



Taiwan - Land reclamation in South-Star site

❖ Slag aggregates for land reclamation (Kaohsiung, Taiwan)



South-Star Project is promoted by the government of Kaohsiung City, and it is one of the largest land reclamation sites in Taiwan.



South-Star Project

❖ South-Star site (Kaohsiung, Taiwan)



Stage I:

NT\$ 500 million

❖ **October, 1996, finished.**

❖ **BOF slag: 2,812,510 tons.**

Stage II, Section 1:

NT\$ 570 million

❖ **November, 1996 started.**

❖ **June, 2000, finished**

❖ **BOF slag: 665,632 tons.**

Stage II, Section 2:

NT\$ 1.386 billion

❖ **July, 2000 started.**

❖ **2012, finished.**

❖ **BOF slag: 1,054,257 tons.**

❖ **Surrounding roads: BOF slag: 21,475 tons.**

❖ **Total amount of BOF slag :
4,553,847 tons.**



Backfill operating of slag aggregates



Photo of the backfill operating.

2010.06.21





Backfill operating of slag aggregates

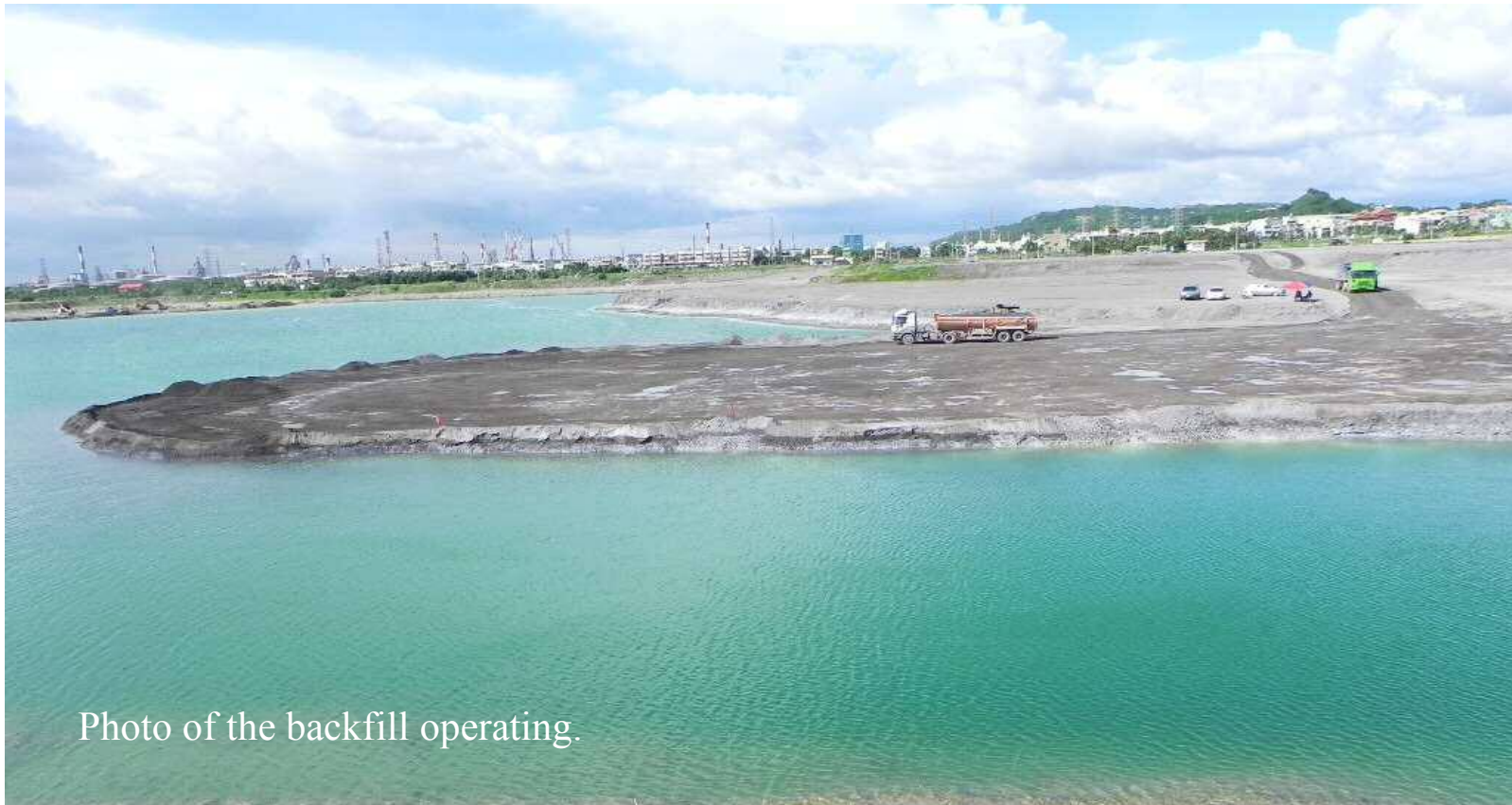
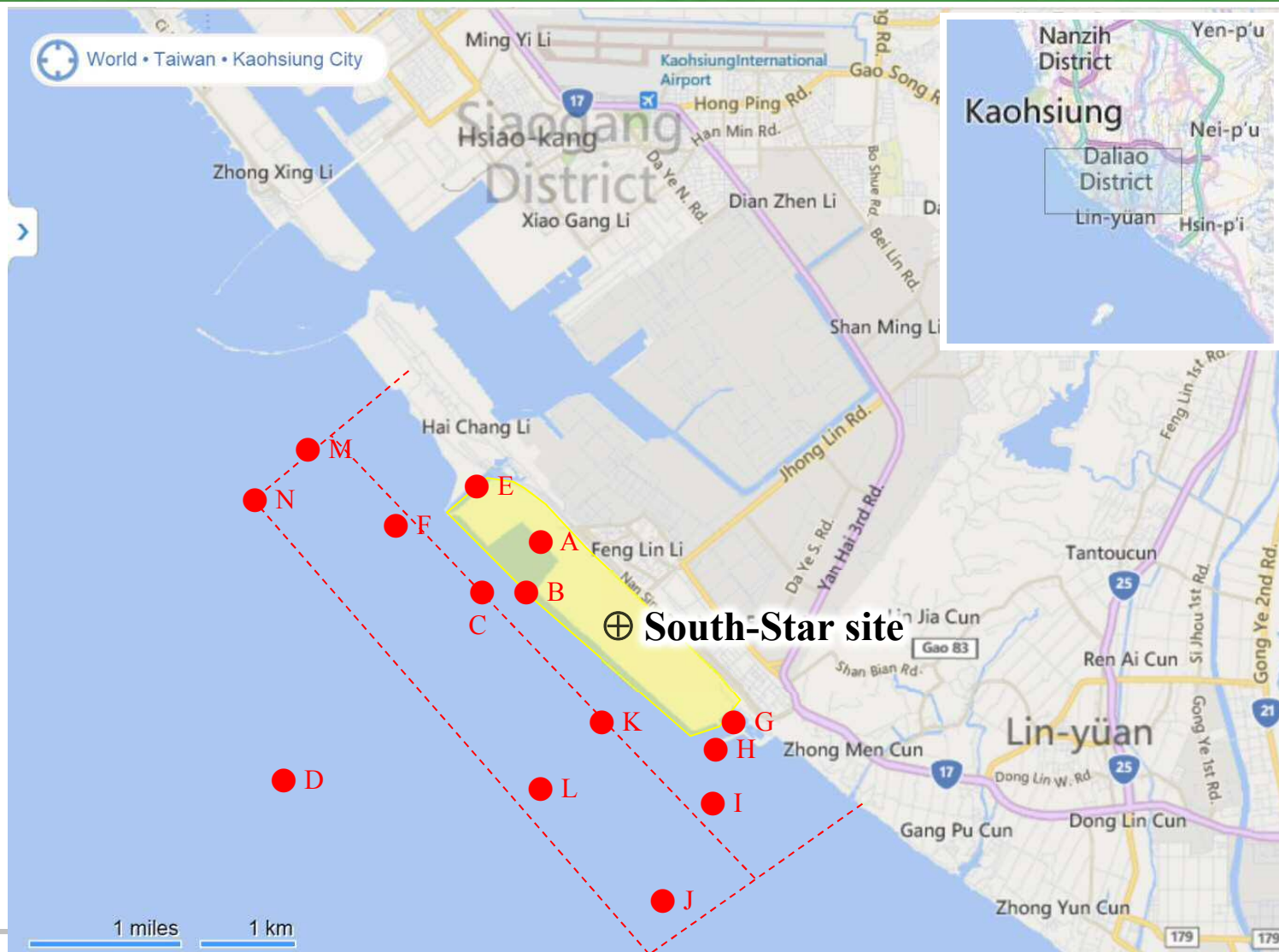


Photo of the backfill operating.





Environmental monitoring in South-Star site (by Kaohsiung Environmental Protection Bureau)

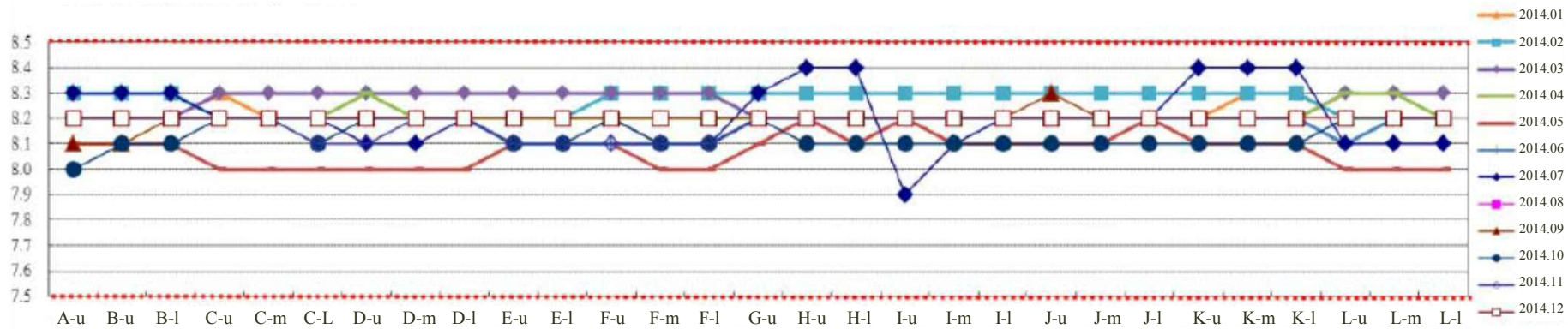
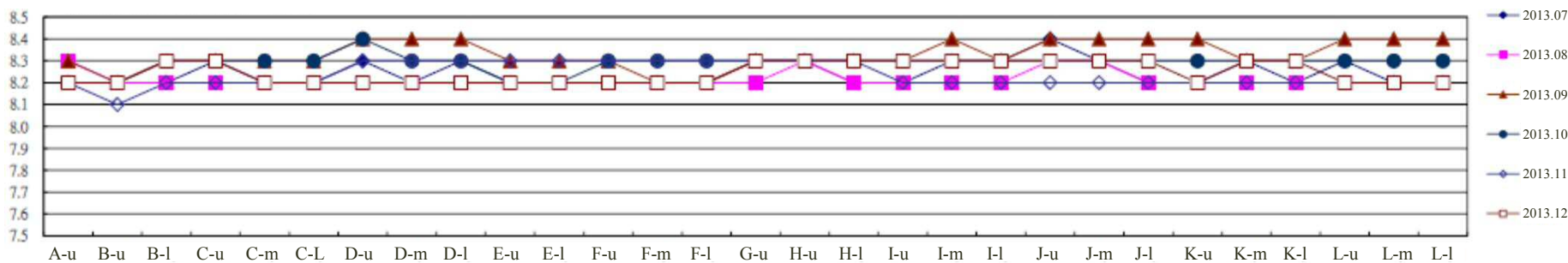
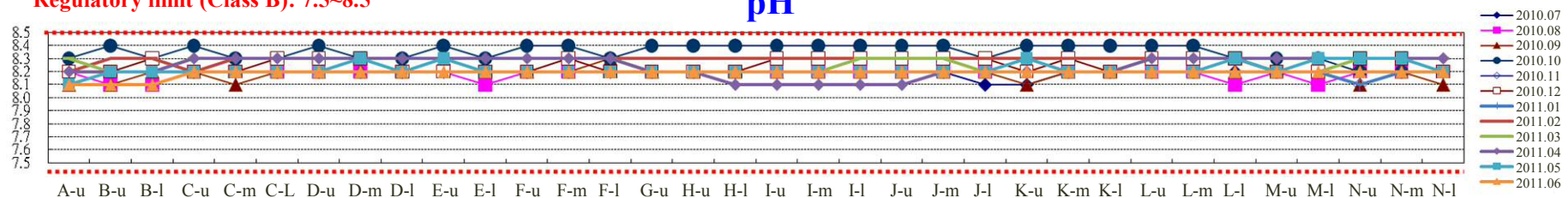




Seawater quality monitoring: pH

Regulatory limit (Class B): 7.5~8.5

pH



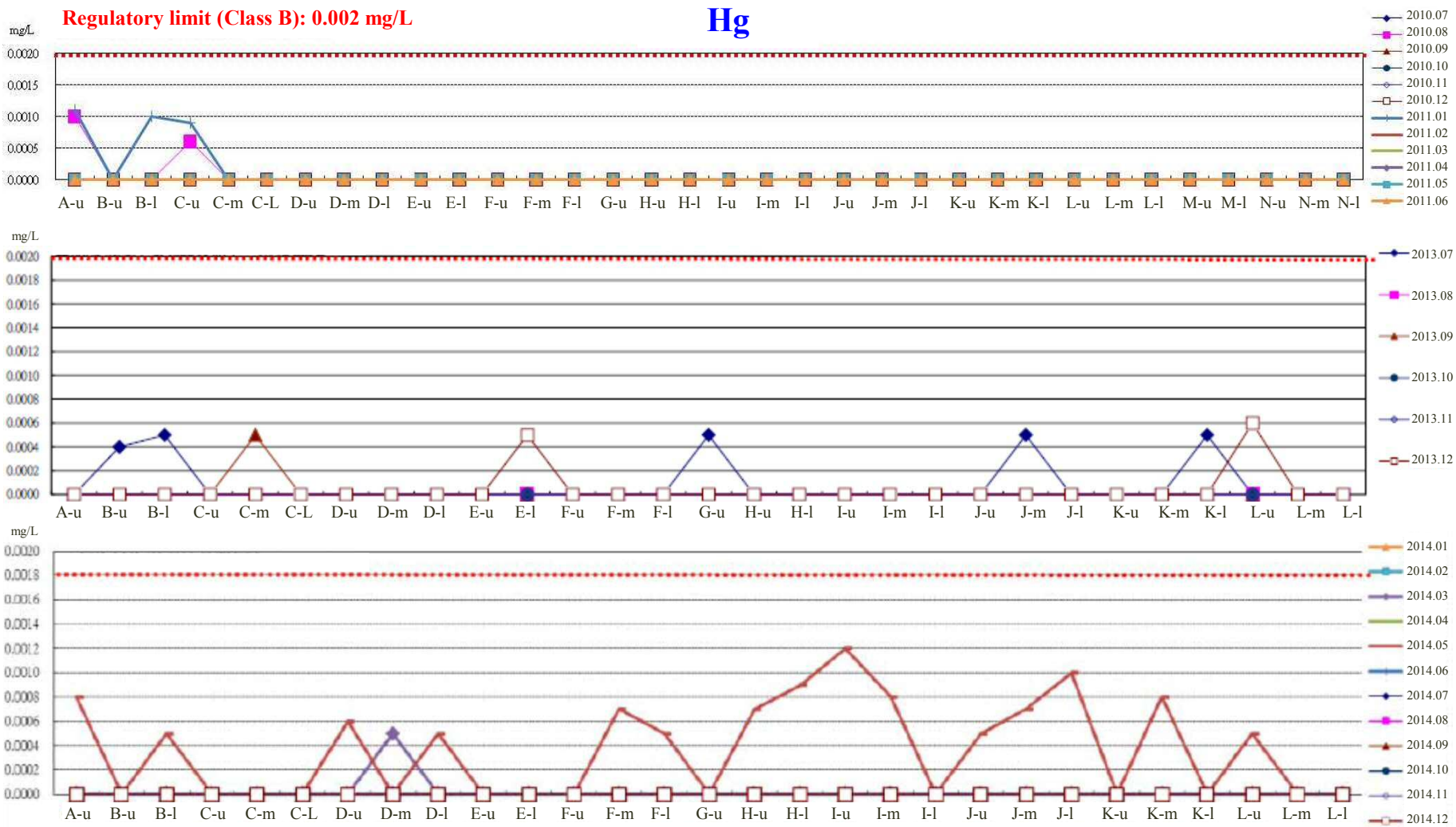
u: upper layer, m: middle layer, l: lower layer



Seawater quality monitoring: Hg

Regulatory limit (Class B): 0.002 mg/L

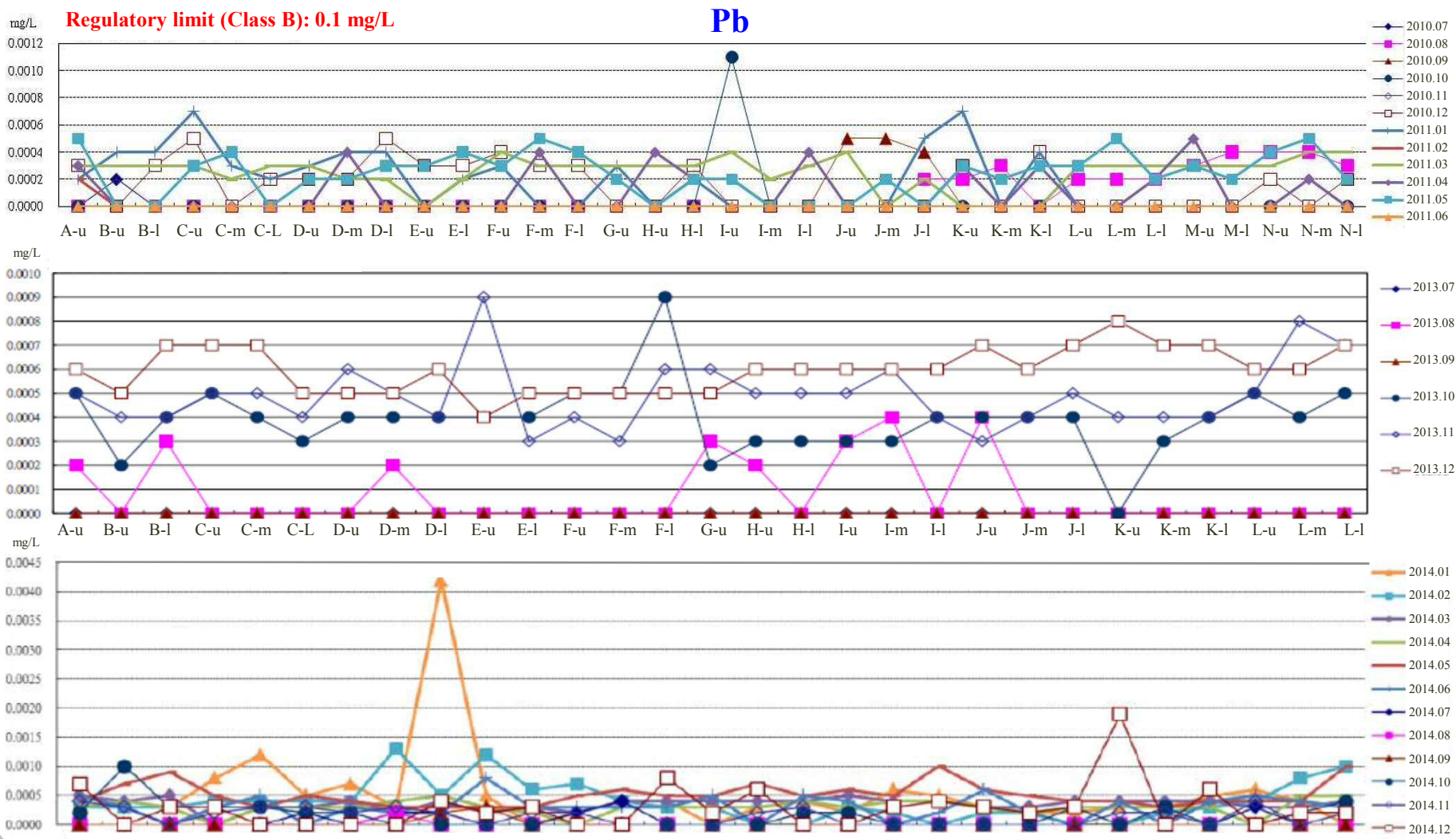
Hg



u: upper layer, m: middle layer, l: lower layer



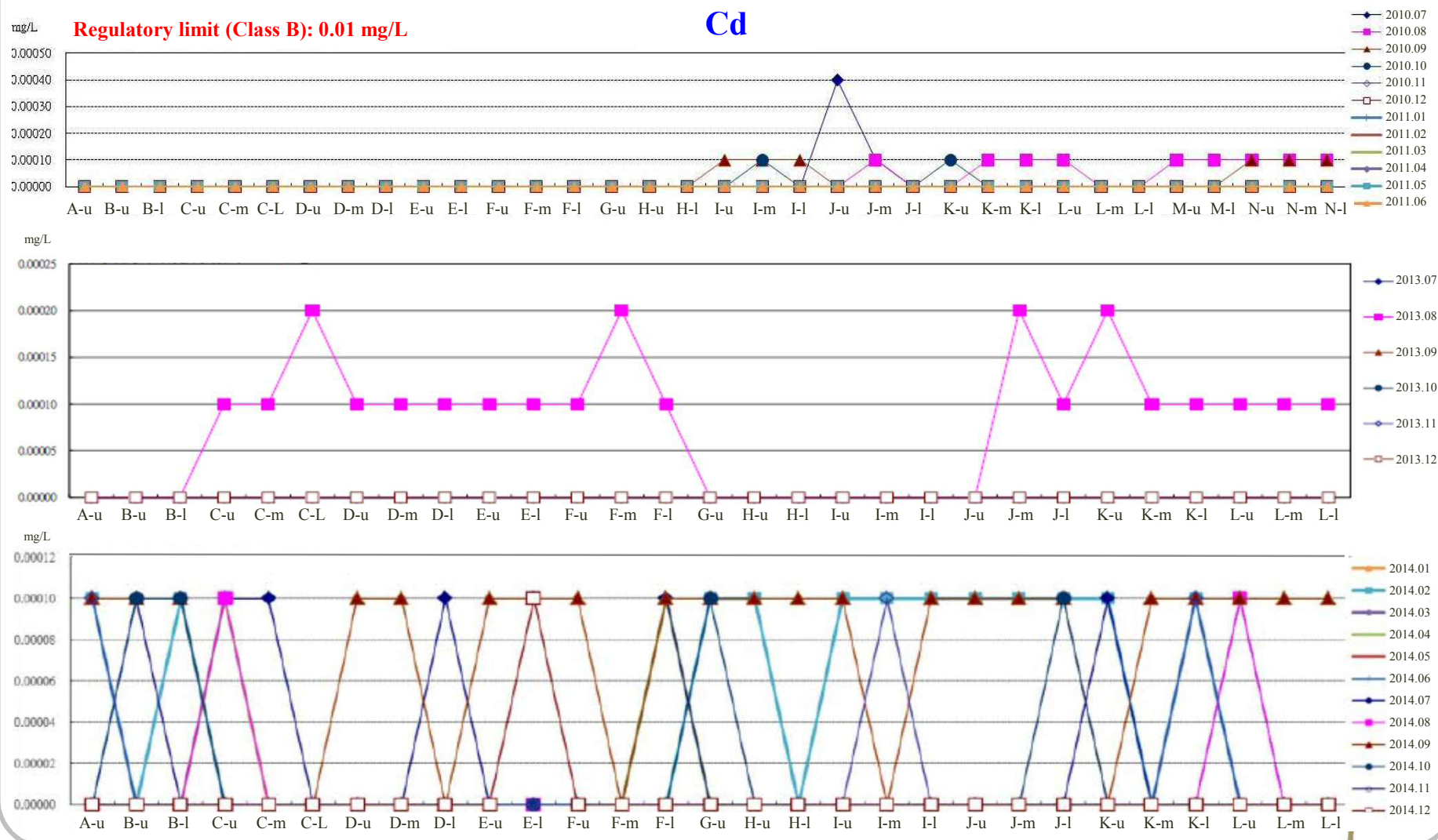
Seawater quality monitoring: Pb



u: upper layer, m: middle layer, l: lower layer



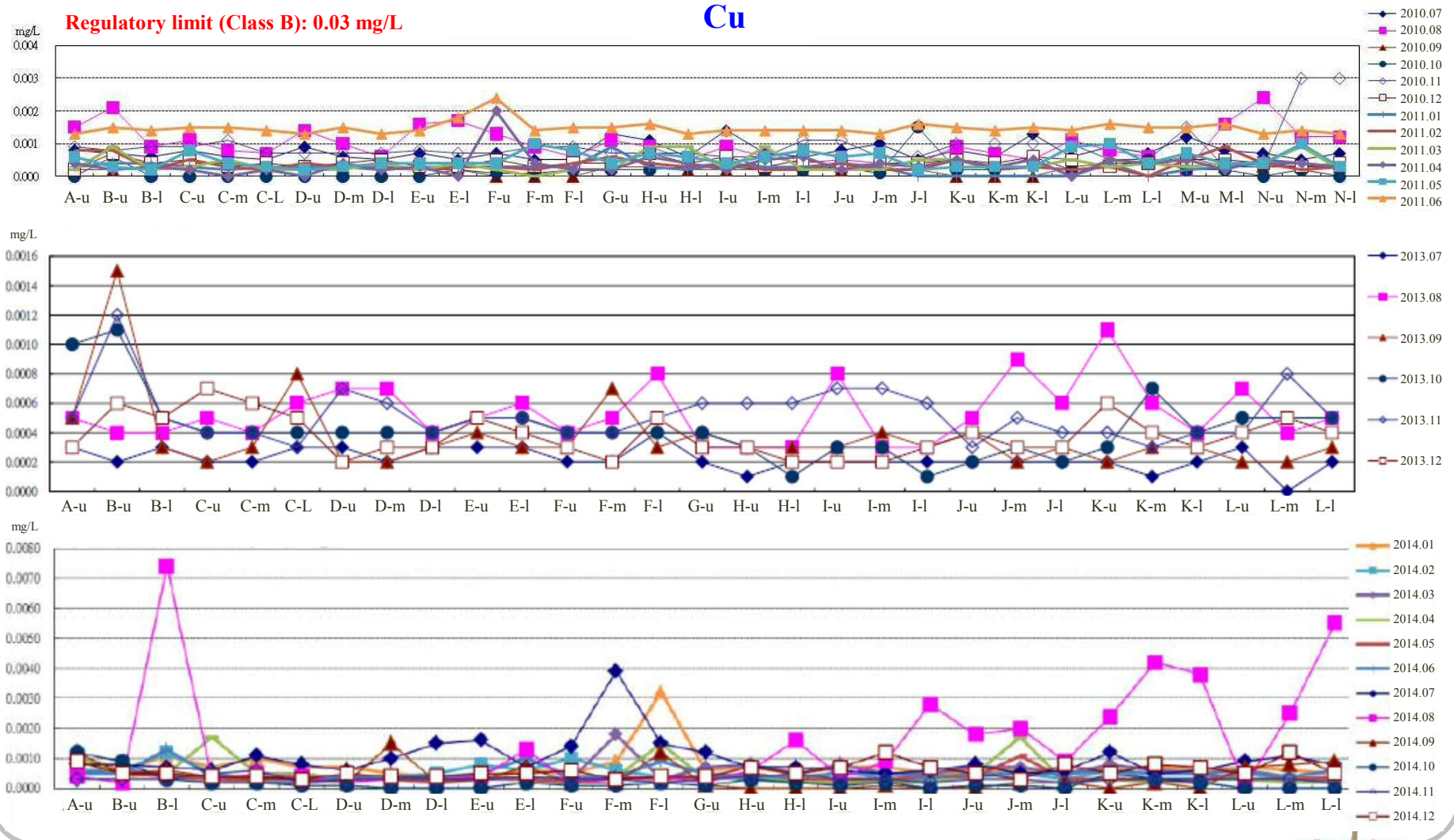
Seawater quality monitoring: Cd



u: upper layer, m: middle layer, l: lower layer



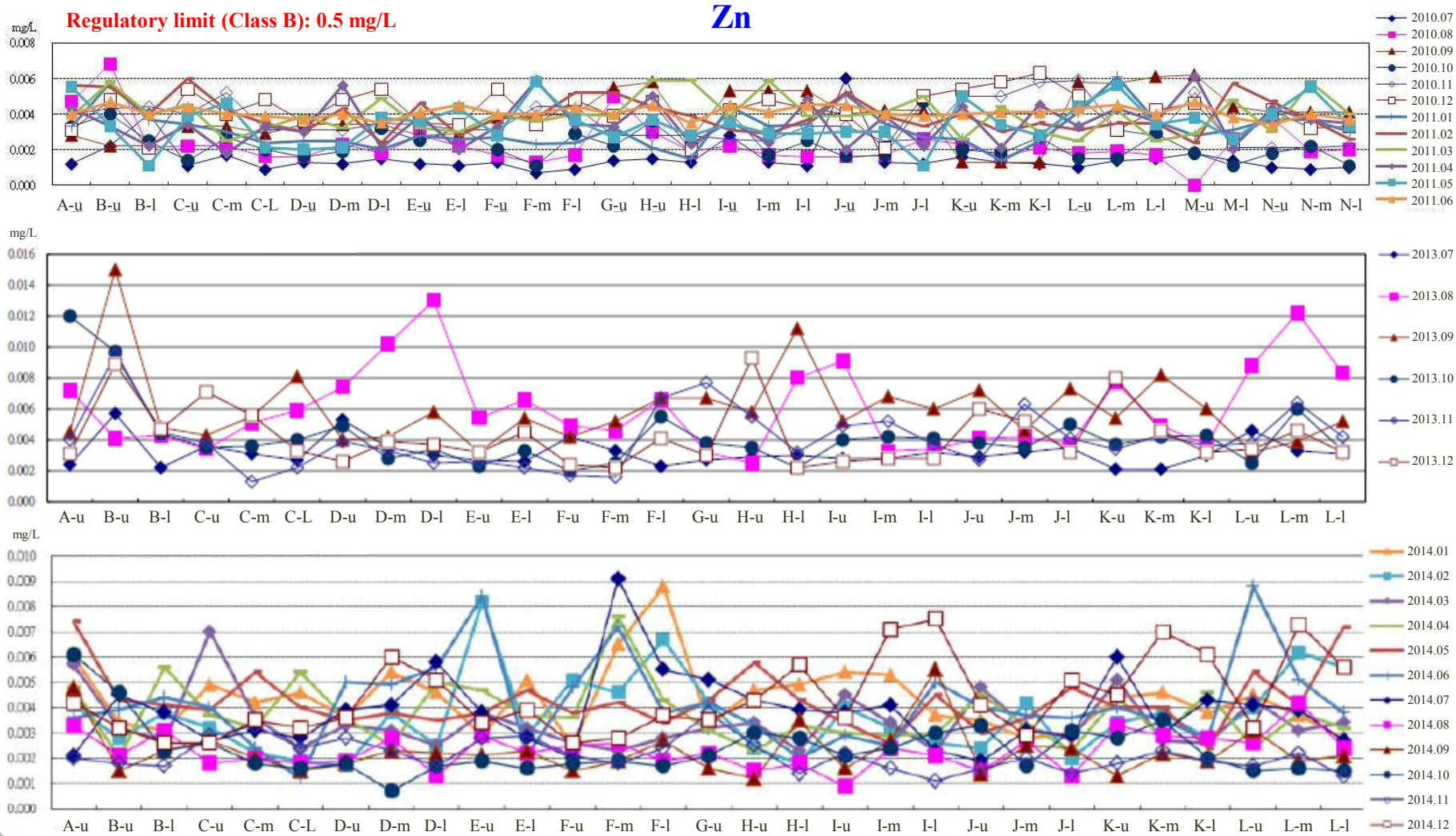
Seawater quality monitoring: Cu



u: upper layer, m: middle layer, l: lower layer



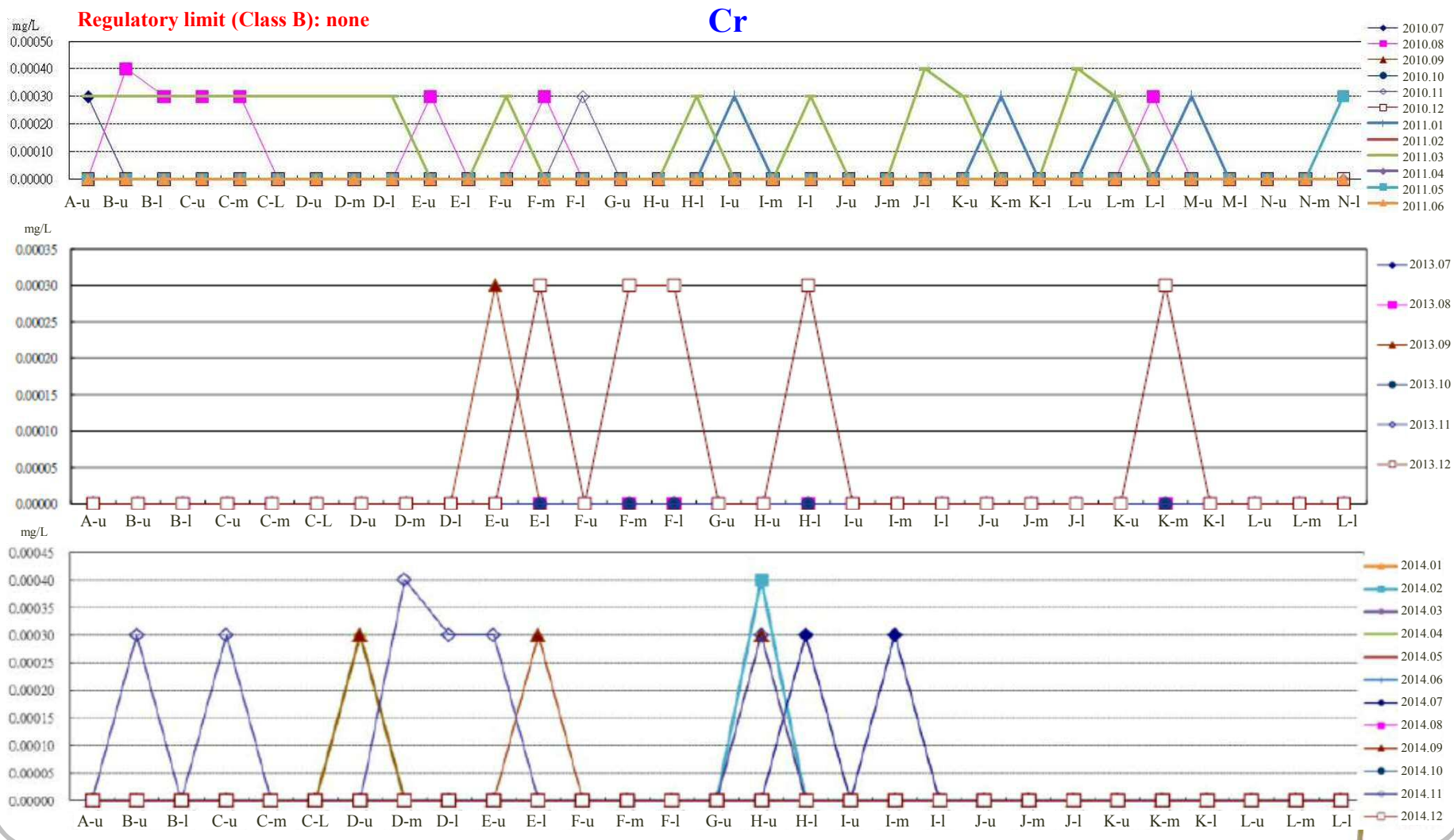
Seawater quality monitoring: Zn



u: upper layer, m: middle layer, l: lower layer



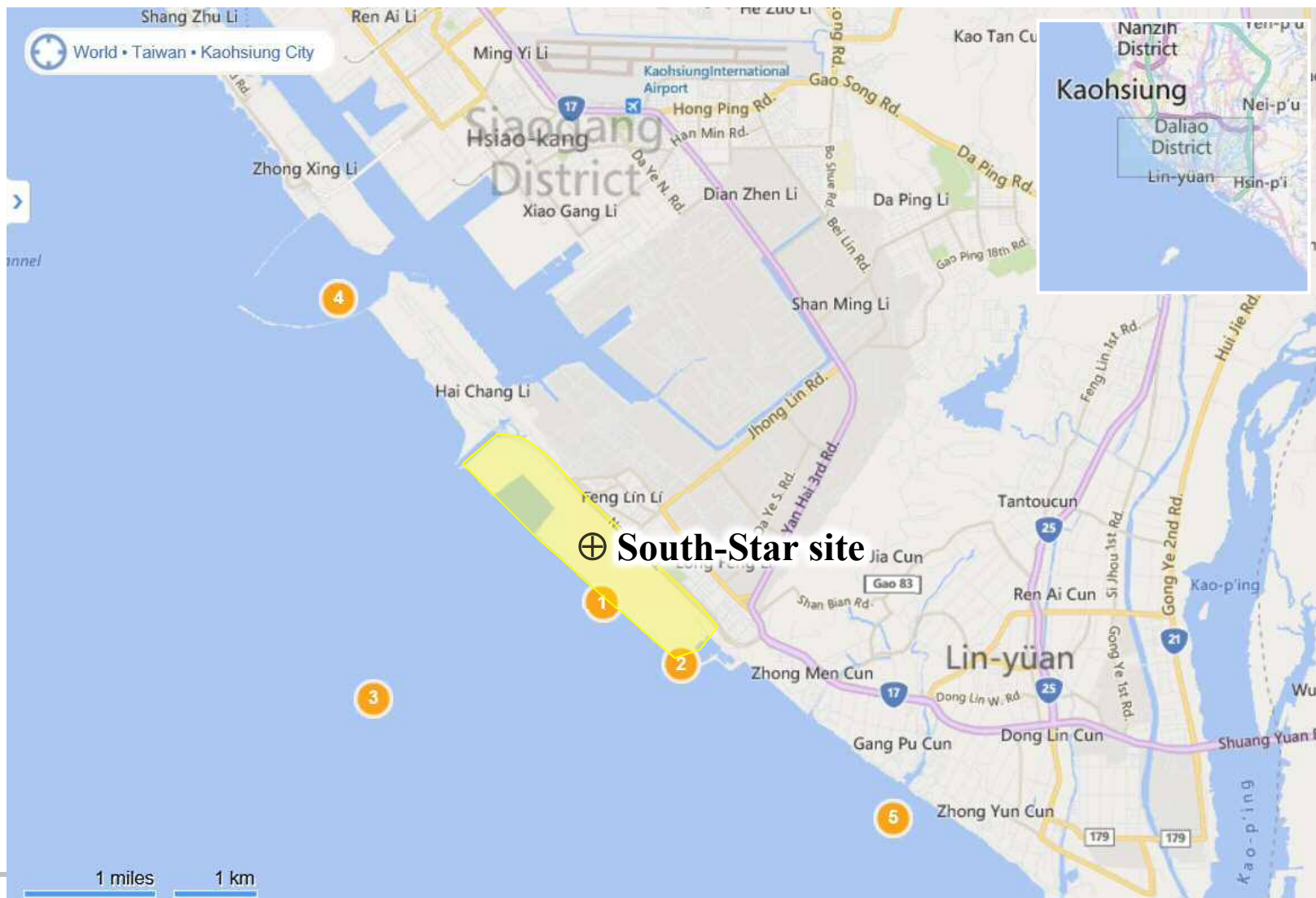
Seawater quality monitoring: Cr



u: upper layer, m: middle layer, l: lower layer



Database of Ocean Environment (by Kaohsiung Marine Bureau)





Seawater quality: Point 1

Upper layer

Date	pH	Upper layer					
		Cd (µg/L)	Pb (µg/L)	Cr(VI) (µg/L)	Hg (µg/L)	Cu (µg/L)	Zn (µg/L)
2004/3/26	8.19	ND	ND	ND	ND	ND	1.23
2004/5/28	8.21	ND	ND	ND	ND	1.13	1.73
2004/9/19	8.16	ND	ND	ND	ND	1.90	3.78
2004/10/21	8.27	ND	ND	ND	ND	0.80	3.42
2005/3/22	8.60	ND	ND	ND	1.30	0.70	6.40
2005/6/21	8.20	ND	ND	ND	ND	1.70	13.20
2005/9/29	8.20	ND	ND	ND	ND	2.76	1.70
2005/11/8	8.30	ND	ND	ND	ND	0.80	3.90
2006/3/28	8.10	ND	ND	ND	ND	1.80	8.70
2006/5/25	8.10	ND	ND	ND	ND	1.40	1.50
2006/9/21	8.30	ND	ND	ND	0.50	1.10	2.80
2006/11/2	7.90	ND	ND	ND	ND	3.80	3.40
2007/5/10	8.00	—	—	—	ND	—	—
2007/3/22	8.10	ND	1.20	4.00	ND	1.50	5.00
2007/09/06-07	7.20	—	—	—	ND	—	—
2007/11/8	8.40	ND	0.15	ND	ND	0.40	4.10
2008/3/21	8.10	ND	0.20	ND	ND	0.40	5.80
2008/5/15	8.00	—	—	—	—	—	—
2008/8/19	8.20	ND	0.40	ND	ND	0.60	8.20
2008/10/21	8.20	—	—	—	—	—	—
2009/3/18	8.00	ND	ND	ND	ND	12.50	5.80
2009/5/7	8.20	—	—	—	—	—	—
2009/9/17	8.10	—	—	—	—	—	—
2009/10/15	8.30	ND	0.50	4.60	ND	1.80	9.60
2010/3/9	8.40	—	—	—	—	—	—
2010/5/6	8.20	ND	ND	ND	ND	0.70	4.70
2010/8/4	8.40	—	—	—	—	—	—
2010/10/4	8.40	ND	ND	ND	ND	0.50	12.50
2011/3/23	8.20	ND	8.10	10.00	0.30	2.10	11.20
2011/4/27	8.20	NA	NA	NA	NA	NA	NA
2011/8/2	8.10	ND	ND	ND	ND	0.50	2.50
2011/10/25	8.10	—	—	—	—	—	—
2012/3/16	7.90	ND	ND	<10	ND	0.60	3.00
2012/5/4	7.90	ND	ND	ND	ND	5.90	4.60
2012/9/23	8.00	ND	ND	ND	ND	0.50	3.10
2012/11/14	8.00	ND	ND	ND	ND	0.50	4.00
2013/3/13	8.00	ND	ND	ND	ND	0.70	5.10
2013/5/29	8.10	ND	0.20	<10	ND	0.60	14.30
2013/8/27	7.90	0.90	ND	<10	ND	0.90	4.00
2013/11/7	8.00	ND	0.20	<10	ND	0.40	1.90
2014/3/28	8.00	<0.10	0.20	<10	ND	0.50	2.90
2014/5/23	8.00	ND	0.10	<10	ND	0.40	1.50
2014/9/5	8.10	ND	ND	<10	ND	1.20	1.90
2014/11/20	8.10	ND	ND	<10	ND	0.30	4.30

Lower layer

Date	pH	Lower layer					
		Cd (µg/L)	Pb (µg/L)	Cr(VI) (µg/L)	Hg (µg/L)	Cu (µg/L)	Zn (µg/L)
2004/3/26	8.12	ND	ND	ND	ND	0.70	1.07
2004/5/28	8.21	ND	ND	ND	ND	ND	3.95
2004/9/19	8.15	ND	ND	ND	ND	6.44	2.91
2004/10/21	8.29	ND	ND	ND	ND	1.30	2.76
2005/3/22	8.60	ND	ND	ND	2.10	0.70	4.50
2005/6/21	8.00	ND	ND	ND	ND	0.60	7.20
2005/9/29	8.10	ND	ND	ND	ND	2.60	1.20
2005/11/8	8.30	ND	ND	ND	ND	0.60	3.50
2006/3/28	8.10	ND	ND	ND	0.90	2.40	5.80
2006/5/25	8.00	ND	ND	ND	ND	1.00	1.10
2006/9/21	8.30	ND	ND	ND	0.50	0.90	2.20
2006/11/2	7.90	ND	ND	ND	ND	3.60	5.40
2007/5/10	8.00	—	—	—	ND	—	—
2007/3/22	8.20	ND	1.10	3.00	ND	0.80	3.80
2007/09/06-07	7.40	—	—	—	ND	—	—
2007/11/8	8.50	ND	0.13	ND	ND	0.80	5.00
2008/3/21	8.20	ND	<0.2	ND	ND	0.60	6.50
2008/5/15	7.90	—	—	—	—	—	—
2008/8/19	8.10	ND	0.50	ND	ND	0.70	10.50
2008/10/21	8.20	—	—	—	—	—	—
2009/3/18	7.90	ND	ND	ND	ND	0.60	6.20
2009/5/7	8.20	—	—	—	—	—	—
2009/9/17	8.20	—	—	—	—	—	—
2009/10/15	8.30	ND	0.50	ND	ND	1.80	12.30
2010/3/9	8.40	—	—	—	—	—	—
2010/5/6	8.20	ND	ND	ND	ND	1.90	11.70
2010/8/4	8.30	—	—	—	—	—	—
2010/10/4	8.30	ND	ND	ND	ND	ND	7.80
2011/3/23	8.20	ND	ND	ND	0.40	ND	5.40
2011/4/27	8.20	NA	NA	NA	NA	NA	NA
2011/8/2	8.10	ND	ND	ND	ND	0.90	5.00
2011/10/25	8.10	—	—	—	—	—	—
2012/3/16	8.00	ND	ND	<10	ND	0.20	7.00
2012/5/4	7.90	ND	ND	ND	ND	4.00	3.50
2012/9/23	8.00	ND	ND	ND	ND	0.70	3.80
2012/11/14	8.00	ND	0.20	ND	ND	0.50	2.10
2013/3/13	8.00	ND	ND	<10	ND	0.80	6.10
2013/5/29	8.10	ND	0.20	<10	ND	0.70	23.20
2013/8/27	8.00	0.60	ND	<10	ND	0.60	3.70
2013/11/7	8.00	ND	0.10	<10	ND	0.50	3.10
2014/3/28	8.10	<0.1	0.10	<10	ND	0.60	2.40
2014/5/23	8.10	ND	1.60	<10	ND	0.50	1.80
2014/9/5	8.10	ND	ND	<10	ND	1.40	2.50
2014/11/20	8.00	ND	ND	<10	ND	0.30	2.50



Seawater quality: Point 2

Upper layer

Date	pH	Cd	Pb	Cr(VI)	Hg	Cu	Zn
		(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)
2012/3/16	8.00	ND	ND	ND	ND	0.20	2.60
2012/5/4	7.90	ND	ND	ND	ND	3.10	8.30
2012/9/23	8.00	ND	ND	<10	ND	0.40	2.80
2012/11/14	8.00	ND	0.20	<10	ND	0.40	10.80
2013/3/13	8.00	ND	ND	ND	ND	0.60	5.00
2013/5/29	8.20	ND	0.20	<10	0.40	0.70	14.20
2013/8/27	7.80	0.80	ND	<10	ND	0.80	5.40
2013/11/7	8.00	ND	ND	<10	ND	0.60	2.00
2014/3/28	8.00	<0.1	0.20	<10	ND	0.50	2.70
2014/5/23	8.00	ND	ND	<10	ND	0.40	2.50
2014/9/5	8.10	ND	ND	<10	ND	0.90	2.50
2014/11/20	8.00	ND	ND	<10	ND	0.30	4.30

Lower layer

Date	pH	Cd	Pb	Cr(VI)	Hg	Cu	Zn
		(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)
2012/3/16	8.00	ND	ND	ND	ND	0.10	5.60
2012/5/4	7.90	ND	ND	ND	ND	3.50	9.80
2012/9/23	8.00	ND	ND	<10	ND	0.50	3.60
2012/11/14	8.00	ND	ND	<10	ND	0.40	8.60
2013/3/13	8.00	ND	ND	<10	ND	0.70	7.30
2013/5/29	8.10	ND	ND	<10	ND	0.60	5.50
2013/8/27	7.90	0.60	ND	<10	ND	0.60	2.40
2013/11/7	8.00	ND	1.00	<10	ND	0.60	2.90
2014/3/28	8.10	<0.1	0.20	<10	ND	0.60	1.80
2014/5/23	8.00	ND	ND	<10	ND	0.40	1.10
2014/9/5	8.10	ND	ND	<10	ND	0.90	2.10
2014/11/20	8.00	ND	ND	<10	ND	0.30	3.50





Seawater quality: Point 3

Upper layer

Date	pH	Upper layer					
		Cd (µg/L)	Pb (µg/L)	Cr(VI) (µg/L)	Hg (µg/L)	Cu (µg/L)	Zn (µg/L)
2004/3/26	8.16	ND	ND	ND	ND	2.04	1.40
2004/5/28	8.22	ND	ND	ND	ND	0.83	3.09
2004/9/19	8.23	ND	ND	ND	ND	2.19	2.92
2004/10/21	8.32	ND	ND	ND	ND	2.00	2.83
2005/3/22	8.60	ND	ND	ND	2.50	0.70	3.30
2005/6/21	8.20	ND	ND	ND	ND	1.10	6.20
2005/9/29	8.30	ND	ND	ND	0.80	0.80	1.10
2005/11/8	8.30	ND	ND	ND	ND	0.80	3.40
2006/3/28	8.10	ND	ND	ND	ND	1.90	5.50
2006/5/25	8.00	ND	ND	ND	ND	1.20	9.80
2006/9/21	8.30	ND	ND	ND	1.40	1.10	2.70
2006/11/2	8.10	ND	ND	ND	0.80	3.60	2.30
2007/5/10	8.00	—	—	—	ND	—	—
2007/3/22	8.10	0.03	1.70	4.00	ND	3.60	11.80
2007/09/06-07	7.20	—	—	—	ND	—	—
2007/11/8	8.40	ND	0.20	ND	ND	0.50	4.40
097/03/21	8.20	ND	0.20	10.00	ND	0.60	7.40
097/05/15	8.10	—	—	—	—	—	—
097/08/19	8.10	ND	0.60	ND	ND	0.40	7.50
097/10/21	8.20	—	—	—	—	—	—
2009/3/18	7.90	ND	ND	ND	0.50	18.80	6.80
2009/5/7	8.20	—	—	—	—	—	—
2009/9/17	8.10	—	—	—	—	—	—
2009/10/15	8.40	ND	ND	ND	ND	1.00	11.40
2010/3/9	8.50	—	—	—	—	—	—
2010/5/6	8.10	ND	ND	ND	ND	1.00	45.90
2010/8/4	8.40	—	—	—	—	—	—
2010/10/4	8.50	ND	ND	ND	ND	0.80	9.90
2011/3/23	8.20	ND	ND	ND	0.30	1.60	7.40
2011/4/27	8.20	NA	NA	NA	NA	NA	NA
2011/8/2	8.20	ND	ND	ND	ND	0.70	4.20
2011/10/25	8.10	—	—	—	—	—	—
2012/3/16	7.80	ND	ND	ND	ND	0.60	4.40
2012/5/4	8.00	ND	ND	ND	ND	2.50	5.00
2012/9/23	8.00	ND	0.20	ND	ND	0.70	7.20
2012/11/14	8.00	ND	0.20	ND	ND	0.30	2.30
2013/3/13	8.00	ND	ND	ND	ND	0.40	4.90
2013/5/29	8.20	ND	ND	<10	ND	0.30	7.90
2013/8/27	8.00	0.40	ND	<10	ND	0.40	2.70
2013/8/27	8.00	0.60	ND	<10	ND	0.60	3.60
2013/11/7	8.00	ND	0.20	<10	ND	0.50	1.60
2014/3/28	8.00	<0.1	1.20	<10	ND	0.60	3.70
2014/5/23	8.10	ND	0.10	<10	ND	0.50	1.30
2014/9/5	8.20	ND	ND	<10	ND	0.90	9.50
2014/11/20	8.10	ND	ND	<10	ND	0.50	2.40

Lower layer

Date	pH	Lower layer					
		Cd (µg/L)	Pb (µg/L)	Cr(VI) (µg/L)	Hg (µg/L)	Cu (µg/L)	Zn (µg/L)
2004/3/26	8.18	ND	ND	ND	ND	2.38	0.70
2004/5/28	8.17	ND	ND	ND	ND	2.21	6.23
2004/9/19	8.17	ND	ND	ND	ND	4.12	3.22
2004/10/21	8.31	ND	ND	ND	ND	0.70	3.44
2005/3/22	8.60	ND	ND	ND	2.30	0.70	4.00
2005/6/21	8.00	ND	ND	ND	ND	0.70	5.90
2005/9/29	8.20	ND	ND	ND	ND	2.49	1.10
2005/11/8	8.20	ND	ND	ND	ND	0.80	3.20
2006/3/28	8.10	ND	ND	ND	ND	3.10	4.90
2006/5/25	7.80	ND	ND	ND	ND	1.20	1.50
2006/9/21	8.30	ND	ND	ND	1.20	1.10	2.00
2006/11/2	8.00	ND	ND	ND	1.00	3.80	2.20
2007/5/10	8.00	—	—	—	ND	—	—
2007/3/22	8.10	ND	1.40	4.00	ND	0.80	2.50
2007/09/06-07	7.30	—	—	—	ND	—	—
2007/11/8	8.50	ND	ND	ND	ND	0.50	4.90
2008/3/21	8.10	ND	0.30	ND	ND	0.70	7.60
2008/5/15	8.10	—	—	—	—	—	—
2008/8/19	8.10	ND	0.60	ND	<0.5	0.40	7.50
2008/10/21	8.10	—	—	—	—	—	—
2009/3/18	7.90	ND	0.30	ND	ND	0.80	6.40
2009/5/7	8.20	—	—	—	—	—	—
2009/9/17	8.20	—	—	—	—	—	—
2009/10/15	8.30	ND	0.60	ND	ND	2.80	10.80
2010/3/9	8.50	—	—	—	—	—	—
2010/5/6	8.10	ND	ND	ND	ND	0.50	8.60
2010/8/4	8.30	—	—	—	—	—	—
2010/10/4	8.30	ND	ND	ND	ND	0.80	9.70
2011/3/23	8.20	ND	ND	10.00	0.40	0.50	5.60
2011/4/27	8.20	NA	NA	NA	NA	NA	NA
2011/8/2	8.10	ND	ND	ND	ND	0.70	4.50
2011/10/25	8.10	—	—	—	—	—	—
2012/3/16	7.90	ND	0.30	ND	ND	0.60	7.00
2012/5/4	7.90	ND	ND	<10	ND	1.70	2.80
2012/9/23	8.00	ND	ND	<10	ND	0.50	4.00
2012/11/14	8.00	ND	0.20	<10	ND	0.30	3.90
2013/3/13	7.90	ND	ND	ND	ND	0.50	7.20
2013/5/29	8.00	ND	ND	<10	ND	0.50	5.20
2013/11/7	8.00	ND	ND	<10	ND	0.40	2.80
2014/3/28	8.10	<0.10	0.30	<10	ND	0.60	2.10
2014/5/23	8.10	ND	0.30	<10	ND	0.40	0.90
2014/9/5	8.10	ND	ND	<10	ND	1.90	4.40
2014/11/20	8.10	ND	ND	<10	ND	0.20	2.90



Seawater quality: Point 4

Upper layer

Date	pH	Upper layer					
		Cd (µg/L)	Pb (µg/L)	Cr(VI) (µg/L)	Hg (µg/L)	Cu (µg/L)	Zn (µg/L)
2004/3/26	8.08	ND	ND	ND	ND	2.57	2.90
2004/5/28	8.20	ND	ND	ND	ND	1.28	7.91
2004/9/19	8.15	ND	ND	ND	ND	0.60	2.64
2004/10/21	8.29	ND	ND	ND	ND	1.70	5.66
2005/3/21	8.50	ND	ND	ND	1.80	1.70	6.10
2005/6/20	7.90	ND	ND	ND	ND	0.80	5.60
2005/9/26	8.00	ND	ND	ND	ND	1.06	12.30
2005/11/7	8.20	ND	ND	ND	ND	1.60	6.80
2006/3/27	8.10	ND	ND	ND	ND	0.90	8.60
2006/5/24	7.90	ND	ND	ND	ND	2.30	9.50
2006/9/20	7.80	ND	ND	ND	1.10	2.20	6.00
2006/11/1	7.90	ND	ND	ND	ND	3.90	6.30
2007/5/10	8.00	—	—	—	ND	—	—
2007/3/22	8.20	0.05	1.30	3.00	ND	0.80	4.00
2007/09/06-07	7.10	—	—	—	ND	—	—
2007/11/8	8.40	0.04	0.13	ND	ND	0.90	6.70
2008/3/21	8.10	ND	0.30	ND	ND	1.30	8.60
2008/5/15	8.00	—	—	—	—	—	—
2008/8/19	8.00	ND	1.20	ND	ND	1.40	26.30
2008/10/21	8.20	—	—	—	—	—	—
2009/3/18	7.80	ND	ND	ND	ND	13.20	9.50
2009/5/7	8.10	—	—	—	—	—	—
2009/9/17	8.00	—	—	—	—	—	—
2009/10/15	8.30	ND	ND	ND	ND	1.20	20.50
2010/3/10	8.40	—	—	—	—	—	—
2010/5/5	8.10	ND	ND	ND	ND	1.80	10.10
2010/8/4	8.40	—	—	—	—	—	—
2010/10/4	8.20	ND	ND	ND	ND	1.60	62.40
2011/3/23	8.20	ND	ND	ND	0.20	0.80	33.30
2011/4/27	8.20	NA	NA	NA	NA	NA	NA
2011/8/3	8.10	ND	ND	ND	ND	1.70	8.00
2011/10/25	8.00	—	—	—	—	—	—
2012/3/15	7.90	ND	ND	ND	ND	0.80	5.20
2012/5/3	7.90	ND	0.60	<10	ND	18.30	14.20
2012/8/10	7.90	ND	ND	ND	ND	4.60	13.50
2012/11/13	7.80	ND	0.30	<10	ND	1.20	13.30
2013/3/14	8.00	0.10	0.40	ND	ND	0.70	4.80
2013/5/30	8.10	ND	ND	<10	ND	1.20	7.50
2013/8/26	7.90	ND	ND	<10	ND	1.80	15.20
2013/11/6	8.00	ND	ND	<10	ND	1.30	10.90
2014/3/27	8.00	0.50	0.20	<10	ND	1.00	5.70
2014/5/22	8.00	ND	ND	<10	ND	1.20	3.10
2014/9/3	8.10	ND	ND	<10	ND	1.60	2.00
2014/11/19	8.00	ND	ND	<10	ND	0.90	4.90

Lower layer

Date	pH	Lower layer					
		Cd (µg/L)	Pb (µg/L)	Cr(VI) (µg/L)	Hg (µg/L)	Cu (µg/L)	Zn (µg/L)
2004/3/26	8.10	ND	ND	ND	ND	4.49	3.20
2004/5/28	8.18	ND	ND	ND	ND	0.91	7.50
2004/9/19	8.10	ND	ND	ND	ND	3.40	3.45
2004/10/21	8.26	ND	ND	ND	ND	1.50	5.45
2005/3/21	8.40	ND	ND	ND	2.10	2.00	5.50
2005/6/20	7.80	ND	ND	ND	ND	0.40	8.20
2005/9/26	8.10	ND	ND	ND	ND	3.68	7.70
2005/11/7	8.20	ND	ND	ND	ND	1.00	5.00
2006/3/27	8.10	ND	ND	ND	ND	0.80	8.40
2006/5/24	8.10	ND	ND	ND	ND	2.50	8.80
2006/9/20	7.90	ND	ND	ND	1.40	1.50	5.30
2006/11/1	7.90	ND	ND	ND	ND	4.10	7.10
2007/5/10	8.00	—	—	—	ND	—	—
2007/3/22	8.20	0.03	0.90	ND	ND	1.20	4.10
2007/09/06-07	7.40	—	—	—	ND	—	—
2007/11/8	8.50	ND	0.14	ND	ND	1.00	6.60
2008/3/21	8.20	ND	0.30	ND	ND	0.90	8.60
2008/5/15	8.00	—	—	—	—	—	—
2008/8/19	8.00	ND	1.20	ND	ND	1.40	19.60
2008/10/21	8.20	—	—	—	—	—	—
2009/3/18	7.90	ND	0.50	ND	ND	1.30	8.90
2009/5/7	8.30	—	—	—	—	—	—
2009/9/17	8.10	—	—	—	—	—	—
2009/10/15	8.30	ND	ND	ND	ND	1.30	15.40
2010/3/10	8.40	—	—	—	—	—	—
2010/5/5	8.10	ND	0.60	ND	ND	3.10	15.40
2010/8/4	8.20	—	—	—	—	—	—
2010/10/4	8.20	ND	ND	ND	ND	1.40	23.10
2011/3/23	8.20	ND	ND	ND	0.30	0.90	34.30
2011/4/27	8.20	NA	NA	NA	NA	NA	NA
2011/8/3	8.10	ND	ND	ND	ND	1.20	6.30
2011/10/25	8.00	—	—	—	—	—	—
2012/3/15	7.90	ND	ND	ND	ND	1.40	7.10
2012/5/3	7.80	ND	0.60	<10	ND	13.00	11.40
2012/8/10	7.90	ND	ND	ND	ND	4.90	19.50
2012/11/13	7.80	ND	0.20	<10	ND	1.00	11.70
2013/3/14	8.00	ND	0.20	<10	ND	0.90	9.90
2013/5/30	8.10	ND	0.20	<10	ND	1.30	10.80
2013/8/26	7.90	ND	ND	<10	ND	14.10	17.80
2013/11/6	8.00	ND	ND	<10	ND	0.70	2.80
2014/3/27	8.00	<0.1	0.10	<10	ND	1.00	4.30
2014/5/22	7.90	ND	ND	<10	ND	1.50	3.80
2014/9/3	8.00	ND	ND	<10	0.30	1.20	1.90
2014/11/19	8.00	ND	ND	<10	ND	1.10	7.40



Seawater quality: Point 5

Upper layer

Date	pH	Cd	Pb	Cr(VI)	Hg	Cu	Zn
		(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)
2011/6/6	8.30	ND	ND	ND	ND	0.80	9.80
2011/10/28	8.00	ND	ND	ND	ND	ND	15.90
2012/3/16	7.90	ND	ND	ND	ND	0.20	3.40
2012/5/4	8.00	ND	ND	<10	ND	1.00	4.30
2012/9/23	8.00	ND	ND	<10	ND	0.50	3.60
2012/11/14	8.00	ND	ND	ND	ND	0.30	2.40
2013/3/13	8.00	ND	ND	<10	ND	0.60	7.60
2013/5/29	8.10	ND	0.20	<10	ND	0.60	6.80
2013/8/27	8.00	0.50	ND	<10	ND	0.50	1.90
2013/11/7	8.00	ND	ND	<10	ND	0.40	0.90
2014/3/28	8.00	<0.10	0.10	<10	ND	0.60	3.40
2014/5/23	8.00	ND	ND	<10	ND	0.50	3.60
2014/9/5	8.10	ND	ND	<10	ND	1.20	1.90
2014/11/20	8.10	ND	ND	<10	ND	0.30	4.30

Lower layer

Date	pH	Cd	Pb	Cr(VI)	Hg	Cu	Zn
		(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)
2011/6/6	8.30	ND	ND	ND	ND	0.80	5.00
2011/10/28	8.00	ND	ND	ND	ND	ND	15.50
2012/3/16	7.90	ND	ND	ND	ND	0.50	8.60
2012/5/4	7.90	ND	ND	ND	ND	1.10	4.70
2012/9/23	8.00	ND	ND	ND	ND	0.40	2.30
2012/11/14	8.00	ND	ND	ND	ND	0.30	1.20
2013/3/13	8.00	ND	ND	<10	ND	0.70	9.60
2013/5/29	8.10	ND	ND	<10	ND	0.40	7.50
2013/8/27	8.00	0.70	ND	<10	ND	0.70	2.00
2013/11/7	8.00	ND	0.20	<10	ND	0.40	2.10
2014/3/28	8.10	<0.10	0.20	<10	ND	0.50	1.40
2014/5/23	8.10	ND	ND	<10	ND	0.40	1.70
2014/9/5	8.10	ND	ND	<10	ND	1.10	1.60
2014/11/20	8.00	ND	ND	<10	ND	0.30	3.40

Detection limits

Cd	Pb	Cr(VI)	Hg	Cu	Zn
(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)
0.25	2.07	3	0.51	0.53	0.59

Taiwan regulations (Marine area water)

Class	pH	Cd	Pb	Cr(VI)	Hg	Cu	Zn
		(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)
A	7.5~8.5	10	100	50	2	30	500
B	7.5~8.5	10	100	50	2	30	500
C	7.0~8.5	10	100	50	2	30	500

1 µg/L = 0.001 mg/L





Summary

- ❖ During the environmental monitoring period, the **pH values** and **heavy metal concentrations** in the seawater near South-Star site were **all below the regulatory limits of Taiwan EPA**.
- ❖ The results of environmental monitoring show that **the slag aggregate did not affect the marine environment** near the South-Star site.
- ❖ According to the Database of Ocean Environment, the seawater quality around South-Star site in **2004–2014** can meet the Taiwan regulations. **There was no increase in pH of seawater near South-Star site**.

