CULLINAN ENGINEERING

September 20, 1995 CEC No. 940354-02

Keyes Associates
One Moody Street
Waltham, MA 02154

RECEIVED
SEP 26 1995
SOUTHBOROUGH BOARD OF HEALTH

Dear Sirs:

Cullinan Engineering Co., Inc., at your request, has performed additional soil evaluations and percolation test at the Margaret Neary Elementary School. The purpose of this investigation was to investigate a specific area of the site where unofficial testing by others suggested that there may be acceptable soils to support subsurface sewage disposal.

Two test pits (E & F) were excavated in this general area during a previous general soils investigation conducted by us on January 3 and 4, 1995 which found high groundwater and dense sand and silt soils. No percolation testing was performed at that time due to the high groundwater encountered. The area investigated by this current testing is located on the northwestern portion of the property approximately 2200' north of the existing elementary school.

Three test pits and eight percolation pits were evaluated on August 16 & 17, 1995, using S.C.S. Soil Evaluation Methods (see attached soil logs). The testing was witnessed by Mr. Robert Kimball (Water Pollution Control Division, D.E.P.) and Mr. Paul Pisinski (Southboro B.O.H. Agent). Mr. Michael Sullivan and Mr. Robert DiPitrie, Jr., members of the School Building Committee, were present during a portion of the testing. Percolation Tests #3 and #4 had rates of 3 min./in. and 2 min./in., respectively. Perc Tests #1, #2, #5, and #6 failed to drop the initial 3" in 30 minutes, and overnight soaks were performed (310 CMR 15:105(6)). These holes were retested on August 17, 1995. The percolation test results for these four tests were 51 min./in., 12 min./in., 50 min./in. and 42 min./in., respectively. Percolation Tests #7 and #8 were run on August 17, 1995 and produced rates of less than 2 min./in.

In summary, percolation tests #2, 3, 4, 7 & 8 had acceptable (passing) percolation rates. Tests #1, 5 and 6 failed (over 30 min/in) for the percolation test. The percolation rates and the soil evaluation of the test pits suggests that there are quite variable conditions in the general area. The attached Figure #1 depicts the relative location of the testing that has been performed. The test holes have not been located by survey at this time, the locations are approximated only.

The preliminary test results suggest that a part of the tested area may be suitable for subsurface sewage disposal. Cullinan performed preliminary calculations for sizing a leach trench system based on the obtained percolation rates and for a 9,500 gal./day (475 student/faculty x 20 gal./day = 9,500 gal./day) absorption system. Figure #1 shows concept layout of such a system, it assumes 3' wide x 2' deep trenches with reserve area between

active trenches. The sketch, as illustrated, provides 3,000 l.f. of trench. There is the possibility that additional deep soil holes and/or percolation tests may be necessary to verify that at least four feet of naturally occurring pervious material exist throughout the area proposed for the soil absorption system. To determine more definitely the acceptability of this area, Cullinan recommends the following:

1. Perform a topographic survey of the area; locate and obtain ground elevation of all the test holes; flag and locate all wetland resources; establish location of the property lines in this vicinity.

2. Based on the survey information, evaluate the concept design for the soil absorption system.

3. Perform additional testing as needed to verify acceptability of area under the proposed soil absorption system.

4. Obtain a written determination from the Department of Environmental Protection regarding an interpretation relating to Section 15.010 of the State Environmental Code, Title 5. The specific question relates to whether or not under the regulations that D.E.P. considers this a facility with the existing Margaret Neary Elementary School and a proposed Middle School, the combined estimated design sewage flow will be over 10,000 gpd. Section 15.010 (4) states "The Department or the approving authority, upon determining that ownership or control of the facilities asserted to be in separate ownership or control was arranged to circumvent the treatment or effluent standard requirements of 310 CMR 15.202 (recirculating sand filters) or 314 CMR 5.00 or 314 CMR 6.00 (groundwater discharge program), may order the owner or operator to consolidate the separate systems, to comply with the requirements of 310 CMR 15.202 (Recirculating Sand Filters), to obtain a groundwater discharge permit pursuant to 314 CMR 5.00 and 6.00, or to take any other action necessary to protect public health, safety, welfare or the environment."

The acceptability of this area for siting of a subsurface sewage disposal system to accommodate a new middle school is dependent on completion of the above items. It appears at this time that the site is rather marginal for subsurface sewage disposal, however, if properly proven out with survey and additional testing, it may be found to be acceptable.

We trust that the information provided herewith is sufficient for the intended purposes. If you have any questions or if we can be of any further assistance in this matter, please contact us.

Very truly yours,

Dennis C. Rice

Dennis C. Rice, PE
Senior Project Manager

DCR/rjd/pch

cc: Southboro Board of Health

NOTES:

1) TESTING PERFORMED ON AUGUST 16 & 17, 1995

2) ALL LOCATIONS ARE APPROXIMATE ONLY

1" = 100' ± (USGS 1983)
CONTOUR INTERVAL = 3 METERS

PERC RESULTS 8/16/95 & 8/17/95

P-1	> 30 MPI (FAILURE)
P-2	12 MPI
P-3	3 MPI
P-4	7 MPI
P-5	> 30 MPI (FAILURE)
P-6	> 30 MPI (FAILURE)
P-7	< 2 MPI
P-8	< 2 MPI

10 TRENCHES - 2'x 3'x 100'
(RESERVE AREA BETWEEN TRENCHES)

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(RESERVE AREA BETWEEN TRENCHES)

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(RESERVE AREA BETWEEN TRENCHES)

LEGEND:

- P-1 PERCOLATION TEST
- T.P.A TEST PIT (8/16/95)
- 96 EXISTING CONTOURS
- CaB / MeB SOIL DELINEATION & SYMBOLS
- PROPERTY LINE

CLIENT / PROJECT: KEYES ASSOCIATES
SOILS TESTING LOCATION PLAN
PRELIMINARY SOIL ABSORPTION SYSTEM LOC.
SUBJECT: MARGARET NEARY ELEMENTARY SCHOOL, SOUTHBORO, MA

DATE 8/22/95 JOB NO. 940945
BY AJTC CHKD. BY DR SHEET 1 OF 1

CULLINAN ENGINEERING
AUBURN • BOSTON

No. _____ Date 8/16/95

Commonwealth of Massachusetts

Southborough, , Massachusetts

Site Suitability Assessment for On-site Sewage Disposal

Performed By: Robert J. Duff, Cullinan Engineering Co., Inc. Certification Number: .....

Witnessed By: Robert Kimball, D.E.P.
Paul Pisinski, Southborough B.O.H.

Location Address or Lot No.	Owner's Name, Address and Tel. #
Town of Southborough Margaret Neary School Parkerville Street Southborough, MA	Same

New Construction [X] Repair [ ]

Office Review

Published Soil Survey Available: No [ ] Yes [X]

Year Published 1985 Publication Scale ..... Soil Map Unit 23

Drainage Class Poorly Drained Soil Limitations .....

Surficial Geologic Report Available: No [X] Yes [ ]

Year Published Publication Scale

Geologic Material (Map Unit) .....

Landform .....

Flood Insurance Rate Map:

Above 500 year flood boundary No [ ] Yes [X]

Within 500 year flood boundary No [X] Yes [ ]

Within 100 year flood boundary No [X] Yes [ ]

Wetland Area:

National Wetland Inventory Map (map unit) .....

Wetlands Conservancy Program Map (map unit) .....

Current Water Resource Conditions (USGS): Month July, 1995

Range : Above Normal [ ] Normal [ ] Below Normal [X]

Other References Reviewed: .....

On-site Review

Deep Hole Number A Date: 8/16/95 Time: AM Weather 95° Sunny, Hot

Location (identify on site plan)

Land Use Field Slope (%) 5-8% Surface Stones None

Vegetation

Landform Kane Terrace

Position on landscape (sketch on the back)

Distances from:

Open Water Body NA feet Drainageway 450± feet

Possible Wet Area 450± feet Property Line 100 feet

Drinking Water Well NA feet Other

DEEP OBSERVATION HOLE LOG (TP A)

Depth from Surface (inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (Munsell)	Soil Mottling	Other (Structure, Stones, Boulders, Consistency, % Gravel)
0 - 9	Ap	Sandy Loam	10YR4/3		
9 - 28	Bw	Sandy Loam	2.5Y6/6		
28 - 48	C_1	Dense Loamy Sand	2.5Y6/2	@ 36" 7.5YR5/8 > 5%	
48 - 108	C_2	Looser Loamy Sand	2.5Y7/1		Friable

Parent Material (geologic) Depth to Bedrock: NA

Depth to Groundwater: Standing Water in the Hole: None Obs Weeping from Pit Face: None Obs.

Estimated Seasonal High Ground Water: 36" (based on soil mottling)

Determination for Seasonal High Water Table TPA

Method Used:

- ☐ Depth observed standing in observation hole ..... inches
- ☐ Depth weeping from side of observation hole ..... inches
- ☒ Depth to soil mottles ..... 36 inches
- ☐ Ground water adjustment ..... feet

Index Well Number ..... Reading Date ..... Index well level .....
Adjustment factor ..... Adjusted ground water level .....

Depth of Naturally Occurring Pervious Material

Does at least four feet of naturally occurring pervious material exist in all areas observed throughout the area proposed for the soil absorption system? _____

Additional testing may be required to verify this after a preliminary design is developed.

If not, what is the depth of naturally occurring pervious material? _____

Certification

I certify that on 4/26/95 (date) I have passed the examination approved by the Department of Environmental Protection and that the above analysis was performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017.

Signature Robert J Duff Date 9/20/95

No. _____ Date 8/16/95

Commonwealth of Massachusetts
Southborough, , Massachusetts

Site Suitability Assessment for On-site Sewage Disposal

Performed By: Robert J. Duff, Cullinan Engineering Co., Inc. Certification Number: .....
Witnessed By: Robert Kimball, D.E.P.
Paul Pisinski, Southborough B.O.H.

Location Address or Lot No.	Owner's Name, Address and Tel. #
Town of Southborough Margaret Neary School Parkerville Street Southborough, MA	Same

New Construction [X] Repair [ ]

Office Review

Published Soil Survey Available: No [ ] Yes [X]
Year Published 1985 Publication Scale ..... Soil Map Unit 23
Drainage Class Poorly Drained Soil Limitations .....
Surficial Geologic Report Available: No [X] Yes [ ]
Year Published Publication Scale
Geologic Material (Map Unit) .....
Landform .....
Flood Insurance Rate Map:
Above 500 year flood boundary No [ ] Yes [X]
Within 500 year flood boundary No [X] Yes [ ]
Within 100 year flood boundary No [X] Yes [ ]
Wetland Area:
National Wetland Inventory Map (map unit) .....
Wetlands Conservancy Program Map (map unit) .....
Current Water Resource Conditions (USGS): Month July, 1995
Range : Above Normal [ ] Normal [ ] Below Normal [X]
Other References Reviewed: .....

On-site Review

Deep Hole Number B Date: 8/18/95 Time: AM Weather 90° Sunny, Hot

Location (identify on site plan)

Land Use Field Slope (%) 5-8% Surface Stones None

Vegetation Grass

Landform Kame Terrace

Position on landscape (sketch on the back)

Distances from:

Open Water Body N/A feet Drainageway 600 feet

Possible Wet Area 600 feet Property Line 200 feet

Drinking Water Well N/A feet Other

DEEP OBSERVATION HOLE LOG

Depth from Surface (Inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (Munsell)	Soil Mottling	Other (Structure, Stones, Boulders, Consistency, % Gravel)
0 - 10"	Ap	Sandy Loam	10YR4/3		
10 - 25"	Bw	Sandy Loam	2.5Y6/6		
25 - 132"	C	Loamy Sand	2.5Y5/3	@43" Mottles 7.5YR6/8	Stones 15%

Parent Material (geologic) Depth to Bedrock: N/A

Depth to Groundwater: Standing Water in the Hole: None Obs. Weeping from Pit Face: None Obs. @ 132"

Estimated Seasonal High Ground Water: 43"

Determination for Seasonal High Water Table

TPB

Method Used:

- ☐ Depth observed standing in observation hole ..... inches
- ☐ Depth weeping from side of observation hole ..... inches
- ☒ Depth to soil mottles 43 inches
- ☐ Ground water adjustment ..... feet

Index Well Number ..... Reading Date ..... Index well level .....
Adjustment factor ..... Adjusted ground water level .....

Depth of Naturally Occurring Pervious Material

Does at least four feet of naturally occurring pervious material exist in all areas observed throughout the area proposed for the soil absorption system? _____

Additional testing may be required to verify this after a preliminary design is developed.

If not, what is the depth of naturally occurring pervious material? _____

Certification

I certify that on 4/20/95 (date) I have passed the examination approved by the Department of Environmental Protection and that the above analysis was performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017.

Signature Robert J. Duff Date 9/20/95

No. _____ Date 8/16/95

Commonwealth of Massachusetts
Southborough, , Massachusetts

Site Suitability Assessment for On-site Sewage Disposal

Performed By: Robert J. Duff, Cullinan Engineering Co., Inc. Certification Number: .....
Witnessed By: Robert Kimball, D.E.P.
Paul Pisinski, Southborough B.O.H.

Location Address or Lot No.	Owner's Name, Address and Tel. #
Town of Southborough Margaret Neary School Parkerville Street Southborough, MA	Same

New Construction [X] Repair [ ]

Office Review

Published Soil Survey Available: No [ ] Yes [X]
Year Published 1985 Publication Scale ..... Soil Map Unit 23
Drainage Class Poorly Drained Soil Limitations .....
Surficial Geologic Report Available: No [X] Yes [ ]
Year Published Publication Scale
Geologic Material (Map Unit) .....
Landform .....
Flood Insurance Rate Map:
Above 500 year flood boundary No [ ] Yes [X]
Within 500 year flood boundary No [X] Yes [ ]
Within 100 year flood boundary No [X] Yes [ ]
Wetland Area:
National Wetland Inventory Map (map unit) .....
Wetlands Conservancy Program Map (map unit) .....
Current Water Resource Conditions (USGS): Month July, 1995
Range : Above Normal [ ] Normal [ ] Below Normal [X]
Other References Reviewed: .....

On-site Review

Deep Hole Number C Date: 8/18/95 Time: PM Weather 90° Sunny, Hot

Location (identify on site plan)

Land Use Field Slope (%) 5-8% Surface Stones

Vegetation Grass

Landform Kane Terrace

Position on landscape (sketch on the back)

Distances from:

Open Water Body N/A feet Drainageway 700 feet

Possible Wet Area 700 feet Property Line 100 feet

Drinking Water Well N/A feet Other

DEEP OBSERVATION HOLE LOG

Depth from Surface (Inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (Munsell)	Soil Mottling	Other (Structure, Stones, Boulders, Consistency, % Gravel)
0" - 11"	Ap	Sandy Loam	10YR4/2		
11" - 36"	Bw	Sandy Loam	2.5Y6/6	@ 34" 7.5YR5/8	
36" - 108"	C	Loamy Sand	2.5Y6/2		Stones 15% Friable

Parent Material (geologic) Depth to Bedrock: N/A

Depth to Groundwater: Standing Water in the Hole: None Obs. Weeping from Pit Face: None Obs. @ 108"

Estimated Seasonal High Ground Water: 34" @ 108"

Determination for Seasonal High Water Table TPC

Method Used:

- ☐ Depth observed standing in observation hole ..... inches
- ☐ Depth weeping from side of observation hole ..... inches
- ☒ Depth to soil mottles 34 inches
- ☐ Ground water adjustment ..... feet

Index Well Number ..... Reading Date ..... Index well level .....
Adjustment factor ..... Adjusted ground water level .....

Depth of Naturally Occurring Pervious Material

Does at least four feet of naturally occurring pervious material exist in all areas observed throughout the area proposed for the soil absorption system? _____

Additional testing may be required to verify this after a preliminary design is developed.

If not, what is the depth of naturally occurring pervious material? _____

Certification

I certify that on 4/26/95 (date) I have passed the examination approved by the Department of Environmental Protection and that the above analysis was performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017.

Signature Robert J Duff Date 9/20/95

COMMONWEALTH OF MASSACHUSETTS

Southboro , Massachusetts

Percolation Test #1		
Date: 8/16/95 & 8/17/95 Time: 9:15 a.m.		
Observation Hole #	#1	Overnight
Depth of Perc	54"	
Start Pre-soak	9:32	9:15
End Pre-soak	9:47	9:34
Time at 12"	9:47	9:34
Time at 9"	10:35	10:57
Time at 6"		1:27
Time (9"-6")		152 Min.
Rate Min./Inch		51 Min./In.

Site Passed ☐ Site Failed ☒ (Area of Perc Failed)

Performed By: R. Duff - W. Richard, Cullinan Engineering Co., Inc.

Witnessed By: R. Kimball, D.E.P.; P. Pisinski, Southboro B.O.H. Agent

Comments:

FORM 12 - PERCOLATION TEST

COMMONWEALTH OF MASSACHUSETTS

Southboro , Massachusetts

Percolation Test #2

Date: 8/16/95 & 8/17/95 Time: 9:30 a.m.

Observation Hole #	#2	Overnight
Depth of Perc	52"	
Start Pre-soak	10:52	9:30
End Pre-soak	11:01	9:49
Time at 12"	11:07	9:49
Time at 9"	11:40	10:12
Time at 6"		10:46
Time (9"-6")		34 Min.
Rate Min./Inch		12 min./in.

Site Passed [X] Site Failed [ ] (Area of Perc Passed)

Performed By: R. Duff - W. Richard, Cullinan Engineering Co., Inc.

Witnessed By: R. Kimball, D.E.P.; P. Pisinski, Southboro B.O.H. Agent

Comments:

FORM 12 - PERCOLATION TEST

COMMONWEALTH OF MASSACHUSETTS

Southboro , Massachusetts

Percolation Test #3		
Date: 8/16/95	Time: 11:20 a.m.	
Observation Hole #	#3	
Depth of Perc	60"	
Start Pre-soak	11:20	
End Pre-soak	11:37	
Time at 12"	11:37	
Time at 9"	11:39	
Time at 6"	11:48	
Time (9"-6")	9 Min.	
Rate Min./Inch	3 min./in.	

Site Passed [X] Site Failed [ ] (Area of Perc Passed)

Performed By: R. Duff - W. Richard, Cullinan Engineering Co., Inc.

Witnessed By: R. Kimball, D.E.P.; P. Pisinski, Southboro B.O.H. Agent

Comments:

FORM 12 - PERCOLATION TEST

COMMONWEALTH OF MASSACHUSETTS

Southboro , Massachusetts

Percolation Test #4		
Date: 8/16/95	Time: 12:52 p.m.	
Observation Hole #	#4	
Depth of Perc	56"	
Start Pre-soak	12:52	
End Pre-soak	1:09	
Time at 12"	1:09	
Time at 9"	1:14	
Time at 6"	1:20	
Time (9"-6")	6 Min.	
Rate Min./Inch	2 min./in.	

Site Passed [X] Site Failed [ ] (Area of Perc Passed)

Performed By: R. Duff - W. Richard, Cullinan Engineering Co., Inc.

Witnessed By: R. Kimball, D.E.P.; P. Pisinski, Southboro B.O.H. Agent

Comments:

FORM 12 - PERCOLATION TEST

COMMONWEALTH OF MASSACHUSETTS

Southboro , Massachusetts

Percolation Test #5		
Date: 8/16/95 & 8/17/95	Time: 9:46 a.m.	
Observation Hole #	#5	Overnight
Depth of Perc	52"	
Start Pre-soak	1:13	9:46
End Pre-soak	1:31	10:01
Time at 12"	1:31	10:01
Time at 9"	*	11:07
Time at 6"		1:39
Time (9"-6")		152 min.
Rate Min./Inch		50 min./in.

Site Passed ☐ Site Failed ☒ (Area of Perc Failed)

Performed By: R. Duff - W. Richard, Cullinan Engineering Co., Inc.

Witnessed By: R. Kimball, D.E.P.; P. Pisinski, Southboro B.O.H. Agent

Comments:

* 10" @ 2:26

FORM 12 - PERCOLATION TEST

COMMONWEALTH OF MASSACHUSETTS

Southboro , Massachusetts

Percolation Test #6		
Date: 8/16/95 & 8/17/95 Time: 10:26 a.m.		
Observation Hole #		Overnight
Depth of Perc	60"	
Start Pre-soak	2:29	10:26
End Pre-soak	2:45	10:42
Time at 12"	2:45	10:42
Time at 9"	*	11:53
Time at 6"		2:00
Time (9"-6")		126 min.
Rate Min./Inch		42 min./in.

Site Passed ☐ Site Failed ☒ (Area of perc failed)

Performed By: R. Duff - W. Richard, Cullinan Engineering Co., Inc.

Witnessed By: R. Kimball, D.E.P.; P. Pisinski, Southboro B.O.H. Agent

Comments:

* 10" @ 3:21

FORM 12 - PERCOLATION TEST

COMMONWEALTH OF MASSACHUSETTS

Southboro , Massachusetts

Percolation Test #7

Date: 8/17/95 Time: 12:51 p.m.

Observation Hole #	#7	
Depth of Perc	68"	
Start Pre-soak	12:51	
End Pre-soak	1:04	
Time at 12"	1:04	
Time at 9"		
Time at 6"	1:05	
Time (9"-6")	< 2 min.	
Rate Min./Inch	< 2 min./in.	

Site Passed [X] Site Failed [ ] (Area of Perc Passed)

Performed By: R. Duff - W. Richard, Cullinan Engineering Co., Inc.

Witnessed By: R. Kimball, D.E.P.; P. Pisinski, Southboro B.O.H. Agent

Comments:

FORM 12 - PERCOLATION TEST

COMMONWEALTH OF MASSACHUSETTS

Southboro , Massachusetts

Percolation Test #8		
Date:	8/17/95	Time: 1:36 p.m.
Observation Hole #	#8	
Depth of Perc	54"	
Start Pre-soak	1:36	
End Pre-soak	1:43	
Time at 12"	1:43	
Time at 9"		
Time at 6"	1:47	
Time (9"-6")	3 min.	
Rate Min./Inch	< 2 min./in.	

Site Passed [X] Site Failed [ ] (Area of Perc Passed)

Performed By: R. Duff - W. Richard, Cullinan Engineering Co., Inc.

Witnessed By: R. Kimball, D.E.P.; P. Pisinski, Southboro B.O.H. Agent

Comments: