



pH Impact Assessment

January 2011 Exceedance at HCSW-1

May 2011

Prepared For
Mosaic Fertilizer, LLC.

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Background

This report was prepared as a component of the Horse Creek Stewardship Program (HCSP). The HCSP plan document requires that an “impact assessment” be conducted for any trigger level exceedances or water quality trends found while preparing the annual HCSP report. However, this assessment is being proactively provided at the request of Sam Stone of the Peace River Manasota Regional Water Supply Authority (PRMRWSA) based on monthly monitoring data not yet incorporated into an annual report.

As part of the HCSP, Mosaic monitors four locations monthly on Horse Creek for a number of water quality parameters. Most of the monitored parameters have trigger levels that are set to track conditions in the stream. The trigger levels for pH are exceeded below 6.0 SU or above 8.5 SU. In January 2011, pH at HCSW-1 at State Road 64 (4.80 SU) exceeded the lower trigger level. All of the HCSP pH sampling data is presented below, as well as provisional data from ambient monitoring conducted by SWFWMD at two of the HCSP stations.

The January 2011 pH values recorded by Mosaic represent the minimum pH levels observed at station HCSW-1 for the duration of the Stewardship Program that was initiated in April 2003 (Table 1). The previous minimum pH at HCSW-1 was 6.09 SU (Table 2). The pH measured at HCSW-1 during the months prior to and following the January 2011 event were more than 2 SU above the January 2011 sample (Table 2, Figure 1), a condition not observed previously in over 80 months of monitoring.

Table 1. Summary statistics of pH levels at Horse Creek Stewardship Program monthly sampling stations from April 2003 to March 2011.

	HCSW-1	HCSW-2	HCSW-3	HCSW-4
	State Road 64	Goose Pond Rd	State Road 70	State Road 72
Minimum	4.80	5.95	5.91	6.03
Median	7.21	6.59	6.86	7.01
Mean	7.18	6.63	6.87	7.09
Maximum	8.83	7.98	8.49	8.85

Table 2. All recorded pH levels at Horse Creek Stewardship Program monthly sampling stations from April 2003 to March 2011.

Date	HCSW-1	HCSW-2	HCSW-3	HCSW-4
	State Road 64	Goose Pond Rd	State Road 70	State Road 72
4/30/2003	6.99	6.10	7.00	6.86
5/27/2003	7.22	6.25	6.88	7.09
6/19/2003	7.10	6.31	6.65	6.84
7/14/2003	7.04	6.31	6.83	6.94
8/28/2003	7.09	6.59	6.96	6.47
9/25/2003	7.21	6.45	7.03	7.09

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Date	HCSW-1	HCSW-2	HCSW-3	HCSW-4
	State Road 64	Goose Pond Rd	State Road 70	State Road 72
10/29/2003	7.04	6.69	6.92	6.78
11/20/2003	7.20	6.56	6.75	6.61
12/16/2003	7.05	6.50	7.10	6.76
1/29/2004	7.75	6.67	7.38	7.39
2/24/2004	7.30	6.57	7.19	7.17
3/16/2004	7.13	6.62	7.04	6.92
4/14/2004	7.32	6.89	7.23	7.16
5/26/2004	7.34	6.82	7.18	7.38
6/29/2004	6.76	6.36	7.22	7.46
7/27/2004	6.96	6.55	6.71	6.78
8/30/2004	6.94	6.35	6.32	6.13
9/29/2004	6.59	6.45	6.45	6.57
10/27/2004	6.62	6.46	6.73	7.13
11/18/2004	6.67	6.79	6.24	6.74
12/15/2004	6.60	6.13	6.45	6.49
1/26/2005	7.21	6.71	6.87	6.88
2/24/2005	6.97	7.07	7.19	7.21
3/30/2005	6.96	7.63	7.11	6.99
4/27/2005	6.18	6.63	6.63	6.69
5/25/2005	6.92	6.89	7.50	7.23
6/22/2005	6.45	6.09	6.00	6.03
7/27/2005	6.56	6.13	5.91	6.31
8/23/2005	6.67	6.33	6.29	6.29
9/29/2005	6.62	6.39	6.72	6.82
10/27/2005	6.86	6.72	7.26	7.17
11/17/2005	6.79	6.65	6.72	6.64
12/20/2005	6.84	6.84	6.8	6.74
1/30/2006	6.84	6.82	7.00	7.17
2/23/2006	6.91	6.89	6.88	6.73
3/28/2006	7.37	6.84	7.27	7.69
4/27/2006	7.21	7.17	7.04	7.89
5/25/2006		6.86		7.48
6/29/2006	6.95	6.70	6.81	8.10
7/27/2006	6.94	5.95	6.42	6.92
8/21/2006	7.25	6.09	6.31	6.86
9/27/2006	6.89	6.18	6.28	6.40

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Date	HCSW-1	HCSW-2	HCSW-3	HCSW-4
	State Road 64	Goose Pond Rd	State Road 70	State Road 72
10/19/2006	6.49	5.99	6.42	6.67
11/9/2006	6.90	6.56	6.85	6.89
12/13/2006	6.54	6.31	6.69	6.84
1/23/2007	8.83	7.98	8.49	8.85
2/14/2007	7.55	6.67	7.20	7.39
3/14/2007	7.63	6.44	6.92	7.53
4/25/2007	7.38	6.30	6.84	8.29
5/16/2007	7.57	6.76	6.77	6.88
6/20/2007	7.37	6.90	6.22	7.21
7/18/2007	7.53	7.05	6.24	6.75
8/27/2007	7.28	6.45	6.57	6.82
9/26/2007	7.53	6.65	6.83	7.25
10/29/2007	7.06	6.13	6.42	6.99
11/29/2007	7.75	6.31	6.53	7.12
12/17/2007	7.47	6.37	6.65	7.40
1/30/2008	7.07	6.89	7.01	7.26
2/26/2008	7.11	6.27	6.80	7.00
3/27/2008	7.89	6.04	6.14	7.00
4/23/2008	7.21	6.20	6.40	7.17
5/29/2008		6.33	6.74	7.08
6/26/2008	6.96	6.72	6.77	7.01
7/31/2008	7.48	6.46	6.52	6.83
8/26/2008	7.50	6.50	6.17	6.45
9/30/2008	7.80	6.85	6.93	7.2
10/16/2008	7.55	6.99	6.74	7.00
11/12/2008	7.91	6.47	7.32	7.62
12/4/2008	7.64	6.44	7.25	7.52
1/5/2009	7.44	6.97	6.90	7.31
2/2/2009	7.40	7.57	7.39	7.66
3/4/2009	7.43	7.68	7.72	7.55
4/1/2009	7.81	7.13	6.95	8.00
5/4/2009				7.11
6/3/2009	7.33	6.19	6.56	6.61
7/8/2009	7.64	6.94	6.97	6.89
8/5/2009	7.23	6.54	6.93	6.75
9/2/2009	7.49	6.78	7.07	7.05

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January 2011 Exceedance at HCSW-1**

Date	HCSW-1	HCSW-2	HCSW-3	HCSW-4
	State Road 64	Goose Pond Rd	State Road 70	State Road 72
10/7/2009	7.53	6.34	6.64	6.88
11/3/2009	7.96	6.76	7.57	7.32
12/2/2009	7.51	7.30	7.48	7.90
1/5/2010	7.03	6.51	6.81	6.61
2/2/2010	7.56	6.83	6.87	7.00
3/3/2010	7.08	6.79	7.00	7.03
4/6/2010	7.65	7.34	6.71	6.79
5/5/2010	6.92	6.64	7.00	6.97
6/2/2010	7.27	6.57	7.3	7.58
7/12/2010	6.15	6.44	6.56	7.03
8/3/2010	7.35	6.60	7.33	7.47
9/8/2010	8.11	6.78	7.41	7.67
10/6/2010	7.22	6.68	6.81	6.89
11/3/2010	7.20	6.45	6.71	7.01
12/7/2010	7.40	7.43	7.78	7.96
1/4/2011	4.80	6.22	6.90	7.02
2/3/2011	7.30	6.27	6.97	7.18
3/2/2011	7.50	7.31	7.66	7.94

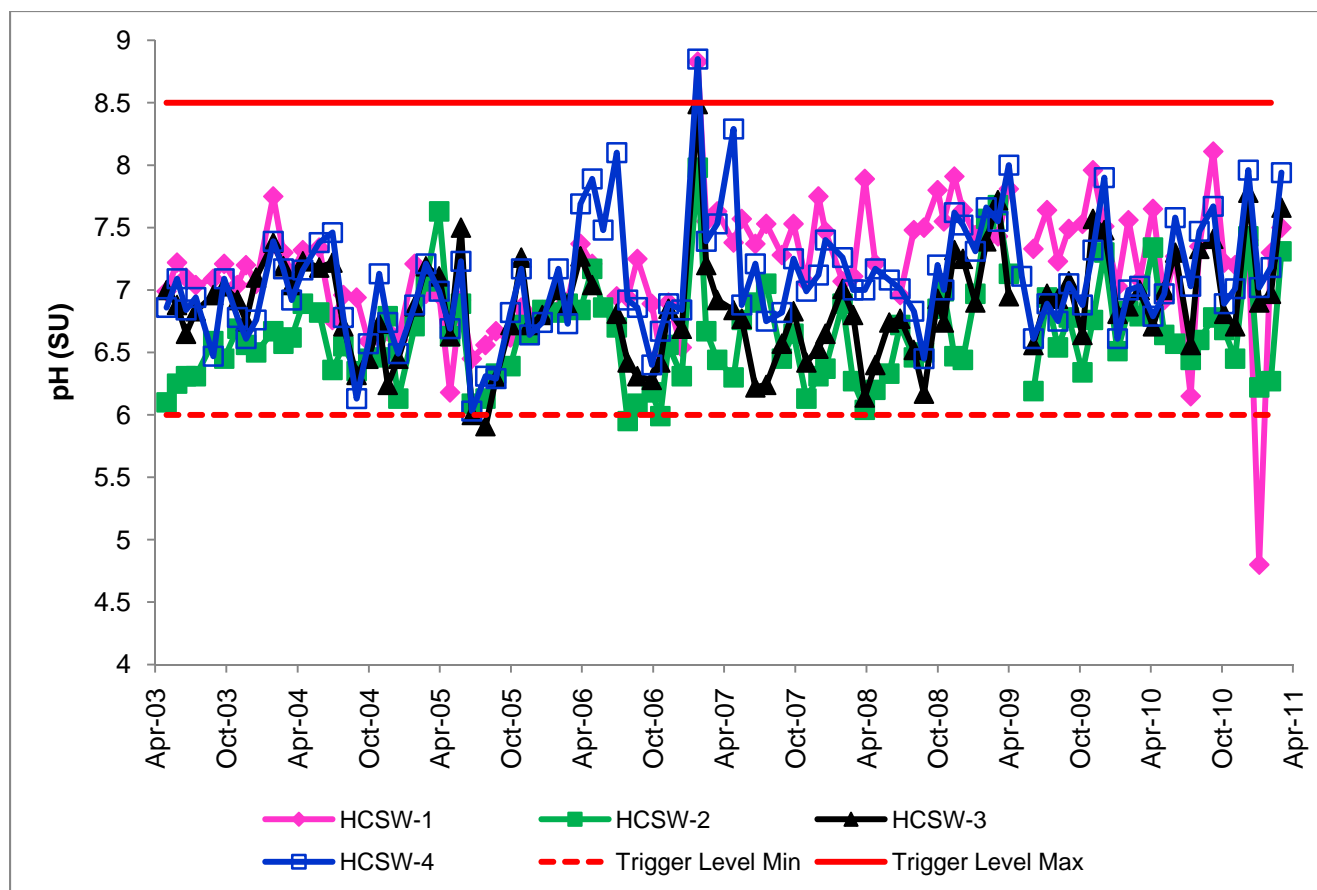


Figure 1. Measured pH at Horse Creek Stewardship Program monthly sampling stations from April 2003 to March 2011.

The Southwest Florida Water Management District (SWFWMD) also conducts monthly ambient monitoring at two sites on Horse Creek: Horse Creek near Myakka Head (HCSW-1) and Horse Creek near Arcadia (HCSW-4). SWFWMD visited those sites on 6 December 2010, 3 January 2011, 9 February 2011, and 7 March 2011 (Table 3). The pH recorded by SWFWMD during these four events was about 2.0 SU more than the pH recorded at HCSW-1 in January 2007. The pH recorded by Mosaic during December 2010 and February/March 2011 at HCSW-1 and all four months at HCSW-4 was much closer to the values recorded by SWFWMD (Figure 2).

Table 3. Provisional pH data from SWFWMD sampling on Horse Creek end of 2010/early 2011.

Date	Horse Creek near Myakka Head	Horse Creek near Arcadia
	HCSW-1	HCSW-4
12/6/2010	6.78	6.83
1/3/2011	6.91	7.16
2/9/2011	7.08	7.00
3/7/2011	7.78	7.89

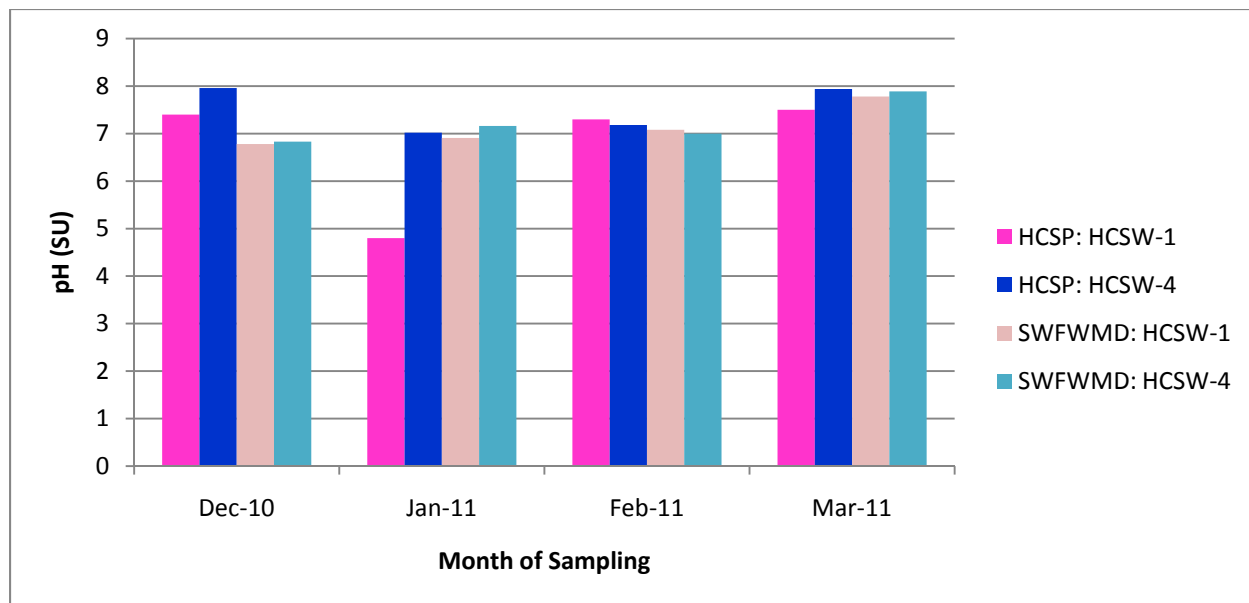


Figure 2. Measured pH at Horse Creek Stewardship Program monthly sampling stations from December 2010 to March 2011 along with provisional SWFWMD sampling from December 2010 to March 2011.

The history of pH measurements recorded throughout the HCSP, as well as independent measurements taken by SWFWMD, indicate that the 4 January 2011 HCSP pH measurement at HCSW-1 is probably incorrect. That measurement is the lowest ever recorded at any station, and other measurements taken from within a few days to a few weeks of the 4 January measurement are more than 2 SU higher and well within the HCSP trigger values. As shown in Figure 1, occasional, slightly depressed pH values at HCSP stations are normal, but are usually isolated and tend to occur at HCSW-2. The 4 January 2011 measurement was unusually low only at HCSW-1. The pH measurements at all other stations appeared to be within the normal range for January 2011.

An instrument with a faulty pH probe, or one that was calibrated incorrectly, is the most reasonable cause for the anomalous pH measurements reported for all stations sampled that day. Mosaic field technicians have stated that the pH meter used on 4 January 2011 had calibrated and verified within the limits, but may not have been stabilizing properly at the first station (HCSW-1), possibly due to an air bubble forming around the probe as a result of cooler water temperatures. Faulty equipment is the most likely cause of the depressed pH value at HCSW-1 for 4 January 2011.

In conclusion, we believe that the depressed pH level recorded at HCSW-1 by Mosaic staff in Horse Creek was inaccurate based on data collected by Mosaic and SWFWMD within a few days or weeks of the low pH measurement. Instead, the measurement in question is most likely the result of instrument error. In addition, Mosaic did not discharge water from mining operations in the basin during December 2010 and January 2011. Therefore, mining operations would not be a likely cause of the low pH measurement in January 2011, even if the measurement accurately reflected water quality conditions at that time.