

SEAWATER RADIATION DETECTION SYSTEM WATER PROTECTION

Model ~ NEXGEN-SEA

FEATURES:

- MEASURES AT OR BELOW EPA/DHS PAG LEVELS
Protective Action Guideline & Military Drinking Water Limits
- REAL TIME, IN-LINE, CONTINUOUS
- DETECTS ALPHAS, BETAS AND GAMMAS
- NO REAGENT TANKS TO FILL
- NO WASTE STREAM
- EASY CALIBRATION
- PREVENT ACUTE HEALTH EFFECTS
- REDUCE RISK OF CHRONIC EXPOSURE
- WORLD'S ONLY PAG-LEVEL $\alpha\beta\gamma$ water monitor
- Full SCADA compatibility



PROBLEM:

Seawater is vulnerable to accidental or knowing contamination by individuals, groups, industry, medical labs, terrorists and from naturally occurring radioactive materials (NORM). As yet very few locations have real-time radiation monitors in place to notify industry or the public of seawater radioactive contamination.



APPLICATION:

- Monitor seawater against any & all RADIOACTIVE contaminants.
- Monitor liquid-waste stream from seawater cooled nuclear plants.
- Monitor around desalination systems.

SOLUTION:

For the first time in a **Continuous Real Time** monitor the Model **NEXGEN-SEA** solves this problem by continuously monitoring the water using alpha, beta and gamma detectors. The information from these detectors is analyzed and displayed in units of picoCuries per liter. The calculations are updated every 2 minutes, every hour and every day. The longer update times correspond with greater precision and increased sensitivity. Sensitivities in the daily updates each meet or exceed the DHS protective Action Guideline Levels.

Please see attached chart of measurements. Using TA Tried and True sample collection & measurement technology these detectors measure Alpha, Beta and Gamma from any radioactive liquids.

Measurements of radiation concentration and total discharge are logged 24 hr/day, 7 day/week.



TECHNICAL ASSOCIATES

7051 Eton Ave., Canoga Park, CA 91303
(Phone) 818-883-7043 (Fax) 818-883-6103

tagold@nwc.net WWW.TECH-ASSOCIATES.COM

A Division of

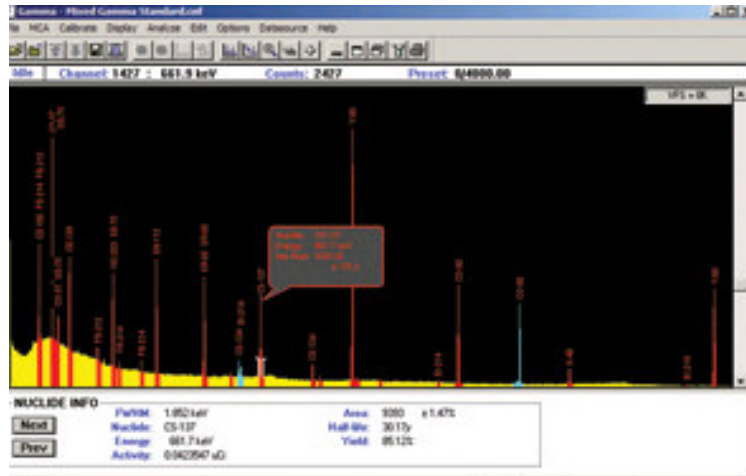


US NUCLEAR CORP

SEAWATER RADIATION DETECTION SYSTEM WATER PROTECTION

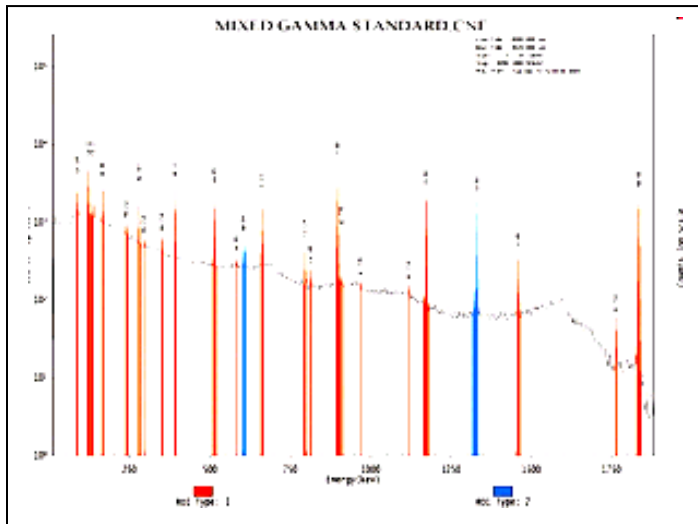
Model ~ NEXGEN-SEA

GAMMA-MCA ISOTOPE IDENTIFIER



ADDITIONAL NUCLIDES DETECTED

NUCLIDE	NUCLIDE
Tc ^{99m}	Cs ¹³⁷
I ¹³¹	Ba ¹⁴⁰
Cs ¹³⁴	La ¹⁴⁰
Cs ¹³⁶	



MULTI-SOURCE GAMMA SPECTRUM



TECHNICAL ASSOCIATES

7051 Eton Ave., Canoga Park, CA 91303
(Phone) 818-883-7043 (Fax) 818-883-6103

tagold@nwc.net WWW.TECH-ASSOCIATES.COM

A Division of



US NUCLEAR CORP

SEA WATER RADIATION DETECTION SYSTEM WATER PROTECTION

Model ~ NEXGEN-SEA

DESCRIPTION:

Model **NEXGEN-SEA** is a multi-detector water monitor /controller for simultaneous measuring of alpha, beta and gamma-emitting radio nuclides. The electronics are microprocessor with color LCD display. The pre-amps are plug in modules allowing change or addition of functions at a later date, and allow rapid repair by module replacement in the field. The modular system is covered by TA's unique exchange warranty system in addition to the full one year warranty. On-site warranties available in many areas.

Detector shields are made of lead encased in welded housing for long useful life and easy decontamination. The alpha and beta flow cells are easily changed via disconnect fittings. Gamma Spec shield can be opened for cleaning with minimum effort. All connections are sealed against leaks. The standard water moving system is based on a high precision pump. It has a 10 liter per minute capacity.

A wide range of pump capacities are available to meet users specific needs. The entire system is mounted in a wheeled, self-contained rugged cabinet. The **NEXGEN-SEA** comes complete with all cabling tubing and connectors in place and is ready to operate. 115 Volt 60Hz is standard; 220 Volt 50/60 Hz is optional.

Three principal detectors make up the **NEXGEN-SEA** system.

1. Alpha Detectors: A special plastic Alpha scintillator that consists of a light-tight detector assembly which interfaces with the sample via quick disconnect coax cables and medical grade hoses. The sample is viewed by a matched pair of photo-multiplier tubes.
2. Beta Scintillation detectors with 1,100cm² sensitive area.

The Alpha, Beta pulse analysis portion of this system conditions and analyzes the output from the photo-multiplier tubes by **pulse height, duration and coincidence**. Thereby permitting the system to eliminate counting most background and noise counts. Sensitivity is enhanced by the use of stochastic resonance plus high gain, low noise PM tubes and pre-amps.

3. The water is measured for Gamma-emitter content, using a MCA analyzer with greater than 1,000 channels. The energy range is user settable. For example the MCA can be set for Gamma energy of 10 KeV to 3 MeV.

Isotope Identification System

Peak Detection and Isotope Identification

TA SMART-PEAK™ Software detects radiation peaks even at very low gamma concentration, In the event of high activity and during system calibration; the isotope identifier function takes over and displays the exact radioactive nuclides in the sea water.



TECHNICAL ASSOCIATES

7051 Eton Ave., Canoga Park, CA 91303
(Phone) 818-883-7043 (Fax) 818-883-6103

tagold@nwc.net WWW.TECH-ASSOCIATES.COM

A Division of



US NUCLEAR CORP

SEA WATER RADIATION DETECTION SYSTEM WATER PROTECTION

Model ~ NEXGEN-SEA

DATA: Analysis – Display - Hard-Copy-Archive

In each peak or area of interest, the net counts are automatically converted to concentration units, of picoCuries/liter (using the detector efficiencies automatically measured and stored previously by NEXGEN-SEA semi-automatic self-calibration procedure).

The concentration and total activity released and MDA levels are continuously calculated and recorded. This real time information will alert the notification system. Also, all data is saved to the hard drive in spreadsheet format.

Historical data is easily displayed on-screen (and/or printed out on the optional printer) in tabular or graphical format, showing quantitative information as well as trends. Data is recorded frequently so time-resolution is excellent.

Ethernet and USB ports (with security) make it easy to archive and further analyze data.

Continuous, Reliable Data – **YES**, False Alarms – **NO**

Our newest systems have multiple layers of protections and redundancy in both the software and the physical act of reporting an alarm that prevent false alarms. This includes an alarm voting system so that alarms will come on only if all the data is consistent and conclusive. The data is continuously recorded to allow human interpretation.

Each alarm activates fail-safe relays. Relay contacts are available to user to operate external devices.

Triggered Aliquot: This feature automatically collects and stores a small water sample for independent analysis whenever an alarm or event of interest occurs.

UV Lamp: Used on inlet as algae-cide.

OPTIONAL: Ozone System

3 GHz COMPUTER INCLUDES:

3 GHz Processor, 600 Gig Hard Drive, 4 GIG Ram

USB Ports

OPTIONAL: Full Graphics Printer, color + BW

15" LCD Monitor, Keyboard, Mouse

10 Channel Data Acquisition Board, All Cables

Ethernet for hook up to your LAN

Windows Specific Software for Alpha, Beta, Gamma Counting.

Software is easily customized by user for special needs.

Data from the 1024 channel MCA- multi-channel analyzer

Port: Full SCADA compatibility

OPTIONAL: MODBUS or DNP3 or other protocols.



TECHNICAL ASSOCIATES

7051 Eton Ave., Canoga Park, CA 91303

(Phone) 818-883-7043 (Fax) 818-883-6103

tagold@nwc.net

WWW.TECH-ASSOCIATES.COM

A Division of



US NUCLEAR CORP

SEA WATER RADIATION DETECTION SYSTEM WATER PROTECTION

Model ~ NEXGEN-SEA

DETECT	PAG LEVEL	LOWER LIMIT of SENSITIVITY	TOP OF RANGE	SENSOR / METHOD USED	TIME	MAINTENANCE for finished water ACTION
Alpha	U-238 3,000 pCi/l			5" dia. Dual PM Tube crushed scintillation bed of crystals	3 mo	Replace particulate filter cartridge
U-238	30 min 24 hr	2,000 pCi/l 500 pCi/l	2 x 10 ⁷ pCi/l			
Po-210	30 min 24 hr	2,000 pCi/l 500 pCi/l				
Beta	K-40 30,000 pCi/l			5" dia. Dual PM Tube 1000ml chamber	3--6 mo	Replace particulate filter cartridge
Cs-137	30 min 24 hr	1,200 pCi/l 200 pCi/l	2 x 10 ⁷ pCi/l	1100cm ² Beta Scintillator		
K-40	30 min 24 hr	600 pCi/l 100 pCi/l				
Sr-90	30 min 24 hr	200 pCi/l 15 pCi/l				
Gamma	Co-58 30,000 pCi/l			MultiChannelAnalyzer Smart peak detection software	3--6 mo	Simple MCA check
Co-58	30 min 24 hr	1,000 pCi/l 250 pCi/l	2 x 10 ⁷ pCi/l	75x75mm NaI(Tl) Crystal		
Co-60	30 min 24 hr	400 pCi/l 100 pCi/l				
I-131	30 min 24 hr	600 pCi/l 150 pCi/l				
OPTIONS:		LOWER LIMIT	TOP OF RANGE			
DETECT						
Tritium		500,000pCi/l	1 x 10 ⁶ pCi/l	crushed scintillation bed of crystals		Replace ion exchange cartridge
Radon		100pCi/liter	2000pCi/liter		1-3 mo	Clean or replace vapor trap
PRE- CONDITION						
Expel Radon						Clean or replace vapor trap



TECHNICAL ASSOCIATES

7051 Eton Ave., Canoga Park, CA 91303
(Phone) 818-883-7043 (Fax) 818-883-6103

tagold@nwc.net WWW.TECH-ASSOCIATES.COM

A Division of



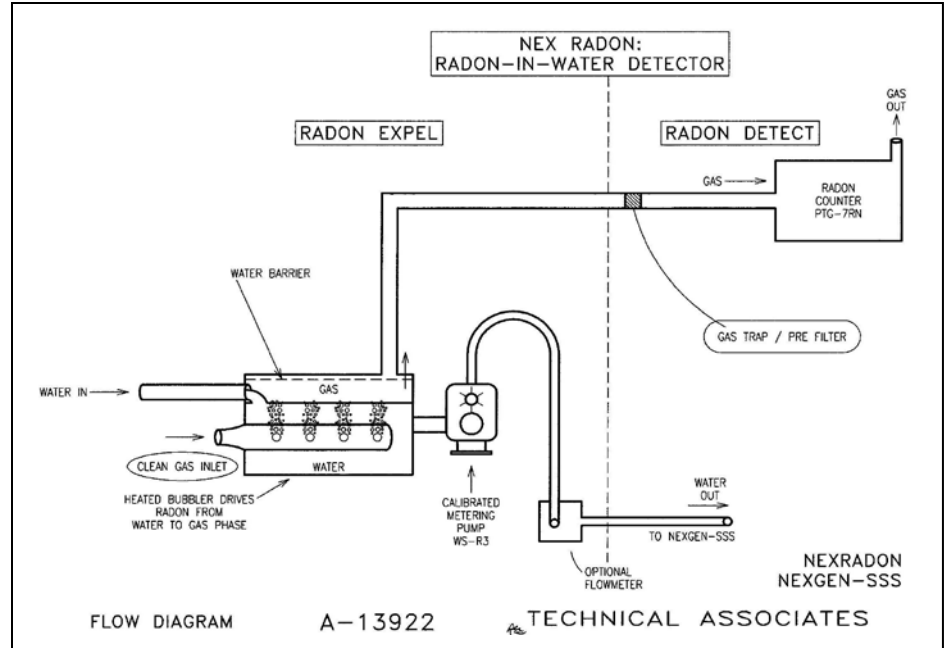
US NUCLEAR CORP

SEA WATER RADIATION DETECTION SYSTEM WATER PROTECTION

Model ~ NEXGEN-SEA

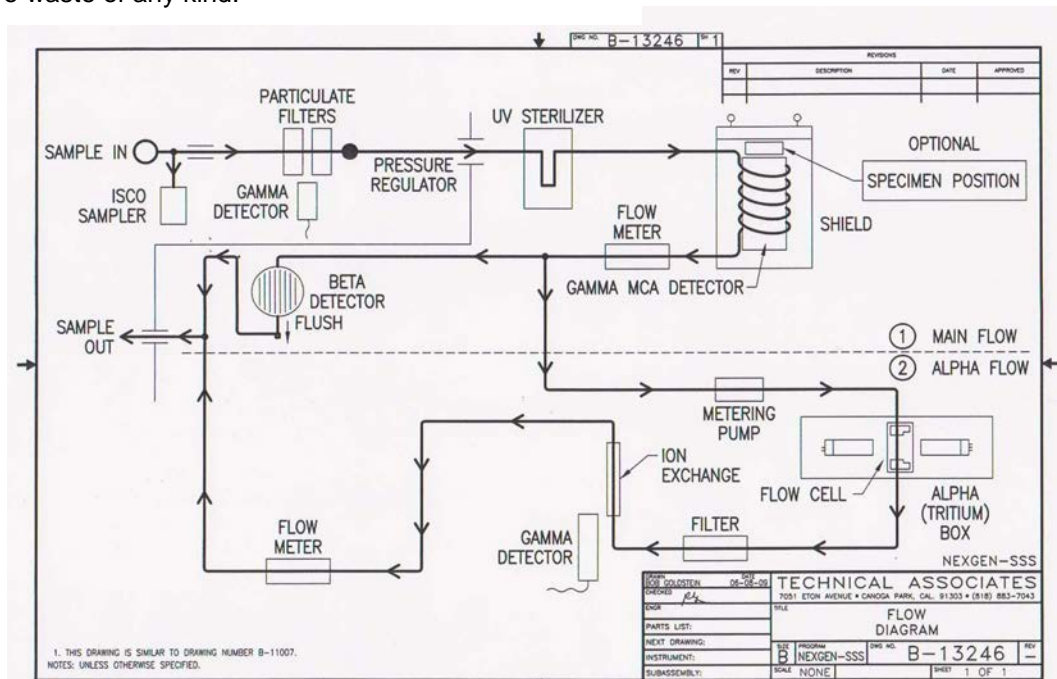
FLOW PATH:

- Water Inlet Port
- 15 – 90 PSIG (Typical)
- ISCO Sampler
- Particulate Filter (with Gamma Detector)
- Ultra Violet Sterilizer
- Gamma Spec Shield
- Main Gamma Detector with MCA
- Mass Flow Meter
- Metering Pump for Alpha Detector Loop
- Alpha Detector Flow Cell
- Alpha Loop Flow Meter



- Discharge water is clean and can go back into the source.
- No liquid scintillate or reagents are added.
- No toxic or radioactive waste of any kind.

MAIN SYSTEM FLOW CHART



TECHNICAL ASSOCIATES

7051 Eton Ave., Canoga Park, CA 91303
(Phone) 818-883-7043 (Fax) 818-883-6103

tagold@nwc.net WWW.TECH-ASSOCIATES.COM

A Division of

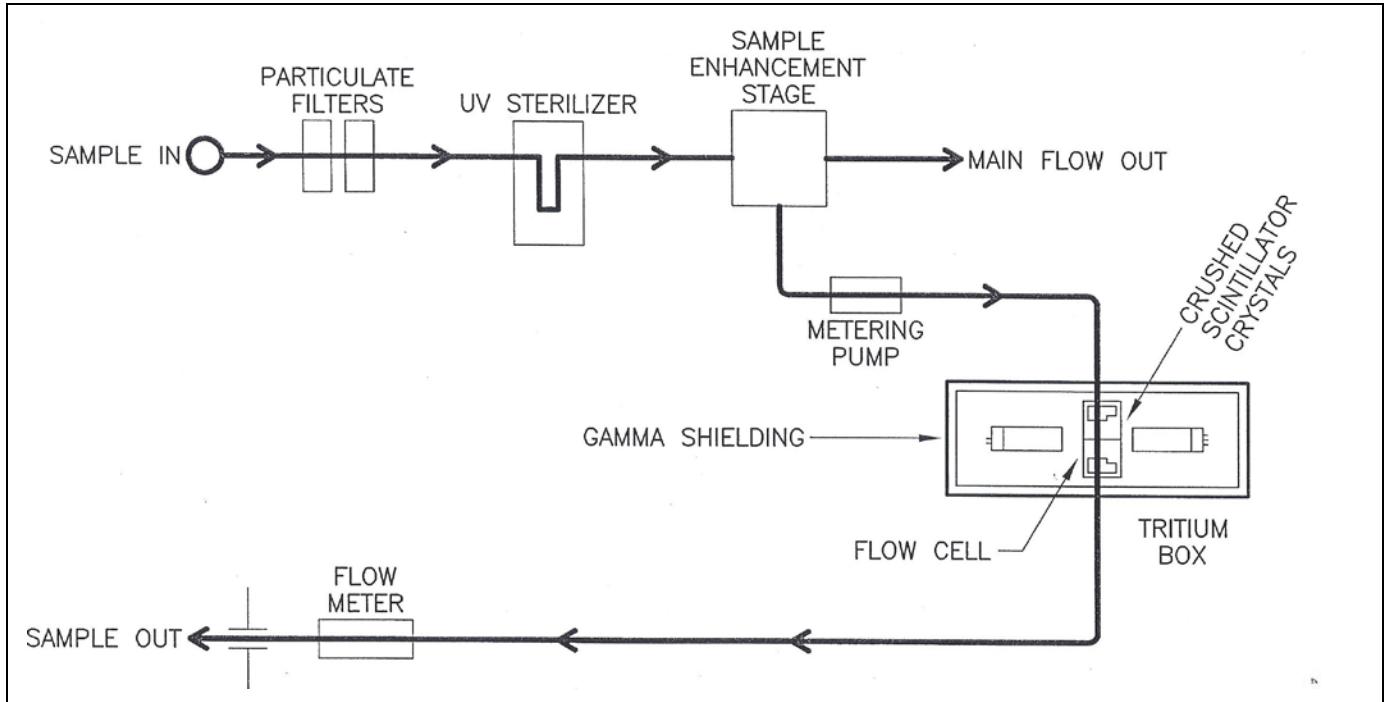


US NUCLEAR CORP

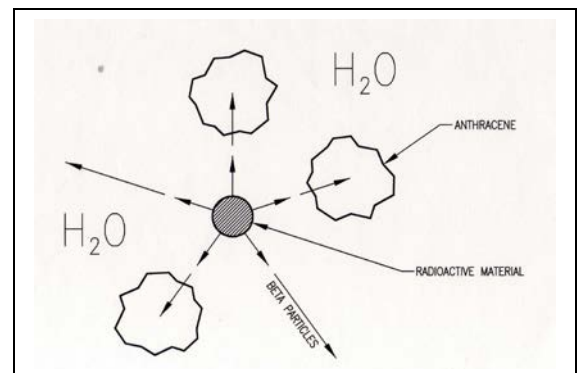
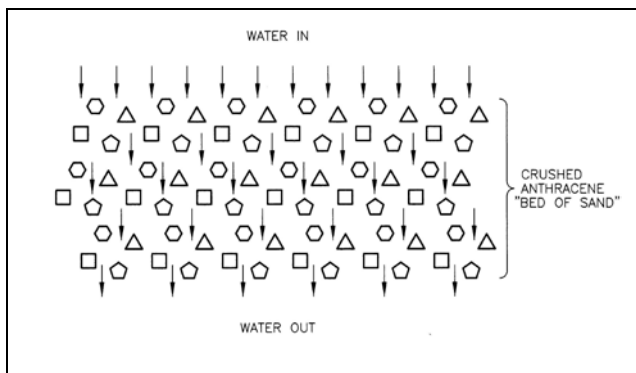
SEA WATER RADIATION DETECTION SYSTEM WATER PROTECTION

Model ~ NEXGEN-SEA

OPTIONAL TRITIUM DETECTION PROCESS



Optional Tritium Detection Loop



Anthracene Scintillation Crystal Bed Detail for Optional Tritium Detector



TECHNICAL ASSOCIATES

7051 Eton Ave., Canoga Park, CA 91303
(Phone) 818-883-7043 (Fax) 818-883-6103

tagold@nwc.net WWW.TECH-ASSOCIATES.COM

A Division of



US NUCLEAR CORP

SEA WATER RADIATION DETECTION SYSTEM WATER PROTECTION

Model ~ NEXGEN-SEA

SYSTEM FLOW RATE:

Standard Main Flow: 10 l/minute
Alpha - Tritium Flow: 100 ml/minute

OPTIONAL: Very wide range of flow rates is available

Sample temperature standard: Up to 80° F liquid. (**OPTIONAL** to higher temperatures)

Ambient temperature: 65 - 100 ° F (wider temperatures ranges **OPTIONAL**)

OPTIONAL: Cooler **Model Cool-33** for detector & sample is used in case of higher sample or ambient temperatures.

SIZE AND WEIGHT:

Dimensions: One cabinet: 34" wide X 31" deep X 72" high including wheels

Wheels: 5" dia, high capacity, rugged wheels with lock & rubber tires.

Shipping Weight: Standard unit: 380kg - excluding shielding

NOTE: Lead Shot for shielding can be shipped with or stripped separately or overseas customers may wish to buy lead shot locally.

FRONT CABINET VIEW



TECHNICAL ASSOCIATES

7051 Eton Ave., Canoga Park, CA 91303
(Phone) 818-883-7043 (Fax) 818-883-6103

tagold@nwc.net WWW.TECH-ASSOCIATES.COM

A Division of  US NUCLEAR CORP

SEA WATER RADIATION DETECTION SYSTEM WATER PROTECTION

Model ~ NEXGEN-SEA

FILTER DETECTORS

SPECIFICATIONS	PARTICULATE DETECTOR	ION EXCHANGE DETECTOR
Detector	Pre-filter	De-ionizer
Radiation detected	GAMMA	GAMMA
Materials monitored	Particulates	Dissolved metals and salts
Scintillator shape	2" x 2" dia	2" x 2" dia
Scintillating crystal	NaI TI Spectroscopic grade	NaI TI Spectroscopic grade
Shielding	None	None
More Shielding (Optional)	1/2" 2pi	1/2" 2pi



DESALINATION PLANT



TECHNICAL ASSOCIATES

7051 Eton Ave., Canoga Park, CA 91303
(Phone) 818-883-7043 (Fax) 818-883-6103

tagold@nwc.net WWW.TECH-ASSOCIATES.COM

A Division of



US NUCLEAR CORP

SEA WATER RADIATION DETECTION SYSTEM WATER PROTECTION

Model ~ NEXGEN-SEA

DESIGN CRITERIA

MODEL	NexGen-SEA
MAJOR USE PROTECTIVE-ACTION GUIDELINE	NEXT GENERATION WATER MONITOR
Serve as Accident/Attack Alarm	
Serve as Alarm in case of major pollution event	
MEASURES AT OR BELOW	
Acute Health Effects Rad Level	Reads at Full Scale
Chronic RAD levels leading to severe health risk	Yes
Military Limits for Drinking Water	Yes
DHS Protective Action Guideline Levels	Yes
Public Drinking Water Limits	Send sample for lab analysis
DETECTS	
Detects Alpha and Beta as well as Gamma OPTIONAL: Tritium Detection	Has never been done before in real time, in liquids
False Alarm Protection	Yes
Action	Saves water sample for independent analysis
Local and remote Alarms	Yes
Local and remote data availability and data archive	Yes
Response Time	Prompt response – 2 min & 1 hr warn or alarms
Efficient	Continuous, automatic, unattended operation
Maintenance interval	30 days or longer see “Maintenance Schedule”
Serviceable	Easy Maintenance, low cost
Durability	Rugged, dependable
Customer Support	Annual upgrades are available on request
Software upgrades	No Charge
Hardware upgrades	At Cost



TECHNICAL ASSOCIATES

7051 Eton Ave., Canoga Park, CA 91303
(Phone) 818-883-7043 (Fax) 818-883-6103

tagold@nwc.net WWW.TECH-ASSOCIATES.COM

A Division of



US NUCLEAR CORP