I. PROFESSIONAL PRACTICE (5%) – Apply pertinent federal and /or state regulations to hydrogeologist practice.

Task	*Knowledge*
T1. Identify need to perform a contamination assessment based on legal/regulatory requirements. T2. Identify water rights implications from groundwater information. T3. Apply knowledge of rules and regulations as it relates to the practice of hydrogeology.	K1. Knowledge of regulations pertaining to water rights and water law in Washington. K2. Knowledge of pertinent health and safety regulations. K3. Knowledge of federal and state water quality standards. K4. Knowledge of state regulations pertaining to groundwater protection. K5. Knowledge of state regulations pertaining to well construction/decommissioning. K6. Knowledge of reporting requirements for release to the environment. K7. Knowledge of state regulations for site investigation and remediation.

II. PROJECT PLANNING (20%) - Establish project objectives and develop scope of hydrogeologic work.

Task	*Knowledge*
T4. Identify needs for water supply protection. T5. Identify needs for water supply (groundwater and/or soil restoration/remediation). T6. Identify groundwater management issues and alternatives. T7. Identify potential sources of water supply. T8. Identify water resource impacts on designated beneficial use. T9. Develop a conceptual hydrogeologic model. T10. Identify need for control of groundwater flow direction or head relevant to engineered controls. T11. Identify consequences of changes to water table or potentiometric surface. T12. Identify existing site conditions that may constrain investigation approach. T13. Prepare schedule and identify location for soil and/or groundwater remediation. T14. Identify type, collection methods, quantity and quality of data needed to achieve project objectives. T15. Develop a groundwater investigation work plan.	K8. Knowledge of methods to develop conceptual hydrogeologic models. K9. Knowledge of general hydrogeology of Washington. K10. Knowledge of the hydrologic cycle. K11. Knowledge of drainage basin definitions. K12. Knowledge of techniques and procedures used for water budget evaluations. K13. Knowledge of effects of hydrogeologic facies on groundwater flow. K14. Knowledge of principles of groundwater flow pertaining to confined and unconfined aquifers. K15. Knowledge of sources of hydrogeologic data and their meanings. K16. Knowledge of types and sources of contaminants associated with specific categories of land use and industrial processes. K17. Knowledge of effects of existing site conditions on field studies. K18. Knowledge of the interaction between groundwater and surface water. K19. Knowledge of groundwater and/or soil restoration/remediation cleanup goals. K20. Knowledge of methods to evaluate natural attenuation in groundwater. K21. Knowledge of chemical and biochemical transformations of contaminants. K22. Knowledge of physical and chemical properties of contaminants affecting fate and transport. K23. Knowledge of different types of wells. K24. Knowledge of techniques to construct wells. K25. Knowledge of techniques to site wells. K26. Knowledge of well construction techniques that prevent cross-contamination. K27. Knowledge of methods to develop well fields for groundwater production. K28. Knowledge of drilling techniques and construction practices for different types of wells. K29. Knowledge of permits required for hydrogeologic investigations. K30. Knowledge of techniques to interpret aerial photographs, maps and datums. K31. Knowledge health and safety requirements for conducting field work. K32. Knowledge of elements of groundwater monitoring programs. K33. Knowledge of quantity and quality of data necessary to achieve project objectives. K34. Knowledge of advantages and disadvantages of different groundwater and vadose zone and modeling techniques. K35. Knowledge of advantages and disadvantages of different site investigation methods. K36. Knowledge of advantages and disadvantages of different field sample collection methods. K37. Knowledge of advantages and disadvantages of different field methods to measure water quality parameters. K38. Knowledge of advantages and disadvantages of different geophysical investigation techniques. K39. Knowledge of advantages and disadvantages of laboratory methods to determine chemical concentrations in soil, rock, water, gas and waste samples. K40. Knowledge of advantages and disadvantages of laboratory methods to determine physical properties of soil, rock, water, gas and waste samples K41. Knowledge of pertinent sources of historical data.

III. DATA ACQUISITION (24%) – Perform surface and subsurface exploration and document groundwater conditions.

Task	*Knowledge*
T16. Identify previous land uses and conditions from photographs, topographic maps, and other available historical sources. T17. Identify the applicable data for hydrogeologic analysis by reviewing existing documents, records, maps, and well logs. T18. Evaluate the physical condition and construction of existing wells. T19. Verify current conditions and site features in the field. T20. Collect soil, rock, and soil gas samples to evaluate surface and subsurface conditions. T21. Prepare field notes, boring logs and well construction details to document surface and subsurface conditions. T22. Prepare field notes to document sample collection, site conditions and deviations from work plan. T23. Collect samples of sediment or waste to evaluate soil or groundwater conditions. T24. Collect samples of groundwater or surface water to evaluate groundwater conditions. T25. Identify lithology, stratigraphy, structure, changes in moisture, water levels, and other properties of geologic materials based on field observations to interpret subsurface conditions. T26. Measure groundwater levels or free product thickness from wells. T27. Measure field water quality parameters. T28. Measure water flow and discharge rates.	K42. Knowledge of techniques to obtain groundwater and surface water samples. K43. Knowledge of techniques to obtain soil and waste samples. K44. Knowledge of techniques to obtain soil gas samples. K45. Knowledge of techniques to obtain field measurements of water quality. K46. Knowledge of techniques to measure water and NAPL levels in wells. K47. Knowledge of techniques to measure well discharge. K48. Knowledge of techniques to measure surface water. K49. Knowledge of field procedures for aquifer and slug tests. K50. Knowledge of classification systems for soil and rock. K51. Knowledge of techniques to obtain geophysical data. K52. Knowledge of procedures to measure infiltration. K53. Knowledge of procedures to decontaminate drilling equipment and sampling tools. K54. Knowledge of hazards of chemical contaminant exposure. K55. Knowledge of limitations of techniques for screening soil and groundwater samples in the field. K56. Knowledge of site reconnaissance and field mapping techniques

IV. DATA EVALUATION (34%) – Interpret data from historic, field, and laboratory sources and evaluate technical and economic feasibility of groundwater projects.

T29. Analyze infiltration/percolation data to calculate recharge rates and permeability. T30. Identify possible recharge/discharge areas from maps, photographs, and historic records. T31. Prepare interpretive hydrogeologic illustrations. T32. Construct time-series graphs of water level data. T33. Calculate vertical and horizontal hydraulic gradients. T34. Calculate hydraulic parameters from aquifer test data. T35. Assess well performance from pumping test data. T36. Determine aquifer parameters based on slug test. T37. Calculate fate and transport of contaminants in groundwater or vadose zone. T38. Interpret hydrogeologic boundaries, heterogeneity, and/or anisotropy from single or multi-well tests. T39. Delineate water resource boundaries and zones from available data or field observations. T40. Assess surface water/groundwater interactions. T41. Delineate the nature and extent of groundwater contamination. T42. Evaluate data to prepare hydrologic inventory/water balance. T43. Characterize nature and extent of contamination based on laboratory analysis of soil, soil gas or groundwater samples. T44. Determine interaction between vadose zone and groundwater using physical or chemical parameters. T45. Interpret trends from water level and/or quality data. T46. Interpret borehole geophysical logs to determine aquifer stratigraphy and properties. T47. Estimate contaminant concentrations for use in risk assessment. T50. Prepare groundwater level/potentiometric contour maps. T51. Prepare isoconcentration contour map. T52. Prepare graphical representations of water quality data. T53. Analyze infiltration/percolation data to calculate recharge rates and permeability.	K57. Knowledge of effects of climate data on hydrogeologic investigations. K58. Knowledge of effects of climate on natural groundwater recharge. K59. Knowledge of effects of groundwater on soil and rock stability. K60. Knowledge of factors that can influence data quality in hydrogeologic investigations. K61. Knowledge of conditions that influence gas or fluid flow through an unsaturated/vadose zone. K62. Knowledge of procedures for assessing water level fluctuations in wells. K63. Knowledge of the relationship between fresh water and saline water in aquifers. K64. Knowledge of groundwater/surface water interactions and evaluation techniques. K65. Knowledge of effects of natural and human activities on groundwater quality and quantity. K66. Knowledge of potential influence of groundwater fluctuations on land stability. K67. Knowledge of procedures to validate the usefulness of hydrogeologic, hydrologic and water quality data. K68. Knowledge of physical and chemical properties of organic and inorganic compounds in soil and groundwater. K69. Knowledge of factors that affect migration of contaminants through soil. K70. Knowledge of fate and transport processes for chemical constituents. K71. Knowledge of statistical methods to evaluate soil or groundwater data. K72. Knowledge of unsaturated flow models. K73. Knowledge of analytical and numerical models that simulate groundwater flow. K74. Knowledge of analytical and numerical methods to model contaminant fate and transport. K75. Knowledge of use and limitations of various aquifer test methods. K76. Knowledge of techniques to analyze aquifer test data. K77. Knowledge of well bore storage and skin effects on aquifer test results. K78. Knowledge of the practical significance and implications of equilibrium and non-equilibrium aquifer tests. K79. Knowledge of effects of boundary conditions on water levels during pumping. K80. Knowledge of effects of groundwater pumping in confined and unconfined aquifers. K81. Knowledge of analytical and numerical methods to determine hydraulic parameters for saturated and unsaturated earth materials. K82. Knowledge of methods to calculate hydraulic gradients. K83. Knowledge of methods to calculate groundwater flow rate and volume. K84. Knowledge of similarities and differences in fractured and porous groundwater flow systems. K85. Knowledge of graphical and tabular techniques for analysis and presentation of hydrogeologic data.

V. DESIGN AND IMPLEMENTATION (17%) – Design monitoring and production wells, and design programs for treatment and production systems.

Task	*Knowledge*
T54. Evaluate remedial technologies for soil, soil gas or groundwater. T55. Design a resource protection well. T56. Design a groundwater production well. T57. Develop cleanup goals for soil or groundwater remediation. T58. Develop criteria for a groundwater control/remediation system. T59. Design a monitoring plan for natural attenuation remedy. T60. Design a monitoring plan for remedial treatment system. T61. Design a monitoring plan for waste management units. T62. Design well decommissioning plan. T63. Design a well field specifying number, location, flow rate, and spacing of wells. T64. Design a monitoring plan for water supply system. T67. Design a groundwater injection/recharge system. T69. Assess performance of a remedial system. T70. Assess groundwater monitoring program effectiveness. T71. Assess impacts of water resource protection, development or use on current and future land and water uses. T72. Design a pumping test plan. T73. Design a well rehabilitation plan.	K86. Knowledge of well design for production wells and well fields. K87. Knowledge of well design for vapor extraction wells. K88. Knowledge of well design for resource protection wells K89. Knowledge of groundwater remediation systems K90. Knowledge of soil remediation systems. K91. Knowledge of artificial recharge and infiltration systems. K92. Knowledge of pilot tests used in hydrogeology investigations. K93. Knowledge of techniques for well rehabilitation. K94. Knowledge of techniques for well decommissioning. K95. Knowledge of pumping tests.