

# A Summary and Perspective of Recent IRIS Assessments and Impact on Planning Environmental Investigations

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| Report Documentation Page                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                    |                                     |                                                           | Form Approved<br>OMB No. 0704-0188                  |                                 |
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# Role of Risk Assessment on Environmental Projects

- Used to determine whether site requires further study or remediation
- Used with regulatory values to determine cleanup levels
- Risk-based screening levels (aka PRGs, RBCs, RSLs)
  - ▶ Screen sites early in project lifecycle
  - ▶ Determine project quantitation limits



# Risk-Based Values Function of Toxicity and Exposure

$$\text{Risk} = \frac{\text{Intake}}{\text{Toxicity}}$$

↑ Toxicity = ↓ Criteria

- Tiered approach used to identify toxicity values for site risk assessments
- Integrated Risk Information System (IRIS)
- IRIS values also inform regulatory decisions (MCLs etc.)



# Emerging Contaminants (ECs)

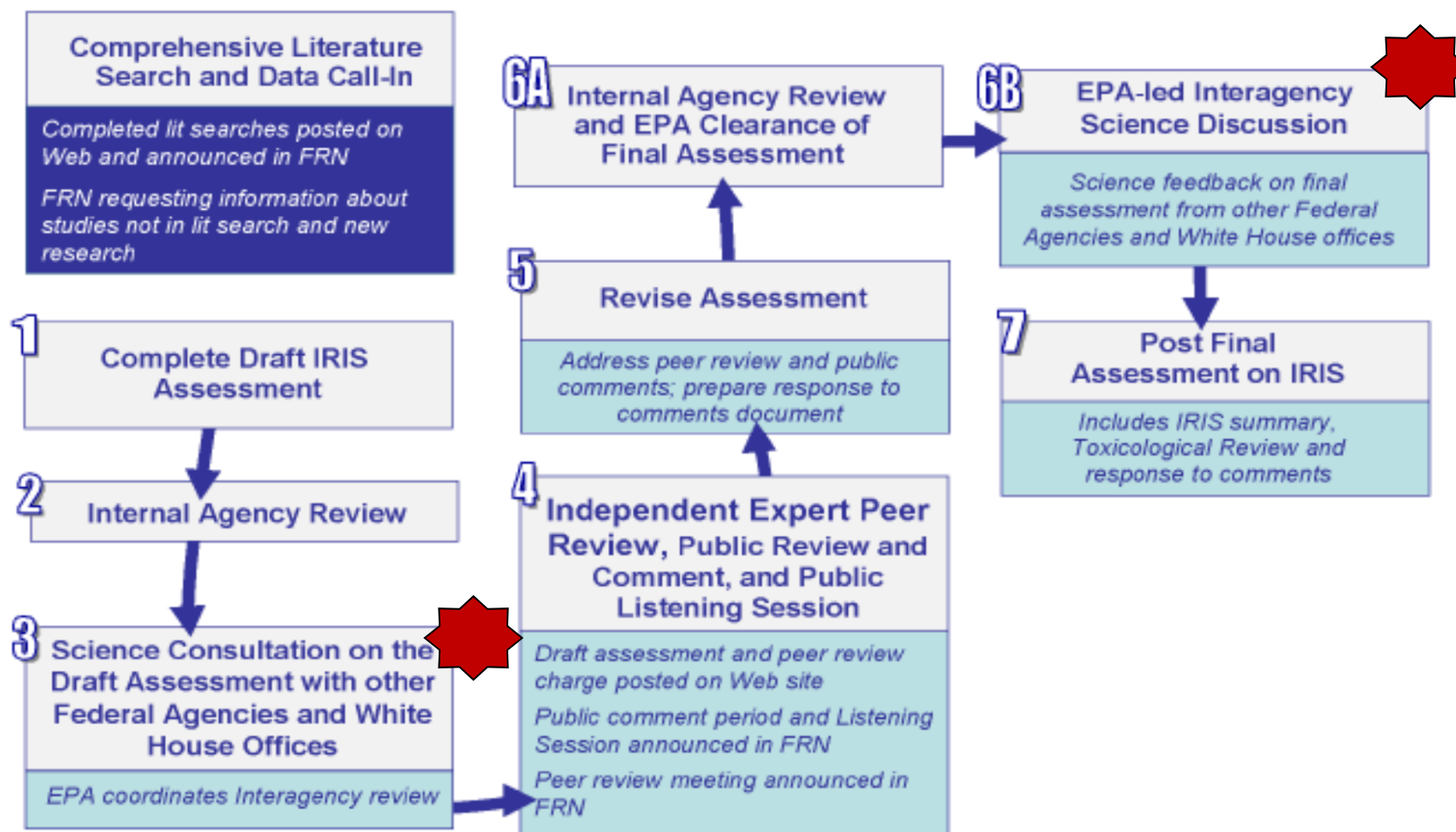
- Are chemicals or materials of interest that are characterized by:
  - ▶ a perceived or real threat to human health or environment, and
  - ▶ there is no currently published health standard or there is an existing health standard, but the standard is evolving or being re-evaluated.

Source: “Initiation of Emerging Contaminants Characterization and Response Actions for Protection of Human Health” Issue Paper (ECOS & DoD Sustainability Workgroup, 2008)



# DoD Participation in IRIS Interagency Reviews

## *Assessment Development Process for New IRIS*



# Tetrachloroethylene

## Status: External Peer Review

- 1998 initiated
- June 2008 external review version released
- Nat'l Academy Review Feb 2006
- Current external (SAB) and public review

| Risk-Based Screening Levels*                                                                                                                           |                      |                             |                                    |
|--------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|-----------------------------|------------------------------------|
|                                                                                                                                                        | Res. Soil<br>(mg/kg) | Res. Water<br>Use<br>(µg/L) | Indoor Air<br>(µg/m <sup>3</sup> ) |
| Current                                                                                                                                                | 0.55                 | 0.11                        | 0.41                               |
| New<br>(draft)                                                                                                                                         | 0.293                | 0.179                       | 0.122                              |
| Sources of current toxicity values include EPA IRIS, ATSDR and CalEPA. Lowest RSL target risk = $10^{-6}$ . Draft values not suitable for project use. |                      |                             |                                    |



# Trichloroethylene

## Status: External Peer Review

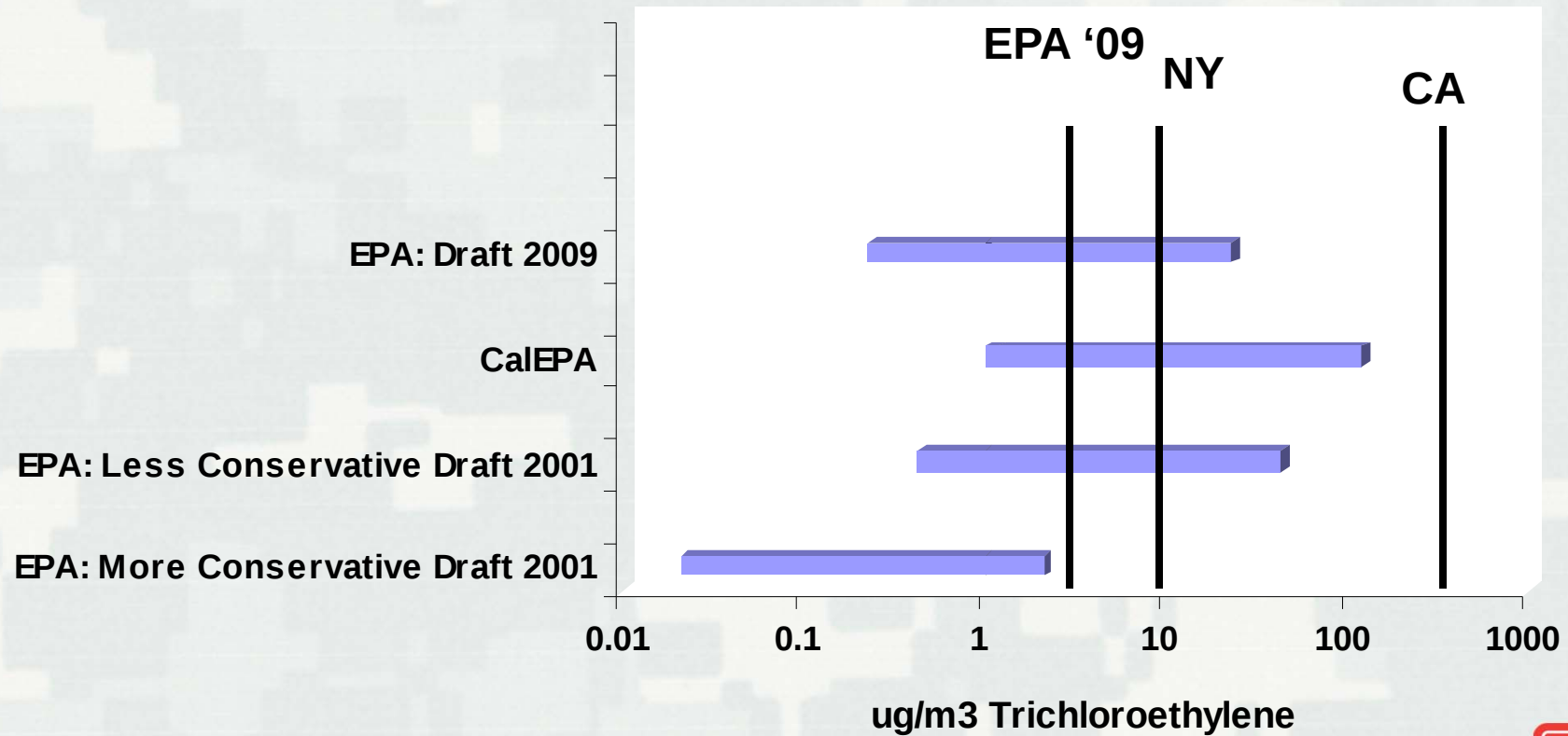
- IRIS values withdrawn late 1980s
  - 2001 draft released
  - 2006 NAS review
  - 2009 re-released
  - Lowest RSLs based on  $10^{-6}$  cancer risk
- Do not utilize levels derived from draft toxicity values.

### Risk-Based Screening Levels\*

|                                                                                                                        | Res.<br>Soil<br>(mg/kg) | Res.<br>Water Use<br>(µg/L) | Indoor<br>Air<br>(µg/m <sup>3</sup> ) |
|------------------------------------------------------------------------------------------------------------------------|-------------------------|-----------------------------|---------------------------------------|
| Current                                                                                                                | 2.8                     | 2                           | 1.2                                   |
| New<br>(draft)                                                                                                         | 0.48                    | 0.23                        | 0.24                                  |
| CalEPA source of current values.<br>Lowest RSL target risk = $10^{-6}$ . Draft<br>values not suitable for project use. |                         |                             |                                       |



**Risk-Based TCE Residential  
Indoor Air Concentrations**  
1E-04 to 1E-06 cancer risk and Noncancer



# Dioxin

## Status: External Peer Review

- Assessment initiated in 1990
- Released for public and peer review 2010
- Using cancer toxicity values in this draft residential screening levels could be as low as 0.45 ppt dioxin toxicity equivalent (TEQ, for dioxin-like compounds)
- Current EPA policy recommends 1000 ppt
  - ▶ Interim PRG may be released



# Final IRIS Reference Dose for Cis-1,2-Dichloroethylene (September 2010)

- Oral noncancer reference dose (RfD) = 0.002 mg/kg-day; increased kidney weight
  - ▶ PPRTV used until this time
  - ▶ MCL = 70 µg/L
- No cancer toxicity values published

| Risk-Based Screening Levels* |                          |                              |
|------------------------------|--------------------------|------------------------------|
|                              | Residential Soil (mg/kg) | Residential Water Use (µg/L) |
| Old                          | 780                      | 370                          |
| New                          | 156                      | 73                           |
| Fold Change                  | 5x                       |                              |



\*Using EPA Regional Screening Level Calculator

# Final IRIS Reference Dose for Trans-1,2- Dichloroethylene (September 2010)

- Oral noncancer reference dose (RfD) = 0.02 mg/kg-day;
- Based on decreased antibody production by the spleen
- No change in RfD value, but change of critical effect
- MCL = 100 µg/L
- No cancer toxicity values published



# Final IRIS Values for 1,4- Dioxane (August 2010)

- Oral noncancer reference dose (RfD) = 0.03 mg/kg-day; Liver & kidney effects
  - ▶ Inhalation RfC will be developed in separate document
- Oral cancer slope factor (SF) = 0.1 mg/kg-day<sup>-1</sup>; Rodent liver tumors

| Risk-Based Screening Levels* |                             |                                 |
|------------------------------|-----------------------------|---------------------------------|
|                              | Residential Soil<br>(mg/kg) | Residential Water Use<br>(µg/L) |
| Old                          | 44.1                        | 6.1                             |
| New                          | 4.85                        | 0.67                            |
| Fold Change                  | 9x                          |                                 |



\*Using EPA Regional Screening Level Calculator

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# Final IRIS Values for Hydrogen Cyanide and Cyanide Salts (September 2010)

- New Oral noncancer RfD = 0.0006 mg/kg-day; male reproduction effects
- New inhalation RfC = 0.0008 mg/m<sup>3</sup>; effects on nervous system and thyroid
- RfD is 33 times more conservative than previous IRIS value
- RfC is 3.75 times more conservative than previous IRIS value



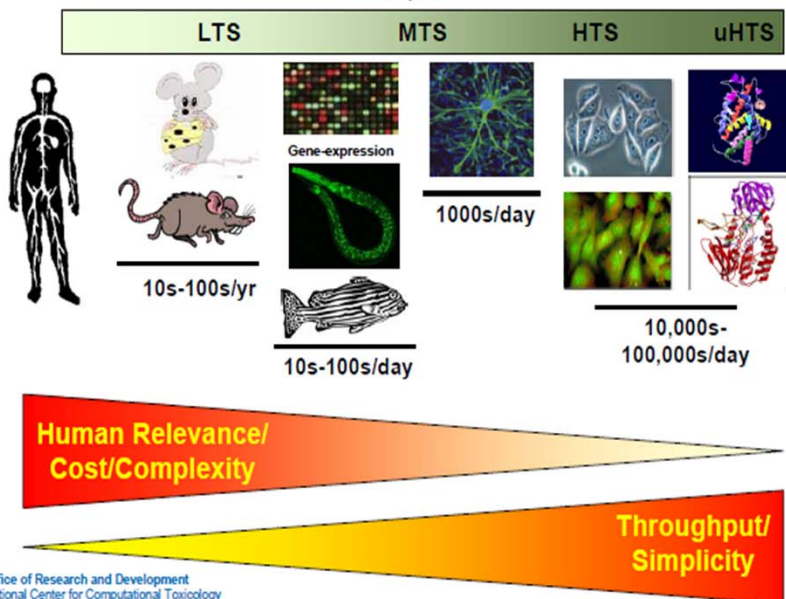
# Basis for Changes

- New study data
  - ▶ Sensitive measurements
- Science policy
  - ▶ Mutagenic mode action adjustment
  - ▶ Uncertainty factor application



## High-Throughput Screening Assays

batch testing of chemicals for pharmacological/toxicological endpoints using automated liquid handling, detectors, and data acquisition



**The future!**  
**EPA Next Generation Risk Assessment**  
New technology will lead to greater capacity and speed. Interpretation of results is a challenge; studies underway to link known effects with screening assay data.

## Systems Exposure Science : Extending Network Analysis

Consider coupled networks spanning multiple levels of biological organization

