J.E. LANDERS-CAULEY, P.E.
civil-environmental engineering
P.O. Box 364
West Falmouth, MA 02574
(508)-540-7733; 508-540-3344 fax

Mr. Scott Michaud
Cape Cod Commission
3225 Main Street
PO Box 226
Barnstable, MA 02563

September 04, 2015

Re: Nitrogen Loading and Drainage Calculations
123 Waterhouse Road
Bourne, MA

Mr. Michaud,

Below is a copy of the body of our letter sent in May of this calendar year as reference to one of our conversations.

It is apparent there are two issues which must be clarified for this project to move forward-the pre and post construction nitrogen loading generated and the pre and post construction drainage conditions and mitigation which is proposed. Below are our comments:

Nitrogen loading:

Presently the site has a traditional Title V system (septic tank, distribution box and soil absorption system-SAS). The present design flow is designed based upon the first floor of the building being used as a combination professional office and medical facilities with a calculated flow of 1400+/-gpd. It has no advanced treatment or other form of I/A treatment of the effluent. It has the minimum standard treatment of effluent.

Presently the entire flow is calculated on the use of the first floor as a combination of professional offices and medical facilities. The existing Board of Health permit reflects this design.

The proposed project intends to increase the daily design flow by the development of the second floor as solely professional office space. Office space as defined by Title V requires a daily design flow of 75gpd per 1000sf. Therefore, based on floor plans, we have anticipated the net increase in gross leasable area is not to exceed 8000sf. or a net increase of 600+/-gpd. The new daily flow proposed will be a maximum of 1995 gpd. The same design loading data is on the latest plans.

Nitrogen loading data calculation sheets were also provided in our prior submission. They depicted several nitrogen loading design scenarios. These nitrogen loading calculations were based upon the proposed design criteria of lot coverage by structures, landscaping and paving, and adjusted nitrogen loading rates. Nitrogen loading rates which are different than those you expect to calculate using the standard CCC method.

The adjusted nitrogen loading of 13.5+/ppm was targeted by us and the manufacturing representative as the maximum discharge effluent strength, based upon assurances by the manufacturing company, that the design of the sewerage system depicted upon the plan, will keep the post-construction nitrogen effluent discharge levels below the 5ppm the Cape Cod Commission are targeting.

We agree the nitrogen loading data sheets provided by you depict nitrogen loading rates higher than

permitted. However, they also do not consider the reduction in effluent strength by the proposed placement of additional advanced treatment units as proposed and shown on the latest plans. The data sheets we provided do include the reduction.

The proposed on site sewerage disposal system design was reviewed by our office and the local Board of Health. The local agent agreed that as long as it was approved technology and monitored as required by the manufacture it was acceptable with her.

The I/A system is complex yet but not unique. It incorporates carbon feeding, recirculation and aeration processes as well as the standard Title V components. It represents a rather large financial commitment by the proponent /applicant.

Drainage Calculations:

In our prior submission we stated the drainage design was based upon the use of a modified rational method. We chose this method given the area of the proposed development was too small to employ an alternate design. The rational method given the size of the watershed would permit more realistic calculations for both a higher frequency lower intense storm and a lower frequency higher intense storm (100yr-24 hour). In both cases of storm intensity the time of concentration being very short also indicated the rational method would be better suited for determining the drainage design upon this property.

We chose to determine the incremental and gross volume of water runoff based upon sheet flow. Standard coefficients of infiltration were used and the calculations were based upon the runoff either flowing to the swale/settling basin or drywells.

Two different stormwater characteristics were analyzed. A unit flow rate for the 100 year 24 hour storm and a total stormwater volume for a more frequent, shorter duration, storm. Please note a unit hydrograph was not provided given the size of the watershed is very small and a unit hourly flow rate was provided.

The 100 year-24 hour storm has a unit hourly flow rate of 519+/- cf. The other stormwater event was based upon a total rainfall of 2.5” in 3 hours. Both calculations, albeit simple, reflect accurate and realistic rainfall conditions.

The plan submitted depicting the drainage incorporates the basic elements: of pretreatment of TSS, detention, filtration and temporary stormwater detention area. In the event of large storm which would result in surface flow in excess of the capacity of the detention area a leaching pit with a raised inlet was incorporated within the detention area to accommodate the additional surface water flows.

The drainage system that has been designed does comply with all the design recommendations outlined in the Mass. Stormwater Design recommendations except for one-the side slopes standards of swales and detention construction. Given the unique shape of the lot and the restrictions of zoning it was necessary to design the side slopes at 2/1 instead of the recommended 3/1. It is our opinion the drainage design will function properly but simply need a more rigorous maintenance program. In any event it still our opinion, the drainage system designed will contain a 24 hour 100 year storm event and the shorter more frequent storm events.

Jack landers-cauley

J.E. LANDERS-CAULEY, P.E.

At your request I have prepared drainage calculations for the southeasterly portion of the site which is proposed to be constructed with a detached professional office, parking, landscaping and other normal improvements associated with the development of commercial property. The design assumptions and calculations are attached.

In our most recent discussion (05-11-2015) regarding the LID you had asked if we could redesign the side slopes of the swale, forebay and detention drainage area to 3/1 slopes versus the 2/1 slopes proposed. We have looked at that issue and determined it cannot be done without expanding the forebay and detention areas onto either the road layout or the drainage easement. Albeit we believe we could possibly encroach upon the drainage easement without interrupting the use of the drainage easement he would need approval beforehand. The road layout we do not believe we can encroach upon.

Because of the small size of the drainage area it was our opinion a modification of the rational method would be the most accurate method to use to determine drainage flow and storage. We have performed the calculations they are attached. We have also determined the watershed areas for the site improvements. They are on an accompanying plan.

Design of storm water retention and or conveyance drainage systems:

Soils:
Two soil tests were taken within the immediate area of the proposed development. Their locations are noted on the watershed plan.

*The soil tests profiled are as follows:
Test 1: 0-9" loamy sand
9"-14' medium to coarse sand
Groundwater not encountered.

Test 2: 0-8" loamy sand
8-14' medium to coarse sand
Groundwater not encountered.

The soils have been assigned a Hydrologic Group Type A soil.
Operation and Maintenance Plan:
The name of the storm water management system:
Paesano Realty Trust
Party responsible for operation and maintenance:
Paesano Realty Trust

Schedule for implementing routine maintenance:
*Each spring the entire roadway system shall be inspected by the Trust for need of maintenance or repair. Each spring those portions of roadway and parking areas which have pot holes, raveled or simply damaged by winter storms and weather shall be repaired, smoothed out, regarded or otherwise "fixed".

*Twice a year (early April and late September) the swale, forebay, detention basin and leaching pits shall be inspected by a firm, or the Trust's staff. Any necessary repairs will be conducted immediately. The inspections

shall include:

-regrading slopes.

-replanting slopes.

-cleaning the swale, forebay and detention area of organic litter and silts, sands and gravel.

-clean the leaching basins.

-sweep, in the spring, the parking areas of winter sands and salts.

Estimated Operation and Maintenance Budget:

Less than $1500 per year.

Operation and Maintenance Log:

The Trust shall provide a Maintenance form upon issuance of the permit(s) to construct the professional office and before issuance of the occupancy permit.

Description and delineation of public safety features:

All of the internal roadways and parking are private, for the exclusive use of the tenants and their clients. The Trust shall maintain complete control of the site for purposes of safety.

Prohibition of Illicit Discharges or accidental releases:

No illicit discharges are known to have taken place. This area is strictly monitored by the Trust. The tenants are proposed to be medical and professional offices. The possibility of a discharge event is extremely unlikely.

It is our opinion, the post construction Operation and Maintenance Plan is consistent with the standards as outlined by the Commonwealth of Massachusetts. If you need additional information please call my office.

Jack Landers-Cauley, PE

Drainage-123 Waterhouse.off

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(508)-540-7733; 508-540-3344 fax

Mr. Scott Michaud
Cape Cod Commission
3225 Main Street
PO Box 226
Barnstable, MA 02563

July 13, 2015

Re: Drainage Calculations-modified
123 Waterhouse Road
Bourne, MA

Mr. Michaud,

Based upon our last telephone conversation we have redesigned the drainage system to accommodate the design storm event you had requested: 24hr-100 year storm- which is equivalent to 6" of rain within 24 hours.

The redesign still incorporates the original swale to forebay to 2.5" storage capacity detention area but with the added design of a combination leaching pit and stone drainage system within the detention area. The leaching pit is proposed to have an elevated rim (as depicted on the plan) to minimize the direct infiltration of silts, sands and other fines from entering the leaching basin and the groundwater.

In our prior submissions for the lots directly to the north as well as this lot all the deep hole soil test were the same: a thin 0/A layer, variable thickness B layer, and a coarse sands and gravels C layer. In fact, the deep hole tests are remarkably similar and suggest a soil group that is very uniform. Our proposed leaching pit is to be entirely placed within the C layer.

Page 4 of 5 of the drainage calculations dated:5-11-15 notes the unit flow from the proposed improved site is 519cf for a 0.5" rainfall. The leaching pit has been sized based upon the long term rates as defined by Rawls and as the revise plan shows has a capacity greater than required.

Attached is a copy of the soil textural classes and their infiltration rates.

Jack Landers-Cauley, PE