

**APPENDIX A**  
**COMPLIANCE WITH THE PASSIVE INSTITUTIONAL**  
**CONTROLS ASSURANCE REQUIREMENT**



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CONTROLS ASSURANCE REQUIREMENT**

In 40 CFR 194.43, the U.S. Environmental Protection Agency (EPA) requires that:

"Any compliance application shall include the period of time passive institutional controls are expected to endure and be understood." (61 FR 5243c/EPA, 1996b).

At the same time, the EPA has indicated in the Supplementary Information published with 40 CFR Part 194 their desire to reduce undue speculation as it relates to human actions in their specification of what they call the "future states assumption":

"The Agency recognizes the inherently conjectural nature of specifications on future states and wishes to minimize such speculation in compliance applications. The Agency has found no acceptable methodology that could make reliable predictions of the future state of society, science, languages or other characteristics of future mankind . . . . Hence, the final rule requires that performance assessments and compliance assessments shall include dynamic analyses of geologic, hydrogeologic and climatic processes and events that will evolve of the 10,000-year regulatory time frame. DOE shall assume that all other present day conditions will exist in their present state for the entire 10,000-year regulatory time frame." (61 FR 5227c-5228a/EPA, 1996c)

In addition, the EPA has stated in their Response to Comments Document For 40 CFR Part 194 that

"The design of passive institutional controls, both markers and records, must be designed so that they are as permanent as possible, taking into account, to the extent possible, potential collapses in institutional, societal, or linguistic structures. The final rule requires that DOE document the period of time passive controls are expected to endure and be understood [§194.44]. Compliance with the assurance requirement for passive controls will be evaluated based in part on the depth of the analysis and the scope of potential societal changes which are accounted for in the design of passive controls." (EPA, 1996b, p. 7-7)

Thus, the DOE must address the two objectives of longevity of marker structures and communications means, and the addressing potential variability in society. The combination of the requirement for analysis and the prohibition on undue speculation about the future state of society leads one to conclude that the analysis must be qualitative in nature and not require specific numbers that would involve assumptions about the future state of society and the undue speculation EPA attempted to eliminate.

**Analysis of Most Permanent Practicable Passive Institutional Controls**

A method for evaluating the requirement in §191.14 for "the most permanent markers, records, and other passive institutional controls practicable" is to examine analogues of human constructed buildings or sites as a key to what is most permanent and what was practicable to create. If markers incorporate lessons learned in long-term durability and communication effectiveness, and are consistent in design with the longest lasting structures, then markers and records are the most permanent designs practicable.



Reference to Chapters 5 and 8, and to the Markers Panel reports (Trauth et al., 1993) will indicate that the design elements reflect lessons learned. The DOE's commitment to the design elements as represented in the conceptual design show the PICs to be implemented are consistent with the longest lasting human structures.

### **Scope of Potential Societal Changes Represented in the Passive Institutional Controls Design**

A method for evaluating the design of the PICs in response to consideration by the EPA of the "depth of the analysis and the scope of potential societal changes which are accounted for in the design of passive controls" is to examine the societal basis for the communications recommendations from the Markers Panel.

The Markers Panel deliberations did not assume that one could validate predictions about the future state of languages, level of technological sophistication, or governmental control. Their response to the uncertainty of future societies was to assume that communication means had to be available for individuals from any culture, speaking any language, or with any level of technological sophistication.

The overall recommendations for markers (which is applicable to archives and records) was to utilize a systems approach whereby different components are available to communicate with different individuals and to provide different pieces of information, with enough interconnections to reinforce the information and help fill in any gaps. Within the system, messages are to be provided in different levels of complexity (five different levels from the most basic information of a manmade structure to detailed scientific information on the waste inventory) to address possible variation in the future level of technological sophistication. The different media used for the communications (e.g., berms, stone monuments, buried ceramic disks, and paper) address durability and access issues. Information was to be communicated by linguistic (seven current languages of wide distribution and usage) and non-linguistic (e.g., pictographs, star charts, and the periodic table of the elements) means to address uncertainty about languages to be spoken in the future. While languages change over time, certain basic words are more stable, so the linguistic messages need to be created with simple sentences (no idioms or complex sentences) and with the most basic vocabulary available. Even the uncertainties of human actions with respect to vandalism or the desire to place things of value in museums, the marker design fundamentals suggest large constructions that are difficult to move or destroy. Even the uncertainty about future continuity of property rights is addressed by the requirement for truthful messages about the health implications of possible intrusions.

Technical consultations on archives and records suggest that for long-term maintenance of information in an archives or records system, the physical format should be rather small in size (communicate the salient information quickly and as a guard against curators destroying bulky information), have distinctive binding (reduce the probability of being misfiled and not rediscovered), be produced on durable archival paper, with the documents having little resale value (no original signatures in the records and multiple copies in different locations), and with distinct cover language convincing a curator of the importance of the information and the need to preserve it for long periods of time.

