

Health Consultation

An Evaluation of Volatile Organic Compounds in Indoor Air

FREELAND/GARLAND TCE SITE
(a/k/a GARLAND/FREELAND G.W. SITE)

FREELAND BOROUGH, LUZERNE COUNTY, PENNSYLVANIA

EPA FACILITY ID: PAD987350063

JUNE 26, 2003

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service
Agency for Toxic Substances and Disease Registry
Division of Health Assessment and Consultation
Atlanta, Georgia 30333

Health Consultation: A Note of Explanation

An ATSDR health consultation is a verbal or written response from ATSDR to a specific request for information about health risks related to a specific site, a chemical release, or the presence of hazardous material. In order to prevent or mitigate exposures, a consultation may lead to specific actions, such as restricting use of or replacing water supplies; intensifying environmental sampling; restricting site access; or removing the contaminated material.

In addition, consultations may recommend additional public health actions, such as conducting health surveillance activities to evaluate exposure or trends in adverse health outcomes; conducting biological indicators of exposure studies to assess exposure; and providing health education for health care providers and community members. This concludes the health consultation process for this site, unless additional information is obtained by ATSDR which, in the Agency's opinion, indicates a need to revise or append the conclusions previously issued.

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HEALTH CONSULTATION NO. 2

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Prepared by:

Pennsylvania Department of Health
Under a Cooperative Agreement with the
Agency for Toxic Substances and Disease Registry

Summary

At the request of the Pennsylvania Department of Environmental Protection (PADEP), the Pennsylvania Department of Health (PADOH), working under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR), prepared this health consultation (HC) to determine if residents near the Freeland/Garland TCE Site (the site) are exposed to trichloroethylene (TCE) and other volatile organic compounds (VOCs) in their homes at levels that would harm their health.

Acetone, benzene, hexane, pentane, toluene, and xylene were detected in basement air. The levels of these contaminants are low. With the exceptions of benzene and pentane, the concentrations are below ATSDR comparison values. Exposure by children and adults to the levels of benzene, pentane and other contaminants that were detected in the basement air would not threaten the health of the residents living in homes discussed in this HC. TCE was not detected in the basement air in any of the homes.

The interpretation, conclusions, and recommendations regarding the Freeland/Garland TCE Site are site-specific and do not necessarily apply to any other site.

Background and Statement of Issues

The Freeland/Garland TCE Site (the site) is in a residential area of Freeland Borough, a rural area in Luzerne County, Pennsylvania (Figures 1B3). The site, which contains two buildings and two parking areas, is bordered to the north by the Borough of Freeland Municipal Authority Water Department, to the east by Graham Street, to the south by South Street (PA Route 940), and to the west by Adams Street. The site is owned by Garland Commercial Industries, Inc., and is used for fabricating steel commercial cooking equipment [1]. The area of concern is a nearby residential area with a few homes that are not connected to municipal water lines and are using water from private wells. Contaminants (TCE and other VOCs) in the well water in these homes that are believed to have originated from a groundwater plume near the site were evaluated in a previous Health Consultation [2]. ATSDR reported in that HC that exposure to TCE and other VOCs in the private well water would not threaten the health of residents using their well water and recommended water from two additional private wells be sampled. The two wells were subsequently sampled by PADEP and PADOH determined that exposure to VOCs in the water would not threaten the health of the residents using their private wells. PADEP then sampled indoor basement air in the homes to ensure that VOCs had not migrated from the groundwater into the indoor air. PADEP requested PADOH evaluate the indoor air sampling results and determine the public health significance of families being exposed to these contaminants in their basement air. This health consultation (HC) responds to their request.

During February 2002, PADEP sampled indoor basement air from four (4) homes (BAS: 1-4) near the site along Loomis, Brengle, and Front & Graham Streets. Approximately eight (8) people reside in these homes. PADEP also sampled basement air at two (2) additional residential locations (BAK: 1 & 2) outside the area of concern along Crescent Road to serve as background samples.

Low levels of acetone, benzene, hexane, pentane, toluene, and xylene were detected in the basement air of all four homes [Table 1]. These same contaminants, with the exception of hexane, were also found in both homes used for background sampling. Hexane was not detected in one of the background residences along Crescent Road, however, it was present in the other residence. Sample results indicated that the maximum concentration of acetone in one of the background residences was slightly higher than the maximum concentration found in basement air of the homes near the site. The maximum concentration of acetone (43 parts per billion (ppb)) was detected

along Crescent Road in BAK-1. The maximum concentrations of benzene (6 ppb), hexane (8 ppb) and pentane (26 ppb) were detected in a residential basement (BAS-1) along Loomis Street. The maximum concentrations of toluene (32 ppb) and xylene (16 ppb) were detected in a residential basement (BAS-3) along Brengle Street. TCE was not detected in any of the samples [3].

Discussion

In this section, PADOH evaluates indoor air data and determines whether the residents are being exposed to harmful levels of the contaminants detected in the basement air of their homes. PADOH considers how individuals came into contact with the contaminants as well as the duration and frequency of exposure. PADOH also considers whether the contaminants were present at harmful levels.

To determine the likelihood of possible health effects of site-specific chemicals, ATSDR has developed health-based comparison values (CVs). These CVs include Minimal Risk Levels (MRLs) for non-cancerous health effects and Cancer Evaluation Guides (CREGs) for cancer. If environmental media guides cannot be established due to lack of health data, other comparison values may be used to select a contaminant for further investigation.

ATSDR established MRLs based upon an evaluation of the toxicological literature for a given substance. MRLs are not established as thresholds of toxicity but were developed as screening tools, below which noncancer adverse health effects are unlikely. In that framework, a lifetime of exposure below a chronic MRL would not be expected to result in adverse effects. However, exposure to levels above the MRL may not necessarily lead to adverse health effects. There is a wide range of uncertainty between levels known to cause adverse health effects and the MRLs. Therefore, the MRL does not establish the highest *A*safe@ level, nor is it intended to imply that levels above those discussed are necessarily harmful. Rather, it identifies a level below which exposure is not likely to be harmful. If environmental exposures occur at concentrations exceeding the MRL then further evaluation is necessary to determine the significance of those exposures.

Residential exposures to acetone, hexane, toluene, and m/p xylene are at concentrations below their corresponding MRLs [4] and should not threaten the health of the residents using their basements [Table 1]. Therefore, these contaminants will not be further addressed in this HC. We have selected benzene and pentane for further evaluation because ATSDR does not have chronic MRLs to serve as screening values for these contaminants and the maximum concentration of benzene is equal to its intermediate MRL.

In the past benzene was used as an industrial solvent. Currently, it is banned as an

ingredient in products intended for use in the home. Although its use has been largely reduced, it is still used along with other high octane aromatic hydrocarbons such as pentane as a component in gasoline [5].

Benzene and pentane are typically released to the environment through the manufacture, use, and disposal of products containing gasoline. Background concentrations ranging from 0.02 to 34 ppb have been reported for benzene in outdoor air [6]. Varying concentrations have also been reported for pentane in ambient air. In one study, pentane was detected in outdoor air in rural North Carolina at concentrations ranging from 0.1 to 26.2 ppb. In another study, the atmospheric concentration of pentane at the Jones State Forest in rural Texas was 11.1 ppb [5]. The concentrations of benzene and pentane detected in the basement air of the homes evaluated in this HC are consistent with background ambient air levels in other rural areas.

The National Institute of Occupational Safety Health (NIOSH) has determined a time-weighted-average (TWA) of 120,000 ppb for exposure to pentane. NIOSH's TWA is based on a maximum daily exposure of 10 hours and a maximum weekly exposure not to exceed 40 hours. The maximum concentration of pentane detected in residential basement air was 26 ppb. This level is about 1000 times less than the NIOSH guideline even after adjusting for a home environment (i.e. 24 hours/day, 7 days/week) and also within the normal range typically found in rural air. Exposure to pentane at the levels detected in basement air would not be expected to cause adverse health effects in residents.

Although a chronic MRL for benzene does not currently exist, ATSDR/DHAC guidance states that when evaluating exposures where the maximum concentration of benzene is at or below 10 ppb, a finding of no apparent public health hazard (exposures are not at levels expected to cause adverse health effects) is an appropriate conclusion [7]. The concentrations of benzene (3 ppb to 6 ppb) detected in all of the homes are below levels which ATSDR and PADOH consider a threat to health and the range of benzene concentrations also falls within the normal background concentrations (0.02 to 34 ppb) that have been reported for rural outdoor air [6]. Exposure to benzene at the levels found in the basement air would not be expected to cause noncarcinogenic adverse health effects in residents.

Benzene is known to be a carcinogen [8]. PADOH estimates the maximum excess cancer risk for lifetime exposure (24 hours per day) to benzene at 6 ppb is one additional cancer per 10,000 people or a low increased risk [10]. Our calculation is based on the assumption that there is no safe level of exposure to a chemical that causes cancer. However, the calculated risk is not exact and tends to overestimate the actual risk associated with exposures that may have occurred. Also, assuming that residents spend at most a few hours each day in their basements, their overall cancer risk would further decrease. While benzene has been associated with leukemia, no detectable excess of leukemia is seen in workers exposed to benzene at levels of 1000 ppb or less for 40 years [9]. Given the low level of benzene (6 ppb) in comparison to studies that

associated benzene to leukemia, and given a periodic residential exposure scenario, it is unlikely that the estimated exposure would result in increased cancer. Also, because residents spend at most a few hours each day in their basements, their overall cancer risk would further decrease. Under a periodic residential exposure scenario, PADOH and ATSDR would not expect any health impact with indoor air levels of benzene at 6 ppb or less.

The levels of all of the contaminants detected in the indoor air would not be expected to threaten the health of residents exposed to them and represent no apparent health hazard to families using their basements and other areas of their homes. Although indoor air samples were not obtained for the upper levels of the houses evaluated in this document, we would expect concentrations of VOCs originating in the basement air to be diluted as it moved into other areas in the home further reducing any risk of adverse health effects. Proper use and disposal of household products containing VOCs along with appropriate ventilation can further reduce the levels of these common indoor air pollutants.

Site Visit

On April 16, 2002, Robert M. Stroman and John S. Mellow met with residents from the site area (BAS: 1-4) where contaminants were detected in their indoor basement air. Stroman discussed with the residents the significance of their basement air results and answered their health questions. Mellow answered questions regarding PADEP=s sampling.

Child Health Considerations

ATSDR recognizes that infants and children may be more vulnerable to chemical exposure than adults. As part of its Child Health Initiative, ATSDR is committed to evaluating children=s special interests. Considering exposure to indoor residential basement air near the Freeland/Garland TCE site, children may have an increased vulnerability due to many factors including: 1) children weigh less than adults, resulting in higher doses of chemical exposure relative to body weight, 2) children have higher rates of respiration, 3) metabolism and detoxification mechanisms differ in both the very young and very old and may increase or decrease susceptibility; and 4) the developing body systems of children can sustain permanent damage if toxic exposures occur during critical growth stages. PADOH and ATSDR considered child-specific doses in the analysis for this health consultation document.

Conclusion

PADOH and ATSDR conclude the following:

Exposure by children and adults to benzene and other VOCs at the levels detected in the residential basement air would not threaten the health of the residents. The presence of the VOCs in indoor air represents no apparent health hazard for families living in the homes (BAS: 1-4 & BAK: 1-2) discussed in this HC.

Public Health Recommendation

1. Residents should properly use, store, and dispose of VOC containing household products.
2. No further public health action is needed at this time.

Public Health Actions Completed

1. PADOH and PADEP met with affected residents identified in this HC and discussed the public health significance of their exposure to VOCs in their indoor air, PADEP's role and involvement at this site, and encouraged the proper use, storage, and disposal of household products containing VOCs.

References

1. AMEC Earth & Environmental, Inc. Draft site investigation work plan for the Freeland/Garland TCE Site, Freeland Borough, Luzerne County, Pennsylvania, prepared for the Pennsylvania Department of Environmental Protection. Hartford, Cheshire, UK: AMEC Earth & Environmental, Inc.; August 2001.
2. Agency for Toxic Substances and Disease Registry, Health Consultation for the Freeland/Garland TCE Site(a/k/a Garland/Freeland G.W. Site), Freeland , Luzerne County, Pennsylvania, EPA Facility ID: PAD98750063; U.S. Public Health Service, Atlanta, Georgia: December 12, 2001.
3. Pennsylvania Department of Environmental Protection. E-mail to Robert M. Stroman, Pennsylvania Department of Health, from John S. Mellow containing Lancaster Laboratories sampling data results. April 11, 2002.
4. Agency for Toxic Substances and Disease Registry, Minimal Risk Levels (MRLs) for Hazardous Substances, U.S. Public Health Service, Atlanta, Georgia: ATSDR, Available at URL: <http://www.atsdr.cdc.gov/mrls.html>.
5. National Library of Medicine, Specialized Information Services, Hazardous Substances Data Base available online through ToxNet. National Institute of Health. Benzene and Pentane. URL: <http://www.nlm.nih.gov/hinfo.html>. Searched February 21, 2003.
6. Agency for Toxic Substances and Disease Registry, Toxicological Profile for Benzene, (Update), U.S. Public Health Service, Atlanta, Georgia: ATSDR, September 1997.
7. Division of Health Assessment and Consultation, Agency for Toxic Substances and Disease Registry. Memorandum for interim guidance on benzene exposure by Dr. Allan Susten. January 12, 2000.
8. Agency for Toxic Substances and Disease Registry, ToxFAQs for Benzene, U.S. Public Health Service, Atlanta, Georgia: ATSDR, URL: <http://www.atsdr.cdc.gov/tfacts3.html>. Searched February 21, 2003.
9. Rinsky RA, Alexander BS, Hornung R, Filloon TG, Young RJ, Okun AH, Landrigan PJ. Benzene and leukemia, an epidemiologic risk assessment. *New England Journal of Medicine* 1987;316:1044-50.
10. Agency for Toxic Substances and Disease Registry, Public Health Assessment Manual (Draft Update for Public Comment), U.S. Public Health Service, Atlanta, Georgia: ATSDR, March 2002.

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Certification

This Freeland/Garland TCE Site Health Consultation has been prepared by the Pennsylvania Department of Health under cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR). It is in accordance with approved methodology and procedures existing at the time the health consultation was initiated.

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The Division of Health Assessment and Consultation, ATSDR, has reviewed this health consultation and concurs with its findings.

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Figures

Figure 1

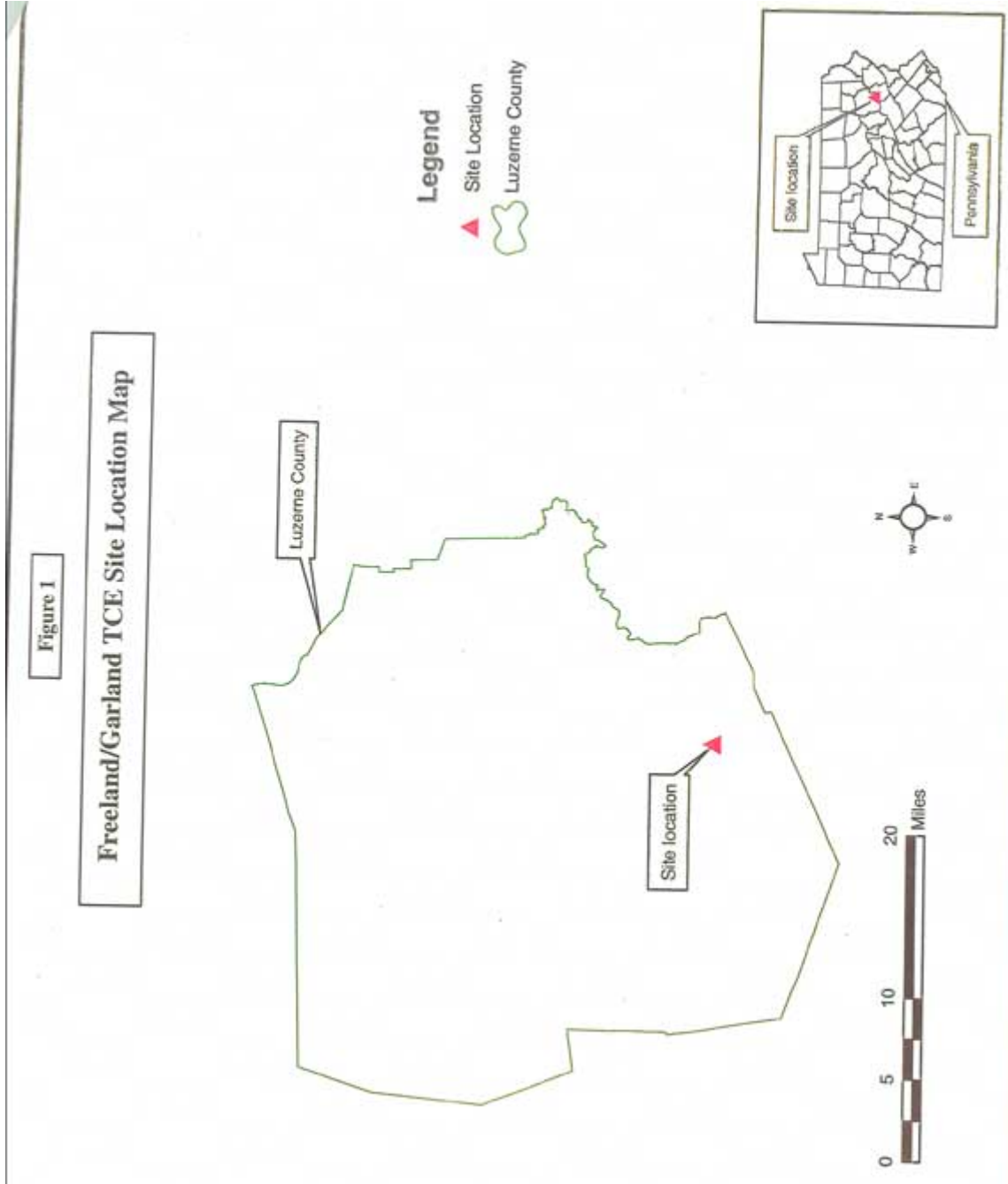
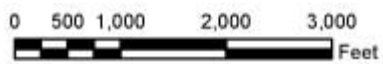
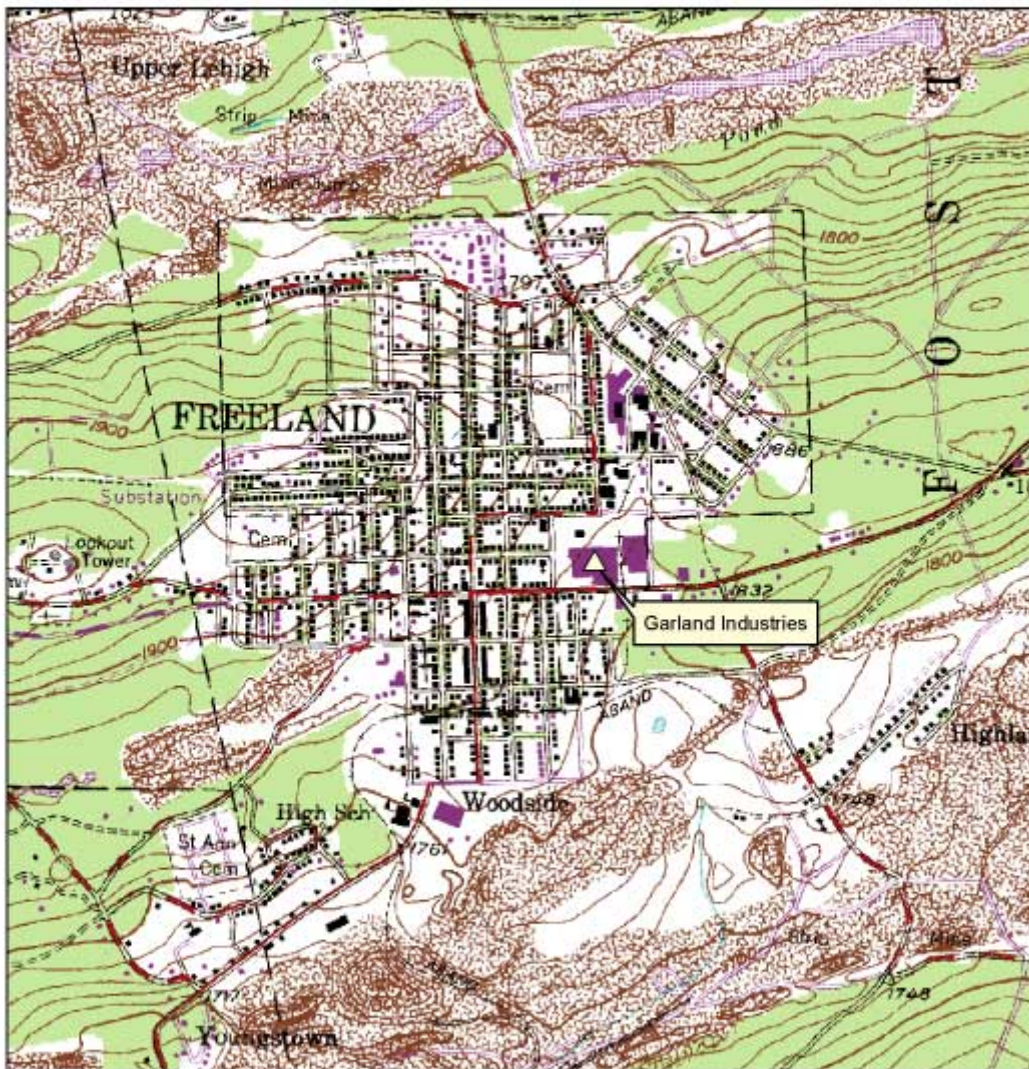


Figure 2

Figure 2

Freeland/Garland TCE Site Location Map



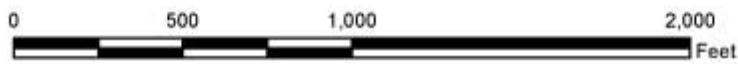
Legend

△ Garland Industries

Figure 3

Figure 3

Residential Areas Near the
Freeland/Garland TCE Site



Table

**Table 1: Summary of Data for Selected VOCs From Indoor Air Samples
(Basement) Freeland/Garland Site**

Contaminant	Sampling Event	Frequency of detection (homes)	Concentrations Detected in ppb	ATSDR Comparison Values	
				Value	Source
Benzene	February 2002	4/4	3.0 - 6.0	0.1 ug/m3 (0.03 ppb) 4.0 ppb	CREG (c) MRL (I)
Acetone	February 2002	4/4	7.0 - 42.0	13,000 ppb	MRL (c)
Hexane	February 2002	4/4	1.0 - 8.0	600 ppb	MRL (c)
Pentane	February 2002	4/4	0.7J - 26.0	n/a	n/a
Toluene	February 2002	4/4	8.0 - 32.0	80.0 ppb	MCL (c)
m/p Xylene	February 2002	4/4	2.0 - 16.0	100.0 ppb	MCL (c)

n/a = not available

J = estimated value

ppb = parts per billion

ug/m3 = micrograms per cubic meter

MRL (C)= Chronic Minimal Risk Level

MRL (I)= Intermediate Minimal Risk Level

CREG = Cancer Risk Evaluation Guide