Feasibility Studies: At many sites, remediation is required to mitigate the impact and/or restore the resource. Prior to the design of a remediation program, the feasibility of various approaches needs to be considered. **Aquilogic** staff has experience conducting literature reviews, designing laboratory bench studies, and conducting field pilots for soil and groundwater remediation.

Soil and Groundwater Remediation: After the feasibility of various remedial options has been considered, a remedial approach is selected and detailed in a Remedial Action Plan (RAP) and remedial system designs. At various design stages, application for permits to implement the remedy can proceed. **Aquilogic** staff has extensive experience preparing RAPs, engineering designs, permit applications, contractor tender documents, and installation and performance reports for remediation systems.

Environmental Permitting: Federal, State and local agencies all require that certain permits be obtained to proceed with a project. In some cases, the permitting requirements can be particularly extensive with multiple agencies involved. **Aquilogic** can manage the overall environmental permitting process, obtain specific permits, or support the preparation of an Environmental Impact Report or Study (EIR/S).

Facility Decommissioning: There are numerous industrial facilities that have reached the end of their operational life. Many of these facilities can be restored providing value to the land owner and surrounding community. The process of restoring an industrial facility includes several steps: deactivation, decommissioning, decontamination, demolition, remediation, and re-development. Decontamination and remediation are performed by environmental consultants familiar with the complex scientific issues and regulatory requirements associated with such actions. **Aquilogic** staff has participated in many facility decommissioning and redevelopment programs, focusing on the decontamination and remediation phases.

Natural Resource Damage Assessment: In some cases, when a release of chemicals impacts natural resources such as sensitive ecological habitats, the regulators conduct a Natural Resource Damage Assessment (NRDA). The NRDA is then used as a basis to monetize the damage and develop mitigation actions. **Aquilogic** staff has supported NRDAs as part of a consultant team, focusing on impacts to surface water, groundwater, and near-shore marine environments.

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Other Services

Groundwater Management

Water Resources Assessment
Water Balance & Safe Yield
Groundwater Modeling
Groundwater Development
Contaminant Hydrogeology
Source Water Assessment
Water Re-use & Conjunctive Use
Aquifer Storage & Recovery
Drinking Water Treatment
GIS & Geomatics

Strategic Solutions

Litigation Support
Expert Witness
Forensic Engineering
Environmental Risk Management
Stakeholder/Public Participation
Regulatory Strategy
Environmental Cost-Benefit Analysis
Public Relations Support

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Groundwater Contamination

Responsible Party Identification
Remedial Investigation
Contaminant Hydrogeology
Fate & Transport Modeling
Risk Assessment
Remediation Feasibility Studies
Remediation
Environmental Permitting
Facility Decommissioning
NRDA

Environmental approvals, sustainable business practices, and the monitoring of environmental quality are now a go-no-go requirement for project success. In addition, we are still addressing the legacies of past practices that led to contamination of soil and water. At **aquilogic**, we offer a range of services to deliver project approvals and address contamination. Some of the services we offer are described in this brochure. More detailed information on these services, along with descriptions of current and completed projects, can be found at our website: www.aquilogic.com

Responsible Party Identification: In some instances, the source of contamination is unknown. **Aquilogic** can assist in the identification and assessment of "source sites" and potentially responsible parties (PRPs). The identification initially involves a review of regulatory records to refine the number of source sites. Subsequent field investigation and fate and transport analysis may then be needed to define the location, volume, and timing of releases.

Remedial Investigation: Investigations are needed to characterize the nature, extent, and magnitude of the contaminants, and the pathways they follow. The remedial investigation (RI) usually involves extensive field work and often follows an iterative process. **Aquilogic** has extensive experience implementing RI programs, including those with complex hydrogeology, multiple and comingled plumes, multiple source sites/PRPs, and impacted receptors.

Fate and Transport Modeling: The environmental setting, contaminant properties, and physio-chemical processes in the subsurface will determine contaminant fate and transport. Initially, a working hypothesis on how the contaminant will behave is developed – the conceptual site model (CSM). In some cases, a numerical model that uses mathematical algorithms to simulate the behavior of the contaminant is needed. **Aquilogic** has extensive experience developing CSMs and numerical models for groundwater flow, geochemistry, and contaminant transport.

Risk Assessment: A risk assessment considers three components: the source, the pathway, and the receptor. At the receptor, the routes of exposure are considered along with the exposure concentration and duration to determine the dose. **Aquilogic** staff has conducted risk assessments, primarily supporting the source and pathway analysis, while associate toxicologists and biologists focus on receptor exposure evaluation.

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Properties of Common Organic Contaminants

	Molecular Weight	Boiling Point	Density	Vapor Pressure [20-25 °C]	Sorption Coefficient [Log K_{oc}]	Solubility [20-25 °C]	Henry's Law Constant	Diffusion Coefficient in Air	Diffusion Coefficient in Water	Regulatory Levels		
Compound	(g/mol)	(◦C)	(g/cm^3)	(mmHg)	(unitless)	(mg/L)	(unitless)	(cm^2/s)	(cm^2/s)	CA PHG (µg/L)	CA Prim./ Second. (µg/L)	USEPA (µg/L)
PCE	165.83	121.1	1.62	18.4	2.19	200	0.76	0.072	8.2×10^{-6}	0.06	5	5
TCE	131.39	87.2	1.46	72	1.97	1,100	0.43	0.079	9.1×10^{-6}	1.7	5	5
1,1-DCE	96.94	32.0	1.21	591	1.81	2,400	1.06	0.090	1.0×10^{-5}	10	6	7
cis-1,2-DCE	96.94	60.2	1.28	175	1.46	4,930	0.19	0.074	1.1×10^{-5}	100	6	70
trans-1,2-DCE	96.94	48.5	1.26	352	1.7	6,300	0.39	0.071	1.2×10^{-5}	60	10	100
1,1,1-TCA	133.40	74.0	1.32	124	2.04	1,330	0.72	0.078	8.8×10^{-6}	1,000	200	200
1,1,2-TCA	133.40	113.5	1.44	25.2	1.7	4,420	0.038	0.079	8.8×10^{-6}	0.3	5	5
1,1-DCA	98.96	57.2	1.20	228	1.5	5,500	0.24	0.074	1.1×10^{-5}	3	5	-
1,2-DCA	98.96	84.0	1.25	81.3	1.24	8,700	0.053	0.10	9.9×10^{-6}	0.4	0.5	5
EDB	187.86	129	2.18	11	1.73	4,320	0.029	0.022	1.9×10^{-5}	0.01	0.05	0.05
TEL	323.45	84	1.65	0.15	3.69	0.8	3.31	0.013	6.4×10^{-6}	-	15	-
Vinyl chloride	62.50	-13.4	0.91	2,800	1.04	2,760	3.49	0.11	1.2×10^{-5}	0.05	0.5	2
1,4-dioxane	88.11	101.1	1.03	38	-0.27	Miscible	2.0×10^{-4}	0.23	1.0×10^{-5}	-	1 (NL)	-
Freon-11	137.37	23.8	1.49	687	2.13	1,100	4.03	0.087	9.7×10^{-6}	700	150	-
Freon-12	120.91	-29.8	1.31	4,800	2.11	280	16.67	0.052	1.1×10^{-5}	-	1,000 (NL)	-
Freon-113	187.38	47.7	1.56	360	3.11	200	22.03	0.078	8.2×10^{-6}	4,000	1,200	-
1,2,3-TCP	147.43	156.9	1.38	3.7	2.59	1,900	0.016	0.071	7.9×10^{-6}	0.0007	0.005	-
DBCP	236.33	196.0	2.08	0.76	2.23	1,000	8.3×10^{-3}	0.080	8.0×10^{-6}	0.0017	0.2	0.2
Telone	110.97	104.0	1.22	31.16	1.72	1,550	0.12	0.063	1.0×10^{-5}	0.2	0.5	-
D-D	223.96	96.0	1.16	50	1.77	2,800	0.12	0.078	8.7×10^{-6}	0.5	5	5
NDMA	74.08	153.0	1.01	5.37	0.56	Miscible	2.2×10^{-5}	0.13	9.7×10^{-6}	0.3	0.01 (NL)	-
MTBE	88.15	55.2	0.74	249	1.15	48,000	0.024	0.079	9.4×10^{-5}	13	13/5*	20-40
TBA	74.12	82.4	0.78	31.42	0.62	Miscible	0.003	0.085	9.1×10^{-6}	-	12 (AL)	NS
MeOH	32.04	65.0	0.79	122	-0.74	Miscible	1.9×10^{-4}	0.15	1.6×10^{-5}	-	NS	NS
EtOH	46.07	78.4	0.79	32.57	0.077	Miscible	2.8×10^{-4}	0.11	1.2×10^{-5}	-	NS	NS
ETBE	102.18	66.9	0.74	89.96	1.57	5,031	0.10	0.069	7.3×10^{-6}	13	5*	NS
DIPE	102.18	69.0	0.73	77.56	1.81	2,666	0.16	0.068	7.2×10^{-6}	-	NS	NS
TAME	102.18	86.3	0.76	99.72	1.62	4,295	0.13	0.070	7.4×10^{-6}	13	5*	NS
Benzene	78.11	80.1	0.88	95	1.82	1,770	0.23	0.088	9.8×10^{-6}	0.15	1/NS	5
Toluene	92.14	111	0.87	28.2	2.15	530	0.28	0.087	8.6×10^{-6}	150	150	1000
Ethylbenzene	106.17	136	0.87	9.6	2.31	169	0.33	0.075	7.8×10^{-6}	300	300	700
O-Xylene	106.17	144	0.88	6.75	2.11	178	7.4×10^{-4}	0.087	1.0×10^{-5}	1,800	1,750	10,000
Gasoline	~100	40-200	0.75	47.9	3.6	5.4	50	-	-	-	-	-
Kerosene/Jet Fuel	~160	150-250	0.80	0.48	5.4	0.034	120	-	-	-	-	-
Diesel #2	~200	250-350	0.83	0.036	6.7	8.0×10^{-4}	520	-	-	-	-	-
Fuel/Mineral Oils	~270	>150	0.88	8.0×10^{-4}	8.8	2.0×10^{-6}	4,900	-	-	-	-	-
Napthalene	128.17	218	1.14	0.09	3.19	31.4	0.02	0.059	7.5×10^{-6}	-	170 (AL)	-
Benzo(a)pyrene	252.31	495	1.24	4.89×10^{-9}	5.98	1.6×10^{-3}	4.7×10^{-5}	0.043	9.0×10^{-6}	0.007	0.2	0.2
Benz(a)anthracene	228.29	438	1.19	1.54×10^{-7}	5.55	0.01	1.4×10^{-4}	0.051	9.0×10^{-6}	0.07	-	-
Benzo(b)fluoranthene	252.32	481	1.29	8.06×10^{-8}	6.08	1.5×10^{-3}	5.0×10^{-4}	0.023	5.6×10^{-6}	0.07	-	-
Benzo(k)fluoranthene	252.32	480	1.29	9.59×10^{-11}	6.09	5.0×10^{-4}	4.4×10^{-7}	0.023	5.6×10^{-6}	0.07	-	-
Chrysene	228.29	448	1.27	7.8×10^{-9}	5.49	2.0×10^{-3}	5.0×10^{-5}	0.025	6.2×10^{-6}	0.7	-	-
Sulfolane	120.17	285	1.26	6.1×10^{-4}	-0.79	8370	4.8×10^{-7}	0.70	9.3×10^{-6}	-	87.5 (AK)	-