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May 27, 2014

Att: Mr. Jeff Kints, Huron Produce
c/o
Ted Halwa, MCIP, RPP Associate Planner
MONTEITH BROWN PLANNING CONSULTANTS
610 Princess Avenue
London ON
N6B 2B9

Dear Sir: **RE: On-Site Sewage Servicing for 7- Lot Development, Exeter (South Huron) ON – For Mr. Jeff Kints, Huron Produce Ltd.**

1. Background

The subject property is comprised of 7 existing parcels (Parts 33 through 39 of Plan 52) fronting onto the west side of Morrison Line just north of Kirkton Road. The total area is 1.65 ha in size for an average lot size of 0.24ha (0.59 ac).

Based on the work plan identified in a scoping letter dated April 8 2014, investigations were carried out to assess the proposed development in the context of:

1. The Ontario Building Code for wastewater treatment system sizing in respect of house sewage load, minimum setbacks to structures, lot lines and water sources as well as native soil, slopes and anticipated residential sewage loads.

2. Procedure D5-4 of the Ontario Ministry of the Environment regarding attenuation of contaminants to groundwater.

3. Any Municipal By-laws regarding contingency bed requirements.

Since sewage servicing is highly dependent on the native soils and site drainage, subsurface and topographical investigations were completed.

2. Existing Subsurface

On April 25th, a site visit was carried out, accompanied by a backhoe and operator. Six test pits were formed as indicated on the enclosed drawing. The test pit logs are presented on drawing 1 attached and are summarized below:

TEST PIT	DEPTH (cm)	SOIL TYPE
TP1	0 - 25	Clay Topsoil
	25 - 69	Br. Silty CLAY (Tested: T >50 min/cm)
	69 - >132	Hard Gr. CLAY (Mottled) (Est : T >50 min/cm)
TP2	0 - 23	Clay Topsoil
	23 - 38	Br. Silty CLAY (Est : T >50 min/cm)
	38 - >183	Hard Gr. CLAY (Mottled) (Est : T >50 min/cm)
TP3	0 - 23	Clay Topsoil
	23 - 46	Br. Silty CLAY (Tested: T >50 min/cm)
	46 - >122	Hard Gr. CLAY (Mottled) (Est : T >50 min/cm)
TP4	0 - 27	Clay Topsoil
	27 - 76	Br. Silty CLAY (Moist) (Est : T >50 min/cm)
	76 - >135	Hard Gr. CLAY (Mottled) (Est : T >50 min/cm)
TP5	0 - 25	Clay Topsoil
	25 - 48	Br. Silty CLAY (Est : T >50 min/cm)
	48 - >145	Hard Gr. CLAY (Mottled) (Est : T >50 min/cm)
TP6	0 - 18	Clay Topsoil
	18 - 38	Br. Silty CLAY (Est : T >50 min/cm)
	38 - >142	Hard Gr. CLAY (Mottled) (Est : T >50 min/cm)

All test pits were consistent. The upper clay topsoil ranged in depth from 18 to 27cm underlain by brown silty clay extending to depths of 38 to 76 cm. The underlying soil was hard grey clay to test pit termination up to 183cm depth. The coefficient of permeability of the grey Clay is low and estimated to be less than 10^{-7} cm/s, while that of the upper brown Clay is not much more permeable at 10^{-6} cm/s.

All test pits were dry. The upper brown silty clay at test pit 4 was observed to be moist as it was located within a surface drainage route.

One soil grain size analysis was conducted on the native clay soil, only to confirm the negligible sand content. The test result is presented in Appendix A.

3. Topography

A topographical survey was conducted. The site is undulating and slopes toward the road ditch along the west side of Morrison Line. The road ditch has a "breakpoint" between Parts 37 and 38.

Drainage waters from Parts 33 through 37 drain toward an existing 300mm diameter corrugated steel pipe located between the Parts 35 and 36 that discharges to the east

side of Morrison Line. Parts 38 and 39 drain toward the same road ditch that slopes northward along Morrison Line.

The subject lots also accept drainage waters from the westerly agricultural and golf course lands. The extent of the contributing drainage area was not investigated but there are three defined swales for overland flow that enter the subject site, as indicated on Drawing 1.

4. Proposed Servicing

The lots are to be serviced by private wells and private on-site wastewater treatment systems. The systems will be designed for municipal approval according to the requirements of the Ontario Building Code (OBC) for systems with *peak daily loading of less than 10,000 L/day.* Such on-site systems are used in unserviced areas and provide primary treatment of effluent for dissipation and dilution into the subsoil and eventually to receiving waters.

Enhanced treatment systems are currently in common use on clay soils to provide improved treatment of wastewater prior to subsurface discharge. The benefits of enhanced treatment also include a smaller footprint (approximately 50% of the footprint of a standard raised bed) and a smaller and slightly lower raised area.

The proposed development will contain seven (7) single-family dwellings. The OBC specifies minimum setbacks from buildings, wells, water tables and property lines that are to be respected in the design.

A concept plan for wastewater servicing and grading is presented on Drawing 1 enclosed. This plan includes assumptions for typical home sizes, characteristics and sewage loads. A typical sewage load of 2500L/day was used in the calculations for sizing the systems, although the indicated septic system footprints are capable of treating 2900 L/day, if enhanced treatment (Level IV treatment) is used. Conventional raised filter beds can also be accommodated in the front yards of these lots for a sewage load of 2500 L/day if house elevations are further raised by approximately 30cm and the bed footprint is extended to the lot lines and driveways.

5. Sewage Impact Assessment

In the context of a multi-lot development, municipalities often require assessment of groundwater impacts in accordance with MOE Procedure D5-4. This procedure outlines a multi-step process to gauge the effects of the combined effluent discharges from all of the individual sewage systems in a development, usually based on nitrogen as an indicator of groundwater impact potential.

5.1 Definition of Minimum Lot Size

Generally, if the average lot size is larger than 1.0 ha in size with no lot being smaller than 0.8 ha, then a hydrogeological assessment is not required provided that the area is not hydrogeologically sensitive. Since the lots are smaller, it is necessary to proceed to the next step.

5.2 System Isolation Considerations

Where smaller lots than 1.0 ha are proposed, it is necessary to consider the status of isolation of the sewage effluent from the existing or potential supply aquifer. Based on the shallow soils as assessed, it is probable that the supply aquifer is hydrogeologically isolated from the surficial brown clay soils that will receive the sewage effluent. However, review of deeper soil profiles through water well records in the area should be undertaken to verify this.

In reviewing publicly available data in the Groundwater Information Network *(a mapping project coordinated by The Geological Survey of Canada and Natural Resources Canada)*, there are four documented wells within 500m of the site and two of these are identified on lands north of the subject property:

- Well 3004662 is 9.75m deep and appears to be unsuccessful in documenting water.
- Well 3003970 is 9.14m deep through 8.6m of clay before reaching a gravel aquifer. Static water depth is 6.71m.

There is also a well on the adjacent upslope golf course:

- Well 3002057 is 7.92m deep through 6.8m of clay before reaching a sand and gravel aquifer. Static water depth is 1.83m.

One well exists near the intersection of Kirkton Road and Morrison Line with the following characteristics:

- Well 3001683 is 10.97m deep through 9.5m of clay before reaching a sand aquifer. Static water depth is 6.1m.

All of these wells document 6.8 to 9.5m of surficial clay before reaching the aquifer. Based on this information, and the negligible permeability of the native soil, ($<10^{-7}$ cm/s) the aquifer appears to be sufficiently isolated from the impacts of sewage effluent.

Since the documented aquifer appears to be confined, no further analysis is required.

6. Conclusions and Recommendations

1. The water-supply aquifer appears to be isolated from the surface by at least 6.8m of clay that is essentially impermeable.

2. Despite this isolation, it is recommended that all proposed sewage systems on this sloping site be located downslope of the proposed wells on these lots. All setbacks should conform, at minimum, to Ontario Building Code requirements with septic systems located at the fronts of the homes adjacent Morrison Line and Wells located upslope in the rear yards.

3. No assessment of water availability/supply has been conducted. Sufficient groundwater quantity and quality of supply should be verified by others.

4. Although conventional raised beds will fit in the front yards of the lots, the use of enhanced treatment on all lots, as indicated on Drawing 1 will yield environmental benefits by reducing suspended solids, BOD_5 and phosphorus in effluent discharged to the surficial brown clay soils and ultimately to the road ditch and will also allow a smaller bed footprint providing future owners with flexibility for house siting and other amenities.

5. The use of enhanced treatment systems will require regular maintenance and monitoring as outlined in the OBC. Each future homeowner using enhanced treatment will be required to enter a maintenance and monitoring contract with the supplier.

6. Native clay soils will require treatment beds that are raised above existing grades. The finished grade at the fronts of the homes on these lots should generally be raised approximately 1.0m above existing grade to facilitate an aesthetically pleasing treatment bed that would avoid the need for sewage pumping. Driveway grades should generally be 30cm lower than the finished grade across the front of each home.

7. It presently appears that all drainage is surficial toward the road ditch along Morrison Line. The owner is not aware of any municipal drain near the site and to date no response has been received from the Municipality to a recent query in this regard. Conveyance of off-site drainage from westerly lands onto the subject lots should certainly be examined and accommodated within the ultimate development plan.

8. The Chief Building Official confirms that South Huron does not require the designation of a contingency septic bed in development of lots. A lot grading plan and detailed septic system design will of course be required at the building permit stage for each lot.

We trust this meets the requirements of our scope of work.

Sincerely,
BOS Engineering & Environmental Services Inc.

Art W. Bos P. Eng.

Enclosure: Appendix "A" and One D-Size Drawing: "Concept Plan for Onsite Servicing & Grading"

APPENDIX A

SOIL GRAIN SIZE ANALYSIS

(SAND FRACTION ONLY)

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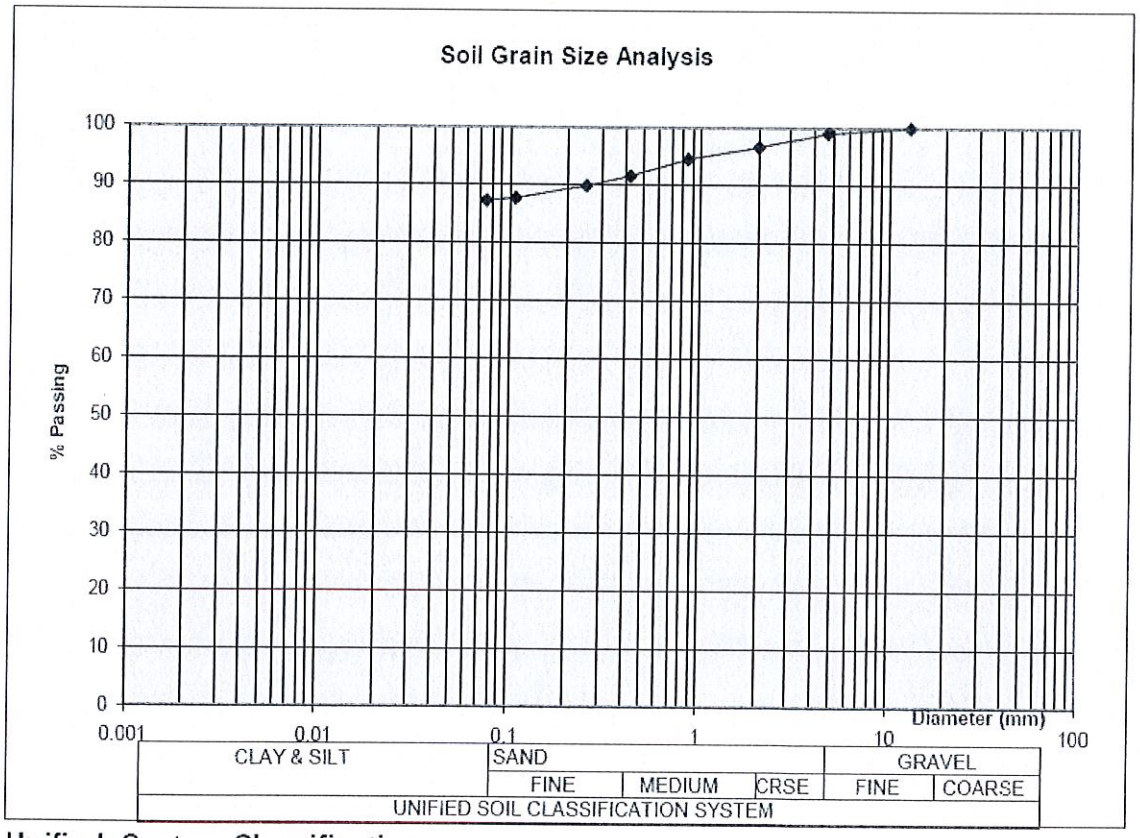
Project :	Native Soil	*Client :*	Jeff Kints
Test Pit :	TP 1	*RE:*	Waste Treatment System
Depth :	23 to 69 cm	*Proj. No .*	
Dry Mass:	199.9 g	*Date:*	Apr 26/14

CHART DATA

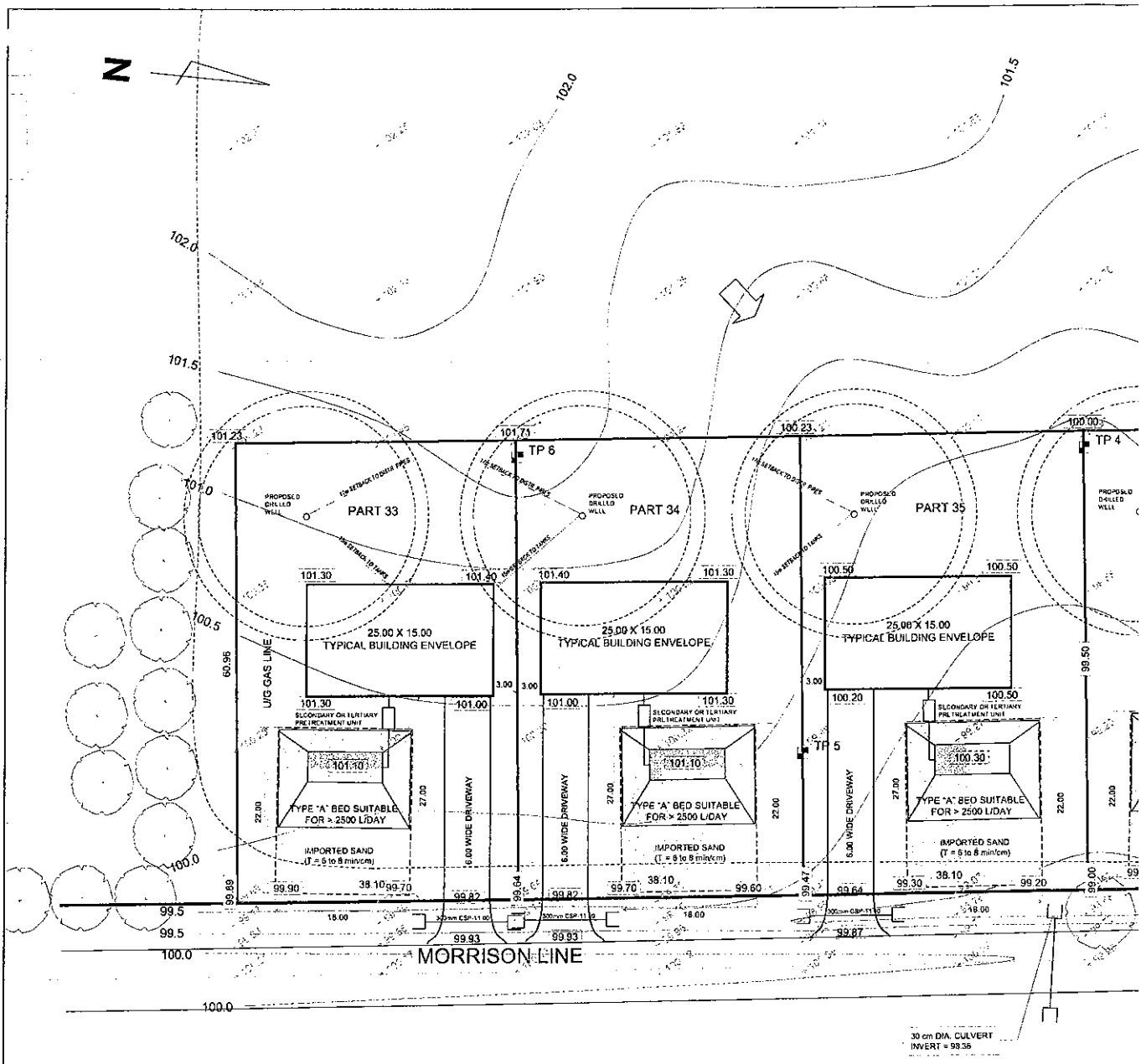
Sieve No.	Mass	Cum. Mass	Diam. (d)	% Passing
		0	12.7	100
4	1.9	1.9	4.75	99
10	4.8	6.7	2	97
20	4.2	10.9	0.85	95
40	5.9	16.8	0.425	92
60	3.3	20.1	0.25	90
140	4.5	24.6	0.106	88
200	0.8	25.4	0.075	87



Unified System Classification:

OH Organic CLAY (87% Finer than 200 sieve)

Est. Percolation Time: T >50 min/cm Coefficient of Permeability =10^{-6} cm/s



TYPICAL NEW HOME CHARACTERISTICS & RELATED SEWAGE SYSTEM DESIGN

THIS PLAN IS NOT FOR BUILDING PERMIT APPROVAL. A SPECIFIC SITE/WASTE/GRADING PLAN IS REQ'D FOR FINAL HOME DESIGN & LOCATION – FOR BUILDING PERMIT APPROVAL. THIS PLAN PROVIDES ASSUMED TYP
APPROVAL ONLY. THE PLAN IS NOT NECESSARILY MEANT TO LIMIT THE PROPOSED BUILDING SIZE OR CHARACTERISTICS TO THE ASSUMED VALUES. IT IS ALSO NOT MEANT TO NECESSARILY LIMIT THE TYPE OF TRE

TYPICAL BUILDING SIZE & PLUMBING FIXTURES

ITEM	No.	LOAD	TOTAL
1. FULL BATHROOM	3	6	18
ADDED INDIVIDUAL ITEMS :			
2. ANY TYPE OF BATH	0	1.5	0
3. FLUSH TANK TOILETS	0	4	0
4a SHOWER(1 HEAD)	0	1.5	0
4b SHOWER(2 HEAD)	1	3.0	3.0
5. FLOOR DRAIN	1	2 - 4	3.0
6 LAVATORY (DOMESTIC)	1	1	1.0
7. BIDET	0	1	0
8. KITCHEN SINK	1	1.5	1.5
9. DISHWASHER	1	1.5	0.5
10. LAUNDRY TUB	1	1.5	1.5
11. CLOTHES WASHER	1	1.5	1.5
12. DRINKING FOUNTAIN	0	0.5	0
13. GARBAGE GRINDER	0	3	0
TOTAL UNITS			30.0
NO. OF BEDROOMS:			4
TOTAL LIVING AREA:			250m²

WASTE SYSTEM – PEAK LOAD DESIGN CAPACITY FOR THE ASSUMED BUILDING CHARACTERISTICS

MAX. BASE LOAD (4 BEDROOM):	2000
Add Highest of 1 or 2 below:	
1. F. U. OPTION (30 - 20) X 50 :	500
2a. L. A. OPTION (250-200)/10 X 100:	500
2b. L.A. ADDED (0 - 400)/10 X 75:	0
2c. L.A. ADDED (0 - 600)/10 X 50:	0
TOTAL(ITEM 2):	900
ADD HIGHEST OF 1, 2 & 3 ABOVE:	500
DESIGN LOAD =	**2500 L/DAY**

TYPE "A" BED SIZING CALCULATIONS FOR SEWAGE LOAD OF 2500 L/day

1. DESIGN LOAD = 2500 L/DAY (SEE "DESIGN CAPACITY")
2. USE ONE FAST TREATMENT UNIT (MODEL 0.9) OR EQUIVALENT TO MEET BMEC APPROVAL FOR 2500 L/DAY. (NOTE: SIGNED MAINTENANCE AGREEMENT REQUIRED)
3. MIN. STONE AREA = 2500 / 75 = 33.3 m² SPECIFIED: 4.00 X 10.00 = 40.0 m²
4. MIN. TOTAL SAND CONTACT AREA = QT/400 = 313 m². TOTAL SPECIFIED MANTLE FOOTPRINT = 22.0 x 18.0 = 395 m²
5. IMPORTED SAND : T = 6 to 8 min/cm
6. SEPTIC TANK: INCLUDED IN TREATMENT UNIT CAPACITY.

AS CONSTRUCTED SERVICES COMPLETION

No.	REVISIONS	DATE	BY
0	FOR DEVELOPMENTAPPROVAL (WASTEWATER)	27 May 14	AWS

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