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ReOpt V2.0

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October 1992

Prepared for U.S. Department of Energy
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Pacific Northwest Laboratory
Operated for the U.S. Department of Energy
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ReOpt™ V2.0 User Guide

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Summary

Cleaning up the large number of contaminated waste sites at Department of Energy (DOE) facilities in the U.S. presents a large and complex problem. Each waste site poses a singular set of circumstances (different contaminants, environmental concerns, and regulations) that affect selection of an appropriate response.

Pacific Northwest Laboratory (PNL) developed ReOpt to provide information about the remedial action technologies that are currently available. It is an easy-to-use personal computer program and database that contains data about these remedial technologies and auxiliary data about contaminants and regulations. ReOpt will enable engineers and planners involved in environmental restoration efforts to quickly identify potentially applicable environmental restoration technologies and access corresponding information required to select cleanup activities for DOE sites.

Acknowledgments

The database and software for accessing it that are described in this report are the results of the collaborative efforts of numerous individuals. The authors would particularly like to acknowledge the contributions of J. L. Buelt, G. M. Holter, T. L. Brouns, K. A. Pennock, E. S. Overton, and M. L. Wilkins. In addition, the authors would like to commend the efforts of the staff at CH2M Hill (Corvallis, Oregon) for their assistance in defining and providing the technology data included in the database.

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1.0 What Is ReOpt?

The U.S. Department of Energy (DOE) is faced with a tremendously complex challenge -- potential cleanup of a large number of waste sites. In support of this task, DOE sponsored development of a computer-based methodology to streamline the remedial investigation/feasibility study process required prior to cleanup of their waste sites. The Pacific Northwest Laboratory (PNL)[a] has developed the Remedial Action Assessment System (RAAS) (Buelt 1991; White 1991; Pennock 1992), which can be used for screening, linking, and evaluating established technology process options to support conducting feasibility studies under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). RAAS will support corrective measures studies required by the Resource Conservation and Recovery Act (RCRA). ReOpt is one component of this methodology.

ReOpt functions like an electronic encyclopedia, sorting and presenting information to quickly familiarize engineers and planners with available remediation technologies. The system will help users focus quickly on the technologies most likely to be effective for a particular site. Information about these technologies is presented in a concise, easy-to-use way, helping users identify the key factors and constraints to consider in evaluating the use of a particular technology.

ReOpt contains information on approximately 90 established (i.e., currently available) remediation technologies that could potentially be used for DOE waste-site cleanup (see Table 1). The information is divided into categories that describe the technology, explain where and how it is applied, and identify sources of additional information.

ReOpt also contains auxiliary information about hazardous and radioactive contaminants and the federal regulations that govern their disposal. This information is included to help users understand the technical and regulatory constraints that affect the application of the various remedial technologies.

A personal computer program and database that provides information about remedial action technologies, ReOpt has a *user-friendly* graphical interface. Intuitively designed buttons, menus, and lists help users identify and access particular information which is presented in a format that facilitates its use. Users may view ReOpt information on the screen of their personal computer, print specific information about a particular technology, or print a complete technology report for later use.

The ReOpt methodology described in this report is an update of the RAAS Technology Information System database and software that were provided for DOE (and other government users) in 1991 (White 1991). Major ReOpt enhancements in version 2.0 include operation on both DOS-based and Macintosh personal computers, rather than only

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Table 1. ReOpt Technology Functions and Technologies

Institutional Control	Ex Situ Volume Reduction	Ex Situ Toxicity Reduction	In Situ Volume Reduction	Recovery or Removal
Access Controls	Air Stripping	Aerobic Biological Treatment	Bioaccumulation	Bulk Material Storage
Alternative Water Supply	Bioaccumulation	Anaerobic Biological	Electro-Kinetic Separation	Dredging
Groundwater Use	Coagulation and Flocculation	Treatment	In Situ Soil Heating	Drum and Debris Removal
Restrictions	Crystallization	Calcining	Soil Flushing	Excavation
Land Use Restrictions	Dewatering	Catalytic Destruction	Soil Vapor Extraction	Extraction Wells
Monitoring	Distillation	Catalytic Oxidation		Pipelines
	Electro-Kinetic Separation	Chlorinolysis	**In Situ Toxicity Reduction**	Surface Water Control
Containment	Evaporation (forced)	Dehalogenation		Transportation
	Evaporation Ponds	Hydrolysis	In Situ Biodegradation	Underground Tank Removal
Capping	Freeze Crystallization	Incineration	In Situ Chemical Treatment	
Constructed Barriers	Gas Absorption/Adsorption	Molten Solids Processing	In Situ Vitrification	**Disposal**
Dust and Vapor Suppression	Gas Particulate Removal	Neutralization	Photolysis	
Erosion Control	Gravity Separation	Oxidation		Deep Well Injection
Extraction and Injection Wells	Ion Exchange	Photolysis	**In Situ Mobility Reduction**	Discharge to POTW
Liners	Liquid Adsorption	Precipitation		Discharge to Surface Water
Subsurface Drainage	Liquid-Liquid Extraction	Pyrolysis	Bioaccumulation	Gas Discharge to
Surface Water Control	Media Filtration	Reduction	In Situ Solidification	Atmosphere
	Membrane Separations	Roasting	In Situ Sorption	Geologic Repository
	Oil-Water Separation	Wet Air Oxidation	In Situ Vitrification	In Situ Soil Disposal
	Soil Washing			In Situ Water Disposal
	Solids Classification	**Ex Situ Mobility Reduction**		Injection Wells
	Solvent Extraction			Land Application
	Thermal Desorption	Encapsulation		Landfill
		Solidification and Stabilization		Low Level Waste Burial
		Molten Solids Processing		Materials Reuse
				Mixed Waste Landfill
				Offsite Disposal
				TRU Disposal
				Waste to Energy

Macintosh computers, contaminant and regulatory data for substantially more contaminants, improved data access performance, and improved report generation features.

- Section 2 describes the information that is contained in ReOpt.
- Section 3 explains how ReOpt is installed on a computer and also contains information on user registration and support.
- Section 4 explains how ReOpt is used, how to print reports, and also includes a step-by-by step tutorial that includes reproductions of the screens to illustrate each step through the software.
- Section 5 lists the references used in this text.

2.0 What Information Is In ReOpt?

ReOpt contains information about technologies that might potentially be used for cleanup at DOE (or other) waste sites, auxiliary information about possible hazardous or radioactive contaminants at such sites, and the federal regulations that govern disposal of wastes containing these contaminants.

2.1 Technology Information

ReOpt contains data for approximately 90 remedial action technologies. They are divided into categories according to the portion of a remedial action (i.e., containment, treatment, etc.) that they relate to or perform. Table 1 lists the remedial technologies that are included in ReOpt and the function each performs in remedial actions.

To identify potentially applicable remedial technologies for specific environmental restoration problems, the technologies in Table 1 are further categorized as to the media and contaminants to which they can be applied. Table 2 lists the contaminated media categories. These include the primary contaminated media associated with contaminated soil, groundwater, or surface water, and residual media that may be generated as a result of treating the primary contaminated medium.

Table 2. Contaminated Media

groundwater	particulate solid
surface water	monolithic solid
unsaturated soil	aqueous stream
saturated sediment	organic liquid
sludge	gas or air

Technologies are also classified according to the contaminants to which they may be applied. Approximately 700 primary contaminants may be selected from a list of ten organic and four inorganic categories. The contaminants and contaminant categories included in ReOpt are discussed in the Section 3 of this report.

The information for each technology includes both descriptive information and application information, and identifies additional information sources. Technology information is subdivided to allow the user to access specific information about the technology. The following types of information may be selected for each technology:

Descriptive Information

- a graphical depiction or flow diagram of the process
- a brief narrative description of the process
- engineering parameters such as power and space requirements

Application Information

- contaminants for which the technology is applicable
- data requirements (important information or parameters that should be considered in deciding whether or how to implement the technology)
- other processes that are frequently combined with the selected technology (associated processes for pretreatment or treatment of residual waste streams)
- limiting technical constraints to a unit process, such as pH or particulate loading limits on feed materials
- regulatory constraints, including federal compliance with air, water, and solid waste discharge regulations

Additional Information

- a list of sites where the technology has been considered or implemented in the past
- a list of key technical references.

How the information for each of the categories is accessed is further described in Section 4.

2.2 Contaminant Information

It is important to know the contaminants for which a given remedial technology is effective. ReOpt contains a list of approximately 700 primary contaminants in ten organic and four inorganic categories as an aid to identifying potentially applicable technologies for a particular environmental restoration problem. Or, for a selected technology, the contaminants to which it is applicable within each category can be listed. Table 3 lists the organic contaminant categories and contaminants, and Table 4 lists the inorganic contaminant categories and contaminants.

Table 3. Organic Compounds

Halogenated, Non-Polar Aromatics	PCBs, Halogenated Dioxins, Furans	Halogenated Aliphatics	Other Halogenated Compounds
1,2,4,5-tetrachlorobenzene	hexachlorodibenzo-p-dioxin	1,1,1,2-tetrachloroethane	1-(o-chlorophenyl) thiourea
1,3-dichlorobenzene	hexachlorodibenzofurans	1,1-dichloroethane	1-bromo-4-phenoxy-benzene
2-chloronaphthalene	PCB (general classification)	1,2-dichloroethane	1-chloro-4-phenoxybenzene
aldrex	PCB 1016	1,2-trans-dichloroethene	2,2'-dichloroisopropyl ether
carbax	PCB 1221	1,3-cis-dichloro-1-propene	2,2-dichlorovinyl dimethyl phosphate
chlordane	PCB 1232	1,3-trans-dichloropropene	2-chloroethyl vinyl ether
chlorobenzene	PCB 1242	1-chloro-2,3-epoxypropane	alpha-lindane
chlorobenzilate	PCB 1248	1-chloro-2-propene	beta-benzene hexachloride
chlorophenothane	PCB 1254	2-butylene dichloride	beta-chloronaphthalene
dichlorodiphenyldichloroethane	PCB 1260	acetylene tetrachloride	bis(2-chloroethoxy)methane
dichloroethylene	TCDD	bromoform	bis(chloromethyl) ether
endrin		bromomethane	chlorambucil
heptachlor epoxide	**Other Halogenated Polar Aromatics**	carbon tetrachloride	chlornaphazine
hexachlorobenzene		chlorodibromomethane	chloromethyl methyl ether
hexachlorophene	1,3-dichloro-4-hydroxybenzene	chloroethane	chlorophacinone
o-dichlorobenzene	2,3-dibromo-1-propanol phosphate	chloroform	cyclophosphamide
p-dichlorobenzene	2,4,5-trichlorophenol	chloromethane	delta-hexachlorocyclohexane
pentachlorobenzene	2,4,6-trichlorophenol	dibromochloropropane	dichloroethyl ether
quintozene	2,6-dichlorophenol	dibromomethane	endosulfan
unsym-trichlorobenzene	2-chlorophenol	dichlorobromomethane	heptachlor
	3-methyl-4-chlorophenol	dichloromethane	kepone
	4,4-diamine	dieldrin	lindane
	amidox	difluorochloromethane	melphalan
	banvel	fluorotrichloromethane	o-toluidine hydrochloride
	benzal chloride	freon 12	toxaphene
	benzotrichloride	glycerol trichlorohydrin	
	benzyl chloride	hexachlorobutadiene	
	bis amine	hexachlorocyclopentadiene	
	dowicide 6	hexachloroethane	
	methoxychlor	hexachloropropene	
	p-chloroaniline	methyl iodide	
	pentachlorophenol	methylchloroform	
	perchloromethyl mercaptan	neoprene	
	silvex	pentachloroethane	
	tordon	perchloroethylene	
	vonduron	propylene dichloride	
		TCE	
		trichlorotrifluoroethane	
		trimethylene dichloride	
		vinyl chloride	
		vinyl trichloride	

Table 3. (contd)

Nitrated Aromatics and Aliphatics	Heterocyclics, Non-Halogenated Aromatics	Polynuclear Aromatics and Heterocyclics	Other Non-Polar Organics
1-amino-2-nitrobenzene	2,2'-bioxirane	1,2-benzacenaphthene	bihexyl
1-hydroxy-2,4-dinitrobenzene	2-methyl pyridine	1,2:7,8-dibenzopyrene	butane
1-methyl-2,4-dinitrobenzene	4-aminopyridine	1-aminonaphthalene	carbon sulfide
2,6-dinitrotoluene	5-(aminomethyl)-3-isoxazolol	2,3-phenylenepyrene	cyclohexane
2-amino-4-nitrotoluene	aromatic solvent	2-acetylaminofluorene	cyclohexanone
2-nitrophenol	benzene	2-aminonaphthalene	dimethyl ether
4,6-dinitro-o-cyclohexylphenol	brucine	3,4-benzopyrene	ethane
alpha,alpha-dimethylphenethylamine	cumene	3-methylcholanthrene	ethyl ether
cyclonite	diethylene oxide	7,12-dimethylbenz(a)anthracene	ethylene glycol mono ethyl ether
dinitro-o-cresol	dihydrosafrole	acenaphthene	heptane
dinitrobenzene	dimethylbenzene	acenaphthylene	hexane
dinitrobutylphenol	ethyl benzene	allyldioxybenzene methylene ether	isobutane
n-nitroso-n-methylurethane	ethylene oxide	anthracene	isopentane
nitrobenzene	furfural	benz(c)acridine	kerosene
octagen	glycol ethylene ether	benz(e)acephenanthrylene	methylcyclohexane
p-nitrophenol	m-xylene	benzo(k)fluoranthene	methylcyclopentane
paranitroaniline	maleic anhydride	chrysene	nonane
sym-trinitrobenzene	methapyrilene	daunomycin	octane
tetranitropentaerythrite	mitomycin c	dibenzol(a,h)anthracene	p-benzoquinone
trinitrotoluene	nicotine and salts	diphenylenemethane	pentane
	o-xylene	hydroxyquinoline	propane
	oxacyclopentadiene	isosafrole	tributyl phosphate
	p-xylene	methylnaphthalene	
	paraldehyde	naphthalene	
	pyridine	phenanthrene	
	streptozotocin	pyrene	
	toluene	reserpine	
	trimethylbenzene	saccharin and salts	
	uracil mustard	tetraphene	
	vinylbenzene		

Table 3. (contd)

Other Polar Non-Halogenated Compounds	Other Polar Non-Halogenated Compounds (continued)	Other Polar Non-Halogenated Compounds (continued)	Other Polar Non-Halogenated Compounds (continued)
1,1-dimethylhydrazine	benzidine	formic acid	phthalic acid
1,2-cyanopropene	benzoic acid	glyphosphate	phthalic anhydride
1,2-dimethylhydrazine	carbolic acid	hexone	propargyl alcohol
1,2-diphenylhydrazine	creosote	isobutanol	propenal
1,4-naphthalenedione	cresol	isobutyl mercaptan	propenol
1-acetyl-2-thiourea	crotonaldehyde	isoforon	tetraethyl dithiopyrophosphate
1-butanol	cyanogen	isopropyl alcohol	thioacetamide
1-hydroxy-2,4-dimethylbenzene	dequestrol	lasiocarpine	thiophenol
1-nitrosopiperidine	di-n-octylphthalate	lead subacetate	thiosemicarbazide
2,4,6-trimethylphenol	di-n-propylnitrosamine	m-cresol	thiourea
2,4-dithiobiurat	diacetone alcohol	m-hydrophenol	toluene diisocyanate
2,4-toluenediamine	diazinon	m-phenylenediamine	triethanol amine
2-hexanone	dibutyl phthalate	malathion	triethylene glycol
2-methoxy-1-propanol	dibutylnitrosamine	malononitrile	trypan blue
2-methyllactonitrile	dichlorophenylarsine	methanol	vinyl acetate
3,3'-dimethoxybenzidine	diethyl phthalate	methyl cyanide	vinyl cyanide
4-aminobiphenyl	diethylnitrosamine	methyl ethyl ketone	
4-dimethylaminoazobenzene	diethystilbesterol	methyl hydrazine	
4-methylphenol	dimethyl parathion	methyl isocyanate	
4-nitrosomorpholine	dimethyl phthalate	methyl methacrylate	
acephate	dimethylamine	methylene dithiocyanate	
acetaldehyde	dimethylformamide	n,n'-diethylhydrazine	
acetic acid	dimethylnitrosamine	n,nitroso-di-ethanolamine	
acetone	dioctyl adipate	n-methyl-n'-nitro-n-nitrosoguanidine	
acetophenone	dioctyl phthalate	n-nitroso-n-ethylurea	
acrylamide	diphenylamine	n-nitroso-n-methylurea	
acrylic acid	diphenylnitrosamine	n-nitrosomethylvinylamine	
adipic acid	disulfoton	n-nitrosopyrrolidine	
alkyl aryl sulfonate cleaner	epinephrine	n-phenylthiourea	
alpha-naphthylthiourea	ethanol	o-methylphenol	
aminobenzene	ethyl acetate	o-tolidine	
aquazine	ethyl carbamate	oxalic acid	
auramine	ethyl methacrylate	p-toluidine	
azaserine	ethylene glycol	parathion	
benlate	formaldehyde	phenacetin	

Table 4. Inorganic Compounds

Non-Volatile Metals	Volatile Metals	Other Inorganics	Other Inorganics (continued)
alumina	ammonium vanadate	ammonia	promethium
aluminum	arsenic (V) oxide	argon	rhenium
antimony	barium cyanide	arsenic	rhodium
barium	bismuth	arsenic acid	rubidium
beryllium	cadmium	arsenic oxide	ruthenium
boron	calcium chromate	astatine	samarium
calcium	calcium cyanide	bromine	selenious acid
cerium	cesium	calcium oxide	sulfur
chromium	copper cyanide	carbon	sulfur dioxide
cobalt	lead	chlorine	sulfuric acid
copper	lead phosphate	chromic acid	tellurium
gold	lithium hydroxide	dysprosium	terbium
iron	magnesium	erbium	thulium
lanthanum	mercury	europium	ytterbium
lithium	mercury fulminate	fluoride	
manganese	nickel cyanide	fluorine	
molybdenum	osmium tetroxide	francium	
nickel	polonium	gadolinium	
niobium	potassium cyanide	gallium	
scandium	potassium hydroxide	germanium	
silicon	potassium silver cyanide	hafnium	
silver	selenium	holmium	
strontium	silver cyanide	hydrazine	
tantalium	sodium	hydrochloric acid	
technetium	sodium azide	hydrofluoric acid	
tin	sodium chloride	hydrogen	
titanium	sodium hydroxide	hydrogen sulfide	
tungsten	strontium sulfide	indium	
vanadium	thallic oxide	iodine	
vanadium oxide	thallium	iridium	
yttrium	thallium (I) acetate	lutetium	
zirconium	thallium (I) carbonate	neodymium	
	thallium (I) chloride	nitrate	
	thallium (I) nitrate	nitric acid	
	thallium (I) selenide	nitrogen dioxide	
	thallium (I) sulfate	nitrogen monoxide	
	zinc	osmium	
	zinc cyanide	palladium	
		phosphoric acid	
		phosphorus	
		platinum	

Table 4. (contd)

Radionuclides	Radionuclides (continued)	Radionuclides (continued)	Radionuclides (continued)	Radionuclides (continued)
actinium	cerium-137m	iodine-129	plutonium-238	technetium-97
actinium-224	cerium-139	iodine-131	plutonium-239	technetium-98
actinium-225	cesium-130	iodine-135	plutonium-240	technetium-99
actinium-226	cesium-132	krypton-85	plutonium-241	technetium-101
actinium-227	cesium-134	lead-203	plutonium-242	thallium-200
actinium-228	cesium-135	lead-209	polonium-203	thallium-201
americium	cesium-136	lead-210	polonium-205	thallium-202
americium-237	cesium-137	lead-211	polonium-207	thallium-204
americium-238	cesium-138	lead-212	polonium-210	thorium
americium-239	cobalt-55	manganese-51	potassium-40	thorium-229
americium-240	cobalt-56	manganese-52	potassium-42	thorium-230
americium-241	cobalt-57	manganese-52m	protactinium	thorium-231
americium-242	cobalt-58	manganese-56	protactinium-230	thorium-232
americium-242m	cobalt-58m	mendelevium	protactinium-231	tin-121
americium-243	cobalt-60	mendelevium-257	protactinium-232	tin-123
antimony-119	curium	mendelevium-258	radium	tin-125
antimony-120	curium-238	neptunium	radium-224	tin-126
antimony-122	curium-240	neptunium-232	radium-225	tritiated water
antimony-124	curium-241	neptunium-233	radium-226	tritium
antimony-125	curium-242	neptunium-234	radon	uranium
berkelium	curium-243	neptunium-235	radon-210	uranium-232
berkelium-245	curium-244	nickel-56	radon-211	uranium-233
berkelium-249	einsteinium	nickel-57	ruthenium-103	uranium-234
beryllium-7	einsteinium-251	nickel-63	ruthenium-105	uranium-235
beryllium-10	einsteinium-253	niobium-88	ruthenium-106	uranium-236
bismuth-200	einsteinium-254	niobium-89	samarium-147	uranium-238
bismuth-201	einsteinium-254m	niobium-90	samarium-151	yttrium-87
bismuth-202	europium-145	niobium-93m	samarium-153	yttrium-88
bismuth-203	europium-146	niobium-94	samarium-155	yttrium-90
bismuth-205	europium-147	niobium-95	selenium-70	zinc-63
bismuth-206	europium-148	palladium-100	selenium-73	zinc-65
californium	europium-149	palladium-101	selenium-73m	zinc-69
californium-244	europium-150	palladium-103	selenium-75	zirconium-89
californium-246	europium-152	palladium-107	selenium-79	zirconium-93
californium-248	europium-154	palladium-109	selenium-81	
californium-250	europium-155	phosphorus-32	sodium-22	
californium-252	fermium	phosphorus-33	sodium-24	
californium-253	fermium-252	plutonium	strontium-85	
californium-254	fermium-253	plutonium-234	strontium-89	
carbon-14	fermium-254	plutonium-235	strontium-90	
cerium-134				
cerium-135				
cerium-137				

In addition to information about the applicability of remediation technologies to particular contaminants, ReOpt includes physical and chemical data about the individual contaminants. Table 5 describes the contaminant information that is included. The contaminant data included in ReOpt is derived in part from the Environmental Protection Agency (EPA) Treatability Database (EPA 1990).

Table 5. Contaminant Information

synonyms
contaminant class
CAS registry number
chemical formula
physical state
molecular weight
melting point
boiling point
water solubility
vapor pressure
Henry's Law constant
carbon/matter partition coefficient
octanol/water partition coefficient
half-life
specific activity
density

2.3 Federal Regulatory Information

ReOpt includes federal regulatory information that relates to applying the various technologies. For each technology, regulatory constraints that apply to the site at which the technology is applied (site constraints), the use of the technology (action constraints), and/or the contaminants to which it may be applied (contaminant constraints) are identified. For all but disposal technologies, regulatory information is qualitative rather than quantitative. This regulatory information is typically an identification of the parameter or action that has a regulatory constraint and a citation for the corresponding federal regulation that may apply. This information is intended to alert the user to the primary regulatory issues that are involved with using a particular technology, and to identify the regulations that should be reviewed in detail. A comprehensive discussion of each regulation that may apply is beyond the scope of ReOpt.

For disposal technologies, more specific contaminant constraint information is included. Release or disposal of contaminated media (i.e., treated soil, water, etc.) is typically limited by one or more federal regulations that constrain the amount or concentration of specific contaminants. Therefore, for disposal technologies, the quantitative limits that may apply to each of the contaminants in ReOpt are included. Table 6 lists the federal regulations for which ReOpt contains such quantitative data.

Table 6. Federal Regulations

Clean Air Act
Clean Water Act
Federal Insecticide, Fungicide, and Rodenticide Act
Resource Conservation and Recovery Act
Safe Drinking Water Act
Toxic Substance Control Act
Atomic Energy Act
DOE Order 5400.5, "Radiation Protection of the Public and the Environment."
DOE Order 5820.2A, "Radioactive Waste Management."

3.0 How Is ReOpt Installed?

This section outlines the system requirements for operating ReOpt on both a Windows-based IBM (or compatible) personal computer (PC) and a Macintosh personal computer. It provides installation instructions for the software and includes information about user registration and support.

Both the PC and Macintosh versions of ReOpt are implemented using the OMNIS Seven database, which supports cross platform applications. The components of OMNIS Seven required for ReOpt have been licensed with Blyth Software, Inc., and are included with the software disks provided for the user.

3.1 System Requirements

The following is a list of hardware and software required to operate ReOpt:

3.1.1 IBM (or compatible) Personal Computer

- IBM 386 class or higher
- MS-DOS 3.3 or higher
- At least 4 MB of RAM
- 12 MB of hard disk storage
- VGA color monitor
- Microsoft Windows 3.0 or higher
- A 3½-inch high-density disk drive

3.1.2 Macintosh Personal Computer

- Macintosh II class or higher
- At least 5 MB of RAM
- 12 MB of hard disk storage
- Standard 13-inch Macintosh color monitor
- A 3½-inch high-density disk drive
- System 6.0 or higher
  (ReOpt is System 7 compatible, but does not
  support 32-bit addressing)

3.2 Software Installation

ReOpt is installed on either the PC or the Macintosh using 3½-inch program disks. The steps for installing ReOpt follow:

- Refer to section 3.2.1 for the IBM PC
- Refer to section 3.2.2 for the Macintosh

Important: When you install the ReOpt application, the system loads certain files in locations specific to the program design. Moving these files to different locations on your system may cause the ReOpt application to fail. For example, the REOPT.DFI and the REOPTHLP.DFI files must be in the same directory as REOPT.EXE in the PC version of ReOpt, and in the Macintosh version, these two files must be in the same folder.

3.2.1 Install ReOpt application on IBM (or compatible) Personal Computer

(Installation should take approximately 30 minutes)

You need the 3½-inch disks containing the ReOpt application. You also must be at the Program Manager screen in Windows 3.0 or greater.

1. Insert Disk 1 in drive A. This instruction assumes that the 3½-inch disk drive on your PC is designated ***drive A***. You may designate a different drive if necessary.

2. Choose **Run** from the Program Manager File menu.

3. At the Command Line, type **a:\install.**

4. Click on the **OK** button or press **Enter/Return.**

5. Click on the **Install** button to install ReOpt.

6. The system automatically selects C:\REOPT. Click on the **Open** button, OR, if you want to load ReOpt in another directory, double click on the directory you have selected, or type the directory name.

7. Click on the **Open** button.

8. Click on the **Install** button.

9. Type the user name. Use the mouse or the tab key to move the cursor to the next line.

10. Type the company name. Use the mouse or the tab key to move the cursor to the next line.

11. Type the serial number from the ReOpt program disks. This is the serial number for the OMNIS Seven software license provided as part of ReOpt). Your serial number will look similar to this: **6WRI 217936 83647.**

12. Choose the **Default** radio button.

13. Click on the **OK** button.

    The installer will begin unpacking files and copying them to the drive you selected. It will prompt for new disks as it needs them, using a pop-up window.

14. After exchanging a disk, click on **Install** or press **Enter** to continue installation.

15. After you complete the steps above, click on the **OK** button, then click on the **Quit** button to return to the installer screen.

16. The system will prompt you to create a ReOpt program group. Click on **Yes** to create a ReOpt program group and an icon called ReOpt. Then Click on **OK**.

    Install the Accuware fonts for use with the ReOpt application as follows:

17. From the Windows Main group, double click on the **Control Panel** icon.

18. Double click on the **Fonts** icon, then click on the Add button.

19. Choose the drive and directory where you installed ReOpt.

20. Select the three Accuware fonts displayed (Accujen, Accumon, and Accushi) with the Select All button.

21. Click on the **OK** button, then close the Fonts dialog box.

22. Double click on the **ReOpt** icon to launch the program.

23. A blank screen will appear. Choose **Open Application** from the **File** pulldown menu. A window will appear. Click on **C:\reopt** in the box, then click **OK**.

24. A pop-up will prompt you to preload lists. Choose the **Yes** button. (You may choose **No** and not preload all of the lists upon start-up. However, this will cause some longer wait times within the application while lists are loading.)

25. You will now be in ReOpt. Exit the program by using the pull-down menu.

3.2.2 Install ReOpt on the Macintosh Personal Computer

(Installation should take approximately 30 minutes.)

1. Insert Disk 1 in a high-density 3½-inch disk drive.

2. Double click on the **Install.exe** icon in the contents window to open the installer dialog box.

3. Click once on the **Install** button in the installer dialog box.

4. Click once on the **Drive** button to display a list of directories.

5. Choose the target directory for the installation. Double click on it, or click on the directory name once to highlight it and then click once on the **Open** button. (Double click on the target directory to automatically ***open*** it.) With either method, the target directory name should appear in the box above the directory contents window.

6. Click once on the **Install** button to install ReOpt. The installer will automatically create a ReOpt folder in the target directory to store ReOpt program files.

7. Enter the user name in the user name box. Use the mouse or the tab key to move the cursor to the next line.

8. Enter the company name. Use the mouse or the tab key to move the cursor to the next line.

9. Type the serial number from the ReOpt program disks. This is the serial number for the OMNIS Seven software license provided as part of ReOpt). Your serial number will look similar to this: **6MDSI 213596 21229**.

10. Choose the **Default** radio button.

11. Click on the **OK** button.

The installer will begin unpacking files and copying them to the ReOpt folder in the directory you selected. It will prompt for the other disks as it needs them, using a pop-up window.

12. Click once on the **Quit** button in the installer screen when installation is complete.

13. Double click on the **ReOpt** icon to launch the program.

14. A pop-up menu will prompt you to preload lists. Choose the **Yes** button. (You may choose **No** and not preload all of the lists upon start-up. However, this will cause some longer wait times within the application while lists are loading.)

15. You will now be in ReOpt. Quit the program by using the pull-down menu.

3.3 User Registration and Support

A copy of the U.S. Federal Limited Rights software license agreement is included in the appendix. This copy, Schedule A, is provided for two purposes: 1) to remind the user of the rights and obligations of the U.S. Federal Limited Rights license, and 2) to provide the form to be completed to obtain additional copies of ReOpt for U.S. Federal Contract use.

User registration information from the Schedule A is maintained to ensure that licensed users receive notification of updates to the ReOpt user interface and data. Licensed users may send user registration changes (e.g., mailing address, operating system upgrades) to ReOpt User Registration and Support via the ReOpt Fax Hotline. A Hotline Troubleshooting form is included in the appendix. The form should be completed and returned as indicated.

Copies of ReOpt for non-federal contract use may be purchased from

Sierra Geophysics, Inc.
11255 Kirkland Way
Kirkland, Washington 98033
Attention: James Tallet
Phone: (206) 822-5200
Fax: (206) 827-3893

4.0 How Is ReOpt Used?

ReOpt allows users to identify, select, and access various types of information about or associated with remediation technologies and to print that information. The various types of information are stored as data in database tables or as pictorial information in graphic files. The user interface performs two generic functions with regard to the stored information:

Sorting/Selection

Based on input from the user, usually in the form of choices made via menus or buttons, ReOpt identifies technologies, contaminants, or regulations that reflect the user's selections. The user may then select a particular technology, contaminant, or regulation for access to specific corresponding information.

Information Retrieval

Selected information may be retrieved for viewing on the screen, or in many cases, printed for subsequent use. In each case, the information is organized and formatted to facilitate its use.

The user interface for ReOpt consists of linked screens and dialog boxes. Figure 1 shows the basic navigation logic for ReOpt. Top level sorting and selecting of technology attributes to identify a particular technology for detailed examination is performed on *index* screens with their associated dialog boxes. Specific items of information about the selected technology are selected from a *contents* screen, which accesses individual technology information screens for viewing or printing of selected information.

The use of index and contents screens, and the auxiliary screens and dialog boxes that can be accessed through each, is illustrated in the tutorial in Section 4.3 of this report. Navigation among the various screens or dialog boxes and retrieval or printing of information is performed using the menu bar associated with each screen, and by using pop-up menus, lists, and buttons on the individual screens and dialog boxes (see Figure 2).

- Section 4.1 describes the use of the menu bar.
- Section 4.2 provides additional information about printing selected information.
- Section 4.3 is a tutorial that illustrates the processes of selecting and viewing information for a particular technology using the various ReOpt screens and dialog boxes. The individual ReOpt screens and dialog boxes are further described in Table A.1 in the appendix.

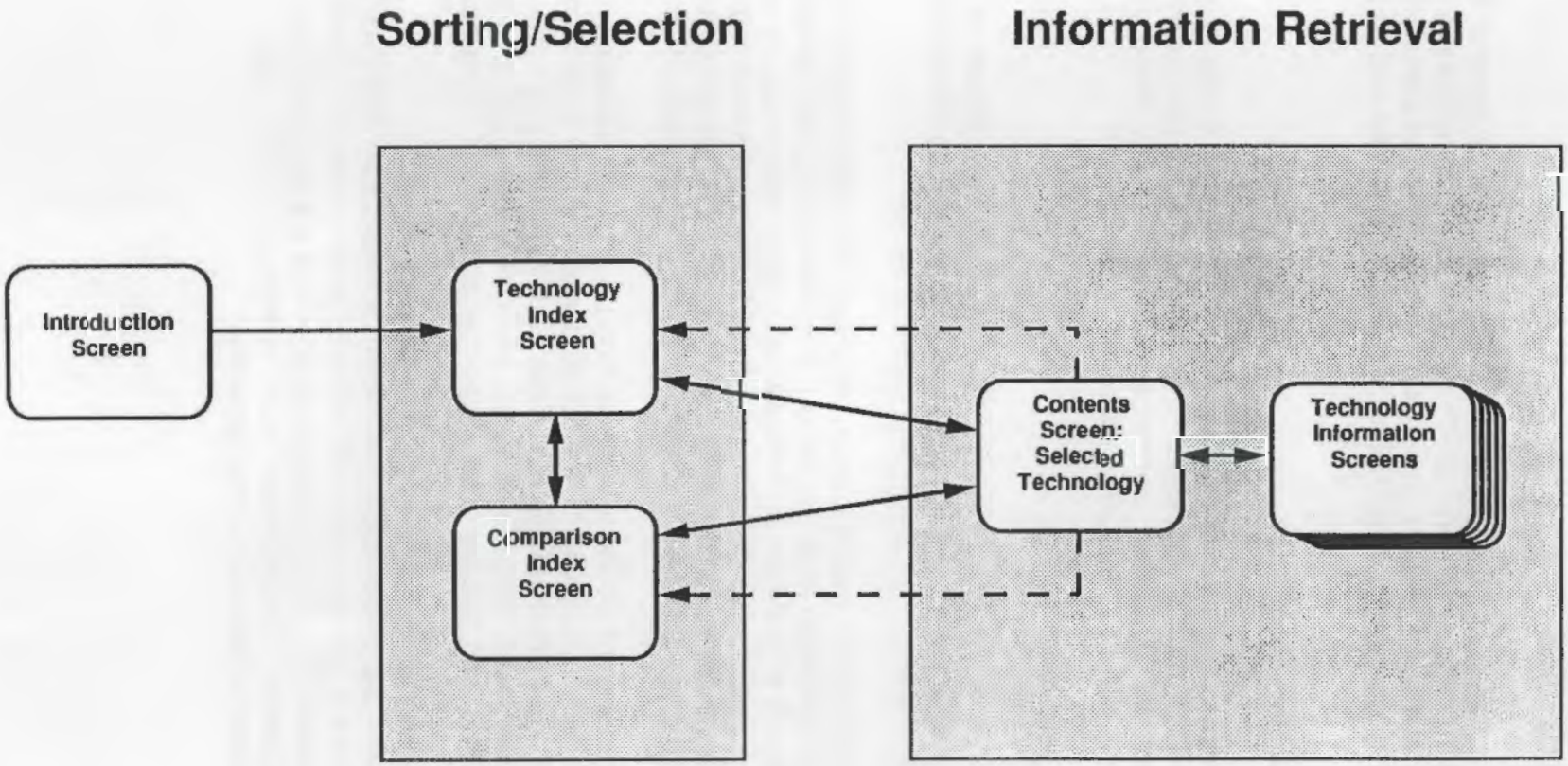


Figure 1. ReOpt Navigational Flowchart

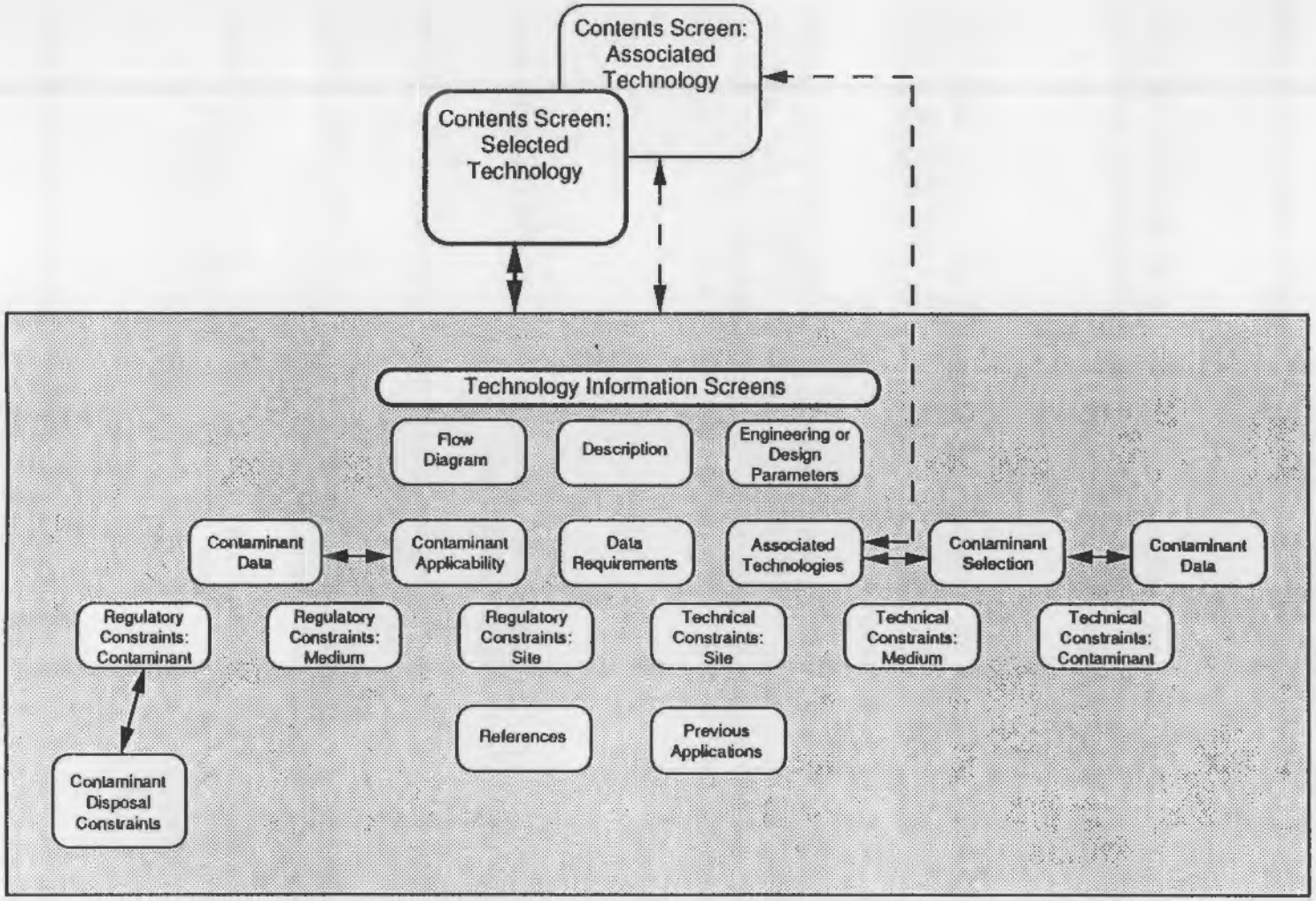


Figure 2. ReOpt Information Contents

Note:	Please note that users may see slight differences in navigation and available menu items depending on whether they are running ReOpt on a DOS-based system or a Macintosh personal computer.

4.1 Menu Bar

The menu bar for ReOpt has three pull-down menus that can be used in conjunction with its various screens: File, Lists, and Help. The menus and corresponding menu items are activated or deactivated as appropriate for each screen.

File

- **Print Entire Technology** - prints all of the information associated with the selected technology. The print option allows you to direct your printing output to the screen, a printer, a computer file, or to the **Clipboard.** Output directed to the **Clipboard** can be incorporated into other software on your personal computer.

- **Print This Information** - prints only the information currently displayed on the screen. The print option lets you preview the page before you print, or direct your printing output to the screen, a printer, a computer file, or to the **Clipboard.** Output directed to the **Clipboard** can be incorporated into other software on your personal computer.

- **Exit/Quit** - Exits or closes ReOpt.

Lists

- **Applicable Technologies** - Opens a window containing a list of all of the technologies consistent with the current selection parameters.

- **Case Data** - Opens a window containing the current technology selection parameters (technology function, medium, and contaminants).

- **Technology Synonyms** - Opens a window containing a list of the additional names by which the selected technology is listed in the technology synonym list.

- **Keywords** - Opens a window containing a list of keywords or acronyms commonly encountered in environmental restoration activities. The window provides a description or definition of the keyword or acronym selected from the list.

Help

- **Context Sensitive Help** (F1) - Displays **Help** information at the bottom of the screen based on the subject where the cursor is positioned.

- **About ReOpt...** - Opens a window containing information about the developers and the sponsors.

4.2 Print Feature

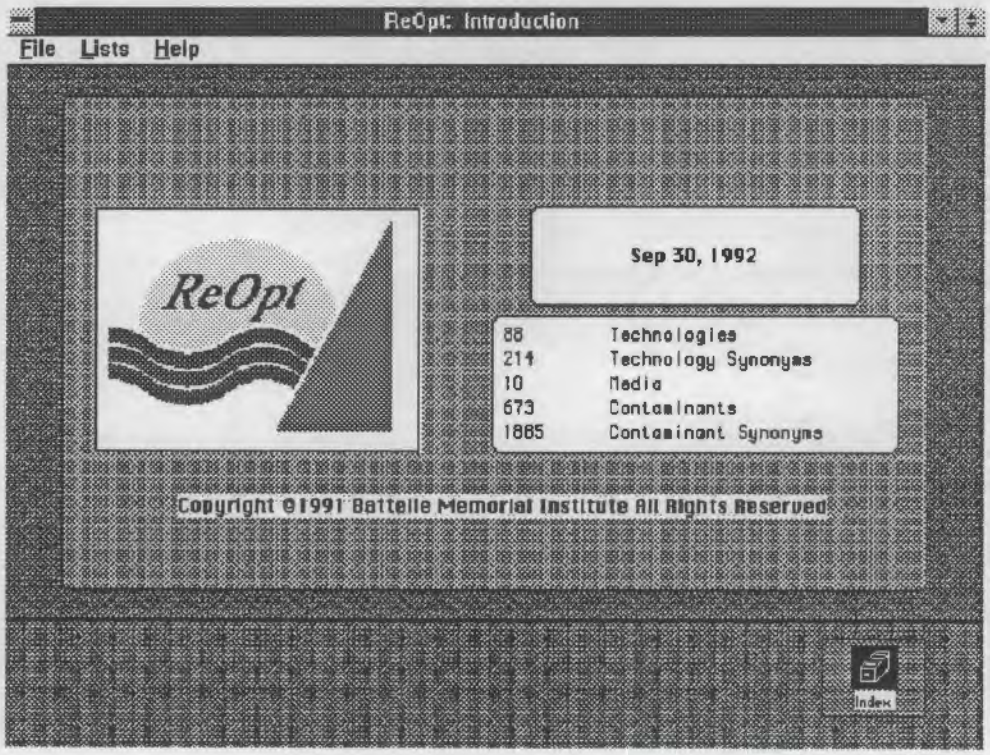
Under the **File** pull-down menu, you can either print the currently displayed information or print an entire technology. If you elect to print an entire technology, please be aware that the technology files contain a significant amount of information and may take a few minutes to complete. The print option allows you to preview the page on the screen before you print, or to direct your printing output to the screen, a printer, or a computer file. Output can also be directed to the **Clipboard** from which it can be incorporated into other software on your personal computer.

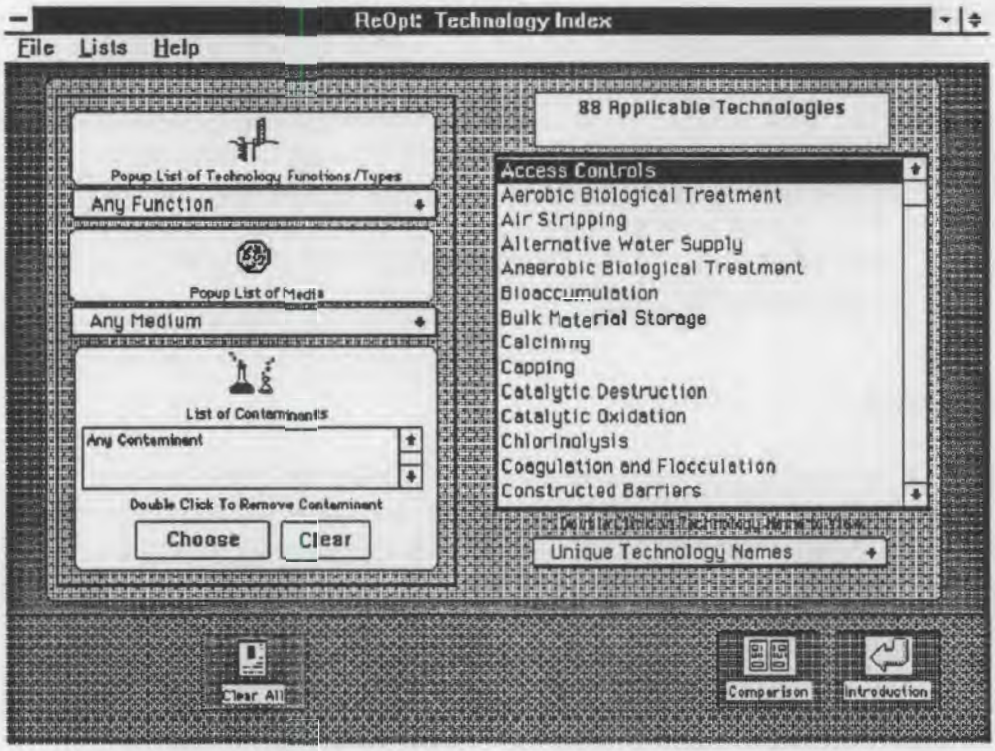
4.3 ReOpt Tutorial

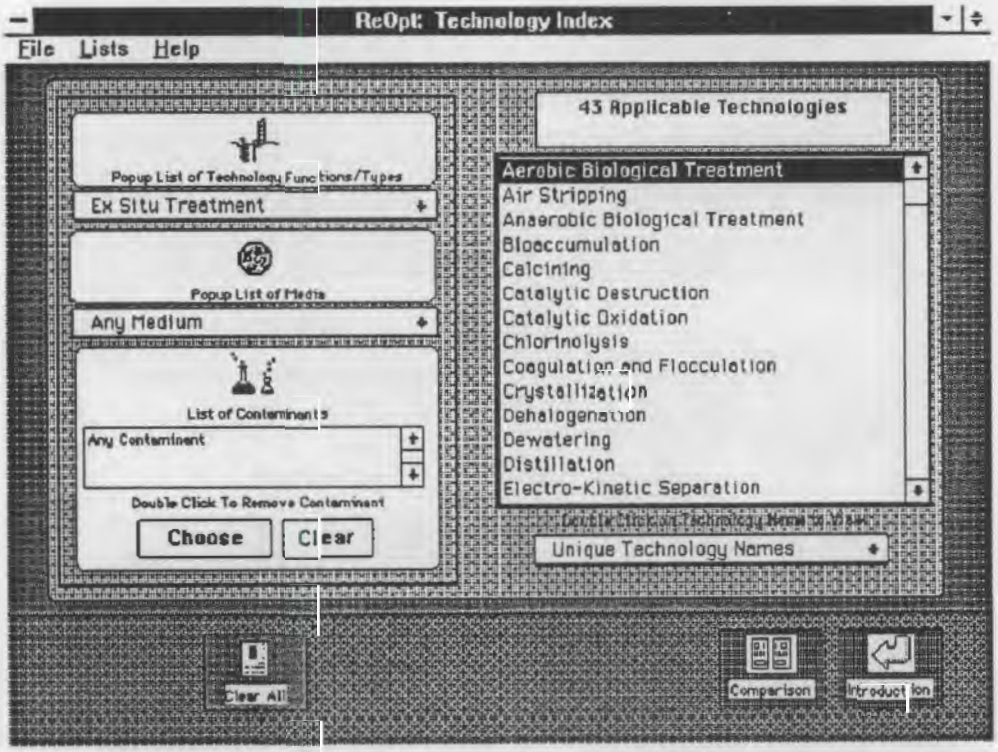
This tutorial is intended to help users navigate ReOpt to get a general idea of the functionality that allows either a broad overview of available remediation technologies or a focused view that details a specific technology. This tutorial assumes that the user has ReOpt installed on a personal computer according to the specification outlined in Section 3 of this guide. It also assumes that the user has read the above information in Section 4 that discusses in high-level terms how to operate the program.

Accessing ReOpt

1. Double click on the ReOpt icon to open the application and bring up the ReOpt Introduction screen. Click once on the Index button in the bottom right corner of the screen.




ReOpt: Technology Index
File Lists Help
88 Applicable Technologies
Popup List of Technology Functions/Types
Any Function
Popup List of Media
Any Medium
List of Contaminants
Any Contaminant
Double Click To Remove Contaminant
Choose
Clear
Access Controls
Aerobic Biological Treatment
Air Stripping
Alternative Water Supply
Anaerobic Biological Treatment
Bioaccumulation
Bulk Material Storage
Calcining
Capping
Catalytic Destruction
Catalytic Oxidation
Chlorinolysis
Coagulation and Flocculation
Constructed Barriers
Unique Technology Names
Clear All
Comparison
Introduction


ReOpt: Technology Index
File Lists Help
43 Applicable Technologies
Popup List of Technology Functions/Types
Ex Situ Treatment
Popup List of Media
Any Medium
List of Contaminants
Any Contaminant
Double Click To Remove Contaminant
Choose
Clear
Aerobic Biological Treatment
Air Stripping
Anaerobic Biological Treatment
Bioaccumulation
Calcining
Catalytic Destruction
Catalytic Oxidation
Chlorinolysis
Coagulation and Flocculation
Crystallization
Dehalogenation
Dewatering
Distillation
Electro-Kinetic Separation
Unique Technology Names
Clear All
Comparison
Introduction

The ReOpt Technology Index will appear on the screen. Take some time to note the information here:

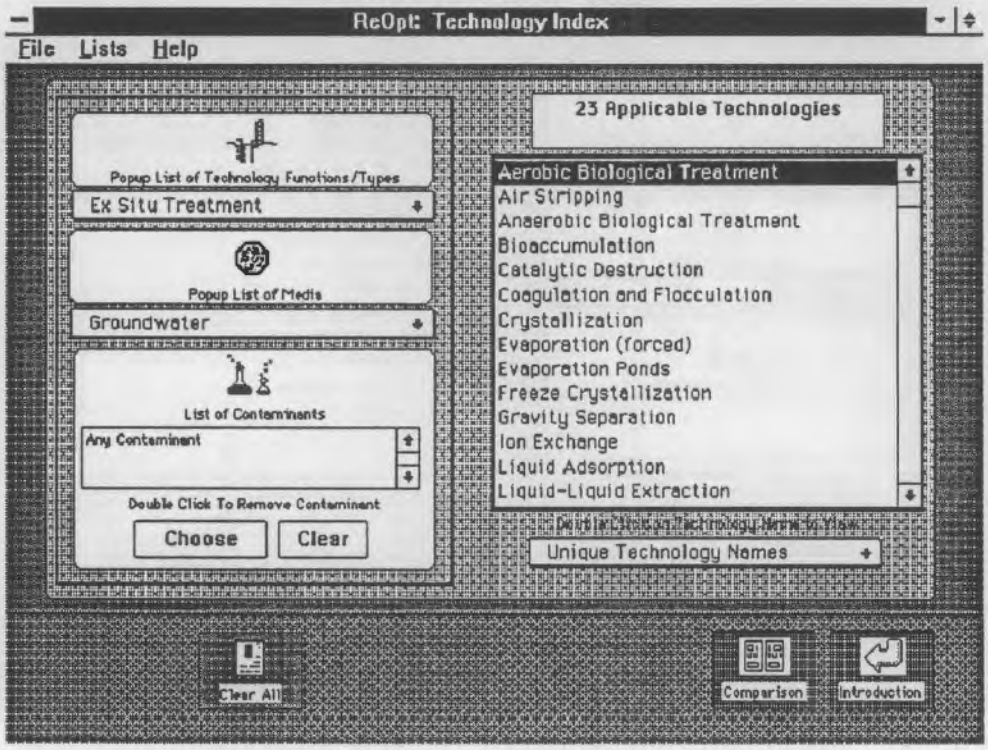
- The menu bar across the top of the screen
- The left side of the screen
  - Pop-up List of Technology Functions or Types
  - Pop-up List of Media
  - The List of Contaminants is too detailed to include in a Pop-up List. Click on **Choose** to open a dialog box from which you can select a particular contaminant.
  - The right side of the screen contains 88 applicable technologies in alphabetical order (see page 24).

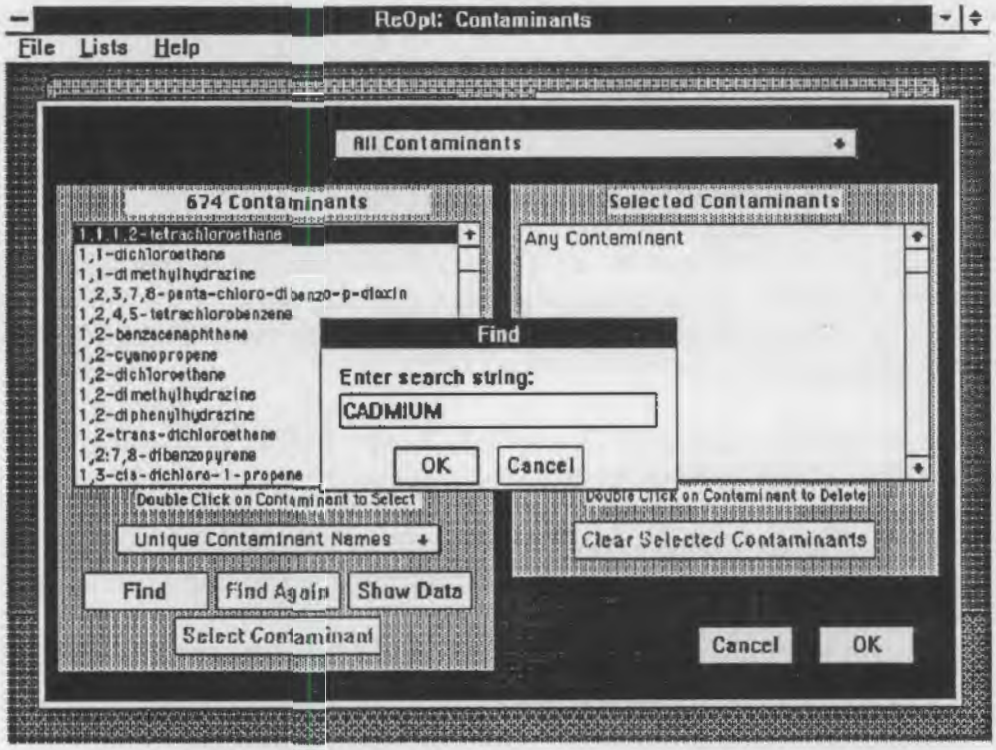
2. Click once on the Pop-up List of Technology Functions/Types to bring up the menu of available items. Click once on **Ex Situ Treatment.**

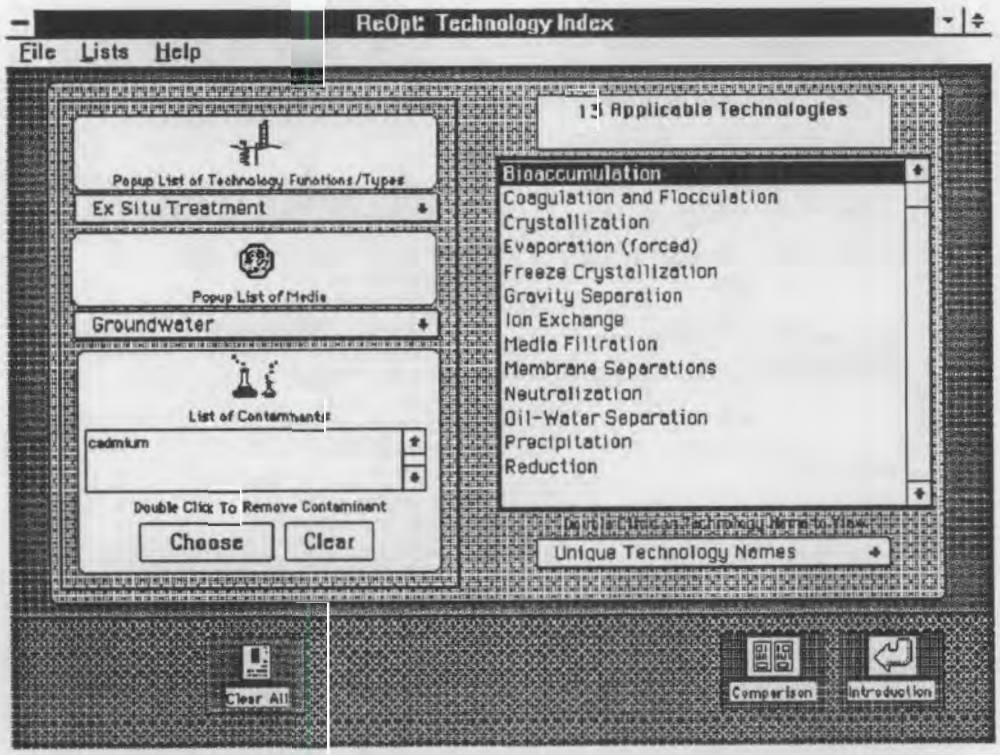
   ■ Note how the list of applicable technologies is focused to only those Ex Situ Treatment technologies available (43 applicable technologies) (see page 24).

3. Click once on the Pop-up List of Media to bring up the menu of available items. Click once on **Groundwater.**

   ■ Note again how the list of applicable technologies is even more focused (23 technologies) now that the selection criteria is more defined (see below).




ReOpt: Contaminants
File Lists Help
All Contaminants
674 Contaminants
1,1,1,2-tetrachloroethane
1,1-dichloroethene
1,1-dimethylhydrazine
1,2,3,7,8-penta-chloro-dibenzo-p-dioxin
1,2,4,5-tetrachlorobenzene
1,2-benzacenaphthene
1,2-cyanopropene
1,2-dichloroethene
1,2-dimethylhydrazine
1,2-diphenylhydrazine
1,2-trans-dichloroethene
1,2:7,8-dibenzopyrene
1,3-cis-dichloro-1-propene
Double Click on Contaminant to Select
Unique Contaminant Names
Find
Find Again
Show Data
Select Contaminant
Selected Contaminants
Any Contaminant
Double Click on Contaminant to Delete
Clear Selected Contaminants
Find
Enter search string:
CADMIUM
OK
Cancel
Cancel
OK


ReOpt: Technology Index
File Lists Help
Popup List of Technology Functions/Types
Ex Situ Treatment
Popup List of Media
Groundwater
List of Contaminants
cadmium
Double Click To Remove Contaminant
Choose
Clear
13 Applicable Technologies
Bioaccumulation
Coagulation and Flocculation
Crystallization
Evaporation (forced)
Freeze Crystallization
Gravity Separation
Ion Exchange
Media Filtration
Membrane Separations
Neutralization
Oil-Water Separation
Precipitation
Reduction
Unique Technology Names
Clear All
Comparison
Introduction

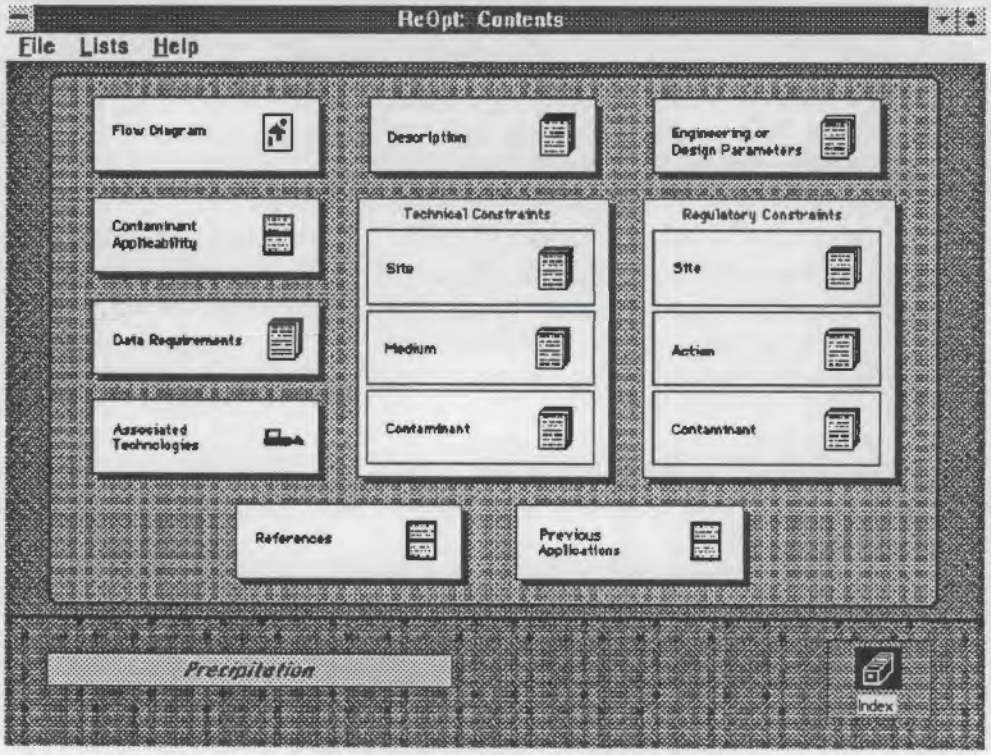
4. Click once on the **Choose** button under the List of Contaminants. This will take you to the contaminants dialog box shown on page 26. Click on **Find** and at **Enter search string** type **cadmium**.

   At this command line you can enter any number of characters and either click **OK** or press **Enter** or the **Return** key to begin searching the list of nearly 700 contaminants for a matching character string. For example, you may need to enter only **cad**; this portion of the word is recognizable enough to match the contaminant **cadmium**. Click on the **OK** button, then click on the **Select Contaminant** button. The word cadmium will display in the **Selected Contaminants** list box. (You may also choose the contaminant by double clicking on the name of the contaminant in the list box.) When you have selected as many contaminants as you desire, click on the **OK** button to return to the **Technology Index** window.

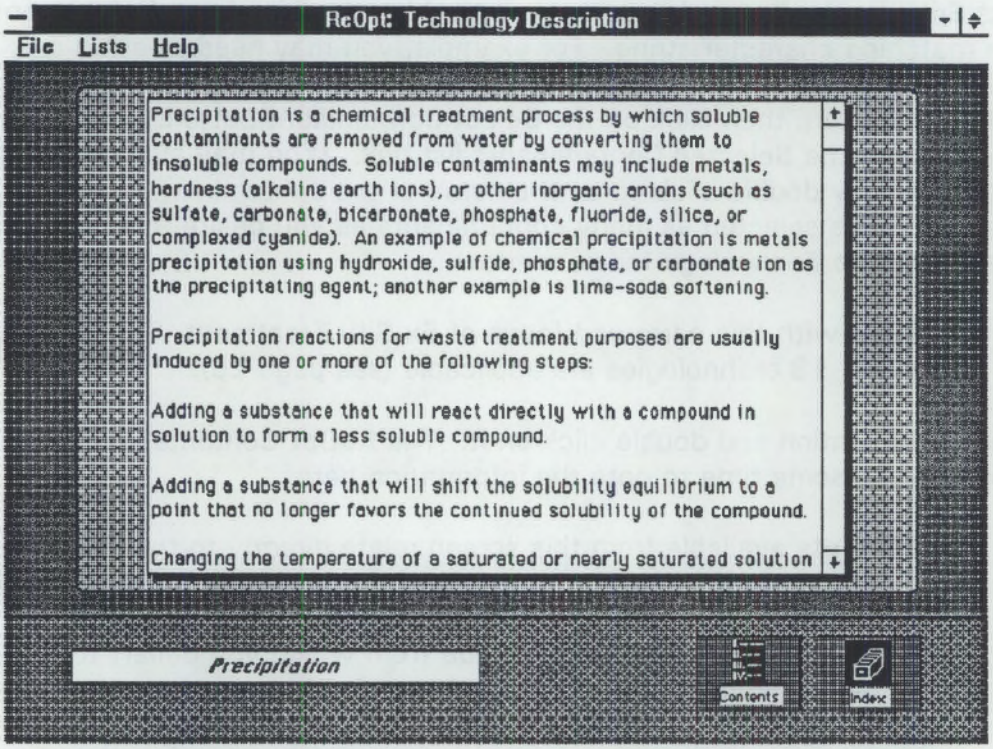
   ■ Note that with this narrowed focus of Ex Situ Treatment, Groundwater, and Cadmium, 13 technologies are applicable (see page 26).

5. Select **Precipitation** and double click on it. The ReOpt Contents window displays (see below). Take some time to note the information here:

   - The contents available from this screen relate directly to the **Precipitation** technology. And so you remember, **Precipitation** is indicated on the bottom left of the screen.
   - This screen can be considered the *hub* from which you depart to find out the detailed information that pertains to this technology.

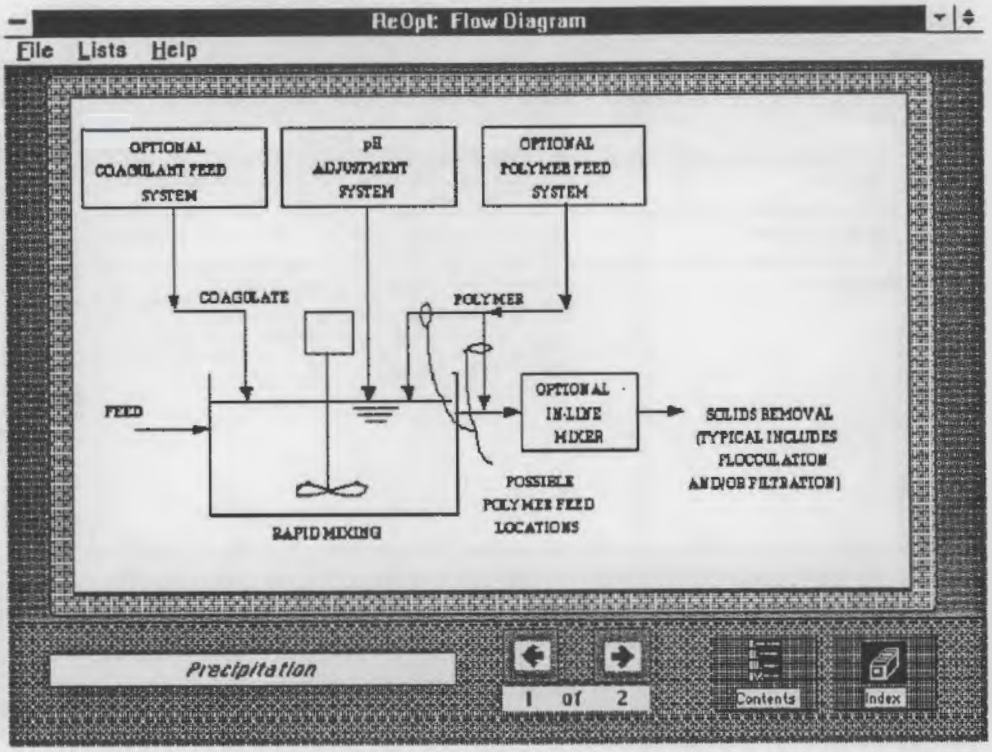


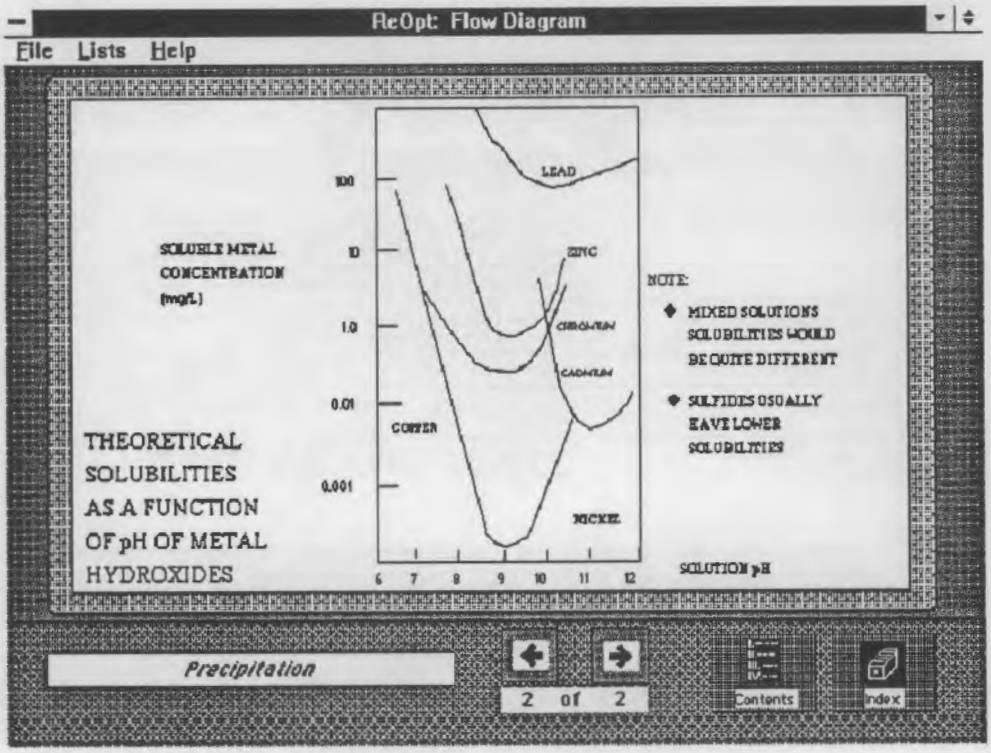
6. To find out more about the technology, click on the **Description box.** It provides a textual description of the technology. Click on the **Contents** button to return to the Contents window.

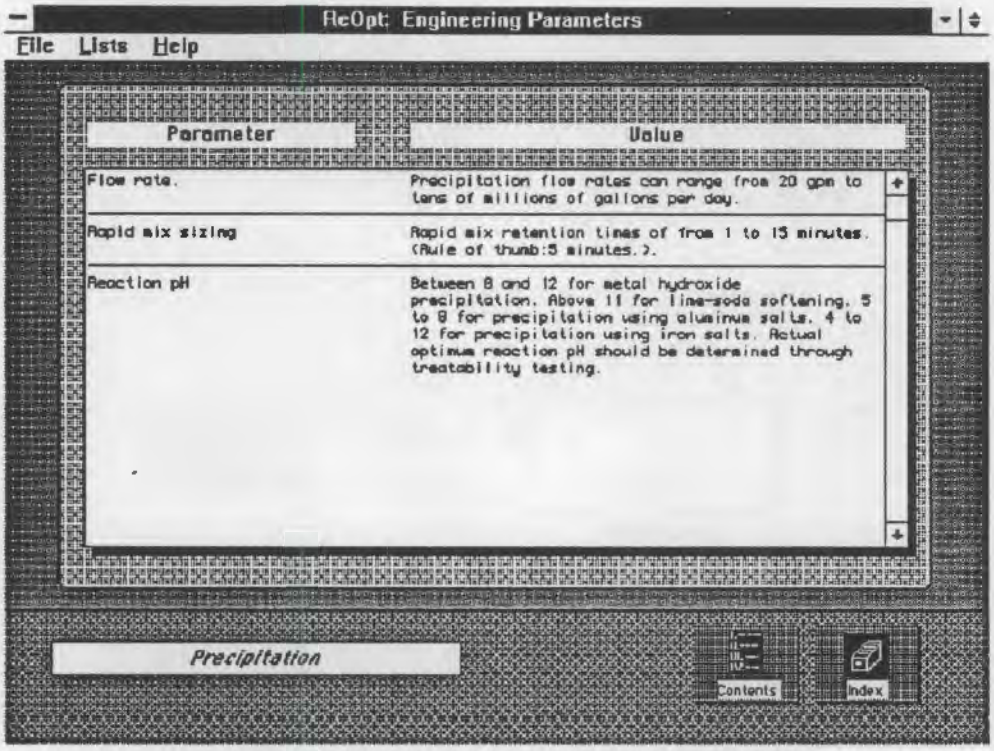


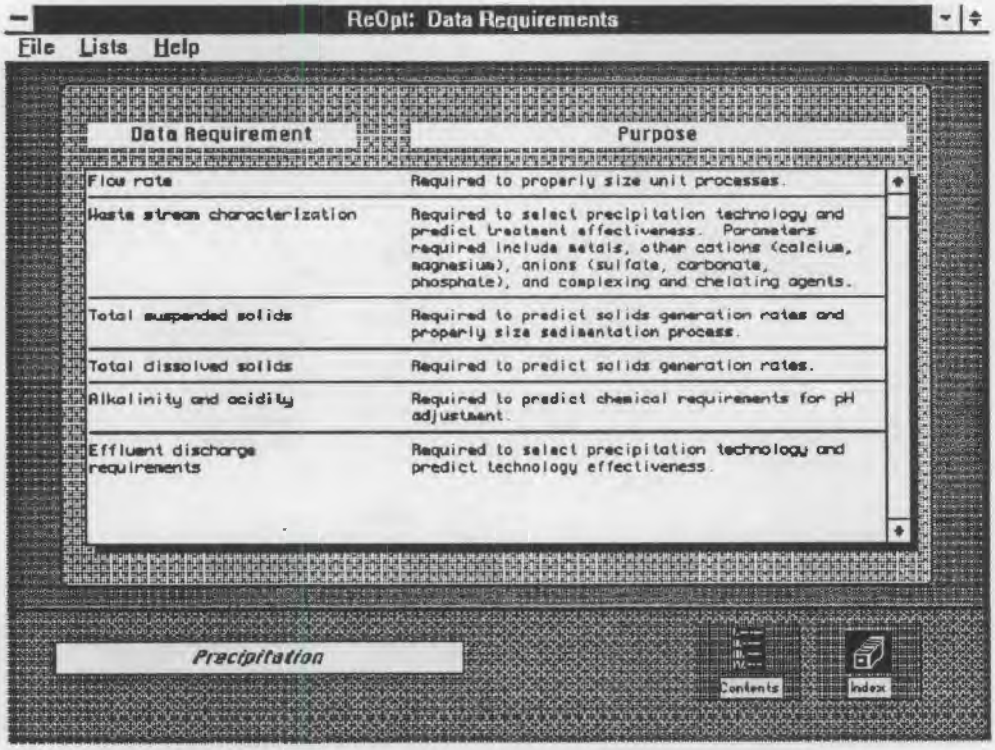
Then click on the flow diagram for a graphical depiction of how the technology is used for environmental restoration.

- Note on the bottom of the screen, **1 of 2.** This means this is the first flow diagram of two that are available. Click on the arrow above the numeral 2 to bring up the next flow diagram. Note that it now says, **2 of 2 (see page 29).** If you click on the arrow again, you will cycle back to the first diagram. Click on the **Contents** button to return to the Contents window.


ReOpt: Flow Diagram
File Lists Help
OPTIONAL COAGULANT FEED SYSTEM
pH ADJUSTMENT SYSTEM
OPTIONAL POLYMER FEED SYSTEM
COAGULATE
POLYMER
FEED
OPTIONAL IN-LINE MIXER
SOLIDS REMOVAL (TYPICAL INCLUDES FLOCCULATION AND/OR FILTRATION)
POSSIBLE POLYMER FEED LOCATIONS
RAPID MIXING
Precipitation
1 of 2
Contents
Index

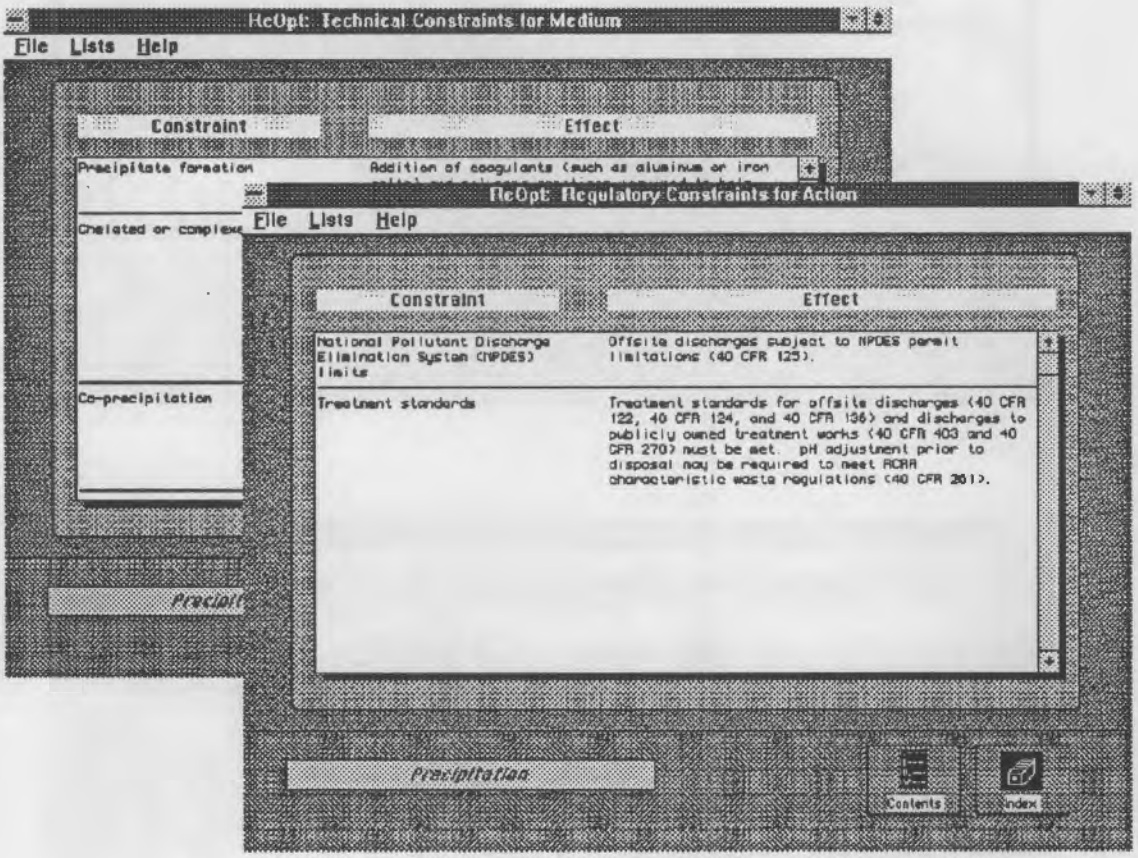

ReOpt: Flow Diagram
File Lists Help
SOLUBLE METAL CONCENTRATION (mg/L)
100
10
1.0
0.01
0.001
LEAD
ZINC
COPPER
NICKEL
6 7 8 9 10 11 12
SOLUTION pH
NOTE:
MIXED SOLUTIONS SOLUBILITIES WOULD BE QUITE DIFFERENT
SULFIDES USUALLY HAVE LOWER SOLUBILITIES
THEORETICAL SOLUBILITIES AS A FUNCTION OF pH OF METAL HYDROXIDES
Precipitation
2 of 2
Contents
Index

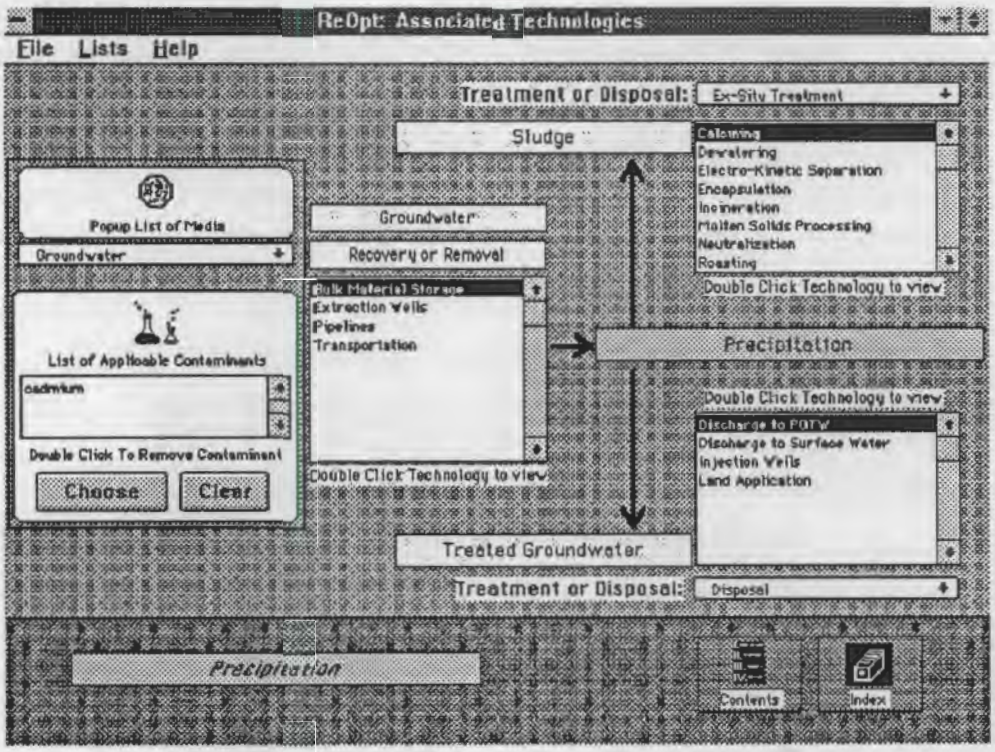

ReOpt: Engineering Parameters
File Lists Help
Parameter
Value
Flow rate.
Precipitation flow rates can range from 20 gpm to tens of millions of gallons per day.
Rapid mix sizing
Rapid mix retention times of from 1 to 15 minutes. (Rule of thumb:5 minutes.).
Reaction pH
Between 8 and 12 for metal hydroxide precipitation. Above 11 for lime-soda softening. 5 to 8 for precipitation using aluminum salts. 4 to 12 for precipitation using iron salts. Actual optimum reaction pH should be determined through treatability testing.
Precipitation
Contents
Index

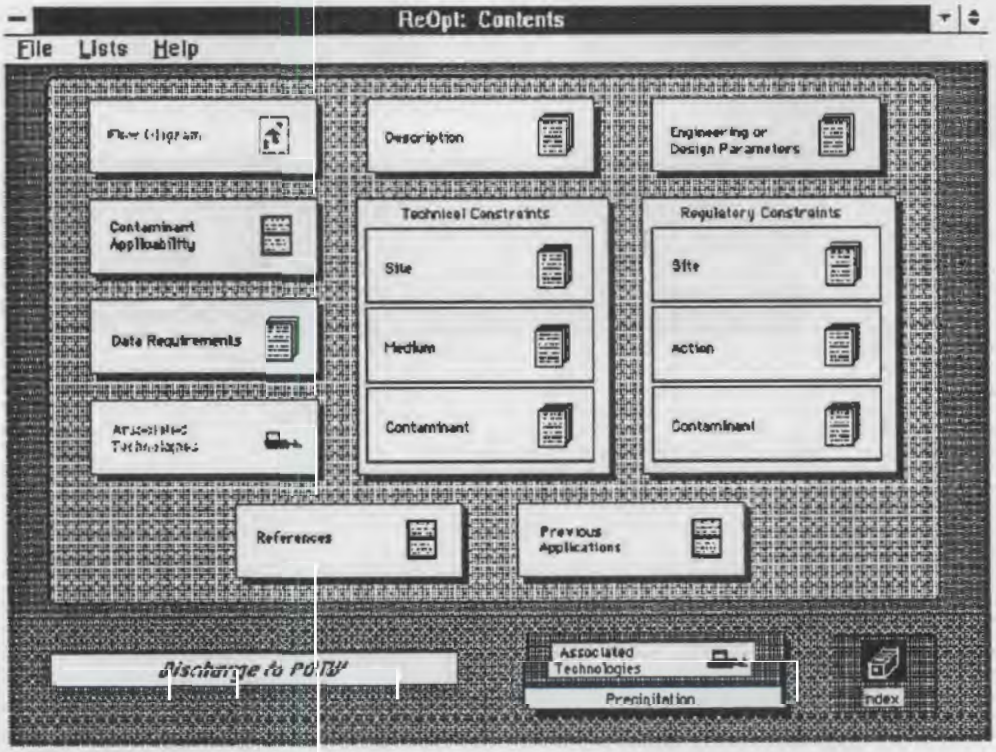

ReOpt: Data Requirements
File Lists Help
Data Requirement
Purpose
Flow rate
Required to properly size unit processes.
Waste stream characterization
Required to select precipitation technology and predict treatment effectiveness. Parameters required include metals, other cations (calcium, magnesium), anions (sulfate, carbonate, phosphate), and complexing and chelating agents.
Total suspended solids
Required to predict solids generation rates and properly size sedimentation process.
Total dissolved solids
Required to predict solids generation rates.
Alkalinity and acidity
Required to predict chemical requirements for pH adjustment.
Effluent discharge requirements
Required to select precipitation technology and predict technology effectiveness.
Precipitation
Contents
Index

7. To find out more about the how the technology is typically applied, click on the **Engineering** or **Design Parameters** (see page 30) to read the values for a particular parameter. Click on the **Contents** button.

8. Click on **Data Requirements** (see page 30), **Technical Constraints - Medium**, and **Regulatory Constraints - Action** (see below). Clicking on any of these buttons brings up a text window. After reading about the Precipitation topic, click on the **Contents** button.




ReOpt: Associated Technologies
File Lists Help
Treatment or Disposal:
Ex-Situ Treatment
Sludge
Calcining
Dewatering
Electro-Kinetic Separation
Encapsulation
Incineration
Molten Solids Processing
Neutralization
Roasting
Double Click Technology to view
Popup List of Media
Groundwater
Groundwater
Recovery or Removal
Bulk Material Storage
Extraction Wells
Pipelines
Transportation
Precipitation
List of Applicable Contaminants
cadmium
Double Click To Remove Contaminant
Choose
Clear
Double Click Technology to view
Discharge to POTW
Discharge to Surface Water
Injection Wells
Land Application
Double Click Technology to view
Treated Groundwater
Treatment or Disposal:
Disposal
Precipitation
Contents
Index


ReOpt: Contents
File Lists Help
Description
Engineering or Design Parameters
Contaminant Applicability
Technical Constraints
Regulatory Constraints
Site
Site
Data Requirements
Medium
Action
Contaminant
Contaminant
References
Previous Applications
Discharge to POTW
Associated Technologies
Precipitation
Index

9. Click on **Associated Technologies** and take some time to review all the associated technologies that relate to **Precipitation:**

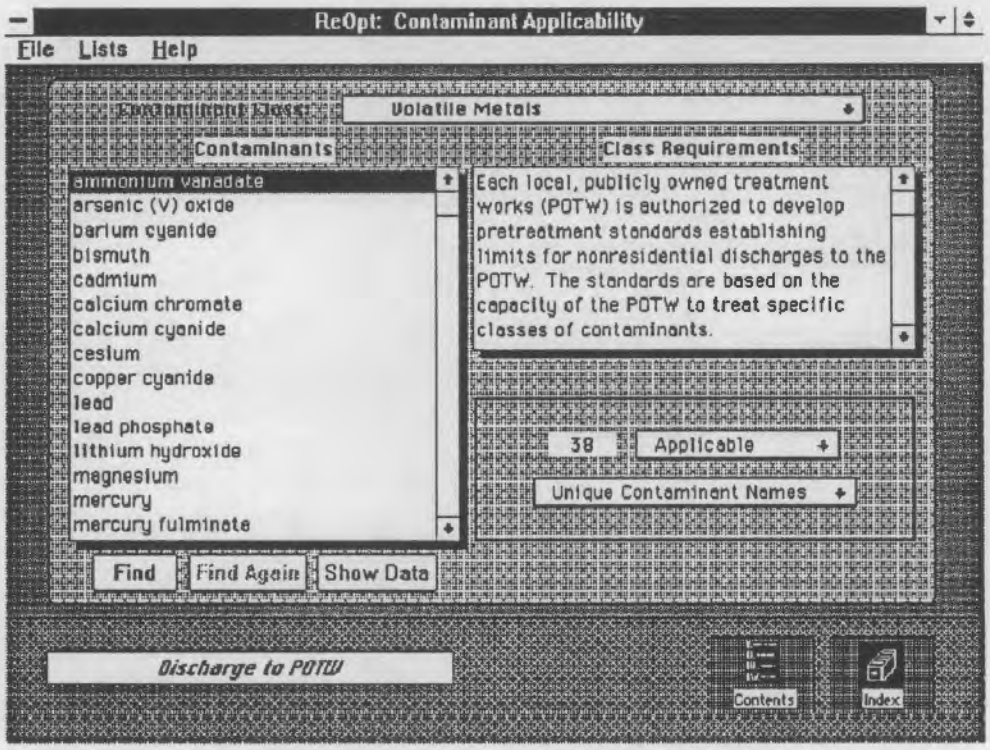
   - Note that the pop-up menus provide an option of reselecting different criteria (see page 32). For example, if you changed groundwater to surface water or other aqueous, the associated technologies lists may change.

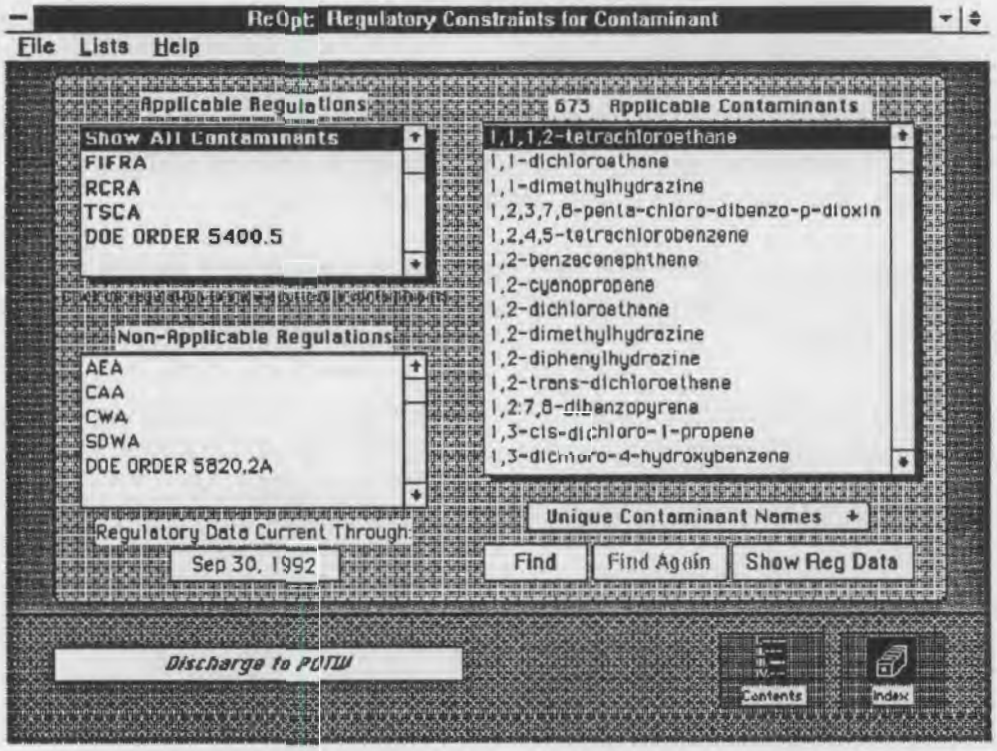
10. You can double click to select an associated technology from any of the lists. For example, in the **Treatment or Disposal** scroll list, double click on the highlighted **Discharge to POTW.**

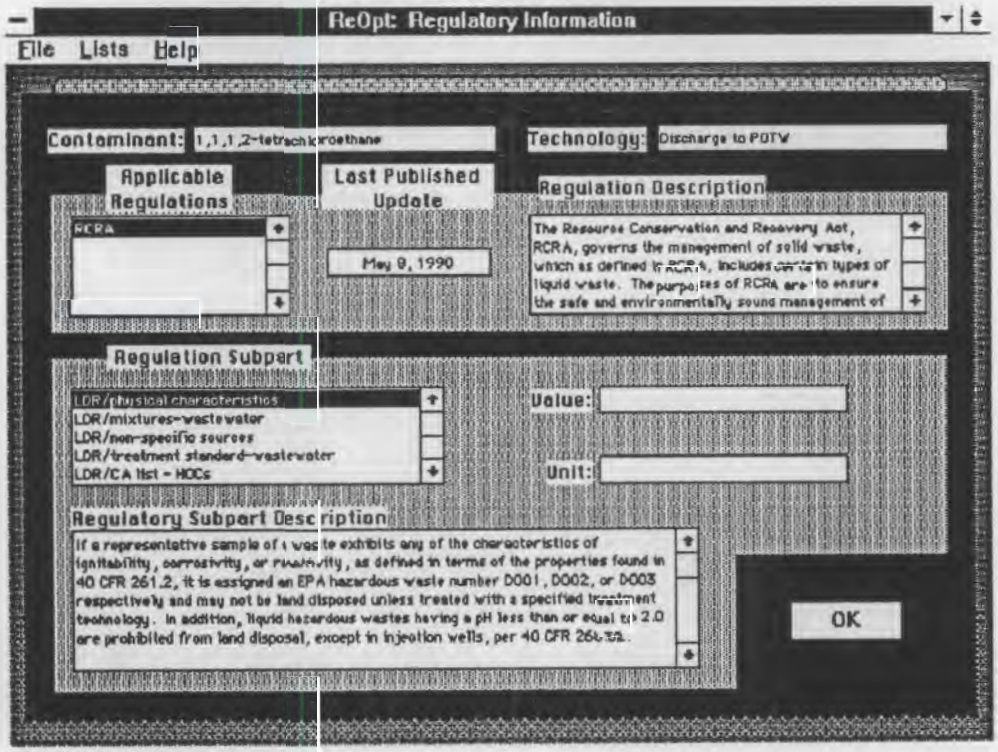
    - Note that the Contents window for **Discharge to POTW** displays, but the Associated Technologies option is no longer selectable (grayed out), and the screen identifier is now **Discharge to POTW** (see page 32). You have taken a side trip to review a technology used in conjunction with precipitation (Discharge to POTW).

11. Click on **Contaminant Applicability**, then open the Contaminant Class drop-down list box and choose **Volatile Metals** (see below).

    - Note that *cadmium* is fifth on the list. Class requirements for this contaminant applicability indicate that POTW is authorized to treat this type of contaminant.




ReOpt: Regulatory Constraints for Contaminant
File Lists Help
Applicable Regulations
Show All Contaminants
FIFRA
RCRA
TSCA
DOE ORDER 5400.5
Non-Applicable Regulations
AEA
CAA
CWA
SDWA
DOE ORDER 5820.2A
673 Applicable Contaminants
1,1,1,2-tetrachloroethane
1,1-dichloroethane
1,1-dimethylhydrazine
1,2,3,7,8-penta-chloro-dibenzo-p-dioxin
1,2,4,5-tetrachlorobenzene
1,2-benzacenephthene
1,2-cyanopropene
1,2-dichloroethane
1,2-dimethylhydrazine
1,2-diphenylhydrazine
1,2-trans-dichloroethene
1,2:7,8-dibenzopyrene
1,3-cis-dichloro-1-propene
1,3-dichloro-4-hydroxybenzene
Unique Contaminant Names
Regulatory Data Current Through:
Sep 30, 1992
Find
Find Again
Show Reg Data
Discharge to POTW
Contents
Index


ReOpt: Regulatory Information
File Lists Help
Contaminant: 1,1,1,2-tetrachloroethane
Technology: Discharge to POTW
Applicable Regulations
RCRA
Last Published Update
May 9, 1990
Regulation Description
The Resource Conservation and Recovery Act, RCRA, governs the management of solid waste, which as defined by RCRA, includes certain types of liquid waste. The purposes of RCRA are to ensure the safe and environmentally sound management of
Regulation Subpart
LDR/physical characteristics
LDR/mixtures-wastewater
LDR/non-specific sources
LDR/treatment standard-wastewater
LDR/CA list - HOCs
Value:
Unit:
Regulatory Subpart Description
If a representative sample of a waste exhibits any of the characteristics of ignitability, corrosivity, or reactivity, as defined in terms of the properties found in 40 CFR 261.2, it is assigned an EPA hazardous waste number D001, D002, or D003 respectively and may not be land disposed unless treated with a specified treatment technology. In addition, liquid hazardous wastes having a pH less than or equal to 2.0 are prohibited from land disposal, except in injection wells, per 40 CFR 264.
OK

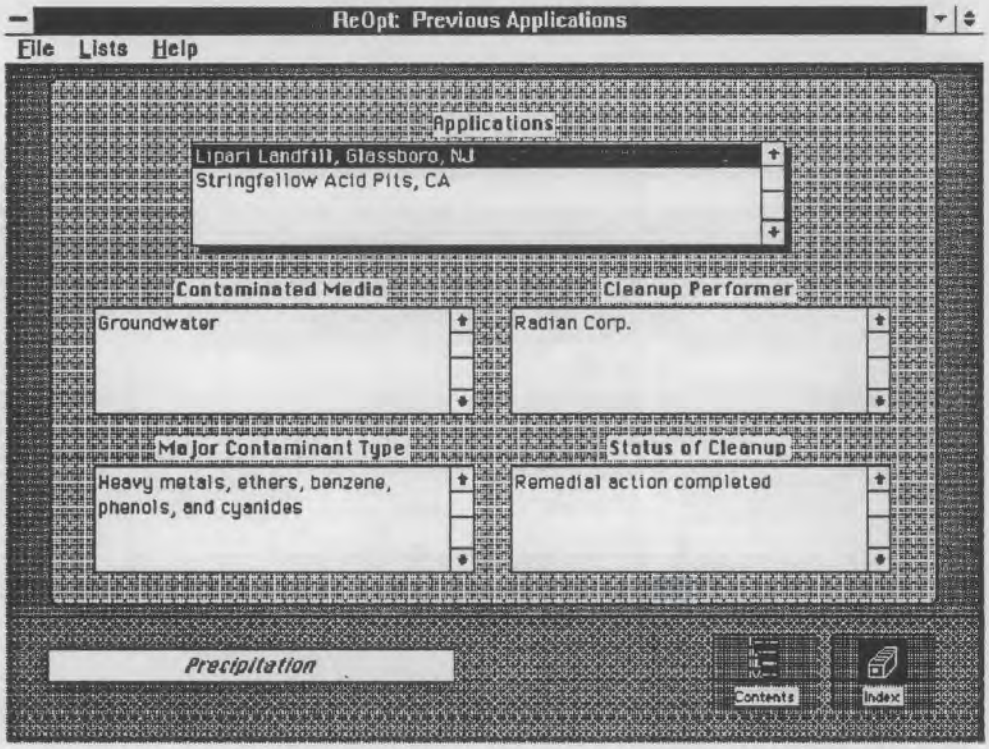
12. Return to the Discharge to POTW Contents screen and click on **Regulatory Constraints - Contaminant.** **Find** *cadmium* (See #4 in this tutorial for a reminder about the Find feature.)

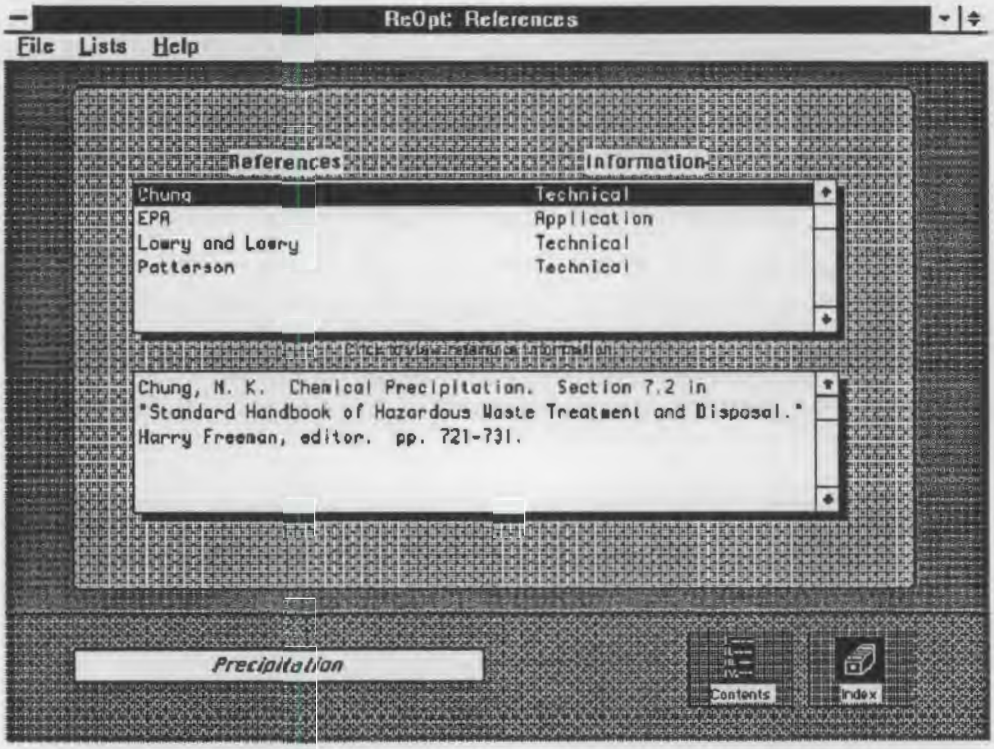
    - Note the regulations potentially applicable to cadmium and Discharge to POTW (see page 34).

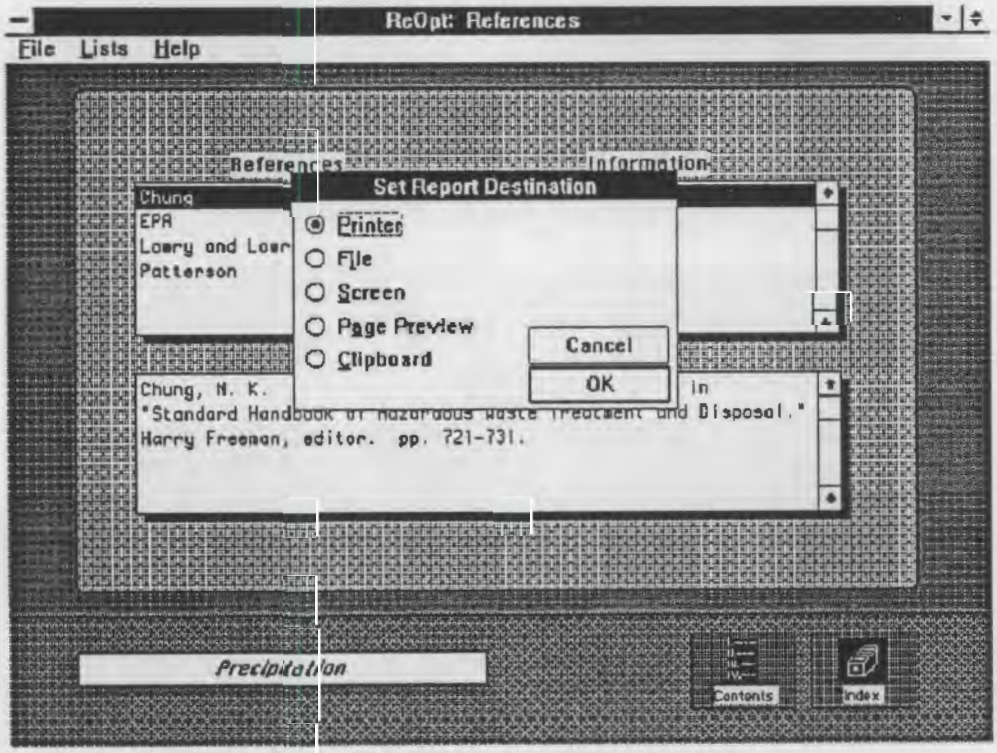
13. To delve even deeper, click on the **Show Reg Data** button. The applicable regulations display along with a description of the regulation and subparts to that regulation (see page 34). Click **OK** to return to **Regulatory Constraints** screen, then on the **Contents** button to return to the Discharge to POTW Contents screen. Click on the **Associated Technologies - Precipitation** button to return to the Associated Technologies screen for Precipitation.

    Now, click on the **Contents** button to end your side trip through Discharge to POTW.

14. On the Precipitation Contents screen, click on **Previous Applications** and you will see where this technology has been applied and its status (see below). Click on the **Contents** button.



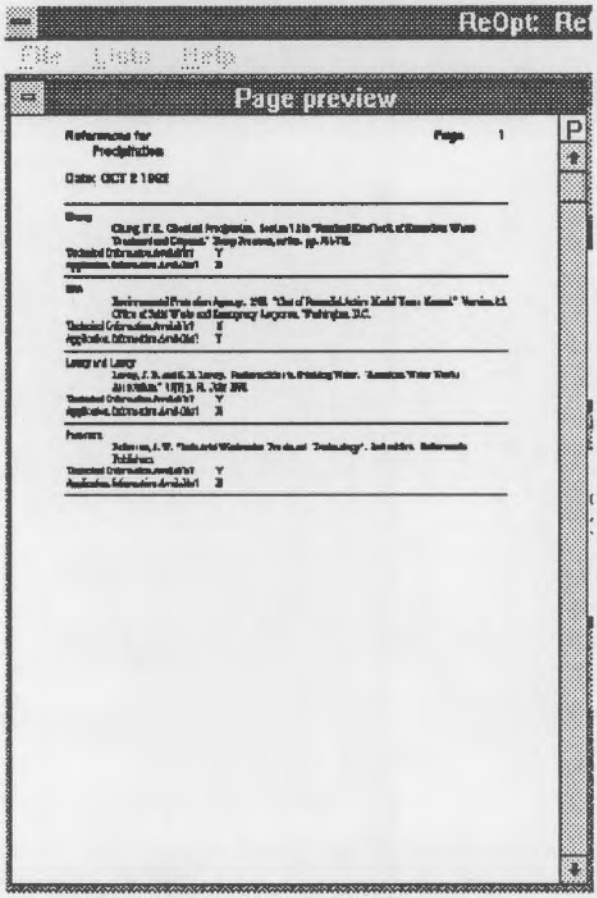

ReOpt: References
File Lists Help
References
Information
Chung Technical
EPA Application
Lowry and Lowry Technical
Patterson Technical
Chung, N. K. Chemical Precipitation. Section 7.2 in
"Standard Handbook of Hazardous Waste Treatment and Disposal."
Harry Freeman, editor. pp. 721-731.
Precipitation
Contents
Index


ReOpt: References
File Lists Help
References
Information
Chung
EPA
Lowry and Lowr
Patterson
Set Report Destination
Printer
File
Screen
Page Preview
Clipboard
Cancel
OK
Chung, N. K.
in
"Standard Handbook of Hazardous Waste Treatment and Disposal."
Harry Freeman, editor. pp. 721-731.
Precipitation
Contents
Index

15. Click on **References** to bring up cited reference material on Precipitation (see page 36). If you decide you want to read this material, since you are considering this technology for your particular need, you can print this information so you have hardcopy for later reference. (Information contained in other screens cal also be printed as illustrated.)

16. From the **File** menu choose **Print This Information**. This opens a dialog box from which you can *Set report destination* (see page 36).

17. Choose **Page Preview** and click **OK**. This information will display in a page so you can see how it will look when printed. If you choose **Printer**, a printer menu will appear, identifying all the printer connections you have to your computer system. Click **OK** and the report will go to the printer you select.



5.0 REFERENCES

Buelt, J. L., J. A. Stottlemyre, and M. K. White. 1991. "Remedial Action Assessment System (RAAS) - A Computer-Based Methodology for Conducting Feasibility Studies." National Research & Development Conference on the Control of Hazardous Materials, Anaheim, California.

Pennock, K. A., S. J. Bohn, and M. K. White. 1992. "Expert Software That Matches Remediation and Strategy." *Remediation*, Spring 1992.

U.S. Environmental Protection Agency (EPA). 1990. *Risk Reduction Engineering Laboratory Treatability Database.* Risk Reduction Engineering Laboratory, Cincinnati, Ohio.

White, M. K. 1991. "Remedial Action Assessment System - A Computer-Based Methodology for Conducting Feasibility Studies." Waste Management '91, Tucson, Arizona.

Appendix

Appendix

Table A.1 contains a description of each of the screens and dialog boxes identified in Figures 2 and 3. For each screen or dialog box, the table includes information about the purpose, information content, information selection or access functions, and navigational connections with other windows or screens.

Table A.1. Description of ReOpt Technology Information System Screens and Dialog Boxes

Screen or Dialogue Box	Purpose	Technical Information	Information Selection or Access Functions	Navigation to Screens or Dialogue Boxes
Introduction	Provide introductory information	# of contaminants # of techs # of media # of functions	none	technology index
Technology Index	sort technologies by function, medium, and contaminants select technology for information retrieval	primary technology names and technology name synonyms technologies applicable for sort conditions	select technology function from pulldown menu select contaminated medium from pulldown menu clear previous selections revise technology list (as selections vary) select display of unique technology names or all technology synonyms with radio button select technology from scroll list	introduction contaminant selection comparison index contents

Table A.1. Description of ReOpt Technology Information System Screens and Dialog Boxes

Screen or Dialogue Box	Purpose	Technical Information	Information Selection or Access Functions	Navigation to Screens or Dialogue Boxes
Comparison Index	sort technologies by function, medium, and contaminants for two sites in order to compare applicable technologies select technology for information retrieval	primary technology names and technology name synonyms technologies applicable for two sort conditions	select technology function for either of two sites with pop-up menus select contaminated medium for either of two sites with pop-up menus clear previous selections for either of two sites revise technology lists (as selections vary) for either of two sites select display of technologies for first site, second site, first site but not second site, second site but not first site, or for both sites with pop-up menu select display of unique technology names or all technology synonyms with radio buttons select technology from scroll list	introduction contaminant selection technology index contents

Table A.1. Description of ReOpt Technology Information System Screens and Dialog Boxes

Screen or Dialogue Box	Purpose	Technical Information	Information Selection or Access Functions	Navigation to Screens or Dialogue Boxes
Contaminant Selection	select contaminants for sorting technologies	contaminant class contaminants in each class primary contaminant names and contaminant synonyms	contaminant class selection from pulldown menu contaminant selection from scroll list select display of primary contaminant names or contaminant synonyms with pulldown menus find contaminant names containing user-entered text string clear previously selected contaminants cancel selected contaminants (revert to selection prior to entering contaminant selection screen)	technology index or comparison index (screen from which contaminant selection screen accessed) contaminant data
Contaminant Data	display selected physical and chemical parameters for selected contaminant	contaminant name synonyms for primary contaminant name contaminant class physical and chemical properties with references	select a parameter to view the reference	contaminant selection

Table A.1. Description of ReOpt Technology Information System Screens and Dialog Boxes

Screen or Dialogue Box	Purpose	Technical Information	Information Selection or Access Functions	Navigation to Screens or Dialogue Boxes
Contents	select specific technology information for access	none	select desired information for selected technology	flow diagram description engineering or design parameters contaminant applicability data requirements associated technologies technical constraints regulatory constraints references previous applications technology index or comparison screen (screen from which contents screen accessed)

Table A.1. Description of ReOpt Technology Information System Screens and Dialog Boxes

Screen or Dialogue Box	Purpose	Technical Information	Information Selection or Access Functions	Navigation to Screens or Dialogue Boxes
Flow Diagram	one or more flow diagrams or schematics are displayed to give a quick, visual overview of what the technology does and how it works	graphics files	page forward and back if more than one graphic is included for the technology	contents technology index or comparison screen (screen from which contents screen accessed)
Description	a narrative overview of the technology operation	text information (single narrative)	none	contents technology index or comparison screen (screen from which contents screen accessed)
Engineering or Design Parameters	typical operating conditions for the technology	text information (multiple individual data elements in column format)	page forward and back to view three individual data elements at a time	contents technology index or comparison screen (screen from which contents screen accessed)
Contaminant Applicability	a list of contaminants for which the selected technology is likely to be effective	contaminant classes contaminants in each class for which technology is effective explanation of characteristics of contaminants within a contaminant class for which technology is effective primary contaminant names and contaminant synonyms	contaminant class selection from pulldown menu select list of applicable or not applicable contaminants select display of primary contaminant names or contaminant synonyms with pulldown menus find contaminant names containing user-entered text string	contaminant data contents technology index or comparison screen (screen from which contents screen accessed)

Table A.1. Description of ReOpt Technology Information System Screens and Dialog Boxes

Screen or Dialogue Box	Purpose	Technical Information	Information Selection or Access Functions	Navigation to Screens or Dialogue Boxes
Data Requirements	site and contaminant information to consider in determining whether or how well the technology will perform	text information (multiple individual data elements in column format)	none	contents technology index or comparison screen (screen from which contents screen accessed)
Associated Technologies	identify technology functions and specific technologies for those functions (consistent with selected medium and contaminants) that may be applied along with the selected technology as part of a remedial action	technology functions typically performed in conjunction with selected technology treated and residual media associated with selected technology technologies performing those functions that are effective for user-selected medium and contaminants	select contaminated medium from pop-up menu select treatment or disposal from pop-up menus for treated or residual streams select associated technology from scroll list	contents (associated technologies) contaminant selection (associated technologies) contents technology index or comparison screen (screen from which contents screen accessed)

Table A.1. Description of ReOpt Technology Information System Screens and Dialog Boxes

Screen or Dialogue Box	Purpose	Technical Information	Information Selection or Access Functions	Navigation to Screens or Dialogue Boxes
Contaminant Selection (associated technologies)	select contaminants from those for which the selected technology is effective for determining how associated technology choices are affected by contaminants	contaminant classes contaminants in each class for which selected technology is effective primary contaminant names and contaminant synonyms	contaminant class selection from pulldown menu contaminant selection from scroll list select display of primary contaminant names or contaminant synonyms with pulldown menu find contaminant names containing user-entered text string clear previously selected contaminants cancel selected contaminants (revert to selection prior to entering contaminant selection screen)	associated technologies contaminant data

Table A.1. Description of ReOpt Technology Information System Screens and Dialog Boxes

Screen or Dialogue Box	Purpose	Technical Information	Information Selection or Access Functions	Navigation to Screens or Dialogue Boxes
Contents (Associated Technology)	select specific technology information for access	none	select desired information for selected technology (associated technology for selected technology not accessible)	flow diagram description engineering or design parameters contaminant applicability data requirements technical constraints menu regulatory constraints menu references associated technology screen for technology from which contents screens are accessed previous applications technology index or comparison screen (screen from which contents screen accessed)
Technical Constraints: site	site considerations that may limit the technology applicability or effectiveness	text information (multiple individual data elements in column format)	none	contents technology index or comparison screen (screen from which contents screen accessed)

Table A.1. Description of ReOpt Technology Information System Screens and Dialog Boxes

Screen or Dialogue Box	Purpose	Technical Information	Information Selection or Access Functions	Navigation to Screens or Dialogue Boxes
Technical Constraints: medium	medium considerations that may limit the technology applicability or effectiveness	text information (multiple individual data elements in column format)	none	contents technology index or comparison screen (screen from which contents screen accessed)
Technical Constraints: contaminant	contaminant considerations that may limit the technology applicability or effectiveness	text information (multiple individual data elements in column format)	none	contents technology index or comparison screen (screen from which contents screen accessed)
Regulatory Constraints: site	federal regulatory consideration relating to the site at which the technology is applied	text information (multiple individual data elements in column format)	none	contents technology index or comparison screen (screen from which contents screen accessed)
Regulatory Constraints: action	federal regulatory consideration relating to applying the specific technology	text information (multiple individual data elements in column format)	none	contents technology index or comparison screen (screen from which contents screen accessed)
Regulatory Constraints: contaminant (non-disposal technology)	federal regulatory consideration relating to the types of contaminants to which the technology is applied	text information (multiple individual data elements in column format)	none	contents technology index or comparison screen (screen from which contents screen accessed)

Table A.1. Description of ReOpt Technology Information System Screens and Dialog Boxes

Screen or Dialogue Box	Purpose	Technical Information	Information Selection or Access Functions	Navigation to Screens or Dialogue Boxes
Regulatory Constraints: Contaminant (Disposal Technology)	federal regulatory consideration relating to the specific contaminants for the selected disposal technology	contaminants for which the selected technology is applicable contaminants for which the selected regulation and the selected technology are applicable	select a regulation to view applicable contaminants select class from pulldown menu	regulatory data contents technology index or comparison screen (screen from which contents screen accessed)
Regulatory Data	federal regulatory information applicable to selected technology and contaminant	text information describing a regulation and its subparts, including regulatory limits of the selected contaminant	select a regulation and/or a subpart to view its information	regulatory constraints: contaminant
References	bibliographic information to allow user to find additional technology information	bibliographic information and indication of contents for individual references	select desired reference from scroll list to access corresponding bibliographic and content information	contents technology index or comparison screen (screen from which contents screen accessed)
Previous Applications	examples of previous applications of the technology and the results	information about who and where the technology was previously applied and the contaminated medium, contaminants, and status for each previous application	select desired application from scroll list to access corresponding application information	contents technology index or comparison screen (screen from which contents screen accessed)

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_____	_____
_____	_____
_____	_____

2. Software: ReOpt Technology Information System (4 - 3½-inch disks)

   Documentation: User Guide, PNL-7840

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(12/91)

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Troubleshooting Form

TELEFAX THE COMPLETED FORM TO:
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FTS or Commercial (509) 375-3765
Fax - (509) 375-6417

Please complete ALL possible sections so we may assist you.
Thank You!

We will obtain the necessary information and call you back as soon as possible with answers.

Software Registration Number _____

Nature of the problem:

Title of screen displaying on the
Monitor:_____

Technology Selected:_____

Medium Selected _____

Contaminant(s) Selected

_____

_____

_____

What were you doing just before the problem occurred?

Name:_____

Telephone #:_____

Organization_____

TELEFAX # _____

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