

CURRENT EVENTS: ELEVATED NITRATES IN SAIPAN GROUNDWATER

MARIANA ISLANDS WATER OPERATOR ASSOCIATION
DECEMBER 13, 2017
PACIFIC ISLANDS CLUB, SAIPAN

WELL OPERATION PERMIT REQUIREMENTS

Section 13. Well Operations Permit Obligations

13.1 All owners of projects with a total well discharge capacity requirement greater than 20 gpm shall, on a semi-annual basis, perform routine water quality analysis on the water from each well. Samples shall be taken from a point prior to any chemical addition or form of treatment. Routine analysis includes sampling for the following parameters. Such analysis may be performed at the Division's laboratory or other EPA certified laboratory.

- Chloride
- Total Hardness
- Nitrate
- pH
- Total Dissolved Solids
- Conductivity
- Total Coliform (if a public water supply)

Well Drilling and Well Operation Regulations

September 2005

WHY MONITOR FOR NITRATES?

- NITRATE (NO3) – WHEN NITROGEN (N) COMBINES WITH OXYGEN OR OZONE
- NITROGEN IS ESSENTIAL FOR LIFE
- HIGH LEVELS OF NITRATE IN DRINKING WATER CAN BE DANGEROUS TO HEALTH (ESPECIALLY INFANTS)

Nitrate Health Risks

- Methemoglobinemia = "blue baby syndrome"
 - NO₂ + bacteria → NO₂ (nitrite anion)
 - NO₂ combines with Hemoglobin, blocking oxygen transport (thus the blue color)
 - Most adults have enzymes that return the Hemoglobin to a useful state
 - Most infants don't yet have the mechanism to do this
 - Largely a rural problem, as is nitrate pollution

WHY MONITOR FOR NITRATES?

- ALSO A POSSIBLE INDICATOR OF CONTAMINATION (IF SOURCE OF NITRATES IS MANURE/URINE OR SEPTIC SYSTEMS.
- SOURCE OF NITRATES COULD BE FERTILIZER, OR FROM NITRATE FIXING PLANTS
- MCL FOR NITRATES IS 10 MG/L

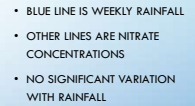
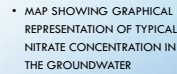
HISTORICAL NITRATE DATA

- CUC/DEQ BEGAN GOOD RECORDS IN 2001 – ALL RESULTS BELOW 10 MG/L UNTIL...
- JUNE 2006 – 1 CUC WELL > 10 MG/L
- DECEMBER 2006 – 1 MORE > 10 MG/L
- JUNE 2007 – 8 WELLS > 10 MG/L & AS HIGH AS 14 MG/L
- 2 WEEKS LATER NO3 BETWEEN 6-8 MG/L
- SEVERAL DAYS OF HEAVY RAIN BETWEEN

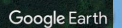
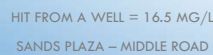
Nitrate Concentration Southern Saipan Sample Sites

WERI GRANT/STUDY

- CUC/DEQ APPLIED FOR GRANT (HEIDI & DEREK)
- LINK BETWEEN RAINFALL AND NITRATE CONCENTRATION?
- MONITORED 20 WELLS IN SOUTHERN SAIPAN WEEKLY FOR 1 YEAR
- COMPARED RESULTS TO RAINFALL



- ALL NITRATES IN SDWIS 2001 - 2015
- OVER 3,500 RECORDS
- HIGHEST EVER WAS 14.7 MG/L
- [SPREADSHEET](#)





SANDS PLAZA WELL – PAST NITRATES

- WELL DRILLED AUGUST 2011 – 60 FEET DEEP (SCREENED FROM 40 FT – 60 FT)
- 3/2012 = 9.7 MG/L
- 4/2013 = 9.7 MG/L
- 3/2014 = 11.3 MG/L
- 9/2014 = 4.1 MG/L
- 3/2016 = 6.2 MG/L
- 4/2017 = 9.8 MG/L

BECQ –
INSPECTS SITE

COWS





NITROGEN GENERATED BY:

- 1 PERSON = 10 POUNDS NITROGEN / YEAR
- 1 COW = 100 POUNDS NITROGEN / YEAR

MODELING NITRATE CONCENTRATION

- SEE [SPREADSHEET](#)
- USING 4 COWS & 100 LBS/N/YEAR & 50 IN RAINFALL FOR 2 ACRE SITE = 17.69 MG/L
- (THIS IS HOW MUCH NITROGEN IS BEING ADDED TO THE GROUNDWATER)



CONCLUSION

ANIMALS CAN HAVE A SIGNIFICANT IMPACT ON GROUNDWATER QUALITY!

END OF CURRENT EVENTS: NITRATES IN SAIPAN GROUNDWATER