MERCHANTVILLE-PENNSAUKEN WATER COMMISSION

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August 9, 2010

Ramesh Patel
New Jersey Department of Environmental Protection
401 East State Street
P.O. Box 426
Trenton, New Jersey 08625

Re: National Highway Filter Media Project
Permit #WCP 080002

Dear Mr. Patel:

On 7 August 2008, the MPWC received the approved permit referenced above. The media at the treatment plant has since been changed to Greensand Plus. The filters were tested and made operational at the end of February 2009. MPWC received approval to permanently run the filters at 9.0 gpm/sq. ft. and continue with the long term pilot study at 12.0 gpm/sq. ft. in your 23 April correspondence. The results and conclusions are summarized below.

Plant setup

The National Highway Plant pumps water from the Potomac-Raritan-Magothy (PRM) formation using two groundwater production wells. Each well is capable of supplying 1,000 gallons per minute to the treatment system. Raw groundwater from the production wells is pumped to one of two vertical air stripping towers for the removal of any volatile organic contaminants. From the air stripper towers, water flows by gravity to two clear wells where lime is added for pH control. The level of the clear well basin is maintained at a near constant elevation by the operation of the level controlled high service pumps. The site utilizes two 75 HP pumps. These pumps direct water to a sodium hypochlorite contact tank and then through two GreenSand Plus media filters.

The changes made to the treatment plant eliminated the sodium bisulfite feed and the carbon dioxide feed. The media in the filter units was changed from [redacted] to Greensand Plus. Less sodium hypochlorite is required to disinfect the finished water and maintain an acceptable residual.

Testing Results

The current flowrates and testing period has been taking place for over three months. The iron and manganese were readily reduced to concentrations well below the respective MCL of 0.3 mg/L and 0.05 mg/L throughout the testing period. The end of the filter runs were based on time. Each unit was run for 24 hours and then backflushed for 6 minutes. The filters were alternated to run at a flowrate of 1,000 gallons per minute (gpm) or 12.0 gpm / sq. ft. just at the same flowrate the filters were run at when the

[redacted] media was used to filter the water. This allowed a total flow of 1,440,000 gallons to be treated prior to the unit backwashing. There was no noticeable pressure increase throughout the filter runs.

As can be seen from the testing data included in **Appendix A**, the filters are equally removing iron and manganese at their respective flowrates.

The results from this period were compared to the initial results when the filters were run at 3.0 gpm / sq. ft and 6.0 gpm / sq. ft. There were no noticeable differences between the effluent quality when the filters were run at the lower flowrates verses the 12.0 gpm / sq. ft.

May

The influent iron concentrations to both filters ranged from 0.3 to 0.4 parts per million (ppm). The iron was completely removed during May. The influent manganese concentrations ranged from 0.215 to 0.312 ppm. The highest effluent reading taken was 0.013 ppm. As can be seen from the data included in **Appendix A** and compared to the results from the 1 July 2009 pilot test report, the effluent manganese concentrations are almost identical at both flowrates and in many cases, the concentrations are lower at the higher flowrates. The highest effluent reading was 0.013 ppm compared to 0.015 ppm at the lower flowrates. These values are well below the MCL of 0.05 ppm.

June

The influent iron concentrations to both filters ranged from 0.2 to 0.4 parts per million (ppm). The iron was completely removed during June. The influent manganese concentrations ranged from 0.235 to 0.314 ppm. The highest effluent reading taken was 0.012 ppm. As can be seen from the data included in **Appendix A** and compared to the results from the 1 July 2009 pilot test report, the effluent manganese concentrations are almost identical at both flowrates and in many cases, the concentrations are lower at the higher flowrates. The highest effluent reading was 0.012 ppm compared to 0.015 ppm at the lower flowrates. These values are well below the MCL of 0.05 ppm.

July

The influent iron concentrations to both filters ranged from 0.2 to 0.5 parts per million (ppm). The iron was completely removed during July. The influent manganese concentrations ranged from 0.214 to 0.321 ppm. The highest effluent reading taken was 0.013 ppm. As can be seen from the data included in **Appendix A** and compared to the results from the 1 July 2009 pilot test report, the effluent manganese concentrations are almost identical at both flowrates and in many cases, the concentrations are lower at the higher flowrates. The highest effluent reading was 0.013 ppm compared to 0.015 ppm at the lower flowrates. These values are well below the MCL of 0.05 ppm.

Conclusions

The filter units have been running for a period of over 17 months since being changed over to Greensand Plus. The removal of the [redacted] media and the installation of GreenSand Plus has allowed the filter plant to eliminate both the sodium bisulfite and carbon dioxide chemical feeds. Both the necessary lime and sodium hypochlorite usage at the treatment plant have been reduced due to the media change. The plant runs have increased from 12 hour increments on the [redacted] media to scheduled 24 hour runs on the new Greensand Plus.

The GreenSand Plus media does not use the sodium bisulfite or carbon dioxide necessary to run the [redacted] media. The elimination of these two chemicals saved the MPWC over $41,000 per year. By pilot testing the media and increasing the flowrate, we are seeing identical or better removal efficiencies than at the lower flowrates. We also are saving backwash water. The current flowrate is four times higher than the initial test flowrate. This means that we use ¼ the amount of backwash water or save approximately 36,000 gallons of water for each cycle we run at the higher flowrate. We run over 1.4MM gallons of water prior to backwashing verses 360,000 gallons at the lower flowrate. Additionally, there is less back pressure produced against the filters and pumping equipment at the higher flowrate. Although the overall system usage is the same, there is more water available for instantaneous demand, minimizing potential system pressure changes and customer complaints.

Throughout the testing period, both filter units are removing iron and manganese to concentrations well below the respective MCL of 0.3 mg/L and 0.05 mg/L. This data matches the data obtained from the pilot test report dated 30 January 2008 when the pilot units tested the water at 12 gpm / sq. ft. At this time, MPWC respectively requests the final flowrate for the filter units to remain at 12.0 gpm / sq. ft.

Thank you for your time and attention to this matter. If you have any questions, please do not hesitate to contact me at (856) 663-0043.

Sincerely,

Richard F. Spafford, P.E.
MPWC Engineer
N.J. License No. 43642

CC: Michael Saraceni, Chief Operating Officer - MPWC
Jeff Whalen, Superintendent - MPWC
Tom Huck, Hungerford & Terry

Appendix A

	Filter 1								
Date	Flowrate	Maximum	Daily H2O pumped through filter	Backwash	Time til backwash	Iron (infl)	Iron (eff)	Mg (infl)	Mg (eff)
	(gpm)	Flowrate	(gallons)	Totalizer	hours / min	ppm	ppm	ppm	ppm
1-May-10	0	1000	603	0	23 hours 59 minutes				
2-May-10	0	1000	610	0	13 hours 19 minutes				
3-May-10	1000	1000	148	13	2 hours 35 minutes	0.4	0	0.312	0.012
4-May-10	0	1000	625	0	24 hours				
5-May-10	1000	1000	741	12	13 hours 0 minutes	0.3	0	0.289	0.006
6-May-10	0	1000	671	0	24 hours				
7-May-10	1000	1000	697	12	12 hours 13 minutes	0.4	0	0.234	0.003
8-May-10	0	1000	0	0	24 hours				
9-May-10	0	1000	0	0	24 hours				
10-May-10	0	1000	630	0	24 hours				
11-May-10	1000	1000	736	12	12 hours 56 minutes	0.3	0	0.268	0.009
12-May-10	0	1000	0	0	24 hours				
13-May-10	0	1000	310	0	24 hours				
14-May-10	1000	1000	700	0	18 hours 32 minutes	0.4	0	0.215	0.003
15-May-10	0	1000	325	0	6 hours 13 minutes				
16-May-10	0	1000	26	12	0 hours 29 minutes				
17-May-10	0	1000	388	0	24 hours				
18-May-10	1000	1000	976	13	17 hours 10 minutes	0.3	0	0.278	0.005
19-May-10	0	1000	41	0	24 hours 0 minutes				
20-May-10	1000	1000	1255	13	23 hours 14 minutes	0.4	0	0.258	0.009
21-May-10	0	1000			24 hours 0 minutes				
22-May-10		1000							
23-May-10		1000	407	0					
24-May-10	1000	1000	728	13	13 hours 31 minutes	0.3	0	0.269	0.007
25-May-10	0	1000	242	0	24 hours				
26-May-10	1000	1000	1055	12	19 hours 30 minutes	0.4	0	0.271	0.002
27-May-10	0	1000	0	0	24 hours 0 minutes				
28-May-10	0	1000	645	0	24 hours 0 minutes				
29-May-10	1000	1000	245	0	12 hours 0 minutes	0.3	0	0.258	0.005
30-May-10	1000	1000	154	0	7 hours 28 minutes	0.3	0	0.249	0.003
31-May-10	1000	1000	248	12	4 hours 35 minutes	0.4	0	0.293	0.009

	Filter 2								
Date	Flowrate	Maximum	Daily H2O pumped through filter	Backwash	Time til backwash	Iron (infl)	Iron (eff)	Mg (infl)	Mg (eff)
	(gpm)	Flowrate	(gallons)	Totalizer	hours / mins	ppm	ppm	ppm	ppm
1-May-10	0	1000	0	0	24 hours				
2-May-10	0	1000	0	0	24 hours				
3-May-10	0	1000	813	0	24 hours				
4-May-10	1000	1000	543	13	9 hours 34 minutes	0.3	0	0.215	0.013
5-May-10	0	1000	673	0	24 hours				
6-May-10	1000	1000	686	13	12 hours 6 minutes	0.3	0	0.287	0.009
7-May-10	0	1000	277	0	24 hours				
8-May-10	0	1000	560	0	19 hours 0 minutes				
9-May-10	0	1000	435	0	9 hours 8 minutes				
10-May-10	0	1000	77	13	1 hour 21 minutes				
11-May-10	0	1000	78	0	24 hours				
12-May-10	1000	1000	794	0	22 hours 36 minutes	0.4	0	0.256	0.012
13-May-10	0	1000	481	13	8 hours 33 minutes				
14-May-10	0	1000	0	0	24 hours				
15-May-10	0	1000	0	0	24 hours				
16-May-10	0	1000	581	0	24 hours				
17-May-10	1000	1000	775	13	13 hours 41 minutes	0.3	0	0.247	0.004
18-May-10	0	1000	152	0	24 hours				
19-May-10	1000	1000	1145	12	21 hours 8 minutes	0.4	0	0.289	0.002
20-May-10	0	1000	17	0	24 hours 0 minutes				
21-May-10	1000	1000			23 hours 39 minutes	0.4	0	0.312	0.008
22-May-10		1000							
23-May-10		1000	0	0					
24-May-10	0	1000	375	0	24 hours 0 minutes				
25-May-10	1000	1000	911	13	16 hours 59 minutes	0.3	0	0.279	0.013
26-May-10	0	1000	79	0	24 hours 0 minutes				
27-May-10	1000	1000	1092	0	22 hours 32 minutes	0.4	0	0.301	0.011
28-May-10	1000	1000	116	13	2 hours 8 minutes	0.3	0	0.287	0.002
29-May-10	0	1000	0	0	24 hours 0 minutes				
30-May-10	0	1000	0	0	24 hours 0 minutes				
31-May-10	0	1000	425	0	24 hours				

	Filter 1								
Date	Flowrate	Maximum	Daily H2O pumped through filter	Backwash	Time til backwash	Iron (infl)	Iron (eff)	Mg (infl)	Mg (eff)
	(gpm)	Flowrate	(gallons)	Totalizer	hours / min	ppm	ppm	ppm	ppm
1-Jun-10	0	1000	20	0	24 hours 0 minutes				
2-Jun-10	1000	1000	1242	0	23 hours 36 minutes	0.2	0	0.28	0.005
3-Jun-10	1000	1000	34	12	0 hours 37 minutes	0.3	0	0.312	0
4-Jun-10	0	1000	892	0	24 hours 0 minutes				
5-Jun-10	0	1000	403	13	7 hours 28 minutes	0.2	0	0.287	
6-Jun-10	0	1000	0	0	24 hours 0 minutes				
7-Jun-10	0	1000	508	0	24 hours 0 minutes				
8-Jun-10	1000	1000	788	13	14 hours 36 minutes	0.2	0	0.295	
9-Jun-10	0	1000	279	0	24 hours 0 minutes				
10-Jun-10	1000	1000	1016	12	18 hours 48 minutes	0.3	0	0.248	0.011
11-Jun-10	0	1000			24 hours 0 minutes				
12-Jun-10		1000							
13-Jun-10		1000	426	0					
14-Jun-10	1000	1000	869	12	15 hours 59 minutes	0.2	0	0.298	0.008
15-Jun-10	0	1000	0	0	24 hours 0 minutes				
16-Jun-10	0	1000	883	0	24 hours 0 minutes				
17-Jun-10	1000	1000	414	12	7 hours 39 minutes	0.3	0	0.301	0.007
18-Jun-10	0	1000	237	0	24 hours 0 minutes				
19-Jun-10	0	1000	743	0	19 hours 33 minutes				
20-Jun-10	0	1000	314	13	5 hours 50 minutes				
21-Jun-10	0	1000	568	0	24 hours 0 minutes				
22-Jun-10	1000	1000	729	12	13 hours 27 minutes	0.4	0	0.305	0.01
23-Jun-10	0	1000	482	0	24 hours 0 minutes				
24-Jun-10	1000	1000	815	12	15 hours 4 minutes	0.2	0	0.29	0.005
25-Jun-10	0	1000	161	0	24 hours 0 minutes				
26-Jun-10	1000	1000	604	0	21 hours 1 minutes	0.3	0	0.254	0.001
27-Jun-10	0	1000	529	13	9 hours 50 minutes				
28-Jun-10	0	1000	0	0	24 hours 0 minutes				
29-Jun-10	0	1000	889	0	24 hours 0 minutes				
30-Jun-10	1000	1000	1036	15	7 hours 31 minutes	0.3	0	0.297	0.007
1-Jul-10									

	Filter 2								
Date	Flowrate	Maximum	Daily H2O pumped through filter	Backwash	Time til backwash	Iron (infl)	Iron (eff)	Mg (infl)	Mg (eff)
	(gpm)	Flowrate	(gallons)	Totalizer	hours / mins	ppm	ppm	ppm	ppm
1-Jun-10	1000	1000	862	13	16 hours 2 minutes	0.4	0	0.301	0.002
2-Jun-10	0	1000	0	0	24 hours 0 minutes				
3-Jun-10	0	1000	1146	0	24 hours 0 minutes				
4-Jun-10	1000	1000	142	12	2 hours 39 minutes	0.3	0	0.279	0.003
5-Jun-10	0	1000	68	0	24 hours 0 minutes				
6-Jun-10	0	1000	496	0	22 hours 43 minutes	0.2	0	0.273	
7-Jun-10	1000	1000	722	12	13 hours 25 minutes	0.4	0	0.258	0.005
8-Jun-10	0	1000	265	0	24 hours 0 minutes				
9-Jun-10	1000	1000	1026	13	19 hours 4 minutes	0.3	0	0.279	0.002
10-Jun-10	0	1000	78	0	24 hours 0 minutes				
11-Jun-10	1000	1000			22 hours 25 minutes	0.2	0	0.28	0.007
12-Jun-10		1000							
13-Jun-10		1000	191	13					
14-Jun-10	0	1000	10	0	24 hours 0 minutes				
15-Jun-10	1000	1000	953	0	23 hours 48 minutes	0.2	0	0.29	0.002
16-Jun-10	1000	1000	323	13	6 hours 0 minutes	0.3	0	0.257	0.01
17-Jun-10	0	1000	729	0	24 hours 0 minutes				
18-Jun-10	1000	1000	561	13	10 hours 27 minutes	0.4	0	0.289	0
19-Jun-10	0	1000	0	0	24 hours 0 minutes				
20-Jun-10	0	1000	524	0	24 hours 0 minutes				
21-Jun-10	1000	1000	764	12	14 hours 13 minutes	0.3	0	0.254	0.009
22-Jun-10	0	1000	516	0	24 hours 0 minutes				
23-Jun-10	1000	1000	775	13	14 hours 23 minutes	0.2	0	0.314	0.007
24-Jun-10	0	1000	283	0	24 hours 0 minutes				
25-Jun-10	1000	1000	1004	13	18 hours 41 minutes	0.3	0	0.235	0.008
26-Jun-10	0	1000	1004	0	24 hours 0 minutes				
27-Jun-10	0	1000	279	0	24 hours 0 minutes				
28-Jun-10	1000	1000	789	0	18 hours 41 minutes	0.2	0	0.292	0.004
29-Jun-10	1000	1000	220	12	4 hours 6 minutes	0.3	0	0.301	0.012
30-Jun-10	0	1000	10	0	24 hours 0 minutes				
1-Jul-10		1000							

	Filter 1								
Date	Flowrate	Maximum	Daily H2O pumped through filter	Backwash	Time til backwash	Iron (infl)	Iron (eff)	Mg (infl)	Mg (eff)
	(gpm)	Flowrate	(gallons)	Totalizer	hours / min	ppm	ppm	ppm	ppm
1-Jul-10	1000	1000	334	13	6 hours 11 minutes	0.4	0	0.301	0.003
2-Jul-10	0	1000	481	0	24 hours 0 minutes				
3-Jul-10	1000	1000	725	0	7 hours 31 minutes	0.3	0	0.29	0
4-Jul-10	1000	1000	89	12	1 hours 39 minutes	0.2	0	0.301	0
5-Jul-10	0	1000	203	0	24 hours 0 minutes				
6-Jul-10	1000	1000	1094	12	20 hours 14 minutes	0.3	0	0.287	0.002
7-Jul-10	0	1000	99	0	24 hours 0 minutes				
8-Jul-10	1000	1000	1197	12	22 hours 9 minutes	0.4	0	0.289	0.004
9-Jul-10	0	1000	0	0	24 hours 0 minutes				
10-Jul-10	0	1000	408	0	24 hours 0 minutes				
11-Jul-10	1000	1000	534	0	16 hours 24 minutes	0.2	0	0.285	0.005
12-Jul-10	1000	1000	350	13	6 hours 28 minutes	0.3	0	0.289	0.007
13-Jul-10	0	1000	514	0	24 hours 0 minutes				
14-Jul-10	1000	1000	781	11	14 hours 28 minutes	0.3	0	0.254	0.003
15-Jul-10	0	1000			24 hours 0 minutes				
16-Jul-10		1000							
17-Jul-10		1000							
18-Jul-10		1000	0	0					
19-Jul-10	0	1000	1086	0	24 hours 0 minutes				
20-Jul-10	1000	1000	210	11	3 hours 53 minutes	0.3	0	0.279	0.011
21-Jul-10	0	1000	791	0	24 hours 0 minutes				
22-Jul-10	1000	1000	509	11	9 hours 25 minutes	0.4	0	0.287	0.009
23-Jul-10	0	1000	667	0	24 hours 0 minutes				
24-Jul-10	1000	1000	630	12	11 hours 39 minutes	0.2	0	0.246	0.004
25-Jul-10	0	1000	0	0	24 hours 0 minutes				
26-Jul-10	0	1000	472	0	24 hours 0 minutes				
27-Jul-10	1000	1000	823	11	11 hours 43 minutes	0.4	0	0.289	0.007
28-Jul-10	0	1000	369	0	24 hours 0 minutes				
29-Jul-10	1000	1000	927	11	17 hours 10 minutes	0.4	0	0.302	0.011
30-Jul-10	0	1000	0	0	24 hours 0 minutes				
31-Jul-10	0	1000	0	0	24 hours 0 minutes				

	Filter 2								
Date	Flowrate	Maximum	Daily H2O pumped through filter	Backwash	Time til backwash	Iron (infl)	Iron (eff)	Mg (infl)	Mg (eff)
	(gpm)	Flowrate	(gallons)	Totalizer	hours / mins	ppm	ppm	ppm	ppm
1-Jul-10	0	1000	738	0	24 hours 0 minutes				
2-Jul-10	1000	1000	551	12	10 hours 14 minutes	0.3	0	0.284	0
3-Jul-10	0	1000	0	0	24 hours 0 minutes				
4-Jul-10	0	1000	599	0	24 hours 0 minutes				
5-Jul-10	1000	1000	786	12	12 hours 49 minutes	0.3	0	0.315	0.007
6-Jul-10	0	1000	160	0	24 hours 0 minutes				
7-Jul-10	1000	1000	1131	12	21 hours 1 minute	0.4	0	0.321	0.011
8-Jul-10	0	1000	97	0	24 hours 0 minutes				
9-Jul-10	1000	1000	1166	0	22 hours 9 minutes	0.3	0	0.214	0.002
10-Jul-10	1000	1000	25	13	0 hours 27 minutes	0.3	0	0.319	0.01
11-Jul-10	0	1000	0	0	24 hours 0 minutes				
12-Jul-10	0	1000	728	0	24 hours 0 minutes				
13-Jul-10	1000	1000	559	11	10 hours 25 minutes	0.4	0	0.289	0.002
14-Jul-10	0	1000	271	0	24 hours 0 minutes				
15-Jul-10	1000	1000			18 hours 51 minutes	0.3	0	0.231	0.009
16-Jul-10		1000							
17-Jul-10		1000							
18-Jul-10		1000	614	0					
19-Jul-10	1000	1000	26	11		0.4	0	0.298	0.013
20-Jul-10	0	1000	922	0	24 hours 0 minutes				
21-Jul-10	1000	1000	365	11	6 hours 47 minutes	0.3	0	0.278	0.009
22-Jul-10	0	1000	615	0	24 hours 0 minutes				
23-Jul-10	1000	1000	674	11	12 hours 31 minutes	0.4	0	0.239	0.004
24-Jul-10	0	1000	346	0	24 hours 0 minutes				
25-Jul-10	1000	1000	311	0	17 hours 31 minutes	0.3	0	0.287	0.001
26-Jul-10	1000	1000	629	11	11 hours 43 minutes	0.4	0	0.259	0.004
27-Jul-10	0	1000	372	0	24 hours 0 minutes				
28-Jul-10	1000	1000	918	11	17 hours 3 minutes	0.5	0	0.301	0.013
29-Jul-10	0	1000	59	0	24 hours 0 minutes				
30-Jul-10	1000	1000	719	0	22 hours 52 minutes	0.3	0	0.287	0.007
31-Jul-10	1000	1000	336	0	9 hours 25 minutes	0.3	0	0.31	0.01