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Mixed Low-Level Radioactive and Hazardous Waste Disposal Facilities

Heart of America Northwest

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Glossary of Terms

ALARA: As low as Reasonably Achievable
A LLW: Class A Low Level Waste
ARAR: Applicable or Relevant and Appropriate Requirements
CAMU: Corrective Action Management Unit
CERCLA: Comprehensive Environmental Response, Compensation, and Liability Act
COC: Contaminant of Concern
CPA: Cleanup Priority ACT aka: Initiative 297
CQC: Contractor Quality Control
CWA: Cleanup Water Act
DNS: Determination for non-Significance
DOE: US Department of Energy
DOH: WA Department of Health
DQO: Data Quality Objectives
Ecology: WA Department of Ecology
EDE: Effective Dose Equivalent
EIS: Environmental Impact Statement
ERDF: Environment Restoration Disposal Facility
(F)EIS: (Final) Environmental Impact Statement
GW: Ground water
HQ: Hazard Quotient
HSWEIS: Hanford Solid Waste EIS
ICR: Incremental Cancer Risk
ILAW: Immobilized Low Activity Waste
LLBG: Low Level Burial Grounds
LCRS: Leachate Collection Removal System
LLW: Low Level Waste
IDF: Integrated Disposal Facility
LARW: Low Activity Radioactive Waste
MCL: Maximum Concentration Limit
MTCA: Model Toxics Control Act
NARM: Natural Occurring and Accelerator Produced Radioactive Material
NEPA: National Environmental Policy Act
NORM: Naturally Occurring Radioactive Materials
NRC: Nuclear Regulatory Commission
NTS: Nevada Test Site
NUREG: US Nuclear Regulatory Commission¡¯s Regulations
PA: Performance Assessment
RCRA: Resource Conservation and Recovery Act
QC/QA: Quality Control/Assessment
RIFS: Remedial Investigation Feasibility Study
RWMS: Radioactive Waste Management Site
SEPA: State Environmental Policy Act
TPA: Tri Party Agreement
USACE: US Army Corps of Engineers

The Cross-Site Comparison of USDOE Mixed Waste Disposal Options

1.1 Executive Summary: with Background & Findings

As a result of decades of nuclear weapons production, the United States Department of Energy (USDOE) is faced with a staggering quantity of different radioactive waste streams that need to be managed and disposed. Radioactive waste can remain dangerous to human health for thousands to millions of years. This lengthy duration of toxicity for radioactive waste forces it to be considered on a time scale comparable to geological history. "Mixed Waste" – comprised of both radioactive and chemical hazardous waste - poses special challenges. Chemicals may speed migration, or the effect of radiation on the chemicals may create new substances or gases. Many of the chemicals mixed with radioactive wastes during Plutonium production include powerful solvents, combustibles, volatile organics, heavy metals, poisons and carcinogens. At this time, manmade containments have not accomplished complete isolation of radioactive wastes from their hydrogeological environment. The technology for this does not yet exist. Already, landfills used to dispose of USDOE wastes have leaked and caused significant contamination.

Migration of radioactive and hazardous wastes from burial grounds, leading to human exposure, health and environmental impacts, is contingent on the hydrogeological landscape. Landfills leak. Caps and engineered barriers above landfills fail. These predictable failures, along with intrusions, loss of "institutional controls", animal and plant intrusion, nearby construction projects that disturb caps…. result in reasonably foreseeable exposure scenarios involving direct exposure or indirect exposure via consumption of contaminated groundwater, fish, crops, etc. Therefore, radioactive and mixed waste burial sites must be carefully chosen and monitored to ensure safety.

Candidate sites for disposal of USDOE's Mixed Wastes (MW), must be judged according to their hydrogeology over an appropriate time frame: up to 10,000 years. US Department of Energy (USDOE) has identified three options for disposal of vast quantities of Mixed Waste. Those three options include the Hanford Nuclear Reservation (alongside the Columbia River in Washington), Nevada Test Site (NTS) and at a private facility in Clive, Utah run by Envirocare of Utah (whose parent company was recently renamed "EnviroSolutions"). The quantities of wastes that might be added to the soils at these sites are enormous.[1] All three are currently disposing of Mixed Waste or in the process of permitting for this purpose.

Mixed Waste Quantities Requiring Disposal - Different Figures Disclosed by USDOE:

Waste Management Programmatic EIS (WMPEIS, 1997) 20 Year Forecast of Mixed Waste Requiring Disposal (covering *entire* nuclear weapons complex):	219,000m3	7.665 million ft3
Hanford on-site MW requiring disposal through 2046 From Revised Draft Hanford Solid Waste EIS (3-03) (excluding environmental restoration waste):	58,000m3	2.062 million ft3
Off-site MW proposed for disposal at Hanford through 2046 From Revised Draft Hanford Solid Waste EIS (3-03): Table 3.4 and Pages 1.7,1.8 (excluding environmental restoration waste)	140,438m3	4.957 million ft3
MW from Hanford High-Level Nuclear Waste Treatment Plant (both glassified waste for burial in IDF Landfill and melters requiring burial – under current approach): Revised Draft Hanford Solid Waste EIS Table 3.6	217,825 m3	7.689 million ft3
Note- Final EIS figures were same with slight adjustment downward for waste disposed in interim.		
Total disposal capacity MW for Hanford IDF landfill as proposed in permit application (3 cell): (LLW would be equal or greater capacity)	450,000 m3	15.885 million ft3

USDOE asserts that the WMPEIS considered the Mixed Wastes proposed for disposal at Hanford and NTS, and provides it with NEPA coverage for its 2000 decision to dispose of both on-site and off-site MW at Hanford and NTS. Yet, as the above figures make abundantly clear, the volume of Mixed Waste at Hanford requiring disposal is *more than 125% of the total amount of Mixed Waste considered in the Waste Management Programmatic EIS for the entire nation.*

In 2000, USDOE issued a formal "record of decision" to use Hanford and NTS as national disposal facilities for both Low-Level Waste and Mixed Wastes from other nuclear weapons complex sites for the next four decades. This decision implemented a proposal from USDOE's 1997 Waste Management Programmatic Environmental Impact Statement (WMPEIS). The WMPEIS and decision have been criticized for not considering reasonable alternatives, including sites, such as Envirocare or new facilities, in locations that are better suited for disposal.

In this report, for the first time, the alternative sites for disposal of Mixed Waste are independently compared in regard to their fundamental geologic and hyrodologic conditions, design, standards utilized, and actual monitoring. A fundamental conclusion of the report by John Brodeur, L.G.E, P.E., is that the hydrogeologic landscape determines the fundamental scale of impacts to the environment and human health – regardless of

engineering efforts. *In sum, the site matters. In addition to the site, the design and actual operation are shown to matter a great deal, and we find tremendous differences exist between alternative sites.*

This publication is a compilation of research and work products undertaken during the duration of a Citizens Monitoring and Technical Assistance Fund grant from 2004 through March 2006, to create a Cross-Site Review of Mixed Waste Disposal Facilities, and review Hanford specific landfill related documents and decisions. While comparing the three major alternative disposal sites (Hanford, NTS and Envirocare), four specific burial grounds were considered at the Hanford Nuclear Reservation: Environmental Restoration Disposal Facility (ERDF); Integrated Disposal Facility (IDF); US Ecology Commercial Low-Level Waste landfill; and, USDOE's Hanford Low-Level Burial Grounds (LLGB).[2] The first section reports the findings of this first ever Cross-Site Review by hydro-geological engineer, John Brodeur, with Energy Science & Engineering.

The Review and Comparison of Mixed Low-Level Radioactive and Hazardous Waste Disposal Facilities by John Brodeur ("Cross-Site Review") provides a first-ever comparison of the three different disposal sites.[3] It reviews the protectiveness of the landfills relative to groundwater pathways, design, monitoring and human health risks from future exposure. Alternative site locations will have different impacts to groundwater, future land use, and human health. Risk of exposures through the mobility of wastes is dependent on the hydrogeology of a given location. Both the Hanford and NTS sites are preparing Environmental Impact Statements (EIS) on the disposal of Mixed Wastes to apply for landfill permits. This report enables concerned citizens to evaluate Mixed Waste disposal and treatment options for current and future environmental impact statements and permits.

Following the engineering report is Heart of America Northwest Research Center's Comments on Proposed State Hazardous Waste Permit for the Integrated Disposal Facility. In the Final Hanford Site Solid Waste Environmental Impact Statement (HSWEIS - 2004), USDOE identified the Integrated Disposal Facility (IDF) landfill as its preferred alternative for disposal of Mixed Wastes. USDOE stated the goal of the IDF is to:

> ***"provide DOE with the capability to accommodate projected waste receipts from the Hanford Site and offsite DOE facilities."***[4]

The total potential amount of on-site waste expected to be generated from cleanup of Hanford and requiring disposal at IDF is 156,735 m3. Of this amount, 58,054m3 is expected to be Mixed Waste.[5] Yet, USDOE plans IDF to have 900,000 m3 of disposal capacity.[6]

In February, 2004, USDOE formally adopted a plan (referred to as a "Preferred Alternative") to import and dispose of 12.7 million cubic feet of offsite Low-Level and Mixed Waste in IDF. (360,000 m3) [7] In June, 2004, USDOE issued a formal Record of Decision authorizing the IDF landfill for disposal of over 3 million cubic feet (90,000m3) of LLW and MW from offsite generators, and 156,000 cubic meters of on-site waste.[8] However, the design and permit application allows for a total disposal capacity of 900,000 m3. This new facility is currently under construction in the 200 East Area at Hanford. Health risks for the initial capacity of the IDF have not been adequately considered. In an unusual legal admission, USDOE informed the US District Court for Eastern Washington that the Final HSWEIS had significant flaws in its analyses of groundwater, health and safety impacts. USDOE's admissions reflect some of the inadequacies identified in this report and comments. The Washington Attorney General noted that USDOE agreed that *"Energy would have gone ahead and disposed of radioactive and hazardous waste based on an environmental analysis that all sides now agree is not trustworthy."*[9]

USDOE has agreed to issue a new analysis of the impacts from IDF and existing burial grounds in a forthcoming "Tank Closure and Waste Management EIS".[10] This report includes Heart of America Northwest Research Center's comments for, and in-depth analysis and suggestions on, the proposed IDF facility – which draw on John Brodeur's analyses and other analytical work by Heart of America Northwest staff, board and volunteer experts.

The Analysis of USDOE's Performance Assessments for Low-Level Radioactive Waste Burial Grounds looks specifically at Hanford's Low-Level Burial Grounds (LLBG) to evaluate the risk and Performance Assessments relative to operational plans, closure plans, covers, monitoring, exposure assumptions, groundwater and vadose zone transport models & monitoring data. We also review the adequacy of DOE Order 435.1 as a basis for determining acceptability of health impacts from USDOE LLW waste disposal (which will be co-disposed with MW in IDF). The Hanford Solid Waste Environmental Impact Statement (HSWEIS) based its human health risks on assumptions and modeling in two inadequate Performance Assessments. USDOE's analyses of the IDF landfill continued this pattern by relying on DOE Order 435.1 for the impact analysis. This report concludes that USDOE's reliance on its Performance Assessments and the DOE Order 435.1 Guidance does not meet the requirements of NEPA and SEPA and other applicable laws. Under Order 435.1, USDOE failed to consider the combined cumulative impacts from both radioactive and non-radioactive carcinogens. USDOE's standards for determining acceptability of impacts and landfill plans under Order 435.1 would allow the proposed new landfills and existing LLBGs to grossly violate relevant health standards. USDOE's Performance Assessments and guidance are based on allowing future releases of radionuclides from the IDF and LLBGs, which *would result in cancer in 15 to 25% of children*

exposed directly or via the groundwater. The Performance Assessments failed to consider river or surface contamination, and ignore the additional risk from non-radioactive carcinogens. These accompanying hazardous substances – which include powerful solvents, flammable or ignitable chemicals, poisons, carcinogenic wastes - are ignored and never considered in cumulative impacts despite their carcinogenic risks and ability to mobilize radionuclides. This stands in stark contrast to Washington State law under which says that the maximum allowable risk from current and future releases is no more than one additional cancer for every one hundred thousand people exposed to contamination from the site.[11]

The final section is Heart of America Northwest's Review of the EIS recently adopted by Washington Departments of Health and Ecology for the US Ecology Commercial LLW landfill at Hanford: "Environmental Impact Statement for the Commercial Radioactive Waste Dump at Hanford ignores Cancer Causing Radionuclides and Violates Policies on Use of Unlined Trenches for a National Radioactive Waste Dump." The two state agencies adopted this EIS and issued a formal notice on October 21, 2005 to implement proposed actions. These include: a rule allowing massive expansion of disposal of NORM/NARM (Naturally Occurring / Accelerator Radioactive Materials); relicensing; investigation of releases; standards for operation, monitoring and capping. The commercial LLW site is operated by a private company, USEcology, as the facility for the Northwest Interstate Compact for Low-Level Waste Disposal. Our report documents that the site: has received hazardous wastes; has a significant set of releases which have reached groundwater (in defiance of prior models); is proposed to continue to operate without liners and leachate collection or adequate early detection of releases. Yet, despite the on-going storage and release of hazardous wastes, the EIS and agencies have failed to consider requiring permitting of the site under hazardous waste laws.

Just as USDOE's Performance Assessments for the Hanford unlined Low-Level Burial Grounds fail to consider the combined impact of radionuclides and hazardous chemical carcinogens, the Washington Departments of Health and Ecology failed to consider the total carcinogen risks from all leaks, wastes already disposed and wastes proposed to be disposed in the US Ecology landfill. Ecology is not including radionuclides in its investigation of the releases from the landfill. Our review finds that the licensing standards were also not met. The EIS, along with source term and groundwater models in the Performance Assessments, were reviewed for this report with regard to total impacts. Due to objections from Heart of America Northwest, the State issued an emergency rule delaying adoption of the EIS and NORM/NARM rule (but proceeding with relicensing). This will allow consideration of the major issues raised in this report and an opportunity for the public to utilize this report in commenting on the landfill.

1.1.2 Timely Developments:

This report was developed after Washington voters adopted Initiative 297, the Cleanup Priority Act (CPA), in November 2004. The CPA is a state parallel to the federal Superfund Offsite Waste Rule[12], which has never been followed for Hanford and NTS. The Offsite Waste Rule prohibits adding waste from one federal Superfund site to a second site where the landfill in which the waste would be disposed at the second site is spreading contamination from releases; or, other hazardous waste units at the second site have uncontrolled releases. The CPA also repeats existing standards in state rules and adopted explanatory statements requiring that the State's cancer risk standard for hazardous substance release sites must be considered in making decisions on permitting new mixed waste landfills.

In October 2005, Washington Ecology and Health Departments adopted the EIS for the US Ecology Commercial LLW Landfill and, Health published notice of its proposed adoption of the rule allowing 100,000 cubic feet of NORM/NARM to be disposed annually in the US Ecology landfill. A review of the EIS and NORM/NARM rule revealed that neither attempted to meet the standards of the State's new Cleanup Priority Act. Due to significant opposition, the adoption of the EIS and NORM/NARM rule was postponed until August 15, 2006 to allow the state to consider the impact of a potential federal court ruling on the CPA. Public comment will be taken again.

In February 2004, USDOE released the Final Hanford Solid Waste Environmental Impact Statement (HSWMEIS). The State of Washington filed a lawsuit (Washington v. Bodman) alleging inadequacy of this EIS. An audit by USDOE Headquarters found the EIS to be seriously flawed in three major areas: Groundwater (including cumulative impacts), Transportation, and Health and Safety. In January, 2006, USDOE and the State of Washington reached a settlement under which USDOE agreed not to rely on the groundwater analysis in the HSWEIS until a new analysis was included in a forthcoming EIS, which would include cumulative impacts to groundwater from all sources on Hanford's Central Plateau. On February 2, 2006, USDOE issued a Notice of Intent to prepare a new Environmental Impact Statement for Tank Closure and Waste Management (TC&WMEIS). The final product of this grant, the Cross Site Examination of Mixed Waste facilities will be useful to concerned citizens submitting public comments at the Scoping Hearings, when reviewing the draft EIS and in commenting on proposed permits for the IDF landfill. This product will assist in educating concerned citizens with the relevant facts and the germane issues, allowing them to become more effectively involved in the Clean-Up decision-making process.

1.1.3 Findings of the Cross-Site Comparison of Mixed Waste Disposal Facilities

Overarching Cross-Site Findings Comparing Hanford, Nevada Test Site and Envirocare:

- Disposal location is the first and most central performance factor, because all landfills will leach sooner or later, regardless of engineered barriers.
- The key factors for determining site acceptability are: geology, groundwater regime and climate. Major differences exist between the three sites that affect their acceptability.
- Less favorable environments for long term storage of Mixed Waste must be equipped with more controls, isolation requirements, and stricter waste acceptance criteria and monitoring to ensure safety. Climate and geology affect long term cap and barrier performance. This should translate into stricter waste acceptance criteria and reduced volumes, along with evaluation of eventual closure performance and requirements when designing and initially assessing landfills. The USDOE sites have not met this expectation – with the possible exception of the ERDF site (however, waste acceptance criteria appears to have been waived without a final performance assessment).
- The Hanford site has the least favorable environment of the three. Hanford's groundwater is a valuable resource and flows into the Columbia River – where it impacts the last major natural salmon spawning grounds and contaminates the shorelines of the Hanford Reach National Monument.
    - Hanford's Low-Level Burial Grounds (LLBGs) and US Ecology commercial landfill are not only releasing contamination, but their contamination has reached groundwater in a few decades (rendering modeling claims invalid). Yet, Hanford's LLBGs and USEcology commercial waste landfill have far less monitoring and safety oversight than Envirocare. Hanford's IDF facility may only have appropriate controls over one half of the cells (the MW cells), despite the cumulative impacts from co-disposal of LLW in the other cells.
- Envirocare has the most favorable location for Mixed Waste disposal, and for Low-Level Waste disposal. The groundwater under Envirocare is not usable – even under the strongest guidelines for defining beneficial uses to be protected. The climate is favorable and the design takes advantage of the climate.
    - Envirocare far exceeds federal and state standards – e.g., for monitoring - in starkest contrast to the USDOE low-level waste burial grounds at Hanford and NTS, and the US Ecology commercial site. Envirocare's operational controls and monitoring far exceed those at NTS and Hanford.
- At the Nevada Test Site, USDOE is resisting use of liners and leachate collection for mixed waste disposal despite the clear mandate of federal and state hazardous waste laws. Existing burial grounds lack early detection and adequate groundwater monitoring, and USDOE's proposal for the MW landfill will not have adequate monitoring.

- USDOE has failed to consider the long-term (fully burdened) costs of disposal of waste at NTS and Hanford. This violated a July, 2002 commitment by the Energy Secretary to Congress. These costs include long-term monitoring, remediation, closure of the landfill etc... At Hanford, USDOE charged offsite generators less than half of the *immediate* fixed and variable actual costs of disposal. Disposal at a regulated commercial site, such as Envirocare, includes long-term fully burdened costs.
    - The failure to consider charging generators the long-term costs of disposal violates NEPA.
    - The Final Hanford Solid Waste EIS (2004) continued USDOE's refusal to consider the fully burdened long-term costs of disposal.
    - If the fully burdened, long-term costs of disposal were considered, use of better hydrogeologically situated and externally regulated disposal facilities, such as Envirocare, would be highly advantageous. This would also avoid long-term interference with the cleanup of Hanford and NTS.
- USDOE's Waste Management Programmatic EIS (1997) and Record of Decision (2000) failed to consider the benefits of the more favorable geology and groundwater at the Envirocare Site in Utah; and, failed to consider cumulative impacts from other waste sites, actual monitoring, closure plans, groundwater regimes or waste acceptance criteria in selecting Hanford and NTS as the national disposal sites. The WMPEIS acknowledged this and stated that site specific analyses would be necessary along with site specific waste acceptance criteria and other performance measures to avoid violating standards at Hanford. The Hanford Solid Waste EIS fails to include such considerations.
- USDOE's evaluation standards for landfills, under Order 435.1, would allow far more children and adults to get cancer from exposure to releases and intrusions into the landfills than are allowed under the federal Superfund law or Washington State standards. USDOE fails to consider the combined cancer risk from radioactive and other hazardous substance releases. Ironically, Washington State also failed to consider this for its investigation of releases from the US Ecology landfill.

Envirocare (Clive, Utah)

- The commercial Mixed Waste facility operated by Envirocare is sited in a location which provides strong environmental protection and low risk for long-term human exposures compared to Hanford.
- The groundwater at Envirocare is relatively shallow compared to NTS and Hanford, but not located over usable groundwater.
- The groundwater at Envirocare is 15.7% more saline than seawater. Even if a major failure occurred in the engineering systems at Envirocare, contamination would release into an unusable water source and would be relatively easy to clean up compared to NTS and Hanford. The advanced monitoring systems at Envirocare would allow for early detection before reaching groundwater.

- Envirocare has a negative net recharge to groundwater in a closed hydrologic regime.
- Envirocare has, by far, the best monitoring system and strictest waste acceptance criteria for any of the USDOE's options for MW disposal. (The same was found for LLW disposal, including in comparison to US Ecology).
- Closure plans – required for licensing – are more detailed than USDOE sites or US Ecology, and based on actual data. Operational standards (e.g., waste acceptance criteria) are based on consideration of closure plans and realistic assessments of the failures of engineered and institutional controls. Closure plans are based on protecting groundwater and human health for 10,000 years.

Hanford

- Hanford has a very valuable groundwater resource, which flows into the Columbia River. The groundwater resource and Columbia River shorelines – where seeps of contamination now prevent access and are causing harm to fish and wildlife - affect the rights of Native Americans guaranteed the right to live along, and fish, the Hanford Reach of the Columbia River.
- The fairly rapid movement of contaminants through the soil column (vadose zone) to the River make Hanford a poor choice for disposal. Because even well designed landfills with liners and leachate collection and closure caps will leach, contamination from Hanford landfills will expose people and the environment.
- Hanford's Low-Level Burial Grounds and the US Ecology commercial landfill are already releasing contamination, and that contamination has reached groundwater. This defies predictions from recent models used for permitting and in environmental impact statements.
- The cumulative impacts to groundwater and human health from exposure to the wastes already disposed on Hanford's Central Plateau are simply not known. Therefore, it is impossible to ascertain the acceptability of proposals to add more waste to the soil column.
- Although the groundwater at Hanford is already contaminated, this does not make further contamination acceptable. Adding more waste to Hanford may serve to increase contamination to groundwater and cancer risks. The health risks may be much higher than predicted.
- In the Hanford Solid Waste EIS, USDOE asserted that groundwater would not be impacted from any alternative proposed for "hundreds of years."[13] This ignored the reality that Low-Level Burial Grounds and the US Ecology site are already contaminating groundwater. Reality contradicts USDOE's models for Hanford.
- USDOE recently admitted that the Hanford Solid Waste EIS failed to consider groundwater impacts for 10,000 years. The standard which USDOE was using for protection was not the

relevant state and federal standard for releases of carcinogens, but, instead, USDOE's own standard which would allow cancer in up to 25% of the exposed children.

- The US Ecology Commercial Landfill at Hanford lacks a liner, leachate collection systems, and early detection monitoring in the soil column. The license renewal and permits do not require adequate monitoring and violate standards for requiring liners and leachate collection systems.
    - Hazardous wastes continue to be in active storage at the site, and the site is actively releasing hazardous substances.
- Washington Ecology and Health have failed to consider the combined cancer risks from radionuclides and hazardous wastes. Those combined risks could cause significant and unacceptably high rates of fatal cancers – especially in Native American children exposed to the releases and site while exercising Treaty rights.
- The IDF (under construction) and ERDF have liners and leachate collection systems for early detection, but no soil column monitoring.

- From Hanford Advisory Board Consensus Advice #103, "Characterization of Burial Grounds and Importation of Waste", February 4, 2000:

"Historical records, process knowledge and documentation of burial, as late as 1995, indicate that the Hanford Site's low-level waste burial grounds contain mixed low-level waste, which contain "hazardous" or "dangerous' waste. If the burial grounds do contain hazardous waste, they do not have monitoring, leachate collection systems, and other environmental protection systems as required under state and federal laws for landfills in which dangerous or hazardous waste have been disposed. The U.S. Department of Energy has no immediate plans to investigate or remediate potential contamination from these burial grounds, install monitoring, or create compliant disposal facilities.

"The Board urges no offsite wastes be disposed into the low-level waste burial grounds (urged to be) being investigated until the determination is made, and they are appropriately regulated."

- USDOE has failed to consider the appropriate cancer risk standards in its Hanford landfill decisions. Instead, USDOE would allow exposures causing cancer in as many as 25% of exposed children.
- The IDF landfill is proposed to have six times more capacity than needed for on-site cleanup wastes and three times more than all the waste buried in the Central Plateau's unlined low-level burial grounds since the Manhattan Project. The cumulative impacts from existing wastes are not known – making it impossible to set a "risk budget" for the IDF landfill. Washington State has recently agreed to limit the IDF permit in a manner to preserve the risk budget first for on-site cleanup needs, ahead of offsite waste.

Nevada Test Site

- NTS has a negative net recharge to groundwater in a closed hydrologic regime.
- The groundwater at NTS is of good quality but, at 790 ft deep, it is not a viable economical water source and likely never will be.
- USDOE is seeking to proceed with a Mixed Waste landfill without liner and leachate collection, which is neither appropriate for a landfill above a groundwater resource, nor compliant. USDOE does not propose to mitigate this by having early detection in the soil column. Groundwater monitoring at the existing Low-Level Burial Grounds is not adequate.
- By permit restriction, Nevada has barred offsite Mixed Waste disposal until there is a final environmental review and permit. USDOE has not considered the federal Superfund law's Offsite Waste Rule; and, does not know the cumulative impacts from other waste disposal at the Site, nor how additional wastes (especially if disposed without liner and leachate collection) may affect cleanup.

1.2 Introduction to Reports and Sites

1. Review and Comparison of Mixed Low-Level Radioactive and Hazardous Waste Disposal Facilities

Mixed Waste Facilities were compared for the first time ever at Hanford, Envirocare, and the Nevada Test Site. Each was evaluated in the same categories relevant to effective design and safety. Natural barriers were considered through the site's geology and hydrology, as well as proposed or existing engineered barriers. Engineered containment structures for mixed wastes are evaluated in the Isolation and Engineering Approach section. An example of an important engineered structure is the protective closure cover that seals a landfill post burial. Infiltration and containment transport models predict the migration of moisture through the embankment systems for potential transport of contaminants. The final category covered in the report is the Environmental Monitoring of groundwater, vadose zone, and other constituents. These models and monitoring systems are the foundation to determine human and environmental impacts.

Envirocare

Envirocare located in Clive Utah has a desert like climate with little rainfall, a high evapotranspiration rate, and no net recharge of its groundwater located in a closed basin. The groundwater is at a shallow depth, but is saline with a salt concentration 15.7% higher than seawater. Despite the accessibility of the groundwater, it lacks economic viability because of its high salt concentration.

Envirocare is the only one of the three sites not run by the United States Department of Energy (DOE). Although located in the region of the Northwest Low-Level Waste Compact (NWC), all commercial LLW generated in the NWC is sent to the United States Ecology (US Ecology) commercial LLW facility at Hanford. All LLW disposed of in the LARW (Low Activity Radioactive Waste) cell comes from the states in other compacts without LLW burial grounds. A RCRA (Resource Conservation and Recovery Act) Landfill accepts 'Mixed Waste,' which is composed of both Low Level Radioactive Waste and Hazardous Waste, also called Mixed Low Level Waste (MLLW).

Our review found that operations at Envirocare are maintained at the highest level of quality. Envirocare was found to not only meet, but surpass relevant standards and regulations set by RCRA or the NRC (Nuclear Regulatory Commission). One example can be seen in the timetable for groundwater protection. Where NRC requires only 200 years of protectiveness, Envirocare strives for 10,000 years of protectiveness. Design, construction, and monitoring are held to the highest, perhaps excessive standards. At this time, there are no reported contamination leaks at Envirocare facilities.

Nevada Test Site

The Nevada Test Site (NTS) is located in the Yucca Flats Region and is pocketed by craters from former Nuclear Testing. At this time Pit 3, an underground crater formed during previous testing, in Area 5 is the only location permitted for onsite Mixed Waste disposal. The site is located on a closed basin where groundwater is unable to exit or drain into any river systems. The groundwater table is flat with an extremely slow Horizontal Flow. The annual average precipitation is less than 5 inches with an evapotranspiration rate 5 times greater than the precipitation. The groundwater is located at a depth of 790 feet below the surface, securing the groundwater as an unviable resource. There is an ongoing debate of whether a liner and leachate collection system is necessary. It should be noted that the maximum projected lifetime of a liner is fifty years, and maximum consideration of performance of engineered barriers is 10,000 years. However, the flow of surface moisture to the groundwater at NTS is 51,000 years. The debate of a liner seems insignificant when compared to the 12-20 year travel time of groundwater at Hanford to the Columbia River. New facilities for Mixed Waste of NTS are in the process of being permitted.

Hanford

The Hanford site is located along the banks of the Columbia River. It is dominated by the Columbia and Yakima River systems that cut through the area and account for the principal drainage systems. All ground water from the Central Plateau – where the landfills discussed are located - flows into the Columbia River with travel times as small as 12-50 years and 200 years in some areas. Recent data suggests that the flow of

groundwater may be shifting to the North. If this is the case, the groundwater will impact the Mixed Waste Facilities more than previously estimated, and cumulative impacts from prior disposal may be far greater than estimated.

ERDF at Hanford

The first of the Mixed Waste Facilities examined was the Environment Restoration Disposal Facility (ERDF), intended to accommodate **onsite** cleanup wastes undertaken as Superfund actions under Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). ERDF was designed with intentions of meeting RCRA standards, but RCRA compliancy has not been obtained. In order to justify the construction of ERDF, DOE administered Remedial Investigation Feasibility Study (RIFS), Performance Assessments (PA), and waste acceptance criteria. The purpose of the RIFS is to evaluate human exposure to groundwater and effects of intrusion into wastes. However, only very conservative estimates of infiltration moisture flux were used. The PAs ignore consideration of other hazardous wastes, and deems groundwater-monitoring wells not essential. These are important oversights in the opinion of the author.

IDF at Hanford

The Integrated Disposal Facility (IDF) is being constructed at Hanford in the 200 East Area. It is important to note that the IDF is divided into two sections. The two sides of the IDF were created for different purposes and will receive different waste types. The West Cells are for Mixed Waste and will be regulated by the Washington State Department of Ecology pursuant to RCRA and state hazardous waste laws. The East cells will be for Low-Level Waste. USDOE asserts that it is subject to no external regulation regarding disposal of LLW. The initial cells under construction will have a disposal capacity of 160,000m3. However, the full-proposed disposal capacity will be 900,000m3.

The state has proposed limiting the initial permit to allow only three types of waste to be disposed of in the West Cell including onsite Mixed Waste from vitrification, ILAW (Immobilized Low Activity Waste), and Leachate from the IDF itself. The permit for the West Cell is still pending, but a final permit will decide if the West Cell is limited to onsite waste only. If the West Cell is allowed to accept offsite waste there are concerns that total cumulative impacts might violate the Model Toxics Control Act (MTCA) and other groundwater standards. This may seriously limit the ability to dispose of onsite waste if forced to compete with offsite waste. Although the West and East Cells are located side by side, cumulative impacts in a “risk budget” have not been adequately analyzed to include effects and impacts from both cells together.

The East Cell is self-regulated by USDOE and is not covered under RCRA. It was designed to receive LLW from around the country. The East Cell is a replacement for the formerly used unlined burial grounds, whose use was abandoned in 2004 when USDOE was faced with a ban being enacted in the Cleanup Priority Act (CPA, aka I-297). The use of the lined East Cell is a significant improvement over the old unlined Burial Grounds for disposal of LLW. However, little more is known about the Quality Assurance (QA) and adequacy of monitoring systems in the East Cell. USDOE has a history at Hanford of waiving its waste acceptance criteria to accept wastes without adequate characterization, or which would violate the standards and criteria of its own performance assessment.

The DOE conducted the Final Hanford Solid Waste Environmental Impact Statement (HSWEIS) before construction of the IDF. The HSWEIS did not adequately address the cumulative impacts from the IDF and Washington State filed suit (Washington v. Bodman) against USDOE for reasons along this vein. To settle this suit the USDOE agreed it could not rely upon the groundwater analysis in the HSWEIS, and has committed to issue a new Environmental Impact Statement. This new document will address prior inadequacies and expand to cover a range of topics including: High-Level Waste Tanks, vitrification, health and safety risks, transportation of radioactive waste, contaminated soil and groundwater, soil trenches, and the decommissioning of FFTF. This new study is called the Tank Closure & Waste Management Environmental Impact Statement (TC&WM EIS).

Major concerns facing the IDF are that the permissiveness of the East Cell will cancel careful planning and monitoring for the adjacent, RCRA controlled West Cell. Studies suggest that significant groundwater flow direction changes will result in more groundwater contact with the IDF disposal facilities. The courts have temporarily sealed all documentation of the groundwater shifting data.

2. **Summary of Heart of America Northwest Research Center (HOANWRC) Comments on IDF**

On June 20, 2005, HOANWRC submitted comments on a proposed state hazardous waste permit and a determination of Non-Significance by Ecology under the State Environmental Policy Act (SEPA) for a massive new landfill called the Integrated Disposal Facility (IDF). The IDF is 1,463 feet wide and 1,823 feet long, and is 50 feet deep. This huge disposal facility would have a total disposal capacity of 900,000 cubic meters. In the context of Hanford Clean-Up, the total amount of waste disposed in Hanford's soil from the start of nuclear weapons production until 2004 was only 283,000 cubic meters. The IDF will have three times more capacity than all Hanford wastes disposed to date. In 2004, USDOE announced a plan to import and dispose of 360,000 cubic meters of waste in IDF.

Consequently, the determination of non-significance, which concluded that the IDF will not have a probable significant impact on the health and the environment, flies in the face of reason. The only conceivable reason designing and constructing a facility with capacity greater than 156,735 cubic meters would be for it to serve as the National Radioactive Waste Dump. Use of IDF as a National Radioactive Waste Dump is reasonably foreseeable to have a significant impact on the environment and require an environmental impact statement under Washington SEPA rules. Under SEPA, the public has a right to review a legally sufficient environmental impact statement on the construction of the IDF and have all reasonable alternatives considered. Washington residents have a right to a full Environmental Impact Statement (EIS) which meets SEPA requirements before Ecology grants USDOE a Resource Conservation Recovery Act/Hazardous Waste Management Act (RCRA) permit for IDF. Due to the determination of non-significance, there has been no consideration of either the cumulative impacts or the impacts from key components of the existing plan for IDF.

Washington Ecology had proposed to rely on USDOE's Hanford Solid Waste EIS, but then went to court to challenge it as inadequate. In January 2006, USDOE and Washington settled that challenge, following USDOE Headquarters' issuing a report, which acknowledged that the HSWEIS groundwater analysis was inadequate and misleading.

HOANWRC's comments provide a nutshell analysis of why Ecology's Determination of Non-Significance and HWMA/RCRA permit for IDF should be withdrawn until at a legally adequate analysis can be completed. HOANWRC's research found that:

- Ecology's Notice for the current RCRA/HWMA permit application/SEPA determination notice was inadequate and failed to disclose key information that it was planned for 12.7 million cubic feet of offsite waste;
- The proposed RCRA/HWMA permit and SEPA determination of non significance violate provisions and policies of the Washington Clean-Up Priority Act;
- Ecology has failed to meet SEPA's requirement to consider the impacts of violating the Federal Offsite Waste Rule as well as parallel state policies;

- Ecology has a legal duty to consider and disclose the probable significant impacts from transporting waste to the IDF; and,
- Because there are known probable and significant impacts from construction and operation of IDF, Ecology must disclose and receive comments on, and consider reasonable alternatives.

3. Performance Assessment Review for IDF and LLGBs

In February 2004, DOE released the Final Hanford Solid Waste Environmental Impact Statement (HSWEIS). The numbers used to calculate the acceptable risk for the HSWEIS came from two Performance Assessments in the 200 W Area (June 1995) and in the 200E Area (August 1996). These Performance Assessments are inherently flawed because they base risk analysis on radioactive exposure rates higher than federal and state acceptable limits. The State of Washington requires stricter limitations on exposure under the Model Toxics Control Act (MTCA), and these limitations are expected to apply to the Hanford Burial Grounds, where Mixed Wastes were buried and stored – and, which are releasing contamination into the environment. Under MTCA the maximum risk of cancer from exposure from all sources at the release site is one fatal cancer for every 100,000 exposed people (including children) (This would be less than 5 millirem per year of exposure). The Performance Assessments exceed the MTCA fatal cancer rates by 50 to 1000 times with allowable exposure up to 25-100 mrem/year; and intrusion exposures of up to 500 mrem. USDOE's standard allows for incredibly high cancer risk for children, especially in Native American children. Their fatal cancer rates may be as high as 1,600 times the MTCA standard from exposure to the site, contaminated water and fish.

DOE's Performance Assessments ignores the effects of other non-radioactive Hazardous Wastes, such as Carbon Tetrachloride, which have significant releases exceeding MTCA standards. Many of the hazardous wastes disposed are known to be corrosive of waste containers, to act as solvents mobilizing radioactive wastes, and affect the radionuclide's ability to sorb to soils. The PA's therefore severely underestimates radionuclide migration through the soil to the groundwater.

The Performance Assessments utilize a groundwater "point of compliance" one well located 100 meters from the burial grounds. Results showed that 8 different Radioactive Materials exceed the 4 mrem/year federal Drinking Water Standard and MTCA standard with cumulative impacts pulling fatal cancer rates up around 90 in 100,000 (9E-4). However, these cumulative cancer risks were never reported in the PA. The HSWEIS did not use these PA findings, but rather used another hypothetical well 1 km away from the Burial Grounds to determine if the impacts to groundwater would be acceptable. This well only contained only 2 radionuclides in the groundwater compared to the 8 reported in the PA. Speculations surround the decision to use samples

from a well a full kilometer away for the HSWEIS when a closer more highly contaminated well was adequate for the PA. Furthermore, a majority of the groundwater monitoring wells at the edge of the LLBG has dried up, making sufficient monitoring impossible, and accurate groundwater contamination data obscure.

The PA's providing data for the HSWEIS are incomplete and inaccurate, resulting in an HSWEIS, which we found, cannot possibly calculate risk for the LLBGs. The PA's use allowable fatal cancer rates 50 to 100 times higher than those set by Washington State standards under MTCA and blatantly ignore other Hazardous Wastes known to corrode containers and mobilize radioactive material. The monitoring wells used in the Performance Assessments are insufficient to determine the extent of groundwater contamination in LLBGs. Applicable laws require monitoring wells must be placed at the edge of a burial ground in order to ensure accurate and early detection. The Performance Assessments used data from wells over 100 meters away, and the HSWEIS bases its findings on hypothetical monitoring wells over 1 kilometer away from the edge of the burial grounds. The data and evaluations of the PA's and HSWEIS are flawed beyond any usable accuracy and should not be used in any conclusive statements of Risk for the LLBG. The recommendations for the new EIS are listed at the end of this report.

4. Review of the Final EIS for US Ecology Commercial LLW Landfill at Hanford (FEIS)

On October 21, 2005 the Final EIS (FEIS) for the US Ecology Commercial Landfill was adopted by Washington departments of Health and Ecology. At the same time, WA Health published notice of its intent to adopt a rule allowing 100,000 ft3 per year of NORM/NARM to be disposed at the US Ecology landfill (with the amount available to rollover from unused years). NORM stands for Naturally Occurring Radioactive Materials and NARM is Naturally Occurring and Accelerator-Produced Radioactive Materials. These materials are produced during the operation of atomic particle accelerators for medical, research, or industrial purposes or from natural radionuclides concentrated through activities like Uranium ore and mineral extraction. If carried through, 100,000 cubic feet/year of NORM/NARM waste would be shipped to the US Ecology Site at Hanford, plus additional 100,000 cubic feet/year of waste backlogged since 1996 because of an included rollover provision in the NORM/NARM rule.

Nearly a year before the FEIS, Washington State passed Initiative 297 also known as the Cleanup Priority Act (CPA) with 70% voter approval. The US has obtained an injunction against enforcement of the CPA at Hanford pending a hearing scheduled for May 23, 2006. However, provisions of the NORM/NARM rule are in direct violation of the CPA. The FEIS failed to consider the new provisions in the CPA, as well as existing licensing requirements under the NRC, such as monitoring and use of liners and leachate collection. The

FEIS fails to adequately assess impacts from adding NORM/NARM waste, or the effect of radionuclides on drinking water standards. The FEIS fails to consider legally required alternatives to prevent further spread of contamination.

The State of Washington should not re-license the US Ecology facility described in the FEIS. The FEIS predicts groundwater contamination above drinking water standards. The lack of a liner and adequate environmental monitoring systems are not compliant with the required capabilities to detect releases of radionuclides or continued release of mixed wastes. Releases will not be detectable until it is too late to allow economical mitigation. The FEIS presumes this is justified because DOE has already contaminated the groundwater. Neither this FEIS for the US Ecology site nor the HSWEIS for USDOE's IDF site examine the cumulative impacts of all these sites collectively.

Due to objections from Heart of America Northwest, Washington Department of Health and Department of Ecology issued an emergency rule delaying adoption of the FEIS and the NORM/NARM rule until December 21, 2005. Under continued pressure as this date approached, the adoption was pushed back until August 15, 2005 to allow for the court's ruling on the CPA.

END NOTES FOR INTRODUCTION, FINIDNGS AND EXECUTIVE SUMMARY:

(Endnotes)

[1] USDOE's Waste Management Programmatic EIS (1997) identified 219,000 cubic meters (m3) – approximately 7.8 million cubic feet - of Mixed Waste from current inventory and future generation requiring disposal over a twenty year horizon. WPMEIS Summary at page 39. (May, 1997). This excluded all waste from cleanup of sites ("Environmental Restoration" wastes), the quantity of which dwarfs this figure – but, which USDOE excluded from analysis in the WMPEIS.

[2] USDOE's WMPEIS and 2000 Record of Decision stated that Hanford was selected as one of two national disposal sites for LLW and MW due to the availability of "existing facilities", which included the massive unlined Low-Level Burial Grounds. "Most LLMW, LLW, and HW can be disposed of by shallow burial provided that they are first treated and then placed in a properly regulated disposal facility." (page 7). In the Revised Draft and Final Hanford Solid Waste EIS, USDOE proposed to construct a massive new landfill at Hanford, the Integrated Disposal Facility. This facility has been largely constructed as of March, 2006 and a permit is pending. In 2004, the voters of Washington passed a new law, the Cleanup Priority Act (RCW Chapter 70.105E), which bars further use of Hanford's unlined burial grounds. The law also bars adding offsite mixed waste to be disposed until existing wastes are in compliance and releases are cleaned up. USDOE has filed suit to overturn the new law as facially unconstitutional.

[3] The WMPEIS did not consider the reasonable alternative of Envirocare in Utah. Further, it did not consider site specific impacts and conditions at NTS and Hanford – leaving that to subsequent site specific environmental impact statements. However, the Hanford Solid Waste EIS was acknowledged, in January, 2006, to be inadequate and have serious flaws in regard to consideration of groundwater impacts, cumulative impacts, health and safety analyses and transportation analysis. The WMPEIS found – without considering actual conditions – that Hanford disposal of MW (and LLW) from offsite could meet performance standards IF appropriate site specific and waste acceptance conditions were imposed. These were not described in the WMPEIS. As the enclosed Review of USDOE's Performance Assessments and Order 435.1 describes, USDOE fails to consider in the HSWEIS or in its performance assessments the relevant standards for protection of human health at Superfund sites or state toxic release sites. What the WMPEIS described as acceptable would violate these standards by magnitudes.

[4] USDOE Record of Decision on Hanford Solid Waste Disposal EIS, June, 2004; at page 2.

[5] Final HSWEIS Vol. II, Appendix C. Higher volumes in Revised Draft were explained as due to further analyses and having disposed of wastes between issuing the Revised Draft and Final. 187,112m3 (58,000m3 of MW) was the total onsite volume of LLW and MW for disposal in Tables 3.3 and 3.4 Revised Draft HSWEIS.

[6] SEE Permit Application to Washington Department of Ecology.
[7] Preferred Alternative, Final Hanford Solid Waste Disposal Environmental Impact Statement, February, 2004

[8] June 23, 2004
[9] Washington State News Release announcing settlement in WA. v. Bodman, January 9, 2006.
[10] SEE Washington State-USDOE settlement announced January 9, 2006. The State's announcement included Attorney General Robert McKenna stating:
"(T)he Department of Energy would have gone ahead and disposed of radioactive and hazardous waste based on an environmental analysis that all sides now agree is not trustworthy."

The State's news release continued: "Under the settlement, USDOE will not rely on its current solid waste environmental impact statement to make decisions regarding disposal of the waste identified in the lawsuits."

[11] WAC 173-340-700(5); Also SEE RCW 70.105E.050.
[12] CERCLA Sec. 121(d)(3); 42 USC 9621(d)(3)
[13] USDOE, Draft Hanford Solid Waste EIS. DOE asserts on page 5.244 that "By the time the waste constituents from the action alternatives are predicted to reach groundwater (hundreds of years) the waste constituents would not superimpose on existing plumes and would not exceed the benchmark dose, because the existing contaminant plumes will have migrated out of the unconfined aquifer by then." This is highly doubtful. The existing contamination plumes are the leading edge of contamination entering the aquifer from the vadose zone. The EIS ignored the reality that unlined LLBGs are already contaminating groundwater — not taking hundreds of years as the model postulated.

A Review and Comparison of Mixed Low-Level Radioactive and Hazardous Waste Disposal Facilities

by

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2.0-2.1 Facility Description

The Envirocare of Utah, Inc. site is a commercial waste disposal facility located near Clive, UT which is about 70 miles west of Salt Lake City and just south of Interstate 80. It is situated on an essentially flat topography in a large valley basin within Utah's Basin and Range Province. This is a semi-arid region where the average annual rainfall of 6 to 10 inches is exceeded by the average potential evapotranspiration rate of 60 to 70 inches. With this high evaporation rate, the groundwater in the basin is saline and it is not hydrologically connected to other basins in the region, meaning that there is no groundwater outlet. This area is very hot in the summer and relatively mild in the winter. The dominant hydrologic feature in the region is the Great Salt Lake.

The Envirocare facility includes embankment landfill cells for disposal of commercial Low Activity Radioactive Waste (LARW), 11e.(2) waste from uranium mill tailings and other uranium mining operations, and a mixed radioactive and hazardous waste embankment.

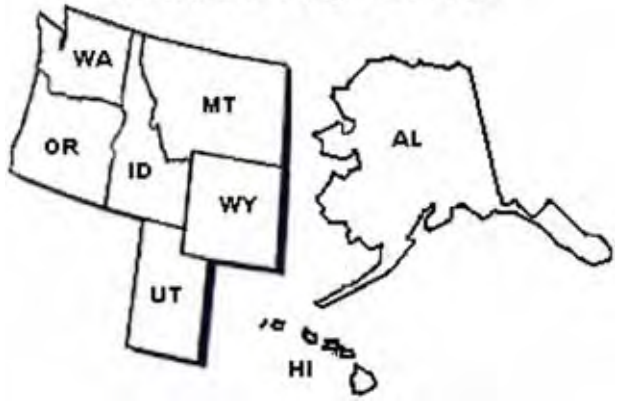
Fig. 2.1 LARW Waste Embankment Cell

The waste cells are called "embankment fills" because they are essentially above ground fills surrounded and covered by an isolation fill material and a cover system. Figures 2.1 and 2.2 provide a schematic of the site and close up view of an embankment cell. The Envirocare facility is contained within a one square mile Section shown in Figure 2.1 (from Envirocare, 2000a). Within that section is the LARW disposal cell, the RCRA Landfill Area (mixed waste cell), the 11e.(2) disposal cell and the "Vitro Embankment". The Vitro Embankment is an older DOE disposal cell for the Vitro uranium mill tailings that is now closed and is not a part of the commercial facility. The northwest portion of the Section is identified for future LARW.

Envirocare began waste disposal operations in 1988. They accept only Class A waste into their LARW cell. A permit was recently denied by the Utah State government that would allow Envirocare to accept Class B and C low level waste which are both higher radioactivity waste but still classified as "low level". Class A waste includes any commercial waste from hospitals, low-level waste from commercial power plants and laboratory waste from commercial labs. Low-level waste from DOE facilities and labs is not disposed of at Envirocare.

The state of Utah is a part of the Northwest Compact of states. According to the legislated compact agreement, all commercial low level waste generated by the Northwest Compact states is required to go to the US Ecology, low level waste facility at Hanford, WA. That is, unless approval is granted by the compact. As a result, most of the low level waste disposed of in the LARW cell is from states from other compacts that do not have low level burial grounds in their states or from "non-compact" states that are not a part of the compact agreement.

Fig. 2.1.2 Northwest Compact States



The 11 e.(2) waste disposal cell is for the clean-up and disposal of uranium mill tailings and uranium mining operations. This is for either private party material or smaller scale government clean-up operations, both of which pay a disposal fee for disposing of their materials in the cell.

The RCRA landfill area shown in Figure 2.1 is the mixed waste embankment fill for both low-level radioactive and hazardous waste. Northwest compact waste acceptance restrictions and requirements also come into play with the mixed waste embankment although mixed wastes are not accepted at the US Ecology facility.

Envirocare also has other capabilities at the facility to enhance disposal options and to meet certain disposal requirements such as the waste emplacement requirements and compaction requirements. These facilities include a waste encapsulation facility (both micro and macro encapsulation), a waste compaction facility, a liquid segregation facility and some specialized industrial hygiene and cleaning capabilities such as a rail car washing system and various monitoring and equipment cleaning systems. The Envirocare facility is in a remote location and they have attempted to provide all services that would be needed for an economically viable facility.

2.2 Site Geology and Hydrogeology

Regional Geology

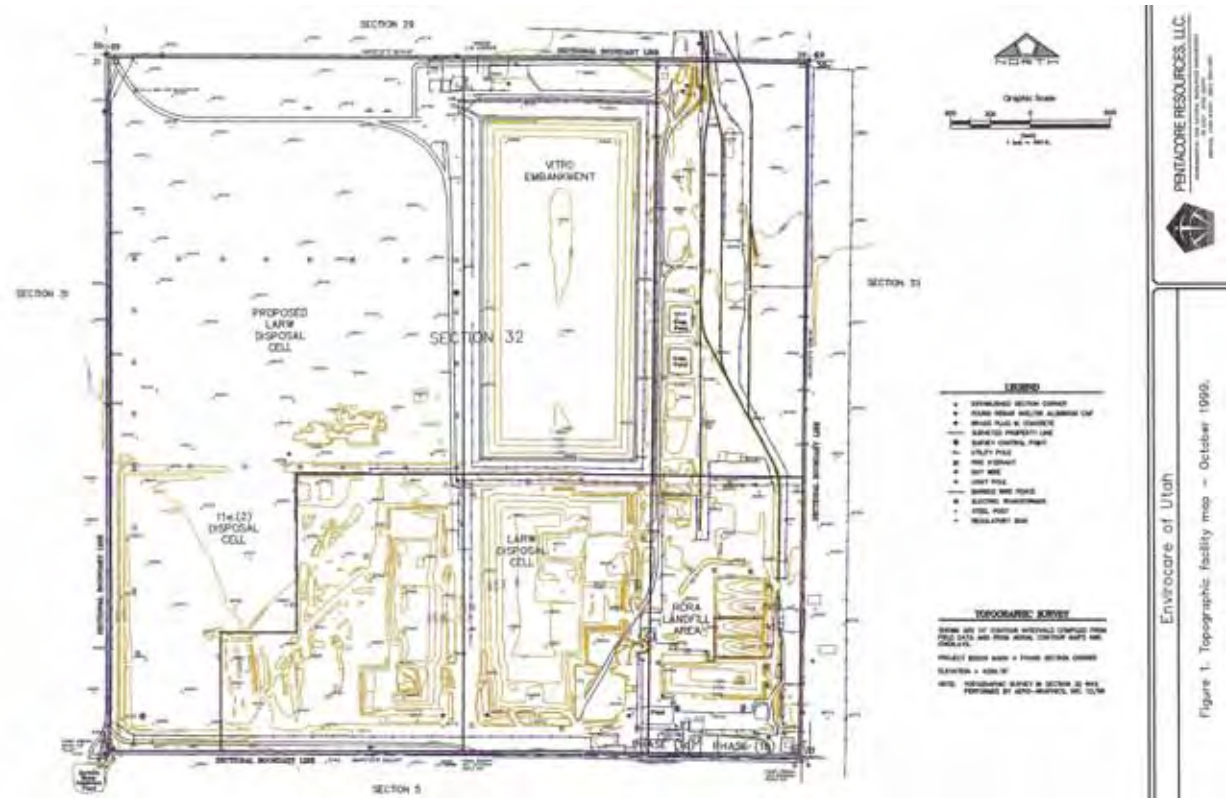
The Envirocare site sits within an hydrologically closed basin that is a part of the Basin and Range geologic province. The geology of the Basin and Range province is characterized as north-south trending structural uplift mountain ranges surrounded by large vast sediment filled basins. This same geologic province covers western Utah and extends through most of Nevada.

The basins are depositional areas where sediments from the mountain ranges are accumulating within the basins. These sediments are up to a few thousand feet thick in some of the basins and greater than 700 ft thick in the basin at the landfill site.

The centers of the basins contain lacustrine (lake) deposits of very fine sand, silt and clay along with varying quantities of evaporite salts. The margins of the basins or the areas closer to the mountain ranges have greater quantities of gravels and sands deposited primarily by runoff or river water action.

The Envirocare facility sits at a base elevation of about 4270 ft on lacustrine deposits from Lake Bonneville which was a much larger version of the Great Salt Lake during the late Pleistocene or about 15,000 years before present. This area was subjected to temporal rise and fall of the lake level and to changes in the rate of sediment accumulation. The last time water (saline) had reached the base elevation at the landfill site was about 13,000 years before present when it reached what is called the "Provo level" of 4740 ft elevation. The current elevation of Great Salt Lake is 4200 ft.

Fig 2.2 Envirocare Schematic



Unit 2 is beneath Unit 3 and is composed of clay with occasional lenses or interbeds of silty sand. Unit 2 is between 2.5 and 25 ft thick and is saturated with saline groundwater.

Unit 1 is the lower-most strata and is composed of silty sand with interbedded clay and silt layers. The total depth extent of this unit is not known because boreholes are limited in depth at the site to less than 300 ft.

From the data in the hydrogeologic report, there appears to be some spatial variability of the sediment with respect to the individual units described above. That variability is the result of minor textural variations such as the difference between a sandy silt and a silty sand or variations in the clay content. In general, the horizontal variability of these lake bed deposits is minor and the density of characterization boreholes probably exceeds characterization requirements.

Envirocare Site Hydrology

The groundwater at the site is found in the form of a salt water aquifer within Unit 3. This aquifer has a very low vertical permeability between the surface and the groundwater. The depth to groundwater is between 20 and 30 ft deep at an approximate elevation of 4250 ft.

There is a slight horizontal groundwater gradient across the site from the south-west to the north or north-east. This gradient is calculated for the unconfined aquifer by considering the variation in the density of the saline water due to variations in salt content. Thus, across the one square mile site, there is a net drop in fresh water equivalent elevation of about 7 ft or an average gradient just greater than 1/1000. This precision in the water level determination is required to establish the groundwater flow direction which is required for groundwater monitoring purposes.

The hydraulic conductivity of Unit 3, where the unconfined aquifer is found, was determined by field measurement in about 80 boreholes. The average hydraulic conductivity of Unit 3 is 2.7 ft/day (10^{-5} cm/s). Combining that conductivity value with the gradient discussed above and an average groundwater flow velocity of 0.003 ft/day is determined. This groundwater flow velocity is a general number that gives one an idea of how fast contaminants could move through the natural subsurface soil-groundwater system.

The groundwater beneath the site has a total dissolved solid (TDS) content of 40,500 mg/l with sodium and chloride making up the great majority of the cations and anions, respectively. Sea water has a typical TDS content of 35,000 mg/l. So, this water has a higher salt content than normal sea water.

There are no detectable radionuclides (other than naturally occurring) or other contaminants in the groundwater (see Envirocare 2001a). This is the baseline for the groundwater monitoring for contamination detection purposes. There is no indication from the groundwater contaminant monitoring data, that any of the disposal cells on the site have leaked and there has been no adverse impact to the groundwater as a result of the embankment waste fills.

2.3 Mixed Waste Facility Disposal and Isolation Engineered Approach

The basic approach to providing long-term disposal and isolation of both the LARW cell and the mixed waste cell at the Envirocare Site is to surround the waste with geologic barriers using a liner and cover system. The liner and cover systems are engineered so that the cover has a lower permeability and a lower potential moisture flux than the liner. This minimizes the possibility of water accumulation within the waste in the embankment cell system. Regardless of this, the cover is designed to prevent moisture movement through the cells with a low permeability layer and drainage layers so there is no measurable moisture flux into the waste cell (see Envirocare 2000b and 2001b).

Also, because the liner and cover systems are engineered systems, contaminant migration rates, moisture flux rates and the associated contaminant migration travel times are easier to model and predict. This is in contrast to utilization of a natural system for isolation where the natural system may not be comparatively predictable due to inhomogeneities in the natural system.

The basic design timeframe is to provide 1000 years of isolation when reasonably achievable with a minimum of 200 years as required by NRC and State regulations. The 1000 year design life goal has been adopted by Envirocare as a minimum and shown to extend to 10,000 years. They are also required to show a groundwater protection timeframe of 500 years minimum for radionuclides and 200 years minimum for heavy metals. This too has been extended to 10,000 years. The primary method of demonstrating compliance with the above isolation time standards is with the use of contaminant transport models.

Table 2.3 Time Table of Envirocare operations

	NRC and State Regulations	Envirocare
Overall Timetable	200 years	1000-10,000 years
Ground water Protection	500 years	10,000 years
Radionuclide Protection	500 years	10,000 years
Heavy Metals Protection	200 years	10,000 years
LARW Model	200-500 years	10, 000 years
Allowable daily dose standard of exposure to Radionuclides	25 mrem/year	4 mrem/year*

*Assumes ingestion of water with salt concentration 15.7% greater than that of sea water

The Envirocare facility design for the mixed waste embankment is provided in their engineering justification report (Envirocare 2001b) and details of the LARW embankment are provided in the construction project plan (Envirocare 2002) and in the contaminant transport model report (2000b).

The engineering justification report (Envirocare 2001b) provides an excellent reference showing just how the Envirocare facility satisfies the basic design and performance requirements for low-level waste landfills (NUREG-1199) and mixed waste facilities (NRC/EPA, 1987). This creates a very transparent design process making it very easy to perform an independent review of this facility.

In this report, they list the design requirements and criteria, and they show the method of performance to assure compliance with each specific requirement. For instance, the facility is required to minimize contact with standing water during operation. This is accomplished by providing surface drainage and by limiting the meteoric water exposure time by doing a cut and cover operation, i.e. covering as the waste is placed. One result of this specific requirement is a maximum of 4 year exposure time before the waste material must be covered.

The Envirocare design documents list the design requirements and identify the specific components of the system or functions that are used to assure compliance with each specific requirement. In most cases, there are multiple design features or components that assure performance or compliance with each requirement. This design approach constitutes a defense-in-depth design.

The mixed waste embankment primary design features include a liner and leachate collection system, waste emplacement of embankment filling processes and procedures, a cover design and a design for an embankment drainage system. Each design feature is broken down into specific design elements which are tied to specific regulatory design criteria and performance requirements.

Design documents for critical systems such as the liner and leachate collection system, include a liner design engineering report, a liner QA/QC manual, and a liner as-built report. These documents each require approval by the State of Utah Division of Radiation Control (DRC), their primary regulator.

The basic cover design requirements are to minimize infiltration, allow runoff over and around the cover, prevent desiccation, limit frost potential and prevent bio-intrusion. Differential settlement of the cover is limited to 0.02 or 2 ft vertical in 100 ft horizontal. This requirement creates waste placement criteria as well as backfill and compaction criteria. Each cell or section of the landfill is an engineered lift with distinct criteria for compaction, waste placement and QA requirements depending on the type and form of waste to be placed.

The cover design is provided in a separate engineering report. It too is governed by a QA/QC manual and a final cover design report is approved by the State DRC before an embankment is closed.

An open cell modeling analysis was used to assess the impact of maintaining the cell without a cover during waste filling operations. This provided an engineering estimation of potential enhanced infiltration into the waste and provides a basis for establishing the time frame for a requirement to place a cover over the waste. From this report, the maximum open cell time is conservatively set at four years.

A construction project plan includes work elements regulating waste placement and compaction criteria. Waste placement is governed by a QA/QC manual.

The mixed waste embankment is designed for a minimum of 1000 years of isolation. Man-made components of both the liner and cover are not considered in the system performance estimations as nobody really knows how long the man-made geotextiles will last.

The mixed waste liner and leachate collection system is a RCRA compliant double liner system composed of multiple layers of man-made and natural soil or clay materials. Specific details of the liner system are provided in the design document (Envirocare, 2001b). All liner construction activities at the mixed waste

embankment are governed by a QA/QC manual, a suite of QC tests and review and approval by the State DRC.

The mixed waste material placement is governed by the embankment Engineering Justification Report (Envirocare 2001b) and operations are governed by the Construction Project Plan. All bulk soil waste is moisture conditioned and compacted and debris packages are placed to minimize void spaces and backfilled and surrounded with grout.

The cover of the mixed waste embankment is also a multi-layer system composed of natural soil material and man-made geotextiles. The following is list of the layers from the top down to the mixed waste fill material.

18 in. Rip-Rap erosion barrier
6 in. "Type A" Upper filter zone (coarse gravel)
12 in. Sacrificial soil (freeze/thaw barrier)
6 in. "Type B" Lower filter zone (coarse sand to fine gravel)
Non-woven Geotextile
60 mil HDPE liner
2 ft Clay barrier ($5x10^{-8}$ cm/sec)
Mixed waste material

Each of these layers has a particular function relative to the principal design requirements of the cover. For instance, the sacrificial soil freeze/thaw layer has a specific obvious function and the drainage layers are designed to allow drainage of any precipitation that is not evaporated.

The cover is constructed and the layers are placed according to the same QA/QC requirements of the liner system and the same review and approval is required by the State DRC.

2.6 LARW Infiltration and Contaminant Transport Model (LARW)

An infiltration and contaminant transport model was developed for the Envirocare low activity radioactive waste cell by Whetstone Associates, Inc. of Lakewood Colorado (Envirocare 2000b).
A similar model was developed for the mixed waste embankment (Whetstone Associates, 2000) but it was not reviewed for this report.

The basic function of the LARW model is to predict the migration of moisture through the embankment system and predict the potential transport of radioactive and hazardous contaminants for 500 and 200 years, respectively. The 500 and 200 year time frames are established by NRC and EPA (RCRA) criteria. This analysis time frame is currently being extended to 10,000 years. The ultimate goal is to determine potential dose to man and environmental impacts. The dose standard is conservatively set at 4mrem/yr instead of the 25 mrem/yr required by NRC standards. This assumes ingestion of saline water.

There are three basic components to the Envirocare model. First the infiltration is modeled using the HELP model. This HELP model program was developed by the EPA to predict infiltration through cover systems at landfills. Its primary use at the LARW is to establishes the long-term steady state moisture levels within the waste material as a result of infiltration through the embankment cover system. This establishes the amount of moisture within the waste that can cause contaminant transport.

The HELP model predicts an infiltration through the top of the embankment of 0.104 inches per year under a steady state. That value is conservatively high because of the high values used as the annual precipitation rate and because of spatial parameters used in the model.

An additional part of the infiltration modeling with the HELP model involves performing a sensitivity analysis. This basically varies numerous cover design parameters and environmental parameters such as precipitation and cover layers to determine what aspects of the design most significantly effect the net infiltration. This type of sensitivity analysis is used to guide the design of the cover system and to improve on it, thereby assuring the design is adequately conservative.

The second part of the modeling involves the use of the UNSAT-H model to predict the moisture content and moisture flow rate through the vadose zone from the bottom of the waste to the top of the saturation zone (approx. 30 ft). Since moisture or water is the basic carrier of contaminants and the main cause of contaminant migration (excluding gaseous phase migration), knowing the moisture content and the net moisture movement rates in the unsaturated zone is critical to the overall prediction of contaminant levels at an exposure point. The UNSAT-H model was specifically designed to model this aspect of the unsaturated zone dynamics.

The UNSAT-H modeling takes the infiltration value calculated with the HELP model and predicts the moisture content profile through the liner and through the unsaturated zone system to the groundwater.

Of the three major components of the total model, the unsaturated zone modeling probably has the greatest uncertainty and provides the best opportunity for inaccuracy. That is because the model uses the physical properties of the soil layers as input to the calculations. Determination of those properties is often difficult and those properties can be quite variable both spatially and as measured in the laboratory. However, in an engineered system such as the LARW where the soil properties are well characterized, homogeneous and essentially controlled, the uncertainty of the model is significantly reduced.

The last major component of the model is the modeling of the contaminant transport. For the LARW, this was done a modeling code called PATHRAE. This code was used to calculate a constant rate uptake of contaminants, transport the contaminants through the saturated zone and deliver them to a point of compliance monitoring well located 90 ft away. Certain assumptions are made in the PATHRAE model to estimate the quantity of contaminant uptake and to account for geometric differences in the embankment between the side slopes and the top slope. The results of this portion of the modeling is to produce estimations of contaminant concentration at the compliance monitoring well.

The net result of the modeling at the LARW embankment is that all radionuclides are predicted to remain below groundwater protection levels within 500 years at the 90 ft compliance monitoring well. There are limitations placed on the disposal of nine radionuclides at the landfill to prevent potentially exceeding groundwater protection levels. These nuclides include Al-26, Bk-247, Cf-249, Cf-250, Cl-36, Re-187, Tb-157 and Tb-158. All are relatively obscure and are not likely to be in the waste material as significant sources.

This short review does not get into the details of the modeling and there is much more to the modeling effort than what is reviewed above. A great portion of the work focused on performing sensitivity analyses of various components and providing refinements of the isolation systems design. Modeling of the transport of metals was also completed to assure compliance with requirements for isolation of these waste materials.

In summary the modeling of the LARW is relatively comprehensive and useful. They attempted to cover several possible scenarios for contaminant release and to utilize the modeling to improve the design of the embankment isolation systems. The model was basically a homogeneous model of a homogeneous environment with exceedingly low moisture flux and highly sorbing soils. It showed that the combined properties produce a contaminant migration level that does not come close to producing a dose near the criteria.

The accuracy of the groundwater contamination predictions of each radionuclide was not investigated in this review as they should be and probably were by the State. This should always be questioned considering the current level of knowledge of the geochemistry and thermodynamics of the soil system as it relates to radionuclide migration at these low concentrations. This is obviously one of the limitations of modeling.

The modeling of the Envirocare facility has effectively demonstrated with a very conservative model that they have designed a good facility at a favorable site that easily complies with dose limitations.

2.5 Environmental Monitoring

Environmental monitoring of the Envirocare embankment systems includes suite of radiation monitoring, soil and vegetation monitoring, vadose zone moisture monitoring, groundwater monitoring and monitoring of the leachate from the leachate collection systems at the mixed waste embankment. Other types of monitoring is also done for various reasons including precipitation and weather monitoring, and various types of compliance monitoring for verification or quality assurance purposes such as subsidence or settlement monitoring of the cover.

Groundwater monitoring requirements arise from a State Groundwater Quality Discharge Permit for low activity waste and from RCRA Part B Permit requirements. The State of Utah regulates both.

Both the mixed waste embankment and the LAWR embankment are surrounded by groundwater wells with spacings between monitoring wells on the order of 400 ft (see Figure 2.2). Although a geostatistical analysis and a modeling assessment of the groundwater monitoring well placement was not done, if one considers the relatively homogeneous nature of the natural soils and man-made barriers, the number of groundwater monitoring wells could be considered to be excessive for the intended purpose of detecting contaminants in the groundwater.

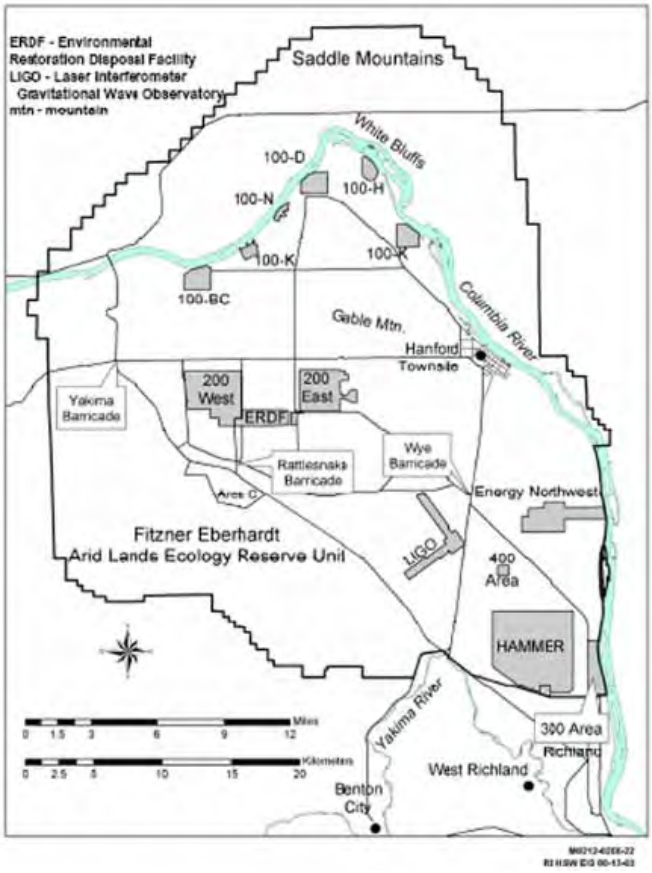
Groundwater samples are obtained quarterly and analysis is conducted for constituents listed in the permits. Also, as is typical with a groundwater monitoring system, groundwater elevations, salinity, temperature and other pertinent physical and chemical parameters are quantified in each monitoring session. State issued permits identify detection limits and compliance levels for specific contaminants and all groundwater sampling and laboratory work is conducted under a quality assurance program which is part of the State's oversight program.

Three suction lysimeters are used to extract vadose zone moisture samples to quantify contaminants or constituents within the vadose zone moisture. The intent of the vadose zone monitoring lysimeters is to detect contaminants that could migrate in the vadose zone vapor.

The leachate collection system is considered a monitoring system because it collects any moisture that has migrated through the waste material zone. This water originates from water added during the waste compaction process or from precipitation while the cell is open during the filling process. Once the cell is filled and covered, residual leachate should disappear and any new leachate would indicate a failure in the system. This leachate collection and monitoring scheme provides a means of direct monitoring of the vadose zone contamination before it reaches the underlying sediment or groundwater.

Envirocare also developed and built an embankment test cell (see Orton, 2001). This cell is analogous to the full size LARW cell except that it is much smaller in area and it is filled with monitoring instrumentation. The test cell undergoes the same environmental conditions as the full size cell and provides a record of thermodynamic and moisture profile changes with time.

Fig. 3.0 Hanford Map



3.0 Hanford Mixed Waste Disposal Facilities

Hanford has two large mixed waste disposal facilities that we are concerned with in this report. This includes the existing Environmental Restoration Disposal Facility (ERDF) and the planned Integrated Disposal Facility (IDF). There are also two more lined and RCRA permitted mixed waste cells in the 200 West Area, but these are smaller cells that are currently used for Hanford generated mixed waste.

3.1 Hanford Geology and Hydrology

The Hanford site sits within the Pasco basin of the Columbia Plateau in southeast Washington State. This region of the state has an arid climate as a result of the Cascade Mountains blocking precipitation from weather systems traveling from west to east. This area recieves an average rainfall of about 6.3in of precipitation per year (ranging up to over 11 inches annually) and it is hot in the summer and mild in the winter.

This short summary of the Hanford site geology is described from the lowest basement rock to the upper most sediments in the chronological order of the deposition of the formations.

The Hanford site sits on basalt bedrock that originated as massive volcanic flood eruptions during the Miocene. Some of these basalt lava flows are hundreds of feet thick. These layered basalt flows were then subjected to a predominantly north-south compression, creating the Yakima fold belt which is a series of NW to SE trending anticline uplifts and syncline depressions in the basalt bedrock.

In the late Miocene (approx. 10 M years before present), the volcanic eruptions ceased and sediment began to accumulate on top of the basalt. This sediment overlying the basalt is the Ringold formation which is composed of layers of silt, sand and gravel that accumulated in the valleys as fluvial (river) or lacustrine (lake) deposits. The Ringold formation sediments are classified according to the type of material and depositional environment or facies. Distinct Ringold sediment facies include fluvial gravel, fluvial sand, overbank mud, lacustrine mud and basaltic gravel.

The Ringold formation is up to about 600 feet thick on the Hanford site and is usually separated into characteristic layers called the upper, middle and lower Ringold.

Fig. 3.1

Over the west portion of the 200 Area plateau, the Ringold formation is overlain by a relatively thin unit called the Plio-pleistocene unit or its formal name the Cold Creek Formation. This is a distinctive sand and silt layer that contains variable amount of clay, caliche or carbonate material characteristic of a quiescent evaporating lake.

Next, during the late Pleistocene, the Cold Creek Formation was eroded in places and deposition of the Hanford formation sediments began. The Hanford formation sits on top of either the Ringold formation or the Cold Creek Formation if that unit is present.

The Hanford formation is composed of sands, silts and gravels that were primarily deposited from cataclysmic floods. These floods occurred when ice dams creating glacial Lake Missoula breached, creating massive flooding all across the northwest. This flooding is episodic in that it occurred many times during multiple glaciation events.

The result is that the Hanford formation is made up of everything from silt size material to coarse gravel and cobble. Sediment grain size is related largely to the velocity of the water that deposited the sediment with the high velocity or high energy environment depositing large gravel to cobble material and the lower energy water depositing silt and fine sand. Fluvial structures such as cross-bedding, and river channel depositional structures are found through much of the Hanford formation.

As with the Ringold, the Hanford formation sediments and individual units or beds are classified according to the dominant sediment facies. The three most common facies of the Hanford formation are a silt dominated, sand dominated and gravel dominated.

After the last glaciation event, the surface of the Hanford site was reworked to varying degrees by rivers and streams and by wind (eolian) erosion or deposition. River action created large ancient river terraces around the basalt uplifts of Gable Mountain on the northeast and Rattlesnake Mountain on the west. One large terraced area is a plateau area where the 200 Area process facilities and landfills are located.

Much of the current surface of the Hanford site is composed of reworked fine grained eolian sand and silt.

The hydrology of the Hanford site is dominated by the Columbia and Yakima river systems that cut through the site, creating the principal drainage systems. There are no other continuous streams on the Hanford site due to the low precipitation.

In the 200 West Area, the unconfined groundwater table is within the Ringold formation at a depth of about 210 ft. Beneath the 200 East Area, the groundwater is within the lower portion of the Hanford formation at a depth of approximately 350 ft. Some regions with perched water are found on top of impermeable strata such as the previously mentioned Cold Creek Formation.

Overall, groundwater at Hanford – including the groundwater under the Central Plateau – flows towards the Columbia River. Travel times for groundwater to the River vary, as do predictions for future travel times. Travel times for groundwater from the 200 East Area to the River have been in the 12 to 20 year time frame, while groundwater travel to the River from 200 West has been considerably longer. The direction of groundwater flow is influenced by the bedrock topography or the height of the uplifts in the basalt bedrock (subcrops). Along the north end of the 200 East Area the groundwater flows to the north toward Gable gap and to the northeast and east toward the old Hanford town site. In the south of the 200 East Area the

groundwater flows to the east or southeast toward the Columbia River and south toward the Yakima River. Under the 200 West Area the groundwater flow is generally toward the east.

Recent data (July-November, 2005) indicate that conservative modeling requires consideration that the groundwater flow direction for 200 East will be changing to move towards Gable Mountain, to the north. This would require consideration of cumulative impacts to groundwater from sources in the northern portion of 200 East, 200 West and the portions of the 200 East, IDF and ERDF landfill areas, for which groundwater has been presumed in prior modeling (including that of the HSWEIS) to flow only to the East. This would dramatically change maximum concentrations in groundwater, and concentrations reaching the Columbia River. Documents relating to the flaws in the HSWEIS groundwater model were ordered sealed, at the request of the USDOE, by Judge Alan McDonald (US District Court for Eastern WA). USDOE's effort to prevent scrutiny of the modeling and quality assurance documentation prevent stakeholders and Tribal nations from reviewing the potential impacts and calculating what the potential human health effects are from ingestion of the groundwater under the site or exposure pathways where the combined flow would migrate to the River.

IDF siting was based explicitly on assumptions in the HSWEIS and IDF Performance Assessment that groundwater flow was to the East and faster than flow to the North via Gable Mountain. This is the basis for projections that the maximum concentration of contaminants from the IDF landfill will not build up, but rather, flow rapidly to the River. Thus, the maximum concentrations from siting IDF in the 200 East are projected to be lower than siting to the West. However, if the groundwater flow shifts predominantly to the North due to the reduction in Hanford's discharges, then the impacts will be greater and the entire rationale for siting the IDF landfill must be called into question.

3.2 Environmental Restoration Disposal Facility Summary

The Environmental Restoration Disposal Facility (ERDF) is a below ground, near-surface disposal facility that was designed and constructed in the mid to late 1990's for disposal of contaminated materials resulting from the CERCLA clean-up operations at Hanford.

The ERDF is a massive landfill that was designed and sized for disposal of about 28 million cubic yards (750 million cu. Ft.) of contaminated material resulting from clean-up of old waste site soil, building demolition material and other miscellaneous contaminated materials. The eventual total footprint of the ERDF will cover about 1.6 mi^2. The location of ERDF on the Hanford site is shown in Figure 3.1. The first phase of ERDF began with the construction of two disposal cells on the west end with a total capacity of 1.2 million cubic yards.

The ERDF was originally planned to be a dual use CERCLA and RCRA Corrective Action Management Unit (CAMU). Toward the end of the decision process, the RCRA CAMU portion of the decision and design were removed. The resulting CERCLA design incorporates many of the RCRA design elements but compliance with RCRA requirements is not demonstrated.

This facility was designed and constructed with Hanford waste site clean-up funds and is only used to dispose of wastes that originate from on-site CERCLA clean-up work. A Remedial Investigation/Feasibility Study, a performance assessment, and associated waste acceptance criteria were prepared to provide the justification for the construction of ERDF as well as the basis for establishing its environmental protectiveness. The use of the ERDF for disposal of wastes not covered in the RIFS or performance

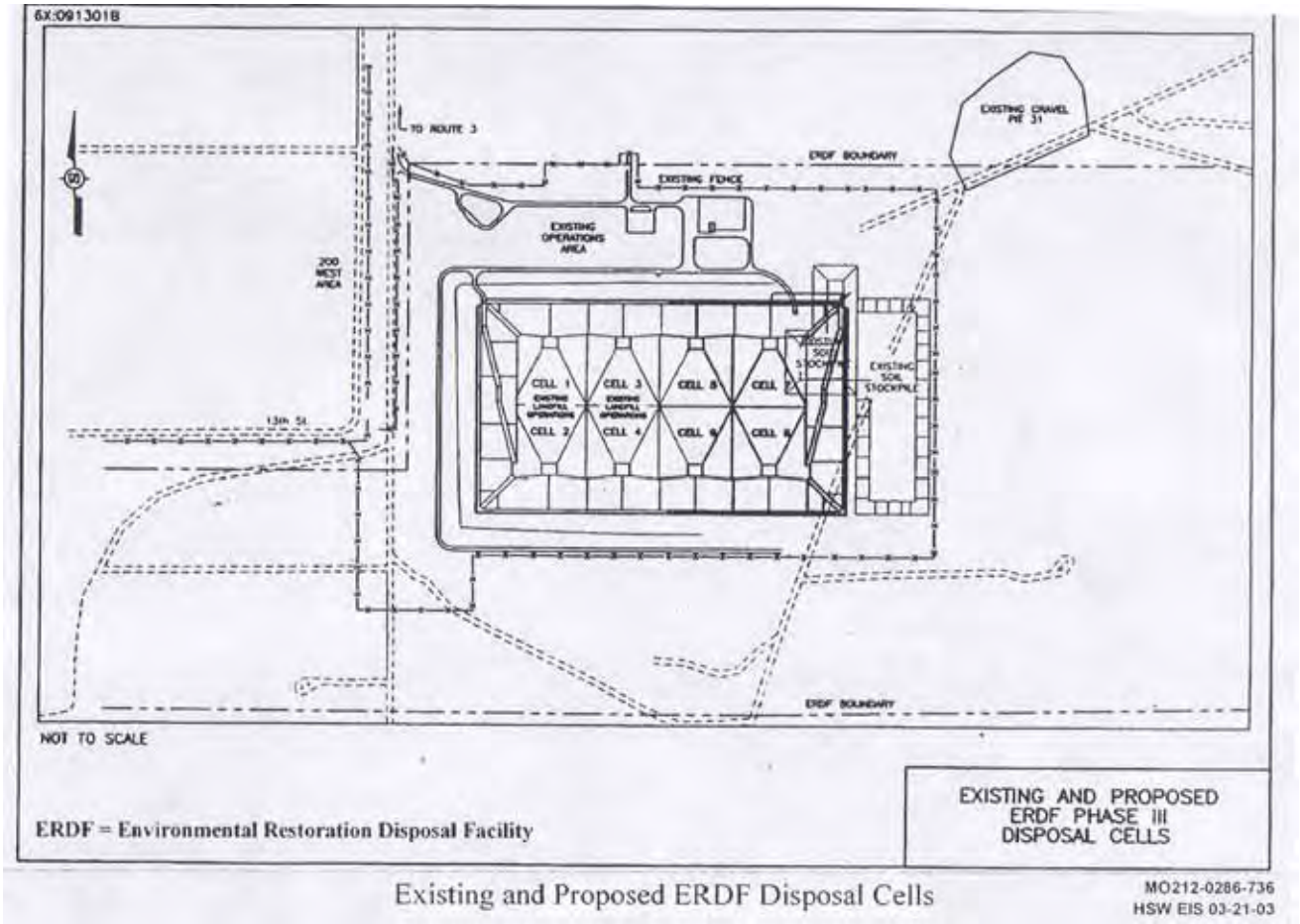
assessment would require a RCRA permit and as well as a revision to the performance assessment and waste acceptance documentation.

The ERDF was designed and is licensed to accept low level radioactive waste as well as CERCLA hazardous waste. This was done because much of the material from the clean-up operations contains both and segregation of the materials is usually not possible or economically justified. In addition, the conceptual design work and performance assessment models showed that aside from regulatory requirements for the liner and cover designs, there are minimal appreciable design differences between a low-level waste facility and a mixed waste facility.

The Environmental Protection Agency (EPA) has the primary responsibility for regulation of CERCLA clean-up operations at Hanford under the Hanford Tri-Party Agreement. They are the primary regulatory agency providing oversight of ERDF design and operations.

The ERDF design and construction details are found in the conceptual design report (USACE, 1994) and in the construction specifications (USACE, 1995). General design requirements for the ERDF are found in the Record of Decision (EPA, 1995). Detailed design and operations procedures exists for the facility but they were not available for this review.

Fig. 3.2 ERDF Disposal Cells



Existing and Proposed ERDF Disposal Cells

MO212-0286-736
HSW EIS 03-21-03

3.2.1 ERDF Waste Disposal and Isolation Engineered Approach

Requirements for the design and performance of the ERDF facility are listed in detail in the Remedial Investigation Feasibility Study for the ERDF (DOE 1993). Applicable or relevant and appropriate requirements (ARAR's) listed in the RIFS report are derived from RCRA and CERCLA regulations and other federal regulations, from WA State regulations, and from DOE Orders. The reader is referred to the RIFS report for specific language and details of each requirement.

The status of compliance with the regulations and requirements listed in the RIFS report is not determined or evaluated in this report and the listing of the RCRA regulations in the RIFS report does not necessarily imply compliance with those regulations.

From a geotechnical standpoint, the most significant minimum technology requirements for the design and operation of the ERDF are the RCRA requirements for a mixed waste facility. The ERDF was built to satisfy the specific RCRA requirements for a composite liner system along with a leachate collection system. The basic design approach with a RCRA compliant liner is to make the liner and cover as impermeable as possible and utilize a leachate collection system to prevent the collection of free liquid above the liner.

Other RCRA requirements that appear to be addressed in the RIFS report include operational practices such as waste characterization requirements, waste segregation, waste placement and compaction requirements, monitoring and inspections.

RCRA closure requirements include installation of a cover system to minimize the infiltration and moisture flux through the waste material. However, it is not known if the final cover will meet all RCRA closure requirements as the final cover design has not been completed.

Environmental monitoring at the ERDF includes groundwater monitoring and a leak detection monitoring system based on the collection of leachate, in addition to monitoring of other environmental media.

Additional general requirements as well as some very specific requirements influencing the design and configuration of the ERDF are found in the Record of Decision (EPA, 1995).

The manner in which the ERDF satisfies the requirements mentioned above, is really determined or specified in the RIFS as opposed to the conceptual design report (USACE 1994). The RIFS provides the basic design requirements and identifies most of the design functions. However, the RIFS is not a design document but an alternative selection document. Assurance of compliance with the requirements or a method of performance is not provided in either the RIFS or the conceptual design report.

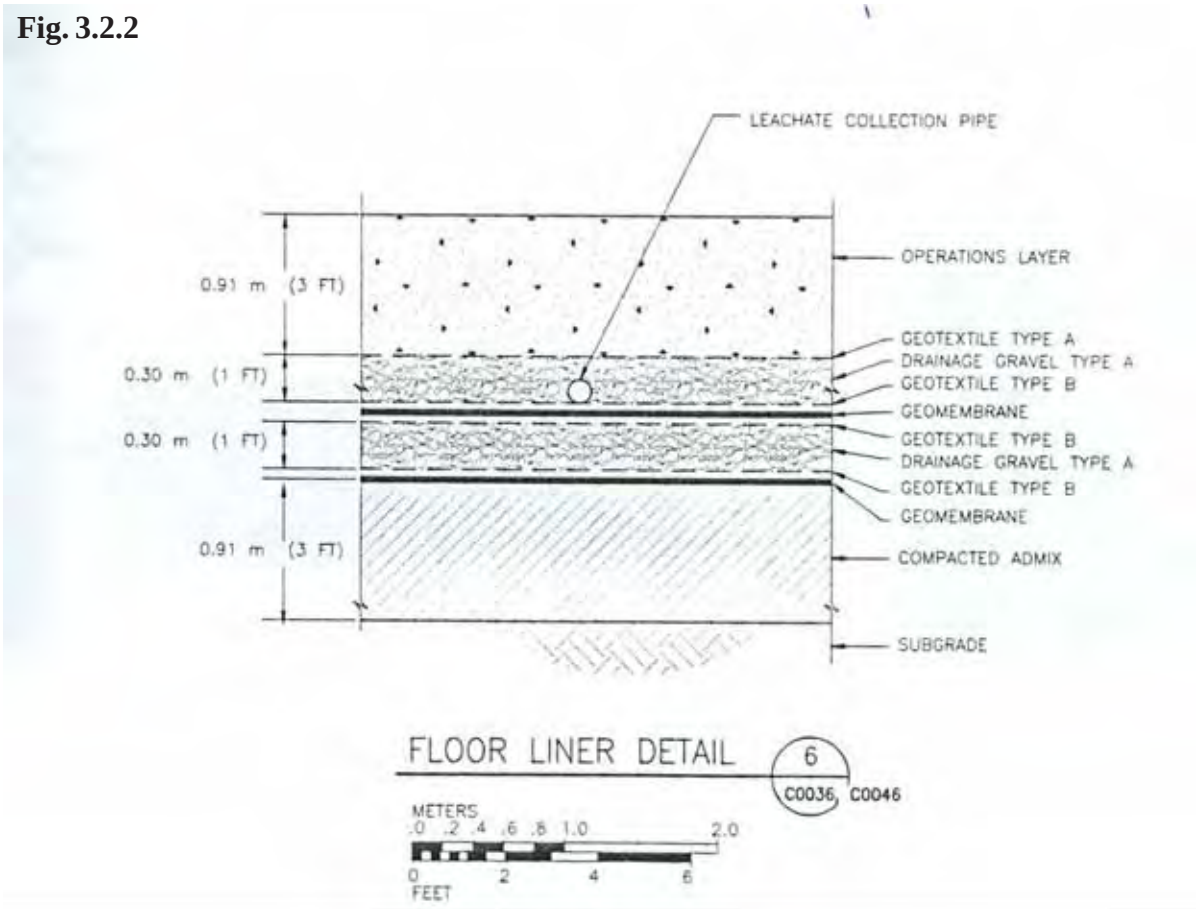
The approach used at the ERDF to assure isolation of the wastes from the accessible environment is to surround the waste with engineered barriers including a liner and cover system. The ERDF is a below ground facility where a large pit is excavated and a man-made liner system is installed, along with the leachate collection system, before the waste is placed in the pit. The liner extends up the sides of the pit and a cover system will be constructed over top of the waste, extending out beyond the lined sides of the pit. The cover system will be designed to inhibit infiltration and discourage intrusion into the waste zone after the institutional control period.

3.2.2 ERDF Design, Construction and Operation

Final design documents and drawings for the ERDF were not available for review in preparation of this section. However, construction specifications and the conceptual design report provide enough information to summarize the principal geotechnical features of the ERDF.

The construction of the ERDF began with the excavation of the trench or pit for waste landfill. The base of the excavation which is the sub-grade of the landfill, was compacted to specified soil density requirements and tested as specified in a construction quality assurance plan by a qualified quality assurance engineer. The compacted sub grade was graded to slope down to a common leachate collection point.

Fig. 3.2.2



The liner was then constructed on top of the compacted sub grade. A schematic of the ERDF liner is shown in Figure 3.2.2.

The first or lower-most layer of the liner is composed of an admixture of on-site sandy soil with 10 to 14% bentonite clay. Admix preparation and verification requirements assure an homogeneous mix with a moisture content appropriate for compaction (USACE, 1995). The admix is placed and compacted to at least 95% of the maximum attainable density (ASTM 1557) using specified placement and compaction methods. The construction specifications require the admix to achieve an in-place permeability of 10^{-7} cm/sec, although permeability testing requirements are not specified.

Above the admix layer, two HDPE geomembrane layers are placed. Both geomembrane layers are covered with a protective geotextile and then with a one foot layer of drainage gravel to allow free liquid (leachate) above the geomembranes to drain off to the leachate collection sumps. These two

geomembrane/drainage layers are a principal RCRA requirement for hazardous waste landfills. Leachate collection piping for the upper leachate collection system, is placed at the bottom of the upper drainage gravel layer to aid free liquid drainage.

Above the geomembrane and gravel layers, a three foot thick layer of soil is placed as an operations layer. The operations layer provides protection of the cell liner system from mechanical damage by machinery used for waste placement. The operations layer is composed of on-site soil with specified grain size gradation characteristics. This layer is also placed and compacted to specified criteria.

All liner materials including the geomembranes, geotextiles, soils and gravel layers, have material specifications and tolerances listed in the construction plan. All liner materials and layers are placed according to specific requirements and then tested to assure compliance with specifications. In this manner, all components of the liner system are engineered and the construction methods and quality are controlled.

The construction contractors were required to establish and maintain an effective QA/QC program composed of plans, procedures and an organization necessary to assure production of an end product that complies with all of the construction requirements. A Contractor Quality Control plan was submitted and reviewed as an integral part of the construction bidding process. Key elements of the QC plan were specified in the construction specifications.

Record drawings were maintained during construction showing any approved changes or addenda to the construction plans. These drawings created the facility "as-built" drawings of record for the facility and they were submitted to DOE after completion of the work.

Waste Placement

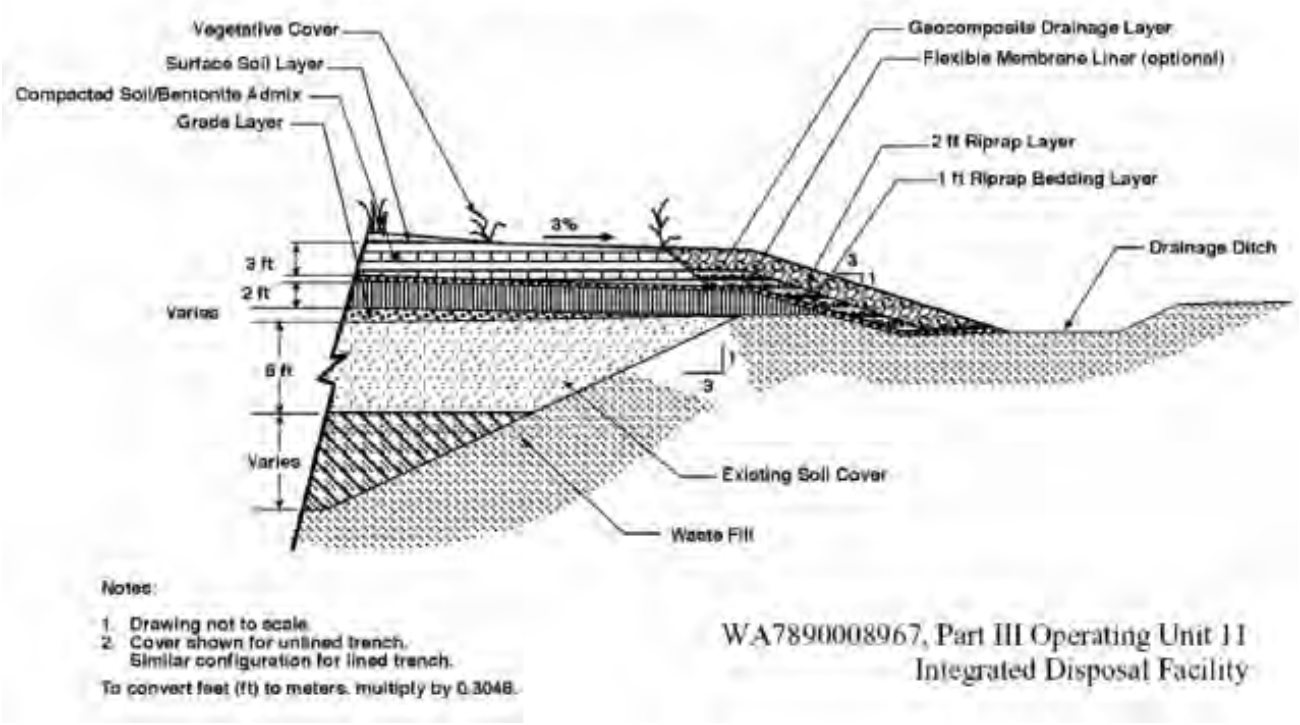
Specifications and requirements for placement of the waste materials in the landfill were not in the conceptual design report or other documents available for review. However, during a visit to the site, an opportunity was provided to discuss waste placement with the Bechtel operations manager.

Soil waste material is placed in shallow lifts and compacted with a large track dozer. Compaction of the soil is verified with either a nuclear-density gauge (ASTM D-2922) for fine grained material or with a sand cone density measurement (ASTM D-1556).

Irregular shaped materials such as construction debris, metal containers and other items are placed so that waste soil can be placed and compacted around these materials. Voids within irregular shaped items are filled with a controlled density grout. Waste placement and void filling is controlled at the landfill to help prevent settlement damage to the cover.

The rigor and quality assurance of the waste placement and void filling operations is not known.

Fig. 3.2.3 Typical Hanford Site Landfill Cover Design



Cover system

The cover system design has not yet been finalized. However, the ROD indicates that the cover will be either a RCRA compliant cover or a modified RCRA cover. The modified RCRA cover adds features such as a layer of rip-rap rock to help deter intrusion into the waste and features such as an infiltration barrier designed to enhance evapotranspiration in the Hanford climate.

Enough specifications are provided in the ROD to assume for this review, that the cover system will be constructed with the same care and quality control as the liner. However, the cover system's compliance with all RCRA requirements should not be assumed.

Additional features

Additional features of the ERDF relevant to the geotechnical aspects of the facility include a decontamination facility for waste hauling canisters and a surface runoff and drainage system that helps to control potential contamination along haulage roads and off-load areas.

Another important aspect of the facility is that the EPA has and continues to provide active oversight of the ERDF construction and operation. The extent and depth of the oversight has not been explored.

3.2.3 ERDF Infiltration and Contaminant Transport Model

Two types of exposure models were calculated for the ERDF. One model was developed for and contained in the RIFS (DOE 1993a). This model was developed for the purpose of evaluating potential environmental impacts of the ERDF that would need to be addressed in the ERDF design and later in a more comprehensive performance assessment. The RIFS model was used to compare potential environmental impacts of the differing alternatives.

The second model (Bechtel 1995) is the more comprehensive performance assessment estimation. It was used to estimate primarily human exposure risk and to help determine environmental impacts of the ERDF, after the final design and configuration was selected.

RIFS Risk Assessment

The RIFS risk assessment model is indicated as a conservative model because it uses a source term that contains the maximum concentrations of contaminants that are reported in the limited field investigations of the sites being remediated.

This is not encouraging considering the limitations of the limited field investigations. A previous assessment by this author suggest that for most of the 100 Area facilities, the analogous sites that are used as the model for remediation of other sites in the area, are poorly characterized and very little is known about the spatial distribution or even the levels of contamination (Brodeur, 2005). Other sites are not subject to any significant site characterization other than perhaps a surface exposure survey.

It is also not certain if the data from the limited field investigations are the most conservative or the highest concentrations. Previous samplings of the soil Dorian and Richards (1978) might provide more conservative source data but even those are too limited in facility and spatial coverage.

Having said that, it is also not certain how critical this is to the exposure model.

This model is conservative in that it does not consider the liner system or an intrusion barrier. An infiltration moisture flux of 0.5 cm/yr is used as a conservative value for a landfill that has an engineered cover over the waste material.

The RIFS model is used to evaluate human exposure to the groundwater and to evaluate the effects of inadvertent intrusion into the waste. The purpose of this evaluation is to identify contaminants of concern that need to be addressed with the remedial action and in the ERDF design. This model was primarily developed to allow a rudimentary comparison of the various remedial action alternatives including a comparison to the alternative of leaving the contamination in place along the Columbia River and elsewhere on the Hanford Site.

The resulting human health risk is evaluated as either a hazard quotient (HQ) or an incremental cancer risk (ICR). The HQ is a ratio of the projected potential groundwater intake of the contaminant to the chronic dose. An HQ greater than 1 establishes the contaminant as a contaminant of concern (COC) for the ERDF. The ICR is a numerical assessment of the potential to cause a cancer. An ICR greater than 10^{-6} establishes the contaminant as a COC.

Three exposure scenarios were evaluated including human exposure to groundwater at some time in the future, human and ecological media exposure to contaminated soil as the result of inadvertent intrusion, and human and ecological media exposure to contamination via a drilling intrusion scenario. Details on the calculations including the methods, assumptions, contaminant transport methodology and equations are provided in the RIFS (DOE 1993a).

For the groundwater exposure scenario, the following contaminants are identified as COC's due to either an HQ greater than one or an ICR greater than 10^{-6}.

Antimony, Arsenic, Chromium, Fluoride, Nitrite, Selenium, C-14, Tc-99 and Uranium.

The risk from exposure to contaminated soil via inadvertent intrusion is evaluated using the conservative assumptions that the ERDF cover does not inhibit intrusion. This produced a relatively long list of contaminants of potential concern.

Once the contaminants of potential concern were identified in the risk assessment, potential remedial technologies were explained and remedial action alternatives were developed. This was the basic point of performing this risk assessment, that is, to help develop and help select the remedial action alternatives.

ERDF Performance Assessment

Once the ERDF remedy was selected and a design was finalized, a more comprehensive performance assessment (PA) was completed (Bechtel, 1995). This PA establishes the geotechnical basis of operation for the ERDF by evaluating its capability to comply with principal requirements established in DOE Orders and RCRA requirements.

The PA does not consider or evaluate any of the hazardous constituents that are included in this mixed waste facility, thus compliance with RCRA for hazardous constituents is not demonstrated in this regard. The alternative selection process and the risk assessment utilized in the RIFS is used to demonstrates compliance with the mixed waste requirements (40 CFR 264 and 265 and WAC 173 303) however, review and assessment of the hazardous constituent aspects of the ERDF is not a review criteria for this report.

The PA performs a calculation of dose-to-man from radionuclides released through the soil, water (groundwater) and air pathways. No other environmental dose calculations are considered or needed to satisfy the performance requirements. Dose calculations are only performed for radionuclides that approach the performance objective limitations as a way to demonstrate compliance with standards and to establish limitations for waste acceptance criteria. This is done in the following manner.

First, the source term for the modeling was derived from the source inventory estimation (DOE/RL 1994). This source inventory is based on the limited field investigations which are acknowledged to be less than comprehensive.

Calculations were run to quantify the performance of the disposal system with the inferred source inventory. Then the model was assessed to determine its sensitivity relative to the source term. In other words, if an increase in a particular source term caused a significant increase in environmental dose, then that source term is deemed sensitive and it was modeled further. If a particular source term was shown to be limiting in terms of its potential impact, the concentration or quantity of that contaminant was constrained in the waste acceptance criteria. In this way, the PA is used as a basis for the waste acceptance criteria and vice-versa. Based on the PA calculations, no waste form enhancement or immobilization is required provided the waste acceptance criteria are satisfied.

Waste acceptance criteria are specified and based on calculations performed for specific concentration limits in terms of activity per volume (curies/cubic meter) for isotopes with a half life greater than 5 years and for the net total activity and total projected inventory for all long-lived radionuclides.

Two basic radionuclide release scenarios are developed in the PA calculations including direct intrusion into the waste zone and leaching of contaminants through the soil, into the groundwater and ingestion of the groundwater.

The intrusion scenario is considered to occur after the end of institutional control (100 years) and for up to 500 years later. This scenario ultimately only considered a scenario of drilling a groundwater well through the waste zone to groundwater and bringing contaminated soil to the surface to cause the exposure. It did not consider a large scale excavation such as the excavation of a basement for a home as a viable scenario. The intrusion scenario exposure occurs as a result of acute exposure to direct radiation from the contaminated soil or from the intake of contaminated dust. Chronic exposure is modeled as intake of food crops grown in contaminated soil.

The intrusion scenario dose calculation showed that the dose received was directly proportional to the initial radionuclide concentration in the waste zone. As a result, radionuclide concentration limits were established as waste acceptance criteria in order to meet maximum dose allowed by the performance objectives (DOE Order 435.1-1). It is assumed that an excavation intrusion will exceed performance criteria as that type of exposure will be greater than the drilling intrusion scenario.

The groundwater contamination exposure scenarios were pared down to a calculation of the most significant dose; that resulting from ingestion of contaminated groundwater near the facility. This calculation was extended from 1000 years and eventually carried out to 10,000 years.

The point of compliance in this calculation is “the nearest groundwater well”. The basis of the location of the reception well is not clear because a conservative model would put the uptake well directly adjacent to or under the facility. They appear to be using the contamination travel distance in the groundwater and the associated contamination dispersion and diffusion to reduce the concentration levels in the uptake well. It is not certain which contaminant would be critical to dose or a sensitive parameter if the point of compliance was closer.

The groundwater dose calculation does not consider the RCRA compliant double liner in the ERDF but it does include the sandy soil and clay admixture liner.

The vadose zone and groundwater model is composed of four basic parts. First a steady state moisture flux through the cover and waste zone is established at 0.5 cm/yr. Next, different source release mechanisms and quantities are estimated making the source available for transport. The contamination is then transported through the vadose zone and into the groundwater to a receptor well. The final calculation is the intake and dose-to-man calculation.

The calculations use a finite element modeling program called VAM3D-CG for determining the steady state moisture flow and for the contaminant transport calculations through the vadose zone and groundwater. This program creates a simplified two dimensional model that uses conservative values for soil properties. All soil layers are homogeneous, constant thickness layers with consistent recharge rate and steady state moisture flow in the vertical direction. The only variation in the model is for different sorption coefficients for different radionuclides.

Sensitivity analysis of the model indicates that the primary controlling factors for dose quantity are the magnitude of moisture flux through the soil column, the cover permeability, the soil permeability and the hydraulic gradient.

The model does not consider small scale variations in the hydrologic properties of the soil such as the pore pressure or the Van Genuchten function constants that are found in the heterogeneous fluvial sediment strata. The model does use conservative values for the homogeneous soil property variables such as the sorption

coefficients. But, there is the question as to whether or not the heterogeneous soil can be modeled accurately using a homogeneous model.

The small scale variations in the soil texture and hydraulic properties are known to cause an irregular, non-homogeneous distribution of contaminants in the fluvial soil. This high spatial variability and irregular distribution of contaminants in the soil is seen at virtually every subsurface contamination plume at Hanford including the tank farms plumes and the crib sites, including the BY cribs located in the same geologic media just east of the ERDF site.

However, in favor of the conservativeness of the model is the fact that the ERDF facility is lined with not only a double RCRA compliant liner but also with an homogeneous, carefully constructed clay and soil admixture liner. There is high confidence that the engineered admixture liner can be modeled as a homogeneous material and the migration of contaminants through that material can be effectively predicted. The accuracy of the model beyond the admixture layer is open to considerable debate.

From an engineering standpoint, the most of the credit for isolation time and concentration in the PA model goes to the clay and soil admixture liner.

Groundwater pathway dose modeling shows that long-lived radionuclides that have low sorption in the sandy soil could cause a dose in excess of the performance requirements. Therefore, total activity limits were established in the waste acceptance criteria (Bechtel, 2002) for the radionuclides C-14, Tc-99 and Uranium.

A sensitivity analysis was used to help establish limitations in the waste acceptance criteria (Bechtel, 2002). The sensitivity analysis indicated limitation should be placed on specific radionuclides in terms of either total quantity in the ERDF or maximum concentration. There is a potential uncertainty in the sensitivity analysis in that the radionuclides selected for assessment may not have included all of the radionuclides to be delivered to the ERDF in significant quantities as the selection was based on quantities reported in the limited field investigations.

One waste acceptance criteria requires knowledge of the presence of radionuclides in the waste that are greater than 1 pCi/g. It is highly unlikely that the current site characterization programs or site specific operational monitoring, satisfies the 1 pCi/g requirement with any degree of certainty.

A positive point for the ERDF disposal system is that the complete system helps to provide a defense-in-depth for this situation. The ERDF liner system and conservative modeling parameters help to assure a conservative defense-in-depth. The waste acceptance criteria could be better at specifying contaminated materials characterization requirements and require better verification of the same. Better contamination characterization data is also needed for source term input for the performance assessment.

3.2.4 ERDF Environmental Monitoring

Current environmental monitoring at ERDF includes groundwater and leachate monitoring, surface contamination monitoring and air monitoring. The surface and air monitoring are performed as a part of the overall Hanford site environmental monitoring program and those programs were not reviewed.

The ERDF groundwater monitoring program currently consists of semiannual sampling of 4 groundwater monitoring wells located as shown in Figure 4.1. The list of analytes, laboratory methods and statistical information are provided in the most recent groundwater and leachate monitoring report (Bechtel 2002). It is reported that the list of analytes was determined with consideration of the current groundwater contamination from previous operations in the 200 West Area and the baseline characterization report (Bechtel, 1995) is referenced.

The number and distribution of groundwater sampling wells (4) is probably compliant with regulatory requirements at the current size of the cell filling operations but considering the existing groundwater contamination beneath the ERDF, there is a good argument for increasing the monitoring well density around the current waste cells if "*groundwater monitoring is considered essential for monitoring site performance*". It would be beneficial to have additional wells on the south, the north and at the northwest corner of Cells 1 through 4. This is particularly important considering the uncertainties associated with the historical groundwater contamination data in this area.

Groundwater contaminant trends show a slight increase in some contaminants due to migration of contaminant plumes from 200 West Area. Also, there is a gradual decrease in groundwater table elevation due to the cessation of releases of effluent in the 200 West Area.

Leachate sampling shows an increase in the C-14, Tc-99 and total Uranium concentration as sampled at the leachate collection sumps. This leachate originates from precipitation into the open cell, plus water added to the open cell for dust suppression and soil compaction. The volume of leachate obtained during each sampling interval is not reported in Bechtel (2002). This information would be useful to better understand trends in the leachate contaminant data.

The only other monitoring of the ERDF is proposed moisture monitoring beneath the cover as suggested in the performance assessment (Bechtel 1995). This would involve installing moisture-monitoring instruments or horizontal instrumentation tubing beneath the cover as the cover is being built. Measurement of moisture content changes in the landfill just below the cover would help to demonstrate the performance of the cover. Cover monitoring will likely be considered in the cover design phase.

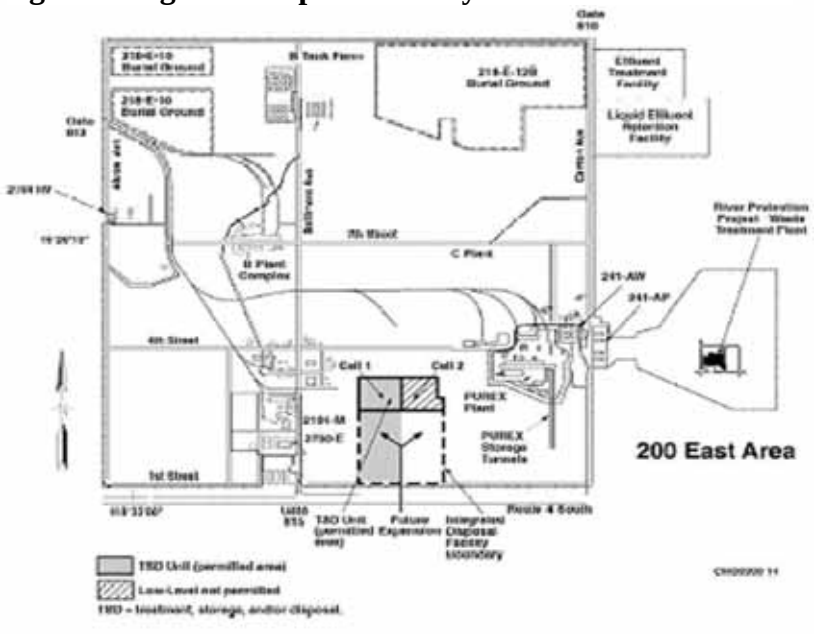
3.3 IDF Disposal Facility Summary

The USDOE's proposed Integrated Disposal Facility (IDF) is currently under construction in the 200 East Area at Hanford (see Figure 3.3). This facility is a combination of two identical disposal cells sitting side-by-side and referred to as the East Cell and the West Cell. Figure 3.3 provides the only site plot that could be found for the IDF because maps and schematics were redacted from the Ecology permit application (presumably due to USDOE request for security controls intended to mitigate terrorist threats to the facility). This inexplicable redaction of siting and design adds to the difficulty of getting information on this facility, and makes commenting on the permit and impacts more difficult.

- Total capacity of initial East (LLW) and West (MW) Cells: 164,000 m3
- Total capacity planned for IDF when fully built: 900,000 m3
- Total amount of solid wastes disposed to date in Hanford's soil: 283,000 m3[1]
- Total on-site wastes estimated by USDOE as requiring disposal: 156,735 m3[2]

[1] HSWEIS, USDOE, February 2004.
[2] HSWEIS, USDOE, February 2004.

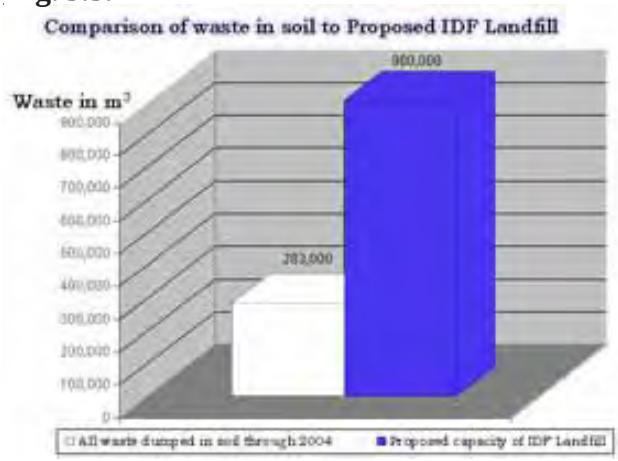
Fig. 3.3 Integrated Disposal Facility Site Plan



Washington Ecology issued a proposed permit for construction and operation of the IDF landfill on May 6, 2005, along with a proposed "Determination of Non-Significance" (DNS) under the State Environmental Policy Act (SEPA).

Washington State acknowledges that USDOE's Hanford Solid Waste Disposal EIS (HSWEIS)[1] is legally inadequate in regard to the cumulative impacts from the IDF landfill (offsite wastes and secondary wastes from vitrification of High-Level Wastes are key components of these cumulative impacts) and the Hanford Tank Waste Closure and Supplemental EIS has not been issued, which USDOE says will consider the impacts from disposal of secondary wastes in IDF. Because of the inadequacies alleged by Washington State, the state has sued the USDOE in federal court alleging that the HSWEIS is legally inadequate under the National Environmental Policy Act. The State, therefore, can not adopt the entire HSWEIS in support of the mixed waste permit sought for the facility, and the State has proposed conditions limiting the West cell of the IDF to onsite mixed wastes from a demonstration of bulk vitrification, Immobilized Low Activity Waste (despite the names, both of these waste types are highly radioactive wastes from Hanford's High-Level Nuclear Waste tanks, but they do not include the hottest wastes from those tanks), and leachate collected from the IDF itself. No limits are proposed to be placed on the wastes to be accepted in the East cell, which is for LLW. The draft permit foresees allowing additional types of waste to be disposed in the mixed waste portion of the landfill based upon future analyses of whether the additional waste streams will violate any standard (focusing on groundwater standards, rather than the health based standards of the Model Toxics Control Act).

Fig. 3.3.1



The draft permit also foresees additional cells being added until the entire capacity increases from 164,000 cubic meters for the initial East and West cells to a total capacity of 900,000 cubic meters.

The initial East Cell of the IDF will be used for disposal of 82,000 cubic meters of low level radioactive waste from both on-site and offsite, but no mixed waste. This new low level waste disposal facility will be used in place of DOE's current low level waste burial grounds in the 200 East and 200 West Areas which are unlined soil trenches of up to 1,500 feet in length.

[1] Final HSWEIS, February, 2004. Washington State has filed suit (Washington v. Bodman) in the the U.S. District Court for the Eastern District of WA alleging that the HSWEIS is inadequate to support decisions to import waste from offsite to IDF, to dispose of secondary wastes from vitrification of waste removed from Hanford's High-Level Nuclear Waste Tanks, and to support a decision that Hanford's groundwater is "irretrievably and irreversibly committed" to contamination.

The new IDF facility will represent a significant improvement in DOE's low-level waste facility operations compared to use of Hanford's massive unlined soil trenches, which Heart of America Northwest has fought to end use of for over 15 years. Washington's voters enacted the Cleanup Priority Act (Initiative 297) with the largest vote total in state history for a ballot initiative, which barred continued use of unlined trenches for disposal of wastes at facilities where such unlined landfills were releasing contamination and had received mixed wastes.[1] In June, 2004, faced with passage of I-297, USDOE adopted a Record of Decision to end dumping waste directly into the soil in unlined trenches and to construct the Integrated Disposal Facility, as proposed in the HSWEIS. For Low-Level Waste, USDOE is basically going from use of unlined, uncontrolled burial grounds to a lined and monitored disposal facility. For Mixed Waste, IDF represents a massive expansion of capacity for regulated mixed waste disposal at Hanford.

Many of the details on the design, construction, quality assurance, risk assessment and proposed operations are not available for the East Cell facility. They are not covered under the RCRA mixed waste permit which covers only the West Cell of the IDF. This is because the State does not regulate radioactive waste disposal facilities. In this case, the DOE is self-regulated and as a result, there is little documentation available for review.

Washington Ecology could require disclosure and consideration of this information in order to assess the cumulative impacts of the IDF under SEPA, and to mitigate impacts or set permit conditions. However, Ecology has chosen not to do so. Rather, Ecology has sued USDOE in federal court alleging that the HSWEIS (prepared by USDOE under NEPA) is inadequate for failure to disclose such cumulative impacts. Under its SEPA authority, Heart of America Northwest believes that Ecology could set total waste acceptance limits to ensure that the total quantities of waste do not exceed the allowable "risk budget" for the entire facility, and limit offsite low-level wastes to that portion of the risk budget which is not forecast to be necessary for on-site cleanup wastes.

The design, construction, operation and closure of the East Cell are reported to be the same as that of the permitted and regulated RCRA West Cell. It is assumed that the East Cell will be operated in a manner consistent with either the West Cell of the IDF or the ERDF relative to waste placement, fill material compaction, environmental monitoring and the rest. However, with no information, all of this remains to be verified.

Only a small temporary soil berm will separate the unregulated East cell from the regulated MW West cell. As the name states, the landfill is "integrated", and it is necessary to examine operations, waste acceptance, monitoring, etc… for both sides to assess cumulative impacts. However, there is nothing integrated about the regulatory approach, consideration of impacts and disclosure for the two sides of the IDF.

Examples of what is not disclosed about the East Cell of the facility (due to the inadequacy of the EIS and the failure to describe operations and conditions in the permit application) are:

- whether or not USDOE will continue the practice of random dumping of the waste materials as they have done at most of the low level burial grounds; and,
- waste acceptance criteria and quality assurance associated with the disposal operations.

Without any description or limitations on disposal operations, waste acceptance criteria, etc… it is impossible to assess the cumulative impacts of the "integrated disposal facility."

[3] RCW 70.105E.060.

Low-Level Waste (LLW)
Low-level radioactive waste that is not high-level radioactive waste, spent nuclear fuel, transuranic waste, byproduct material (as defined in Section 11e.(2) of the Atomic Energy Act of 1954, as amended) or naturally occuring radioactive material.

Mixed Low-Level Waste (MLLW)
Mixed low-level waste is LLW that contains both radionuclides subject to the Atomic Energy Act of 1954, as amended (42 USC 2011), and a hazardous componet subject to the Resource Conservation and Recovery Act or Washington State Dangerous Waste Regulations.

Low-Activity Waste (LAW)
Immobilized low-activity waste is the waste that remains after separating form high-level waste as much of the radioactivity as practicable, and that when solidified may be disposed of as low-level waste in a near-surface facility.

Immobilized Low-Activity Waste (ILAW)
Immobilized low-activity waste is the solidified low-activity waste from the treatment and immobilization of Hanford tank waste. The ILAW would be disposed of on the Hanford Site or at a qualified offsite facility.

Even if plans were described, the lack of controls via permit has allowed USDOE to "waive" waste acceptance criteria in the past for Hanford's Low-Level Burial Grounds (LLBGs); e.g., for highly radioactive Remote-Handled LLW, or even for suspect MW. This practice is likely to continue. Thus, IDF is like a water balloon with controls over half the balloon (the West, or MW side) and none over the remainder. It is likely that the balloon (the total risk budget for the landfill in comparison to standards) will still burst from the pressure of what is added to the East side.

The West Cell of the IDF is to be a RCRA regulated and permitted mixed waste disposal facility. A RCRA permit application for the West Cell only, was prepared by the DOE (DOE, 2005) and a Draft RCRA permit was prepared by the WA Dept. of Ecology and is currently under public review.

The permitting of IDF is proposed to be phased, with the initial phase of the permit limiting use of the West Cell to dispose of Immobilized Low-Activity Waste (ILAW), bulk vitrification waste, and miscellaneous mixed waste originating from IDF operations. ILAW and bulk vitrification wastes are wastes that are retrieved from High-Level Nuclear Waste tanks and glassified (vitrified) using two different approaches. Immobilized Low-Activity Waste (ILAW) is vitrified material that will originate from the low activity waste[1] vitrification process also being built at Hanford. This process takes high level waste from the tanks, segregates out some of radionuclides into a lower-activity fraction and vitrifies this material into a stable waste form. This waste form will likely be a glass cull material or a fractured monolithic glass inside of a sealed stainless steel cylindrical container measuring 4 ft in diameter and about 7 ft tall.

Bulk vitrification waste will be lower-activity material retrieved from the High-Level Waste tanks that is melted in large containers and left in bulk glass form. This bulk glass will be allowed to cool and then disposed of, container and all, in the West Cell mixed waste IDF landfill.

The West Cell RCRA permit currently does not include allowance for disposal of any off-site waste. That issue is the subject of two cases currently being argued in the courts.[2] If off-site mixed waste is brought in to Hanford and buried at the IDF, a RCRA permit modification will be required.

The rationale for phasing of the permit is the lack of adequate cumulative impact analysis for IDF, and Washington's disagreement with USDOE over the mobility and risk from Iodine 129 and Technetium 99 in secondary wastes generated from vitrification. In a nutshell, Washington has challenged the HSWEIS (which was the basis for USDOE's Record of Decision to proceed with the IDF landfill) for failure to disclose and

assess impacts if 95% of the Iodine 129 is disposed of in the IDF landfill, rather than being vitrified with the High-Activity Wastes retrieved from the tanks.

The West Cell RCRA permit also does not include any on-site generated mixed waste. Hanford generated mixed waste currently goes to two smaller RCRA permitted mixed waste disposal facilities in the 200 West Area. Those smaller facilities are presently being used for disposal of on-site generated waste including mixed waste and low-level waste and they are filling fast. A permit modification will be required in the future if there is a need to dispose of any additional on-site generated mixed waste at the West Cell of the IDF.

The Draft RCRA permit (Ecology 2005) has adopted the existing NEPA documentation of environmental impacts that were prepared for the separate disposal facilities as being adequate and appropriate for the purposes of the integrated facility (IDF). They issued a determination of non-significance relative to the integrated approach.

With this determination, much of the information such as the performance assessment for the previous ILAW facility, becomes relevant to the IDF. Not all these documents could be reviewed in this study due to lack of availability.

As noted in the earlier description of the site, new data emerged after the July 27, 2005 admission from USDOE to the U.S. District Court for Eastern Washington that there wee such serious flaws in the HSWEIS groundwater model that the model and analysis were not reliable and should be reevaluated. Some documentation exists that the groundwater flow model did not reflect studies showing that the groundwater flow would shift from eastward to northward through the Gable Mountain Gap – creating a greatly increased cumulative impact, and undermining the rationale for siting the IDF in 200 East. That rationale, from the HSWEIS, is that the faster groundwater travel time to the River precludes buildup of contamination and keeps the impacts to groundwater, River and exposure to humans acceptable (in USDOE's eyes). Essentially, faster groundwater flow to the east allows dilution of the same contamination migrating to groundwater and the River. If the flow shifts to the North, it loses the dilution factor and creates a new combined groundwater plume with far greater concentrations and potential impacts. Unfortunately, USDOE asked the federal court to seal the reviews of the HSWEIS groundwater, and refused requests for disclosure.

[1] Low activity is relative to the remainder of the waste in the tanks which is "High-Activity" and which will be vitrified and, one day, expected to be disposed in a deep geologic repository, instead of remaining near the surface at Hanford. The ILAW includes extremely radioactive materials, it just is not the hottest fraction of the tank wastes.

[2] In addition to the case brought by Washington challenging the adequacy of the HSWEIS in regard to offsite waste impacts, the USDOE is challenging the constitutionality of Washington's Cleanup Priority Act, which bars addition of offsite mixed waste so long as existing mixed and hazardous wastes are being released to the environment and fail to meet hazardous waste standards. US v. Washington, Manning, et al, US. District Court for the Eastern District of Washington.

3.3.1 IDF Details

Information on the IDF design comes from the RCRA permit application (DOE 2003) and from the Draft RCRA permit (Ecology 2005) which is currently under public review.[1] The IDF risk assessment is provided in Mann (et al, 2004).

There is not a lot of documentation on the design, construction specifications or quality assurance for the IDF.

There are no engineering justification reports or design configuration report similar to that of Envirocare (2001b). Part of the reason for this is that much of this documentation was prepared for the previously separate disposal facilities that were integrated in the creation of the IDF. Documentation of technical requirements and system specifications and the performance assessment for ILAW waste, for instance, are referenced in the Draft RCRA permit because they are applicable to the IDF. A conceptual design report for the ILAW waste (RPP-7908) is referenced in the IDF permit but was not available for review (in violation of SEPA and other applicable standards)

To make it more difficult for the public to review and comment on the IDF landfill, the full Draft RCRA permit and the permit application can only be reviewed in the libraries, presumably for security reasons.

The following is a short summary of what little we know about the IDF following review of the Draft RCRA permit.

The IDF design requirements come from RCRA and are codified in WAC codes as Washington Dept. of Ecology has delegated RCRA authority[2] and permitting responsibility. These design requirements are quite prescriptive for mixed waste landfills[3].

[1] *Comment period ending June 20, 2005*

[2] Washington Hazardous Waste Management Act, RCW Chapter 70.105; and Washington Administrative Code, Chapter 173-303.

[3] Additional requirements for permitting the IDF landfill are now codified in the Cleanup Priority Act, RCW 70.105E.060. There is no record of Ecology considering the new requirements, specifically that any risk assessment or permitting decision for a mixed waste landfill at a site such as Hanford must consider the cumulative impacts from all carcinogens (which includes radionuclides) and the total risk from projected releases and exposures from the landfill must not exceed the health based protection standard in Washington's Model Toxics Control Act, RCW Chapter 70.105D. This standard – to avoid having the new landfill create new toxic waste cleanup sites – is for all carcinogens projected to be released from the facility not to have a total cancer risk greater than one additional cancer per every one hundred thousand persons exposed to the facility's releases. This state standard is in stark contrast to USDOE's performance assessment design standard (Order 435.1, applied to the East / LLW cells of IDF) which allow 25 millirem of exposure to radiation on top of all other carcinogens from releases from the landfill, and 100 millirem exposure in event of failure of institutional and engineered controls (i.e., intruder). 100 millirem is estimated by EPA and NRC to cause two fatal cancers for every one thousand adults exposed. EPA has issued a formal determination that 25 millirem of exposure from a Superfund Site is "not protective of human health". *"Analysis of What Radiation Dose Limit is Protective of Human Health at CERCLA Sites"; US Environmental Protection Agency, August 20, 1997.*

The IDF is to be 900,000 cubic meters total volume (31,77 million cubic feet, or 1.2 million cubic yards). It will be constructed as a moving waste disposal pit similar to the ERDF, with the initial pit in the north portion and a service ramp toward the south. This allows filling of the North portions first with expansion toward the south to eventually cover the entire footprint area shown in Figure 3.3.

The liner, leachate collection and removal system and leak detection system are "critical systems" in the IDF and apparently subject to appropriate quality assurance requirements.

The IDF will have two leachate collection and removal systems (LCRS). The upper or first LCRS is located in a gravel layer that is just beneath an operations layer. The secondary system is called a leak detection system because it is located beneath the multi-layered liner system. This design of a dual leachate collection allows differentiation of operations derived leachate from leachate that would indicate a failed liner system. The permit indicates the secondary leak detection system was added to comply with the Atomic Energy Act of 1954. Which specific requirement is not known.
The liner will be the equivalent of a double liner system that is compliant with RCRA Subtitle C 40 CFR264 and WAC 173-303-665. This liner system is designed for use during the active life of the landfill where the active life includes the periods of operations, closure and post closure (30 yrs).

The liner is composed of the following layers listed from top down from the waste materials:

- Operations layer – 3ft of operations soil for freeze protection and to protect the liners from damage during operations
- LCRS - 1.0 ft layer of gravel with a non-woven separation fabric above. Leachate collection pipes are located in the gravel and site is graded to allow leachate collection.
- Primary geomembrane – HDPE 0.6 mm thickness
- Primary GCL – Geosynthetic clay liner material consisting of a synthetic mat with bentonite clay
- Secondary geomembrane liner - HDPE 0.6 mm thickness
- Secondary GCL – Geosynthetic clay liner
- Admix layer – 3.0 ft of soil and bentonite mixture
- Secondary Leak Detection system – Composed of soil, gravel, drainage net and tertiary geomembrane

Waste placement will be controlled and monitored with a specific plan. Bulk vitrified mixed waste will be disposed in the containers in which the melt is formed. Vitrified low activity waste will be packed in the waste zone, four layers high. All void spaces between packages are to be filled but details of specific procedures or requirements and verification methods are not included in the permit.

The IDF cover will be designed to comply with WAC regulations. Waste materials will be covered with an interim cover or a final cover during the pre-closure period. Details of the cover design will be provided before closure.

Thus, the "standard" for which USDOE conducted its performance assessment for the IDF landfill would allow magnitudes more exposure and risk than is allowed under the relevant state standard.

The risk assessment (Mann et al., 2003) reports that the cover will have an inverted shallow V shape with the apex of the V running along the center of the cell and parallel to the longest dimension (N-S). It will have a 2% slope to shed water and it will extent 30 ft beyond the inside edge of the trench liner system. The cover will be designed for a 500 year life and it will have an impervious asphaltic concrete cap. No additional information on the cover design is available at this time.

Other documents referenced in the permit include the ILAW project definition criteria (RPP-7303), A conceptual design report for ILAW (RPP-7908) and the IDF Phase 1 critical systems design report (RPP-18486). These were not available for review in time for this report.

A risk assessment for the IDF was prepared to satisfy DOE requirements (DOE Order 435.1). This risk assessment is a modification of a performance assessment that was prepared for ILAW and reconfigured to the waste form, site specific conditions and the geometry of the IDF.

The most significant performance objectives that the IDF must measure (DOE Order) include:

- All pathways maximum dose of 25 mrem effective dose equivalent (EDE) in one year.
- Maximum drinking water dose for beta-gamma emitting radionuclides of 4 mrem/yr EDE.
- Measure of incremental lifetime cancer risk due to chemicals
- Inadvertent intruder all-pathways chronic does objectives of 100 mrem/yr EDE

The model was set up with a series of separate models for the near field, the far field and groundwater.

The near field extends from the surface to the bottom of the engineered structure and includes the actual landfill region composed of the waste material zone and surrounding soil material. The liners, leachate collection systems and cover are not considered in the model with the intention of not taking credit for any isolation they provide. The near field considers different release mechanisms for the different waste forms expected in the IDF. The recharge model through the topsoil surface uses a 4.2mm/yr (0.17 inches) per year moisture flux value, assuming most of the precipitation is evaporated or transpired out the surface.

The far field is the region beneath the bottom of the facility to the groundwater and includes the vadose zone sediment. This region is modeled with a finite element program called VAM3DF, which uses a sorption equation to assess the effect of geochemical retardation. This model uses a homogeneous, 2-layer earth system.

The groundwater region was modeled using a previously developed groundwater model that was scaled to fit the geometry and layout of the IDF. The groundwater uptake well for risk calculations is located 300 ft from the down gradient edge of the IDF. No additional information on the groundwater portion of the model is provided in the IDF risk assessment.

An inadvertent intruder scenario is considered in the risk assessment. It is configured basically the same as the intrusion scenario for the ERDF where the intrusion is assumed to be one of drilling a groundwater well and bringing contamination up to the surface in the drill cuttings. An intrusion scenario associated with excavating for a basement and causing the direct intrusion into the waste material is not considered a credible scenario in this assessment because the waste is more than 15 ft below ground surface.

> This is a highly questionable assumption for the important exposure scenario for failure of institutional controls, given the experience at other Superfund sites in Washington state and the designation of the future use of the area of the IDF as industrial. In similar industrial settings,

construction is far more likely to result in excavation below the 15 foot level. Other likely institutional control failures which should be considered include the installation of water lines and utilities following loss of "configuration control" (i.e., loss of as built blue prints). Installation and excavation of utility lines is likely to result in excavation of waste material which would then be used as fill in another application, and creation of new source of infiltrating water and liquid, and new preferential migration paths – defeating the engineered barrier cap. Thus, adding underground water or sewer lines for industrial uses even alongside the capped area would create the potential for significant increases in liquid infiltration and contaminant migration.

The results of the risk assessment show that for all pathways exposure is considerably lower than the performance objectives identified above. Groundwater impacts from the three waste types in the IDF produce different temporal shapes, time of maximum, and maximum magnitudes in the total exposure plot. Tc-99, I-129 and Np-237 are the primary contributors to dose at 1000, 2400 and 10,000 years. The key sensitive parameters and highest risk driver comes from the inventory of Tc-99 in the waste.

No information is provided in the risk assessment on the comprehensive or combined effects from both the East Cell and West Cell of the IDF as an inclusive risk assessment has not been completed. The lack of such a cumulative impact assessment means that any controls placed on the West Cells are likely to be defeated by the more permissive waste acceptance and operational practices applied by USDOE to the East Cells – with no analysis having been done in advance to determine what the maximum allowable source for potential contaminants should be.

Of course, the use of the East Cell for disposal of Hanford low level waste represents a great improvement in terms of engineered waste isolation and disposal facilities from the current operation of the unlined trenches. Because a combined risk assessment of both cells will undoubtedly not consider the liner in the performance calculations[1], a comprehensive risk assessment will not show a significant risk benefit to the new low-level waste facility as compared to the old unlined burial grounds.

Ultimately, it is the geology of the disposal site and total wastes disposed which determines the logn-term groundwater and cumulative impacts of any disposal site. Thus, it is vital for any decision to consider reasonably available alternatives in a different geologic setting – since the geology is the ultimate arbiter of impacts from disposal facilities. For the IDF plan, this is more important given the massive volumes proposed to be disposed, the unknowns regarding the Iodine and Tc99 from secondary vitrification wastes and the total lack of disclosure of the waste forms and source terms proposed to be disposed from offsite wastes in the East Cell.

USDOE must disclose all aspects of its design, operations, waste inventory, and quality assurance for the East (LLW) Cells of IDF in order for anyone to have an assurance that the cumulative impacts of the facility will not exceed standards. Ecology has the ability to order this as a permit condition and for purposes of meeting its obligation to ensure that cumulative impacts are disclosed and considered in its SEPA determination. Ecology must now use this authority.

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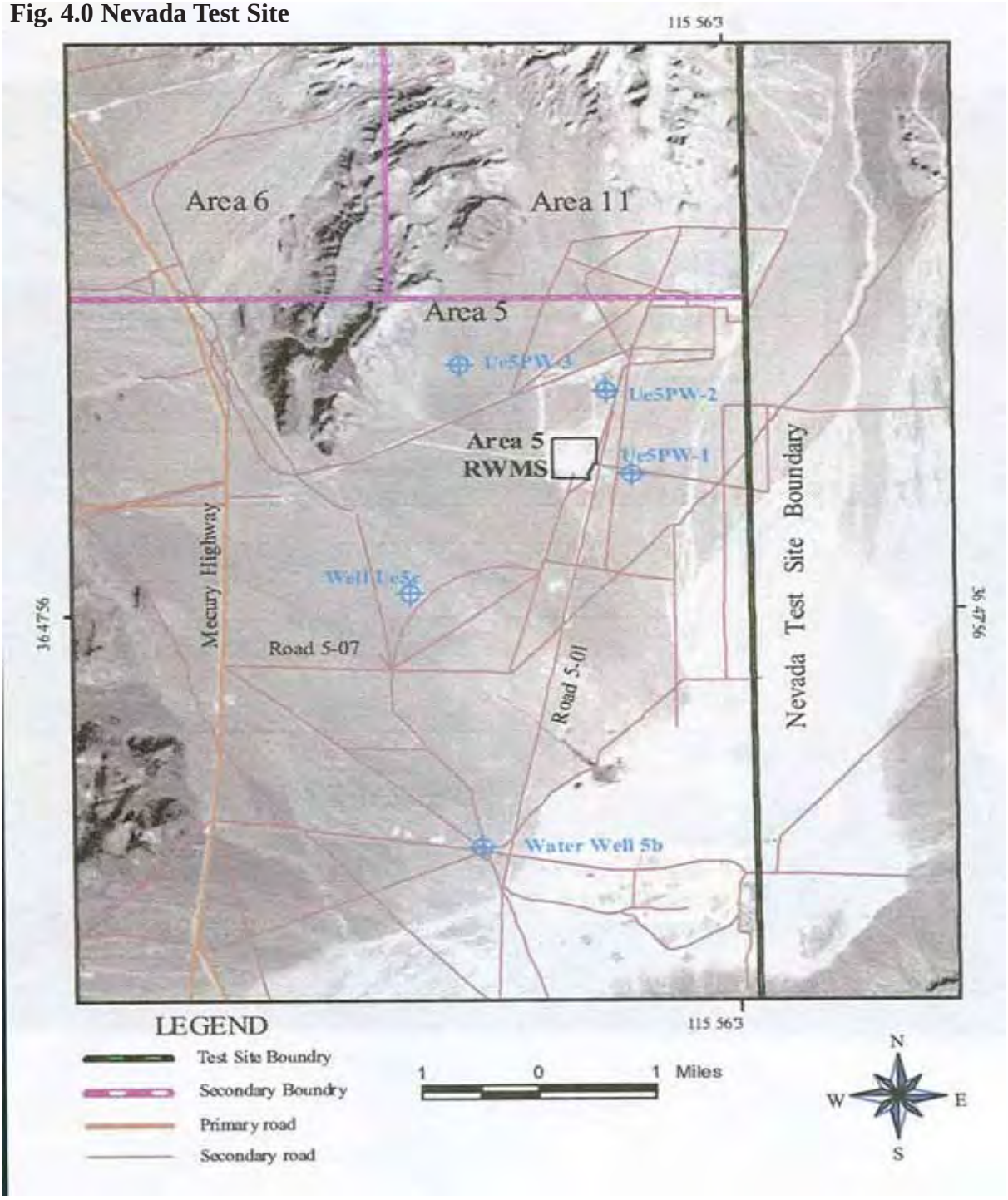
[1] Liners should not be considered in long-term performance since their design life is short – reliably limited to the operational period. Even then, liners often fail before operations cease.

4.0 Nevada Test Site Mixed Waste Disposal Facilities

The Nevada test site (NTS) contains two principal areas at NTS that are used for radioactive and hazardous waste disposal include the Area 3 Radioactive Waste Management Site (RWMS) and the Area 5 RWMS. Documentation on the NTS waste disposal operations wasdifficult to obtain and the only sources available for this review come from performance assessments that were prepared for the two principal low level waste disposal facilities at NTS.

The Nevada test site is located about 65 miles northwest of Las Vegas and encompasses about 1350 square miles of Nevada desert (Figure 4.1).

Fig. 4.0 Nevada Test Site



The NTS was used for nuclear weapons testing from 1951 through 1992 including both above ground testing and below ground shots.

Fig. 4.2 NTS Crater

Photo courtesy of National Nuclear Security Administration: Nevada Site Office

Area 3 is located within the Yucca Flat region of NTS (see Figure 4.1). The Area 3 RWMS was first used for disposal of site generated low level waste (LLW) in 1968 when bulk wastes were disposed in subsidence craters created by underground test shots. Currently, 5 subsidence craters are used for disposal of LLW. Area 3 does not contain a permitted mixed waste disposal facility so it is not described in any detail.

Area 5 RWMS is a 91 acre site located within Frenchman Flat (Figure 4.1) in the southeast corner of NTS. Area 5 RWMS contains a number of pits or trenches that are used for waste disposal. Pit 3 is the only permitted mixed waste pit. It has been used since 1987 to dispose of on-site mixed waste. The new mixed waste disposal facility is to be located just north of the existing footprint of the RWMS. This new facility is in the process of being permitted. No details on the Area 5 mixed waste site or the new mixed waste facilities were available for this review.

Frenchman Flat is a large alluvium filled intermontane basin with desert shrub habitat of varying productivity. It has an average annual precipitation of just under 5 inches and a potential evapotranspiration rate of roughly 5 times the precipitation.

The only surface water in the Frenchman Flat region is found as ephemeral stream channels where storm water will occasional run down from the slopes and accumulate in central valley playa areas before it evaporates or infiltrates into the soil.

Frenchman Flat is also a closed basin, meaning that the groundwater does not exit or drain into a river system. It is within the Colorado River drainage but, due to the lack of infiltration or recharge, the groundwater does not flow out of its confined basin.

The simple explanation of the subsurface geology at Area 5 RWMS is all that can be presented because the principal reference (DOE 2001a) is missing the pages providing details. The geologic section starts with the upper 1200 to 1500 ft of alluvial sediment that originated from nearby uplifted Paleozoic carbonate rock and Tertiary volcanic rock. This material was deposited by fluvial action that eroded the nearby mountains and uplifts and carried material down and deposit it in the valleys.

Beneath the alluvium is found a complex interbedded volcanic ash fall and ash flow tuff material that is about 1800 ft thick in the RWMS area. This is a complex series of strata that varies from primary ash flow and ash fall that was deposited during volcanic activity to sedimentary units which are volcanic material that was reworked and redeposited by fluvial action. The volcanic sequence and interbedded clastic material was later subjected to tectonic activity and contains evidence of faulting.

Underlying the volcanic sequence is a Paleozoic carbonate layer. This is a very old formation that extends down to the Precambrian basement rock.

The groundwater beneath the Frenchman Flats is found at a depth of about 790 ft below ground surface within the alluvium. The groundwater table is essentially flat with no measurable hydraulic gradient across the RWMS. This indicates there is an extremely slow or no horizontal groundwater flow and the flow direction cannot be determined.

Measurements of chloride content and isotope profiles in the soil indicate there is negligible recharge below about 30 ft. Chloride migration below 30 ft ceased to occur about 20 to 30 thousand years before present. The net evaporative demand of the near surface soil is so great that water in the subsurface tends to flow upward from a depth as great as 115 ft.

The downward flow of unsaturated moisture in the sediment below 115 ft is extremely low and the median travel time to groundwater has been estimated at 51,000 years which exceeds the 10,000 year performance assessment criteria.

The performance assessment of the Area 5 RWMS (DOE 2001a) indicates that the most significant potential dose that could be realized is due to volatile radionuclides that migrate to the surface largely in vapor phase. The main contributors to that dose are tritium and radon. The dose is also directly proportional to the quantity and concentration of the contaminant in the waste or for radon, the concentration of the parent radionuclides Th-232 or Uranium.

Sensitivity analyses in the performance assessment shows that the factor in the model with the greatest sensitivity to total dose are the biological release coefficients that are used to factor in the transport of contamination to the surface by plants and burrowing animals. In other words, the greatest influence to

dose comes from the surface release mechanisms. Not surprisingly, the modeling also shows that the intrusion scenarios creates the greatest potential dose.

The new mixed waste facility that is to be located north of the Area 5 RWMS is planned to receive materials from both on-site and off-site waste from other DOE facilities. There is an ongoing argument between DOE and the State (NV) over whether or not the new facility should have a RCRA compliant double liner and leachate collection system. DOE's argument is that the natural soil conditions create a natural liner system and that studies have shown that travel times to groundwater greatly exceed any site performance requirements making additional engineered liner systems unnecessary.

5.0 Site Comparison and Review

This site comparison looks at similarities and differences between the sites.

All of the sites are similar in that they are near-surface disposal facilities that are subject to intrusion by a determined individual. The Envirocare site does not consider an intrusion scenario in their site performance modeling. This is probably just as well because the intrusion scenarios developed for both the two Hanford Site facilities and the NTS facility are probably not realistic anyway. A more realistic intrusion scenario would consider digging down at least 15 ft to the waste zone and building a house, perhaps with a daylight basement, and establishing a residence. It is doubtful that any near-surface disposal facility would be able to design to prevent this scenario.

Building a home on a landfill mound may not be consistent with the concept of an "inadvertent" intrusion as is the language of the NRC guidelines, but it is probably more realistic. It could also be argued that the riprap cover of the Envirocare facility does not make an attractive home site and thus minimizes the possibility of a determined intrusion and resultant residence exposure. However, we must still consider the possibilities of a realistic intrusion with any near surface mixed waste disposal facility.

The Envirocare site and the NTS have similar climates of low rainfall, high evaporative and evapotranspiration characteristics and negative net recharge to groundwater. Both are essentially closed basins where groundwater does not exit the basins in which the disposal facilities are located.

All of the facilities were built to RCRA Subtitle C standards or the associated State requirements which echo the RCRA standards. As a result, the design and construction requirements are rather prescriptive in terms of the liner, cover and facility operations.

The only real exception to the basic RCRA requirements is the current argument over the need for a liner at the Nevada Test Site mixed waste disposal facility. From the DOE perspective, they believe the natural surface and subsurface conditions mitigate the need for a liner. They have shown that the net recharge is essentially zero and that subsurface soil moisture actually migrates upward in about the first 30 ft of soil depth. Isotopic studies and chlorine content data support this assertion although these studies were not reviewed for this report. Assessments of system performance indicate that the contaminant travel time through the soil to the very deep groundwater (790 ft) without considering a liner system, is on the order of 50,000 years, making the liner redundant and unnecessary.

The argument for a liner considers the liner and leachate collection system as a monitoring system that assures there is no appreciable moisture flux through the soil and waste packages and into the deeper

subsurface. A liner and leachate collection system is essentially an operational monitoring system that provides assurance there is no moisture flux during the operational life of the disposal units.

This type of monitoring system may be redundant especially considering that NTS plans to introduce a vadose zone monitoring system. But, no information was obtained on the vadose zone monitoring system and we are in no position to take sides on this issue.

Whether or not the State of Nevada requires this monitoring system should still not stop the DOE from importing mixed waste to the NTS. This, after all, is the real issue. The unspoken concern is that the State will use the liner system as a means of preventing the importation of waste from other DOE sites.

The differences between the sites are really differences in the geology and climate. In this regard, there is little difference between the NTS and Envirocare sites, but significant difference between the Hanford site and the NTS and Envirocare sites.

Both the Envirocare site and NTS have negative net recharge in closed hydrologic regimes. The groundwater at Envirocare is relatively shallow compared to either NTS or Hanford, but this is still a closed basin and the groundwater is so saline that the possibility of anyone using it, especially out in the middle of a barren desert, is exceedingly small.

Hanford, however, has a very valuable groundwater resource that is worth protecting and there is significant uncertainty as to the net recharge level at the mixed waste sites. Unfortunately, the groundwater is already contaminated with radioactive and hazardous constituents to the point that recovery or remediation of the groundwater to drinking water standards is doubtful. This does not make it acceptable to add to that contamination.

If the Envirocare facility had a massive failure of their engineered systems (a doubtful scenario) and contaminated the groundwater, it would create a plume of contamination in an unused groundwater system and likely would not be noticed, but for the required groundwater monitoring systems. Essentially, nobody would care. Any plume from the Envirocare facility would move very slowly and because of its depth, the shallow saline groundwater would be relatively easy to clean up compared to both Hanford and the NTS.

The groundwater at NTS is of good quality but, at 790 ft deep, it is not a viable economical water source and likely never will be.

The biggest problem at both Hanford mixed waste disposal facilities is with the uncertainty of the contaminant transport models. All of the models use an homogeneous isotropic subsurface soil profile. This is hardly the actual conditions where we might expect a groundwater contamination plume. All of the studies of the migration of contaminants in the subsurface soil at Hanford suggest that movement of moisture with its contamination load, occurs by way of a tortuous preferential pathway. This is a fact that essentially invalidates any of the models relative to the actual contamination distribution and related risk. An homogeneous model just doesn't cut it for any accuracy of the models of the Hanford facilities.

We don't really have enough information on either the Hanford IDF or the new NTS mixed disposal facility to evaluate the design or operations of either facility. It is probably safe to assume that the regulated mixed waste portion or the West Cell of the IDF will be operated and have the same manner of quality assurance in construction as that of the Hanford ERDF facility. In that regard the IDF design is not terribly different from the ERDF facility which is a very good prospect.

The question of which site or sites are best suited for the importation of large quantities of mixed waste must look at the inherent differences in the sites and make an informed selection of which site is best suited for the long-term storage of these hazardous and radioactive wastes.

This review shows that it is possible to design and build a mixed waste facility almost anywhere. However, in doing so, it will be necessary to impose more and more controls, isolation requirements and monitoring with a less favorable environment.

6.0 References

General Topic References

Alumbaugh, D.L., D. LaBrecque, J.Brainard, T.C. Yeh, 1999 "A Hydrologic-Geophysical Method for Characterizing Flow and Transport Processes within the Vadose Zone" Final Report US DOE Project DE-FG07-70267

Carrigan, C.R., S.A. Martins, A.L. Ramirez, W.D. Daily, G.B.Hudson, D.Ralston, B. Ekwurzel 2001 "Characterization of Contaminant Transport by Gravity, Capillarity and Barometric Pumping in Heterogeneous Vadose Zones" UCRL-ID-142784 Lawrence Livermore National Laboratory

DOE/NV 2001 "Proceedings from the Remediation of Radioactive Surface Soils Workshop, August 14-15 2001" DOE/NV—798, U.S. Department of Energy, Las Vegas, Nevada

Ebadian, M.A. and H. Weger, 2001 "Review of Current Practice in Characterization and Monitoring" Final Report US DOE Grant No. DE-FG21-95EW55094

Murrell, M., R. Roback, T.L. Ku, and S. Luo, 1999 "Characterization of Contaminant Transport using Naturally-Occurring U-Series Disequilibria" Final Report US DOE Project Number 54741

NRC/EPA, 1987 *Joint NRC-EPA Guidance on a Conceptual Design Approach for Commercial Mixed Low-Level Radioactive and Hazardous Waste Disposal Facilities*, Nuclear Regulatory Commission, Environmental Protection Agency

Piet, S.J., J.J. Jacobson, P.Martian, R. Martineau, and R. Soto, 2003 "Modeling and Simulation of Long-Term Performance of Near-Surface Barriers" Waste Management 03 Conference, Tucson, AZ

Piet, S.J. and R.P. Breckenridge, 2002 "Near-Surface Engineered Environmental Barrier Integrity" INEEL/CON-02-00156

USACE, 1984 *Alternative Methods for Disposal of Low-Level Radioactive Wastes, Task 1:Description of Methods and Assessment of Criteria* NUREG/CR-3774, Vol.1, US Army Corps of Engineers

USACE, 1987 *Recommendations to the NRC for Review Criteria for Alternative Methods of Low-Level Radioactive Waste Disposal, Task 2a: Below-Ground Vaults*, NUREG/CR-5041, Vol.1, US Army Corps of Engineers

USACE, 1988 *Recommendations to the NRC for Review Criteria for Alternative Methods of Low-Level Radioactive Waste Disposal, Task 2b: Earth-Mounded Concrete Bunkers*, NUREG/CR-5041, Vol.2, US Army Corps of Engineers

US NRC, 1988 "Standard Review Plan for the review of a license application for a Low-Level Radioactive Waste Disposal Facility" NUREG-1200 Rev.1 U.S. Nuclear Regulatory Commission, Jan. 1988

Envirocare References

Envirocare of Utah, 2000a, *Revised Hydrogeologic Report for the Envirocare Waste Disposal Facility Clive, Utah*, prepared by Pentacore Resources, January 2000, Version 1.0

Envirocare of Utah, 2000b, *Revised Envirocare of Utah Western LARW Cell Infiltration and Transport Modeling*, Prepared by Whetstone Associates, Inc. July 19, 2000

Envirocare of Utah, 2000c, *Envirocare of Utah Mixed Waste Cell Infiltration and Transport Modeling*, Prepared by Whetstone Associates, Inc. November 22, 2000

Envirocare of Utah, 2001a, *3rd and 4th quarter 11e.(2) and Second Semiannual LARW Compliance Monitoring Report*, February, 2002

Envirocare of Utah, 2001b, *Mixed Waste Embankment Engineering Justification Report*, Rev. 2, October 30, 2001

Envirocare of Utah, 2002 *LLRW Embankment Construction Project Plan, Attachment II-A*, March 1, 2002

Orton, T. L., 2001?, *Development of a Waste Disposal Embankment Cover Infiltration Test Cell*, Envirocare of Utah, Salt Lake City, UT

ERDF References

Bechtel Hanford, Inc. 2002, *Environmental Restoration Disposal Facility Waste Acceptance Criteria* BHI-00139, Rev. 4

Bechtel Hanford, Inc. 2003, *Groundwater and Leachate Monitoring and Sampling at the Environmental Restoration Disposal Facility, Calendar Year 2002* BHI-01684 Rev.0

Bechtel Hanford, Inc. 1995, *Preoperational Baseline and Site Characterization Report for the Environmental Restoration Disposal Facility* BHI-00270, Vol.1 &2 Rev. 0B

Bechtel Hanford, Inc. 1995 *Environmental Restoration Disposal Facility Performance Assessment* BHI-00169, Rev. 0

Brodeur, J.R. and deBruler 2005 "Review of 100-BC Area Clean-up at the U.S. Department of Energy Hanford Site" Columbia Riverkeeper, Bingen, WA

DOE/RL, 1993a *Remedial Investigation and Feasibility Study Report for the Environmental Restoration Disposal Facility* DOE/RL/93-99, Department of Energy, Richland, WA

DOE/RL, 1993b *Hanford Federal Facility State of Washington Leased Land*, DOE/RL-93-76, Rev. 0, Department of Energy, Richland, WA

DOE/RL, 1994 *Source Inventory Development Engineering Study for the Environmental Restoration Disposal Facility,* DOE/RL/12074-29 Department of Energy, Richland, WA

Dorian, J.J. and V.R. Richards, 1978 "Radiological characterization of the retired 100 Areas" UNI-946 United Nuclear Inc., Richland, WA

Delaney, C.D., K.A. Lindsey, and S.P. Reidel, 1991, *Geology and Hydrology of the Hanford Site: A Standardized Text for Use in Westinghouse Hanford Company Documents and Reports*, WHC-SD-ER-TI-003, Westinghouse Hanford Co. Richland, WA

EPA, 1995 *Record of Decision, U.S. DOE Environmental Restoration Disposal Facility, Hanford Site, Benton County, Washington*, US Environmental Protection Agency, January 1995

Gee, 1987, *Recharge at the Hanford Site: Status Report*. PNL-6403, Pacific Northwest Laboratory, Richland WA

Lindsey, K.A., B.N. Bjornstad, J.W. Lindberg and K.M. Hoffman, 1992, *Geologic Setting of the 200 East Area: An Update*, WHC-SD-EN-TI-012, Westinghouse Hanford Co., Richland, WA

Mitchell, R.M. 1995, *Preoperational Baseline Survey Conducted at the Environmental Restoration Disposal Facility*, BHI-00172, Bechtel Hanford, Inc.

PNNL, 1998, *Composite Analysis for Low-Level Waste Disposal in the 200 Area Plateau of the Hanford Site.* PNNL-11800, Pacific Northwest National Laboratory, Richland, WA

Rockhold, M.L., M.J.Fayer, C.T.Kincaid and G.W.Gee, 1995 *Estimation of Natural Ground Water Recharge for the Performance Assessment of a Low-Level Waste Disposal Facility at the Hanford Site* PNL-10508 Pacific Northwest Laboratory, Richland, WA

USACE 1994, *Conceptual Design Report for the Environmental Restoration Disposal Facility* DOE/RL/12074-28 Rev. 0, US Army Corp of Engineers, Walla Walla District
USACE 1995, *Final Construction Specifications- Environmental Restoration Disposal Facility* Vol. 1 & 2 US Army Corp of Engineers, Walla Walla District

WHC, 1994 *Siting Evaluation Report for the Environmental Restoration Disposal Facility,* WHC-SD-EN-EV-009, Rev. 2, Prepared by Golder Associates, Inc. for Westinghouse Hanford Co., Richland, WA

Hanford Integrated Disposal Facility References

Bergeron, M.P. and S.K. Wurstner, 2000 "Groundwater Transport Calculations Supporting the Immobilized Low-Activity Waste Disposal Facility Performance Assessment" PNNL-13400 Pacific Northwest National Laboratory, Richland, WA

DOE 2003 "Hanford Facility Dangerous Waste Permit Application, Integrated Disposal Facility" February 2003, DOE/RL-2003-12 Rev 1.

DOE 2003 "Draft Hanford Site Solid (Radioactive and Hazardous) Waste Program Environmental Impact Statement, Richland, WA" DOE/EIS-0286 D2, US Dept. of Energy, Richland, WA

Ecology, 2005 "Draft Integrated Disposal Facility Dangerous Waste Permit" May 2005, Washington State Department of Ecology

Mann, F.M., R.J. Puigh, S.H. Finfrock, R. Khaleel, and M.I. Wood, 2004 "Integrated Disposal Facility Risk Assessment" RPP-15834, DOE River Protection Project, Richland, WA

Nevada Test Site References

DOE/NV, 2000 "United States Nuclear Tests July 1945 through September 1992" DOE/NV-209-Rev 15, US Department of Energy, Las Vegas, NV

Fehneer, T.R. and F.G. Gosling, 2000 "Origins of the Nevada Test Site" DOE/MA-0518, US Department of Energy, Las Vegas, NV

Schoengold, C.R., M.E. DeMarre, E.M. Kirkwood, 1996 "Radiological Effluents Released from U.S. Continental Tests 1961 through 1992" DOE/NV-317 (Rev.1) Bechtel Nevada, Las Vegas NV

DOE/NV 2003 "Annual Site Environmental Report – 2002" DOE/NV11718—842, US Department of Energy, Las Vegas, NV

DOE/NV 2000 "Addendum 1, Performance Assessment for the Area 5 Radioactive Waste Management Site at the Nevada Test Site Nye County, Nevada" DOE/NV—608, US Department of Energy, Las Vegas, NV

DOE/NV 1998 "Performance Assessment for the Area 5 Radioactive Waste Management Site at the Nevada Test Site, Nye County, Nevada" DOE/NV11718—176, US Department of Energy, Las Vegas, NV

DOE/NV 2001a "Composite Analysis for the Area 5 Radioactive Waste Management Site at the Nevada Test Site, Nye County, Nevada" DOE/NV—594, US Department of Energy, Las Vegas, NV

DOE/NV 2001 "Addendum 1 Composite Analysis for the Area 5 Radioactive Waste Management Site at the Nevada Test Site, Nye County, Nevada " DOE/NV—594 Add1, US Department of Energy, Las Vegas, NV

DOE/NV 2000 “Performance Assessment/Composite Analysis for the Area 3 Radioactive Waste Management Site at the Nevada Test Site, Nye County, Nevada” DOE/NV—491-Rev2.1, US Department of Energy, Las Vegas, NV

Weber, D. and E.Dixon, 2002 “Summary Report, Analysis of the Nevada Test Site Early Warning System for Groundwater Contamination Migrating from Pahute Mesa to Oasis Valley” report published by Citizen Alert, Las Vegas NV

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Comments of Heart of America Northwest
Heart of America Northwest Research Center
Protect Washington: Yes on I-297

on
Proposed New Massive "IDF" Landfill for the Hanford Nuclear Reservation, which is proposed for use as a National Radioactive and Mixed Radioactive and Toxic Waste Dump

June 20, 2005
Comments on
Proposed Washington State Hazardous Waste Permit and
State Environmental Policy Act (SEPA) Determination of Non-Significance

note: all comments in this document are applicable to both the Proposed SEPA Determination of Non-Significance and the proposed Permit, and should be reviewed and responded to in both processes.

Background: *Determination of Non-Significance Inappropriately Proposed for Hanford's Integrated Disposal Facility (IDF) Landfill.*

A massive new landfill to serve as a national waste dump for wastes from other nuclear weapons plants as well as for waste from Hanford Clean-Up is under construction at Hanford. This landfill is huge – 1,463 feet wide (E-W) by 1,821 feet long (N-S) and 50 feet deep[1] – significantly beyond the capacity needed for on-site cleanup activities.[2]

The total disposal capacity of IDF is planned to be 900,000 cubic meters (m3) of waste – approximately 32 million cubic feet (ft3) of waste. The total amount of all waste disposed in Hanford's soil from the start of nuclear weapons production until 2004 was stated by USDOE to be 283,000 cubic meters.[3] Thus, this new landfill will have 3 times more capacity than ***all*** Hanford wastes disposed to date in Hanford's massive unlined burial grounds, causing untold contamination. It is beyond our ability to estimate the impacts to groundwater, the environment and health of future generations from the wastes already disposed in Hanford's soil.

The total potential amount of on-site waste expected to be generated from cleanup of Hanford and requiring disposal is 156,735 m3 - prior to treatment or volume reduction. (Of this

amount, 58,054m3 is expected to be mixed radioactive and hazardous waste (Mixed Waste, or "MW").[4] Yet, USDOE plans IDF to have 900,000 m3 of disposal capacity.

In February, 2004, USDOE formally adopted a plan (referred to as a "Preferred Alternative") to import and dispose of 12.7 million cubic feet of offsite Low-Level and Mixed Waste in IDF. (360,000 m3) [5] The cumulative impacts from this plan to import and dispose of 12.7 million cubic feet of waste in IDF have never been adequately considered[6]

"If you build it, they will come."

USDOE is proposing a landfill with a capacity of nearly 6 times the total amount of on-site Hanford waste estimated by USDOE as requiring disposal. If built, it will be used as a national radioactive and toxic waste dump for waste from other nuclear weapons plants. USDOE's Record of Decision authorizing construction of the IDF explicitly calls for it to be used as such a national radioactive and mixed waste dump. USDOE stated the goal of the IDF is to:

"provide DOE with the capability to accommodate projected waste receipts from the Hanford Site and offsite DOE facilities."[7]

Use of the IDF as a national waste dump, instead of meeting only the need for a landfill for Hanford Clean-Up wastes, is not a given, however. It can be stopped - if Washington State follows its policy that existing contamination is required to be cleaned up and wastes stored in compliance with standards before more waste is added to a site. This mirrors a federal policy in the federal Superfund law, which has been ignored and never enforced at Hanford.[8] It can be stopped if Washington State follows its policy that the cumulative impacts from disposal must be understood and must not exceed the standards approved by Washington's voters in the Model Toxics Control Act (RCW Chapter 70.105D) for protection of human health and the environment.

Washington's State Environmental Policy Act (SEPA) requires consideration now of both the policies against adding more waste to a contaminated site, and the total (or, "cumulative") impacts on health, environment and groundwater from all proposals for use of this landfill. SEPA requires consideration – with public notice and opportunity to comment – of these policies and cumulative impacts NOW, at the time Ecology is considering issuance of a permit which will allow construction of the entire landfill.

Instead of considering these impacts through an adequate environmental impact statement at the one point in time which Ecology can either change or prevent them, Ecology has sought to avoid its responsibilities and issue a "Determination of Non-Significance" for the project and permit.

USDOE's formal justification for designating Hanford to be a national radioactive and mixed waste dump was the availability of "existing facilities", even before USDOE stopped dumping waste in unlined trenches and before it issued the HSWEIS. The only reason for designing and constructing a landfill with anything greater than 156,735 m3 of total capacity is for the landfill to serve as a national radioactive and mixed waste dump.

The U.S. Department of Energy's formally adopted goal is to use IDF as a low level radioactive and mixed radioactive and toxic waste landfill for waste from a variety of nuclear weapons plants around the country.[9] USDOE has been temporarily enjoined by a federal court from importing waste to Hanford pending resolution of the state's federal lawsuit against the U. S. Department of Energy (USDOE) over the adequacy of the required Hanford Solid Waste Disposal Environmental Impact Statement (HSWEIS), on which USDOE based its plans.

Plans to add over 12 million cubic feet of waste to Hanford from other nuclear weapons plants while existing wastes are not cleaned up, and while contamination spreads from unlined landfills, were a driving force behind the campaign to pass Initiative 297 on the November 2004 ballot. This landfill was a major issue in that campaign. The Initiative – now called the "Cleanup Priority Act" – received nearly 70% of the popular vote and more "yes" votes than any initiative in Washington history. The Act adopts as State policy the simple common-sense policy that contamination must be

cleaned up, and hazardous wastes stored in compliance with existing standards, before more waste is added to mixed waste sites.

How Can Washington State Issue a "Determination of Non-Significance While Suing Over USDOE's Failure to Consider the Significant Impacts from the Proposed IDF Landfill?

Ecology's proposed issuance of a Determination of Non-Significance (**DNS**) for the initial permit – which is the only state action needed to allow the full project to go forward with disposal of up to 7 million cubic feet of offsite low-level waste[10] – *is incomprehensible*. This Determination flies in the face of Washington State's federal court challenge to USDOE's Hanford Solid Waste EIS – which is the basis for the IDF landfill – as legally inadequate due to failure to consider cumulative impacts.

Ironically, Washington State is now acting as if it can give approval to a landfill for imported wastes without the same EIS having been issued that Washington State sued to require.

Washington State has formally adopted a position that the Hanford Solid Waste EIS did not adequately meet federal requirements under NEPA to disclose and consider the cumulative impacts from all wastes proposed to be disposed in IDF, and that USDOE may not proceed with any action until there is an adequate EIS. Washington has demonstrated that the total amount of wastes from all USDOE proposals to add waste to IDF will exceed the acceptable "risk budget" for the IDF – resulting in violation of applicable health and groundwater protection standards.

The State Environmental Policy Act (SEPA) is even clearer than NEPA in requiring the cumulative impacts of all related proposals to be considered in an EIS when the actions will have a probable significant impact on health and the environment. Related proposals include the disposal of on-site and offsite Low-Level Waste – especially when those wastes may take up much of the available "risk budget" for the IDF landfill, which would greatly harm cleanup efforts by limiting future disposal of on-site wastes.

SEPA requires identification of enforceable mitigation measures in a DNS, if the agency decides that the project (with all related proposals) will have a probable significant impact absent mitigation (such as enforceable waste acceptance criteria for LLW and volume requirements, or barring offsite waste if the risk budget is close to being exceeded). The proposed DNS has nothing of this sort. Instead, it is an abdication of Ecology's responsibilities under SEPA and Washington's new Cleanup Priority Act.

The public has a right to review an adequate EIS on the entire project with a description of all proposed wastes and cumulative impacts. The public has a right to have all reasonable alternatives considered – which has never been done. USDOE violated these rights by failing to disclose key impacts and data in the HSWEIS, and failing to consider reasonable alternatives. Washington State is to be applauded for suing over this violation of NEPA.

However, Washington's residents have a right to have an EIS which meets SEPA requirements before Ecology grants USDOE a RCRA / HWMA permit for the IDF landfill. USDOE's failure to issue an adequate EIS for NEPA means that the EIS can not be relied upon to meet SEPA requirements. Ecology has acknowledged this. Thus, it is inexplicable that Ecology is insisting it can authorize construction on the basis of an inadequate SEPA checklist for a project which has massive significant and probable impacts. Ecology's claim that it can do so because the permit bars the addition of all but 3 waste types is disingenuous – since the permit allows construction of the entire landfill, while doing nothing to mitigate or control the millions of cubic feet of low-level waste which will go into the landfill on the other side of an artificial dividing line. (The landfill is one *integrated* landfill with one set of cumulative impacts. The dividing line between the MW and LLW sides is entirely artificial and illusory for purposes of considering the cumulative impacts of the entire landfill).

That "low-level waste" may include extremely radioactive "Remote-Handled" wastes which may contribute significantly to the total impacts. On their own, the Low-Level Wastes (LLW) may exceed the allowable "risk budget" for the IDF landfill – exceeding applicable standards. This problem is heightened due to the lack of independent regulation of USDOE's disposal practices, including

USDOE's history of giving itself "waivers" to allow disposal in Hanford's burial grounds of LLW which violates USDOE's own Waste Acceptance Criteria, and a documented history of illegally disposing of mixed wastes with LLW due to inadequate characterization, tracking and designation. While USDOE's Preferred Alternative in the Hanford Solid Waste Disposal EIS (Feb. 2004) was for import and disposal of 7 million cubic feet of LLW from other USDOE nuclear weapons and research sites, the size of the future planned units would allow millions of additional cubic feet of offsite LLW. Ecology has a duty under SEPA to consider the cumulative impacts of these proposals (7 million cubic feet and if the maximum planned disposal capacity of the landfill was utilized) before issuing any permit for the project which would allow construction without mitigating conditions that limit potential impacts.

Ecology has a duty under SEPA, for example, to consider limiting the size of the IDF to onsite wastes because of the probability that the landfill will exceed the acceptable risk budget even if limited to onsite wastes. Indeed, substantive state and federal laws impose a duty on Ecology to adopt such a mitigation measure. If Ecology adopted a "mitigated DNS", it might be able to say that there would no longer be probable significant impacts from the entire project – however, the impacts from onsite waste alone are so great that this one mitigation measure alone could not provide justification for not requiring an adequate EIS.

Ecology's Third Attempt to Issue a Determination of Non-Significance for this Landfill:

This is Ecology's third attempt to authorize construction of the IDF landfill without requiring an adequate environmental impact statement (EIS) considering the cumulative impacts from all wastes which will go into the IDF. Ecology has asserted that it is probable that the total amount of proposed wastes disposed in IDF will significantly impact groundwater and violate standards designed to protect human health. Pubic outcries forced Ecology to retreat from the prior two proposed determinations, and have led USDOE to revise its permit to not include offsite mixed wastes or secondary mixed wastes from vitrification of High-Level Wastes. However, this new proposed limitation of the permit only piecemeals consideration of impacts at a later date and avoids ever considering the cumulative impacts of the entire landfill – including low-level waste and offsite wastes – which are likely to dwarf on-site wastes. This would be the only state action required before construction went forward and the site made available for a national radioactive waste dump.

Ecology has never responded to comments on the prior proposals for a DNS, especially those noting the total inconsistency between WA State suing over the inadequacy of the USDOE's EIS and WA Ecology issuing a Determination of Non-Significance allowing the landfill to proceed to handle low-level radioactive waste from all over the nation.

We have previously urged Ecology to mail notice of this proposed DNS and permit to all members of the public and organizations who commented on the Hanford Solid Waste EIS, especially those who commented on the proposed IDF landfill and use of Hanford as a national radioactive and toxic waste dump. Ecology has failed to meet its basic public notice and comment requirements in this process, by failing to mail notice to all interested persons. Ecology failed to provide adequate mailed notice to all persons on the Hanford TPA interested persons and meetings lists – much less all those who commented on the HSWEIS. Ecology purports to adopt portions of the HSWEIS for SEPA purposes, which makes it incumbent on Ecology to provide notice to everyone who attended hearings and commented on the HSWEIS. This list is readily available to Ecology. The notice must be withdrawn and reissued for public comment.

All comments received on the prior proposals for a DNS and permit for the IDF landfill should be part of this record and responded to – since they have never been responded to by Ecology, and the commentors may not have received notice of this proposed action.

Background on the IDF Landfill Relating to the SEPA DNS and Permit:

In the Hanford Solid Waste Disposal Environmental Impact Statement (HSWEIS), the U.S. Department of Energy (USDOE) proposed to use Hanford as a national radioactive and toxic waste dump for over 12 million cubic feet of waste from other nuclear weapons plants through the year 2046.

Thousands of people submitted comments on the first Draft EIS opposing this scheme, calling for an end to USDOE dumping radioactive waste in unlined soil trenches at Hanford, and calling for the draft to be withdrawn as inadequate due to failure to consider the cumulative impacts of adding these wastes to Hanford's soil on top of existing contamination. USDOE was forced to withdraw and revise the EIS. The revision also considered use of a new landfill with liners for all on-site and offsite wastes to be disposed at Hanford through the year 2046, which USDOE said would meet a mission it had adopted to use the Hanford site as a national radioactive and mixed radioactive and hazardous waste ("Mixed Waste") dump.

Despite thousands of additional comments calling the analyses inadequate and opposing USDOE's plans, USDOE issued a Final HSWEIS in February 2004 with a "preferred alternative" of using a new landfill in Hanford's 200 East Area to dispose of over 12.7 million cubic feet of low-level and mixed waste from other nuclear weapons complex sites, in addition to onsite wastes.

In June, 2004, USDOE issued a Record of Decision (RoD), based on that EIS, to open the "Integrated Disposal Facility" (IDF) landfill at Hanford for on-site and offsite wastes, with the initial decision (subject to future changes) to use the landfill for 3 million cubic feet of offsite waste – and to ship over 460,000 cubic feet of offsite waste to Hanford for disposal in the new IDF landfill by the end of 2007, when the landfill would be operational.

In 2003, Heart of America Northwest with other citizen groups, and joined by Washington State, filed suit to stop USDOE from trucking highly radioactive Plutonium wastes (called Remote-Handled Transuranic Wastes, or "TRU") to Hanford without any consideration of the environmental and health risks in an environmental impact statement. In May, 2003, the US District Court for Eastern WA agreed that import of these wastes had probable significant impacts to health and the environment and the Court enjoined USDOE from importing these wastes to Hanford without considering the impact of these shipments and the cumulative impacts of related plans toad waste to Hanford in the HSWEIS.

Washington State then challenged USDOE's Final Hanford Solid Waste Disposal EIS (HSWEIS) and the Record of Decision issued in June, 2004 as being legally inadequate for failing to consider the cumulative impacts from both the offsite wastes which would be added to Hanford in the proposed IDF landfill, and the on-site "secondary" wastes proposed to go into the landfill from following treatment of waste retrieved from Hanford's High-Level Nuclear Waste Tanks.

Simply put, Washington State has shown that USDOE failed to consider the cumulative impacts from adding massive amounts of offsite waste and the secondary wastes from treatment of High-Level Nuclear Wastes to this new IDF landfill. If all proposed wastes were to go into the landfill, Washington State has shown that USDOE's own documents (many of which USDOE failed to consider in the HSWEIS) reveal that groundwater would be contaminated from the IDF landfill – and that this contamination would be significant, and would adversely affect human health for future generations potentially exposed to the site's contamination.

The significant potential impacts from ALL wastes proposed by USDOE to be disposed in the IDF landfill are required to be considered by Washington Ecology under Washington's State Environmental Policy Act (SEPA) – even if USDOE failed to adequately consider them in USDOE's HSWEIS under the National Environmental Policy Act (NEPA).

Yet, despite having conclusive evidence that the SEPA requirements for consideration of the cumulative impacts from all related proposals for disposal of wastes in the IDF landfill have never been met, Washington Ecology has issued a proposed "Determination of Non-Significance" for the IDF Landfill – allowing Ecology to issue the only permit needed by USDOE to construct and operate

the entire landfill, including construction and operation of portions of the landfill which USDOE says may be used for 7 million cubic feet of poorly defined offsite radioactive waste.

USDOE Made False Statements in its Prior Application in Regard to the Potential to Contaminate Groundwater, Repeated and Relied Upon in Current Application and SEPA Checklist:

USDOE has already acknowledged in other documents that the massive landfill will cause significant groundwater contamination; and, that the cumulative impacts of the proposed additions to the soil, in combination with the wastes already disposed in the soil, will cause groundwater standards to be exceeded. Future releases that cause significant impacts arise from disposal of various wastes from the High-Level Nuclear Waste Tanks, High-Level Waste Vitrification melters, and maximum volumes of offsite waste .

However, in the first application for siting the Integrated Disposal Facility, USDOE stated that: "The low-level waste and mixed low-level waste that will be disposed/stored are not expected to result in increase of potential for release of mixed waste to the groundwater ...compared to existing conditions or to state or federal groundwater protection requirements." (IDF Application at 5; Sec. 2.5.1.3.2.3). This is demonstrably false.

USDOE has repeatedly acknowledged that various alternatives it is currently considering for wastes from the Hanford High-level Nuclear Waste Tanks (ILAW) may all violate standards – without considering the cumulative impacts. Furthermore, Ecology is required to consider the cumulative impacts on groundwater in its review of this application. USDOE has admitted that the cumulative impacts are significant, will violate standards, and will result in an "irreversible and irretrievable commitment" of the State's groundwater resource.

The initial IDF application also falsely certified that the "Justification of Need" for the facility is "to support Tri-Party agreement milestones by providing a means to dispose of low-level and mixed low-level waste on the Hanford facility." (sic, IDF Application, Sec. 4.0; Page 8).

The facility, however, is sized to meet the combined totals of all "Upper Bound" volume alternatives for additional wastes revealed in the Draft and Revised Draft HSEIS, including offsite wastes. The facility's total volume of 900,000 cubic meters exceeds the maximum volume of all potential wastes (from on-site and offsite) to be disposed in landfills on site considered in each "Upper Bound" alternative in the revised Draft HSWEIS.

Further evidence that USDOE does not intend to limit the use of the facility to onsite wastes generated by cleanup pursuant to the TPA or RCRA (or RCW 70.105) actions, is the fact that proposals for dangerous waste facilities to serve on-site cleanup needs are not required to submit an application for consistency with the State's Siting Criteria for Dangerous Waste Facilities. WAC 173-303-282 specifically states that the requirement to demonstrate compliance with siting criteria is not applicable to facilities for wastes from on-site cleanup.[11]

Ecology has not held USDOE accountable for these false statements and claims. Instead, Ecology proceeded to allow siting and initial construction of the IDF landfill's first two massive units to proceed. When the underlying documents and notices to the public include false statements, Ecology has a duty to ensure new notice cures these falsehoods and that the applicant is held accountable. Instead, USDOE has been rewarded by Ecology.

Ecology's Current Notice Was Legally Inadequate, and Continued the Prior Failures to Disclose that the IDF Is Planned for 12.7 Million Cubic Feet of Offsite Waste:

Ecology's notice for the current permit application and SEPA Determination continues with the inadequate notice to the public that the IDF landfill will be used for the controversial disposal of offsite waste – in violation of both State and federal policies against adding more waste to a

contaminated site and policies against adding offsite wastes where the cumulative impacts from disposal are likely to increase cumulative impacts to groundwater and health from the site.

The current Notice (May, 2005) acknowledges that LLW may be disposed in IDF, but fails to provide any notice to the public of the controversial use of IDF for offsite waste. As described in these comments, USDOE has formally adopted a plan to use IDF for 12.7 million cubic feet (360,000 m3) of offsite waste, of which over 7 million cubic feet will be offsite LLW (and will include extremely radioactive LLW, including Remote Handled LLW and waste which is reclassified from High-Level Nuclear Waste). Yet, Ecology's notice merely states:

> "Low-level radioactive wastes (typically gloves, tools, etc. that are contaminated with radionuclides) may also be disposed in this facility. Ecology does not have permitting authority over low-level radioactive waste."[12]

This notice is legally inadequate, and deliberately misleading. The SEPA DNS and Permit must be withdrawn and reissued with proper notice. As described herein, the issuance of a DNS is not appropriate since there is no mitigation of known probable, significant impacts from the full formal plan of the project applicant (USDOE). Inadequacies of the notice requiring mailing of notice to all interested persons include:

- Failure to provide notice that the project will be used for offsite waste;
- Failure of the SEPA Checklist and Notice to disclose the quantities of offsite waste proposed (in a formal plan) to be disposed in IDF;
- Failure to provide public notice that use of the IDF for offsite waste as proposed by the applicant will conflict with state and federal policies on disposal of offsite waste at Superfund and mixed waste contamination sites such as Hanford;
- Failure to provide the public with notice, and failure to disclose in the SEPA checklist, that Ecology has already determined that the full project as proposed will have significant probable impacts to health and the environment;
- Failure to notify the public and disclose in the SEPA checklist the existence of formal plans to use the IDF landfill for extremely radioactive LLW and mixed wastes, and that the extremely radioactive LLW may be disposed before there is any adequate consideration of the cumulative impacts of the entire landfill, if the permit is granted;
    - The representation in the notice that the LLW disposed in the facility will "typically" be akin to gloves is false and without any basis in the record; and, it fails to disclose known plans to dispose of LLW with extremely high levels of radioactivity, including reprocessing wastes, reactor and processing components, etc…
- Failure to mail notice to all persons known by Ecology to be interested in the project – in violation of Ecology's rules.
    - Ecology has a duty to mail notice of the IDF SEPA Determination and Permit to all persons who commented on the IDF landfill and related proposals for import of waste to Hanford under USDOE's Draft and Revised Draft Hanford Solid Waste Environmental Impact Statement. Ecology was consulted and a cooperating agency for that EIS, and Ecology had notice of the interest by thousands of individuals, organizations, members of Congress, Tribes and agencies who commented on the IDF landfill and related plans in the HSWEIS.
    - *Ecology's notice distribution for the IDF landfill was pathetic* – especially after we objected to the lack of notice given in the prior two attempts to adopt a SEPA Determination of Non-Significance and, we repeatedly urged Ecology to mail to all the commentors on the IDF and related issues in the HSWEIS process. The failure to provide meaningful notice of the true character of the proposal , or even the size of the facility violated the public's rights to meaningful notice intended to provide a reasonably interested person with notice of the full scope of the project and known issues relating to potential impacts.

- Ecology's notice was legally inadequate by failing to identify that the proposed project is not solely for on-site cleanup wastes, but includes 12.7 million cubic feet of offsite waste. Ecology has misled the public by providing notice which was designed to appear that the IDF is solely for on-site cleanup wastes. This repeats the same intolerable notices that we objected to in December, 2003 and September, 2004.
  - There is not one word in the notice or the SEPA Checklist revealing that the proposed formal plan of the applicant is to use the facility for offsite waste.

- Adding insult to injury, and making it nearly impossible to comment on the Draft Permit and application, ***the full Draft RCRA permit and the permit application can only be reviewed in the libraries, presumably for security reasons.***
- ***There is inadequate documentation on the design, construction specifications and quality assurance for the IDF.*** This information, vital for informed review, is simply unavailable. The lack of availability violates Ecology's SEPA and permit rules.
  - *There are no engineering justification reports or design configuration report similar to that of Envirocare* (2001b). Part of the reason for this is that much of this documentation was prepared for the previously separate disposal facilities that were integrated in the creation of the IDF. Documentation of technical requirements and system specifications and the performance assessment for ILAW waste, for instance, are referenced in the Draft RCRA permit because they are applicable to the IDF. A conceptual design report for the ILAW waste (RPP-7908) is referenced in the IDF permit but *was not available for review*.
  - *SEPA requires that referenced documents be available for review.*

Ecology has failed in its fundamental duties to the public by failing to provide notice of the full plan for IDF, failing to provide notice to all interested persons, and falsely mischaracterizing the nature of LLW which will be disposed in the IDF. These failures come after the Hanford Public Interest Network organizations and Heart of America Northwest repeatedly objected to similar inadequacies in Ecology's two prior notices for the IDF SEPA Determinations. The notice must be withdrawn and reissued in a manner that provides the interested public with meaningful notice (including mailing to all interested persons). **Ecology is required to reject the application of USDOE for Siting of the Landfill and to reject the SEPA Checklist submitted by USDOE:**

An EIS is required for all projects having a probable significant impact on human health and the environment (under both the National Environmental Policy Act, which applies to USDOE, and the State Environmental Policy Act, RCW Chapter 43.21C).

USDOE has previously and repeatedly acknowledged that the import of 12.7 million cubic feet of waste for burial at Hanford requires an EIS, and that a decision to open a new landfill that would double the amount of radioactive waste in Hanford's soil requires an EIS. Where USDOE has attempted to evade this requirement, federal courts have agreed with Washington State and citizen groups that an EIS is required before waste can be imported to Hanford for burial. USDOE has also acknowledged that it is required to prepare an EIS on its proposal to landfill dispose of unvitrified wastes from Hanford's High-Level Nuclear Waste Tanks (and vitrified wastes as well).

Washington State acknowledges that the Hanford Solid Waste Disposal EIS is legally inadequate in regard to the cumulative impacts from the IDF landfill (offsite wastes and secondary wastes from vitrification of High-Level Wastes are key components of these cumulative impacts) and the Hanford Tank Waste Closure and Supplemental EIS has not been issued, which USDOE says will consider the impacts from disposal of secondary wastes in IDF.

Therefore, there has been no consideration of either the cumulative impacts or the impacts from key components of the existing plan for IDF. However, many of those impacts may occur before either the USDOE issues its Tank Closure EIS or there is any further consideration of cumulative impacts if the IDF proceeds under the proposed permit – since large quantities of offsite waste will be disposed in the LLW cell before such consideration (and USDOE may import MW, and store the imported MW expecting disposal, since the permit does not specify that offsite Mixed waste is barred due to the impacts of adding such wastes to the cumulative impacts of the facility).

In numerous documents, USDOE has admitted that the proposed disposal of unvitrified waste from Hanford's High-Level Nuclear Waste Tanks will have significant impacts on groundwater, and potentially, the Columbia River. In documents describing the alternatives to vitrification that it is considering, ORP acknowledges that several of the alternatives are likely to cause violation of groundwater standards.

USDOE cannot proceed with any state approval for this massive landfill on the basis of a SEPA checklist, rather than an adequate EIS. A SEPA checklist is a tool for making the threshold determination of whether a project may have probable significant impacts. This landfill has already been determined to have such impacts, and the transport of waste to the landfill has also been found to have significant impacts.

Pursuant to RCW Chapter 43.21C and WAC 173-802-110, the Washington Department of Ecology must reject the SEPA checklist and deny the applicant approval of its proposed permit. WAC 173-802-110 explicitly applies to decisions to provide any form of approval for a project, in addition to granting of final permits. The criteria for rejecting this application is clearly spelled out in the Washington Administrative Code, since: a) the applicant has acknowledged in other documents that the project will have significant impacts; b) Washington Ecology has issued formal comments detailing probable significant impacts from this proposal; and, c) USDOE has failed to provide any plan that would mitigate those impacts so as to render them not significant.

Ecology has a duty to: "Deny the permit or approval for a proposal if reasonable mitigation measures are insufficient to mitigate significant adverse environmental impacts and the proposal is inconsistent with the policies in subsection (1) of this section." WAC 173-802-110(2)(b)(ii). For this landfill and the proposal to import waste, for which the landfill is designed, Washington State and Ecology have already issued formal comments and taken formal positions that the fundamental and inalienable right to a healthful environment will be impacted by the full plan and project; and, that USDOE has failed to provide detailed mitigation plans (i.e., fails to limit offsite waste, fails to limit total contamination below MTCA and other standards when all waste types are considered, failure to

set waste acceptance criteria for the entire landfill which are enforceable and include total Iodine 129, Technetium 99, and other contaminant of concern limits). Thus, pursuant to the authority of the Department under the State Environmental Policy Act, the Department must reject both the SEPA checklist and the permit application.

Washington State Has Had Notice of USDOE's Proposal to Use the IDF Landfill

For West Valley Site Waste, Including High-Level Nuclear Wastes, Which USDOE Proposes to Reclassify for Disposal in IDF.

Ecology Violated SEPA, Cleanup Priority Act and Other Notice Provisions by Failing to Provide Public Notice of this Proposed Use of the IDF Landfill

Washington State has had notice from the USDOE of its proposal to import MW, LLW, TRU and High-Level Nuclear Waste to Hanford, and to use the IDF landfill for disposal of each of these (except TRU, which USDOE says it would store, rather than dispose). USDOE proposes to reclassify certain unvitrified, extremely radioactive High-Level Nuclear Wastes remaining at West Valley as "wastes incidental to reprocessing" ("incidental wastes") so that these wastes may be disposed at Hanford. USDOE has now (June 16, 2005) formally adopted its "preferred alternative" to reclassify these High-Level Wastes and pursue their disposal at Hanford, along with LLW and MW.[13] Likewise, USDOE has formally adopted its proposal to seek to "store" Remote-Handled and other TRU wastes at Hanford.[14]

These TRU wastes are not acceptable at the WIPP Repository for TRU wastes in New Mexico, due to statutory restrictions. Thus, if USDOE chooses to send them to Hanford, as USDOE now asserts it has both NEPA coverage and a formal record of Decision allowing it to pursue, these TRU wastes will likely never leave Hanford and are likely to be either disposed or "stored" in the LLW portion of the IDF landfill. [15]

The reprocessing wastes at West Valley include extremely high activity wastes, and wastes with similar iodine and technetium components as those reprocessed Hanford High-Level Nuclear Wastes for which Washington State has objected to disposal in IDF.

USDOE should have disclosed and considered the cumulative impacts of all proposals for disposal of wastes in IDF, including West Valley wastes, in the Hanford Sold Waste Disposal EIS. Because that EIS is legally inadequate, it can not be adopted for SEPA purposes by Washington Ecology.

Therefore, before Washington Ecology can issue any permit which allows construction of the full IDF landfill to proceed and be operated, Ecology must consider the cumulative impacts from all related proposals – which include the formal proposal to use IDF for West Valley wastes. To do so, Ecology must either have precluded disposal of offsite wastes and any unanalyzed wastes which may lead to violation of MTCA and other standards, or issue a SEPA complaint EIS.

Furthermore, under SEPA and Washington Ecology's rules, Ecology had a duty to disclose in its notice the existence of USDOE's proposal to use the IDF landfill for West Valley wastes, along with other USDOE proposals – which Washington State has previously acknowledged to have significant probable environmental and health impacts.

Since Washington State has adopted a policy opposing USDOE's unilateral reclassification of High-Level Wastes for near surface disposal (i.e., in a landfill), Ecology had a duty to disclose and consider that the IDF landfill is proposed for disposal of such wastes.[16] The failure to consider the impacts of reclassification – in violation of the policies adopted by Governor Gregoire, and prior adopted policies of Ecology – is a failure to disclose and consider impacts of a major policy proposal and action which can only occur if Ecology permits the IDF landfill. Further, the nature of the wastes from West Valley gives rise to the same type of concerns that Ecology has raised over near surface / IDF disposal of similar Hanford High-Level Nuclear Wastes, which USDOE has proposed to reclassify, and to the same types of concerns regarding assumptions relating to the iodine and technetium content of reprocessed wastes which Washington has raised in objection to USDOE's Hanford Solid Waste Disposal EIS.

As early as 1999, USDOE's own analysts and Pacific Northwest National Laboratory concluded that vitrification of liquid High-Level Nuclear Wastes from reprocessing was unlikely to capture 95% of the Iodine 129 and much of the Technetium and numerous volatile contaminants of concern. These high risk contaminants would then end up in secondary waste streams sent to Hanford's landfills. However, the HSWEIS failed to disclose the existence of these studies and

arbitrarily and capriciously assumed that 95% of the Iodine 129 would be captured in the vitrified High-Level Waste, rather than disposed of in the IDF landfill. This was significant because it was determined that the Iodine 129 was a bounding contaminant – its presence in larger quantities would cause groundwater contamination in excess of the standards which USDOE was applying to the landfill (which, as we discuss elsewhere, are inappropriately loose and not protective standards – USDOE applies standards to the IDF landfill LLW section which are at least 25 times less protective than required to be considered under WA law). WA State discovered that USDOE's contractors for the High-Level Waste Tank Closure EIS (pending) had concluded that 95% of the Iodine would not be entrained in vitrified waste and that this would create a contaminant of concern for the IDF landfill. Therefore, WA has refused to acknowledge that the HSWEIS is adequate due to failure to consider the impacts of disposal of these secondary wastes in IDF.

USDOE admitted in 1999 that Iodine would not be captured in the vitrified waste, and would end up buried in Hanford's soil. The wastes with the Iodine from the High-Level Waste Taks is now proposed to end up primarily in IDF. However, USDOE failed to disclose in the HSWEIS:

> *"The volatile character of iodine implies it will not be captured in a vitrified high-level waste and subsequently exported from the Hanford Site."*[17]

The failure to consider the impacts of Iodine and other contaminants from Hanford's High-Level Waste reprocessing is directly relevant to the failure of USDOE (and now, Ecology under SEPA) to disclose and consider the cumulative impacts from disposal of reprocessed High-Level Wastes from West Valley. There is no record to indicate that the Iodine, Technetium, volatile and other contaminants of concern are not also present in the same manner in West Valley High-level Wastes, and the wastes left over from vitrification, which USDOE now proposes to reclassify as "incidental" for disposal at IDF.

It is a violation of SEPA to permit the IDF landfill, since this permit would allow the operation and receipt of the West Valley and untold other LLW wastes without adequate consideration of the cumulative or waste stream specific impacts. There is no mitigation proposed in the SEPA Determination, nor in the proposed permit, which would avoid the unconsidered impacts of adding offsite LLW from West Valley to the IDF landfill, including High-Level Nuclear Wastes renamed by USDOE as "incidental" wastes. These LLW alone might consume the available risk budget, or a significant portion of that risk budget, preventing use of the landfill for on-site cleanup wastes. It is the policy of the State of Washington that the cleanup of on-site wastes should not be hindered or made more difficult by the addition of offsite wastes.

The Proposed Permit and SEPA Determination of Non-Significance Violate Provisions and Policies of the Cleanup Priority Act:

Ecology Has Also Failed to Meet SEPA Requirements to Consider the Impacts of Violating the Federal Offsite Waste Rule as Well as Parallel State Policies:

The Cleanup Priority Act, RCW Chapter 70.105E, has express requirements for Ecology to consider impacts and standards for SEPA Determinations, risk assessments and permit decisions relating to new mixed waste landfills and landfills at facilities with illicit unlined mixed waste landfills which are contaminating (or threatening to contaminate) the environment. Amongst the most relevant of these standards, is the requirement that Ecology expressly consider whether risk assessments for a proposed mixed waste landfill (or landfill at a mixed waste site with ongoing non-compliance) show that the landfill will not violate the cleanup standards under the Model Toxics Control Act (MTCA, RCW Chapter 70.105D). There is no record of Ecology considering these standards and requirements in making its SEPA Determination, and Ecology staff have acknowledged that these standards were not considered in either the SEPA review or the permitting of the IDF landfill.

Due to failure to consider the specific standards and impacts referenced in the Cleanup Priority Act, the SEPA Determination is arbitrary, capricious and violates applicable standards under both SEPA and the Cleanup Priority Act (CPA).

How Ecology could ignore the new Cleanup Priority Act provisions – adopted by Washington's voters with the largest vote in the history of Washington State – is something that Ecology management must answer to the public. The public has repeatedly raised the concern that USDOE failed to consider MTCA standards in the Hanford Solid Waste Disposal EIS, and that this was one of the serious inadequacies of that NEPA document (which, therefore, precludes reliance upon the HSWEIS for SEPA purposes).

SEPA requires that all relevant standards be considered in determining if a proposed project may have a probable significant impact on human health or the environment, even if those standards are not directly enforceable at the moment, or applicable by Ecology. There is no doubt that the Cleanup Priority Act has standards, including a requirement to utilize MTCA's standards, which Ecology is legally required to consider in determining if a permit for a mixed waste landfill at Hanford has probable significant impacts. Violation of a relevant standard, or levels of contamination which approach the limits of a relevant standard designed to protect human health, is a per se significant impact under both NEPA and SEPA. Ecology had a pre-existing duty (prior to passage of the Cleanup Priority Act) under SEPA to consider these same standards (e.g., the MTCA standards) in SEPA Determinations for a landfill at a mixed waste facility with ongoing releases and non-compliance for existing mixed and hazardous wastes. Thus, even if a court injunction against enforcement at Hanford of the Cleanup Priority Act were to extend to Ecology's internal consideration of CPA standards in making its SEPA Determination, Ecology had a duty to consider the pre-existing standards under MTCA for the IDF landfill and SEPA Determination. The Cleanup Priority Act repeated in statute the existing duty and authority of Ecology to consider whether MTCA standards would be violated by a landfill. Further, the federal court injunction against the enforcement of the Cleanup Priority Act pending determination of the challenge to the Act does not extend to preclude Ecology from considering all relevant standards under SEPA (which even includes standards that Ecology does not enforce).

The Cleanup Priority Act adopts in statute the State policy that Cleanup is the top priority for sites with contamination that threatens waterways and health. Therefore, consistent with this new policy, I-297 bars adding more waste to such sites if they are not in compliance with applicable standards. Adding more waste detracts from cleanup – which Washington State has asserted in federal court already. This policy is what the courts must consider when interpreting the initiative.

SEPA requires that Ecology consider whether actions which will occur as a result of granting the permit for the proposed project will violate either the policies established in the Cleanup Priority Act, pre-existing policies against adding more waste to Hanford until existing contamination is cleaned up, and consistency with the federal Superfund policy and provisions barring the addition of offsite wastes to contaminated Superfund sites such as Hanford. USDOE has failed to ever consider either these State policies or the federal policy, known as the Superfund Offsite Waste Rule, 42 USC 9621(d)(3). EPA summarizes this policy in its fact sheet and the preamble to the rule implementing the statute as follows:

> "Section 121(d)(3) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) applies to any CERCLA response action involving the off-site transfer of any hazardous substance, pollutant or contaminant (CERCLA wastes). That section requires that CERCLA wastes may only be placed in a facility operating in compliance with the Resource Conservation and Recovery Act (RCRA) or other applicable Federal or State requirements. That section further prohibits the transfer of CERCLA wastes to a land disposal facility that is releasing contaminants into the environment, and requires that any releases from other waste management units must be controlled. These principles are interpreted in the Off-Site Rule (OSR), set forth in the National Contingency Plan (NCP), at 40 CFR 300.440. The purpose of the OSR is to avoid having CERCLA wastes from response actions authorized or funded under CERCLA contribute to present or future environmental problems by directing these wastes to management units determined to be environmentally sound (preamble to final OSR, 58 FR 49200, 49201, Sept. 22, 1993)."

The policy of ensuring that a landfill at a Superfund site does not "contribute to present or future environmental problems" at that site by adding offsite wastes is one which USDOE was required (but failed) to consider in both its Waste Management Programmatic EIS and the Hanford Solid Waste Disposal EIS. Since it was not considered adequately in any other environmental review, Ecology is legally bound to consider the impacts of violation of this policy in an environmental impact statement for the IDF landfill, since there is no dispute that the proposed permit and related actions will enable USDOE to add large quantities of offsite waste to the IDF landfill. A permit condition which limits offsite mixed waste is not adequate under SEPA, when there is no consideration of the cumulative impacts and whether the addition of offsite LLW wastes will preclude use of the landfill for all necessary MW from cleanup.[18]

RCW 70.105E.020(6) establishes a clear state policy requiring that Ecology consider whether the IDF landfill – including both the LLW and MW proposed to be dumped in the IDF landfill, and considering both on-site and offsite wastes proposed to be disposed in the IDF landfill – *will violate the standards for human health and the environment in the Model Toxics Control Act (MTCA, RCW 70.105D*). The voters clearly included this requirement as a backstop in state law for mixed waste sites due to fear that Ecology was not, or would not, consider and enforce existing rules and standards in making decisions at Hanford when faced with opposition from the USDOE. Amongst the rules and standards which USDOE opposes application to Hanford (and which USDOE refused to consider in the HSWEIS in reference to the IDF landfill) are the standards in MTCA requiring that all carcinogens from a site which releases, or threatens to release, contamination to the environment not have a total cumulative impact exceeding more than one additional cancer for every one hundred thousand exposed persons. Under MTCA, all carcinogens includes radionuclides. However, while USDOE has failed to consider whether this standard would be violated by release from IDF in the future, MTCA, SEPA and the new Cleanup Priority Act require that Ecology consider whether these MTCA standards may be violated by the IDF landfill. This is a substantive requirement for permitting of the IDF under the CPA, and is a procedural and substantive requirement under SEPA which must be undertaken at this time. Issuance of a Determination of Non-Significance under SEPA does not comport with the duties for Ecology to disclose these impacts for public review and comment in an environmental impact statement.

The sole health risk standard utilized in USDOE's Performance Assessment for the IDF Low-Level Waste Disposal Units is USDOE's own self-regulatory standard of an allowable dose of 25 millirem per year from projected releases and 100 millirem per year (100 mr/yr) to potentially exposed individuals due to intrusion or failure of institutional controls.[19]

100 mr/yr translates to a fatal cancer risk of approximately 20 fatal cancers for every 10,000 exposed adults at a Superfund Site, under NRC and EPA calculations for risk assessments at Superfund sites and closure of licensed facilities. That is a risk of 2 fatal cancers for every one thousand exposed adults.

MTCA requires cleanup if the total risk from all carcinogens released from a site exceeds one in one hundred thousand.

The USDOE calculation is for exposed adults. EPA estimates that the risk of cancer in children is three to ten times greater than for adults for the same dose. [20]

EPA has found that a 25 millirem dose from contamination at a Superfund Site is "not protective of human health."[21]

Washington State's policy is designed to avoid creating new MTCA or Superfund cleanup sites when making permitting decisions for new landfills. If cumulative impacts from the new landfill may exceed MTCA standards, then the landfill is only creating a new cleanup site for our children – and, a per se significant impact under SEPA.

If the IDF landfill is to remain within MTCA standards, it can not have LLW units which comprise 50% of its capacity and which are analyzed only in regard to whether they result in a dose of 100 mr/yr, in the likely event that institutional controls will fail. That standard is "not protective of human health", and so far outside the bounds of the Washington State MTCA standard as to create a likelihood that disposal in the LLW portion of the landfill will consume all available disposal capacity from a risk budget. Ecology has a legal duty to consider the cumulative impacts of all wastes proposed to be disposed in IDF and whether the cumulative impacts may exceed the relevant MTCA standards.

Ecology has failed to consider and apply the specific standards of the Cleanup Priority Act which require consideration of the cumulative carcinogen exposures from a new landfill in reviewing environmental impact statements, conducting or reviewing performance and risk assessments for new landfills such as the IDF, and in performing its own SEPA analyses for new landfills:

> (2) The department shall include all known or suspected human carcinogens, including radionuclides and radioactive substances, in calculating the applicable clean-up standard, corrective action level, ***or maximum allowable projected release from a landfill or other facility or unit at which mixed wastes are stored, disposed***, or are reasonably believed by the department to be present, for purposes of chapter 70.105 RCW, this chapter, or chapter 70.105D RCW. ***In making any permit decision pursuant to chapter 70.105 RCW*** or this chapter, ***or in reviewing the adequacy of any environmental document*** prepared by another state, local, or federal agency, relating to mixed waste sites or facilities, ***the department shall ensure that the cumulative risk from all such carcinogens does not exceed the maximum acceptable carcinogen risk established by the department for purposes of determining clean-up standards pursuant to RCW 70.105D.030, or one additional cancer caused from exposure to all potential releases of hazardous substances at the site per one hundred thousand exposed individuals, whichever is more protective***.
>
> RCW 70.105E.050(2). Emphases Added.

Ecology has not ensured that cumulative risks from all carcinogens which may be released from the IDF landfill will not exceed the MTCA standards.[22] In fact, the proposed permit fails to: a) mention MTCA standards; b) establish permit conditions which specify that the cumulative carcinogen risks, including all radionuclides and other carcinogens, will not be allowed to exceed a

total carcinogen risk of one in one hundred thousand. This permit condition must be applied to the entire landfill, and can not be deferred to insertion if future amendments create a likelihood of exceeding the limits. Limits and waste acceptance criteria must be established in the permit at this time to ensure that the relevant total carcinogen standards are not violated – and these waste acceptance criteria and limits must apply to all wastes disposed in the landfill.

Ecology has full jurisdiction over any landfill in which hazardous wastes are disposed (including mixed wastes), even if the landfill also is used for solid wastes or other materials. IF the total cumulative impacts of all materials threatens to violate standards, then via SEPA mitigation measures and permit conditions, Ecology has a duty to restrict waste acceptance and set limits on the total quantities of wastes that may be accepted to ensure that the total "load" or "budget" for the facility is not violated. This principle applies to IDF and the 50% of its disposal capacity set aside for LLW. All releases from the LLW units will be hazardous constituents under the federal Superfund law and MTCA, requiring cleanup. Therefore, disposal in a mixed waste landfill is subject to cumulative impact assessments and limitations established by Ecology.

Ecology has:

- failed to perform the cumulative impact analysis for carcinogens required by RCW 70.105E.050(2) (which the public is entitled to see and comment upon in an environmental impact statement),
- failed to consider the policies relevant to the IDF landfill and acceptance of offsite waste under its SEPA mandate, and
- failed to consider in its SEPA Determination whether the cumulative impacts from the entire landfill will have a per se significant environmental and human health impact by creating a significant likelihood that the landfill will result in releases which approach or exceed MTCA standards.

Ecology has a Duty to Consider and Disclose the Probable, Significant Impacts From Transporting Waste to the IDF Landfill:

"If you build it, they will come."

This principle is crucial for any decision to build landfill capacity – just as it is recognized under SEPA to apply to highways (if you build new capacity, the probable significant impacts which must be considered include the pollution and growth associated with attracting users of the new capacity).

USDOE has a formally adopted plan to dispose of 12.7 million cubic feet of offsite waste in IDF. This plan and proposal must be considered in Ecology's SEPA Determination for the IDF landfill permit. Consideration of the full plan can not be deferred by Ecology until some point in the future after USDOE has begun implementing the plan, because the waste will start coming to Hanford long before Ecology has ever considered the impacts of the full plan, unless Ecology considers them now.

IDF is designed for a capacity of 450,000 cubic meters of LLW and 450,000 cubic meters of MW. This far exceeds all projections of on-site waste requiring disposal from Hanford Clean-Up.

The duty to consider the impacts of the full plan are not erased by having a plan to phase construction, with the first East and West units having capacity of 180,000 cubic meters. SEPA requires that the entire project be evaluated at the time of the first state action which will allow the entire project to proceed. Indeed, in this instance, this becomes of the utmost importance because USDOE has formally stated that it intends to have imported and immediately use 13,000 cubic meters of capacity for offsite waste when the IDF landfill opens. This illustrates how a significant portion of the capacity may be devoted to offsite waste before the impacts of such use have ever been considered by Washington State and disclosed adequately to the public for comment.

The fact that the initial cell's capacity is less than the total amount of on-site waste which will be generated from cleanup and requiring disposal over the next twenty years does not eliminate the need to disclose and consider the impacts of using the capacity of the landfill for offsite waste – unless Ecology adopts conditions in the permit barring all offsite waste from the landfill.

Ecology can, and should, adopt conditions barring all offsite waste from the IDF landfill, and limiting its future expansion to either: a) on-site wastes disclosed and considered in the HSWEIS; or b) the total quantity of waste which (with a reasonable cushion for error) will not result in any release (including in event of failure of institutional controls or intrusion) and exposure exceeding 75% of any standard, including specifically MTCA standards for carcinogen exposure.

Significant, probable impacts from the current proposed decision to permit IDF, with a plan for use of half of the IDF capacity available for offsite waste (the LLW side) and no specific bar against adding offsite waste in the future for the MW side (in violation of the mandate of the Cleanup Priority Act), include:

- USDOE's plan to import and use IDF for disposal of 70,000 truckloads of waste[23] pursuant to USDOE's Preferred Alternative in the HSWEIS[24]
    - 70,000 truckloads is a conservative estimate of the number of trucks USDOE would use to ship 12.7 million cubic feet of radioactive and "mixed" radioactive and toxic chemical waste to be dumped at Hanford – the quantity disclosed in 2004 as USDOE's "preferred alternative" in the Final Hanford Solid Waste Disposal Environmental Impact Statement (Final HSWEIS).[25]
- The risks from "incident free transport" of the waste in the HSWEIS "Preferred Alternative" (relying on the IDF landfill for disposal capacity for these wastes) was estimated by USDOE to be nine adult cancer fatalities.
- The risks to children along the transport routes for shipment of waste to be disposed in IDF (or 'stored'), especially in Washington and Oregon, have never been considered by USDOE

– and, never considered by Ecology. Ecology has a formal duty under SEPA to consider the risks to children from the impacts which will occur as a direct result of permitting IDF without limitation to on-site wastes. ***Total fatal cancers, including children, were independently estimated to be 60 from shipping the quantities of waste to Hanford*** in the Preferred Alternative. Ecology has been provided this independent analysis by Dr. Marvin Resnikoff. [26]

- US DOE has already attempted to truck RH-TRU wastes off interstate highways in Oregon along secondary roads that go directly past schools and community centers.[27] Ecology must consider the potential impacts from exposure due to trucks leaving the interstate highway and increasing exposure and risks in communities, and to children, which USDOE impermissibly ignored. RH-LLW shipments are proposed by USDOE for disposal in IDF, posing the same risks of radiation exposure along the routes as is posed by RH-TRU.

- In the event of reasonably foreseeable accidents, fires or terrorist attacks involving a truck of waste heading to Hanford for disposal or storage at IDF, occurring in Bellevue or Spokane, WA (identified by USDOE as transport corridors for shipments to Hanford in the Final HSWEIS), or Portland, OR, the number of fatal cancers could reach 1,400[28] and an area of 300 square miles could be contaminated requiring unprecedented evacuation and decontamination.
  - These impacts were documented using USDOE and NRC computer codes and data on shipping containers and shipment contents by Radioactive Waste Management Associates and Dr. Marvin Resnikoff.
  - USDOE has never considered the impacts of such incidents on Washington or Oregon routes.
  - Ecology has a duty under SEPA to consider the reasonably related impacts which may occur from a project which is being permitted by state action. In this case, transportation related impacts are directly related to providing disposal capacity for offsite waste.
  - USDOE's analysis of the transport impacts from the decision to open IDF and import waste to Hanford for disposal or storage is legally inadequate. For example, we have documented[29] that USDOE failed to consider any exposure to individuals within 100 meters of a truck fire or accident involving LLW or MW shipments to Hanford. Yet, most exposure in an urban setting such as I-405 at Bellevue or I-90 in Spokane, or I-205 in Portland, may occur to individuals within 100 meters of the truck. Such individuals may not be able to evacuate in a timely manner due to the congestion and traffic jam that would result from a collision, fire, etc… involving a radioactive waste shipment truck.

Ecology has a duty under SEPA to consider the cumulative and direct probable, significant impacts flowing from any state decision to permit the IDF landfill and USDOE's proposal/plans to use the IDF landfill for offsite MW and LLW. USDOE's formal proposal is to sue the IDF landfill for offsite MW as well as LLW. Therefore, Ecology has a duty to disclose and consider the probable, significant impacts from the plan. As we have summarized here, and fully described in Heart of America Northwest's comments on the Hanford Solid Waste EIS (Revised Draft and initial Draft) and described in Hanford Advisory Board advice on IDF and offsite waste receipt at Hanford: significant, probable impacts include those from transporting wastes through Oregon and Washington due to the availability of capacity at IDF as planned by USDOE. These impacts have never been adequately considered by USDOE, so Ecology can not adopt the HSWEIS in this regard.

In December, 2003, we submitted the following comments on Ecology's proposed issuance of a Determination of Non-Significance for the IDF landfill in relation to the duty to disclose and consider the transportation impacts from the proposed project. These comments have never been responded to, and are repeated here because they still apply (in fact, more is now known establishing that there are greater probable significant impacts, and the current SEPA checklist fails to address the same impacts described below):

> RCW 70.105.210 and RCW 43.21C clearly give Ecology authority to consider these unresolved and unmitigated transportation impacts in its determination about whether the sting criteria has been met; and, whether to reject the SEPA checklist.[30]
>
> The IDF application, as noted in 3, above, falsely certifies that the "Justification of Need" for the facility is "to support Tri-Party agreement milestones by providing a means to dispose of low-level and mixed low-level wasteon the Hanford facility." (sic, IDF Application, Sec. 4.0; Page 8). The facility, however, is sized to meet the combined totals of all "Upper Bound" volume alternatives for additional wastes revealed in the Draft and Revised Draft HSEIS, including offsite wastes.
>
> Ecology may either condition approval on use of the facility solely for on-site clean-up waste, or it must reject the application for failing to show need for such a high capacity.
>
> Because of the existing contamination, ongoing releases and violations of RCW Chapter 70.105 requirements; and the proposed location of the facility within the boundaries of a National Priorities List Superfund and State MOTCA hazardous waste release site, Ecology has unfettered authority to bar USDOE from using the facility for offsite wastes.
>
> At the time these comments were submitted, over 200,000 registered voters in Washington State had signed formal petitions calling for an end to the sue of Hanford's soil to dispose of waste from other nuclear weapons plants; and, calling for a change in State law to preclude any expansion or creation of new burial grounds for offsite waste under these circumstances. Ecology must consider these petitions as a form of public comment on this proposal (in fact, SEPA requires consideration of proposed legislative or other potentially pending actions).
>
> USDOE's SEPA Checklist is clearly inadequate by failing to disclose the transportation impacts from the proposed action, which is expected to result in over 70,000 truckloads of waste being transported to the site. Washington State has previously stated that such actions involve significant impacts that must be considered. The State is in receipt of extensive documentation from our organizations on these risks and impacts. USDOE states, in its SEPA Checklist, that it will take NO measures to reduce or control transportation impacts.[31] Therefore, the State must reject the SEPA Checklist and the application.
>
> USDOE's failure to address the transportation concerns of the State of Washington, State of Oregon, Members of Congress, Tribes and the public, including the findings of the U.S. District Court for Eastern WA relating to transportation of RH-TRU which may be "stored" in the landfill, and which has similar risks to other wastes proposed for the facility, is shocking.

The SEPA checklist issued May 6, 2005 incredibly still fails to even disclose the transport of waste to the IDF, much less discuss any of the acknowledged and documented risks, The Checklist limits disclosure to personal transportation of workers, and does not show routes and truck numbers or waste types on those routes for trucks heading to IDF for disposal.

Those comments from December, 2003, also included an unmet comment that Ecology use facilitated negotiation to reach an agreement with public interest groups and the public opposed to an unmitigated SEPA DNS and permit for the IDF landfill. Ecology must now hold the facilitated negotiations as we proposed in December, 2003:

1. Ecology is Required by State Law to Implement Negotiations on the Siting of this Landfill, and Can not Simply Ignore Our Concerns; Ecology Must Reject the Checklist and Application; and Should Sanction USDOE for False Statements or Omissions Contained Therein:

Ecology can *not* simply ignore our concerns over the siting of this massive landfill. RCW 70.105.260 requires that the Department consider incorporating into any permits or approvals the results of any agreement to mitigate impacts negotiated pursuant to facilitated negotiations conducted under the authority of that statute.[32] Ecology has a duty to seek to convene such negotiations, and, well knows, that we have the capacity, public support and will to challenge the approval of the landfill. ….

Note: Ecology did not meet the duty under the statute to seek facilitated negotiations as asked by citizen groups, by asking only local governments if they wished to have negotiations on the landfill. We have explicitly asked for such negotiations and conditioned our withdrawal of the request for public hearings on Ecology hosting a facilitated negotiation, which should be based on the use of "principled negotiation", establishing what principles are sought to be protected by state policies and citizens.

Washington's Department of Ecology, by proposing to permit the IDF without any consideration of cumulative impacts and transportation impacts, has abandoned its duty to consider the impacts of this project on Northwest residents[33], and abandoned its mandatory duty to protect our fundamental right to a healthful environment.

Because There Are Known Probable, Significant Impacts from the Project (IDF Landfill), Ecology Has a Duty to Disclose, Receive Comments on, and Consider Reasonable Alternatives for the Project:

The duty to consider reasonable alternatives to the proposed project – which Ecology acknowledges to have probable, significant impacts - has not been met. The public is entitled to a description of such reasonable alternatives and consideration of them by Ecology. Such consideration would undoubtedly lead to reasonable mitigation measures and the required use of alternatives:

- USDOE has available for disposal of LLW and MW a fully regulated, and environmentally preferable alternative through use of the Envirocare facility in Clive, Utah. This facility is available for USDOE to dispose of both onsite Hanford waste and offsite waste. Neither of these alternatives has been considered in the record for the HSWEIS and the WMPEIS. Nor is the availability of this alternative described in the notice to the public and SEPA checklist, which violates Ecology's own rules.
    - The Envirocare site is in a geologic area where there is no potential for contamination of potable groundwater (drinking water or other beneficial purpose). The geology and higher standards at Envirocare for waste acceptance, disposal and monitoring are described in Heart of America Northwest's "Cross-Site Comparison of USDOE Mixed Waste Disposal Site Options: A Review and Comparison of Mixed Low-Level Radioactive and Hazardous Waste Disposal Facilities" by John Brodeur, P.E., L.E.G.; June, 2005.
    - The Nevada Test Site (NTS) is also environmentally preferable to Hanford for disposal of LLW, and may be available to USDOE for Hanford wastes. Again, it sits in a geologic area, as described by John Brodeur, which precludes any likely contamination of groundwater (approximately 790 feet below with much higher evapotranspiration than at Hanford), and makes any use of groundwater extremely unlikely. The Mixed Waste landfill permit issued NTS by the State of Nevada bars use of the landfill for any offsite waste, a condition which Ecology should explicitly adopt for the IDF landfill.
    - **The conditions described in our report imposed on the Envirocare facility should be adopted for the IDF landfill (in its entirety, not just for the MW cell), including**:
        - vadose zone monitoring lysimeters to detect contaminants that could migrate in vadose zone vapor;
        - vapor monitoring for the IDF landfill and cover (during operations as well as after capping);
        - quarterly (rather than biannually) groundwater samples and analysis for all constituents listed in the permit – expansion of the constituents to be monitored to include the wider suite of constituents which are projected to be migrating in any manner from existing Low-Level Burial Grounds, or found in descriptions of waste planned to be disposed;
        - vegetation monitoring;
        - vadose zone moisture monitoring;
        - groundwater wells spaced every 400 feet, (in contrast to the proposed permit for IDF with just four groundwater wells and a point of compliance several hundred feet from the unit);
        - state enforceable waste acceptance criteria with total source limits applicable to all units in the landfill;
        - a design timeframe for the MW units of 1,000 years of isolation and a groundwater protection timeframe of 10,000 years.

- USDOE has failed to meet its obligations under federal legislation to consider the long-term costs of disposing of waste in Hanford's IDF landfill in comparison to other available alternatives, which is legislation promoted by Heart of America Northwest. The use of the Hanford IDF landfill is, logically, greater than the cost of unlined disposal at Hanford. Yet, prior studies show that both short term and the life-cycle (long-term, fully burdened) disposal costs for Hanford actually exceed the costs for disposal of Class A LLW and MW at Envirocare.

> *Low-level radioactive waste disposal costs.*—The Energy and Water Development Appropriations Act, 2002, directed the Department to prepare analysis of life-cycle costs of disposing of low-level radioactive waste and mixed low-level radioactive waste (LLW/MLLW). The conference committee was concerned with DOE's practices for disposal of LLW. These concerns centered on DOE's use of federal versus commercial disposal facilities and the life-cycle costs of each option. The House Committee on Appropriations noted that (1) DOE's was relying too heavily on its on-site and off-site disposal facilities, inhibiting development of a viable and competitive commercial disposal industry, and (2) commercial disposal facilities may offer DOE the lowest life-cycle cost for waste disposal. DOE responded with a July 2002 life-cycle cost report to Congress, which specified actions it would take to ensure that sites use life-cycle cost analyses, including justification for expansion or new construction of on-site disposal facilities. DOE issued guidance in July 2002 directing its field offices to use full "cradle to grave" life cycle costs and analysis of options in making LLW disposal decisions.
>
> U.S. House of Representatives Appropriations Committee Report on the FY'2006 Energy and Water Appropriations Act, at 177 and 178 (May, 2005).

USDOE has never considered the life-cycle costs of disposal of on-site or offsite LLW and MW in the IDF landfill in comparison to other available alternatives. Ecology can, and should, require such consideration of alternatives under its SEPA authority to ensure full and fair consideration of all alternatives to the IDF, including whether the cumulative impacts from wastes proposed to be disposed in the IDF can be reduced by use of available alternatives, and whether the impact from the planned footprint of the IDF can be reduced by reducing its total capacity (including capacity of the initial East and West cells) through use of existing alternative disposal facilities.

Hanford Integrated Disposal Facility (IDF) Permit and SEPA Determination Review,
from

A Review and Comparison of Mixed Low-Level Radioactive and Hazardous Waste Disposal Facilities

by

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Report prepared for

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June, 2005

The following portion of the complete report is produced as part of Heart of America Northwest's comments on the IDF Permit and SEPA Determination, and should be responded to as part of our comments:

3.3 IDF Disposal Facility Summary

The USDOE's proposed Integrated Disposal Facility (IDF) is currently under construction in the 200 East Area at Hanford (see Figure 3.3). This facility is a combination of two identical disposal cells sitting side-by-side and referred to as the East Cell and the West Cell. Figure 3.3 provides the only site plot that could be found for the IDF because maps and schematics were redacted from the Ecology permit application (presumably due to USDOE request for security controls intended to mitigate terrorist threats to the facility). This inexplicable redaction of siting and design adds to the difficulty of getting information on this facility, and makes commenting on the permit and impacts more difficult.

- Total capacity of initial East (LLW) and West (MW) Cells: 164,000 m3
- Total capacity planned for IDF when fully built: 900,000 m3
- Total amount of solid wastes disposed to date in Hanford's soil: 283,000 m31
- Total on-site wastes estimated by USDOE as requiring disposal: 156,735 m3[34]

Washington Ecology issued a proposed permit for construction and operation of the IDF landfill on May 6, 2005, along with a proposed "Determination of Non-Significance" (DNS) under the State Environmental Policy Act (SEPA).

Washington State acknowledges that USDOE's Hanford Solid Waste Disposal EIS (HSWEIS)2 is legally inadequate in regard to the cumulative impacts from the IDF landfill (offsite wastes and secondary wastes from vitrification of High-Level Wastes are key components of these cumulative impacts) and the Hanford Tank Waste Closure and Supplemental EIS has not been issued, which USDOE says will consider the impacts from disposal of secondary wastes in IDF. Because of the inadequacies alleged by Washington State, the state has sued the USDOE in federal court alleging that the HSWEIS is legally inadequate under the National Environmental Policy Act. The State, therefore, can not adopt the entire HSWEIS in support of the mixed waste permit sought for the facility, and the State has proposed conditions limiting the West cell of the IDF to onsite mixed wastes from a demonstration of bulk vitrification, Immobilized Low Activity Waste (despite the names, both of these waste types are highly radioactive wastes from Hanford's High-Level

Nuclear Waste tanks, but they do not include the hottest wastes from those tanks), and leachate collected from the IDF itself. No limits are proposed to be placed on the wastes to be accepted in the East cell, which is for LLW. The draft permit foresees allowing additional types of waste to be disposed in the mixed waste portion of the landfill based upon future analyses of whether the additional waste streams will violate any standard (focusing on groundwater standards, rather than the health based standards of the Model Toxics Control Act).

The draft permit also foresees additional cells being added until the entire capacity increases from 164,000 cubic meters for the initial East and West cells to a total capacity of 900,000 cubic meters.

The initial East Cell of the IDF will be used for disposal of 82,000 cubic meters of low level radioactive waste from both on-site and offsite, but no mixed waste. This new low level waste disposal facility will be used in place of DOE's current low level waste burial grounds in the 200 East and 200 West Areas which are unlined soil trenches of up to 1,500 feet in length.

The new IDF facility will represent a significant improvement in DOE's low-level waste facility operations compared to use of Hanford's massive unlined soil trenches, which Heart of America Northwest has fought to end use of for over 15 years. Washington's voters enacted the Cleanup Priority Act (Initiative 297) with the largest vote total in state history for a ballot initiative, which barred continued use of unlined trenches for disposal of wastes at facilities where such unlined landfills were releasing contamination and had received mixed wastes.3 In June, 2004, faced with passage of I-297, USDOE adopted a Record of Decision to end dumping waste directly into the soil in unlined trenches and to construct the Integrated Disposal Facility, as proposed in the HSWEIS. For Low-Level Waste, USDOE is basically going from use of unlined, uncontrolled burial grounds to a lined and monitored disposal facility. For Mixed Waste, IDF represents a massive expansion of capacity for regulated mixed waste disposal at Hanford.

Many of the details on the design, construction, quality assurance, risk assessment and proposed operations are not available for the East Cell facility. They are not covered under the RCRA mixed waste permit which covers only the West Cell of the IDF. This is because the State does not regulate radioactive waste disposal facilities. In this case, the DOE is self-regulated and as a result, there is little documentation available for review.

Washington Ecology could require disclosure and consideration of this information in order to assess the cumulative impacts of the IDF under SEPA, and to mitigate impacts or set permit conditions. However, Ecology has chosen not to do so. Rather, Ecology has sued USDOE in federal court alleging that the HSWEIS (prepared by USDOE under NEPA) is inadequate for failure to disclose such cumulative impacts. Under its SEPA authority, Heart of America Northwest believes that Ecology could set total waste acceptance limits to ensure that the total quantities of waste do not exceed the allowable "risk budget" for the entire facility, and limit offsite low-level wastes to that portion of the risk budget which is not forecast to be necessary for on-site cleanup wastes.

The design, construction, operation and closure of the East Cell are reported to be the same as that of the permitted and regulated RCRA West Cell. It is assumed that the East Cell will be operated in a manner consistent with either the West Cell of the IDF or the ERDF relative to waste placement, fill material compaction, environmental monitoring and the rest. However, with no information, all of this remains to be verified.

Only a small temporary soil berm will separate the unregulated East cell from the regulated MW West cell. As the name states, the landfill is "integrated", and it is necessary to examine operations, waste acceptance, monitoring, etc… for both sides to assess cumulative impacts. However, there is nothing integrated about the regulatory approach, consideration of impacts and disclosure for the two sides of the IDF.

Examples of what is not disclosed about the East Cell of the facility (due to the inadequacy of the EIS and the failure to describe operations and conditions in the permit application) are:

- whether or not USDOE will continue the practice of random dumping of the waste materials as they have done at most of the low level burial grounds; and,
- waste acceptance criteria and quality assurance associated with the disposal operations.

Without any description or limitations on disposal operations, waste acceptance criteria, etc… it is impossible to assess the cumulative impacts of the "integrated disposal facility."

Even if plans were described, the lack of controls via permit has allowed USDOE to "waive" waste acceptance criteria in the past for Hanford's Low-Level Burial Grounds (LLBGs); e.g., for highly radioactive Remote-Handled LLW, or even for suspect MW. This practice is likely to continue. Thus, IDF is like a water balloon with controls over half the balloon (the West, or MW side) and none over the remainder. It is likely that the balloon (the total risk budget for the landfill in comparison to standards) will still burst from the pressure of what is added to the East side.

The West Cell of the IDF is to be a RCRA regulated and permitted mixed waste disposal facility. A RCRA permit application for the West Cell only, was prepared by the DOE (DOE, 2005) and a Draft RCRA permit was prepared by the WA Dept. of Ecology and is currently under public review.

The permitting of IDF is proposed to be phased, with the initial phase of the permit limiting use of the West Cell to dispose of Immobilized Low-Activity Waste (ILAW), bulk vitrification waste, and miscellaneous mixed waste originating from IDF operations. ILAW and bulk vitrification wastes are wastes that are retrieved from High-Level Nuclear Waste tanks and glassified (vitrified) using two different approaches.

Immobilized Low-Activity Waste (ILAW) is vitrified material that will originate from the low activity waste4 vitrification process also being built at Hanford. This process takes high level waste from the tanks, segregates out some of radionuclides into a lower-activity fraction and vitrifies this material into a stable waste form. This waste form will likely be a glass cull material or a fractured monolithic glass inside of a sealed stainless steel cylindrical container measuring 4 ft in diameter and about 7 ft tall.

Bulk vitrification waste will be lower-activity material retrieved from the High-Level Waste tanks that is melted in large containers and left in bulk glass form. This bulk glass will be allowed to cool and then disposed of, container and all, in the West Cell mixed waste IDF landfill.

The West Cell RCRA permit currently does not include allowance for disposal of any off-site waste. That issue is the subject of two cases currently being argued in the courts.5 If off-site mixed waste is brought in to Hanford and buried at the IDF, a RCRA permit modification will be required.

The rationale for phasing of the permit is the lack of adequate cumulative impact analysis for IDF, and Washington's disagreement with USDOE over the mobility and risk from Iodine 129 and Technetium 99 in secondary wastes generated from vitrification. In a nutshell, Washington has challenged the HSWEIS (which was the basis for USDOE's Record of Decision to proceed with the IDF landfill) for failure to disclose and assess impacts if 95% of the Iodine 129 is disposed of in the IDF landfill, rather than being vitrified with the High-Activity Wastes retrieved from the tanks.

The West Cell RCRA permit also does not include any on-site generated mixed waste, other than bulk vitrification, ILAW and IDF self-generated wastes. Hanford generated mixed waste currently goes to two smaller RCRA permitted mixed waste disposal facilities in the 200 West Area. Those smaller facilities are presently being used for disposal of on-site generated waste including mixed waste and low-level waste. A permit modification will be required in the future to dispose of any additional on-site generated mixed waste at the West Cell of the IDF.

The Draft RCRA permit (Ecology 2005) has adopted the existing NEPA documentation of environmental impacts that were prepared for the separate disposal facilities as being adequate and appropriate for the purposes of the integrated facility (IDF). Ecology issued a determination of non-significance (DNS) relative to the integrated approach.

With this determination, much of the information such as the performance assessment for the previous ILAW facility, becomes relevant to the IDF. Not all these documents could be reviewed in this study due to lack of availability.

3.3.1 IDF Details

Information on the IDF design comes from the RCRA permit application (DOE 2003) and from the Draft RCRA permit (Ecology 2005) which is currently under public review.6 The IDF risk assessment is provided in Mann (et al, 2004).

There is not a lot of documentation on the design, construction specifications or quality assurance for the IDF.

There are no engineering justification reports or design configuration report similar to that of Envirocare (2001b). Part of the reason for this is that much of this documentation was prepared for the previously separate disposal facilities that were integrated in the creation of the IDF. Documentation of technical requirements and system specifications and the performance assessment for ILAW waste, for instance, are referenced in the Draft RCRA permit because they are applicable to the IDF. A conceptual design report for the ILAW waste (RPP-7908) is referenced in the IDF permit but was not available for review (in violation of SEPA and other applicable standards)

To make it more difficult for the public to review and comment on the IDF landfill, the full Draft RCRA permit and the permit application can only be reviewed in the libraries, presumably for security reasons.

The following is a short summary of what little we know about the IDF following review of the Draft RCRA permit.

The IDF design requirements come from RCRA and are codified in WAC codes as Washington Dept. of Ecology has delegated RCRA authority7 and permitting responsibility. These design requirements are quite prescriptive for mixed waste landfills8.

The IDF is to be 900,000 cubic meters total volume (31,77 million cubic feet, or 1.2 million cubic yards). It will be constructed as a moving waste disposal pit similar to the ERDF, with the initial pit in the north portion and a service ramp toward the south. This allows filling of the North portions first with expansion toward the south to eventually cover the entire footprint area shown in Figure 3.3.

The liner, leachate collection and removal system and leak detection system are “critical systems” in the IDF and apparently subject to appropriate quality assurance requirements. However, these requirements do not appear enforceable by Ecology for the East (LLW) cell.

The IDF will have two leachate collection and removal systems (LCRS). The upper or first LCRS is located in a gravel layer that is just beneath an operations layer. The secondary system is called a leak detection system because it is located beneath the multi-layered liner system. This design of a dual leachate collection allows differentiation of operations derived leachate from leachate that would indicate a failed liner system. The permit indicates the secondary leak detection system was added to comply with the Atomic Energy Act of 1954. Which specific requirement is not known.

The liner will be the equivalent of a double liner system that is compliant with RCRA Subtitle C 40 CFR264 and WAC 173-303-665. This liner system is designed for use during the active life of the landfill where the active life includes the periods of operations, closure and post closure (30 yrs).

The liner is composed of the following layers listed from top down from the waste materials:

- Operations layer – 3ft of operations soil for freeze protection and to protect the liners from damage during operations
- LCRS - 1.0 ft layer of gravel with a non-woven separation fabric above. Leachate collection pipes are located in the gravel and site is graded to allow leachate collection.
- Primary geomembrane – HDPE 0.6 mm thickness
- Primary GCL – Geosynthetic clay liner material consisting of a synthetic mat with bentonite clay
- Secondary geomembrane liner - HDPE 0.6 mm thickness
- Secondary GCL – Geosynthetic clay liner
- Admix layer – 3.0 ft of soil and bentonite mixture
- Secondary Leak Detection system – Composed of soil, gravel, drainage net and tertiary geomembrane

Waste placement will be controlled and monitored with a specific plan. Bulk vitrified mixed waste will be disposed in the containers in which the melt is formed. Vitrified low activity waste will be packed in the waste zone, four layers high. All void spaces between packages are to be filled but details of specific procedures or requirements and verification methods are not included in the permit.

The IDF cover will be designed to comply with WAC regulations. Waste materials will be covered with an interim cover or a final cover during the pre-closure period. Details of the cover design will be provided before closure.

The risk assessment (Mann et al., 2003) reports that the cover will have an inverted shallow V shape with the apex of the V running along the center of the cell and parallel to the longest dimension (N-S). It will have a 2% slope to shed water and it will extent 30 ft beyond the inside edge of the trench liner system. The cover will be designed for a 500 year life and it will have an impervious asphaltic concrete cap. No additional information on the cover design is available at this time.

Other documents referenced in the permit include the ILAW project definition criteria (RPP-7303), A conceptual design report for ILAW (RPP-7908) and the IDF Phase 1 critical systems design report (RPP-18486). These were not available for review in time for this report.

A risk assessment for the IDF was prepared to satisfy DOE requirements (DOE Order 435.1). This risk assessment is a modification of a performance assessment that was prepared for ILAW and reconfigured to the waste form, site specific conditions and the geometry of the IDF.

The most significant performance objectives that the IDF must measure (DOE Order) include:

- All pathways maximum dose of 25 mrem effective dose equivalent (EDE) in one year.
- Maximum drinking water dose for beta-gamma emitting radionuclides of 4 mrem/yr EDE.
- Measure of incremental lifetime cancer risk due to chemicals
- Inadvertent intruder all-pathways chronic does objectives of 100 mrem/yr EDE

The model was set up with a series of separate models for the near field, the far field and groundwater.

The near field extends from the surface to the bottom of the engineered structure and includes the actual landfill region composed of the waste material zone and surrounding soil material. The liners, leachate collection systems and cover are not considered in the model with the intention of not taking credit for any isolation they provide. The near field considers different release mechanisms for the different waste forms expected in the IDF. The recharge model through the top soil surface uses a 4.2mm/yr (0.17 inches) per year moisture flux value, assuming most of the precipitation is evaporated or transpired out the surface.

The far field is the region beneath the bottom of the facility to the groundwater and includes the vadose zone sediment. This region is modeled with a finite element program called VAM3DF which uses a sorption equation to assess the effect of geochemical retardation. This model uses a homogeneous, 2-layer earth system shown in Figure 4.2.

The groundwater region was modeled using a previously developed groundwater model that was scaled to fit the geometry and layout of the IDF. The groundwater uptake well for risk calculations is located 300 ft from the down gradient edge of the IDF. No additional information on the groundwater portion of the model is provided in the IDF risk assessment.

An inadvertent intruder scenario is considered in the risk assessment. It is configured basically the same as the intrusion scenario for the ERDF where the intrusion is assumed to be one of drilling a groundwater well and bringing contamination up to the surface in the drill cuttings. An intrusion scenario associated with excavating for a basement and causing the direct intrusion into the waste material is not considered a credible scenario in this assessment because the waste is more than 15 ft below ground surface.

> This is a highly questionable assumption for the important exposure scenario for failure of institutional controls, given the experience at other Superfund sites in Washington state and the designation of the future use of the area of the IDF as industrial. In similar industrial settings, construction is far more likely to result in excavation below the 15 foot level. Other likely institutional control failures which should be considered include the installation of water lines and utilities following loss of "configuration control" (i.e., loss of as built blue prints). Installation and excavation of utility lines is likely to result in excavation of waste material which would then be used as fill in another application, and creation of new source of infiltrating water and liquid, and new preferential migration paths – defeating the engineered barrier cap. Thus, adding underground water or sewer

lines for industrial uses even alongside the capped area would create the potential for significant increases in liquid infiltration and contaminant migration.

The results of the risk assessment show that for all pathways exposure is considerably lower than the performance objectives identified above. Groundwater impacts from the three waste types in the IDF produce different temporal shapes, time of maximum, and maximum magnitudes in the total exposure plot. Tc-99, I-129 and Np-237 are the primary contributors to dose at 1000, 2400 and 10,000 years. The key sensitive parameters and highest risk driver comes from the inventory of Tc-99 in the waste.

No information is provided in the risk assessment on the comprehensive or combined effects from both the East Cell and West Cell of the IDF as an inclusive risk assessment has not been completed. The lack of such a cumulative impact assessment means that any controls placed on the West Cells are likely to be defeated by the more permissive waste acceptance and operational practices applied by USDOE to the East Cells – with no analysis having been done in advance to determine what the maximum allowable source for potential contaminants should be.

Of course, the use of the East Cell for disposal of Hanford low level waste represents a great improvement in terms of engineered waste isolation and disposal facilities from the current operation of the unlined trenches. Because a combined risk assessment of both cells will undoubtedly not consider the liner in the performance calculations[9], a comprehensive risk assessment will not show a significant risk benefit to the new low-level waste facility as compared to the old unlined burial grounds.

Ultimately, it is the geology of the disposal site and total wastes disposed which determines the long-term groundwater and cumulative impacts of any disposal site. Thus, it is vital for any decision to consider reasonably available alternatives in a different geologic setting – since the geology is the ultimate arbiter of impacts from disposal facilities. For the IDF plan, this is more important given the massive volumes proposed to be disposed, the unknowns regarding the Iodine and Tc99 from secondary vitrification wastes and the total lack of disclosure of the waste forms and source terms proposed to be disposed from offsite wastes in the East Cell.

USDOE must disclose all aspects of its design, operations, waste inventory, and quality assurance for the East (LLW) Cells of IDF in order for anyone to have an assurance that the cumulative impacts of the facility will not exceed standards. Ecology has the ability to order this as a permit condition and for purposes of meeting its obligation to ensure that cumulative impacts are disclosed and considered in its SEPA determination. Ecology must now use this authority.

Additional Specific Comments on the Proposed Permit for IDF and the SEPA Checklist and Determination:

1. The draft permit is wrongly limited to the West Cells, instead of covering the entire "integrated" facility. The SEPA Checklist improperly covers only the West half of the landfill.
    a. There is no legal, engineering or scientific basis for separating the cells in terms of overall permit conditions and waste acceptance conditions.
    b. The cumulative impacts from the entire facility must be considered, and permit conditions established which prevent the entire facility from exceeding the relevant standards – which include the total carcinogen risk standards from MTCA for releases reasonably foreseen through risk assessments. SEE RCW 70.105E.050.
        i. The critical Permit Condition III.11.1.5 "Modeling – Risk Budget Tool" is inadequate in numerous key respects:
            1. The condition fails to require consideration of whether the cumulative risk from all carcinogens from releases will exceed the relevant health protective standards of MTCA (RCW Chapter 70.105D, and WAC Chapter 173-340). The key standard is whether reasonably foreseeable exposures – including from use of groundwater for drinking water and other beneficial uses – would result in a total carcinogen risk of 1E-5 (one additional cancer per one hundred thousand exposed individuals).
            2. It requires that the groundwater impact be modeled solely in a concentration basis and makes no provision for translating this into a useful tool for the public and Ecology to consider health impacts.
            3. It fails to provide for public notice and comment on the cumulative risk assessment. This is a critical failure, since Ecology fails to require cumulative impact analysis and disclosure in advance of permitting and operation of the IDF landfill. *There should be public notice and comment on the projected impacts of the landfill, as if it was undergoing a new permit and SEPA determination.*
            4. The condition fails to require cumulative impact assessment for all releases from the facility on reasonably foreseeable maximally exposed individuals, including failing to meet MTCA requirements to consider the likelihood of failure of institutional controls leading to increased exposures and increased migration of contamination.
                a. As such, the proposed condition can not replace SEPA review of potential health impacts from exposure and likely failure of institutional and engineering controls.
                b. The condition fails to establish any enforceable condition for maximum allowable risk level from all wastes disposed in IDF under likely institutional and engineering control failures as well as under predicted cap performance, and fails to establish total waste acceptance conditions to meet such standards.
            5. *Condition III.11.I.5.a.ii has a totally unacceptable substitution of meaningful conditions for a "meeting", in event the modeling shows that releases are within 75% of a performance standard!!!*
                a. This is not a "condition" that is enforceable, or reliable upon by the public. Ecology must specify in the permit now that the cumulative risk – including all wastes disposed in the East cells and proposed under all USDOE proposals for future use of IDF – may never be projected to exceed 75% of any

groundwater protection standard, drinking water standard, or MTCA standard (using MTCA default assumptions for exposure scenarios).

b. Ecology sets itself up for a dispute with USDOE by failing to have specified that "performance standard" includes MTCA standards, rather than USDOE's standards for radionuclides (25mrem / 100mrem). USDOE's standard is far less protective of human health than MTCA – resulting in magnitudes greater contamination and magnitudes higher levels of cancer that MTCA.

6. Ecology needs to set total groundwater concentration and soil contamination standards for the IDF landfill now, based on meeting MTCA risk standards. Rather than wait for USDOE to have added wastes and discover that the marginal increase in contamination will foreclose new waste additions, Ecology can and must set total concentration standards (subject to changes adopted in the future in those standards) which will ensure that MTCA's carcinogen risk and hazard quotient standards will not be violated under reasonably foreseeable maximum exposure scenarios.
7. The condition (and III.11.I.5.a.iii) fails to state that the <u>cumulative</u> impacts from all wastes disposed and proposed to be disposed must not be projected to exceed <u>75%</u> of any regulatory limit, relevant standard, MTCA standard. This must be calculated based on foreseeable failures of institutional and engineering controls (e.g., if water was added nearby) rather than based on a model in which the cap works forever. Cap performance assumptions must be extremely conservative, since the cap has not been approved.
8. Ecology must set a condition preserving the landfill's disposal capacity for Hanford Clean-Up wastes, based on a performance assessment and risk assessment, which limits total wastes disposed to ensure that contaminant releases and all reasonably foreseeable exposures will not exceed 75% of MTCA's standards for carcinogen risk and all other *relevant* standards.

c. Without any description or limitations on disposal operations, waste acceptance criteria, etc… it is impossible to assess the cumulative impacts of the "integrated disposal facility."
    i. Ecology must impose waste acceptance criteria and quality assurance for all wastes disposed in the IDF landfill. We can not tolerate after the fact "discoveries" – as have frequently occurred in the past in Hanford's LLBGs – that mixed wastes or extremely hot wastes (like the "Frisbee from Hell" disposed illegally in the LLBGs) were disposed in the East cells of IDF. There is just one risk budget for the entire landfill.

d. Even if plans were described, the lack of controls via permit has allowed USDOE to "waive" waste acceptance criteria in the past for Hanford's Low-Level Burial Grounds (LLBGs); e.g., for highly radioactive Remote-Handled LLW, or even for suspect MW. This practice is likely to continue.
    i. John Broduer concluded that "The liner, leachate collection and removal system and leak detection system are "critical systems" in the IDF and apparently subject to appropriate quality assurance requirements." However, these requirements do not appear enforceable by Ecology for the East (LLW) cell. Operations, maintenance and monitoring of critical systems must be

made an enforceable condition for the entire landfill. Failure to set such enforceable conditions is likely to lead to a failure of the landfill as a "system".

e. Waste Acceptance Criteria must specify that offsite wastes and wastes exhumed from Hanford soils will undergo full characterization and that "process knowledge" will not be allowed as the basis for designation and meeting waste acceptance criteria for such waste in either the East or West cells, due to the failure of process knowledge in past disposal decisions by USDOE and the finding that reliance on process knowledge has been the single greatest source of all hazardous waste law violations at Hanford. Rigorous confirmational sampling protocols must be required even for wastes with manifests and tracking records.

f. Thus, IDF is like a water balloon with controls over half the balloon (the West, or MW side) and none over the remainder. It is likely that the balloon (the total risk budget for the landfill in comparison to standards) will still burst from the pressure of what is added to the East side.

g. All conditions – such as waste acceptance criteria, operational records, operational placement, total constituent limits – must apply to the entire facility.

2. The permit fails to require cover before the entire unit has a final cap. See II.11.c.1.b.
    a. The failure to have interim cover will result in additional infiltration and accumulation of water mobilizing constituents and of leachate.
    b. During snow melt and unusual conditions, extremely large quantities of water may be added, which is not part of the modeling.
3. The permit fails to specify adequate groundwater sampling for all hazardous constituents which are likely to be disposed, and which have been released and spread from pas burial operations at Hanford. These same constituents are likely to be disposed in IDF.
    a. Requirements under Washingtons' HWMA for description of waste types and sources is inadequate. While the West side is currently limited to three sources, it is known that USDOE will seek to dispose of a great range of MW and LLW, including wastes exhumed from Hanford TSD units. This requires an extensive description and requirement for vadose zone, leachate and groundwater monitoring for these constituents.
    b. Leachate is proposed to be sampled quarterly, rather than monthly. This is inadequate for early detection, especially if covers are not required. III.11.F.1.9.
    c. Leachate from East cells must also be managed as Mixed Waste. Leachate from these cells, with radionuclides, are hazardous constituents when released, and are subject to the RCRA MW permit.
4. The permit totally fails to require any quality assurance, waste analysis or acceptance criteria for the East Cell. USDOE has a history of waiving its own criteria – which would destroy the basis for all risk assessments (if they were disclosed and reliable). The SEPA checklist fails to describe waste acceptance criteria and sources for the East Cell, preventing analysis of cumulative impacts and violating SEPA.
5. Use of 40 hectares of mature sage-steppe habitat is, in and of itself, a significant impact on a threatened habitat.
    a. Because there are reasonably available alternatives for disposal of both LLW and MW, Ecology must require either a full EIS with such analysis of alternatives, or mitigate the impact on habitat by limiting the total size of the IDF landfill to the size necessary to handle forecast Hanford Clean-Up wastes (156,000 m3), which is one sixth the proposed total size of the IDF landfill.
    b. The SEPA Checklist fails to identify cultural and treaty significance of the site, and the mature sage-steppe habitat.

6. The SEPA checklist fails to disclose any of the true transportation impacts from transporting waste to the IDF facility. It falsely discloses the total transportation impact as 85 trips per day, which is for personal transportation and ignored the tens of thousands of shipments of offsite LLW and MW proposed by USDOE in its formally adopted plan and Record of Decision. This is a knowingly false checklist and should be withdrawn. The transportation impacts alone require a full EIS. USDOE has acknowledged significant probable impacts to human health from transporting the full amount of waste to IDF which it proposed in the HSWEIS (USDOE admitted 9 fatal cancers).
7. SEPA checklist fails to address MTCA as the basis for risk assessment and the policy of Washington State to not create new cleanups by allowing disposal of wastes in a landfill in such quantities and conditions such that MTCA standards are forecast to potentially be exceeded.
8. The Checklist falsely says that air releases would not exceed levels immediately dangerous outside of “immediate area” because of the small quantity of material available for release. Other documents and past incidents show that there is a significant potential for airborne releases (i.e. from fires, accidents (e.g., dropping and failure of a High Integrity Cask with RH-LLW or RH-MW), volatiles, etc..) for wastes staged or disposed in IDF. An analysis to what degree the releases significantly impact health is required, not just whether offsite standards are violated.
9. The SEPA checklist must be withdrawn due to failure to disclose the entire project proposed by the applicant. The SEPA checklist fails to disclose offsite LLW planned for disposal in IDF – totaling over 7 million cubic feet. SEPA requires disclosure of all related projects and plans.

End Notes and Citations:

(Footnotes)

1 HSWEIS, USDOE, February 2004.

2 Final HSWEIS, February, 2004. Washington State has filed suit (Washington v. Bodman) in the the U.S. District Court for the Eastern District of WA alleging that the HSWEIS is inadequate to support decisions to import waste from offsite to IDF, to dispose of secondary wastes from vitrification of waste removed from Hanford's High-Level Nuclear Waste Tanks, and to support a decision that Hanford's groundwater is "irretrievably and irreversibly committed" to contamination.

3 RCW 70.105E.060.

4 Low activity is relative to the remainder of the waste in the tanks which is "High-Activity" and which will be vitrified and, one day, expected to be disposed in a deep geologic repository, instead of remaining near the surface at Hanford. The ILAW includes extremely radioactive materials, it just is not the hottest fraction of the tank wastes.

5 In addition to the case brought by Washington challenging the adequacy of the HSWEIS in regard to offsite waste impacts, the USDOE is challenging the constitutionality of Washington's Cleanup Priority Act, which bars addition of offsite mixed waste so long as existing mixed and hazardous wastes are being released to the environment and fail to meet hazardous waste standards. US v. Washington, Manning, et al, US. District Court for the Eastern District of Washington.

6 Comment period ending June 20, 2005.

7 Washington Hazardous Waste Management Act, RCW Chapter 70.105; and Washington Administrative Code, Chapter 173-303.

8 Additional requirements for permitting the IDF landfill are now codified in the Cleanup Priority Act, RCW 70.105E.060. There is no record of Ecology considering the new requirements, specifically that any risk assessment or permitting decision for a mixed waste landfill at a site such as Hanford must consider the cumulative impacts from all carcinogens (which includes radionuclides) and the total risk from projected releases and exposures from the landfill must not exceed the health based protection standard in Washington's Model Toxics Control Act, RCW Chapter 70.105D. This standard – to avoid having the new landfill create new toxic waste cleanup sites – is for all carcinogens projected to be released from the facility not to have a total cancer risk greater than one additional cancer per every one hundred thousand persons exposed to the facility's releases. This state standard is in stark contrast to USDOE's performance assessment design standard (Order 435.1, applied to the East / LLW cells of IDF) which allow 25 millirem of exposure to radiation on top of all other carcinogens from releases from the landfill, and 100 millirem exposure in event of failure of institutional and engineered controls (i.e., intruder). 100 millirem is estimated by EPA and NRC to cause two fatal cancers for every one thousand adults exposed. EPA has issued a formal determination that 25 millirem of exposure from a Superfund Site is "not protective of human health". *"Analysis of What Radiation Dose Limit is Protective of Human Health at CERCLA Sites"; US Environmental Protection Agency, August 20, 1997.*

Thus, the "standard" for which USDOE conducted its performance assessment for the IDF landfill would allow magnitudes more exposure and risk than is allowed under the relevant state standard.

9 Liners should not be considered in long-term performance since their design life is short – reliably limited to the operational period. Even then, liners often fail before operations cease.

(Endnotes)

[1] Permit Application Part III, Operating Unit 11, 4A-1.5. This is 25 hectares, or 63 acres (page 4A-1.4). 446 meters by 555 meters. Multiply meters by 3.28084 to get feet.

[2] See RCRA and Washington Hazardous Waste Management Act Permit Application Submitted by USDOE to Ecology, Section 3.1, Part III.11.3.1. The permit application lists total capacity for the half of the IDF designated for mixed wastes as 450,000 m3. Thus, this confirms prior descriptions of the total capacity of 900,000m3, when the LLW portions of the IDF are included.

Comment requiring Ecology response: It is important to note that USDOE "redacted" from its permit application made available to the public for purposes of review all siting and size information and maps – making it extremely difficult to comment on siting of the IDF and impacts on threatened mature sage – steppe habitat, as well as making comments on groundwater impacts and monitoring extremely difficult or impossible. There is no legal basis for allowing USDOE to redact this information from an *Ecology* permit – since there is no national security or other issue associated with the location of this landfill, and redaction illegally interferes with public comment on the impacts.

Total capacity per email from Washington Ecology Department's Tank Waste Disposal Project Manager Suzanne Dahl to Gerald Pollet, Heart of America Northwest:
From: Dahl, Suzanne
To: Curtis, Nolan ; 'Gerry Pollet, Janet Miller'
Cc: 'office@heartofamericanorthwest.org' ; Wuennecke, Mary Anne
Sent: Friday, September 17, 2004 11:32 AM
Subject: RE: Authorization for Integrated Disposal Facility: questions and problem finding info for permit sought from Ecology

At full build out, the size would be up to approximately 442 meters wide by 555 meters long by 15 meters deep with a disposal capacity of up to 900,000 cubic meters.

The initial construction phase (cells 1 and 2) of IDF is included in the Part B application and is sized (same width and depth, with a length of ~220 meters) with a disposal capacity of up to 166,250 cubic meters. This capacity is less than the projected onsite waste.

[3] Hanford Site Solid Waste Disposal EIS.

[4] Final HSWEIS Vol. II, Appendix C. Higher volumes in Revised Draft were explained as due to further analyses and having disposed of wastes between issuing the Revised Draft and Final. 187,112m3 (58,000m3 of MW) was the total onsite volume of LLW and MW for disposal in Tables 3.3 and 3.4 Revised Draft HSWEIS.

[5] Preferred Alternative, Final Hanford Solid Waste Disposal Environmental Impact Statement, February, 2004

[6] See for example Hanford Advisory Board advices adopted September, 2004 on cumulative impact assessment being necessary, on the Draft and revised Draft Hanford Solid Waste EIS, and on the IDF permit (June, 2005). *Ecology has a duty to consider and respond to all these pieces of formal advice in reviewing the SEPA Determination and permit for IDF.*

Of course, Washington Ecology has acknowledged via federal lawsuit that there has not been an adequate consideration of the impacts from adding offsite waste to the IDF landfill.

[7] USDOE Record of Decision on Hanford Solid Waste Disposal EIS, June, 2004; at page 2.

[8] SEE federal Superfund "Offsite Waste Rule", 42 USC 9621(d)(3). USDOE failed to disclose or discuss the federal offsite waste rule in either the Hanford Solid waste EIS or the Waste Management Programmatic EIS

(1997), which it says was the basis of USDOE's selection of Hanford to be a national radioactive and mixed waste dump in 2001.

[9] USDOE Record of Decision on Hanford Solid Waste Disposal EIS, June, 2004; at page 2:

"DOE has decided to implement the preferred alternative described in the Final HSW EIS, modified as described below. This decision is based on the environmental impact analyses in the HSW EIS, including analysis of impacts to worker and public health and safety; costs; applicable regulatory requirements; and public comments. DOE will limit the volumes of LLW and MLLW received at Hanford from other sites for disposal to 62,000 m3 of LLW and 20,000 m3 of MLLW. Also, effective immediately, DOE will dispose of LLW in lined disposal facilities, a practice already used for MLLW. In addition, DOE will construct and operate a lined, combined-use disposal facility in Hanford's 200 East Area for disposal of LLW and MLLW, and will further limit offsite waste receipts until the facility is constructed. …DOE expects the preferred alternative, as described in this Record of Decision (ROD), will have small environmental impacts, provide a balance among short- and long-term environmental impacts and cost effectiveness, be consistent with applicable regulatory requirements, ***and provide DOE with the capability to accommodate projected waste receipts from the Hanford Site and offsite DOE facilities.***"
(emphasis added).
Note: USDOE has acknowledged in the context of Washington's challenge to the HSWEIS that it asserts it has authority and NEPA coverage to revise this Record of Decision in the future to use the new landfill for disposal of four times more offsite waste than it limited the decision to in this RoD (82,000m3 to 360,000m3).

[10] Of the 12.7 million cubic feet of offsite waste (360,000m3) proposed for disposal in IDF, approximately 7 million cubic feet is LLW.

[11] (b) This section does not apply to:

(i) Owners/operators of facilities or portions of facilities who are applying for research, development and demonstration permits, pursuant to section 3005(g) of the Resource Conservation and Recovery Act, codified in 40 CFR Part 270.65 or WAC 173-303-809;

(ii) Owners/operators of facilities operating under an emergency permit pursuant to WAC 173-303-804;

(iii) Persons at facilities conducting on-site cleanup of sites under the Comprehensive Environmental Response Compensation and Liability Act, Sections 3004(u), 3004(v), and 3008(h) of the Resource Conservation and Recovery Act, chapter 70.105 RCW, or chapter 70.105D RCW, provided the cleanup activities are being conducted under a consent decree, agreed order, or enforcement order, or is being conducted by the department or United States Environmental Protection Agency;

[12] "Notice from WA Dept. of Ecology: May 6, 2005, "Draft Hazardous Waste Permit for the Integrated Disposal Facility .. Tell Us What You Think".

[13] 70 FR 115, 35073-35077; June 16, 2005. This is the Record of Decision, which states that Washington State was provided notice of the West Valley EIS and the "Preferred Alternative", adopted in the Record of Decision, to seek to dispose of these West Valley wastes at Hanford, including High-Level Nuclear Wastes, which USDOE plans to reclassify as "incidental wastes". The EIS was issued in December, 2003. Washington State is not identified as having commented on the EIS, or the preferred alternative to dispose of waste at Hanford, despite having been provided notice. USDOE failed to provide notice to interested citizens in the vicinity of proposed disposal sites, or to site advisory boards. USDOE failed to also disclose this related proposal, and consider the significant impacts from use of Hanford for disposal of West Valley wastes, in its Hanford Solid Waste Disposal EIS, adopted February, 2004.

The Record of Decision allows for USDOE to send LLW and MW to commercial facilities, Nevada Test Site or Hanford. However, what the Record of Decision fails to disclose is that Hanford may be the sole preference for disposal of MW and significant portions of the LLW streams. USDOE has accepted without challenge permit limitations imposed by the State of Nevada which bar offsite mixed waste from disposal at NTS, a status which is likely to continue as USDOE seeks to avoid compliance with state requirements for

liners and leachate collections system pursuant to RCRA and state law at NTS (see portion of these comments and separate report comparing USDOE's mixed waste disposal facilities and options prepared by John Brodeur, licensed geologic engineer, P.E.). The Envirocare Site in Utah, the sole available commercial licensed facility (and sole facility mentioned in the RoD) has withdrawn its application to the State of Utah for a permit amendment to allow disposal of B and C class wastes (which are hotter low-level wastes). Much of the waste streams to be disposed – especially those of greatest concern – are B, C and Greater than Class C, which are barred from disposal at Envirocare. Thus, USDOE has a clear preference for disposal of all West Valley Mixed Wastes at Hanford, and a preference for co-disposal of the LLW, which Envirocare can not accept.

[14] 70 FR 115, 35073-35077; June 16, 2005.

[15] West Valley operations were reprocessing of *commercial* Spent Nuclear Fuel. Under the WIPP Land Withdrawal Act and relevant permits, disposal at WIPP is limited to Defense Program wastes, and disposal of commercial waste, such as West Valley wastes is prohibited. Southwest Research and Information Center provided comments, and the Savannah River Site Citizen Advisory Board adopted advice (July, 2003), noting that TRU from West Valley was ineligible for disposal at WIPP. Therefore, whichever site it is shipped to under this new Record of Decision (Hanford is named along with SRS) is likely to be its permanent disposal site.

[16] USDOE's Record of Decision, June 16, 2005 states: "DOE will ship LLW and MLLW off site for disposal at commercial sites (such as Envirocare, a commercial radioactive waste disposal site in Clive, Utah); at one or both of two DOE sites, the NTS in Mercury, Nevada, or the Hanford Site in Richland, Washington; or a combination of commercial and DOE sites, consistent with DOE's February 2000 decision regarding LLW and MLLW disposal.\1\ ***This decision includes wastes DOE may determine in the future to be LLW or MLLW pursuant to a waste incidental to reprocessing by evaluation process***." *(italics added)*.

[17] USDOE; DOE/Rl-98-48 Vol II. Rev. 0: "Groundwater/Vadose Zone Integration Project Background Information and State of Knowledge"; June 30, 1999 at 4-14.

[18] Ecology has a duty under RCW 70.105E.040 to bar offsite waste by permit condition for any new landfill or expansion of existing trenches or cells, which has not been met in the proposed permit:

> (7) Until all the requirements of subsection (6) have been met, the department shall, by permit condition, limit any new construction of, expansion of, or final facility permit for, a facility for treating, storing or disposing of mixed waste to the capacity or size necessary for investigation, characterization, remediation, or corrective action of facilities or units undergoing closure, or remedial or corrective action at the site.

Because USDOE has agreed to construct and permit the IDF as one landfill – it is a single unit under RCRA and the HWMA, RCW Chapter 70.105 – the IDF is subject to this limitation in the statute. Under this statute, the IDF, as a new landfill (or expansion of existing landfills) being permitted for mixed waste disposal must have permit conditions limiting the landfill capacity or size to that which is necessary for cleanup of on-site wastes.

[19] SEE comments section on IDF performance assessment and Cross-Site Comparison Report by John Brodeur, P.E., and Review of USDOE's Performance Assessment by Gerald Pollet.

[20] EPA limit for NESHAP release to air is 10 mrem/year. Based on EPA and NRC radiation standards, 6.8 mrem per year would result in approximately 1 to 2 fatal cancers in every 10,000 adults exposed. EPA now acknowledges that the same dose from a carcinogen will result in 3 to 10 times more cancers in children than in adults (EPA draft guidelines for cancer risk assessment, released March 3, 2003. http://epa.gov/ncea/raf/

cancer2003.htm). :Draft Final Guidelines for Carcinogen Risk Assessment (External Review Draft, February 2003)

EPA recommends use of a three to tenfold adjustment in cancer rates for children from same dose as adults:

> "*the impacts of early exposure appear greater than the impacts of later exposure"* to ionizing radiation… at 28
>
> *"higher cancer risks typically result from a given exposure occurring early in life when compared with the same amount of exposure during adulthood….*
> *"for exposure below 2 years of age, a tenfold adjustment…"*

at 34 and 35.

[21] "Analysis of What Radiation Dose Limit is Protective of Human Health at CERCLA Sites"; US Environmental Protection Agency, August 20, 1997.

> "EPA has formally issued an opinion that (exposure to 25 millirem annually from residual contamination at sites)... is "not protective of human health and the environment." The internationally recognized BEIR - 5 (Biological Effects of Ionizing Radiation report, 1990) estimates that lifetime exposure to 100 millirem (.1 rem) annually causes 495 extra fatal radiation induced cancers per one hundred thousand exposed adults (Table 4-2). After application of a "Dose Reduction Factor", this level of exposure is estimated to cause 295 extra fatal cancers per hundred thousand exposed adults - this translates to approximately 3 fatal cancers per thousand exposed adults, which is far higher than a Washington State MOTCA standard of one additional cancer per one hundred thousand persons exposed...
>
> The BEIR- 5 report calculated that the additional 10 millirem of dose would cause a fatal cancer in ... one out of every 530 persons exposed."

Gerald Pollet, JD; American Bar Association Section of Environment, Energy, and Resources; 10th Section Fall Meeting; Portland, Oregon October 9-13, 2002: "RCRA Hot Topic: Latest Developments in the Evolution of EPA Risk-Based Decision Making: A Model for Incorporating Risk Assessment in Industrial Re-Use / Brownfields Corrective Action"; citing US EPA: "Analysis of What Radiation Dose Limit is Protective of Human Health at CERCLA Sites"; US Environmental Protection Agency, August 20, 1997. SEE Also NUREG 1717, June 2001, U.S. Nuclear Regulatory Commission (an annual dose of 200 mrem / year would cause an estimated 4 fatal cancers per 1,000 exposed adults).

[22] Ecology's duty to require this under SEPA as substantive mitigation and under the HWMA exists even without the restatement of authority and the mandate in the Cleanup Priority Act. The permitting under the HWMA is using a statute (MWMA and WAC Chapters 173-303 and 173-340) which relies upon MTCA for corrective action. Therefore, it is implicit that, via SEPA and HWMA permit conditions, Ecology has authority and a duty to ensure that the MTCA standards are not exceeded in a newly permitted landfill. MTCA already includes radionuclides within its definition of carcinogens, and Ecology has issued formal interpretations acknowledging this.

[23] How Many Truckloads of Waste and Where Will They Go?

Calculations based upon USDOE's Waste Management Programmatic EIS (still relied upon by USDOE as the NEPA consideration of national waste disposal and transport decisions), relied upon for USDOE's decision to ship waste to Hanford, show that the quantities of waste proposed to be sent to Hanford in the Final Hanford Solid Waste Disposal EIS "Preferred Alternative" would total 92,000 truckloads. Our organizations have consistently used a conservative total of 70,000 truckloads. This figure has been reviewed and supported by the technical staff for Washington State Ecology. (Reviewed and approved for Citizens' Guide on Draft and Revised Draft Hanford Solid Waste EIS). These figures were also cited without challenge in *Columbia Riverkeeper, Heart of America Northwest. et al versus Abraham,* Eastern District WA; May, 2004.). USDOE claimed fewer truckloads will be sent to Hanford in the Record of

Decision by manipulating volumes per truckload to reduce the number of shipments disclosed and to reduce the disclosed impacts. In order to claim to claim that there will "only" be 33,000 truckloads (Response to Comments, Final HSWEIS), USDOE's new calculation increases the volume per truckload by 287% over the amount of waste per truckload in USDOE's own National Programmatic EIS, for the same wastes. USDOE has not responded to comments or questions regarding how it justified this 287% increase in volume of truckloads. USDOE's truckload figures exclude the shipments of Transuranic waste to Hanford.

[24] Washington State has formally acknowledged in federal court that the initial Record of Decision (June, 2004) to import 25% of the quantity of waste from the Preferred Alternative (February, 2004) is subject to USDOE issuing additional Records of decision. USDOE asserts it has NEPA coverage to fully implement the "Preferred Alternative" to import and dispose of 13 million cubic feet of LLW and/or MW in IDF, and to import TRU wastes to Hanford – some of which may end up in the LLW cells pursuant to past practice and likely with the impending closure of the unlined LLBGs.

[25] Preferred Alternative, Final Hanford Solid Waste Disposal Environmental Impact Statement, February, 2004.

Number truckloads from USDOE, Waste Management Programmatic Environmental Impact Statement (WMPEIS), 1997. In fact, the WMPEIS estimated that shipping this quantity of radioactive waste to Hanford, under its centralized or regional disposal alternatives, would require 92,000 truckloads. For the past several years, to be conservative, Heart of America Northwest has used a 70,000 truckload estimate for 12.7 million cubic feet. The WMPEIS data was based on actual field experience, and is the only time USDDOE provided data on the number of shipments that would result from its preferred alternative to centralize disposal at one or two sites.

Pursuant to the National Environmental Policy Act (NEPA), USDOE was required to consider, in a new environmental impact statement, the route specific and site specific impacts of using Hanford as one of two national disposal sites. In 2002, USDOE issued a draft Hanford Solid Waste Disposal EIS, which did not include such analyses. It was withdrawn due to legal inadequacy, and a "Revised Draft Hanford Solid Waste Disposal EIS" was issued in 2003. Comments by Heart of America Northwest showed that this revised draft still failed to consider the risks from 70,000 truckloads of waste coming to Hanford. In February, 2004, USDOE issued the Final Hanford Solid Waste Disposal EIS (Final HSWEIS), with a "preferred alternative" to truck 12.7 million cubic feet of Low-Level and Mixed radioactive wastes to Hanford for disposal and to truck to Hanford over 52,000 cubic feet (1,550 cubic meters)of highly radioactive Plutonium waste to Hanford, called Remote Handled Transuranic (or RH-TRU) waste. The Final HSWEIS stated in response to our comments that the preferred alternative would result in 33,000 truckloads of LLW and MW. USDOE has failed to produce any documentation to justify its claim that it would require fewer truckloads of waste than it had estimated and formally adopted as the official number in the WMPEIS. To support a new claim that there will "only" be 33,000 truckloads, USDOE's new calculation in the Final Hanford Solid Waste Disposal EIS increases the volume per truckload by 287% over the amount of waste per truckload calculated for the same wastes in its prior national Waste Management Programmatic Environmental Impact Statement. USDOE's truckload figures exclude the shipments of Transuranic waste to Hanford. We have requested any data USDOE has to support this volume per truckload, but have not received any.

[26] "Unnecessary Risks" by Dr. Marvin Resnikoff (Ph.D. Nuclear Physics) and Radioactive Waste Management Associates, September, 2004; available at www.hoanw.org.

Truck Routes:

This report focuses on shipment of radioactive waste to and from the Hanford facility near Portland, Oregon and the Tri-Cities in Washington. We consider specific shipments in specific types of containers that will be trucked to and from Hanford. Trucks will be on routes through major metropolitan areas and downtowns, including Portland, Oregon; the Puget Sound region in Washington State (Bellevue, Renton, Issaquah); and, Spokane, Washington.[27] Before reaching the Northwest, truck routes containing many of the most risky shipments will go through cities and communities in states as diverse as California and Iowa. See Figure 1 for truck routes to Hanford.

[28] Declaration of Ken Niles, Oregon Office of Energy, and Gerald Pollett, Heart of America Northwest in HOA and WA State v Abraham and US DOE, 2003, Federal Court for the Eastern District of WA.

[29] "Unnecessary Risks" Introduction, Page 5.

[30] (Comments on the HSWEIS provided to Ecology, and available on www.hoanw.org)

[31] See RCW 70.105.210(7).
[32] SEPA Checklist Section 14.g. "Proposed measures to reduce or control transportation impacts, if any: None" P. 17.
[33] **RCW 70.105.260**
Department to assist conflict resolution activities related to siting facilities — Agreements may constitute conditions for permit.

(1) In order to promote identification, discussion, negotiation, and resolution of issues related to siting of hazardous waste management facilities, the department:

(a) Shall compile and maintain information on the use and availability of conflict resolution techniques and make this information available to industries, state and local government officials, and other citizens;

(b) Shall encourage and assist in facilitating conflict resolution activities, as appropriate, between facility proponents, host communities, and other interested persons;

(c) May adopt rules specifying procedures for facility proponents, host communities, and citizens to follow in providing opportunities for conflict resolution activities, including the use of dispute resolution centers established pursuant to chapter 7.75 RCW; and

(d) May expend funds to support such conflict resolution activities, and may adopt rules as appropriate to govern the support.

(2) Any agreements reached under the processes described in subsection (1) of this section and deemed valid by the department may be written as conditions binding on a permit issued under this chapter.

[34] Under SEPA, the duty to consider probable significant impacts to human health is not limited to within the jurisdictional boundary. Ecology is required to consider the impacts on human health from the proposal across the State line, i.e., for an accident involving shipping waste to IDF in Portland, OR.
[35] . Of this amount, 58,054m3 is expected to be mixed radioactive and hazardous waste (Mixed Waste, or "MW"). Final HSWEIS Vol. II, Appendix C. Higher volumes in Revised Draft were explained as due to further analyses and having disposed of wastes between issuing the Revised Draft and Final. 187,112m3 (58,000m3 of MW) was the total onsite volume of LLW and MW for disposal in Tables 3.3 and 3.4 Revised Draft HSWEIS.

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The Environmental Impact Statement for the Commercial Radioactive Waste Dump at Hanford ignores Cancer Causing Radionuclides and Violates Policies on Use of Unlined Trenches for a National Radioactive Waste Dump

Report Prepared by John Brodeur

Professional Engineer, L.E.G.

With Gerald Pollet and Priscilla Cole

March, 2006

Introduction & Background to the Review

On October 21, 2005, Washington Departments of Health and Ecology announced adoption of a Final Environment Impact Statement (FEIS), which had not been previously mailed or announced to Heart of America Northwest or commenters on the 2000 Draft EIS. At the same time, the Departments gave notice that the Department of Health (DoH) was adopting a final rule allowing for import of 100,000 cubic feet per year of NORM/NARM[1] radioactive wastes, with a rollover provision. Since 2000, it was confirmed that contamination had leaked from the landfill, requiring an investigation under Washington's state Hazardous Waste Substance Cleanup law, MTCA (Model Toxics Control Act). Based on the results of the MTCA site investigation of the contamination released to date, the Departments also adopted a license and plans for capping and implementing new permit requirements and steps for remedial action.

That investigation failed to include total carcinogen risks despite repeated warnings to the agencies that radionuclide contamination is required to be part of any investigation of hazardous substance release. Performance assessments for landfills must consider all MTCA hazardous substances, which the Final Environmental Impact Statement (FEIS) Response to Comments acknowledges to include radionuclides. However this same Response is contradictory by stating that the agencies chose to make policy decisions excluding consideration of radionuclides from the impacts.

DoH and Ecology agreed to issue an emergency rule delaying adoption of the FEIS and NORM rule until December 21, 2005, due to objections from Heart of America Northwest. This delay was issued to consider whether Washington's new Cleanup Priority Act and SEPA require consideration of radionuclides as hazardous substances, and what appropriate health risk and cleanup standards are applicable. Furthermore, the delay was to consider requirements of RCRA compliant groundwater monitoring and leak detection systems, and the potential barring of additional non-Northwest Interstate Compact wastes to the unlined burial grounds prior to completion of the remedial actions and compliance. The FEIS acknowledges that mixed wastes, hazardous/dangerous chemical wastes with radioactive components, were disposed in the landfill, and now have spread chemical contamination into the groundwater that exceeds MTCA cleanup levels.

The NORM/NARM rule allows disposal with a rollover provision. Unused disposal quantities would rollover like cell phone minutes to future years. This rollover would permit 100,000 cubic feet per year since 1996, allowing an immediate disposal of one million cubic feet per year. For the next fifty years, the US Ecology site would be able to add up to 6 million cubic feet of NORM/NARM waste to the unlined burial grounds. One million cubic feet would be added per decade for five or more decades. Heart of America Northwest asked John Brodeur to review the FEIS, the source term, and Ground water models to determine whether the impacts of this additional material were included in source term for performance assessments, and properly considered in regard to the impacts.

John Brodeur agreed to perform an initial review of the FEIS. However, it must be noted that his response was limited by the very limited time granted for consideration of these issues and funding constraints. The FEIS and decisions were issued without prior notice and the emergency rule only pushed back the date to December 21, 2005. His review follows.

Review of The Final Environmental Impact Statement & NORM/NARM Rule

The Final EIS (FEIS) for the State LLBG (US Ecology leased site) is a significant improvement over the draft EIS in some areas. However, it still falls seriously short of satisfying some of the basic NRC requirements for licensing the site and the State should not approve the re-license for the facility as it is configured and described in the EIS. The Final EIS:

- Fails to adequately assess the impacts from adding NORM/NARM
- Fails to adequately assess impacts of proposed actions, the lack of characterization of contamination

- Fails to consider the reasonable (and legally required) alternatives proposed to prevent further spread of, and remediate to relevant standards, contamination.

Groundwater contamination and lack of a liner monitoring system

First we must consider that **the groundwater contamination model described in the EIS predicts contamination of the groundwater above drinking water standards (MCL) for some select radionuclides.** The prediction model considers fifteen radionuclides of which 7 were considered important for the 10k-year period. Of the seven, two were predicted to exceed MCL including I-129 and tritium.

Due to the limited time to review the FEIS, I have not had a chance to review the model. The EIS states that they used the results of new site characterization data in the development of the model. I have also not reviewed the new site characterization data. However, the site characterization failed to consider the radionuclide contamination. This is the same site characterization where, during the DQO meeting to determine what characterization data are needed, the state agencies refused to consider radionuclide contamination issues. I promptly declined to participate in their biased DQO. So, I am doubtful that the new site characterization is at all complete when it comes to consideration of radionuclide migration in the contaminant transport model. The new characterization data showed contamination deeper than the previous contaminant transport model predicted. The new model predicts eventual contamination of the groundwater above MCL levels for I-129 and tritium.

Since the landfill is theoretically, under state and federal rules, not allowed to contaminate the groundwater, it appears the State DOH and Ecology assume that enhancements or revisions to procedures described in Table 3A, and the increased use of secondary containment structures will mitigate the potential groundwater (GW) contamination from these select radionuclides. Their plan is to provide secondary containment to all class B & C waste (as before) as well as to class A LLW containing I-129, Tc, U, tritium, C and Pu. Secondary containment is to be cement vault structures.

Remember that secondary containment of the new waste does not address questions about the waste that has already been placed without secondary containment. This was to be addressed in the site characterization, which did not investigate radionuclides.

Secondary containment also fails to provide early detection of migration – a legal requirement. The site – and expansion trenches – would remain unlined without leachate detection.

The EIS also explains that the GW concentration model is only a hypothetical assessment that is used to evaluate the relative performance of the different alternatives. This statement in the EIS implies that the accuracy of the model is not adequate to predict actual groundwater concentrations. At the same time, they are saying that the precision of the model is appropriate for assessing relative risks of the different alternatives.

The EIS states that the future compliance with GW standards will be determined by the State by comparing GW monitoring data to the standards. The implied approach is that GW monitoring rather than a model will be used to demonstrate compliance.

The basic problem with this whole approach to facility monitoring is that by the time the contamination reaches the GW, it is too late to do anything about it. This is why the monitoring scheme described in the EIS is not effective and does not satisfy NRC regulations and the equivalent State WAC (underline added):

10CFR61.50(2) "The disposal site shall be capable of being characterized, modeled, analyzed and monitored"

10CFR61.52 (a) “A buffer zone of land must be maintained between any buried waste and the disposal site boundary and beneath the disposed waste. The buffer zone shall be of adequate dimensions to carry out environmental monitoring activities specified in 10CFR61.53(d) of this part and take mitigative measures if needed”

10CFR61.53(d) “ … The monitoring system must be capable of providing early warning of releases of radionuclides from the disposal site before they leave the site boundary”

The EIS apparently considers the groundwater at the fence line to be the buffer zone boundary beneath the waste. This boundary does not provide adequate dimensions to carry out the environmental monitoring as required to prevent contamination of the groundwater. There is no capability for early warning to allow adequate time for mitigative measures before contaminants move into the groundwater and eventually off-site. Once the contamination reaches the groundwater and is detected as an increasing trend, the contaminant source(s) in the vadose zone is too deep to perform any kind of an economical mitigation. If they plan to use GW monitoring to demonstrate compliance they must identify a plan or approach to mitigation if contamination of the GW is indicated (which it has been).

NUREG-1200 is the NRC guidance document for performing a review of a LLBG license application. NUREG-1200 provides the process that the State DOH follows to evaluate a license application and demonstrate how they satisfy the requirements of 10CFR60.

NUREG-1200 (Section 4.3.11) states that the principal facility design criteria for determining the extent of the buffer zone should identify (1) dimensional requirements that will be available for environmental monitoring and (2) dimensional requirements for taking corrective measures if unacceptable migration of radionuclides is indicated.

Section 5.2 of NUREG-1200, relating to post closure environmental monitoring, indicates

“The objective of the review (of the license application) were to ensure that the applicant’s post operational environmental monitoring program was adequate to yield sufficient data to assess long-range compliance with the regulatory requirements and acceptance criteria applicable to the site.”

In other words, NUREG-1200 wants a prediction, ie a model demonstrating long-range compliance.

Under the facility design configuration described in the EIS, it appears to me that the environmental monitoring system fails to satisfy these requirements and does not satisfy the clear requirements of 10CFR61.52 (a) and 10CFR61.53(d) above.

To determine just exactly how well the State DOH follows the NUREG-1200, and how well the US Ecology facility does or does not satisfy the NRC regulations, it would be necessary to review their documentation on their license application review. Unfortunately, this is not readily available and certainly not able to be undertaken prior to December 21. We would have to review their NUREG-1200 documentation before the re-licensing could be supported as well as the proposed actions of the EIS.

The other huge advantage of having a liner and leachate collection system is that it provides a monitoring and/ or verification method. Any free liquids making it through the liner will be collected in the leachate collection system. This is highly advantageous because detection is quick and right near the source, thus allowing mitigative measures.

A proper environmental monitoring scheme should include a liner system with leachate collection as a means of monitoring during landfill operations and post closure. If there is a defensible logic to monitoring without using a liner, it has not been disclosed and discussed, and should be the topic of public discussion and

meetings. This is not adequately addressed in the FEIS, or in the response to our comments. It is important to note that HoANW and others urged remedial action to retrieve wastes from unlined portions of the landfill where site investigation indicated contamination has spread, or will spread from. This objective to prevent contamination and remediate existing, documented releases is simply not addressed – and can not be met solely by placing new wastes in cement vaults. The existing disposed wastes will continue to violate these basic standards for early detection.

Photo of US Ecology unlined landfill current practices – illustrating need for retrieval and use of liners, leachate collection for early detection. This need is not limited to future waste, but clearly – as photos show – necessary for previously disposed wastes. Separate analyses for USDOE estimate that drums in Hanford LLBGs fails at a rate of 10-15% / year after less than 30 years. (See, E.g., Risk Data Sheets).

Alternatives to a liner and leachate monitoring could include installation of an effective vadose zone (VZ) monitoring scheme with some sort of regulatory compliance demonstration criteria. Questions would need to be addressed regarding what level of VZ monitoring is effective and what would be needed for a compliance level monitoring system in spatially heterogeneous soils. It is clear that their current VZ monitoring (3 vapor sampling boreholes) contributes little to the compliance-monitoring objective. All of these concerns have to be explained in the EIS for license approval.

To rely entirely upon groundwater monitoring to assure compliance, as it appears the EIS promotes, the agencies must provide the procedures or describe the planned approach for taking mitigative measures before contamination reaches the regulatory boundary (fence line? If this was a RCRA unit, as the presence of MW indicates it should be considered, then the point of compliance is not the property boundary but the edge of the unit itself – see Washington Administrative Code).

Although Ecology and DOH state in the FEIS that the groundwater contamination model is not used to assure compliance and is only used to assess relative impacts or risk for the different alternatives, the NRC regulations state that the site must be capable of being modeled (10CFR61.50(2)). I assume that this regulation is automatically implying that the model has to be accurate.

NUREG-1200 section 3.2 states

"The staff will evaluate the performance confirmation program established by the applicant. This program will provide information indicating whether actual surface and subsurface conditions encountered during construction or waste emplacement operations are within the modeling limits assumed in the staff's licensing review."

The FEIS acknowledges that tritium and I-129 are predicted by modeling to exceed MCL in the future regardless of cover design. But, on page 124 the agencies basically state that this is ok because the groundwater beneath the Hanford site is already contaminated and under institutional control. They argue

that adding a little bit more will contribute little to the overall impact. In other words, it is OK to contaminate the groundwater as long as it has already been contaminated by someone else. Cumulative effects on groundwater are not considered in the EIS as that is DOE's task (which they so effectively completed with the 1998 Composite Analysis and HSWEIS – withdrawn due to USDOE admission of major groundwater analysis flaws for IDF landfill, which USDOE refuses to release for public scrutiny). In other words, the state agencies' duty under SEPA and the Cleanup Priority Act to consider cumulative impacts has never been addressed.

NARM Waste

Most of the above discussion does not apply to NARM waste. The NARM waste is not subject to the federal LLW Policy Act, and is not waste falling within the Northwest Interstate Compact. This is stated on page 61 in the EIS.

The NARM waste of primary concern is the uranium from mill tailings. Uranium is one of the seven radionuclides for which they will provide secondary containment for disposal of LLW. I am assuming that they are excluding U from tailings (diffuse NARM) from the secondary containment requirements. I did not see in the EIS where they specifically excluded this nor did I find any discussion of any differences in the disposal strategy (as compared to class A LLW). Our assumption that the NARM will not be required to be disposed in secondary containment is supported by: the FEIS fails to address secondary containment for NARM (which is a legally significant failure to address an alternative); whereas the FEIS does specify that Class A waste will be within containment; and, the prior discussions and rule relate to bulk NARM, and the quantities would appear to make disposal in concrete impractical.

Excluding U in tailings waste from secondary containment would be a mistake for lack of an engineered barrier and a verifiable monitoring capability. Getting a good handle on Uranium migration and mobility in the complex fluvial stratigraphy is a problem. Case in point, the 300 Area fiasco as well as the large U plume from the BX-102 tank leak. In both cases, the U migration is much more extensive and difficult to model than anyone predicted. The case for a liner beneath diffuse U contamination is an argument that should be made. This is one radionuclide for which a liner was included in the adjacent ERDF facility and is probably the best option to secondary containment.

The exposure or hypothetical dose calculation in the risk assessment model includes a 100,000 ft^3 per year NARM source material. This NARM material will be buried at least 23 ft below surface grade to protect from intrusion dose, but again, the EIS does not specifically state whether or not the U from NARM will include secondary containment – it apparently does not.

The EIS and decision do not meet the relevant MTCA consideration of the likely failure of institutional controls and ensuring that the risk from direct exposure following that loss is within the MTCA health standard for carcinogens and hazardous wastes.

Remember that NARM waste may include tailings from the Midnight mine up near the Colville region of WA. There should be a discussion of whether the tailings from the Midnight mine were to be disposed in a properly designed and monitored LLBG (if it did not increase contamination of groundwater and the River) rather than being left in an uncontrolled condition at the head of a watershed as it is now. But, for the cost of a liner system we could have a modern facility that allows leachate monitoring and assures waste isolation within the disposal system. That is a reasonable thing to ask (consider ALARA requirements).

With an appropriate liner and leachate collection and monitoring system, much of the technical concern over importation of diffuse NARM waste disappears and the site becomes one that is as good or better than many other options.

Compaction and Random dumping

Additional questions remain about the past and current practice of random dumping, void filling and backfill compaction. There are improvements listed in Table 3A to some of the void filling and verification processes. However, I was not able to determine whether or not they plan to continue the practice of random dumping (of barrels) and I was not able to determine if the changes made to the procedures are adequate to verify site stability. In our comparison of the US Ecology site to either the ERDF or the Envirocare facilities (Brodeur, 2005 and 2004), I found a night versus day difference in their backfill and void filling procedures and verification. US Ecology was very haphazard with the actual backfilling and with their verification, while both Envirocare and ERDF prepared filling plans, mapped out and filled voids with grout, verified backfill compaction with in-situ measurements and documented all with procedures, data forms and reports, all of which was reviewed and approved by their regulators.

In this regard, all we are asking for is procedures that are consistent with standard geotechnical practices. I am here to tell you that what I found previously was far from the standard practices that I use every day in my own geotechnical work.

Hold the cover hostage

I also need to comment on the fact that the DOH and their site operator are holding the installation of the cover hostage to the approval of their EIS and all that goes into it. It is very important to get the cover installed over the old site as soon as possible to limit infiltration. The newest portion of the landfill should have a close as you go schedule as they have now adopted to minimize open cell time.

There is no excuse for not proceeding with interim caps under remedial action pursuant to MTCA, if retrieval is not warranted prior to interim cap installation (and, sometimes, interim capping is warranted even where the results of characterization will require future retrieval). IT should be remembered that this is installation of interim caps only – there is no final closure plan with permanent caps to be installed in the near term. MTCA does not envision waiting for an EIS to move forward with interim remedial actions to prevent the spread of contamination.

The agencies and US Ecology have not done an adequate job of characterizing the nature and extent of the contamination around the old landfill site, particularly with regard to radionuclide contamination. However, I don't believe they should hold up the cover for additional site characterization. The State has demonstrated that given more time and money, they still will not do an adequate job of characterization. Their latest effort is a testament to their resistance to use of required measure, conforming to public expectations met at all other MTCA and Hanford cleanup units, as well as ignoring qualified public input to their characterization plans. Their characterization objectives do not even address radionuclide nature and extent.

Vadose Zone (VZ) Monitoring

In sum, there is a lack of any real VZ monitoring. The only monitoring they have is vapor sampling from three VZ monitoring wells around the chemical trench. This is not a monitoring system. This is not spatially comprehensive across the site and it only samples one media (air). This system cannot be used for any kind of compliance monitoring or verification. This is obviously why I strongly support the installation of a liner based monitoring system which is spatially comprehensive and it allows verification of site performance.

(Footnotes)

[1] NORM stands for Naturally Occurring Radioactive Material; NARM is Naturally Occurring and Accelerator produced Radioactive Material

Section 9.0 Analysis of USDOE's "Performance Assessments" As Utilized for Low-Level Radioactive Waste Burial Grounds and Proposed New IDF Landfill

March, 2006

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USDOE relied upon two "Performance Assessments" for its analysis of the proposal to expand Hanford's Low-Level Burial Grounds (LLBGs) to accommodate disposal of an additional 350,000 cubic meters of Low-Level Radioactive Waste in the unlined trenches that comprise the burial grounds.[1] The Performance Assessments are the critical documents underlying conclusory statements in the Hanford Site Solid Waste Environmental Impact Statement (HSWEIS), that the burial of additional waste would not have unacceptable impacts on human health and the environment. The Performance Assessments were published for the burial grounds in 200 West in June, 1995 and for 200 East Area in August, 1996.[2] The HSWEIS also relies upon those performance assessments and the same DOE Guidance and Order for Performance Assessments for Disposal facilities.

USDOE proposed in the Final HSWEIS and Record of Decision (June, 2004) to build a new lined landfill, the Integrated Disposal Facility (IDF) for both Low-Level and Mixed Wastes. USDOE's analysis of this facility utilized DOE Order 435.1, and the HSWEIS also relied upon the Performance Assessments in regard to conclusions about the existing unlined burial grounds and cumulative impacts from adding more waste to the wastes already buried. In its February, 2006, announcement of the revised scope for a new Hanford Tank Closure and Waste Management EIS, with an obligation to perform an entirely new cumulative impact analysis for groundwater and to consider all solid waste burial facilities, USDOE again relies upon the prior Performance Assessments and proposes use of DOE Order 435.1 and DOE's own standards for determining the acceptability of its proposed actions.

The proposed actions in the scope of the new EIS, however, do not include characterization, retrieval, cleanup and "closure" of the massive unlined Low-Level Burial Grounds (LLBGs).[3] As discussed below, this failure to even consider retrieval of wastes and cleanup of the unlined LLBGs is based on the inadequate Performance Assessments, which ignore all hazardous wastes in the burial grounds, and apply DOE's Order 435.1 standards, instead of the applicable state and federal health based standards for cleanup of hazardous substances released to the environment.

USDOE's Order 435.1 standards are so lax as to result in human exposures which greatly exceed levels which EPA has formally declared to pose "unacceptable health risks" and found are not protective of human health and the environment. As discussed in this report, EPA's findings that USDOE's proposed "acceptable exposures" are not protective of human health and the environment are based on EPA's standards that are less protective than those applied at toxic waste sites throughout Washington State.

This report concludes that USDOE's reliance on its Performance Assessments and the DOE Order 435.1 Guidance does not meet the requirements of NEPA and SEPA and applicable laws for consideration of: cumulative impacts; the cumulative impacts from both radioactive and nonradioactive carcinogens; and, whether relevant standards will be violated by the proposed new landfills or existing LLBGs. **USDOE's Performance Assessments and guidance are based on allowing future releases of radionuclides from the IDF and LLBGs which would result in cancer in 15 to 50% of children exposed to the groundwater, River or surface contamination – without even considering the additional risk from**

non-radioactive carcinogens. This stands in stark contrast to Washington State law under which no risk of cancer greater than one in one hundred thousand is allowable from all current or future releases.

Based on its own standards and inadequate performance assessments, USDOE has already concluded that the Tank Closure and Waste Management EIS will be based on the noncompliant assumption that USDOE can leave the unlined LLBGs to spread further contamination without retrieving waste or properly closing the burial grounds. This new EIS is likely to be indefensible if it again relies upon the Performance Assessments for the LLBGs in its cumulative impact analysis – and, if USDOE fails to "actually characterize" the contamination in the burial grounds prior to claiming that it has considered the impacts from them. In regard to IDF or other new landfills which the new EIS proposes, due to reliance on DOE Order 435.1, and inadequate cumulative impact analysis from all sources (unlined burial grounds, cribs, tanks as well as the new landfills), USDOE will be proposing to add far more wastes, with greater hazards, and without long-term controls than should be allowed under relevant and applicable health based standards.

Background on USDOE Decisions to Use Hanford as a National Radioactive and Mixed Waste Dump, and on USDOE's Landfills:

USDOE issued a Final HSWEIS in February 2004 with a "preferred alternative" of using a new landfill in Hanford's 200 East Area to dispose of over 12.7 million cubic feet of low-level and mixed waste from other nuclear weapons complex sites, in addition to 156,763 cubic meters of onsite wastes.[1] In June, 2004, USDOE issued a Record of Decision (RoD), based on that EIS, to open the "**Integrated Disposal Facility" (IDF)** landfill at Hanford for on-site and offsite wastes, with the initial decision (subject to future changes) to use the landfill for 3 million cubic feet of offsite waste – and to ship over 460,000 cubic feet of offsite waste to Hanford for disposal in the new IDF landfill by the end of 2007, when the landfill would be operational.[4] USDOE's permit application for IDF includes formal proposals for the landfill to eventually have 900,000 cubic meters of disposal capacity, which is approximately 32 million cubic feet.[5] The total disposal capacity proposed for the IDF landfill dwarfs the 12 million cubic feet of additional waste burial disclosed and considered in the Hanford Solid Waste Disposal EIS, and far exceeds any quantity considered in USDOE's performance assessments.

USDOE proceeded to construct the initial phase one cells of the landfill without awaiting final permits or issuance of the Final EIS.[6] As of February, 2006, Washington Ecology has not yet issued a Hazardous Waste Management Act (HWMA) / RCRA permit for the landfill. Amongst the controversies, as discussed in our comments on the proposed permit and SEPA Determination for IDF (co-published with this report), is the concept that half of the initial cell will be used solely for low-level radioactive waste and, USDOE claims it is exempt from Washington State permitting. The other side of the cell (across an imaginary dividing line) will be used for Mixed Waste and subject to Washington's HWMA and RCRA permitting. However, the impacts of releases to the soil and groundwater over decades and centuries will not be discernable based on which side of the line wastes were initially disposed on.

Washington State challenged the adequacy of the USDOE's analysis of impacts to groundwater from the IDF landfill in the Hanford Solid Waste EIS. In January, 2006, USDOE made public a "Headquarters' Review of the Hanford Solid Waste EIS".[7] The review found that the groundwater, health and safety and transportation analyses in the Hanford Solid Waste EIS had numerous "data inaccuracies", rendering these sections seriously deficient and, that the groundwater cumulative impact analysis was not "defendable" due to a lack of data quality.[8] USDOE entered into a settlement with Washington to do a new groundwater

impact analysis – this time considering both the cumulative impacts of all past disposal on the Hanford Central Plateau (e.g., the Hanford Low-Level Burial Grounds) and cumulative impacts from all waste proposed to be disposed in new landfill(s).

Thus, this review of USDOE's Low-Level Burial Ground Performance Assessment and USDOE's rules for performance assessments is vital for ensuring that the scope of the new Tank Closure and Waste Management EIS and any permit conditions for the IDF landfill will be adequate to ensure that cumulative impacts are considered and do not result in violation of health standards in the future.

The Need to Adequately Consider Cumulative Impacts Is Not Met With USDOE's Performance Assessments and By Following Order 435.1:

Both state and federal laws require consideration of the cumulative impacts from all related actions – disposal on either side of the imaginary line.[2] Key amongst the cumulative impacts is the consideration of the total cancer risk to future exposed populations using groundwater or the Columbia River that may occur for all wastes proposed to be disposed in the landfill.

State law is predicated on the principle that the Department of Ecology should not permit a new landfill to have impacts from expected future releases of waste that are so high that they will exceed relevant cancer risk standards for groundwater and cleanup – in order to avoid opening new landfills that will turn into future toxic substance cleanup sites.[9]

Ecology has a duty to: "Deny the permit or approval for a proposal if reasonable mitigation measures are insufficient to mitigate significant adverse environmental impacts and the proposal is inconsistent with the policies in subsection (1) of this section." WAC 173-802-110(2)(b)(ii). A proposal has a "per se" unacceptable impact, triggering mitigation or denial, if the impacts will violate or exceed relevant standards. Critical standards for consideration of the IDF landfill and Hanford LLBGs include, but are not limited to:

- The cancer risk standard for maximum risk from exposure to hazardous substances released to the environment in Washington's Model Toxics Control Act (RCW Chapter 70.105D) found at WAC 173-340-700(5)(B). Under this standard, the release must be remediated to ensure that no more than one out of every one hundred thousand persons exposed to the release get cancer. This is expressed in risk analyses using scientific notation as a risk of 1x10-5.
- The cancer risk standard from exposure to all hazardous substances released at a federal facility or federal Superfund site (National Priority List site) under the federal Superfund law, CERCLA, which is a maximum risk of one additional fatal adult cancer for every ten thousand persons exposed (1x10-4). The Superfund law specifies that more protective state standards must be applied to federal Superfund sites and federal facilities. 42 USC 9621(d)(2)(A) and 42 USC 9620(a)(4).
- Maximum Concentration Limits (MCLs) for contaminants, including carcinogens, in groundwater and under the Safe Drinking Water Act (Drinking Water Standards, or DWS).

Thus, it is necessary to determine the cumulative impacts from all potentially released carcinogens for an adequate EIS and for permitting decisions – even if decisions regarding *how* LLW is disposed is outside the purview of state hazardous waste law authority, and is under the sole regulatory authority of the USDOE. So long as USDOE wishes to dispose of mixed wastes, NEPA and state laws require consideration to ensure that applicable cancer limits and other standards are not exceeded (from all sources and related proposals) when the state issues a mixed waste disposal permit. And, under NEPA, USDOE must consider the impacts from all sources in relation to all relevant standards, including the cancer risk standards.

USDOE's Performance Assessments and Order 435.1 Fail to Consider the Combined impact of All Carcinogens:

Despite the necessity of considering all carcinogens in a cumulative impact analysis, USDOE's Performance Assessments for the LLBGs failed to consider non-radionuclide contaminants, and the guidance fails to follow the summing of all carcinogens approach required for federal NEPA, CERCLA and state HWMA/ MTCA and SEPA decision making.

EPA and Washington State have long recognized that it is not possible to consider the impact of proposals, or from existing landfills, on cancer risks without considering – and summing – the risk from both radionuclide releases and all other carcinogens.

Instead, as discussed below, the USDOE claims that its "Performance Assessment" process under DOE Order 435.1 is the exclusive means by which cancer risk from radionuclide releases are to be evaluated for both the existing Low-Level Burial Grounds and proposed new landfills.

- It is necessary to review the Performance Assessments in order to independently assess the basis for USDOE's claims of low health risks from the earlier proposal to more than double the total amount of radioactive waste buried in unlined soil trenches at Hanford; and, from the current proposal to leave waste in the trenches without retrieval and closure (2006). The unlined soil trenches have no leachate collection and inadequate groundwater monitoring.
- Claims related to health risks rely upon exposure scenarios for future users of the Hanford Site and Columbia River that are found in the Performance Assessments.
- These exposure assumptions are dramatically different than those required to be used for human health risk assessment under Washington's Model Toxics Control Act.

Waste Quantity:

USDOE's EISes and Performance Assessments use radically different projections of additional wastes to be buried at Hanford, which are then relied upon – inappropriately and indefensibly – in USDOE's Records of Decision. Thus, USDOE continues to assert in federal court filings[10] and in the announcement of the new scope for the Tank Closure and Waste Management EIS[11] that the decision to use Hanford as a national radioactive and mixed waste dump for other USDOE facilities' wastes was made in a 2000 Record of Decision on the 1997 USDOE Waste Management Programmatic EIS.

The WMPEIS Record of Decision specifically stated that the decision to utilize Hanford as a national radioactive and mixed waste dump was based on the use of "existing facilities" and the acceptability of impacts from projected disposal and past disposal in those existing facilities at Hanford. Those "existing facilities" were Hanford's unlined Low-Level Burial Grounds, and the determination of acceptability was based upon the Performance Assessments. (Note USDOE referred to Hanford as a "regional" disposal facility, although the decision was for only two sites, Hanford and Nevada Test Site, to accept wastes from all other USDOE facilities for the coming decades.)

- The Draft HSWEIS proposed to more than double the total amount of radioactive waste buried in unlined soil trenches at Hanford:
- Documentation: EIS Table 3.2 for LLW: "Previously buried waste" = 283,067 cubic meters
  "Upper Bound" proposed = 631,427
  Added Waste = 348,360
  However: cf: WMPEIS[12] summary at 53 shows Hanford total "current inventory plus 20 years generation" = 89,000 cubic meters.
- 350,000 cubic meters LLW x 35.3 to get cubic feet = 12,355,000 cubic feet
- IDF Landfill Permit proposes 900,000 cubic meters, or 32 million cubic feet of total disposal capacity.

USDOE's Performance Assessments Use Criteria for Acceptable Health Impacts Which Exceed Legal Limits for Radiation Exposure and Health Risk to the Public:

Washington State's Model Toxics Control Act (Chapter 70.95D, R.C.W.; and implementing regulations at Chapter 173-303 WAC) set applicable health based standards for public exposure to "hazardous substances" and carcinogens released from disposal sites. Included in hazardous substances are radionuclides.

The State limits exposure, and requires cleanup, if exposure would result in a total carcinogen risk (from all sources at the site) greater than **one in one hundred thousand**.[13] Thus, if more than one exposed person in one hundred thousand would get cancer, additional cleanup is required. (This is often expressed in scientific notation as 1E-5). The State limit applies at federal Superfund sites in Washington.

- This is one additional cancer in the most sensitive exposed population, per 100,000 exposed; i.e., children or Native American children who consume large quantities of water and food from the site.

United States Environmental Protection Agency (EPA) sets a more relaxed standard utilizing a risk range allowing between one additional fatal cancer per ten thousand and one in one hundred thousand. (1E-4 to 1E-5).[14] However, the Superfund law requires EPA or a federal agency cleaning up a federal site to use a more protective, generally applicable state hazardous substance cleanup standard.[15]

USEPA has issued a formal opinion that exposure to 25 millirem per year of radiation from pollution at a federal Superfund site is not protective of human health or the environment, calling that level of exposure "unacceptably high" because it would result in 5 additional fatal cancers per ten thousand exposed adults (5E-4).[16]

- EPA has formally found that a proposal to allow 100 millirem exposure annually "could create unacceptable health risks to the public… and potentially result in the creation of new Superfund sites."[17]

- The EPA and Washington State standards are applicable to the Hanford Low-Level Waste Burial Grounds because:

1) The burial grounds have released wastes to the environment, and have illegally been used to dispose of hazardous wastes – subjecting them to RCRA and Washington Hazardous Waste Management Act requirements for permitting and remediation. Washington State utilizes the MTCA standard for RCRA

permit actions – consistent with the philosophy that we should not create new Superfund sites requiring cleanup.

2) The burial grounds are in the midst of the federal designated Superfund National Priority List site and MTCA designated site.

EPA has adopted specific guidance for radionuclide cleanup at Superfund sites which requires that the cleanup level be determined by summing ALL carcinogens, including both radionuclides and chemical carcinogens. EPA Guidance to implement this requirement specifies that the risk documents must not consider radionuclides separately:

> "(c)ancer risk from both radiological and non-radiological contaminants should be summed to provide risk estimates for persons exposed to both types of carcinogenic contaminants… risk estimates contained in proposed and final site decision documents (e.g., proposed plans, Record of Decisions…) should be summed to provide an estimate of the combined risk to individuals presented by **all** carcinogenic contaminants."

US Environmental Protection Agency; OSWER 9200.4-18, "Establishment of Cleanup Levels for CERCLA Sites with Radioactive Contamination", Aug 22, 1997. At 4. (parenthetical and **bold** emphasis in original).

USDOE's Performance Assessments for the LLBGs and guidance under Order 435.1 all fail to sum the cancer risk from consideration of releases and exposure to ALL carcinogens. Instead, they only consider radionuclides and ignore the wide range and massive amounts of non-radioactive carcinogenic chemicals disposed in the LLBGs or proposed for the IDF landfill.

For instance, it has been documented that very large amounts of the powerful carcinogen (and poison) Carbon Tetrachloride were disposed in the unlined LLBGs. In Waste Management Area 4, directly to the West of the Plutonium Finishing Plant, levels of Carbon Tetrachloride were found in the trench vapor space at levels of 1,760 ppm, which is 176% of the level identified in literature as fatal to humans.[18] In 2003, Ecology issued a Notice of Deficiency for the USDOE's application for a Part B Permit for Hanford's LLBGs, finding that Carbon Tetrachloride was spreading and contaminating groundwater. More recently, Carbon Tetrachloride levels have been identified in Waste Management Area 3 at levels far above the OSHA Permissible Exposure Limit (PEL). Yet, the Performance Assessments for the LLBGs fail to identify any hazardous chemicals disposed, and the Final HSWEIS fails to identify the quantities of these carcinogens present or their concentrations or potential impacts.

The USDOE's Performance Assessment – and Hanford Site Solid Waste EIS – are Based on Performance Objectives that "create unacceptable health risks to the public… and potentially result in the creation of new Superfund sites":

USDOE's Performance Assessment is based on the burial grounds meeting "Performance Objectives" – pursuant to DOE Order 435.1 - that allow radiation doses of 25 mrem per year to the public and continuous exposure to 100 mrem per year of radiation following reasonably foreseeable intrusions (which

may be animals, plants, seismic events, industrial construction…) causing releases from the waste sites. Doses of 500 mrem per year are considered acceptable by USDOE for single annual exposures following intrusion.

Rather than designing the burial grounds to meet the applicable EPA and Washington State standards, USDOE sets "performance objectives" (which are not regulatory rules) in DOE Order 5820.2A for general public exposure from all pathways and post-intrusion exposures.[19]

EPA has specifically called the 25 mrem per year annual exposure an "unacceptable health risk".[20] This radiation dose is fifty times the allowable carcinogen risk under Washington's Model Toxics Control Act.

Based on EPA, NRC and generally used dose: risk calculations at the time of USDOE's Performance Assessments for the LLBGs, the USDOE performance objective for reasonably foreseeable continuous annual exposure after intrusion into the burial grounds would result in 2 fatal cancers for every 1,000 adults exposed.[3] It is now generally accepted that children are 3 to 10 times more susceptible to cancer from ionizing radiation exposure than adults. For children, post intrusion risk deemed acceptable under USDOE's performance objective could be as high as 1 in 100. (Washington State law sets the standard as 1 additional cancer in 100,000 from all carcinogens remaining on the site).

However, the old dose: risk calculations are no longer considered the best available science, and the newer data reported by the National Academy of Sciences should be utilized (Biological Effects of Ionizing Radiation VII; or "BEIR VII", June, 2005).

When the new dose: risk data is taken into consideration for the levels of radiation dose and exposure deemed "acceptable" by USDOE under Order 435.1 and the Performance Assessments for LLBGs and IDF, we find that the risks that USDOE would allow are shocking to the sensibilities.

The data and findings of the new National Academy of Sciences BEIR VII Report establishes that 15 millirem per year of radiation exposure from contamination at Hanford (or other contaminated sites) would result in far more than 1 additional fatal cancer for every ten thousand persons exposed.

Yet, EPA uses 15 mrem/year as its acceptable level to "generally' (but not specifically) meet the CERCLA maximum cancer risk standard of one additional cancer per ten thousand adults exposed. For years, EPA has calculated that 15 mrem/year exposure will likely result in 3 fatal cancers per ten thousand adults exposed (3x10-4).

In fact, the BEIR VII data establishes that 15 mrem/year of exposure to an adult would be estimated to result in 8 additional cancers per ten thousand exposed adults (8×10^{-4}), or *8 times the EPA standard, and at least 80 times the state MTCA standard*.

Unlike the EPA standard, the state standard under MTCA requires protection of the most vulnerable individuals who are likely to be exposed. Children are 3 to 10 times more susceptible to cancer from the same dose of ionizing radiation or other carcinogens as are adults.[21] Recent research also shows that older adult workers at Hanford are more susceptible to cancer from the same dose than younger workers. [Univ. of North Carolina – Chapel Hill and NIOSH, June 16, 2005]).

The BEIR VII report estimates that 100 mrem/year of exposure will result in approximately 1 (1.142) cancer in every 100 adults exposed[22]. USDOE uses 100 mrem/year as an acceptable dose to the public in its performance assessments. [DOE Order 435.1]. The BEIR VII data shows that this would result in cancers in 1% of exposed adults (1x10-2). Thus, 100 mrem of exposure is now recognized as likely to result in a cancer risk to adults which is two magnitudes greater than allowed by EPA's CERCLA regulations.

If we consider children likely to be exposed under reasonable maximum exposure scenarios used by EPA for Hanford Clean-Up decisions, ***the USDOE allowable dose of 100mrem*** (ignoring that a child's dose may be significantly higher for specific organs than an adult's from the very same exposure – which has not been considered in any performance assessment) will ***result in cancers in 3 to 10% of all children subject to reasonably foreseeable exposure to releases from Hanford's LLBGs and IDF.***

Now, consider that USDOE's Order 435.1 and the Performance Assessment for the LLBGs consider it acceptable to leave waste without retrieval and cleanup in a manner that reasonably foreseeable intrusions will result in 500 mrem doses. USDOE makes unfounded assumptions that – following such intrusion (e.g., after institutional controls fail and an industrial construction project may lay an excavation trench through a burial ground or landfill; or, animals and plants intrude and bring waste to the surface) – the institutional control will somehow be reasserted and that the dose will not continue to the exposed public. ***Under USDOE's plans to leave wastes without retrieval in LLBGs and for IDF, following Order 435.1, potential exposures from current plans would be deemed acceptable with cancer risks reaching between 15 and 50% of children reasonably foreseeable to be exposed to the LLBGs and IDF.***

USDOE's Performance Assessment Ignores the Disposal of Hazardous Wastes in the Low-Level Burial Grounds:

Extensive documentation exists of hazardous wastes disposed in the burial grounds.[23] Not only do the Performance Assessments ignore these wastes, but they also fail to take into account the documented massive volume of Plutonium and Transuranic wastes buried prior to 1970 – often with a mixture of hazardous wastes containing powerful solvents, corrosives, ignitables. These are known to already hasten the spread of waste through the soil. Review of USDOE documents by Oregon State's Dirk Dunning, forwarded to us for use in this analysis found:

"Between all of the sites (in the SW-2 unit, which is the unlined LLBGs), there is about 833 kilograms of plutonium and 1,079 metric tons of uranium along with uncounted tons of lead, mercury and other hazardous materials."

In 2004, Heart of America Northwest published a report (funded as part of this same Citizens Monitoring and Technical Assistance Fund grant), in which we documented from USDOE's own validated and data quality controlled analysis in 2000, that there was 18 times more Plutonium and TRU in Hanford's soil sites than in the "retrievably stored" post 1970 TRU which USDOE is required under TPA milestones to retrieve and assay for shipment to the WIPP deep geologic repository for TRU in New Mexico. USDOE's data for the quantity of buried waste in the unlined 200 Area Burial Grounds which meets the legal definition of TRU wastes – cited in our report – is 65,590 cubic meters.[24] All of this is "suspect" mixed waste.[25]

The **Draft HSWEIS** had the following disclosure for quantities of TRU at Hanford and projected to be added to Hanford's inventory from either onsite generation (especially closure of tanks, decommissioning of High-Level Nuclear Waste treatment facilities, exhuming known burial grounds with RH-TRU) or imported from offsite:

Table C.6. Waste Volumes for Transuranic Waste (m3)

Storage Inventory (10/2001) (Barcot 2002)	Onsite Waste Forecast(Barcot 2002)	Total	Offsite Waste Forecast
16,136	29,613	57	45,806

Assumptions were stated as being based on 2002 SWIFT Report and "maximum forecast estimates were used to provide a bounding analysis."[26] The Final HSWEIS estimated 31,000 m3 of TRU in soil across Hanford, apart from retrievable TRU – again grossly underestimating the TRU in the unlined LLBGs and making any claims about reliability of cumulative impacts indefensible.[27]

The 16,136 m3 cited above in the HSWEIS is the quantity of retrievably stored post 1970 TRU required to be removed under the Tri-Party Agreement. The 29,613m3 is the waste that would remain in the soil under the proposed scope of the Hanford Tank Closure and Waste Management EIS. Yet, as we documented in our 2004 Report ("Transuranic Waste at Hanford: Large Quantities Lost, viewable at www.hoanw.org), the Hanford Solid Waste EIS indefensibly ignored and lost track of the validated 65,590m3 of buried TRU in the Hanford LLBGs, and a total of 156,000 m3 meeting the legal standard for TRU (above 100nci/gm) in Hanford's soils.

Heart of America Northwest's 2004 report found:

> In its 2000 Complex-Wide Data Report on TRU, USDOE confirmed that vast volumes of TRU waste, which were not previously included in cleanup plans or analyses, existed at Hanford. In 2000, USDOE Headquarters published a database on all TRU buried in soil and TRU waste in the ground from past waste disposal practices: "Buried Transuranic-Contaminated Waste Information for U.S. Department of Energy Facilities."[28] USDOE confirmed in 2000 that there was 107,400m3 of buried TRU and TRU contaminated soil at Hanford that met the same definition of TRU as the waste that USDOE planned to send to WIPP.
>
> However, there is no plan to retrieve these dangerous wastes, whose volumes far exceed the safer, retrievably stored wastes… Far more Transuranic waste than USDOE plans to retrieve has, once again, been LOST from all analyses and plans for Hanford Clean-Up.

Hanford's unlined Low-Level Burial Grounds have been established by Ecology to be the source of uncontrolled and continuing releases of toxic and carcinogenic hazardous substances (e.g., Carbon Tetrachloride from Waste Management Areas 3 and 4). SEE Notice of Deficiency issued to USDOE rejecting its Part B RCRA application; 2003. Much of the Carbon Tetrachloride was probably co-disposed in barrels of TRU, as it was used as a solvent in the Plutonium Finishing Plant.

USDOE proposed to keep these unlined burial grounds (LLBGs) open until 2035 (USDOE baseline, April 2004); and proposed in the Draft, Revised Draft and Final Hanford Solid Waste Environmental Impact Statements between 2002 and 2004 to continue to accept large quantities of offsite waste into these unlined burial grounds. USDOE's Record of Decision, June, 2004, stated that USDOE would cease disposal in the unlined burial grounds – but, failed to adopt any plan for "closing" the burial grounds. The Tank Closure and Waste Management EIS, announced February, 2006, also fails to include in its scope any alternative to retrieve TRU and hazardous wastes from the unlined burial grounds, and "close" the unlined LLBGs - despite legal requirements to do so.

We find that the upcoming Tank Closure and Waste Management EIS (scoping March, 2006) should include the impacts from the entire inventory of the massive unlined burial grounds (which will require 'actual characterization" efforts); and, that USDOE is legally obligated to present legally compliant alternatives for retrieving wastes and "closing" the unlined burial grounds. The USDOE baseline plan and proposed Tank Closure and Waste Management EIS assumption that it may leave the waste unretrieved and without closure of the LLBGs until 2035 is not acceptable.

<u>The presence of non-radioactive hazardous wastes is highly significant because:</u>

- Hazardous wastes migrating from the burial grounds create significant health and environmental risks – for the commercial Low-Level Waste Burial Grounds, Washington Ecology has documented releases of nonradioactive hazardous wastes other than radionuclides (there is also evidence of radionuclides reaching groundwater) have reached groundwater in less than forty years of operation, in concentrations exceeding Washington State cleanup standards and Safe Drinking Water Standards.
- Some of the hazardous wastes disposed included liquids that will mobilize other wastes; or were wastes that would increase the corrosion of waste containers.
- Some hazardous wastes disposed in the LLBG were explosive or flammable.
- Hazardous wastes disposed in the burial grounds were often solvents and wastes that will serve to mobilize radionuclide contaminants, and dramatically increase the speed at which they travel to groundwater.
- Hazardous wastes change the ability of radionuclides to "sorb" to the soil, destroying the basis for USDOE's models that show limited radionuclide migration through soil to groundwater.

A sworn affidavit provided to Heart of America Northwest (January, 2006) by former Ecology Unit manager for LLBGs, Richard Heggen, includes the following information on the hazardous wastes disposed in the LLBGs and the risks from having ignored them:

> "Many of these trenches were used to dispose of hazardous chemicals and mixed wastes (composed of both radioactive substances and nonradioactive hazardous waste), including, but not limited to, liquids, ignitables, corrosives, carcinogens. In addition, many of the radioactive or mixed wastes in the trenches may oxidize on contact with air - combusting and spreading contamination. The trenches were open for

lengthy periods and have never been "capped". At times, trenches were flooded. Prior to 1971, USDOE disposed of Plutonium and other Transuranic (TRU) wastes directly in the soil in these trenches.

"The burial grounds lack: liners, leachate collection systems; soil column (vadose zone) monitoring; and, compliant groundwater monitoring systems. Many Hanford burial grounds contain large amounts of mixed waste and hazardous waste. One indication of the condition of the waste buried in the unlined trenches is the numerous past documented releases of radioactive constituents to the ground surface due to poor storage of deteriorating containers in the ground In or adjacent to the LLBGs. ... In 1998, it was determined that the Application was Incomplete and Insufficient, and could not satisfy SEPA. In 2003, USDOE was issued a Notice of Deficiency."

Incredibly, USDOE's Performance Assessment – relied upon for the HSWEIS – totally ignores the presence of hazardous wastes in the Low-Level Burial Grounds.

The discovery in 2002 of Carbon Tetrachloride (CCL4) at 1,760 parts per million at a vent in Waste Management Area 4 of the Hanford Low-Level Burial Grounds shows the danger of relying upon a performance assessment that ignores the presence of non-radioactive hazardous wastes.

USDOE's Performance Assessment does not even reference standards for the burial grounds to meet for non-radioactive hazardous wastes.

Cumulative impacts, which the National Environmental Policy Act and State Environmental Policy Act require to be considered in an EIS, from the burial grounds already appear to exceed applicable standards from the Carbon Tetrachloride release – before considering additional releases from adding more waste to the LLBGs.

Even without considering the impact of hazardous wastes on the models used to predict contaminant transport and perform the risks assessments, the HSWEIS admits that radioactive Iodine 129 and Tritium contamination from the burial grounds will greatly exceed standards at a well one kilometer away from the burial grounds, and require restricting access to a large area (which two Native America Nations have treaty rights to utilize) for "thousands of years".

For the HSWEIS, USDOE inexplicably only presents groundwater contamination data for a single well one kilometer away from the burial grounds – which is further than one kilometer from many of the burial grounds. No explanation is proffered for why or how this single point was chosen.

In discussing "parameters that could influence radionuclide groundwater concentrations", USDOE never mentions the potential for non-radioactive hazardous wastes to increase contaminant mobility.[29]

Groundwater Standards for Radionuclides Are Shown to be Exceeded in the Performance Assessment:

Despite the Solid Waste EIS depicting groundwater results only for a single well in the 200 West Area (one kilometer away from the edge of the nearest burial ground), the Performance Assessment for 200 West clearly shows that for a well 100 meters from the burial grounds, the radiation doses from use of groundwater would exceed standards.

As noted earlier, the Maximum Concentration Limit (MCL) under the Safe Drinking Water Standard, utilized by EPA and Washington State for Superfund and MTCA standards, is based on a maximum dose of 4 mrem per year. At Table 4-22, USDOE provides "Radionuclide Dose Estimates for Groundwater Pathways"[30]. Doses exceeding 4 millirem per year are shown for:

C^{14}; Cl^{36}; Tc^{99}; I^{129}; Se^{79}; Np^{137}; Pa^{231}; U

The total cumulative dose – not shown in the Performance Assessment – from the groundwater pathways would equal >9E+4 mrem/year. The MCL standard would be 4E+1. In plain language, the MCL will be exceeded by three magnitudes.

The HSWEIS, however, presents results solely for one well a full kilometer away from the burial grounds. The EIS shows MCLs violated for that well for only Iodine 129 and Tritium (H3). The reason for USDOE choosing to only present data for a well 1 kilometer away from the burial grounds appears to be to prevent disclosure of the excessive groundwater contamination that will occur from these burial grounds.

The majority of groundwater monitoring wells at the edge of the LLBGs are dry or out of compliance with RCRA requirements. A dry well can not find contamination in the aquifer. The Performance Assessment relies upon models, rather than actual data. The significance of this is shown by the investigation into the nearby Hanford commercial Low-Level Waste site run by US Ecology Corp.. For the EIS for relicensing that site, US Ecology relied upon the same model as USDOE used in the Performance Assessments for 200 East and West. As with the HSWEIS, little migration through soil was predicted and groundwater was not expected to be impacted. However, actual data from monitoring wells (starting in late 2000) conclusively revealed that hazardous substances had reached groundwater from the US Ecology burial grounds.

USDOE utilizes a dose level for performance assessments for new landfills and for proposed cleanup actions based upon 25 millirem/100 millirem and 500 millirem as being allowable doses to the public. Without CERCLA and the more protective state standards being applied, USDOE would allow contamination at a level projected to result in cancer in 1% of adults exposed (when 100 mrem is used) and 27 cancers for every 10,000 adult persons exposed (when USDOE applies 25 mrem/yr exposure as acceptable).[31] When the reasonably foreseeable exposure to children are considered for risk assessment, USDOE's standards and plans for "acceptable risk" from the LLBGs and new landfills would allow cancer risks ranging as high as 15-50% from "reasonable maximum exposure scenarios".

Recommendations:

1. Consideration of cumulative impacts to groundwater and human health in the Tank Closure and Waste Management EIS must be based upon new, actual characterization of the Hanford unlined Low-Level Burial Grounds (LLBGs).
    a. This characterization must assess the total amount and hazard of buried hazardous wastes and Plutonium and other Transuranic wastes; and, the spread of contamination (which can

not be determined using the currently non-compliant and woefully inadequate groundwater monitoring wells at the LLBGs). Characterization pursuant to RCW 70.105E.060 must occur prior to decisions on, and to inform alternative in, the Tank Closure and Waste Management EIS.

b. USDOE must not rely upon the Performance Assessments or HSWEIS for this new analysis.

2. Risk assessments for the unlined LLBGs and new landfills – including the portion of the new IDF landfill claimed to be devoted solely to Atomic Energy Act radioactive materials – must consider carcinogenic risks from ALL sources. These risks from both radioactive and non-radioactive carcinogens must be presented as a single set of risk figures.
    a. an entirely new assessment of all hazardous wastes disposed in soil and the LLBGs must be undertaken, rather than rely upon the two Performance Assessments for the LLBGs, which ignored all hazardous wastes and failed to acknowledge the quantities of TRU disposed.
    b. Urgent attention must be given to the presence of ignitables, corrosives and potentially oxidizing wastes in the LLBGs, and a plan adopted to characterize and remove and treat such wastes consistent with the Cleanup Priority Act, RAC 70.105E.060.
3. The Tank Closure and Waste Management EIS should be utilizing the 'default' or Eastern Washington appropriate assumptions for human health risk assessment pursuant to the Model Toxics Control Act in calculating risks, including use of maximum reasonable exposure scenarios for children and native Americans under conditions of institutional control failure (E.g., intrusion into the burial grounds).
    a. USDOE must not claim in performance assessments or the EIS that risks from institutional control loss and intrusion are one time or acceptable without documenting how those controls will be restored and additional exposure prevented;
    b. nor should USDOE take credit for hypothetical institutional controls to prevent exposure (in justifying decisions not to retrieve waste or decisions on disposal and capping) without documentation of what those measures are and evidence that they will be operative and successful over the entire period of risk.
    c. If USDOE does not utilize these appropriate assumptions for risk assessment, Washington Ecology must reject the analysis and require an additional analysis for purposes of SEPA compliance, and permitting both IDF and closure of the LLBGs.
4. USDOE's Tank Closure and Waste Management EIS must consider and discuss whether risk assessments, including for children, under MTCA compliant reasonable maximum exposure scenarios, indicate that the MTCA and CERCLA carcinogen risk standards will be violated for any period in the future due to releases from the landfills or from intrusion and loss of institutional controls.
    a. USDOE must not rely for any decisions on its own Order 435.1 standards to determine the "acceptability" of exposures from its landfills.
    b. USDOE's self-regulatory "standards' under Order 435.1 would allow doses that are now estimated to cause cancer in ranges between 15 and 50% of children.
    c. All decisions on acceptable risk, and "per se" violations requiring additional remedial action or mitigation (including limitation of waste to be disposed) must be based on the MTCA standard of no more than one additional cancer for every one hundred thousand exposed individuals, including children when they are reasonably forecast to be exposed.
    d. If total cancer risk from all sources exceeds the MTCA cancer risk standard, Ecology must apply limits on the amount and nature of waste to be disposed in the IDF landfill, first

excluding any waste not generated from Hanford cleanup. Failure to follow these recommendations will lead to the new landfill becoming a future Superfund site.

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End Notes:

(Footnotes)

[1] The total potential amount of on-site waste expected to be generated from cleanup of Hanford and requiring disposal is 156,735 m3 - prior to treatment or volume reduction. (Of this amount, 58,054m3 is expected to be mixed radioactive and hazardous waste (Mixed Waste, or "MW"). Yet, USDOE plans IDF to have 900,000 m3 of disposal capacity, which is over 32 million cubic feet.

[2] SEPA and NEPA both require consideration of the cumulative impacts from all related proposals. Washington's new Cleanup Priority Act echoes this requirement for consideration of the cumulative impacts in determining if the related proposals from a landfill will exceed applicable state cancer risk standards. RCW 70.015E.050.

[3] This assumes that USDOE used generally applicable and realistic exposure assumptions, which it did not. For instance, USDOE used lower soil inhalation, direct exposure time, fish consumption and other key assumptions. Each of these dramatically changes the potential dose, and USDOE consistently chose to sue assumptions that were favorable t its analysis of acceptability. Washington State sets default assumptions and requires use of best available science to substitute. When, as in Eastern WA, the wind blows soil, the default for soil ingestion should be the one used for MTCA cleanups in Eastern WA, not national DOE assumptions. USDOE also fails to consider likely child exposures.

(Endnotes)

[1] "Performance Assessment for the Disposal of Low-Level Waste in the 200 West Burial Grounds", WHC-EP-0645, prepared for the U.S. Department of Energy by Westinghouse Hanford Company, June 1995; and, "Performance Assessment for the Disposal of Low-Level Waste in the 200 East Burial Grounds", WHC-SD-WM-TI-730, prepared for the U.S. Department of Energy by Westinghouse Hanford Company, August, 1996.

[2] The documents were provided to Heart of America Northwest by Michael Collins, USDOE Program Manager for the Hanford Site Solid Waste Environmental Impact Statement (HSWEIS), because – while relied upon for analysis in the EIS – the documents are not available on the internet.

[3] See Federal Register announcement February 2, 2006: 71 FR 5655; "Notice of Intent to Prepare a Tank Closure and Waste Management Environmental Impact Statement for the Hanford Site"; and, Briefing Documents and discussion to joint Hanford Advisory Board committees week of February 7, 2006.

[4] USDOE has been enjoined from shipping waste to Hanford by the US District Court for Eastern WA (Washington v. Bodman) due to the State's showing that the Hanford Solid Waste EIS was probably inadequate. USDOE and Washington entered a stipulated settlement entered with the court extending the terms of that injunction until a new, adequate cumulative groundwater impact analysis was finalized in a new Tank Closure and Waste Management EIS, proposed to be issued by early 2008. thus, USDOE can not begin the import of waste to IDF until the new EIS is finalized. In addition, Washington's new Cleanup Priority Act, passed by the voters as Initiative 297 in November, 2004, bars USDOE from adding mixed wastes to the site from other sources until contamination is cleaned up and facilities comply with basic hazardous waste standards. RCW 70.105E.040(6). USDOE has challenged that Act in court, but the injunction against enforcement of the Cleanup Priority Act does not include enjoining the state from enforcing the bar on mixed waste import (due to the existing injunction which also bars such import).

[5] Permit Application Part III, Operating Unit 11, 4A-1.5. (page 4A-1.4). 446 meters by 555 meters. Multiply meters by 3.28084 to get feet. See RCRA and Washington Hazardous Waste Management Act Permit Application Submitted by USDOE to Ecology, Section 3.1, Part III.11.3.1. The permit application lists total

capacity for the half of the IDF designated for mixed wastes as 450,000 m3. Thus, the total capacity of 900,000m3, when the LLW portions of the IDF are included.

[6] Washington Ecology granted interim authorizations for construction.

[7] "Report of the Review of the Hanford Solid Waste Environmental Impact Statement Data Quality, Control and Management Issues"; USDOE, January, 2006 (approval signed by Dr. Inez Triay).

[8] Id at pages iv and vi.

[9] SEE RCW 70.105E.050.

[10] See Declarations of Klein and Dr. Triay, and the US' Statement of Material Facts; in United States v. Manning, Eastern District of WA, filed October, 2005 and January, 2006 (challenging Washington's Cleanup Priority Act).

[11] Published in the Federal Register Feb. 2, 2006.

[12] Waste Management Programmatic Environmental Impact Statement, USDOE, 1997.

[13] WAC 173-340-700(5)(B).

[14] "This guidance clarifies that cleanups of radionuclides are governed by the risk range for all carcinogens established in the NCP (National Contingency Plan) when ARARs are not available or are not sufficiently protective. That is to say, such cleanups should generally achieve risk levels in the 10^{-4} to 10^{-6} range." OSWER No. 9200.4-18; USEPA; August 22, 1997, at P.3.

[15] 42 USC 9621(d)(2)(A); and, 42 USC 9620(a)(4).

[16] "Analysis of what Radiation Dose Limit is Protective of Human Health at CERCLA Sites"; USEPA; August 20, 1997 at Page 7. EPA's limit is 10 millirem from a single source of airborne radionuclides for NESHAP; 4 millirem per year from groundwater and no more than 10 to 15 millirem from all sources would meet NCP requirements.

[17] U.S. Environmental Protection Agency; April 19, 1999; letter to Conference of Radiation Control Program Directors commenting on proposal to allow residual contamination levels resulting in 100 millirem per year of potential public exposure. The EPA cited the same concern for NRC's license termination rule. July 7, 2000.

[18] Monitoring data obtained by Heart of America Northwest under the Freedom of Information Act.

[19] USDOE Performance Assessment for 200 West Burial Grounds, Table S-1 at Page vi; see also same table in 200 East Assessment. Order 5820.2A has been replaced by Order 435.1 since the Performance Assessments were issued. However, USDOE has not changed the performance objectives or standards applicable.

[20] Id and EPA August 20, 1997, Op.Cit..

[21] March 3, 2003. http://epa.gov/ncea/raf/cancer2003.html "Draft Final Guidelines for Carcinogen Risk Assessment".

[22] BEIR VII, National Research Council, June, 2005 (page 500, Table 12-9). This includes 1 fatal cancer in every 175 people so exposed (5.7 in 1000).

[23] See Heart of America Northwest Reports available on our website:www.heartofamericanorthwest.org: "Washington Beware". USDOE has acknowledged prior disposal of hazardous wastes in a Part B RCRA application to Washington State. The Heart of America Northwest report conclusively shows that illegal disposal of hazardous wastes continued in the trenches after 1989.

[24]**"**Transuranic Waste at Hanford: Large Quantities Lost"; Gerald Pollet, J.D., Heart of America Northwest; 2004; Citing Table 2, "Buried TRU Contaminated Waste Sites" in USDOE HQ, 2000.

[25] WMPEIS Section 8.2.1.1, page 8-10: "DOE assumed that all TRUW is mixed waste. This assumption is conservative and consistent with practice in the field, where TRUW is managed as mixed waste unless definitive characterization has been performed to establish that there are no hazardous constituents present."

[26] Draft HSWEIS at C.8.

[27] Table 3.5 "Estimated Volumes of TRU Waste Streams"; Final HSWEIS.

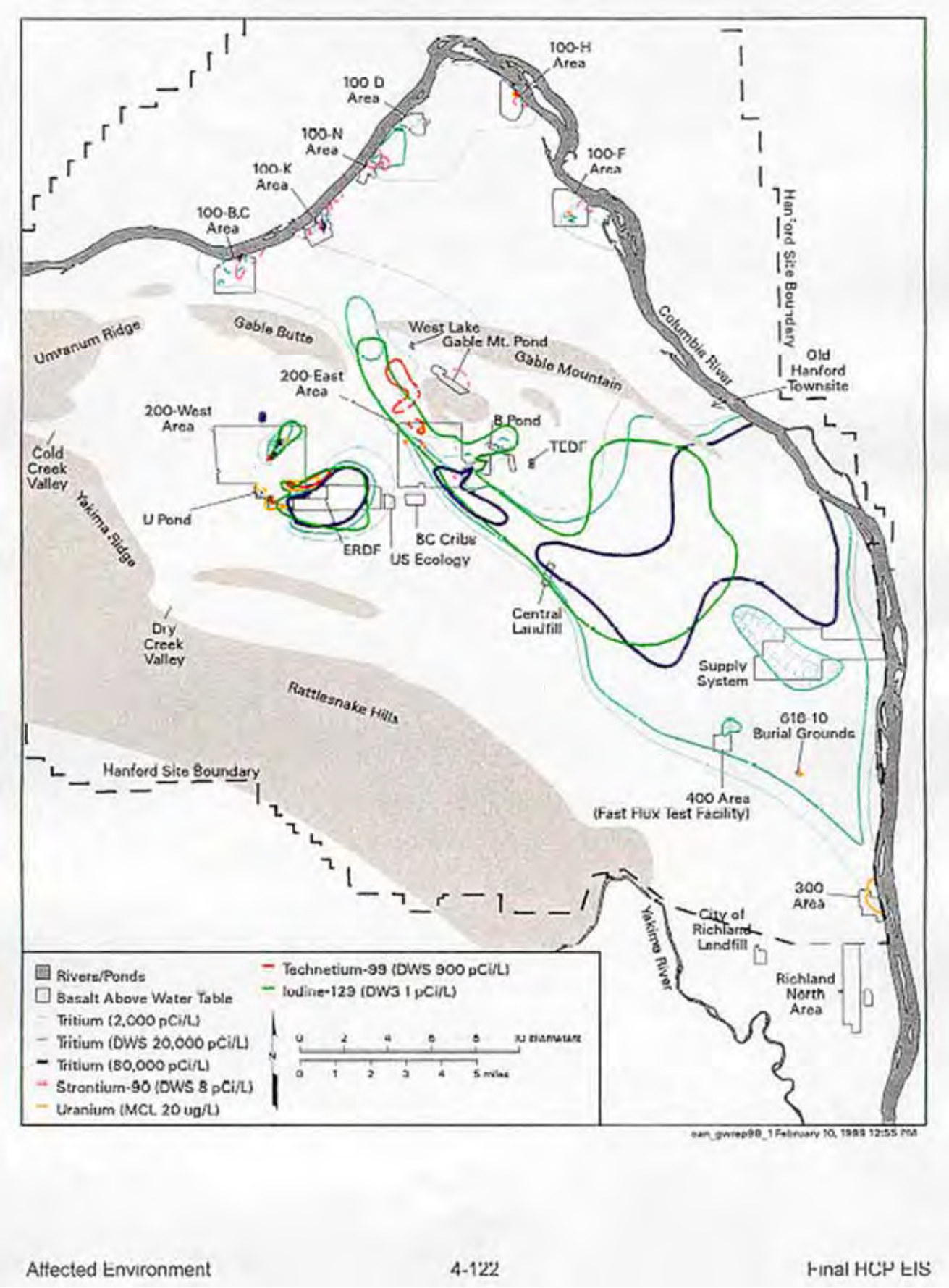
[28] "Buried Transuranic-Contaminated Waste Information for U.S. Department of Energy Facilities."; USDOE, June, 2000. Available as of August, 2004 on USDOE's Environmental Management Program website: http—cid.em.doe.gov-Modules-Reporting-Summary-Buried)TRU.pdf.url .

[29] SEE Performance Assessment for 200 West at 4.2.5

[30] Page 4-48; Assessment for 200 West.

[31] Utilizing BEIR VII Report Data from National Academy of Sciences, June, 2005. The BEIR VII report (page 500, Table 12-9) estimates that 100 mrem/year of exposure will result in approximately 1 (1.142) cancer in every 100 people exposed, which includes 1 fatal cancer in every 175 people so exposed (5.7 in 1000). USDOE uses 100 mrem/year as an acceptable dose to the public in its performance assessments. [DOE Order 435.1]. The BEIR VII data shows that this would result in cancers in 1% of exposed adults.

Figure A.1 Distribution of Radionuclides in Ground water at Hanford[1]



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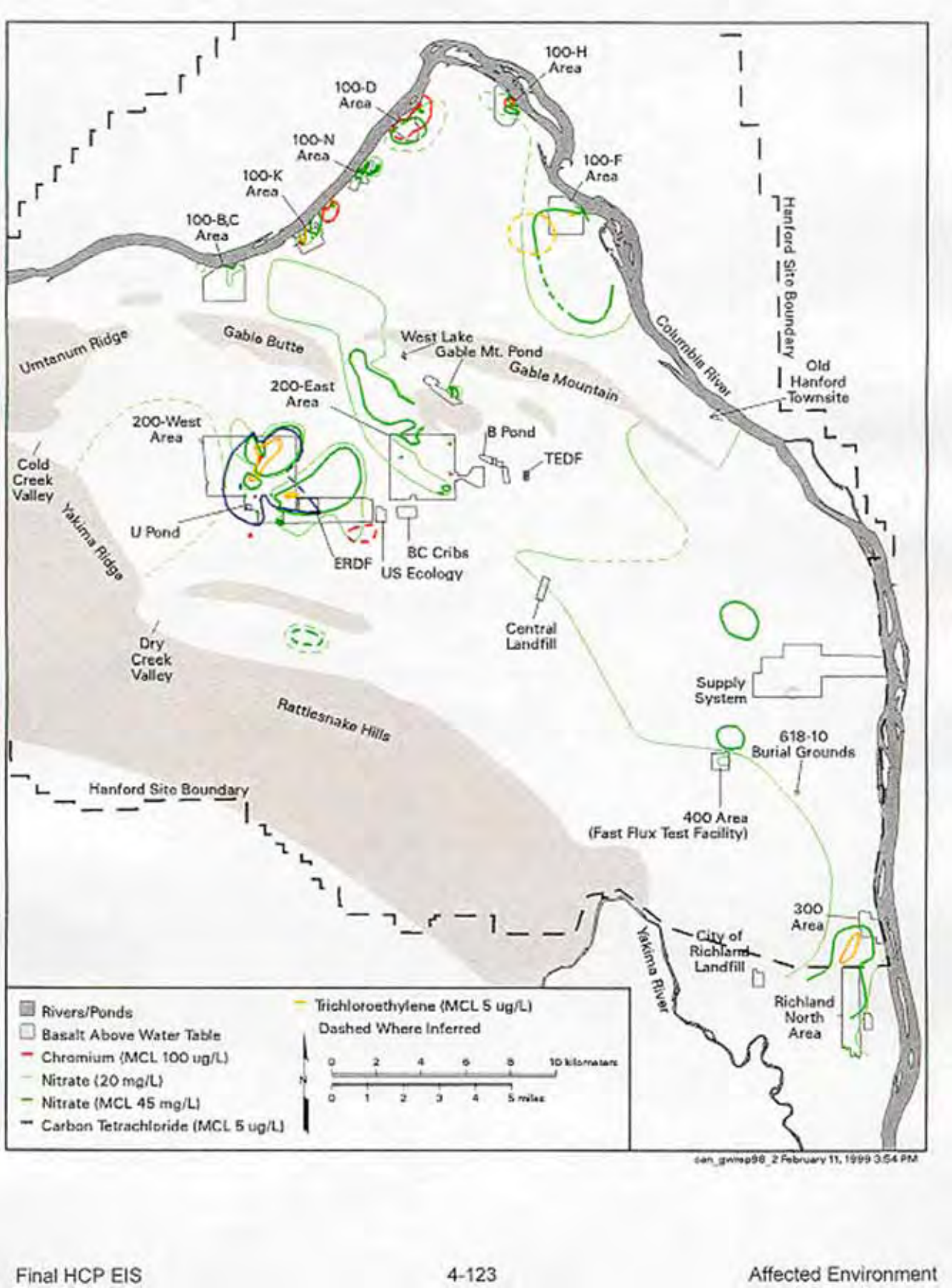
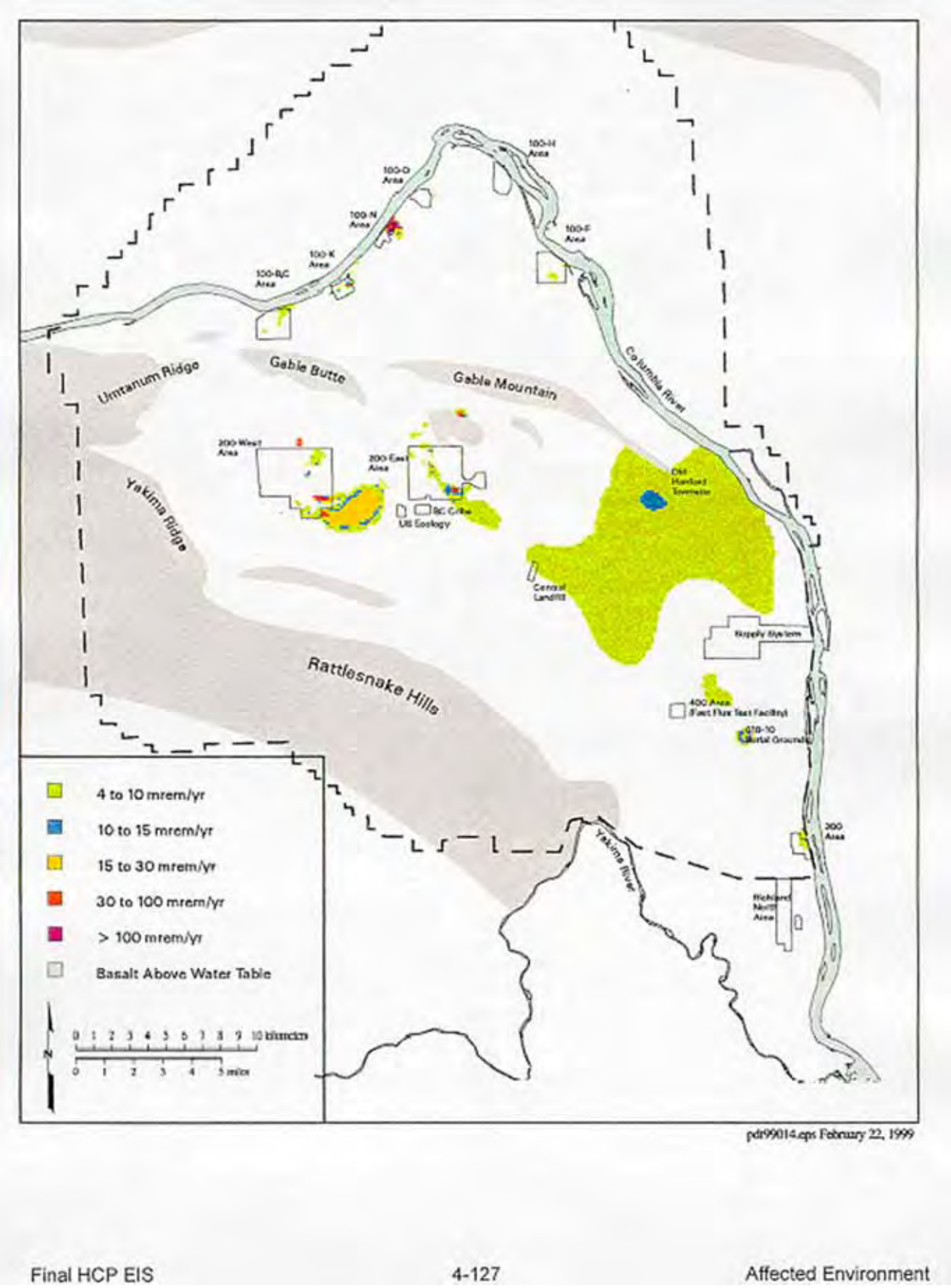
[1] From Figure 4-5 of the PNNL 1998

Figure A.2 Distribution of Hazardous Chemicals of Concern in Groundwater at Hanford[2]



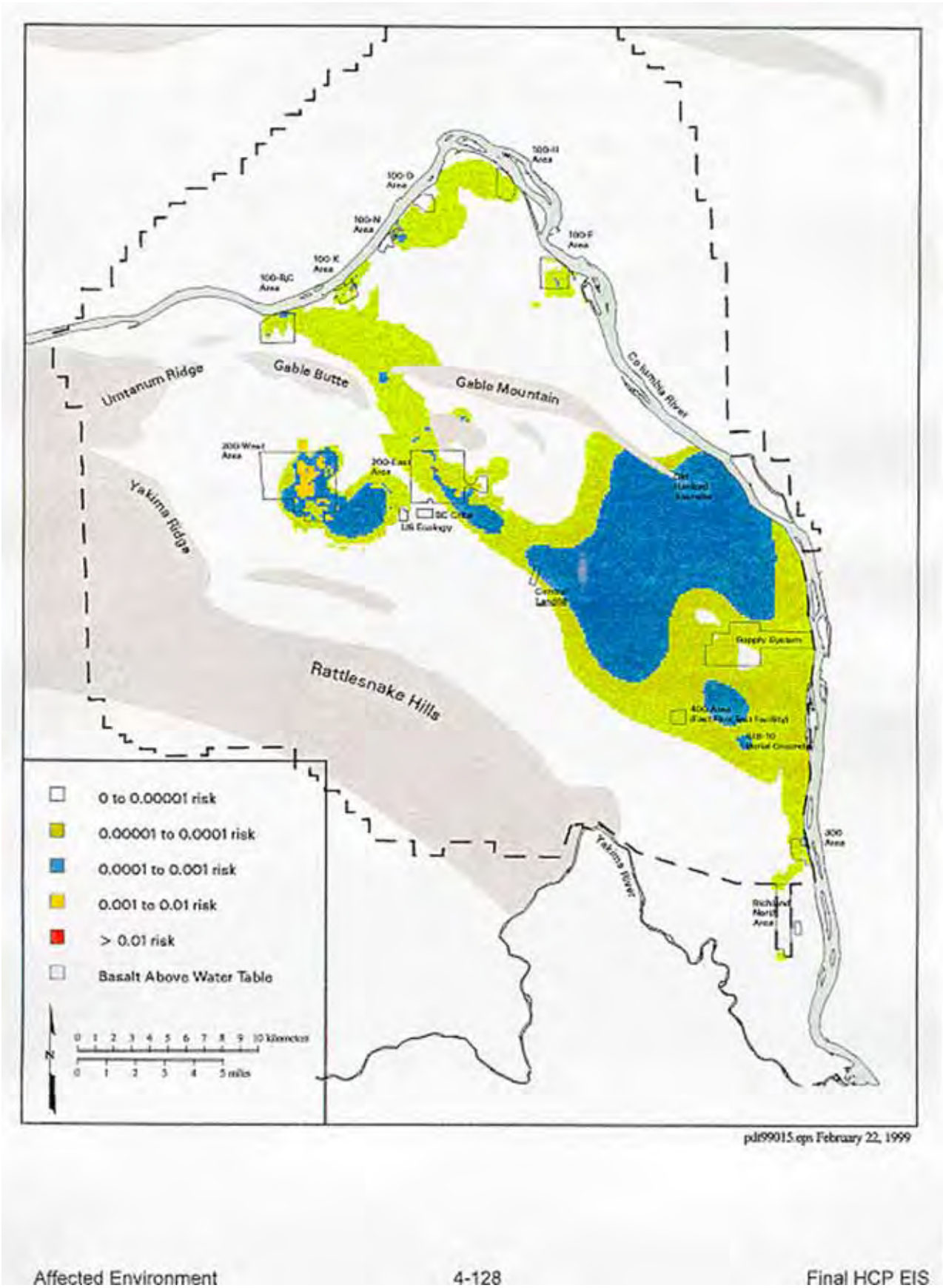
[2]From Figure 4-36 of the PNNL 1998

Figure A.3 Potential Dose Estimates from Ingestion of Groundwater[3]



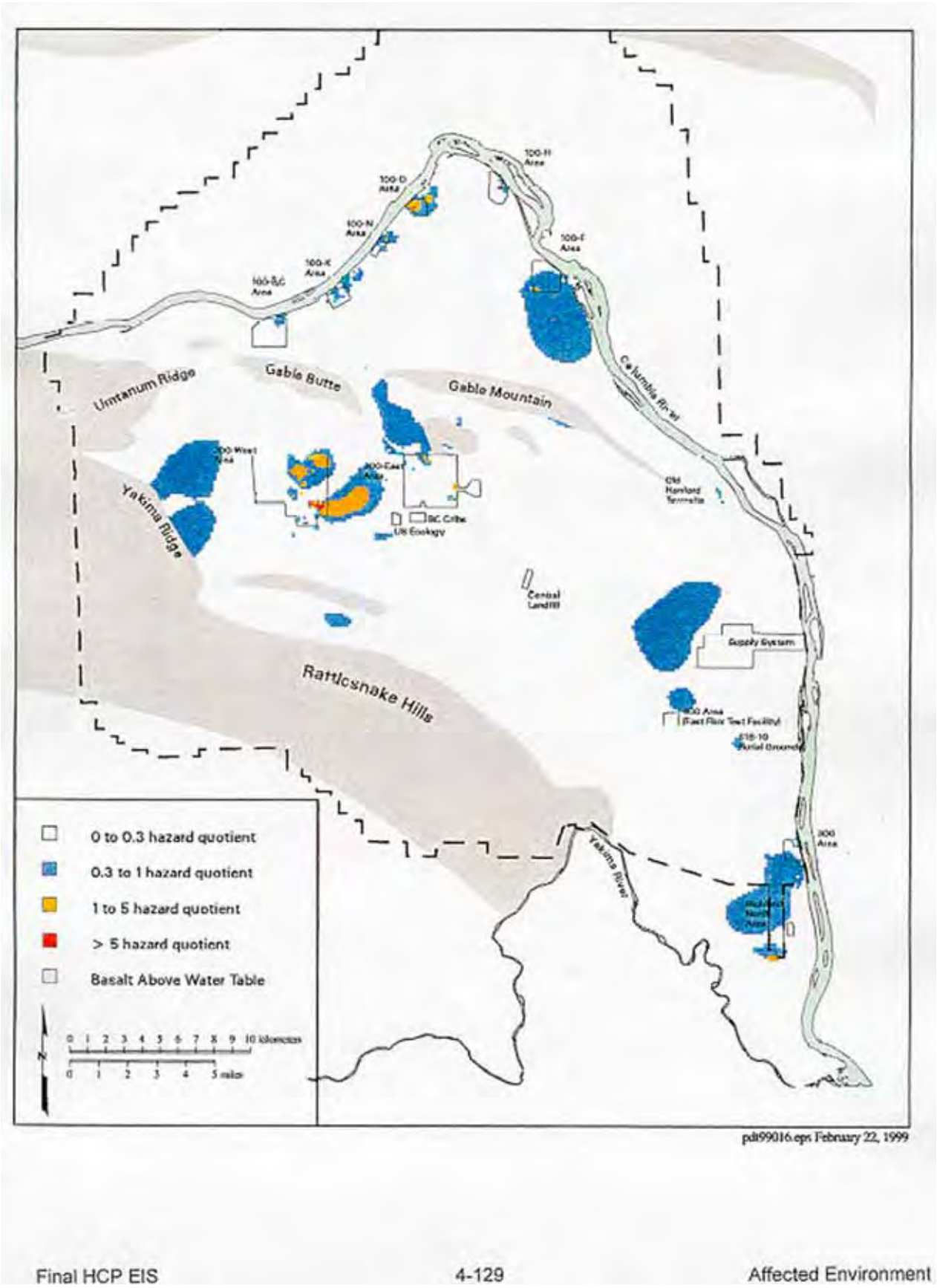
[3]From Figure 4-36 of the PNNL 1998

Figure A.4 Potential Cancer Risk Estimates from Ingestion of Groundwater[4]



[4]From Figure 4-38 of the PNNL 1998

Figure A.5 Potential Hazardous Quotient Estimates from Ingestion of Groundwater[5]



[5]From Figure 4-39 of the PNNL 1998