- A stand-alone document is recommended.

- Where material from an old petition is utilized, incorporate the material including data into the discussion text or as copy in a referenced appendix.

- The Master Table of Contents should include the Volume Number in which the Appendices can be located.

- Consistently request either a specific gravity range or density range, or consistently list equivalent ranges for both specific gravity and density values. If equivalent values are used, the reissuance should include a demonstration justifying that the density range and specific gravity range requested are equivalent at the referenced temperature. For conversion from bottomhole to surface values, a reservoir temperature reference should be provided for each injection interval.

  Note: Even though the modeling may require a value of density as input into the model, the request should be for the type of measurement and reference temperature in which petition compliance can be easily demonstrated. It is recommended that the operator consult their lab personnel to determine the lab's standard measurement temperature and equipment calibration temperature. The reissuance demonstration should contain a discussion justifying that the waste density range modeled is equivalent to the waste density or specific gravity range requested in the petition reissuance. (See EPA letter dated 1-14-99)

- Confirm that a reference datum accompanies the depth, i.e., clarify that the depths listed for the injection interval and injection zone are log depths referenced to the kelly bushing (KB) or provide the datum for the depth measurements.

- Provide elevations for each injection well so corrections can be made for various datums if used.

- Confirm all referenced tables, figures, and plates are included in the document.

- Update the adjacent landowners listing.

- Make sure any regulations are quoted correctly.

- EPA Region 6 does require a 10,000 year demonstration for the heavy waste plume since the regulations require this 10,000 year demonstration. For this demonstration, EPA Region 6 requires a minimum 200 year heavy waste plume demonstration that incorporates an appropriate background gradient. This is based on an EPA headquarters policy that oil and gas production will cease within 200 years. Facilities also need to

show the lack of potential for future oil and gas development during that period. Wells located within the heavy plume and outside the cone of influence, lack a mechanism for waste to migrate vertically upward. Therefore, after 200 years, EPA Region 6 considers this demonstration to be sufficient to demonstrate that waste will not migrate vertically upward in an abandoned well for 10,000 years. Operators must justify the statement that there are no potential impacts of future oil and gas production in the vicinity of the injection well facility, possibly because of the geologic environment, e.g., lack of structural trap, in the area of the injection well facility.

- Remember that all artificial penetrations (AP) must satisfy the no migration standard. State UIC permits are based on a non-endangerment standard.

- Update the search for new wells within the area of review (AOR) and defined waste plume. Verify the status of any active or temporarily abandoned wells to see if a well's status has changed since the last demonstration.

- Include a geological stratigraphic column in the geology section.

- In general, structure, isopach, and base maps should include the following features:

  a. The map scale should be 1"=2000'.
  b. For wells not deep enough to use as control points, label them as "NDE" or if the log is not available, label as "NA."
  c. All maps should show cross-section lines, a facility outline, the AOR boundary, and contain a legend.
  d. The AP numbers (facilities' unique numbering system) for the wells should be included on a base map.

- All cross-sections should include the following features:

  a. Provide a legend, title block, and small scale map showing the cross-section line.
  b. Include the actual electrical logs with the "log headers" if possible and not "tracings" of the logs.
  c. For each electrical log posted, include the operator's name, AP number, status (dry, oil, gas, etc.), total depth, and the KB elevation if not given on the log header.
  d. The injection interval and injection zone should be illustrated on the cross-section along with the completed interval. I.e., perforations, screened interval or open hole.
  e. Logs should not be reduced so much that the depth track can't be read.

- Discuss the historic seismic activity in the area of the facility.

- Include scout tickets, well schematics, and a representative sample of well logs for wells located within the AOR and outside the AOR but within the 10,000 year plume. This information should be consolidated and included in the appendix under the corresponding AP numbers.

- Provide a tabulation for all wells located within the AOR and outside the AOR but within the 10,000 year plume, which will show the Map AP number, well name, operator, status, total depth (TD), location of cement plugs, casing, plugging mud weights, and if it meets the no migration requirement.

- Abandoned portions of sidetracked injection wells should be treated as APs and the operator must demonstrate that they are properly plugged to withstand pressure buildup at the injection well.

- Well records should contain sufficient information to confirm that each AP passes the no migration standard. Log headers should be provided to verify the mud weight behind the casing or in the hole (if there is no long string casing in the hole) if the mud weight is used to make the no migration demonstration. I.e., there are no cement plugs.

- Brine filled boreholes will not pass the no migration standard within the light waste plume.

- Provide an updated commercial structure map. The map will be used for verification of well locations and regional structural geology. Make sure any added text or legends do not cover up the information on wells located within the AOR, cone of influence (COI), or waste plume.

- Provide a discussion on regional geology, hydrology and determination of USDWs (underground sources of drinking water).

- A 1" type log that specifically identifies the individual injection intervals and injection zone should be provided. Interval depths should be legible on the log.

- Provide a well construction section which contains a detailed drilling, workover, and completion history of the well including sidetracking and remedial activity. Provide supporting logs such as cement bond logs and cementing records as necessary.

- Confirm the well construction discussion is consistent with the illustration on the wellbore schematics. Reference depths should be noted. Operators often mix KB and below ground level (BGL) depths so make sure depths are correctly referenced. Provide both KB and GL elevations, if needed.

- List the reference datum depth when defining the confining zone, injection zone, and injection interval.

- When referencing an appendix, include the volume number where the appendix is located.
- Confirm that all necessary waste constituents are requested in the demonstration.

- Provide a summary table for the volumes injected into the well and any offset wells. The table should list the volumes using the timeframe input into the modeling, and also include a column in ft^3/d for verification of the injection volumes input into the SWIFT models.

- List the version of SWIFT utilized in the modeling and include a brief discussion of the computing environment used to run the program.

- Include a SWIFT model run that contains no injection for an extended period of time to verify there is limited or no background gradient in the low density lateral plume model. List the velocities for various time increments to determine the minimum time the model will need to be run for stabilization. For a variable structure grid, a Surfer type map with arrows indicating the magnitude of the velocities must be provided.

- Dip angle justification should include the angles used in both the updip and downdip lateral plume demonstrations.

- The number of decimal places used for the density and specific gravity values should be consist with density values used in the modeling and the values which the facility can measure for compliance.

- Justify all model input values for the reservoir and include supporting documentation for parameter verification.
  a. Justify the rock compressibility in addition to the fluid compressibility value.
  b. A range for the formation fluid density may need to be used if the supporting documentation does justify the use of a single value.
  c. Provide a copy of the portion of any text referenced for determining the density of the wastestream.
  d. Provide the depths for each injection interval and justify the temperature assigned for each depth.
  e. Include the reference temperature used to determine the viscosity values.
  f. Provide justification of the permeability and hydraulic conductivity values used in the demonstration. These values are usually based on the results of the falloff tests conducted in the injection wells. Include the equation used to convert permeability to hydraulic conductivity.

g. Provide the parameters and calculations used to determine the well index in SWIFT.

- Confirm a conservative initial reservoir pressure is used based on historical measured static pressures.

- Provide a table that contains all the available bottomhole pressure measurements.

- Grid effects may distort the waste plume modeled. The waste plume illustrated on the maps should be circular, if no boundaries are present. The circular plume outline at the end of operations should be used for purposes of the no migration demonstration and well record search.

- Include any sinks or sources within a radial distance of at least 10 miles of the facility. Address the impact, if any, of the sink or source. Underpressured reservoirs should identify the source of the pressure sink.

- List the solution method used for a SWIFT model. Both direct and L2SOR methods are accepted. Check for convergence/iteration errors when using the L2SOR method.