

DRAINAGE REPORT

Prepared for:

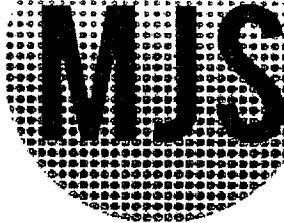
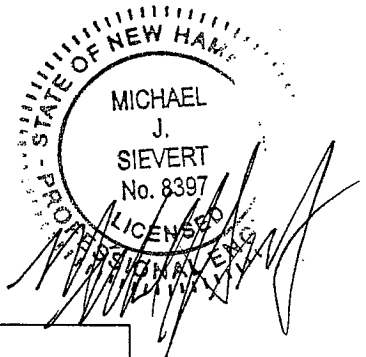
Harmony Homes by the Bay
W. Arthur Grant Circle
Durham, NH 03824
Tax Map 11 Lots (27-1) – (27-7)

RECEIVED
Town of Durham
SEP 17 2015
Planning, Assessing
and Zoning

Prepared on:

September 15, 2015

Prepared by:



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<u>Appendix Number</u>	<u>Date</u>	<u>Description</u>
A	9/17/15	Pre-Development Drainage Analysis and Watershed Plan
B	9/17/15	Post-Development Drainage Analysis and Watershed Plan
C	9/17/15	Site Specific Soil Map Report and Plans
D	9/17/15	Rip Rap Calculations

Project Background / Purpose

John Randolph of Harmony Homes is proposing to develop an eldercare facility at the Durham Business Park. The business park is currently subdivided into 7 lots. The design proposal will include merging the seven lots together, then creating a conservation easement on the area where lots 1 & 7 were and developing the remaining parcel as an eldercare facility. Access to the facility will be via the existing road, including connecting into all of the existing municipal utilities. The proposed changes will include removing a portion of the existing cul-de-sac, constructing a new driveway loop road with parking and vehicle access to the front entrance, associated utilities, stormwater system, landscaping, walking trails, horse barn and paddock. The building layout will include a maximum of 3 single-story buildings and one detached two unit age restricted single family home.

The proposed development is broken into two phases. Phase 1 will consist of the construction of building #1 (northerly building), the access road and parking directly associated with the northerly building, walking paths, as well as the reconstruction of the existing sewer pump station. Phase 2 will consist of the construction of building #2 (southerly building), the access road and parking associated with the southerly building, the age restricted single family homes and the associated driveway, as well as the horse barn and paddock.

The total disturbed area for this development project is approximately 250,000 square feet (5.74 ac).

Soil Mapping

The soils located within the proposed disturbed areas have been identified in accordance with the Society of Soil Scientists of Northern New England (SSSNNE) Special Publication No. 3, Site Specific Soil Mapping Standards for New Hampshire and Vermont. The soils on site consist mostly silty clay with Hydrologic Soil Groups determined to be C and D. Refer to Appendix C for the Site Specific Soil Report.

Drainage Analysis

Drainage conditions have been analyzed based on the runoff characteristics at two points of analysis (POA). This analysis utilizes HydroCAD modeling software. This program models the runoff based on the SCS TR-20 method and the time of concentration based on the SCS TR-55 method. This analysis compares the runoff rates for the 1 inch, 2, 10, and 25-year USDA/SCS Type III 24-hour extreme storm events. The rainfall data used in the model is referenced from the Northeast Regional Climate Center for the property location.

The existing parcels (27-1) – (27-7) have a total area of 1,161,865 square feet (26.67 ac.). The existing lots are currently undeveloped with the exception of the existing road which bisects the overall property. The road, associated drainage structures, and municipal utilities including a sewer pump station are currently on the property. The property is encumbered by the Oyster River, Johnson Creek, freshwater wetlands, tidal wetlands, as well as the associated shoreland setbacks. The existing conditions plan depicts these encumbrances, and the existing development of the property.

Pre-Development Conditions

The enclosed Pre-Development Plan (Attachment 1) depicts the contributing runoff areas that are generated from this property. The watershed areas have been determined via inspection by our office as well as a topographical survey.

Pre-Development Drainage conditions have been analyzed based on the runoff characteristics at three points of analysis (POA). The entire site consists of mostly meadow area with some wooded areas as well as a large area of a paved road known as W. Arthur Grant Circle and a small gravel access road. The entire site drains to the Oyster River but for analysis it has been broken up to the three POA's shown on the Pre-Development Plan.

The cover types located on the lot are pavement, gravel, woods, grass, and meadow areas. The wooded and grass areas are considered to be in good condition. The hydrologic analysis of the existing runoff conditions are provided in Appendix A.

Post-Development Conditions

The proposed site development is depicted on the Post Development Drainage Plan.

Subcatchment 1 of the Pre-Development has been divided into four subcatchments, Subcatchment 2 has been divided into five subcatchments and Subcatchment 3 has not been divided. The cover types are consistent with a use of this type of development and include, impervious areas (paved and roof), landscaped areas, grassed areas, as well as the typical cover types in the Pre-Development.

The stormwater management design includes gravel wetlands, conveyance swales, pre-treatment swales, treatment swales, closed drainage, drip strips, and outlet protection. The presence of clay soil on site precludes the use of infiltration best management practices

The hydrologic analysis of the proposed runoff conditions are provided in Appendix B.

Comparison of Pre- vs. Post-Conditions

The following table quantifies the peak rate of discharge and discharge volume leaving the parcel at POA's 1, 2, and 3 as shown on the Pre- and Post-Development Drainage Plans. The analysis has been run using the extreme rainfall quantities.

Table 1: Peak Rate of Runoff Comparison Table (cfs)

Condition	POA 1			POA 2			POA 3		
	Pre	Post	Change	Pre	Post	Change	Pre	Post	Change
1 inch Storm	0.07	0.19	+0.12	0.13	0.31	+0.18	0.34	0.33	-0.01
2 Yr Storm	6.86	6.52	-0.34	8.73	8.48	-0.25	16.41	15.93	-0.48
10 Yr Storm	14.67	14.55	-0.12	18.26	16.78	-1.48	33.69	32.70	-0.99
25 Yr Storm	21.29	21.06	-0.23	26.29	23.78	-2.51	48.13	46.72	-1.41

Table 2: Discharge Volume of Runoff Comparison Table (cubic feet)

Condition	POA 1			POA 2			POA 3		
	Pre	Post	Change	Pre	Post	Change	Pre	Post	Change
1 inch storm	1,068	2,550	+1,482	1,516	4,194	+2,678	3,561	3,457	-104
2 Yr Storm	25,954	31,201	+5,247	31,767	40,346	+8,579	65,190	63,283	-1,907
10 Yr Storm	53,759	60,804	+7,045	64,777	76,535	+11,758	130,909	127,079	-3,830
25 Yr Storm	77,898	85,960	+8,062	93,244	107,850	+14,606	187,216	181,739	-5,467

There is a reduction or no change in the peak rate of runoff during all the design storm events at POA 1, POA 2, and POA 3 except for the 1 inch storm event. The stormwater BMP's are designed to treat the runoff of the 1-inch storm. The increase during the 1-inch storm event is negligible. The reduction in peak rate of discharge is attributed to the gravel wetlands, treatment swales, conveyance swales, and closed drainage which in addition to treating runoff also provide peak flow attenuation. There is an increase in discharge volume at POA 1 and POA 2. The reduction at POA 3 is attributed to a decrease in total contributing area. The soils present on site are not conducive for infiltration best management practices and therefore a reduction in volume is not possible at POA 1 or POA 2.

Stormwater Treatment and Pretreatment Practices

Stormwater Pre-Treatment Practices

Stormwater pre-treatment will be provided by sediment forebays as well as pre-treatment swales. Sediment forebays dissipate the energy of the runoff and allow for settling of suspended solids. Pre-treatment swales capture sediments and associated pollutants prior to the runoff reaching the proposed treatment practices.

Stormwater Treatment Practices

Stormwater treatment will be provided by gravel wetlands and treatment swales. Gravel Wetlands provide treatment through a combination of microbial, chemical, and physical processes within the specific media of the system. Treatment swales provide treatment through specific residence times which allow for the removal of pollutants.

Erosion & Sediment Control

Temporary and permanent practices are used to prevent and minimize erosion and sedimentation on site. The installation of Silt Soxx™ at the perimeter of construction areas will provide sediment retention during the construction phase of the development. Geosynthetic Sediment Traps (Silt Sacks™) will be installed in all catchbasins accepting runoff from the redevelopment of the lot. Rip rap is proposed in drainage structure outlet areas to prevent erosion (see Appendix D for sizing calculations).

A maintenance plan will be developed for the permanent erosion control structures and stormwater treatment systems.

Conclusion

The enclosed comparative hydrologic model provides sufficient evidence that the proposed treatment swales, sediment forebays, and gravel wetlands will mitigate the typical increase in peak rate of discharge resulting from the increased impervious coverage. The use of erosion and sediment controls and proper construction practices will minimize the impact of this project.

Stormwater Management Checklist

<input type="checkbox"/>	SITE PLAN REVIEW APPLICATION	Project Name	<u>HARMONY HOMES BY THE BAY</u>	
<input type="checkbox"/>	Date of Submittal / /	Applicant's Name	<u>JOHN RANDOLPH</u>	
<input type="checkbox"/>	Engineer	<u>MJS ENG.</u>	Architect	<u>MC HENRY</u>
<input checked="" type="checkbox"/>	New Development	<input type="checkbox"/>	Re-Development	
<input type="checkbox"/>	Total Area of Disturbance _____ Square Feet (SF)			
<input type="checkbox"/>	< 10,000 SF and No Water Quality Threat {No Stormwater Management Plan Required}			
<input type="checkbox"/>	< 10,000 SF and Possible Water Quality Threat {Stormwater Management Plan Required}			
<input checked="" type="checkbox"/>	> 10,000 SF {Stormwater Management Plan Required except as provided for in 9.03 (A) with an approved AOT permit}			
STORMWATER MANAGEMENT PLAN - PART I				
<input checked="" type="checkbox"/>	EXISTING CONDITIONS PLAN			
<input checked="" type="checkbox"/>	Title Block, Appropriate Scale, Legend, Datum, Locus Plan, Professional Stamp(s)			
<input checked="" type="checkbox"/>	Topographic Contours and benchmarks			
<input checked="" type="checkbox"/>	Buildings, Structures, Wells, Septic Systems, Utilities			
<input checked="" type="checkbox"/>	Water Bodies, Wetlands, Hydrologic Features, Soil Codes, Buffer Zone			
<input checked="" type="checkbox"/>	Area of Impervious Surface <u>42,577</u> SF			
<input checked="" type="checkbox"/>	Total Area of Pavement <u>4,979</u> SF	Area of Pervious Pavement <u>0</u> SF		
<input checked="" type="checkbox"/>	PROPOSED CONDITIONS PLAN (include above existing and below proposed features)			
<input checked="" type="checkbox"/>	Title Block, Appropriate Scale, Legend, Datums, Locus Plan, Professional Stamp(s)			
<input checked="" type="checkbox"/>	Topographic Contours and benchmarks			
<input checked="" type="checkbox"/>	Buildings, Structures, Wells, Septic Systems, Utilities			
<input checked="" type="checkbox"/>	Water Bodies, Wetlands, Hydrologic Features, Soil Codes, Buffer Zone			
<input checked="" type="checkbox"/>	Impervious Surface Area <u>151,564</u> SF	Impervious Surface Increase <u>108,987</u> SF		
<input checked="" type="checkbox"/>	Total Area of Pavement <u>102,720</u> SF	Area of Pervious Pavement <u>0</u> SF		
<input checked="" type="checkbox"/>	Effective Impervious Area (EIA) <u>151,564</u> SF			
<input checked="" type="checkbox"/>	Stormwater Management & Treatment System (Describe System Elements Below)			
<input checked="" type="checkbox"/>	Name of Receiving Waterbody <u>OYSTER RIVER</u>			
<input checked="" type="checkbox"/>	Closed Drain & Catch Basin Network	<input type="checkbox"/>	Connected to Town Closed System	
<input type="checkbox"/>	Detention Structure Types <u>GRAVEL WETLANDS</u>			

<input checked="" type="checkbox"/>	Structural BMP Types	TREATMENT SWALES, SEDIMENT FOREBAYS, GRAVEL WETLANDS
<input checked="" type="checkbox"/>	LID Strategies	Through to Structural BMP's THE DESIGN REDUCES RUNOFF AND
<input checked="" type="checkbox"/>	Estimated Value of Parts to be Town Owned and/or Maintained	\$ 0.00 POLLUTANTS

STORMWATER MANAGEMENT PLAN - PART II

DRAINAGE ANALYSIS SEE DRAINAGE ANALYSIS FOR EACH POA

24-Hour Storm Event		Runoff	Pre-Development	Post-Development
<input type="checkbox"/>	1-inch	Rate	_____ Feet ³ /Sec (CFS)	_____ CFS
<input type="checkbox"/>	1-inch	Volume	_____ Feet ³ (CF)	_____ CF
<input type="checkbox"/>	2-Year	Rate	_____ CFS	_____ CFS
<input type="checkbox"/>	2-Year	Volume	_____ CF	_____ CF
<input type="checkbox"/>	10-Year	Rate	_____ CFS	_____ CFS
<input type="checkbox"/>	10-Year	Volume	_____ CF	_____ CF
<input type="checkbox"/>	25-Year	Rate	_____ CFS	_____ CFS
<input type="checkbox"/>	25-Year	Volume	_____ CF	_____ CF
<input type="checkbox"/>	100-Year	Rate	_____ CFS	_____ CFS

EROSION & SEDIMENT CONTROL PLAN

OTHER PERMITS OR PLANS REQUIRED BY USEPA or NHDES (Where applicable)

USEPA Pre- and Post-Construction Stormwater Pollution Prevention Plan

NHDES Alteration of Terrain Permit

Other (Please list)
SHORELAND PERMIT

OPERATION & MAINTENANCE PLAN

Need for 3rd Party Review? YES _____ NO X