21st Century AREOR Data Reporting

Martin Wright
PG&E, Diablo Canyon RP Senior Engineer

Jennifer Peterson
Locus Technologies, Senior Project Manager

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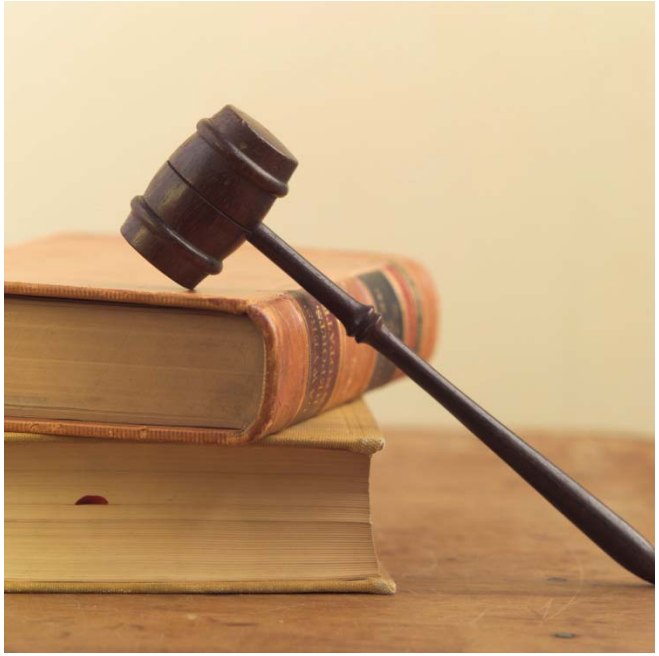
Annual Radiological Environmental Operating Report (AREOR)



- NRC required annual reporting for all REMP programs (ODCM , NUREG1301/1302)
- Highly formatted statistical output summarizing a year's worth of analytical data
- Trending and data comparisons to established background levels
- Summary Tables are per media sampled – typically requiring at least 10 tables be generated annually for this one requirement

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Summary Tables - Stone Age Reporting

- Tedious required reporting for large datasets if not done in an automated fashion can lead to very time consuming reporting
- Most sites are creating their own summary tables, typically outside of a database, manually manipulating analytical data to fit into the AREOR summary table format
- Some are paying their laboratories to create the summary tables – but how do you QC it?

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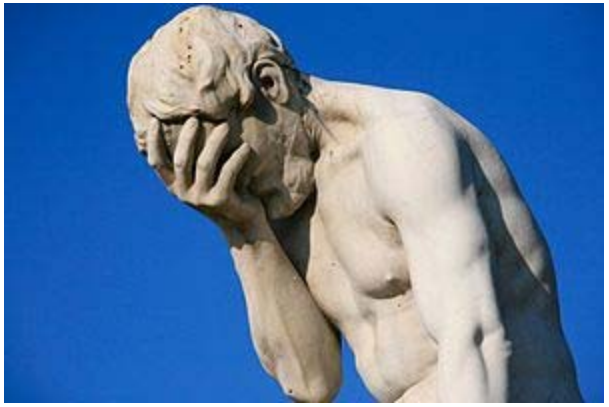
DCPP AREOR Dilemma



- In February or March, I would typically receive all the previous year's REMP analytical data in one single *master* excel file categorized by Station ID and matrix (for example: Station 8S1, Particulate Air).
- This *master* excel file would contain approximately 4000 rows of data and be about 95 pages long.

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- From this initial *master* excel file, I would create multiple additional excel files according to sample matrix for ease of data manipulation. Deleting all other files not associated with that matrix from the *master* file.
- For example:
  - Air Particulate excel file
  - Air Iodine excel file
  - Surface Water excel file
  - Vegetation excel file

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- Once these individual sample matrix files were created, then I could proceed with data manipulation to create the AREOR Summary Tables.
- Data manipulation involved:
  - Total number of analyses per isotope
  - Ratio of positive detections to overall samples obtained
  - All Indicator stations versus Control station
  - Highest indicator station results
  - Averaged results per isotope
  - Data Ranges (high – low) per isotope
  - Number of Reportable Occurrences for each isotope
  - LLD values for each isotope

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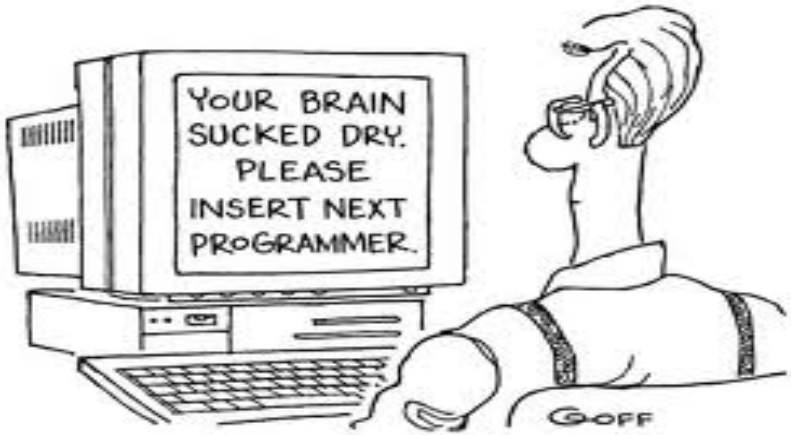

- I could only focus on creating the Summary Tables for a portion of my work day.
- Typically, after 3 hours of data manipulation, I was ready to take a long walk on the beach.
- I had to maintain detailed organization of data to be able to come back to it the next day and pick up where I left off.
- It was a very rare event when I could concentrate on Summary Tables and not be interrupted by a job crisis or other priorities

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- AREOR Summary Tables usually took me about 1 to 2 weeks to complete as I got time to work on them.
- Summary Tables were the greatest burden to creating the AREOR.

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Table A-4

Environmental Radiological Monitoring Program Summary

Report Period: 1/1/12 - 12/31/12

Name of Facility: Diablo Canyon Power Plant

Location of Facility: San Luis Obispo, CA (County , State)

Medium or Pathway Sampled (Unit of Measure)	Type and Total Number of Analyses Performed	Lower Limit of Detection[A] (LLD)	Indicator with Highest Annual Mean Name, Distance, and Direction Mean[B]	Range[B]	All Indicator Locations Mean[B]	Range[B]	All Control Locations Mean[B]	Range[B]	Number of Reportable Occurrences
Drinking Water (pCi/Liter)			5S2, 0.6 mi, 65°		DW1, 5S2, WN2, 1A2		OEL, 10.2 mi, 79°		
	Gamma Isotopic (44)								
	Mn-54	15	none detected (0 / 12)		none detected (0 / 32)		none detected (0 / 12)		0
	Fe-59	30	none detected (0 / 12)		none detected (0 / 32)		none detected (0 / 12)		0
	Co-58	15	none detected (0 / 12)		none detected (0 / 32)		none detected (0 / 12)		0
	Co-60	15	none detected (0 / 12)		none detected (0 / 32)		none detected (0 / 12)		0
	Zn-65	30	none detected (0 / 12)		none detected (0 / 32)		none detected (0 / 12)		0
	Zr-95	15	none detected (0 / 12)		none detected (0 / 32)		none detected (0 / 12)		0
	Nb-95	15	none detected (0 / 12)		none detected (0 / 32)		none detected (0 / 12)		0
	I-131	1	none detected (0 / 12)		none detected (0 / 32)		none detected (0 / 12)		0
	Cs-134	15	none detected (0 / 12)		none detected (0 / 32)		none detected (0 / 12)		0
	Cs-137	18	none detected (0 / 12)		none detected (0 / 32)		none detected (0 / 12)		0
	Ba-La 140	15	none detected (0 / 12)		none detected (0 / 32)		none detected (0 / 12)		0
	Additional Analysis								
	Gross Beta (44)	4	3.27	2.46-5.26 (5/12)	2.87	1.80-5.26 (8/32)	2.19	2.07-2.41 (3/12)	0
	Fe-55 (44)		none detected (0 / 12)		none detected (0 / 32)		none detected (0 / 12)		0
	Ni-63 (44)		none detected (0 / 12)		none detected (0 / 32)		none detected (0 / 12)		0
	Tritium H-3 (44)	400	none detected (0 / 12)		none detected (0 / 32)		none detected (0 / 12)		0
	Total Strontium (44)	1	none detected (0 / 12)		none detected (0 / 32)		none detected (0 / 12)		0

Table Notation:

(A) Unless specified, all required LLDs were met in accordance with Table 2.3

(B) Mean and range based upon detectable measurements only. Fraction of detectable measurements at specified locations is indicated in parenthesis e.g. , (10/12) means 10 samples out of 12 collected showed activity.

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Implementation of the AREOR in Web-Based System

- Locus and PG&E Solution
- Implement an automated report in the Locus EIM' system that requires little initial setup
- Easy maintenance and generation for years to come
- Report can be run year over year with simple date range change in a matter of seconds.

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How Does the Report Work?

- One-time Initial Setup
  - Required location list (i.e. Fish Locations)
  - Required parameters to report (i.e. H-3, CO-60)

Parameter Group Members (FH)

Available Parameters		Selected Parameters
Actinium-228		Cesium-134
Ambient Gamma Radiation		Cesium-137
Americium-241		Cobalt-58
Barium-140		Cobalt-60
Beryllium-7		Iodine-131
BETA	>>	Iron-59
Bismuth-210	>	Manganese-54
Bismuth-212	<	Zinc-65
Bismuth-214	<<	
Chloride		
Iron-55		
Lanthanum-140		
Lead-210		
Lead-212		
Lead-214		
Nickel-63		

Location Groups

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Group Name	Description
AC Control	Air Charcoal Control
AC Indicator	Air Charcoal Indicator
All Locations	All Locations
AP Control	Air Particulate Control
AP Indicator	Air Particulate Indicator
AV Algae Control	Aquatic Veg Algae Control
AV Algae Indicator	Aquatic Veg Algae Indicator
AV Kelp Control	Aquatic Veg Kelp Control
AV Kelp Indicator	Aquatic Veg Kelp Indicator
DW Control	Drinking Water Control
DW Indicator	Drinking Water Indicator
FH Control	Fish Control
FH Indicator	Fish Indicator
GW Control	Groundwater Control
GW Indicator	Groundwater Indicator
IM Control	Intertidal Mussels Control
IM Indicator	Intertidal Mussels Indicator
MK Control	Milk Control
Monitoring Wells	Monitoring Wells
MT Control	Meat Control

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Report Setup Continued

- One-time Initial Setup
  - Required LLD values
  - Required Reporting values

PG&E >> Setup >> Output Options >> Action Limits

Action Limits

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Limit Name	Regulatory Agency	Description
LLD AC		LLD Airborne Charcoal Cartridge
LLD AP		LLD Airborne Particulate
LLD FH		LLD Fish and Mussels
LLD MK		LLD Milk
LLD SD		LLD Sediment, Beach Sand
LLD VG AV MT		LLD Vegetation, Aquatic Veg, Meat
LLD Water		Lower Limits of Detection for Water
LLD Water GW or SW		LLD for Groundwater or Surface Water

Action Limit Values (LLD FH)

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Parameter Name	Parameter Code	Upper Limit	Units
Cesium-134	CS-134	130	pCi/kg
Cesium-137	CS-137	150	pCi/kg
Cobalt-58	CO-58	130	pCi/kg
Cobalt-60	CO-60	130	pCi/kg
Iron-59	FE-59	260	pCi/kg
Manganese-54	MN-54	130	pCi/kg
Zinc-65	ZN-65	260	pCi/kg

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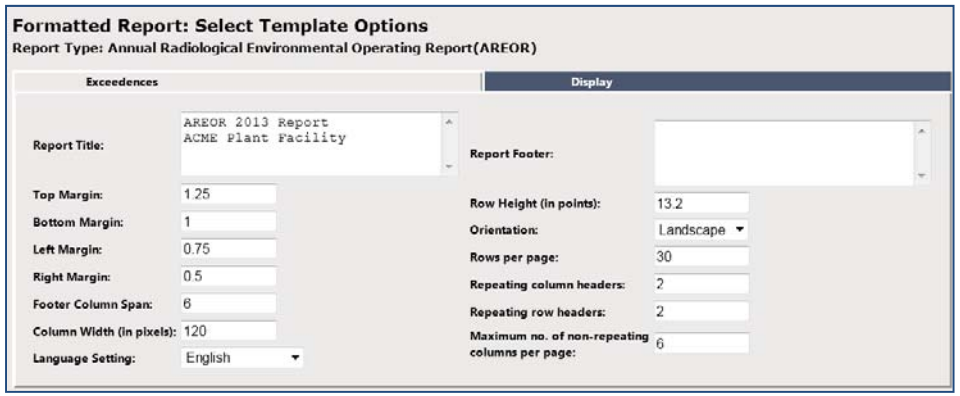
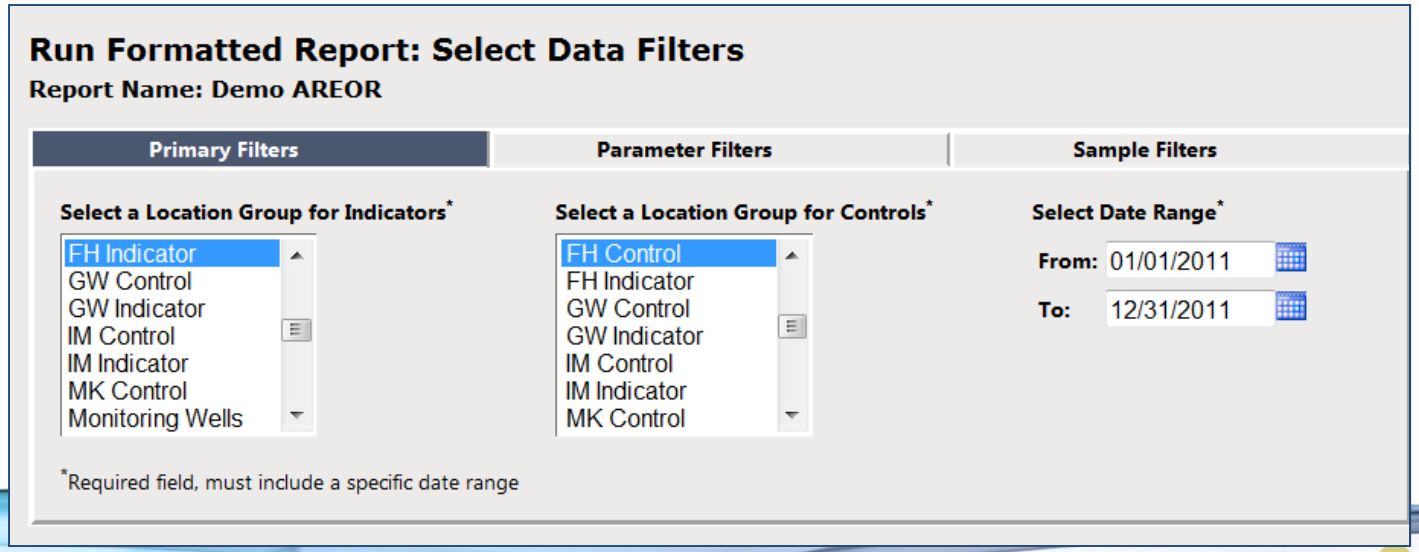
Defining the Template Details

- Define the Template details for all media or by media (i.e. Fish)
- Assign the filters for that report





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Generating the Report

- Run the report, excel based output
- Any new detections for additional parameters will appear in the output

Reporting Period: 01/01/2011 - 12/31/2011

Name of Facility: Diablo Canyon Power Plant

Location of Facility:, (County,State)

Medium or Pathway Sampled (Unit of Measure)	Type and Total Number of Analyses Performed	Lower Limit of Detection(1) (LLD)	Indicator with Highest Annual Mean Name, Distance, and Direction Mean(2)	Range(2)	All Indicator Locations Mean (2)	Range (2)	All Control Locations Mean (2)	Range (2)	Number of Reportable Occurrences
[Use Sample Type]WATER (pCi/L)			OUT ,7930.1 mi, 309°		DCM,OUT		7C2, 7927.0 mi, 309°		
	EPA 900.0								
	BETA (37)		2.78E2	1.77E2 to 4.63E2 (12/12)	2.655E2	1.47E2 to 4.63E2 (24/24)	2.87E2	1.89E2 to 3.57E2 (13/13)	0
	EPA 901.1								
	Barium-140 (37)		none detected (0 / 12)		none detected (0 / 24)		none detected (0 / 13)		0
	Cesium-134 (37)	1.5E1	none detected (0 / 12)		none detected (0 / 24)		none detected (0 / 13)		0
	Cesium-137 (37)	1.8E1	none detected (0 / 12)		none detected (0 / 24)		none detected (0 / 13)		0
	Cobalt-58 (37)	5E-1	none detected (0 / 12)		none detected (0 / 24)		none detected (0 / 13)		0
	Cobalt-60 (37)	1E0	none detected (0 / 12)		none detected (0 / 24)		none detected (0 / 13)		0
	Iodine-131 (37)	5E0	none detected (0 / 12)		none detected (0 / 24)		none detected (0 / 13)		0
	Manganese-54 (37)	6E0	none detected (0 / 12)		none detected (0 / 24)		none detected (0 / 13)		0
	Potassium-40 (36)		3.491E2	2.89E2 to 4.04E2 (11/11)	3.506E2	2.89E2 to 4.04E2 (23/23)	3.549E2	3.08E2 to 4.05E2 (13/13)	0
	Zirconium-95 (37)		none detected (0 / 12)		none detected (0 / 24)		none detected (0 / 13)		0

Table Notation:

(1) Unless specified, all LLDs where met in accordance

(2) Mean and range based upon detectable measurements only. Fraction of detectable measurements at specified location is indicated in parenthesis e.g., (10/12) means 10 samples out of 12 collected showed activity.

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We believe companies should be able to access their environmental data anywhere, anytime from a centralized and integrated system in the Cloud.

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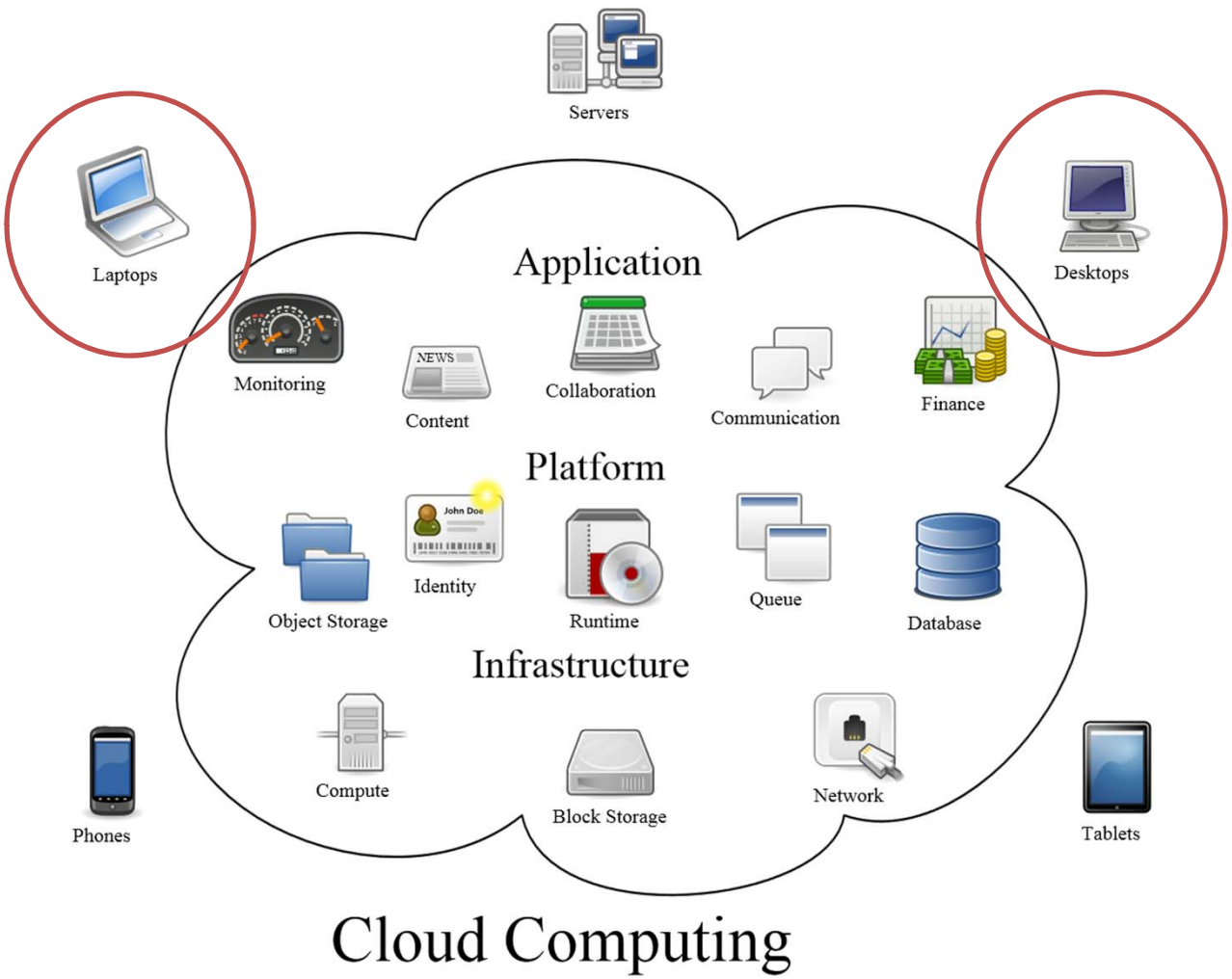

Source: http://en.wikipedia.org/wiki/Cloud_computing
A cloud based system!

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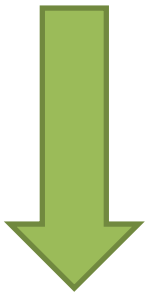
Benefits Realized

- Rolling Upgrade Module – Not a one-off solution
- Uses an engine that can be used by other systems
- Time and Money Savings

  Stone Age – minimum 1 to 3 weeks to combine all data, run the stats, formatting, and QC



21st Century – < 2 hours for one time setup of all items (with low maintenance going forward) + 30 min to run all media reports (17 excel tables)

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Will you embrace cloud technology in the 21st Century?

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Questions?

support@locustec.com

+1-650-960-1640

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