Vehicles > 35 MPH : 7840
Percent of Vehicles > 35 MPH : 77.1%
Mean Speed(Average) : 38 MPH

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Southbound

Start Time	1 15	16 20	21 25	26 30	31 35	36 40	41 45	46 50	51 55	56 60	61 65	66 70	71 75	76 999	Total	85th Percent	95th Percent
05/04/16	0	0	0	1	5	7	3	1	0	0	0	0	0	0	17	42	45
01:00	0	0	0	1	2	5	3	0	0	0	0	0	0	0	11	42	44
02:00	0	0	0	0	0	3	0	0	0	0	0	0	0	0	3	39	39
03:00	0	0	1	0	0	1	0	0	1	0	0	0	0	0	3	52	54
04:00	0	0	0	0	1	6	4	1	0	0	0	0	0	0	12	43	46
05:00	0	0	0	0	8	20	11	4	0	0	0	0	0	0	43	43	47
06:00	0	**1**	0	1	55	127	40	2	0	0	0	0	0	0	226	41	43
07:00	0	1	4	9	**103**	**232**	51	**9**	1	0	0	0	0	0	**410**	39	43
08:00	0	0	3	**21**	86	155	**52**	6	0	0	0	0	0	0	323	40	44
09:00	0	0	0	2	57	109	44	2	**2**	0	0	0	0	0	216	41	44
10:00	0	1	1	15	54	118	43	2	0	0	0	0	0	0	234	41	43
11:00	0	0	**5**	19	101	123	34	4	0	**1**	0	0	0	0	287	39	43
12 PM	0	**2**	2	16	91	153	54	7	0	0	0	0	0	0	325	41	44
13:00	2	0	2	6	64	156	53	5	1	0	0	0	0	0	289	41	44
14:00	1	0	1	27	**129**	172	61	**8**	**2**	0	0	0	0	0	401	40	44
15:00	2	0	1	**40**	112	211	66	1	0	0	0	0	0	0	433	40	43
16:00	2	0	**4**	14	117	**256**	81	8	0	0	0	0	0	0	**482**	41	44
17:00	2	0	0	8	85	219	**98**	6	1	0	0	0	0	0	419	42	44
18:00	**3**	0	0	11	64	183	75	5	0	0	0	0	0	0	341	41	44
19:00	0	0	3	12	64	166	57	8	0	0	0	0	0	0	310	41	44
20:00	0	0	0	6	68	112	22	2	0	0	0	0	0	0	210	39	43
21:00	0	0	0	3	58	92	15	1	0	0	0	0	0	0	169	39	42
22:00	0	0	1	1	21	56	14	2	0	0	0	0	0	0	95	40	44
23:00	0	0	0	0	6	22	16	2	1	0	0	0	0	0	47	43	46
Total	12	5	28	213	1351	2704	897	86	9	1	0	0	0	0	5306		
Percent	0.2%	0.1%	0.5%	4.0%	25.5%	51.0%	16.9%	1.6%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%			
AM Peak		06:00	11:00	08:00	07:00	07:00	08:00	07:00	09:00	11:00					07:00		
Vol.		1	5	21	103	232	52	9	2	1					410		
PM Peak	18:00	12:00	16:00	15:00	14:00	16:00	17:00	14:00	14:00						16:00		
Vol.	3	2	4	40	129	256	98	8	2						482		

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Southbound

Start Time	1 15	16 20	21 25	26 30	31 35	36 40	41 45	46 50	51 55	56 60	61 65	66 70	71 75	76 999	Total	85th Percent	95th Percent
05/05/16	0	0	0	0	2	6	8	0	0	0	0	0	0	0	16	43	44
01:00	0	0	0	0	4	3	5	3	0	0	0	0	0	0	15	46	48
02:00	0	0	0	0	0	0	2	0	0	0	0	0	0	0	2	44	44
03:00	0	0	1	0	0	2	0	0	0	0	0	0	0	0	3	38	39
04:00	0	0	1	0	0	3	5	1	1	0	0	0	0	0	11	46	52
05:00	0	0	0	0	9	18	11	1	0	0	0	0	0	0	39	42	44
06:00	0	0	0	3	55	116	38	7	1	0	0	0	0	0	220	41	44
07:00	4	0	0	25	105	179	71	2	1	0	0	0	0	0	387	41	43
08:00	0	0	0	15	79	171	51	7	0	0	0	0	0	0	323	40	44
09:00	0	0	1	12	43	102	46	5	0	0	0	0	0	0	209	42	44
10:00	0	0	1	8	64	113	36	3	1	0	0	0	0	0	226	40	43
11:00	5	0	3	18	78	114	32	6	0	1	0	0	0	0	257	40	44
12 PM	2	0	3	4	86	157	53	4	0	0	0	0	0	0	309	41	43
13:00	5	0	6	16	68	158	41	2	0	0	0	0	0	0	296	39	43
14:00	2	0	5	24	104	186	60	4	0	0	0	0	0	0	385	40	43
15:00	0	0	1	14	109	222	88	7	0	0	0	0	0	0	441	41	44
16:00	0	0	0	7	92	241	89	8	0	0	0	0	0	0	437	41	44
17:00	1	0	1	8	79	223	92	20	0	0	0	0	0	0	424	42	44
18:00	2	0	0	6	84	204	84	10	0	0	0	0	0	0	390	42	44
19:00	1	0	1	8	77	137	61	5	0	0	0	0	0	0	290	41	44
20:00	4	0	0	1	58	151	37	5	0	0	0	0	0	0	256	40	43
21:00	0	0	0	1	49	135	35	1	0	0	0	0	0	0	221	40	43
22:00	0	0	0	3	31	58	20	6	0	0	0	0	0	0	118	42	45
23:00	0	0	0	2	16	40	15	1	0	0	0	0	0	0	74	41	44
Total	26	0	24	175	1292	2739	980	108	4	1	0	0	0	0	5349		
Percent	0.5%	0.0%	0.4%	3.3%	24.2%	51.2%	18.3%	2.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%			
AM Peak	11:00		11:00	07:00	07:00	07:00	07:00	06:00	04:00	11:00					07:00		
Vol.	5		3	25	105	179	71	7	1	1					387		
PM Peak	13:00		13:00	14:00	15:00	16:00	17:00	17:00							15:00		
Vol.	5		6	24	109	241	92	20							441		
Grand Total	38	5	52	388	2643	5443	1877	194	13	2	0	0	0	0	10655		
Percent	0.4%	0.0%	0.5%	3.6%	24.8%	51.1%	17.6%	1.8%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%			

15th Percentile :	32 MPH
50th Percentile :	37 MPH
85th Percentile :	41 MPH
95th Percentile :	44 MPH

Statistics

10 MPH Pace Speed :	31-40 MPH
Number in Pace :	8086
Percent in Pace :	75.9%
Number of Vehicles > 35 MPH :	7529
Percent of Vehicles > 35 MPH :	70.7%
Mean Speed(Average) :	37 MPH

□ Sight Line Analysis

Stopping Sight Distance - Posted

		SPEED (MPH)	BRAKE REACTION DISTANCE (FT)	BRAKING DISTANCE (FT)	CALCULATED STOPPING SIGHT DISTANCE (FT)
Direction 1	NB	35	128.625	117.4	246.0
Direction 2	SB	35	128.625	117.4	246.0

INPUTS	Direction 1	Direction 2
Travel Direction	NB	SB
Speed	35	35
Grade	0	0
t	2.5	2.5
a	11.2	11.2

Stopping Sight Distance (SSD) - Source: AASHTO

SSD = Reaction Distance + Brake Distance

Reaction Distance = 1.47 x t x V

Brake Distance = V^2 / (30 x ((a/32.2)+G))

Where:
t = reaction time (sec)
V = travel speed (mph)
G= roadway grade
a - deceleration rate (ft/sec^2)

Stopping Sight Distance - Average

		SPEED (MPH)	BRAKE REACTION DISTANCE (FT)	BRAKING DISTANCE (FT)	CALCULATED STOPPING SIGHT DISTANCE (FT)
Direction 1	NB	40	147	153.3	300.3
Direction 2	SB	39	143.325	145.8	289.1

INPUTS	Direction 1	Direction 2
Travel Direction	NB	SB
Speed	40	39
Grade	0	0
t	2.5	2.5
a	11.2	11.2

Stopping Sight Distance (SSD) - Source: AASHTO

SSD = Reaction Distance + Brake Distance

Reaction Distance = 1.47 x t x V

Brake Distance = V^2 / (30 x ((a/32.2)+G))

Where:
t = reaction time (sec)
V = travel speed (mph)
G= roadway grade
a - deceleration rate (ft/sec^2)

Stopping Sight Distance - 85th Percentile

		SPEED (MPH)	BRAKE REACTION DISTANCE (FT)	BRAKING DISTANCE (FT)	CALCULATED STOPPING SIGHT DISTANCE (FT)
Direction 1	NB	42	154.35	169.1	323.4
Direction 2	SB	43	158.025	177.2	335.2

INPUTS	Direction 1	Direction 2
Travel Direction	NB	SB
Speed	42	43
Grade	0	0
t	2.5	2.5
a	11.2	11.2

Stopping Sight Distance (SSD) - Source: AASHTO

SSD = Reaction Distance + Brake Distance

Reaction Distance = 1.47 x t x V

Brake Distance = V^2 / (30 x ((a/32.2)+G))

Where:
t = reaction time (sec)
V = travel speed (mph)
G= roadway grade
a - deceleration rate (ft/sec^2)

Intersection Sight Distance Calculations

Source: *A Policy on Geometric Design of Highways and Street, 6th Edition;* AASHTO; 2011.

Passenger Car
ISD = 1.47 * V * t

V = speed
t = time gap

t = 7.5 s for a passenger car for Left Turn from a Stop
t = 6.5 s for a passenger car for Right Turn from a Stop

Posted (Regulatory) Speed Limit

Proposed Site Driveway ISD = 1.47 * 35 * 7.5 = 386 ft **SAY 390 ft**
(left-turn from a stop)

Proposed Site Driveway ISD = 1.47 * 35 * 6.5 = 335 ft **SAY 335 ft**
(right-turn from a stop)

□ Trip Generation Data

Institute of Transportation Engineers (ITE) 9th Edition
Land Use Code (LUC) 230 - Residential Condominium/Townhouse

Average Vehicle Trips Ends vs: Dwelling Units
Independent Variable (X): 88

AVERAGE WEEKDAY DAILY

Ln T = 0.870 Ln (X) + 2.46
Ln T = 0.870 Ln 88 + (2.46)
Ln T = 6.36
T = 575.53
T = 576 vehicle trips
with 50% (288 vpd) entering and 50% (288 vpd) exiting.

WEEKDAY MORNING PEAK HOUR OF ADJACENT STREET TRAFFIC

Ln T = 0.80 Ln (X) + 0.26
Ln T = 0.80 Ln 88 + (0.26)
Ln T = 3.84
T = 46.61
T = 47 vehicle trips
with 17% (8 vph) entering and 83% (39 vph) exiting.

WEEKDAY EVENING PEAK HOUR OF ADJACENT STREET TRAFFIC

Ln T = 0.82 Ln (X) + 0.32
Ln T = 0.82 Ln 88 + (0.32)
Ln T = 3.99
T = 54.13
T = 54 vehicle trips
with 67% (36 vph) entering and 33% (18 vph) exiting.

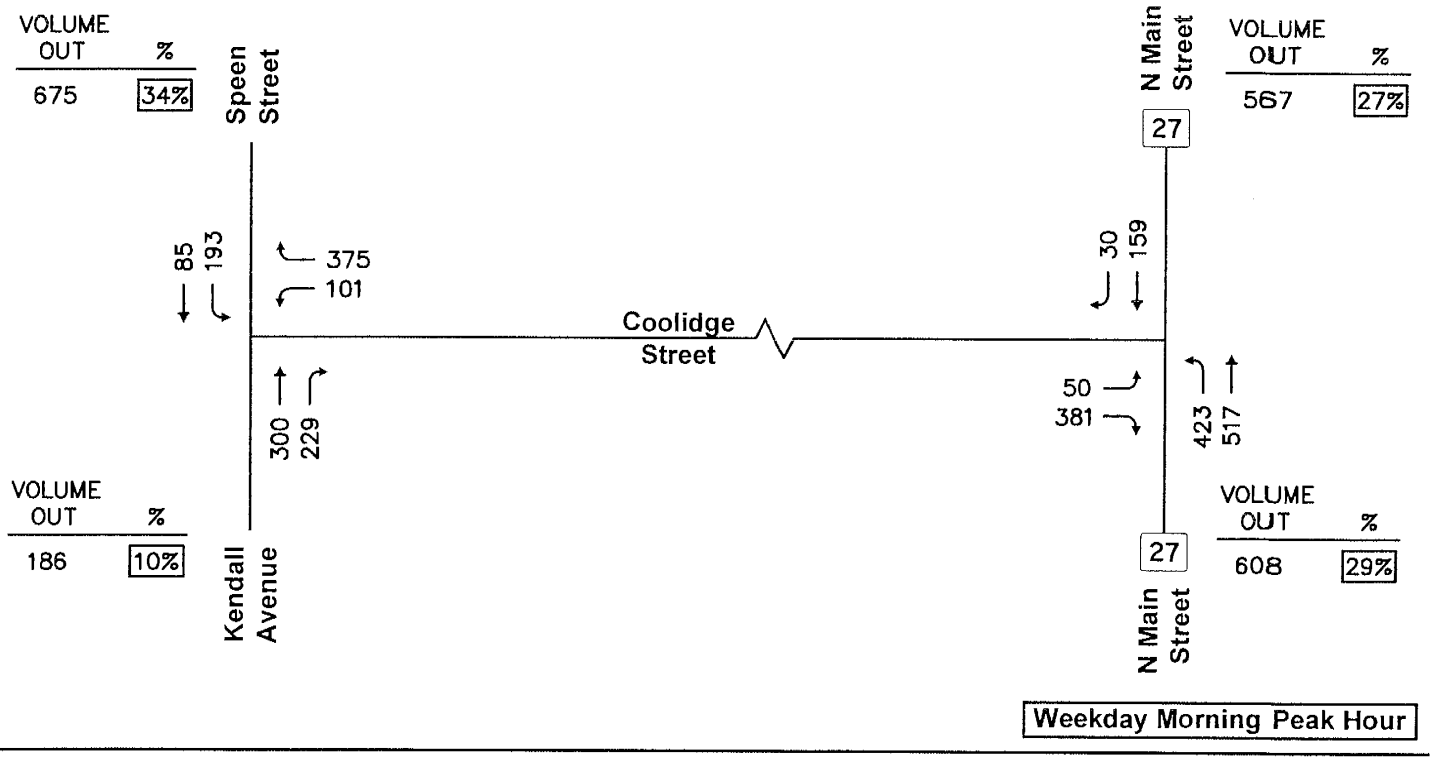
SATURDAY DAILY

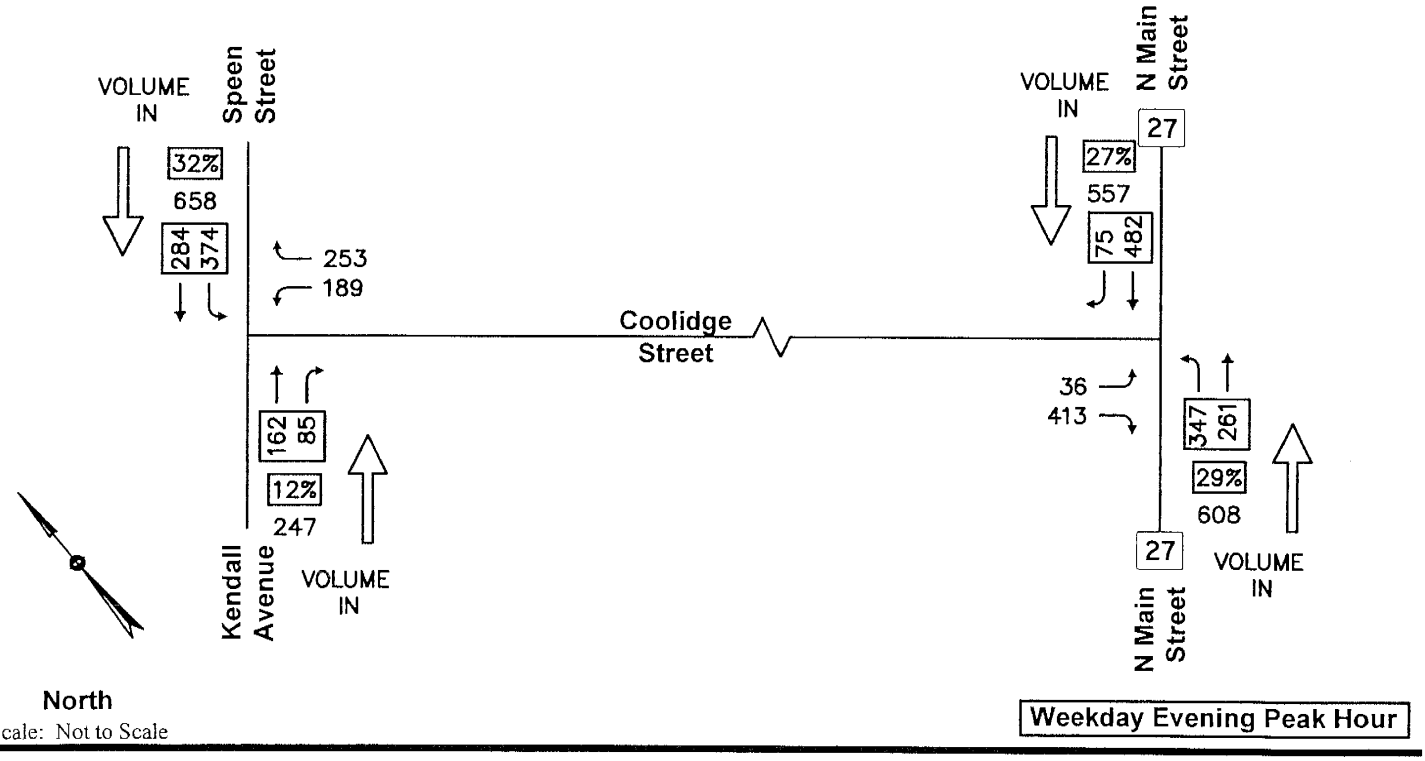
T = 3.62 * (X) + 427.93
T = 3.62 * 88 + (427.93)
T = 746.49
T = 746 vehicle trips
with 50% (373 vpd) entering and 50% (373 vpd) exiting.

SATURDAY MIDDAY PEAK HOUR OF GENERATOR

T = 0.29 * (X) + 42.63
T = 0.29 * 88 + (42.63)
T = 68.15
T = 68 vehicle trips
with 54% (37 vph) entering and 46% (31 vph) exiting.

□ Trip Distribution Calculations





MDM TRANSPORTATION CONSULTANTS, INC.
Planners & Engineers

Attachment

Trip Distribution Calculation (Existing Patterns)

Date: May 2016
Dwg No. 875 TIAS.dwg
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□ Capacity Analyses

LEVEL OF SERVICE METHODOLOGY

Capacity analysis of intersections is developed using the Synchro® computer software, which implements the methods of the 2010 Highway Capacity Manual (HCM). The resulting analysis presents a level-of-service (LOS) designation for individual intersection movements and (for signalized intersections) for the entire intersection. The LOS is a letter designation that provides a qualitative measure of operating conditions based on several factors including roadway geometry, speeds, ambient traffic volumes, traffic controls, and driver characteristics. Since the LOS of a traffic facility is a function of the traffic flows placed upon it, such a facility may operate at a wide range of LOS, depending on the time of day, day of week, or period of year. A range of six levels of service are defined on the basis of average delay, ranging from LOS A (the least delay) to LOS F (delays greater than 50 seconds for unsignalized movements, and greater than 80 seconds for signalized movements).

Signalized Intersection Performance Measures

The six LOS designations for signalized intersections may be described as follows:

- *LOS A* describes operations with low control delay; most vehicles do not stop at all.
- *LOS B* describes operations with relatively low control delay. However, more vehicles stop than LOS A.
- *LOS C* describes operations with higher control delays. Individual cycle failures may begin to appear. The number of vehicles stopping is significant at this level, although many still pass through the intersection without stopping.
- *LOS D* describes operations with control delay in the range where the influence of congestion becomes more noticeable. Many vehicles stop and individual cycle failures are noticeable.
- *LOS E* describes operations with high control delay values. Individual cycle failures are frequent occurrences.
- *LOS F* describes operations with high control delay values that often occur with over-saturation. Poor progression and long cycle lengths may also be major contributing causes to such delay levels.

The LOS for signalized intersections are calculated using the operational analysis methodology of the 2010 *Highway Capacity Manual*.[1] This method assesses the effects of signal type, timing, phasing, and progression; vehicle mix; and geometrics on delay. LOS designations are based on the criterion of control or signal delay per vehicle. Control or signal delay is a measure of driver discomfort, frustration, and fuel consumption, and includes initial deceleration delay approaching the traffic signal, queue move-up time, stopped delay and final acceleration delay. **Table A1** summarizes the relationship between LOS and control delay. The tabulated control delay criterion may be applied in assigning LOS designations to individual lane groups, to individual intersection approaches, or to entire intersections.

Table A1
LEVEL-OF-SERVICE CRITERIA
FOR SIGNALIZED INTERSECTIONS[1]

Level of Service	Control (Signal) Delay per Vehicle (Seconds)
A	≤10.0
B	10.1 to 20.0
C	20.1 to 35.0
D	35.1 to 55.0
E	55.1 to 80.0
F	>80.0

[1]Source: *Highway Capacity Manual 2010;* Transportation Research Board; Washington, DC; 2010.

[1]*Highway Capacity Manual* 2010; Transportation Research Board; Washington, DC; 2010.

Unsignalized Intersection Performance Measures

The six LOS designations for unsignalized intersections may be described as follows:

- *LOS A* represents a condition with little or no control delay to minor street traffic.
- *LOS B* represents a condition with short control delays to minor street traffic.
- *LOS C* represents a condition with average control delays to minor street traffic.
- *LOS D* represents a condition with long control delays to minor street traffic.
- *LOS E* represents operating conditions at or near capacity level, with very long control delays to minor street traffic.
- *LOS F* represents a condition where minor street demand volume exceeds capacity of an approach lane, with extreme control delays resulting.

The LOS designations of unsignalized intersections are determined by application of a procedure described in the 2010 *Highway Capacity Manual.*[2] LOS is measured in terms of average control delay. Mathematically, control delay is a function of the capacity and degree of saturation of the lane group and/or approach under study and is a quantification of motorist delay associated with traffic control devices such as traffic signals and STOP signs. Control delay includes the effects of initial deceleration delay approaching a STOP sign, stopped delay, queue move-up time, and final acceleration delay from a stopped condition. Definitions for LOS at unsignalized intersections are also given in the *Highway Capacity Manual 2010.* **Table A2** summarizes the relationship between LOS and average control delay.

Table A2
LEVEL-OF-SERVICE CRITERIA FOR UNSIGNALIZED INTERSECTIONS[1]

Average Control Delay (seconds per vehicle)	Level of Service	
	v/c ≤ 1	v/c > 1
≤ 10.0	A	F
10.1 to 15.0	B	F
15.1 to 25.0	C	F
25.1 to 35.0	D	F
35.1 to 50.0	E	F
>50.0	F	F

[1]Source: *Highway Capacity Manual 2010,* Transportation Research Board; Washington, DC; 2010.

[2] ibid

Intersection	
Int Delay, s/veh	9.1

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	186	229	193	85	101	375
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	50	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	93	93	93	93	93	93
Heavy Vehicles, %	8	7	7	6	3	4
Mvmt Flow	200	246	208	91	109	403

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	446	0	829	323
Stage 1	-	-	-	-	323	-
Stage 2	-	-	-	-	506	-
Critical Hdwy	-	-	4.17	-	6.43	6.24
Critical Hdwy Stg 1	-	-	-	-	5.43	-
Critical Hdwy Stg 2	-	-	-	-	5.43	-
Follow-up Hdwy	-	-	2.263	-	3.527	3.336
Pot Cap-1 Maneuver	-	-	1088	-	339	713
Stage 1	-	-	-	-	732	-
Stage 2	-	-	-	-	603	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1088	-	271	713
Mov Cap-2 Maneuver	-	-	-	-	271	-
Stage 1	-	-	-	-	732	-
Stage 2	-	-	-	-	482	-

Approach	EB	WB	NB
HCM Control Delay, s	0	6.3	18.6
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	271	713	-	-	1088	-
HCM Lane V/C Ratio	0.401	0.566	-	-	0.191	-
HCM Control Delay (s)	26.9	16.4	-	-	9.1	0
HCM Lane LOS	D	C	-	-	A	A
HCM 95th %tile Q(veh)	1.8	3.6	-	-	0.7	-

Intersection

Int Delay, s/veh 10.9

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	423	517	159	30	50	381
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	50	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	96	96	96	96	96	96
Heavy Vehicles, %	2	4	3	7	2	1
Mvmt Flow	441	539	166	31	52	397

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	197	0	-	0	1601	181
Stage 1	-	-	-	-	181	-
Stage 2	-	-	-	-	1420	-
Critical Hdwy	4.12	-	-	-	6.42	6.21
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.309
Pot Cap-1 Maneuver	1376	-	-	-	117	864
Stage 1	-	-	-	-	850	-
Stage 2	-	-	-	-	223	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1376	-	-	-	64	864
Mov Cap-2 Maneuver	-	-	-	-	64	-
Stage 1	-	-	-	-	850	-
Stage 2	-	-	-	-	121	-

Approach	EB	WB	SB
HCM Control Delay, s	4	0	30.8
HCM LOS			D

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1376	-	-	-	64	864
HCM Lane V/C Ratio	0.32	-	-	-	0.814	0.459
HCM Control Delay (s)	8.8	0	-	-	168.9	12.7
HCM Lane LOS	A	A	-	-	F	B
HCM 95th %tile Q(veh)	1.4	-	-	-	3.7	2.4

Intersection	
Int Delay, s/veh	58.7

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	162	85	374	284	189	253
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	50	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	97	97	97	97	97	97
Heavy Vehicles, %	3	1	1	4	3	2
Mvmt Flow	167	88	386	293	195	261

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	255	0	1275	211
Stage 1	-	-	-	-	211	-
Stage 2	-	-	-	-	1064	-
Critical Hdwy	-	-	4.11	-	6.43	6.22
Critical Hdwy Stg 1	-	-	-	-	5.43	-
Critical Hdwy Stg 2	-	-	-	-	5.43	-
Follow-up Hdwy	-	-	2.209	-	3.527	3.318
Pot Cap-1 Maneuver	-	-	1316	-	~ 183	829
Stage 1	-	-	-	-	822	-
Stage 2	-	-	-	-	330	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1316	-	~ 119	829
Mov Cap-2 Maneuver	-	-	-	-	~ 119	-
Stage 1	-	-	-	-	822	-
Stage 2	-	-	-	-	215	-

Approach	EB	WB	NB
HCM Control Delay, s	0	5	171.4
HCM LOS			F

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	119	829	-	-	1316	-
HCM Lane V/C Ratio	1.637	0.315	-	-	0.293	-
HCM Control Delay (s)	$ 385.7	11.3	-	-	8.9	0
HCM Lane LOS	F	B	-	-	A	A
HCM 95th %tile Q(veh)	14.5	1.4	-	-	1.2	-

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection	
Int Delay, s/veh	12.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	347	261	482	75	36	413
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	50	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	97	97	97	97	97	97
Heavy Vehicles, %	1	1	0	0	0	0
Mvmt Flow	358	269	497	77	37	426

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	574	0	-	0	1521	536
Stage 1	-	-	-	-	536	-
Stage 2	-	-	-	-	985	-
Critical Hdwy	4.11	-	-	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.209	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	1004	-	-	-	132	549
Stage 1	-	-	-	-	591	-
Stage 2	-	-	-	-	365	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1004	-	-	-	77	549
Mov Cap-2 Maneuver	-	-	-	-	77	-
Stage 1	-	-	-	-	591	-
Stage 2	-	-	-	-	212	-

Approach	EB	WB	SB
HCM Control Delay, s	6	0	35.3
HCM LOS			E

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1004	-	-	-	77	549
HCM Lane V/C Ratio	0.356	-	-	-	0.482	0.776
HCM Control Delay (s)	10.6	0	-	-	89.2	30.6
HCM Lane LOS	B	A	-	-	F	D
HCM 95th %tile Q(veh)	1.6	-	-	-	2	7.1

Intersection	
Int Delay, s/veh	11.4

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	308	235	198	87	104	384
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	50	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	93	93	93	93	93	93
Heavy Vehicles, %	8	7	7	6	3	4
Mvmt Flow	331	253	213	94	112	413

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	584	0	977	458
Stage 1	-	-	-	-	458	-
Stage 2	-	-	-	-	519	-
Critical Hdwy	-	-	4.17	-	6.43	6.24
Critical Hdwy Stg 1	-	-	-	-	5.43	-
Critical Hdwy Stg 2	-	-	-	-	5.43	-
Follow-up Hdwy	-	-	2.263	-	3.527	3.336
Pot Cap-1 Maneuver	-	-	966	-	277	599
Stage 1	-	-	-	-	635	-
Stage 2	-	-	-	-	595	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	966	-	212	599
Mov Cap-2 Maneuver	-	-	-	-	212	-
Stage 1	-	-	-	-	635	-
Stage 2	-	-	-	-	456	-

Approach	EB	WB	NB
HCM Control Delay, s	0	6.8	26.8
HCM LOS			D

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	212	599	-	-	966	-
HCM Lane V/C Ratio	0.527	0.689	-	-	0.22	-
HCM Control Delay (s)	39.5	23.3	-	-	9.8	0
HCM Lane LOS	E	C	-	-	A	A
HCM 95th %tile Q(veh)	2.7	5.4	-	-	0.8	-

Intersection	
Int Delay, s/veh	12.2

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	434	530	163	31	51	391
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	50	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	96	96	96	96	96	96
Heavy Vehicles, %	2	4	3	7	2	1
Mvmt Flow	452	552	170	32	53	407

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	202	0	-	0	1642	186
Stage 1	-	-	-	-	186	-
Stage 2	-	-	-	-	1456	-
Critical Hdwy	4.12	-	-	-	6.42	6.21
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.309
Pot Cap-1 Maneuver	1370	-	-	-	110	859
Stage 1	-	-	-	-	846	-
Stage 2	-	-	-	-	214	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1370	-	-	-	58	859
Mov Cap-2 Maneuver	-	-	-	-	58	-
Stage 1	-	-	-	-	846	-
Stage 2	-	-	-	-	112	-

Approach	EB	WB	SB
HCM Control Delay, s	4	0	35.6
HCM LOS			E

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1370	-	-	-	58	859
HCM Lane V/C Ratio	0.33	-	-	-	0.916	0.474
HCM Control Delay (s)	8.9	0	-	-	209.2	12.9
HCM Lane LOS	A	A	-	-	F	B
HCM 95th %tile Q(veh)	1.5	-	-	-	4.2	2.6

Intersection	
Int Delay, s/veh	68.3

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	166	87	383	291	194	259
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	50	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	97	97	97	97	97	97
Heavy Vehicles, %	3	1	1	4	3	2
Mvmt Flow	171	90	395	300	200	267

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	261	0	1306	216
Stage 1	-	-	-	-	216	-
Stage 2	-	-	-	-	1090	-
Critical Hdwy	-	-	4.11	-	6.43	6.22
Critical Hdwy Stg 1	-	-	-	-	5.43	-
Critical Hdwy Stg 2	-	-	-	-	5.43	-
Follow-up Hdwy	-	-	2.209	-	3.527	3.318
Pot Cap-1 Maneuver	-	-	1309	-	~ 176	824
Stage 1	-	-	-	-	818	-
Stage 2	-	-	-	-	321	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1309	-	~ 112	824
Mov Cap-2 Maneuver	-	-	-	-	~ 112	-
Stage 1	-	-	-	-	818	-
Stage 2	-	-	-	-	205	-

Approach	EB	WB	NB
HCM Control Delay, s	0	5.1	200.4
HCM LOS			F

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	112	824	-	-	1309	-
HCM Lane V/C Ratio	1.786	0.324	-	-	0.302	-
HCM Control Delay (s)	$ 452.8	11.4	-	-	8.9	0
HCM Lane LOS	F	B	-	-	A	A
HCM 95th %tile Q(veh)	15.8	1.4	-	-	1.3	-

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection	
Int Delay, s/veh	13.4

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	356	268	494	77	37	423
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	50	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	97	97	97	97	97	97
Heavy Vehicles, %	1	1	0	0	0	0
Mvmt Flow	367	276	509	79	38	436

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	589	0	-	0	1559	549
Stage 1	-	-	-	-	549	-
Stage 2	-	-	-	-	1010	-
Critical Hdwy	4.11	-	-	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.209	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	991	-	-	-	125	539
Stage 1	-	-	-	-	583	-
Stage 2	-	-	-	-	355	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	991	-	-	-	70	539
Mov Cap-2 Maneuver	-	-	-	-	70	-
Stage 1	-	-	-	-	583	-
Stage 2	-	-	-	-	200	-

Approach	EB	WB	SB
HCM Control Delay, s	6.1	0	39.9
HCM LOS			E

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	991	-	-	-	70	539
HCM Lane V/C Ratio	0.37	-	-	-	0.545	0.809
HCM Control Delay (s)	10.8	0	-	-	106	34.1
HCM Lane LOS	B	A	-	-	F	D
HCM 95th %tile Q(veh)	1.7	-	-	-	2.3	7.9

Intersection

Int Delay, s/veh 12.4

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	308	237	201	87	110	400
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	50	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	93	93	93	93	93	93
Heavy Vehicles, %	8	7	7	6	3	4
Mvmt Flow	331	255	216	94	118	430

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	586	0	985	459
Stage 1	-	-	-	-	459	-
Stage 2	-	-	-	-	526	-
Critical Hdwy	-	-	4.17	-	6.43	6.24
Critical Hdwy Stg 1	-	-	-	-	5.43	-
Critical Hdwy Stg 2	-	-	-	-	5.43	-
Follow-up Hdwy	-	-	2.263	-	3.527	3.336
Pot Cap-1 Maneuver	-	-	965	-	274	598
Stage 1	-	-	-	-	634	-
Stage 2	-	-	-	-	591	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	965	-	209	598
Mov Cap-2 Maneuver	-	-	-	-	209	-
Stage 1	-	-	-	-	634	-
Stage 2	-	-	-	-	452	-

Approach	EB	WB	NB
HCM Control Delay, s	0	6.8	28.7
HCM LOS			D

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	209	598	-	-	965	-
HCM Lane V/C Ratio	0.566	0.719	-	-	0.224	-
HCM Control Delay (s)	42.6	24.9	-	-	9.8	0
HCM Lane LOS	E	C	-	-	A	A
HCM 95th %tile Q(veh)	3.1	6	-	-	0.9	-

Intersection	
Int Delay, s/veh	14.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	436	530	163	32	56	403
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	50	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	96	96	96	96	96	96
Heavy Vehicles, %	2	4	3	7	2	1
Mvmt Flow	454	552	170	33	58	420

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	203	0	-	0	1646	186
Stage 1	-	-	-	-	186	-
Stage 2	-	-	-	-	1460	-
Critical Hdwy	4.12	-	-	-	6.42	6.21
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.309
Pot Cap-1 Maneuver	1369	-	-	-	109	859
Stage 1	-	-	-	-	846	-
Stage 2	-	-	-	-	213	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1369	-	-	-	~ 57	859
Mov Cap-2 Maneuver	-	-	-	-	~ 57	-
Stage 1	-	-	-	-	846	-
Stage 2	-	-	-	-	111	-

Approach	EB	WB	SB
HCM Control Delay, s	4	0	41.3
HCM LOS			E

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1369	-	-	-	57	859
HCM Lane V/C Ratio	0.332	-	-	-	1.023	0.489
HCM Control Delay (s)	8.9	0	-	-	244	13.1
HCM Lane LOS	A	A	-	-	F	B
HCM 95th %tile Q(veh)	1.5	-	-	-	4.8	2.7

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection	
Int Delay, s/veh	0.7

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	17	22	488	3	5	433
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	18	24	530	3	5	471

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1014	532	0	0	534	0
Stage 1	532	-	-	-	-	-
Stage 2	482	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	264	547	-	-	1034	-
Stage 1	589	-	-	-	-	-
Stage 2	621	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	262	547	-	-	1034	-
Mov Cap-2 Maneuver	262	-	-	-	-	-
Stage 1	589	-	-	-	-	-
Stage 2	617	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	16	0	0.1
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	371	1034	-
HCM Lane V/C Ratio	-	-	0.114	0.005	-
HCM Control Delay (s)	-	-	16	8.5	0
HCM Lane LOS	-	-	C	A	A
HCM 95th %tile Q(veh)	-	-	0.4	0	-

Intersection	
Int Delay, s/veh	78.8

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	166	92	398	291	197	266
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	50	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	97	97	97	97	97	97
Heavy Vehicles, %	3	1	1	4	3	2
Mvmt Flow	171	95	410	300	203	274

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	266	0	1340	219
Stage 1	-	-	-	-	219	-
Stage 2	-	-	-	-	1121	-
Critical Hdwy	-	-	4.11	-	6.43	6.22
Critical Hdwy Stg 1	-	-	-	-	5.43	-
Critical Hdwy Stg 2	-	-	-	-	5.43	-
Follow-up Hdwy	-	-	2.209	-	3.527	3.318
Pot Cap-1 Maneuver	-	-	1304	-	~ 167	821
Stage 1	-	-	-	-	815	-
Stage 2	-	-	-	-	310	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1304	-	~ 104	821
Mov Cap-2 Maneuver	-	-	-	-	~ 104	-
Stage 1	-	-	-	-	815	-
Stage 2	-	-	-	-	~ 193	-

Approach	EB	WB	NB
HCM Control Delay, s	0	5.2	232.3
HCM LOS			F

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	104	821	-	-	1304	-
HCM Lane V/C Ratio	1.953	0.334	-	-	0.315	-
HCM Control Delay (s)	$ 530.4	11.6	-	-	9	0
HCM Lane LOS	F	B	-	-	A	A
HCM 95th %tile Q(veh)	16.9	1.5	-	-	1.4	-

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection	
Int Delay, s/veh	14.4

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	367	268	494	82	40	428
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	50	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	97	97	97	97	97	97
Heavy Vehicles, %	1	1	0	0	0	0
Mvmt Flow	378	276	509	85	41	441

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	594	0	-	0	1585	552
Stage 1	-	-	-	-	552	-
Stage 2	-	-	-	-	1033	-
Critical Hdwy	4.11	-	-	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.209	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	987	-	-	-	120	537
Stage 1	-	-	-	-	581	-
Stage 2	-	-	-	-	346	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	987	-	-	-	66	537
Mov Cap-2 Maneuver	-	-	-	-	66	-
Stage 1	-	-	-	-	581	-
Stage 2	-	-	-	-	190	-

Approach	EB	WB	SB
HCM Control Delay, s	6.3	0	43.1
HCM LOS			E

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	987	-	-	-	66	537
HCM Lane V/C Ratio	0.383	-	-	-	0.625	0.822
HCM Control Delay (s)	10.9	0	-	-	125	35.5
HCM Lane LOS	B	A	-	-	F	E
HCM 95th %tile Q(veh)	1.8	-	-	-	2.7	8.2

Intersection	
Int Delay, s/veh	0.4

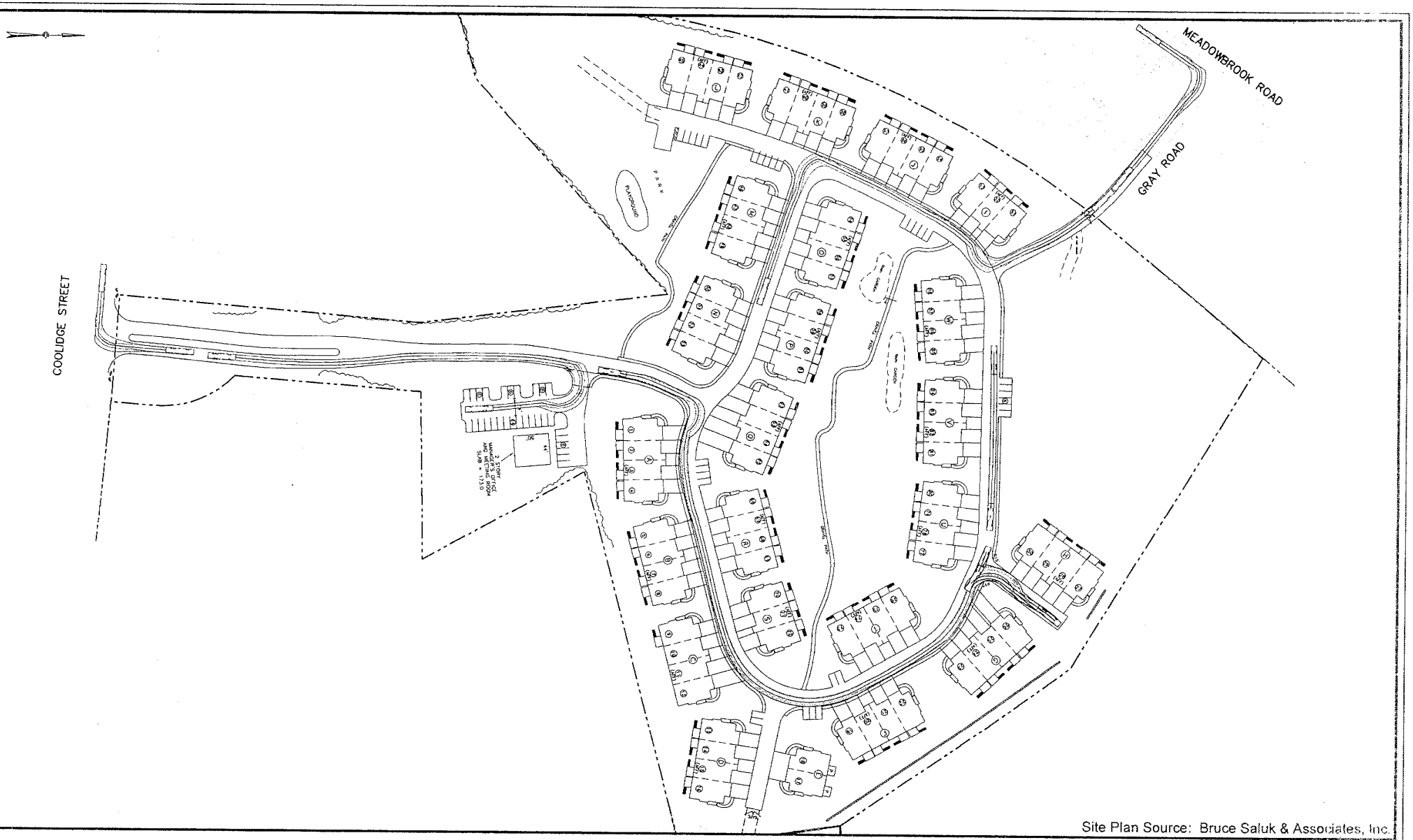
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	8	10	453	16	20	470
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	9	11	492	17	22	511

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1055	501	0	0	510	0
Stage 1	501	-	-	-	-	-
Stage 2	554	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	250	570	-	-	1055	-
Stage 1	609	-	-	-	-	-
Stage 2	575	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	243	570	-	-	1055	-
Mov Cap-2 Maneuver	243	-	-	-	-	-
Stage 1	609	-	-	-	-	-
Stage 2	558	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	15.7	0	0.3
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	357	1055	-
HCM Lane V/C Ratio	-	-	0.055	0.021	-
HCM Control Delay (s)	-	-	15.7	8.5	0
HCM Lane LOS	-	-	C	A	A
HCM 95th %tile Q(veh)	-	-	0.2	0.1	-

□ AutoTurn® Analysis



Site Plan Source: Bruce Saluk & Associates, Inc.

MDM TRANSPORTATION CONSULTANTS, INC.
Planners & Engineers
28 Lord Road, Suite 280
Marlborough, MA 01752

Scale: As Noted
DWG No. 875 Figure 2-Autoturn (10-24-2016).dwg

Date: October 2016
Project No. 875

Proposed Development

Sherborn, Massachusetts

SCALE
0 30 60 120 180 FEET

Exhibit 1
Autoturn Analysis
Sherborn Ladder Truck

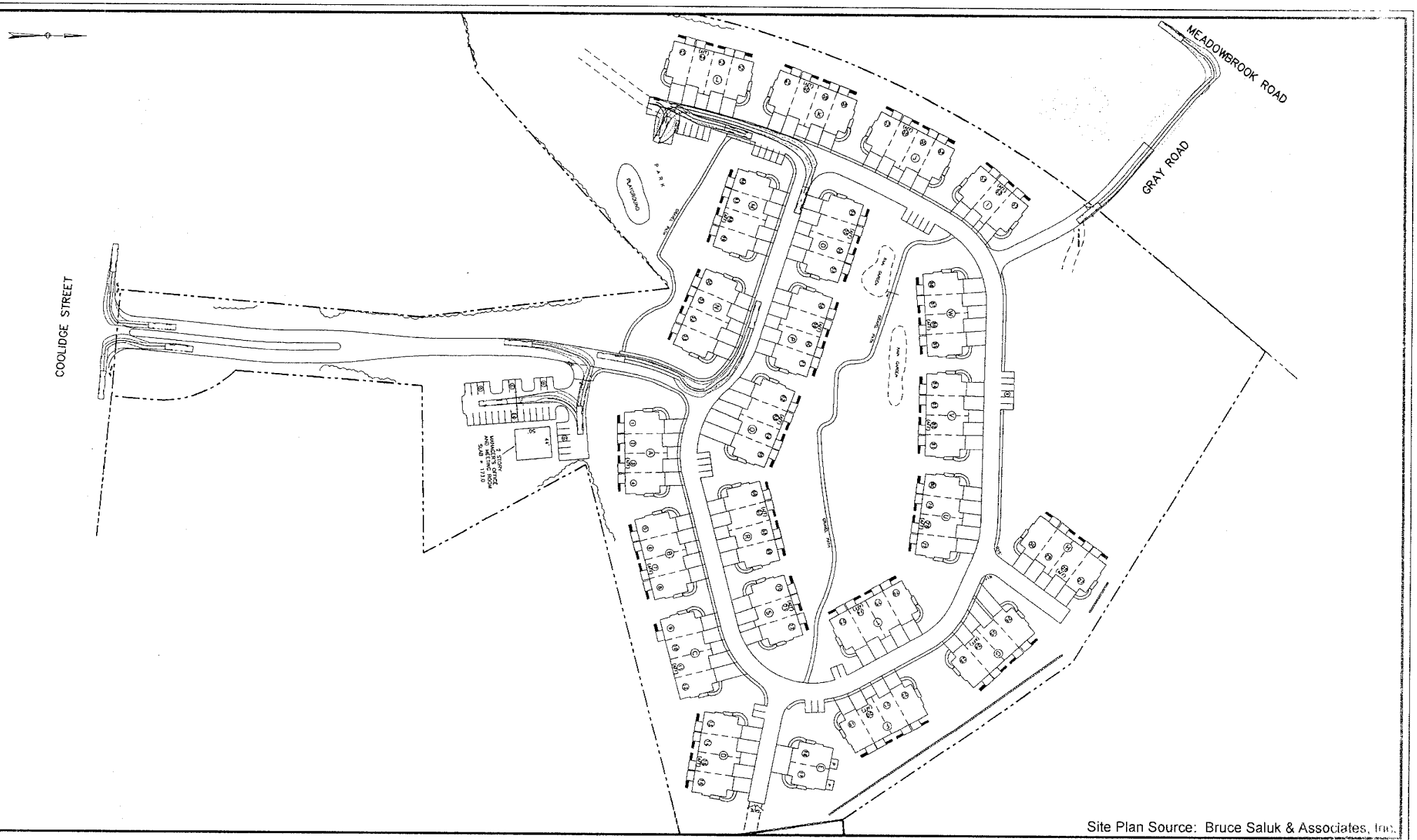


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Exhibit 2
Autoturn Analysis
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