STATE OF MAINE
DEPARTMENT OF ENVIRONMENTAL PROTECTION

JOHN ELIAS BALDACCI
GOVERNOR

DAWN R. GALLAGHER
COMMISSIONER

January 5, 2005

Pam Deahl
Hydro International
94 Hutchins Drive
Portland, ME 04102

Dear Ms. Deahl,

The purpose of this letter is to inform you that, in accordance with the Laboratory Testing Protocol for Manufactured Treatment Systems and based on the results of the confirmation test for removal of OK-110 grade silica sand performed on November 12, 2004 and described in the attached report, the 4 foot diameter First Defense stormwater treatment device is approved for a total suspended solids (TSS) removal rating of 60%, provided that the device is sized such that the projected one year peak flow from the device's drainage area does not exceed 320 gpm.

If you have any questions regarding this letter or the attached report, please feel free to call Jeff Dennis at 207-287-7847.

Sincerely,

Donald T. Witherill
Division of Watershed Management

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Hydro International First Defense OK-110 Sand SSC (TSS) Removal Confirmation Test November 12, 2004

Reported by Jeff Dennis
Division of Watershed Management, DEP

On November 12, 2004 I witnessed a confirmation test of the ability of a 4 ft diameter First Defense® unit with an 8 inch inlet to remove OK-110 grade silica sand. The test was performed in the laboratory of the Hydro International office on Hutchins Drive in Portland, Maine. The target flow rate for the test was 320 gpm.

Lab Set-Up

The laboratory set-up for the test consists of a 23,300 gallon clean water storage reservoir from which water is pumped into an 8 in pipe which feeds water to a 4 ft diameter First Defense® unit. The pipe from the storage reservoir is fitted with a valved bypass to divert excess flows back to the storage reservoir, a butterfly valve along with avariable frequency drive for flow control, and an ISCO UniMag Magnetic Flowmeter. OK-110 sand is fed into the inflow pipe from an elevated 60 gal sand slurry barrel. The sand is kept in a relatively uniform suspension in the slurry tank using a propeller type mixer. Slurry is pumped through plastic tubing from the slurry tank into the inflow pipe by a peristaltic pump. An automatic sampler is located upstream of the slurry feed to collect background samples. Several feet downstream of the slurry feed in the inflow pipe there is a 6 inch T with a sluice gate for collection of inflow samples.

The outflow pipe from the First Defense® unit has a free-fall discharge back into the storage reservoir. Outflow samples are collected by passing the sample bottle through the free fall discharge into the reservoir.

Test Procedure

The target test flow for the test was 320 gpm. The mean water detention time in the system at this flow rate is 78 seconds. Outflow samples lagged inflow samples by this amount. The interval between samples for both the inflow and outflow samples was 60 seconds. Back ground samples were collected at the same time as inflow samples. Flow was observed throughout the test.

The flow rate was stabilized at around 300 gpm and the slurry feed pump started. The system was then allowed to reach equilibrium for a period in excess of four detention times, before the first inflow sample was taken. Outflow sampling commenced about 78 seconds later. Background sampling commenced prior to inflow sampling and continued throughout the test. Six sets of samples were taken.

Inflow, outflow and background samples were taken to the University of Maine Environmental Chemistry Lab for Suspended Sediment Concentration analysis. The analyses was performed by John Cangelosi.

Results

Results of the test are presented in the attached tables. Inflow concentrations ranged from 189.1 mg/l to 299.8 mg/l. Outflow concentrations ranged from 12.6 mg/l to 17.3 mg/l. Background concentrations ranged between 0.9 and 1.9 mg/l.

The removal efficiencies indicated by inflow/outflow pairs ranged from 93.3% up to 95.4%, with a mean of 94.2%. When adjusted for recycled background concentrations, efficiencies were slightly higher, from 94.0% to 95.7% with a mean of 94.7%.

Flow for the test varied from 262 gpm to 328 gpm with a mean of 290 gpm, slightly lower than the target flow rate of 320 gpm.

Conclusions

All the paired sample removal efficiencies exceeded 80%, as did their mean whether or not they were adjusted for background concentrations, so it is very clear that at 290 gpm, a 4 ft diameter First Defense® unit can remove at least 80% of OK-110 grade silica sand, and seems to be able to remove more than 90% at this flow. Variation in paired removal efficiencies was low, and variation in inflow concentration was high, but still acceptable. Since removal efficiencies were so much higher than the required 80% and the flow for at least one pair exceeded 320 gpm, it is reasonable to conclude that, even though the mean flow was less than the target flow of 320 gpm, the unit can remove greater than 80% of OK-110 grade silica sand at the target flow rate of 320 gpm.

Therefore, the conclusion of this report is that the test performed on November 11, 2004, in substantial accordance with the Lab Testing Protocol, indicates that a 4 ft diameter First Defense® unit operating at an average flow rate of 320 gpm provides at least 80% removal of the specified OK-110 grade silica sand.

Signed: _____ Date: _____

First Defense OK-110 Sand Confirmation Test - 11/12/04

	Inflow (mg/l)	Time	Outflow (mg/l)	Time	Background	Rem. Eff.	Inflow - BG	Outflow - BG	BG adj. Rem. Eff.
1	299.8	11:08	13.7	11:09	0.9	95.4	298.9	12.8	95.7
2	268.6	11:09	16.8	11:10	1.2	93.7	267.4	15.6	94.2
3	189.1	11:10	12.6	11:11	1.4	93.3	187.7	11.2	94.0
4	279.1	11:11	15.8	11:12	1.9	94.3	277.2	13.9	95.0
5	291.1	11:12	17.3	11:13	1.4	94.1	289.7	15.9	94.5
6	267.2	11:13	15.8	11:14	1.2	94.1	266.0	14.6	94.5
Mean	265.8		15.3		1.3	94.2	264.5	14.0	94.7

Flow	l/sec
1	17.4
2	20.7
3	19.1
4	18.6
5	16.5
6	17.7
mean	18.3

18.3 l/sec = 290 gpm = 0.65 cfs

Residence Time and interval between samples 78 seconds, time to start of sampling 5 minutes 13 seconds