

# Calculating 3-Event Rolling Averages

- As part of the site-specific objectives (SSO), NPDES dischargers are required to calculate the 3-event rolling average of dissolved copper and total cyanide concentrations in each segment of the Bay, based on RMP data.
- The last three RMP water cruises (2011, 2013, and 2015) were used to update the averages.
- Sample code from R for rolling average algorithm:

```
# aggregate the results by Bay Segment
wat.data3 <- aggregate(wat.data2$Result, by = list(wat.data2$Region),
                      FUN = 'mean')
names(wat.data3) <- c('Region', 'Cu.Average')
```

# # Sites With Results by Year of Water Cruise & Region

Copper  
(dissolved)

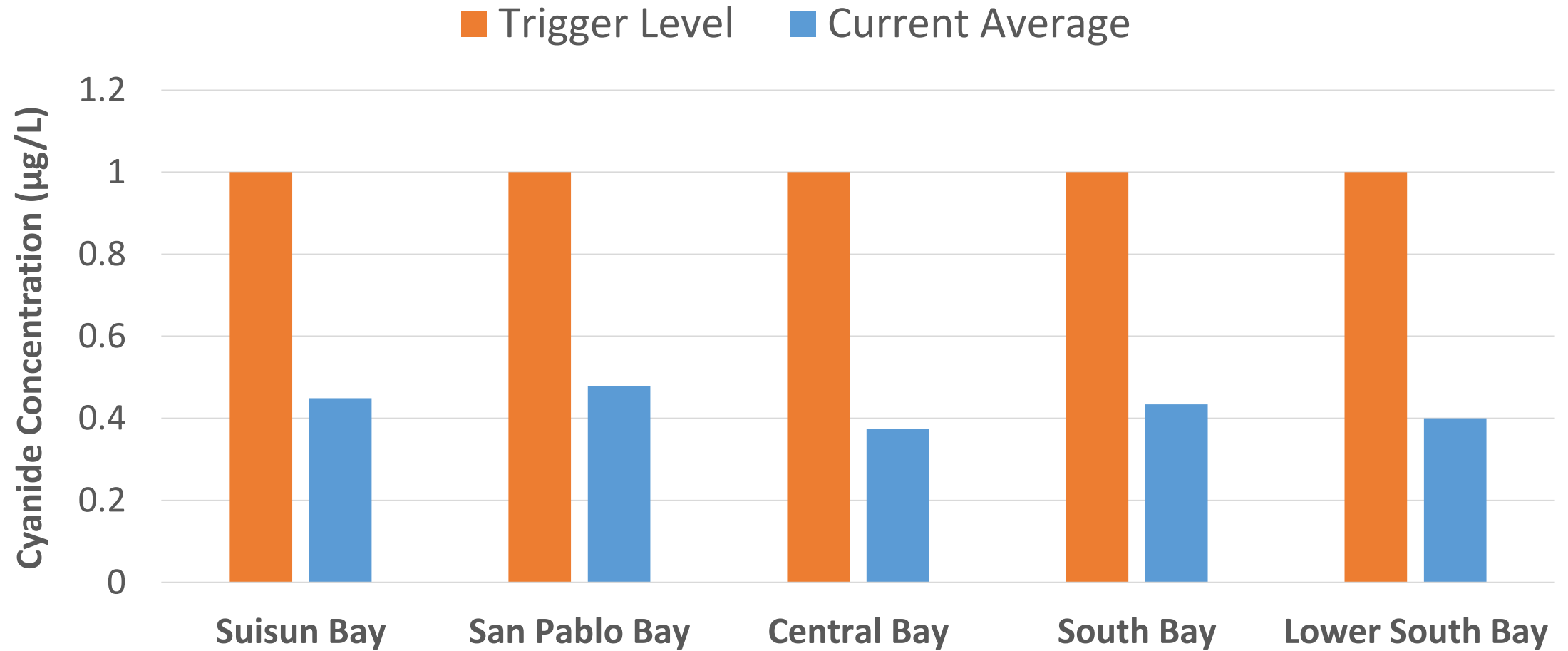
	Suisun Bay	San Pablo Bay	*Central Bay	**South Bay	Lower South Bay
2010	3	3	4	4	5
2011	3	3	4	4	5
2013	3	3	4	4	5
2015	3	3	4	4	5
<b>Total Samples in Rolling Average</b>	<b>9</b>	<b>9</b>	<b>12</b>	<b>12</b>	<b>15</b>

Cyanide  
(total)

	Suisun Bay	San Pablo Bay	*Central Bay	**South Bay	Lower South Bay
2011	3	3	4	3	5
2013	3	3	4	1	5
2015	3	3	4	4	5
<b>Total Samples in Rolling Average</b>	<b>9</b>	<b>9</b>	<b>12</b>	<b>8</b>	<b>15</b>

\*Historical station BC10 included; \*\*Historical station BA30 included

# Cyanide Results



# Cyanide Results

- Cyanide SSO is 2.9  $\mu\text{g/L}$  with a **1  $\mu\text{g/L}$**  trigger level for regional monitoring

**DRAFT**

	Region	# Samples	Current Average $\text{CN}^-$ ( $\mu\text{g/L}$ ) (2011, 2013, 2015 Water Cruises)	Trigger Level ( $\mu\text{g/L}$ )
1	Suisun Bay	9	<b>0.45</b>	1
2	San Pablo Bay	9	<b>0.48</b>	1
3	Central Bay	12	<b>0.37</b>	1
4	South Bay	8	<b>0.43</b>	1
5	Lower South Bay	15	<b>0.40</b>	1

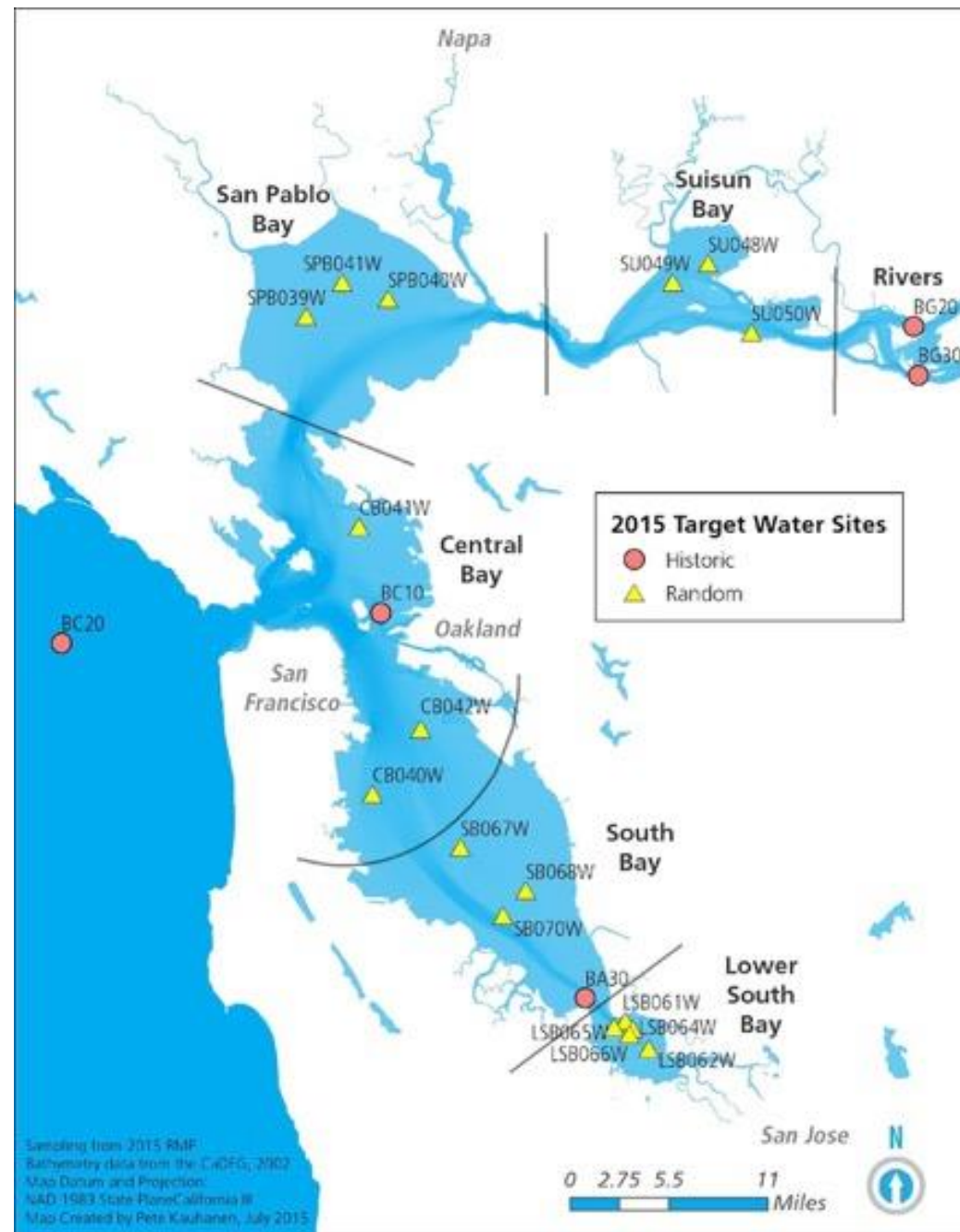
- Average cyanide concentrations are below the trigger level in all regions

# Appendices

- Cu & CN<sup>-</sup>
  - 2011, 2013, 2015 Water Cruise Site Maps
  - Cyanide Data

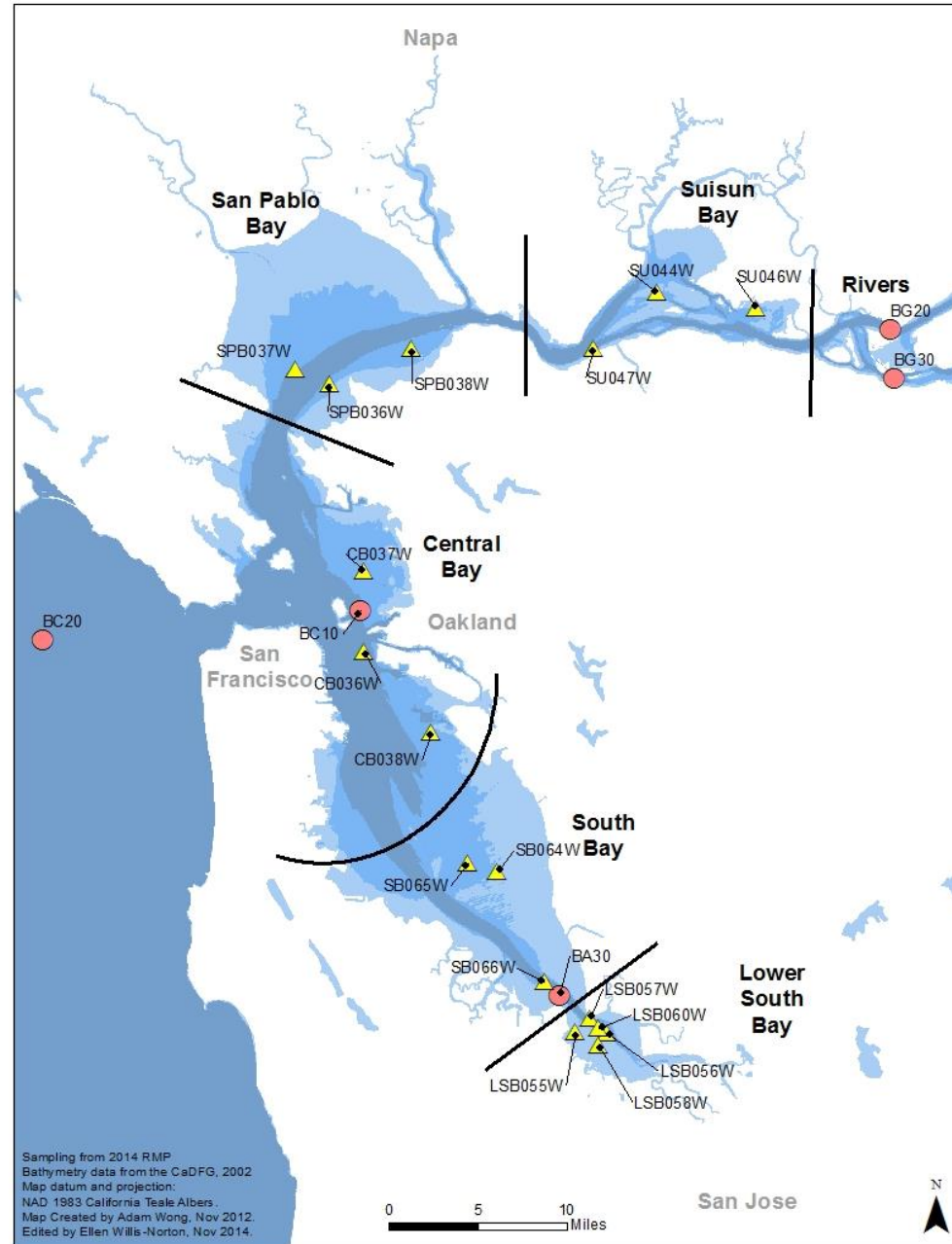
# '15 Water Cruise Map

- Cu & CN<sup>-</sup>:
  - Not river sites (BG20 & BG30)

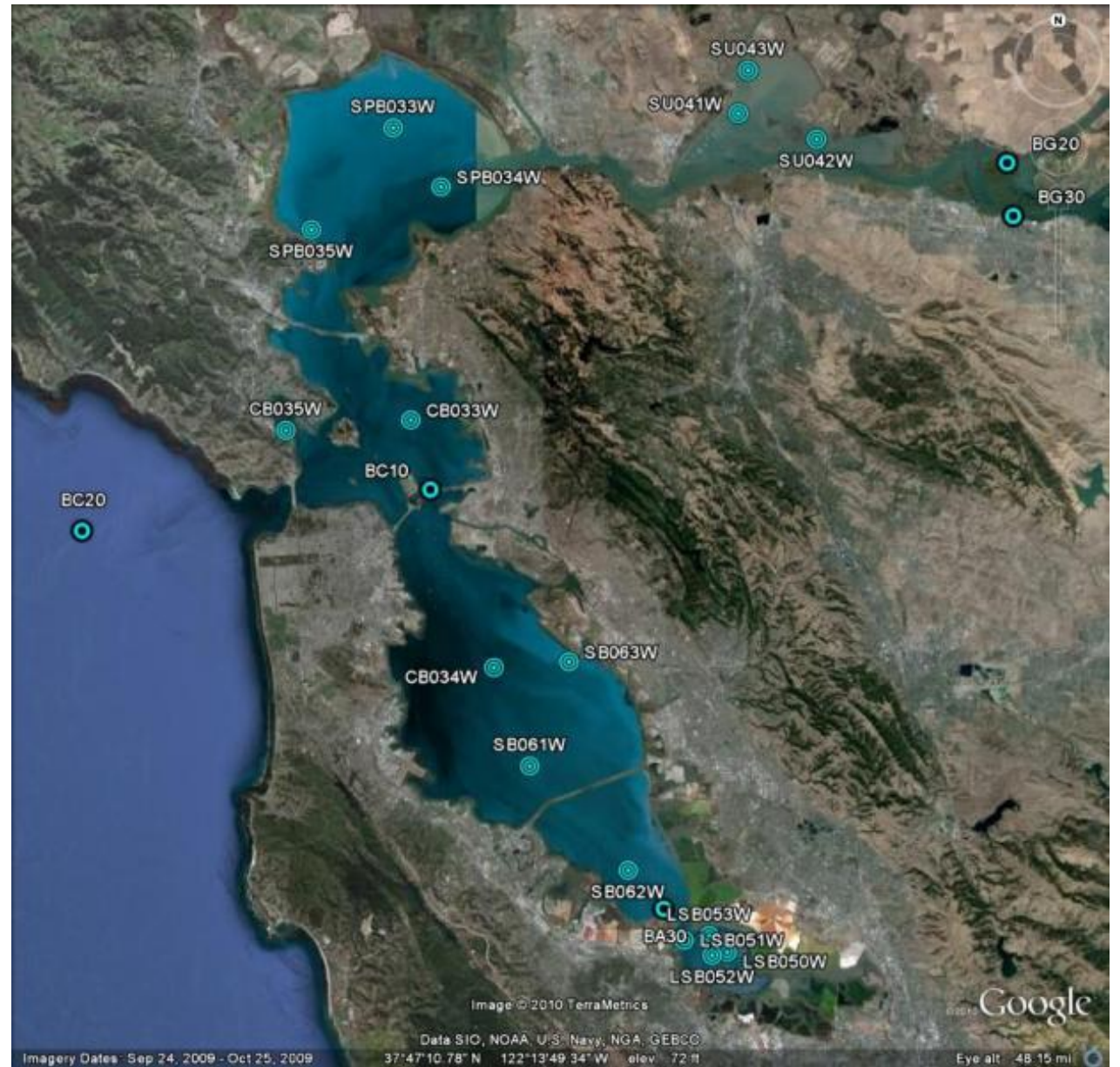


# '13 Water Cruise Map

- CN<sup>-</sup>: missing south bay sites
  - Kept historical site BA30



# '11 Water Cruise Map





# Cyanide Data

Site Code	Region	Collection Date	Parameter	Qualifiers	Result	MDL	Units
BA30	SB	9/14/11	Cyanide	NBC		0.6	0.4 ug/L
BC10	CB	9/16/11	Cyanide	NBC		0.2	0.4 ug/L
BC20	CB	9/19/11	Cyanide	NBC		0.2	0.4 ug/L
CB033W	CB	9/16/11	Cyanide	NBC		0.2	0.4 ug/L
CB034W	CB	9/16/11	Cyanide	DS,NBC		0.49	0.4 ug/L
CB035W	CB	9/19/11	Cyanide	NBC		0.396	0.4 ug/L
LSB050W	LSB	9/13/11	Cyanide	NBC		0.4635	0.4 ug/L
LSB051W	LSB	9/14/11	Cyanide	NBC		0.48	0.4 ug/L
LSB052W	LSB	9/13/11	Cyanide	NBC		0.2	0.4 ug/L
LSB053W	LSB	9/14/11	Cyanide	NBC		0.48	0.4 ug/L
LSB054W	LSB	9/13/11	Cyanide	NBC		0.79	0.4 ug/L
SB062W	SB	9/15/11	Cyanide	DS,NBC		0.65	0.4 ug/L
SB063W	SB	9/15/11	Cyanide	DS,NBC		0.2	0.4 ug/L
SPB033W	SPB	9/20/11	Cyanide	NBC		1.48	0.4 ug/L
SPB034W	SPB	9/20/11	Cyanide	NBC		0.303	0.4 ug/L
SPB035W	SPB	9/20/11	Cyanide	NBC	0.273333333		0.4 ug/L
SU041W	SU	9/21/11	Cyanide	NBC		0.2	0.4 ug/L
SU042W	SU	9/21/11	Cyanide	NBC		0.5315	0.4 ug/L
SU043W	SU	9/21/11	Cyanide	NBC		1.3	0.4 ug/L
BA30	SB	7/31/13	Cyanide	NBC		0.22	0.44 ug/L
BC10	CB	8/2/13	Cyanide	NBC		0.52	0.44 ug/L
BC20	CB	8/5/13	Cyanide	NBC		0.586	0.44 ug/L
CB036W	CB	8/2/13	Cyanide	NBC		0.22	0.44 ug/L
CB037W	CB	8/5/13	Cyanide	NBC		0.45	0.44 ug/L
CB038W	CB	8/2/13	Cyanide	NBC		0.22	0.44 ug/L
LSB055W	LSB	7/31/13	Cyanide	NBC		0.22	0.44 ug/L
LSB056W	LSB	7/30/13	Cyanide	NBC		0.22	0.44 ug/L
LSB057W	LSB	7/31/13	Cyanide	NBC		0.22	0.44 ug/L
LSB058W	LSB	7/30/13	Cyanide	NBC		0.46	0.44 ug/L
LSB060W	LSB	7/30/13	Cyanide	NBC		0.22	0.44 ug/L
SPB036W	SPB	8/6/13	Cyanide	NBC		0.22	0.44 ug/L
SPB037W	SPB	8/6/13	Cyanide	NBC		0.462	0.44 ug/L
SPB038W	SPB	8/6/13	Cyanide	NBC		0.22	0.44 ug/L
SU044W	SU	8/7/13	Cyanide	NBC		0.22	0.44 ug/L
SU046W	SU	8/7/13	Cyanide	NBC		0.22	0.44 ug/L
SU047W	SU	8/7/13	Cyanide	NBC		0.22	0.44 ug/L
BA30	SB	8/26/15	Cyanide	NBC		0.00045	0.0009 mg/L
BC10	CB	8/27/15	Cyanide	NBC		0.00045	0.0009 mg/L
BC20	CB	8/28/15	Cyanide	NBC		0.00045	0.0009 mg/L
CB040W	CB	8/27/15	Cyanide	NBC		0.00045	0.0009 mg/L
CB041W	CB	8/28/15	Cyanide	NBC		0.00045	0.0009 mg/L
CB042W	CB	8/28/15	Cyanide	NBC		0.00045	0.0009 mg/L
LSB061W	LSB	8/26/15	Cyanide	NBC		0.00045	0.0009 mg/L
LSB062W	LSB	8/26/15	Cyanide	NBC		0.00045	0.0009 mg/L
LSB064W	LSB	8/26/15	Cyanide	NBC		0.00045	0.0009 mg/L
LSB065W	LSB	8/26/15	Cyanide	NBC		0.00045	0.0009 mg/L
LSB066W	LSB	8/26/15	Cyanide	NBC		0.00045	0.0009 mg/L
SB067W	SB	8/27/15	Cyanide	NBC		0.00045	0.0009 mg/L
SB068W	SB	8/27/15	Cyanide	NBC		0.00045	0.0009 mg/L
SB070W	SB	8/27/15	Cyanide	NBC		0.00045	0.0009 mg/L
SPB039W	SPB	8/31/15	Cyanide	NBC		0.00045	0.0009 mg/L
SPB040W	SPB	8/31/15	Cyanide	NBC		0.00045	0.0009 mg/L
SPB041W	SPB	8/31/15	Cyanide	NBC		0.00045	0.0009 mg/L
SU048W	SU	9/1/15	Cyanide	NBC		0.00045	0.0009 mg/L
SU049W	SU	9/1/15	Cyanide	NBC		0.00045	0.0009 mg/L
SU050W	SU	9/1/15	Cyanide	NBC		0.00045	0.0009 mg/L