Cu Metals Marina Study – Lower Newport Bay

OC Coastkeeper -Ray Hiemstra
*Santa Ana RWQCB -*Linda Candelaria, PhD*
City of Newport Beach

Background

- Cu boat paints are #1 source of Cu in Newport Bay ~ 60,000lbs/yr – passive leaching+ hull cleaning
- Shelter Island Cu TMDL, NB Metals TMDL
- DPR –reevaluating Cu boat paints registration

Objectives

- *Determine whether Cu antifouling boat paints are a significant source of Cu to the water & sediments in marinas and Lower Newport Bay*
- *Determine metal concentrations in water and sediment in marinas and adjacent channel sites*
- *Determine toxicity in marinas & channels*

Methodology -sampling

- *Collect water and sediment samples throughout Lower Newport Bay*

- *8 marinas & adjacent channels*
  (3 stations/marina, 1 channel station)
  2 storm drains, 1 shipyard station

- *3 sampling events: May, August, December*
  -August –Toxicity/TOC/PSA -10 samples
  -November –additional toxicity tests

Methodology cont.

- *Chemical Analysis*

  Water – dissolved & total metals, TSS, DOC, salinity

  Sediment – metals

  Aug – PCBs, PAHs, toxicity (water & sed) , TOC, PSA, AVS/SEM (sediment) -10 samples
- *Toxicity Analysis* (10 samples)

  -*Water* – mussel embryo,

  -*Sediment* – amphipod (*Eohaustorius),*

  –sediment/water interface, pore water

Newport Marinas Copper Study
Marinas and Sites

0.9 0 0.9 1.8 Miles

N

Results

Water –

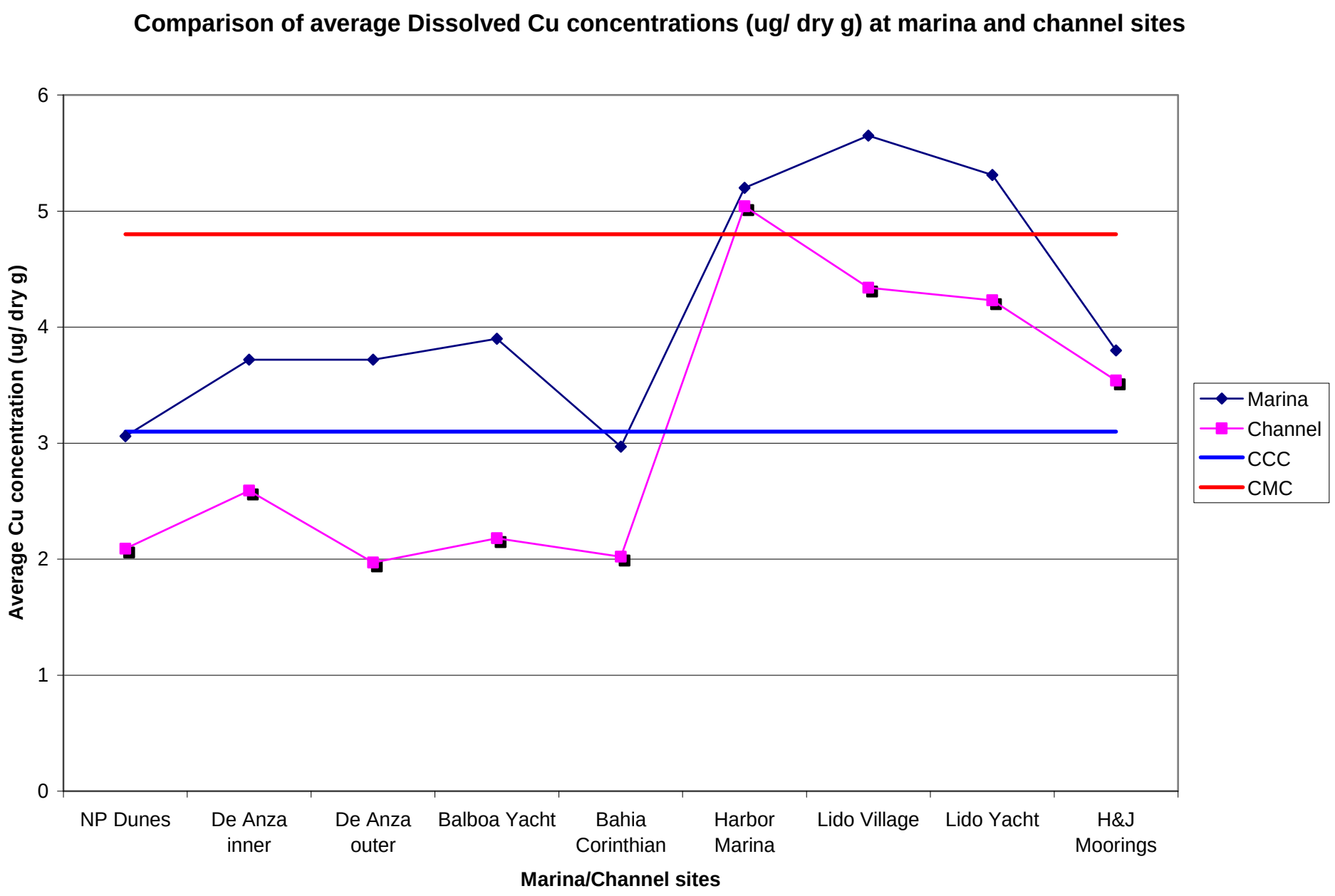
Only Dissolved Cu above CTR standards

-chronic-all marinas, acute 6/8 marinas

(tested Cu, Cd, Cr, Zn, As, Hg, Pb, Ni)

Mean dissolved Cu concentrations in marinas above mean channel Cu concentrations in most sites (not statistically significant)

No water toxicity


Comparison of average Dissolved Cu concentrations (ug/ dry g) at marina and channel sites
Average Cu concentration (ug/ dry g)
0
1
2
3
4
5
6
NP Dunes
De Anza inner
De Anza outer
Balboa Yacht
Bahia Corinthian
Harbor Marina
Lido Village
Lido Yacht
H&J Moorings
Marina/Channel sites
Marina
Channel
CCC
CMC

Results

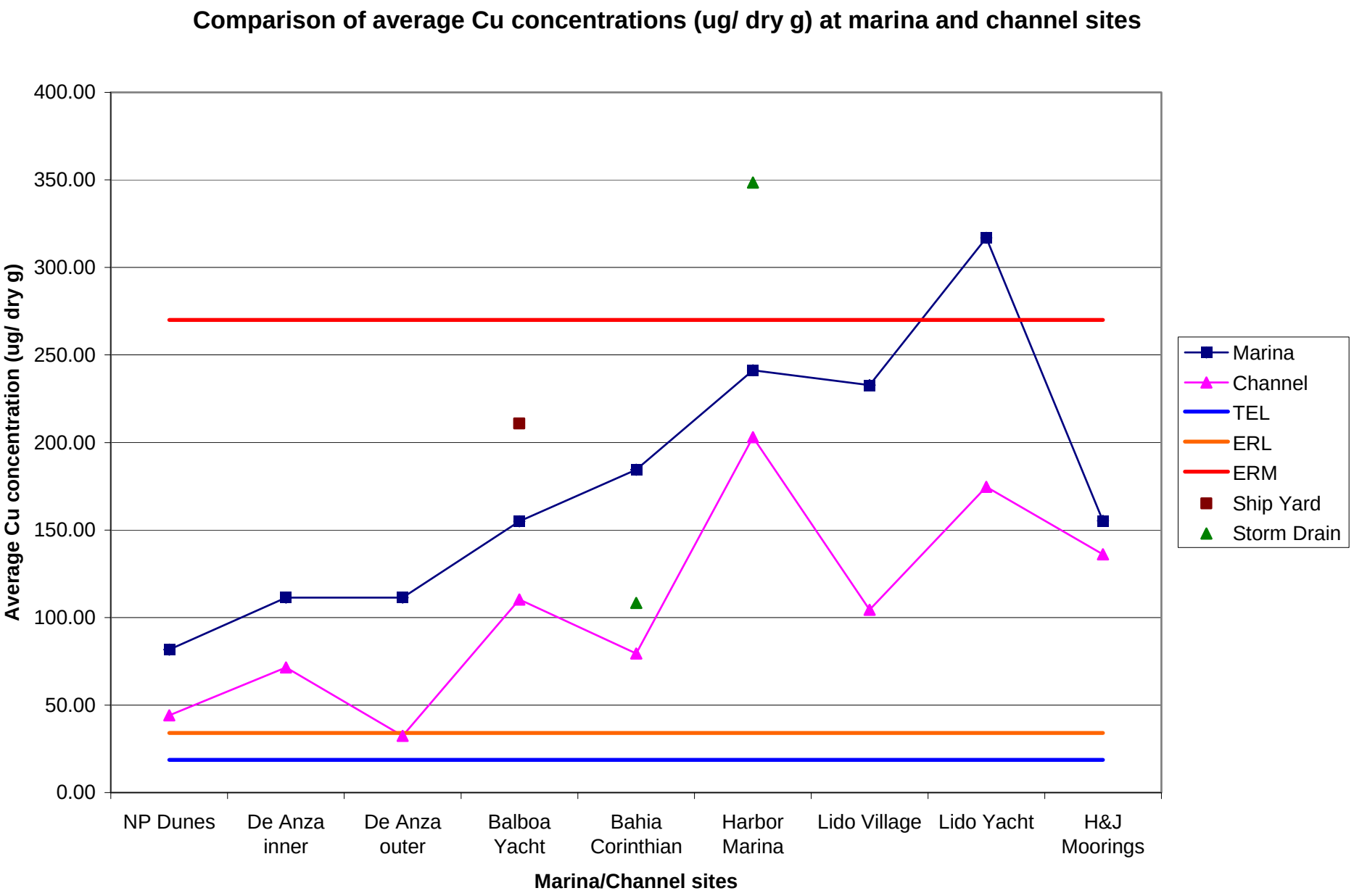
Sediment –

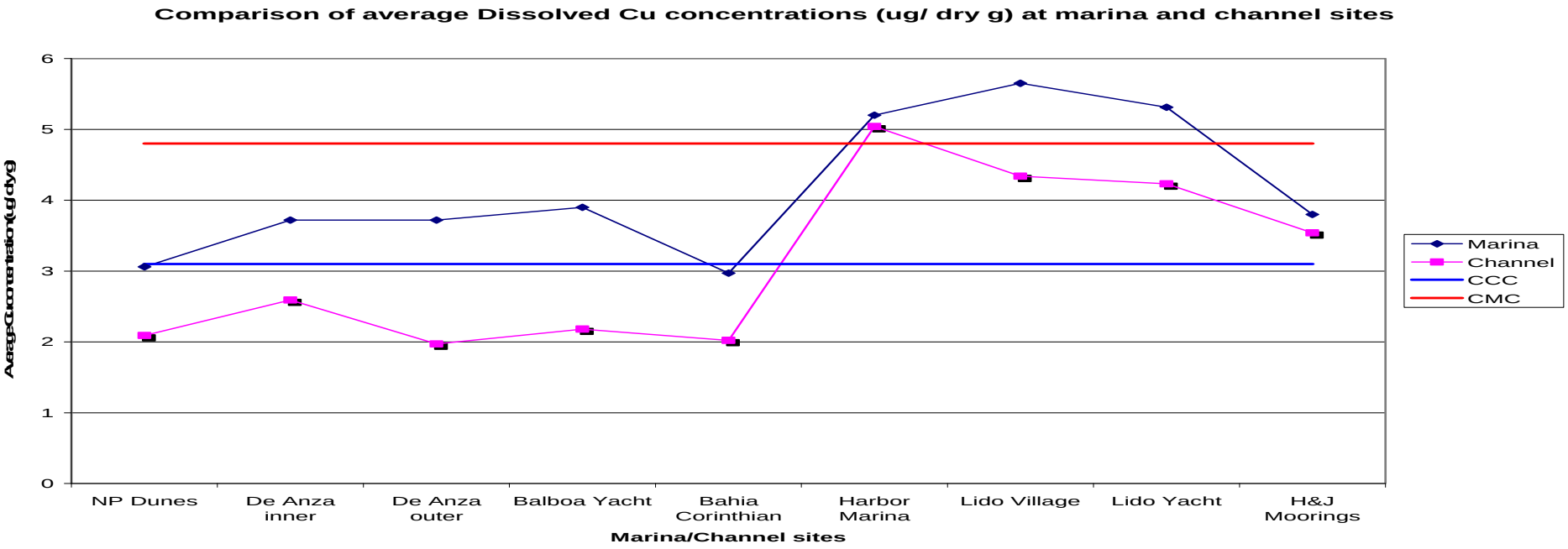
Sediment Cu, Hg, Zn above ERMs

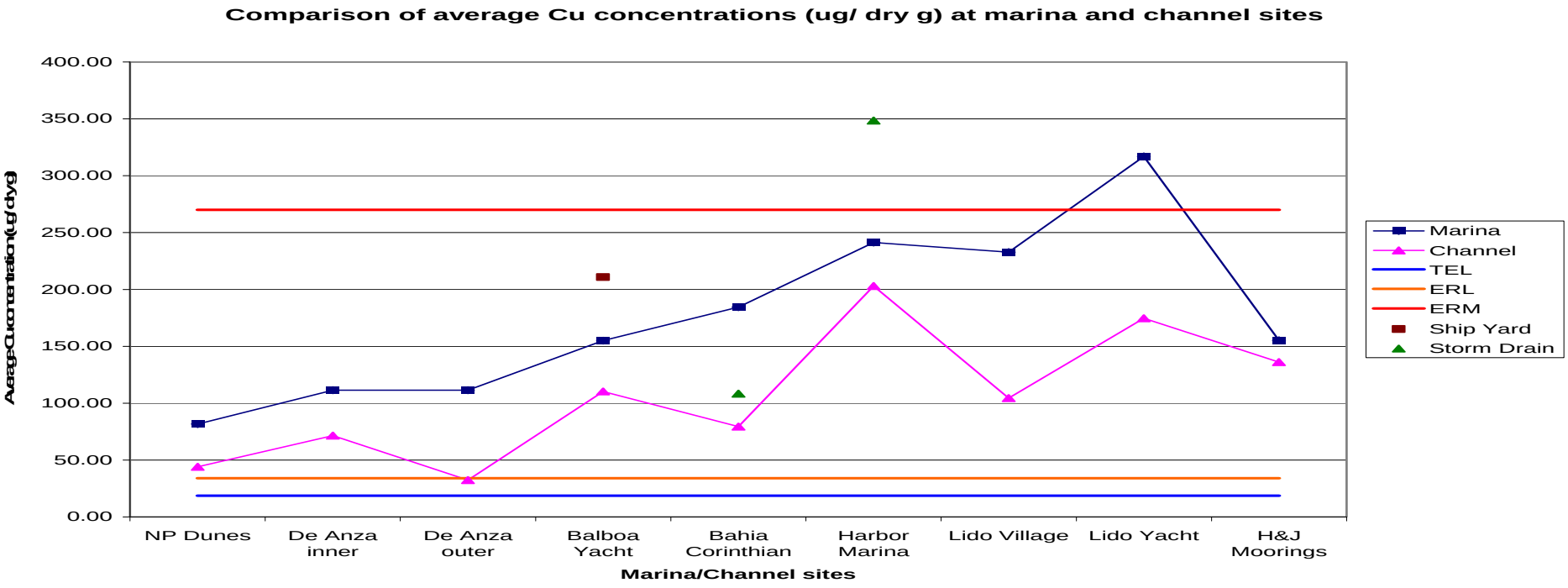
-Cu, Hg 5/8 marinas, Zn 3/8 marinas

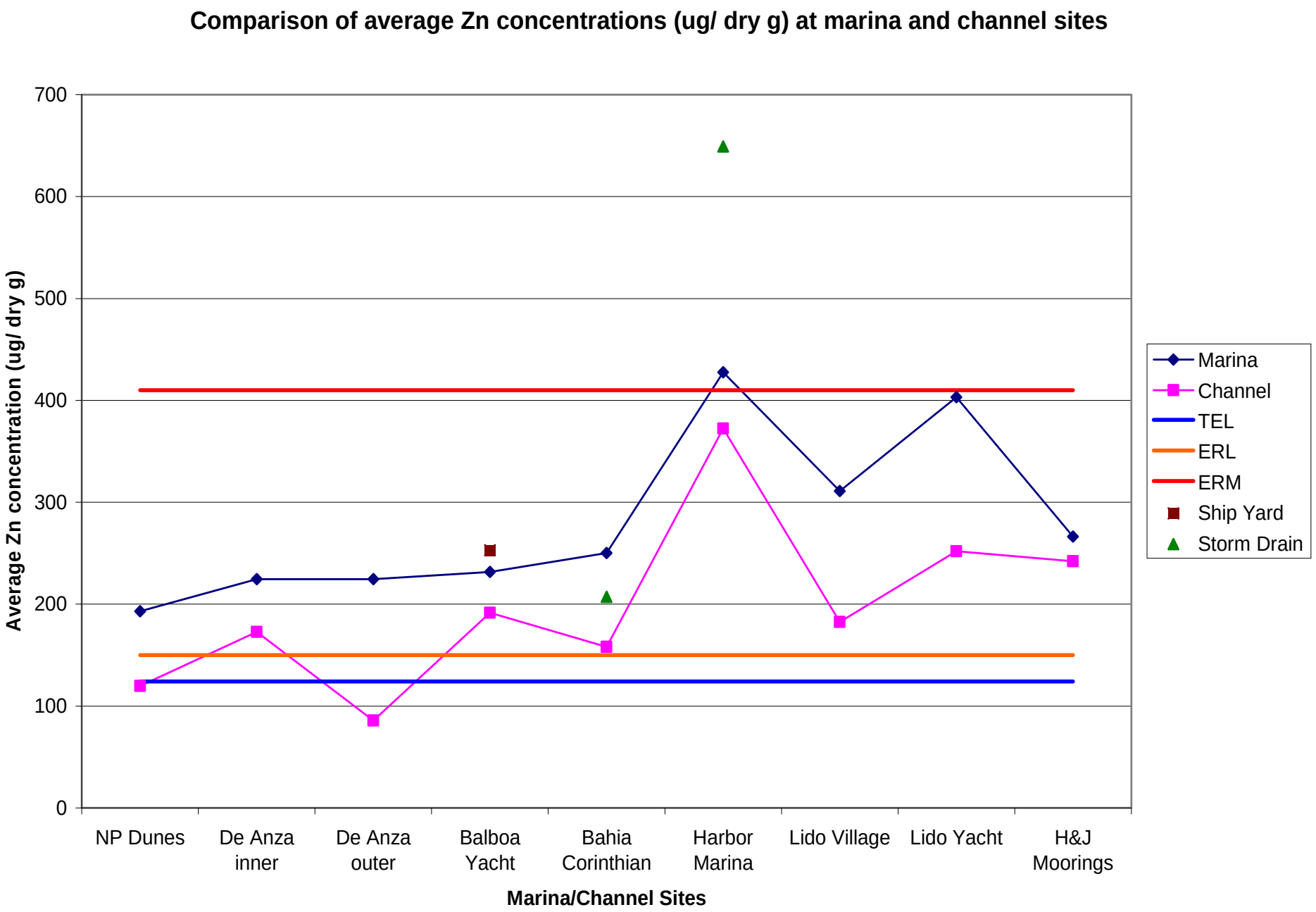
Marina means higher than channel means in most sites -Cu, Zn

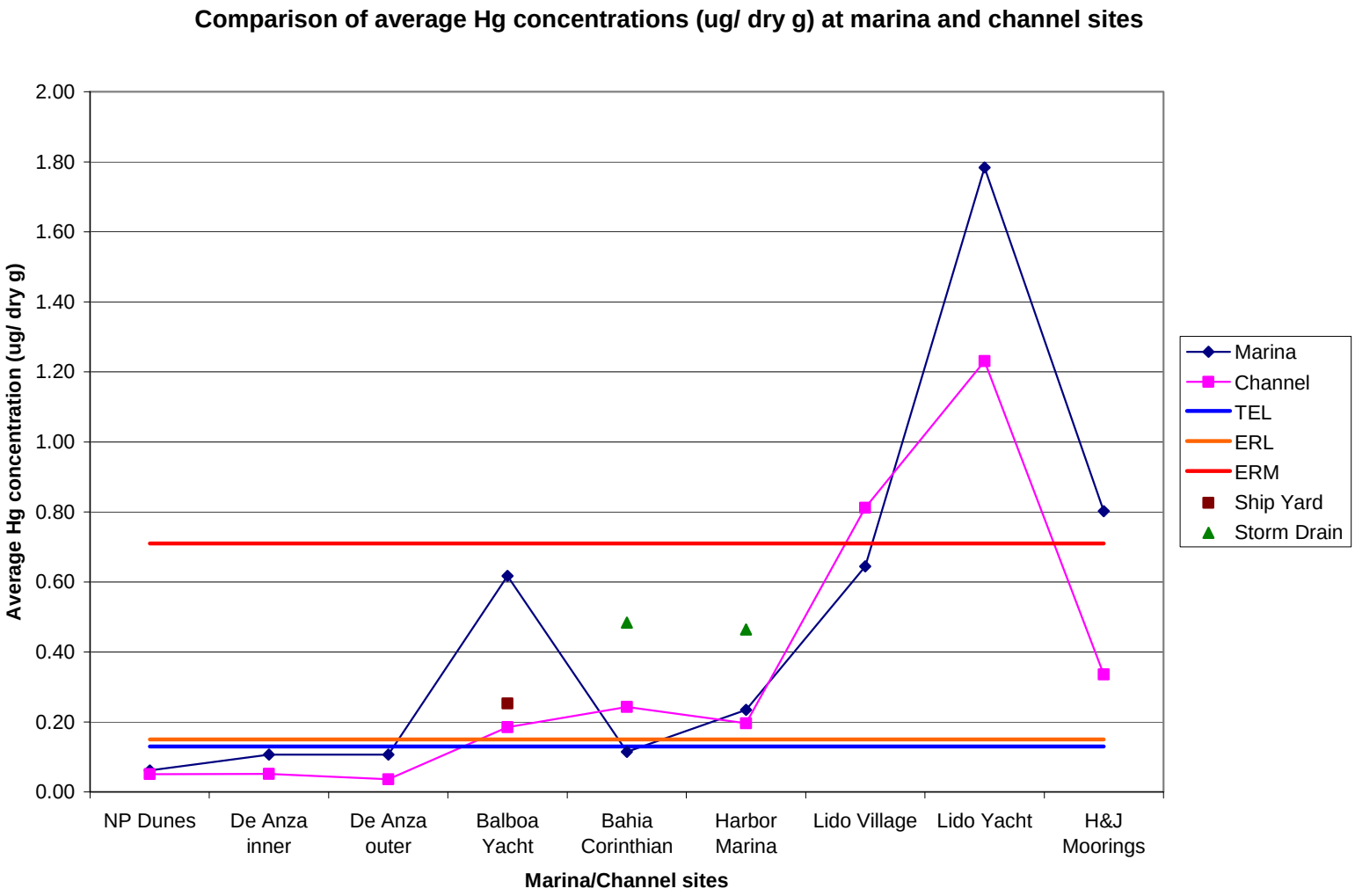
(statistically significant)

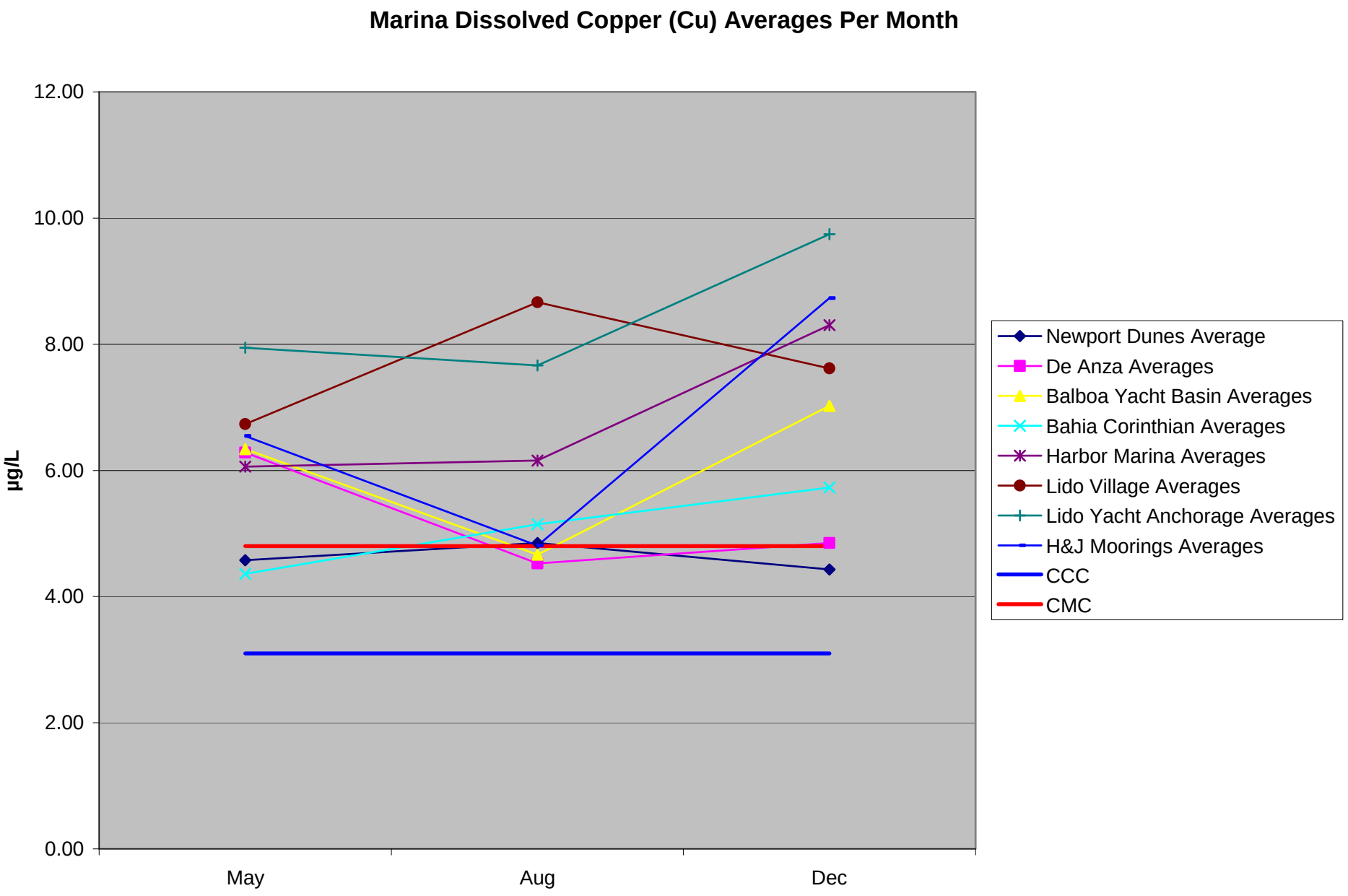

Comparison of average Cu concentrations (ug/ dry g) at marina and channel sites
Average Cu concentration (ug/ dry g)
400.00
350.00
300.00
250.00
200.00
150.00
100.00
50.00
0.00
NP Dunes
De Anza inner
De Anza outer
Balboa Yacht
Bahia Corinthian
Harbor Marina
Lido Village
Lido Yacht
H&J Moorings
Marina/Channel sites
Marina
Channel
TEL
ERL
ERM
Ship Yard
Storm Drain


Comparison of average Dissolved Cu concentrations (ug/ dry g) at marina and channel sites
Average Concentration (ug/dry g)
0
1
2
3
4
5
6
NP Dunes
De Anza inner
De Anza outer
Balboa Yacht
Bahia Corinthian
Harbor Marina
Lido Village
Lido Yacht
H&J Moorings
Marina/Channel sites
Marina
Channel
CCC
CMC

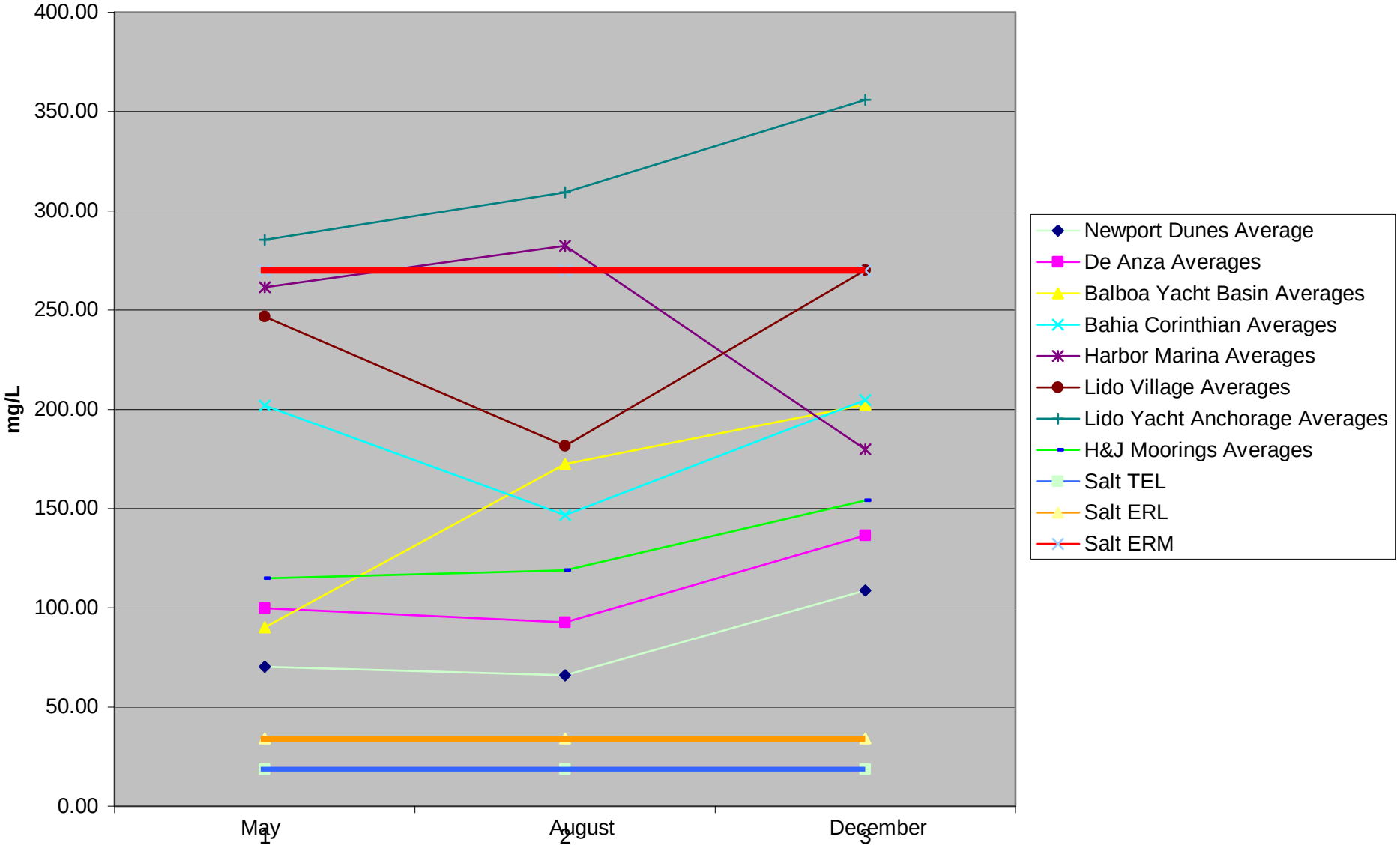

Comparison of average Cu concentrations (ug/ dry g) at marina and channel sites
Average Concentration (ug/dry g)
0.00
50.00
100.00
150.00
200.00
250.00
300.00
350.00
400.00
NP Dunes
De Anza inner
De Anza outer
Balboa Yacht
Bahia Corinthian
Harbor Marina
Lido Village
Lido Yacht
H&J Moorings
Marina/Channel sites
Marina
Channel
TEL
ERL
ERM
Ship Yard
Storm Drain


Comparison of average Zn concentrations (ug/ dry g) at marina and channel sites
Average Zn concentration (ug/ dry g)
700
600
500
400
300
200
100
0
NP Dunes
De Anza inner
De Anza outer
Balboa Yacht
Bahia Corinthian
Harbor Marina
Lido Village
Lido Yacht
H&J Moorings
Marina/Channel Sites
Marina
Channel
TEL
ERL
ERM
Ship Yard
Storm Drain

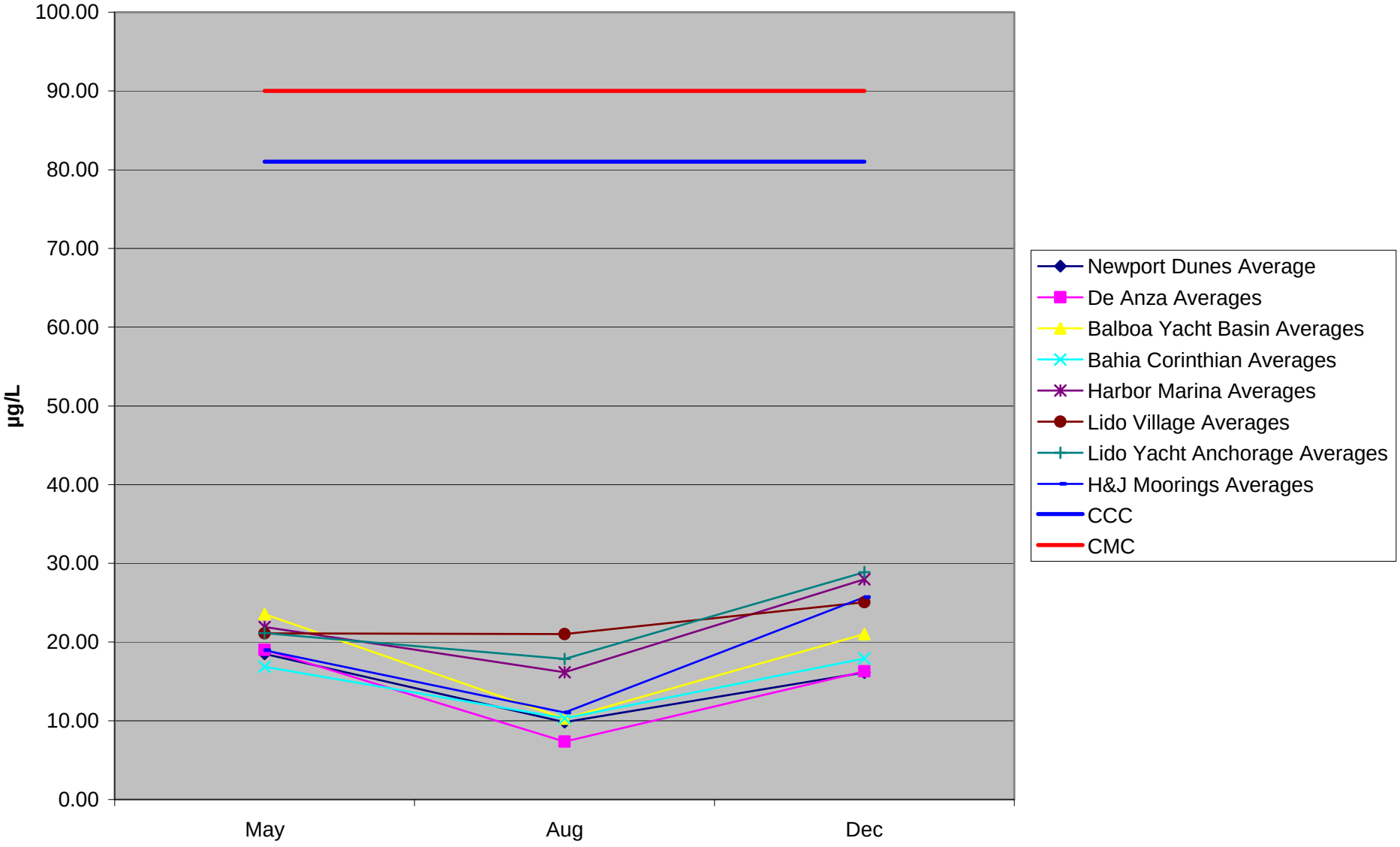

Comparison of average Hg concentrations (ug/ dry g) at marina and channel sites
Average Hg concentration (ug/ dry g)
2.00
1.80
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
NP Dunes
De Anza inner
De Anza outer
Balboa Yacht
Bahia Corinthian
Harbor Marina
Lido Village
Lido Yacht
H&J Moorings
Marina/Channel sites
Marina
Channel
TEL
ERL
ERM
Ship Yard
Storm Drain


Marina Dissolved Copper (Cu) Averages Per Month
µg/L
12.00
10.00
8.00
6.00
4.00
2.00
0.00
May
Aug
Dec
Newport Dunes Average
De Anza Averages
Balboa Yacht Basin Averages
Bahia Corinthian Averages
Harbor Marina Averages
Lido Village Averages
Lido Yacht Anchorage Averages
H&J Moorings Averages
CCC
CMC

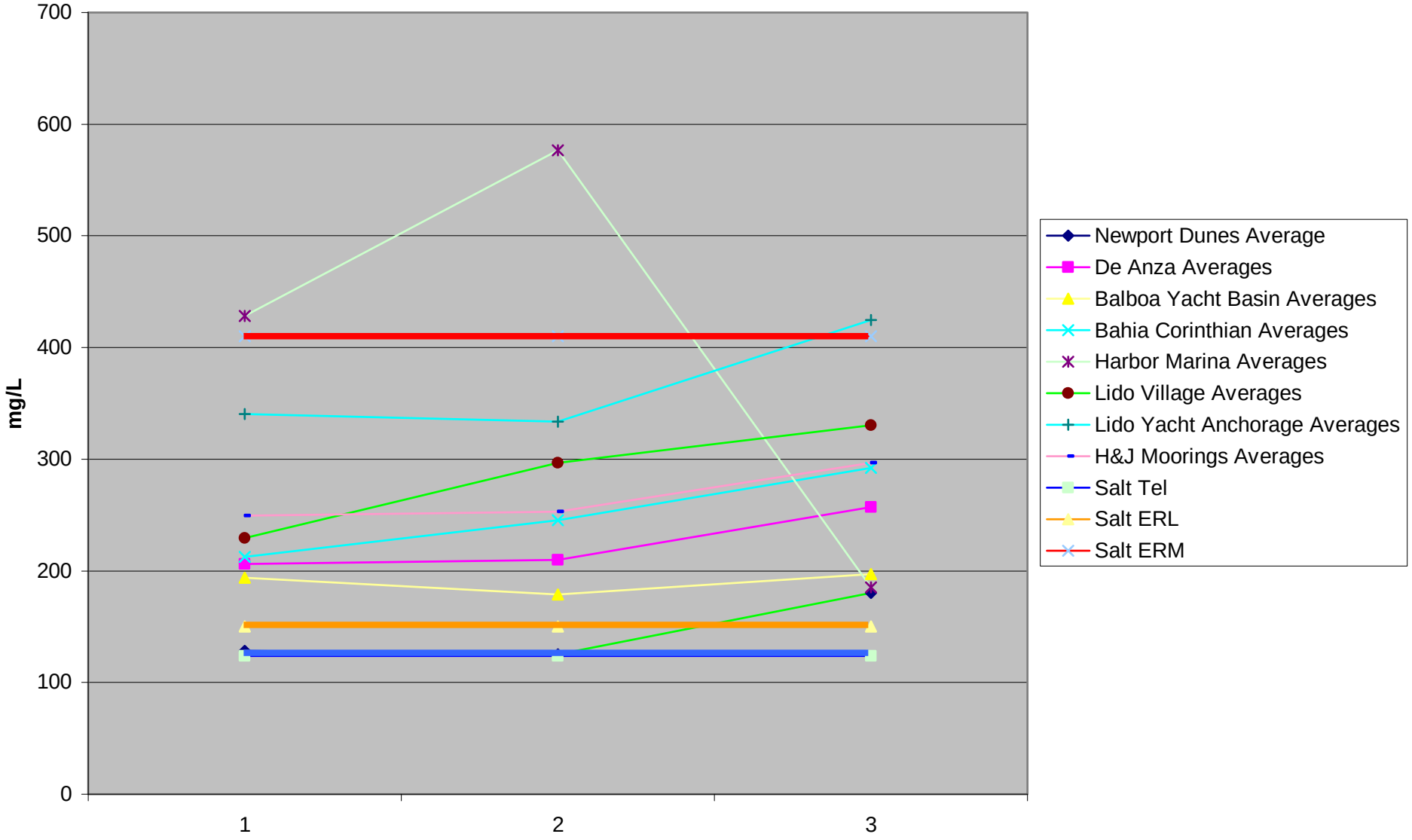
Marina Sediment Copper (Cu) Averages Per Month



Marina Dissolved Zinc (Zn) Averages Per Month



Marina Sediment Zinc (Zn) Averages Per Month



Dissolved Metals

	Marina mean (ug/L)	*Channel mean (ug/L)*
Cu	4.26* *>CTR chronic (3.1)	3.11* *>CTR chronic (3.1)
Zn	18.61	15.21
Cd	0.07	0.05
Pb	0.02	0.01
As	1.11	1.13
Hg	Nd	Nd

Conclusions

Water

- Dissolved Copper only metal above CTR standards acute & chronic (4.8, 3.1 ug/L)
  (biggest source of Cu is boat paints ~ 60,000 lbs/yr)
- Most dissolved Cu marina means & half channel means above CTR
- Mean dissolved Cu concentrations mostly above mean channel concentrations (not statistically significant)
- Highest dissolved Cu concentrations in W Newport (range 2-11 ug/L)

- No Water Toxicity Found

Conclusions cont.

Sediment

- Sediment Cu, Hg, Zn above ERMs -
  mostly in W Newport
- Sediment Cu, As, Cd, Cr, Hg, Pb and Zn above ERLs

- Marina means mostly higher than channel means
  (Sediment Cu, Zn -statistically significantly higher in 5/8marinas)

  -highest sediment concentrations in W Newport, lowest in Dunes, DeAnza

Conclusions cont.

Sediment Toxicity

- Sediment toxicity found at 8/10 stations tested (6/8 marinas) w/Eohaustorius
- Pore water tests showed reduced %alive altho results were inconclusive

- Data suggests that Cu boat paints are significant source of Cu to marina waters and sediments

Contact info

Lcandelaria@waterboards.ca.gov
951-782-4991

Cu Marina report link -
www/waterboards.ca.gov/santaana/html/
tmdl_toxics.html