Technical Comments of
Colorado Department of Natural Resources,
Colorado Department of Public Health and Environment, and
Colorado Department of Local Affairs
on Bureau of Land Management's
Draft Oil Shale and Tar Sands Resource Management Plan Amendments to Address Land Use Allocations in Colorado, Utah, and Wyoming and Programmatic Environmental Impact Statement (December 2007)

The following technical comments from divisions and staff of the Colorado Department of Natural Resources (CDNR), Colorado Department of Public Health and Environment (CDPHE), and Colorado Department of Local Affairs (DOLA) highlight major technical deficiencies in the Bureau of Land Management's (BLM) Draft Oil Shale and Tar Sands Resource Management Plan Amendments to Address Land Use Allocations in Colorado, Utah, and Wyoming and Programmatic Environmental Impact Statement (Draft PEIS).

STATE OF COLORADO

OFFICE OF THE EXECUTIVE DIRECTOR
Department of Natural Resources
1313 Sherman Street, Room 718
Denver, Colorado 80203
Phone: (303) 866-3311
TDD: (303) 866-3543
Fax: (303) 866-2115

COLORADO
DEPARTMENT OF NATURAL RESOURCES

Bill Ritter, Jr.
Governor
Harris D. Sherman
Executive Director

1) Division of Reclamation, Mining and Safety

There is very little real data with which to determine what the environmental effects of *in-situ* processing of oil shale will be since there has not yet been a commercial sized *in-situ* project to date. This information may be obtained in the next 5-10 years upon development and close monitoring through the various permitting processes of the RD&D projects. There is no stated mechanism to revisit the PEIS process in order to re-evaluate regional effects of commercial development if there is critical information gleaned from the RD&D operations. Instead, the PEIS states that such changes will be dealt with on a case by case basis via NEPA review of specific projects, a manner which is similar to the way that coal mining environmental impacts are evaluated. This approach will preclude consideration of regional impacts from the widespread use of new technologies for oil shale development.

In Section 4.1.6, Table 4.1.6-1, the effects and needs of a 2,400 MW generating station are listed. Conspicuously missing are the effects of the coal mine that would be needed to feed the generating station. For example, the Craig Generating Station (1,284 MW) is fed primarily by the Trapper Mine which has a permitted acreage of 10,000 acres and a disturbed acreage of approximately 3,200 acres over its 25 year life. It is noted that the commercial options B, C and D would require the equivalent of almost 10 Craig-sized generating stations over the life of the commercial oil shale operations (12 GW of power required – although estimates of the electrical need for *in-situ* operations is not well documented since no commercial-scale operations have been started) for a total of not only the acreages listed in the table but also some 32,000 additional acres disturbed via coal mining with its own environmental and socio-economic effects and additional water requirements for coal processing, dust suppression, and other mine and workforce related activities. Additionally, if these mines are located near oil shale development areas, they will have their own effects on air quality which has also not been factored in. Moreover, there is no discussion on the effects of uranium fueled power plants and their environmental effects and operating needs if this type of power plant is used.

Chapter 4, Table 4.5-1 lists the water resources available and expected to be available by 2040 (presumably when commercial oil shale operations would be fully functional). It is notable that the water requirements (on the lower estimate of the needs for commercial oil shale operations) will exceed those available in 2040 from surface sources. It is stated that the requirements can be made up from the ground water resources but the estimate of that resource varies by an order of magnitude (2.5 to 25 M ac-ft). The possible diminution of surface and ground water quantity and quality from the direct effects of oil shale development (e.g. mixing of aquifers, drainage of the upper aquifer into the lower aquifer, quality degradation from the release or organics, salts and metals via pyrolysis) is not accounted for in this table but should be estimated and included.

Related to water balance for commercial operations, it is known that ground water in the Piceance Basin travels rather slowly and, therefore, is recharged rather slowly. It is also known and stated that both Piceance and Yellow Creeks (the main drainages out of the Piceance Basin) are both ground water fed creeks. It therefore seems reasonable to assume that withdrawal of the ground water for use in oil shale operations will most probably have a flow lessening effect on one or both of these creeks through the disruption of spring or seep flows that feed them. It is unclear whether this diminution in surface flow has been taken into account in the water balance estimates except for the statement that the freeze wall will mitigate these effects. The freeze wall will not be in existence after oil withdrawal and subsequent rinsing of the retorted area is complete and that area will have to recharge by some mechanism. This doesn't seem to be accounted for.

The Draft PEIS omits discussion of several important issues. There is no mention or discussion of dissolved metals (boron, molybdenum, arsenic, and possibly others) and their effects on ground water from the *in-situ* pyrolysis of oil shale. There is no discussion of noise levels from resource development. There is no discussion on wilderness characteristic areas in Colorado.

Legal Requirements

The Draft PEIS defers site specific NEPA analysis of potential impacts to 360,000 acres of public land in Colorado to future evaluations. There has to date never been commercially viable production of oil from Colorado oil shale resources, even though Colorado possesses the richest and most extensive global reserves. It is stated in the Executive Summary to the Draft PEIS that "As part of this PEIS, potential impacts of currently known technologies also have been described at the programmatic level to aid decision makers and readers in understanding the potential effects of future development." While this may be a currently legitimate course of action, it must be recognized that research and technology development for oil shale will require further analysis at the programmatic level, as opposed the project specific level, as the draft PEIS seems to presume.

Chapter 2, Section 2.2.1 describes "Existing Relevant Statutory Requirements" and breaks out potentially applicable laws into general categories. Appendix D, Table D-3 places the Colorado Mined Land Reclamation Act (MLRA) into the "Energy Project Siting" category. The Energy Project Siting category is described in Chapter 2 as being relevant to "construction of facilities such as pipelines, gathering lines, transmission lines, or generation facilities."

Essentially none of these activities are subject to regulation under the MLRA. The MLRA should be removed from the Energy Project Siting category in Appendix D, and should be included in the Appendix D tables under the following categories, over which the MLRA does exercise authority:

TABLE D-4 Floodplains and Wetlands
TABLE D-5 Groundwater, Drinking Water, and Water Rights
TABLE D-6 Hazardous Materials
TABLE D-7 Hazardous Waste and Polychlorinated Biphenyls
TABLE D-10 Pesticides and Noxious Weeds
TABLE D-13 Water Bodies and Wastewater
TABLE D-14 Wildlife and Plants

It is stated in the Draft PEIS that Chapter 2, Section 2.2.1 "discusses, in very general terms, the major laws, Executive Orders (E.O.s), and policies that may provide environmental protection and compliance requirements for oil shale or tar sands development projects on public lands in Colorado, Utah, and Wyoming." However, there is little or no discussion, and no identified category of State mined land reclamation laws, even though each of the three potentially affected States have such laws. Mined land reclamation should be included in the listing of "major laws" for each of the three states, and the Colorado Mined Land Reclamation Act (34-32-101, *et. seq.*) should be specifically cited.

Comments on Specific Passages of Draft PEIS

On page 1-3, the Draft PEIS states, "The BLM has identified the most geologically prospective areas for oil shale development on the basis of the grade and thickness of the deposits." Are the deposits sufficiently characterized that the agency can definitively state where the most geologically prospective areas are? Is the definition of a geologically prospective area based on detailed exploratory data, such as delineation drilling or geophysical surveys, or have extrapolations and generalizations been made from existing data? If there are deficiencies in the characterization of the geologically prospective areas, then important decisions regarding lease locations, or locations of facilities for exploration, extraction, infrastructure, and support are in danger of being made without adequate background information, leading subsequently to the risk of poorly conceived resource utilization.

On Table 2.2.3-1 on page 2-8 of the Draft PEIS, the importance of the ACEC areas in this table are given considerable weight in the overall context of environmental impacts of oil shale development, yet very little specifics are provided for the ACEC areas.

On page 3-73, the Draft PEIS states that "Oil shale basins and STSAs are situated in much smaller areas," yet it is unclear from the context of the passage to what the oil shale basins and STSAs are being compared.

On page 3-77, the passage starting with "Topper et al. (2003) list common sources of..." is not particularly relevant to the subject of oil shale extraction. The passage refers to contaminants derived from hardrock and metal mines. The mining methods employed, and the geologic environment existing at oil shale deposits will be vastly different than those existing at

hardrock or metal mining sites. The inclusion of this passage implies that the two types of mining situations could give rise to common environmental contaminants, which is an inaccurate and misleading implication.

On page 4-3, the passage referring to the quantity of water used by oil shale operations, is one of many passages referring to the quantity of water that will be "used" by oil shale development, without sufficient explanation as to whether the water is actually consumed or simply diverted, used, and cycled back to the watershed as return flow. Proper emphasis on the amount of total water consumption versus simple usage will help provide a more realistic picture of the actual water demands of the oil shale industry.

On page 4-6, the Draft PEIS states, "Regardless of the retort, spent shale volume would increase by 30%," yet it is unclear from the context of the passage over what the spent shale volume would increase by 30%.

On page 4-12, the Draft PEIS states, "Project economics would likely select for sites closest to existing infrastructure." This passage is inconsistent with other passages in the document stating that companies will construct their own plants to provide power for operations. It seems a foregone conclusion that, due to the economic potential of oil shale development, project economics will drive the locations of power supply and infrastructure, not the other way around.

On page 4-25, the Draft PEIS states, "In Colorado or Utah, 150 to 600 acres would be disturbed at any one time, while in Wyoming, the figure would be 1,000 to 2,000 acres." This is one of several passages in the document referencing the size of impacts or disturbances. However, it is unclear here and in other passages whether these numbers represent the total disturbance at any particular time, or per-site numbers within larger projects containing multiple sites, or something else.

On page 4-33, in the paragraph that starts with "For in situ processes, the impact of in situ processing..." it is important to note that the permeabilities of the aquifers and aquitards may be affected not only by rock fracturing, but also by the removal of hydrocarbons.

Finally on page 4-35, the Draft PEIS states, "In addition, the filled mine could become a vertical conduit for groundwater, resulting in a discharge area for the shallow aquifer and a recharge area for the deeper aquifer." An additional consideration is that of an upward hydraulic gradient. In the case of an upward hydraulic gradient, the opposite could be true, i.e., the filled mine could become a discharge area for the deeper aquifers and a recharge area for the shallow aquifer.

2) Division of Wildlife

The Colorado Division of Wildlife (CDOW) appreciates the opportunity to comment on the December 2007 draft of the Bureau of Land Management's (BLM) Oil Shale and Tar Sands Resource Management Plan Amendments to Address Land Use Allocations in Colorado, Utah, and Wyoming Programmatic Environmental Impact Statement (OSTS PEIS). Proposed oil shale

development in Colorado would occur in the Piceance Basin, which includes portions of the BLM's White River, Glenwood Springs and Grand Junction Field Offices. As each of these field offices are currently undergoing or are about to begin Resource Management Plan (RMP) revisions, it will be important to incorporate new information from these revised RMPs in the OSTS PEIS, especially those areas protected by stipulations that would affect lands available for lease under Alternative C. It will be equally important for BLM to incorporate the impacts and other implications of oil shale development into these RMPs and to evaluate the cumulative impacts of oil shale leasing and development in each of the revised RMPs as well. It is as imperative now as ever that potential oil shale development impacts are evaluated and that an oil shale management strategy is developed to ensure that BLM's multiple use and sustained yield mandates are retained. CDOW expects the BLM to conduct meaningful analysis that is both specific and measurable to evaluate cumulative impacts resulting from mineral extractive industries.

The Piceance Basin is home to the largest migratory mule deer herd in North America, a large migratory elk population, one of only six greater sage-grouse populations in Colorado, conservation and core conservation populations of Colorado River cutthroat trout, and a host of other wildlife species. These resources are of statewide economic, ecological, recreational, and aesthetic importance. Impacts to these wildlife resources from oil shale development will have local, regional, statewide, and even national implications to sportsmen and other wildlife enthusiasts. Areas that would be opened for commercial leasing under Alternative B include:

- 880 acres of important aquatic habitat
- 7 acres of bald eagle active nests (buffered at ½ mile--no surface occupancy)
- 190,478 acres of elk production area
- 6,506 acres of greater sage-grouse leks (buffered at 0.6 mile--no surface occupancy)
- 125,563 acres of greater sage-grouse production area (mapped as a 4 mile radius from leks to protect nesting and brood rearing habitat)
- 78,093 acres of mule deer critical winter range
- 31,479 acres of mule deer migration corridor(s)

This list identifies the minimum set of specific species and habitats that CDOW believes require ***detailed and comprehensive*** analysis prior to any future commercial oil shale leasing in the Piceance Basin. The sum of these areas is shown on the attached map. When and if commercial leasing occurs, CDOW expects to consult with the BLM regarding the suitability of any lands proposed for leasing, the extraction mechanisms proposed, and mitigation techniques required to offset any impacts to wildlife and wildlife habitat that cannot be avoided. For CDOW to most effectively offset these impacts, it will be important for CDOW to be engaged in discussions with BLM early and often. This consultation should occur prior to the release of a NEPA scoping notice whenever possible.

Leasing Alternatives

Five Research, Development and Demonstration tracts have been recently permitted in the Piceance Basin, primarily for the purpose of evaluating oil shale extraction techniques and assessing the environmental impacts of oil shale development. Exploration of geologic

conditions and development plans for these RD&D sites are only in preliminary stages. Therefore, the ability to successfully predict environmental impacts is yet to be determined. While we understand that some amount of RD&D must occur to determine if oil shale can be produced without impacting the environment, CDOW supports BLM's decision not to allow any additional RD&D projects and their associated preference lease right acreages to be permitted. The five existing RD&D tracts include preference rights for commercial leasing of more than 25,000 acres within the Piceance Basin.

CDOW supports a "go slow" approach to oil shale development while it remains in this "experimental" phase and prefers that BLM adopt Alternative A—the No Action Alternative—to allow these RD&D projects sufficient time to provide necessary information to support future commercial leasing. Alternative A includes preference rights allowing more than 25,000 acres of commercial oil shale leasing within the Piceance Basin.

Alternatives B and C propose significant additional lease areas in Colorado. CDOW considers the lease availability proposed in these alternatives, especially the identification of the entire Piceance Basin in Alternative B, to be an irrevocable commitment of the mineral resource that, when developed, will have significant, adverse, and long term impacts on the wildlife resource and that will complicate BLM's statutory mandate to manage federal lands in compliance with the "multiple use" and "sustained yield" concepts required by the Federal Land Policy and Management Act of 1976.

Section 4.8.1.3 of the OSTS PEIS describes a number of impact mechanisms, from direct mortality to habitat loss and fragmentation, through which wildlife could be impacted by oil shale development proceeding from decisions made in the OSTS PEIS. CDOW believes that each of these mechanisms will indeed occur as a direct or indirect result of oil shale development in the Piceance Basin and that the resulting impacts on wildlife will be severe and potentially long lasting. Table 4.8.1-1 states that the effect on wildlife from one or more of these impact mechanisms will be moderate to large for each class of wildlife evaluated. Moderate effects are defined as resulting in measurable loss of wildlife carrying capacity of up to 50% within the affected area. Large effects would result in more than 50% loss of affected wildlife. CDOW believes that the loss of 50% or more of the ability of the landscape to support wildlife from any single activity is neither moderate nor acceptable. In addition, the Piceance Basin does not currently and may not ever have the capacity to meet oil shale's requirements for infrastructure, power, or water. CDOW anticipates this could be a substantially limiting factor to development and should be reflected in the decision about the appropriate amount of the Piceance Basin to make available for leasing.

Alternative B, BLM's Preferred Alternative, proposes to make the entire Piceance Basin available for leasing. Adoption of this alternative is unsupportable given the complete lack of understanding affirmed in the OSTS PEIS about the extraction processes that may be feasible and the impacts that development will create for wildlife and wildlife habitat. While the pre- and post-lease NEPA requirements established by the OSTS PEIS will provide substantial additional protection for wildlife, designating the entire Piceance Basin as open for leasing conveys some expectation to industry, governmental agencies and others that substantial commercial leasing will occur relatively quickly. This expectation cannot be met, given the current state of

knowledge, and still meet the "environmentally sound" standard under which commercial oil shale leasing is to occur.

Finally, CDOW believes that the three alternatives proposed in the draft OSTS PEIS, the no-action alternative and two commercial leasing alternatives, do not constitute a complete range of actions for analysis. Analysis of additional alternatives, including a phased approach to lease availability, would provide a more thorough understanding of the implications of lease availability and the development impacts that will follow.

Additional Recommendations for Analysis Prior to Commercial Leasing

1. Neither the OSTS PEIS nor the White River RMP adequately addresses either the commercial development potential or the likely impacts that will result from oil shale development on the tens of thousands of acres of oil shale that were patented during the previous oil shale boom and that are now privately owned. Additionally, neither document combines an analysis of the landscape effects of additional BLM oil shale leasing and development, private oil shale development, existing oil and gas development levels, or the proposed increase in oil and gas activity within the White River Field Office. This separation of oil shale and oil and gas development impacts results in a piecemeal approach to NEPA that prevents a full presentation and analysis of the full effect of these federal actions.

2. The OSTS PEIS needs to provide a more detailed analysis as to how the proposed alternatives will impact wildlife populations and habitat. For example, the Colorado Division of Wildlife believes that oil shale RD&D activities within the central portion of the Piceance Basin will increase oil and gas activity on the periphery. If oil shale is considered the priority mineral in the area of the RD&D's, and coincident oil and gas development occurs, ecosystem-level effects will significantly impact many different wildlife species. For instance, the Parachute/Piceance/Roan (PPR) greater sage-grouse population utilizes higher elevation areas in the southern portion of the Piceance Basin and in the Magnolia area. The PPR population of greater sage-grouse is geographically isolated. The unique characteristics of greater sage-grouse habitat in the PPR and the high range fidelity exhibited by the species will make adjustment to the increased activity challenging. Consequently, availability of expanded leases for commercial oil shale development, as proposed in the OSTS PEIS, in conjunction with expanded oil and gas development will likely lead to extirpation of the PPR sage-grouse population. The PPR population is one of only six greater sage-grouse populations in Colorado. Extirpation of this population will make the avoidance of future Endangered Species Act (ESA) listing actions substantially more difficult. Any ESA listing will directly affect industry as well as any other users of public lands within the oil shale development areas.

3. The alternatives detailed within the OSTS PEIS need to more fully assess the off-site impacts that might result from oil shale development, including issues such as:

-damage that private landowners will suffer from big game species as a result of added pressure of oil shale development on lands already impacted by natural gas development.

-effects of big game being forced to occupy alternate winter range habitat, resulting in reduced survival of big game herds and increased competition with livestock on private lands.

-effects of oil shale development on water quality and quantity in federally designated critical habitat for threatened and endangered aquatic species in the White River below the confluence with Piceance Creek.

4. An assessment of the water quality impacts to all wildlife species that utilize the Piceance Basin should be provided for each alternative presented in the OSTS PEIS. The assessment should not only factor in the effects of oil shale development, but also consider existing and anticipated oil and gas development within the Piceance Basin, coal extraction areas and new power plants needed to supply power to the oil shale extraction operations, and pipelines and other infrastructure needed to support the oil shale and oil and gas operations. The assessment should include an evaluation of the direct or indirect effects to wildlife populations from:
    a. increased sedimentation;
    b. increased stormwater runoff and salinity;
    c. rising water temperatures and lower stream water levels due to oil shale de-watering activities;
    d. increased contaminant spills to natural waterways; and
    e. increased concentrations of minerals, metals and other by-products liberated during the oil shale extraction and final reclamation processes and the level to which they cause detrimental water quality impacts to aquatic life and cold water fish species.

5. The assessment of changes to water quantity at a watershed level from oil shale development for each alternative should address the anticipated resulting impacts to wildlife populations due to:
    a. elimination of springs, seeps, or other naturally occurring surface water expressions; and
    b. potential reduction and/or elimination of riparian habitat.

6. The discussion in the cumulative impacts section within the present draft OSTS PEIS lacks sufficient detail and analysis to make any determination of the cumulative impacts to wildlife resources resulting from oil shale development and the interplay between oil shale, natural gas, and other types of development occurring in the Piceance Basin. The section of the OSTS PEIS which analyzes cumulative impacts should be substantially expanded to include temporal and spatial boundaries outside the immediate defined project area in order to effectively address impacts to migratory wildlife.

7. The analysis of cumulative impacts should include an assessment of the reasonable foreseeable development of commercial oil shale development in terms of the timing and distribution and size of oil shale production that will occur, including the maximum number of leases that could be in development at any one time and the maximum "footprint" of surface disturbance for any one operation. The assessment of cumulative impacts to wildlife should include an assessment of impacts to all wildlife species occurring within the most geologically prospective area of the Piceance Basin and also on lands within the Piceance Basin that will be subject to surface disturbance via other forms of mineral development and land uses. It should also be expanded to include impacts occurring on other lands outside the boundaries of the prospective area of oil shale development that contain populations of wildlife that utilize all or portions of the prospective area of oil shale development periodically throughout the year. The cumulative impacts analysis section of the OSTS PEIS should include:
    a. an assessment of baseline wildlife data including an evaluation of the status or health of existing populations and how the various populations have been affected previously be other forms of disturbance (oil & gas development, roads, etc.);
    b. detail regarding the thresholds that will cause significant damage to various species;
    c. an inventory of all types of disturbance including oil shale development;
    d. an overlay of crucial habitats including existing migration corridors over the areas slated for commercial oil shale development;
    e. an assessment of the magnitude and extent of crucial habitat areas that will be eliminated as a result of oil shale development;
    f. an assessment of the magnitude and extent of crucial habitat areas that will be adversely affected; and
    g. the duration of time that wildlife populations will be affected.

Additional Issues That Should Be Addressed in the OSTS PEIS or in Subsequent NEPA Analyses

1. Range-wide and interstate conservation agreements and strategies exist for several species present within the Piceance Basin, including Colorado River cutthroat trout, flannelmouth sucker, bluehead sucker, roundtail chub, and greater sage-grouse. These agreements, and conservation actions recommended within them, should be incorporated and referenced in the OSTS PEIS and subsequent NEPA documents.

2. Specific detail should be presented on how the landscape will be managed for multiple uses as well as diverse assemblages of wildlife species as required by NEPA. The OSTS PEIS should contain an evaluation of how industrialization and the accompanying urbanization through oil shale development will reduce the carrying capacity of the landscape. For example, where existing agricultural water rights are acquired to support oil shale development, existing irrigation-based agricultural uses of the land from which the water is acquired will be modified to support lower value dry land use of the lands and may result in a complete loss of agricultural benefits. The final OSTS PEIS and subsequent NEPA documents need to detail how these impacts to the carrying capacity of the landscape at a regional scale will directly and indirectly affect the wildlife

populations of the region. The final OSTS PEIS needs to include detail how the "multiple uses" of the landscape will be maintained at a regional scale in light of oil shale lease availability and subsequent development.

3. The OSTS PEIS contains very limited information and analysis of the feasibility of reclamation of commercial scale oil shale operations. Oil shale development coincident with oil and gas development will likely result in long-term surface disturbance and severely fragment wildlife habitat for extended periods. Additional information should be provided as to the types of habitat and vegetation that will likely not be re-established during final reclamation, those habitat types and vegetation that will be difficult to re-establish, and the length of time needed to successfully re-establish the habitats and vegetation that sustain resident and migratory populations of wildlife and the quality of these reclaimed areas for wildlife following final reclamation. The OSTS PEIS analyses should also include an assessment of the feasibility of reclaiming affected surface and groundwater resources that are used by wildlife within the Piceance Basin.

4. The OSTS PEIS should include an assessment of the existence, location, and extent of noxious weed species and/or infestations within the Piceance Basin and the likelihood that they will become established more widely in the Basin as a result of widespread oil shale development.

5. The OSTS PEIS should include a comprehensive and detailed analysis of the economic impact that changes in wildlife populations resulting from commercial oil shale development, along with oil and gas development, coal extraction and power plant generation, and supporting infrastructure, will have on local communities. Local communities in western Colorado rely heavily on hunting revenue. The short-term influx of energy development may offset the immediate economic impact that will result from loss of hunting revenues. However, as Colorado's history has shown, energy booms do not last forever, whereas the regional wildlife resource is renewable and provides a stable source of revenue to communities like Craig, Meeker, and Rifle.

Research Cooperation Recommendation

Because the Piceance Basin holds such valuable energy reserves and also supports some of the richest wildlife habitat and most abundant wildlife resources in North America, CDOW has developed research proposals to evaluate methods to improve conservation of sage-grouse, mule deer, native plant communities, and the aquatic environments in the Piceance Basin as energy development proceeds. Determining how to extract energy reserves without negatively impacting wildlife populations is an essential test of the ability to promote responsible development. This information is a prerequisite to commercial oil shale development.

The key objectives of the research are to:

- Provide scientific, peer-reviewed, and experimentally-based research to test the effectiveness of mitigation strategies on mule deer and sage-grouse population performance and behavior in Colorado habitats.
- Avoid reliance on studies done in other states.

- Provide opportunities for evaluating creative mitigation solutions versus historically implemented timing regulations or fixed buffer zones.
- Provide a basis for developing consistent guidelines on a landscape level rather than an individual site basis.
- Reduce the need for individual energy companies to conduct independent studies on sage-grouse, mule deer, and appropriate habitat restoration.
- Evaluate potential solutions to allow for responsible energy development and still maintain Colorado's productive wildlife, natural resource values, and heritage.
- Obtain and evaluate baseline aquatic species and water quality information.

Many measures proposed to minimize and mitigate oil shale and natural gas development impacts on wildlife have not been tested. CDOW seeks to fill that knowledge gap. This project represents a comprehensive and coordinated effort to improve understanding of the effectiveness of energy development mitigation practices. CDOW is committing personnel and operational resources to the success of this project over the next decade. This project has been planned within BLM's White River Field Office. Support of this project by industry and land managers is very important. It may prove to be of critical importance in helping wildlife and land managers develop mechanisms to balance wildlife and their habitat requirements with energy development.

Summary

CDOW appreciates the opportunity to comment on this draft resource allocation OSTS PEIS pertaining to oil shale development in Colorado. The Piceance Basin and surrounding areas provide a significant wildlife resource and natural heritage to the people of Colorado and visitors to the state. CDOW understands the importance of the Piceance Basin's mineral resource. However, oil shale development is currently experimental, with poor understanding of the economic and technical aspects of development as well as the environmental impacts of development. For those reasons, CDOW advocates the "go slow" approach to oil shale development embodied in Alternative A.

CDOW is encouraged by the leasing approach taken in the OSTS PEIS, where detailed site-specific NEPA analysis will be required before parcels can be offered for commercial oil shale lease and before a site-specific plan of development is approved. The ability to evaluate impacts and to apply lease terms, stipulations, and mitigations once the development is fully understood provides substantially improved protection for wildlife and other resources on public lands eventually leased for commercial oil shale development. CDOW will participate in future BLM actions pertaining to oil shale leasing and development, including the Leasing NEPA stage and Plan of Operations stage, in order to ensure that adequate planning occurs and that measures for avoidance, minimization, and mitigation of impacts to wildlife are incorporated in future oil shale decisions.

CDOW expects that oil shale leasing potential, commercial development, and cumulative impacts will be evaluated in great detail in the White River, Glenwood Springs and Grand Junction Resource Management Plan revisions that are currently in progress or that will begin soon as well as in this OSTS PEIS. Consideration of potential oil shale impacts along with those resulting from oil and gas development will be important for a complete analysis of impacts on

wildlife and wildlife habitats and the possibility of maintaining desired future conditions. CDOW also strongly encourages BLM to engage in research, such as the Piceance Basin research project described earlier in this letter, to evaluate wildlife impacts and effective habitat mitigation.

We encourage the BLM to strike a balance between the mineral and wildlife resources in the Piceance Basin by integrating these comments into a final Programmatic Environmental Impact Statement that contains adequate detail to assess the potential effects and impacts that the land allocation decisions being made will have on the other natural resources in the Piceance Basin and surrounding areas. Thank you for your consideration of these comments. We look forward to seeing them incorporated in the final OSTS PEIS.

3) Colorado Geological Survey

The Colorado Geological Survey (CGS) conducted a review of the BLM Draft Oil Shale and Tar Sands Resources Leasing Programmatic Environmental Impact Statement (PEIS) for content relevant to geologic resources including water. This review was conducted in order to determine whether the document is adequate to go forward with a decision to have a commercial leasing program for oil shale.

While the total content of the document is immense, it misses the mark in adequately addressing potential impacts to geologic resources by development of oil shale in Colorado and fails to clearly identify constraints under which leasing, exploration, and development would be allowed, particularly with respect to water and potentially damaging seismicity.

The document purports that there will be no impact from simply changing management plans. However, dealing with oil shale leasing in individual management plans, rather than as a programmatic EIS that evaluates the cumulative effects of all resource development within the Piceance Basin, including oil shale; is a violation of the spirit and intent of Congress in directing that an EIS be performed for the programmatic leasing of commercial oil shale. Therefore, because a programmatic environmental impact statement was not performed for commercial oil shale leasing, the only acceptable alternative is Alternative A.

Comments on Water Resources

Whereas the draft PEIS does use current estimates for water availability to Colorado from the Colorado River Basin under the Colorado River Compact, BLM really does not know how much water is available to apply to meet any new demands, regardless of the type of demand. A study, funded through SB07-122, is currently underway to evaluate water availability in the Colorado River Basin. The PEIS is inadequate without reliable data on Colorado River Basin water availability.

The draft PEIS only addresses groundwater as it is tributary to the rivers. The document does not address “non-tributary” groundwater in the region, particularly as it relates to cumulative impacts from in situ processes within the groundwater aquifers. Non-tributary groundwater is important because its availability and use could affect the entire water demand

equation in this region. The PEIS does not adequately address this aspect, and therefore, is inadequate in assessing cumulative impacts to water resources.

There is too much uncertainty in what technologies might be used, and therefore, what the water demands associated with those technologies will be to make reasonable estimates of water demands for oil shale development under the three scenarios.

Both the Colorado River Basin and Yampa/White/Green Basin roundtables have embarked on needs assessments addressing M&I, agricultural, and non-consumptive needs within their watershed areas. Results from these needs assessments would also be of great value to evaluating potential cumulative impacts under different oil shale development scenarios. In addition, the Energy Development Water Needs Study, (funded through the statewide Water Supply Reserve Account) is underway and will address anticipated water needs associated with all energy development in the region. Without these assessments, the PEIS is inadequate to address cumulative impacts on water resources.

Comment on Soil and Geologic Resources

The draft PEIS falls short in integrating cumulative impacts that might arise from oil shale development under the different scenarios. For example, additional power generation would be necessary to meet the demand at the thermo-electric in-situ facilities; however the draft PEIS does not appear to account for the increase in coal mining in the basin that would be required by the additional power plants to produce this energy.

Comments on Hazardous Materials and Waste Management

Impacts of hazardous materials and waste management due to oil shale production cannot be differentiated between alternatives because significant data related to differing technologies, in particular in-situ oil shale processes, is yet to be generated. Without this type of data, the cumulative impacts for specific constituents of concern related to oil shale development in Colorado, such as mercury and arsenic among others, cannot be estimated. Therefore the PEIS is inadequate in allowing discrimination among the alternatives regarding hazardous materials and waste management. Alternative A is the only option in the absence of this data.

Note: Constituent concentration units are not given in Table A-6.

Discussion of 3.2.1.4- Piceance seismology

The draft PEIS is inadequate in terms of evaluating the earthquake risk that could have serious consequences for development in the Piceance Basin resulting from the issuance of rights to extract oil from the Green River Formation oil shale. The PEIS contains only one dismissive sentence on the seismic potential of the Piceance Basin. The seismicity section is inadequate to safely allow leasing from several standpoints:

1. It does not address potential, induced seismicity from fluid injection near fault zones.

2. It does not address the seismogenic potential of Neogene faults in the area.

3. It does not address the probabilistic ground accelerations higher than 5% g in the USGS National Earthquake Hazard Maps, nor

4. It does not address deterministic ground accelerations of >50% g from a strong earthquake on the Dudley Graben fault.

a. Neogene faulting

Forty five years ago, there were no faults in Colorado that had been identified as being active during the Quaternary Period. Today, the catalog contains more than 90. And yet, many parts of Colorado have not been studied in detail for the extent and hazard of young faults, e.g. northwestern Colorado being one of the least studied areas of the state.

Ten, northwest-trending normal faults are shown on the Geologic Map of Colorado cutting Tertiary sediments of the Piceance Basin in the area of most prospective oil shale deposits. Several have prominent topographic expression that suggests a very young history with the potential of generating strong earthquakes. Their orientation and character show that they are Neogene in age and therefore should have been evaluated for potential earthquake hazards before any decisions to lease be made.

The Cimarron fault located at the southern end of the Piceance Basin, is a normal fault of identical attitude and has been shown to have Quaternary movement. The Cimarron fault has been assigned a Maximum Credible Earthquake of M 6.5.

The Dudley Bluffs graben is in the heart of oil shale country. This fault is so youthful in appearance that a major geotechnical firm attributed it as the source of the Magnitude 6.6 earthquake that struck Colorado in 1882. Although that has been largely discredited, the recurrence interval for large earthquakes and the date of the most recent event on this fault has not been determined. If the fault is indeed active and if the mapped length of the fault ruptured in a single event, then the fault would generate a magnitude 6.7 event, with ground accelerations exceeding 50% g.

b. Induced Seismicity

Colorado is the world's premier location for induced earthquakes from liquid injection. The best known events were located at the Rocky Mountain Arsenal and were associated with fluid injection that triggered hundreds of earthquakes in the 1960s, twelve of which caused damage.

Two additional localities with extensive records of induced seismicity are in western Colorado in the Paradox Valley and on the north edge of the Piceance Basin at Rangely field. The potential for induced seismicity from injection of waste fluids including CO2 sequestration must be thoroughly investigated before any leasing decisions are made.

c. Probabilistic and Deterministic Ground Accelerations

The highest area of probabilistic ground accelerations in Colorado as shown on the 2002 USGS Earthquake Hazard Maps lies in the southern Piceance Basin. The PEIS correctly cites the 5% g accelerations from the 10% probability maps, but ignores the 20-30% g accelerations in the 2% probability map, and further ignores a >50% g from a deterministic event.

The potential for damaging earthquakes in the Oil Shale province of Colorado needs much more study before any leasing decisions are made.

4) Division of Water Resources

The Draft PEIS does a good job of identifying potential physical impacts attributed to ground surface disturbance, water uses, wastewater disposal, alteration of hydrologic flow systems in surface water and groundwater, and the interactions between groundwater and surface water. However as detailed below, while the document includes what appears to be a comprehensive list of potential injury to water resources, it contains little discussion regarding the magnitude or mitigation of these impacts.

Because of the large openings created in underground mining operations, the hydrologic properties of the geologic material in the mine are permanently altered. Abandoned mine shafts, as well as partially refilled (by spent shale) mines, will enhance vertical and lateral groundwater movement in the mined area after dewatering ceases and groundwater levels are reestablished.

Groundwater may be extracted from aquifers for use as a resource or for dewatering to control groundwater inflow into a mine. Mine dewatering would be necessary where saturated conditions, including perched aquifers, are present. Dewatering would lower the potentiometric surfaces and/or water table of the aquifers that are intercepted by the surface mine. Because some deeper groundwater is the source for springs and seeps in the region, the lowering of the potentiometric surface would have the same effect as withdrawals from shallow, surficial aquifers, reducing or eliminating flow of the connected springs and seeps. Existing groundwater supply wells within the cones of depression also would have reduced yields or could be dewatered.

Diversion or modification of some natural drainage, and the creation of new drainage near access roads and construction sites. In the case of natural drainage channels that are rerouted, modified, or diverted, the surface runoff would be altered accordingly, affecting downstream flow. Ground surface disturbance would degrade surface water quality and enhance streamflow in areas downstream of development sites, access roads, gravel pits, employer-provided housing, power plants, refinery plants, pump stations, substations, various support facilities, and along the ROWs of pipelines and electrical transmission lines.

In the case of the Shell's in situ conversion process (ICP) sites, fractures could also form in rocks across the entire freeze column. Increased porosity (and permeability) would also occur after kerogen, nahcolite, and other soluble minerals were removed from the rock. Such alteration of permeability would promote vertical as well as horizontal flow and transport of groundwater. The thermal fractures and fractures created by steam, water, or CO2 in the source rock could potentially enhance the groundwater flow within aquifers and potentially increase the vertical

hydraulic conductivities of aquitards after the retorted areas are refilled by groundwater. In other words, the flow system in the subsurface would be modified, as would be the groundwater discharge to the surface water bodies.

Dewatering operations prior to heating of the oil shale could lower the local groundwater potentiometric surface below overburden by as much as 1,600 ft (see Appendix A), and thus reduce groundwater discharge to local springs or streams that are hydraulically connected to the groundwater. Groundwater withdrawal to supply water for oil shale development would have a similar effect. The cone of groundwater depression could extend more than 2 miles from a dewatering well for one foot of drawdown. Existing groundwater supply wells within the cones of depression could have reduced groundwater yields or could be dewatered.

The retorted zone may become a groundwater discharge zone for the shallower aquifers and a groundwater recharge zone for the deeper aquifers.

The streamflow would be reduced in areas downstream of water intakes and could be increased downstream from discharge outfalls.

Withdrawal of water from surface water bodies would reduce streamflows.

Groundwater withdrawals from a shallow, surficial aquifer would produce a cone of depression and reduce groundwater discharge to connected surface water bodies. The withdrawal could reduce streamflows.

If a reservoir is constructed to accommodate the water demand of a project, the construction and the operation of the reservoir can impact the environment. The flow pattern downgradient of the reservoirs could be altered, depending on the release schedule of the reservoirs.

In Colorado, the potential underground mining sites are located in the vicinity of Piceance Creek, Yellow Creek, and East Fork Parachute Creek. If the oil shale mine is situated above the water level of one of those creeks, dewatering the aquifers above the oil shale in support of mining operations could reduce groundwater discharge to the creek. On the other hand, if the oil shale mine is situated below the water level of the creek, the dewatering operations on the aquifers above the oil shale could dewater the creek.

The document provides an estimate of the amount of water necessary for oil shale development and water availability, although the authors are advised to revise the estimates based on the water availability estimates developed by Colorado's Statewide Water Supply Initiative (SWASI). There is very little analysis regarding the severity of the impacts.

The report does not consider in detail the potential sources of water for oil shale development, fails to identify that existing water rights in the Colorado and White River drainages that are decreed for such use, and overlooks the potential administrative impacts on these drainages (i.e. alteration of call periods, curtailment of junior water rights, etc.). Note that these impacts may affect the Upper Colorado River Endangered Fish Recovery Program.

The following are general comments that have appeared in prior reviews of the proposed oil shale demonstration projects:

The Applicant will need to document that the water used at the site was obtained from a legal source, or the water was diverted in priority under a water right decreed for such use or under an approved substitute water supply plan (see http://www.water.state.co.us/wateradmin/wateradmin.asp#swsp) or plan for augmentation.

The proposed operations may have potential impact on existing water rights near the project location. A plan for augmentation (or a State Engineer approved substitute water supply plan) will be required to replace all water depletions in time, place and amount such that no injury will occur to the vested water rights of others. The Applicant needs to demonstrate that the proposed project will not alter or impact the historic operation of existing vested water rights.

Water is commonly collected via surface water drainage collection and conveyance systems to manage drainage throughout mining sites. These systems typically consist of ditches, storm sewers, culverts, curbs, paving and storm water ponds. Stormwater runoff collected and stored out-of-priority, must be released to the stream system within 72 hours. This may require a discharge permit from CDPHE-WQCD. Otherwise, the operator will need to make replacements for evaporation through an approved substitute water supply plan (see http://www.water.state.co.us/wateradmin/wateradmin.asp#swsp) or plan for augmentation.

Jurisdictional size dams must be approved by the State Engineer prior to construction. For non jurisdictional size dams, a Notice of Intent to Construct a Non-jurisdictional Water Impoundment Structure must be filed 10 days prior to construction. There structures are governed by CRS 37-87-101 through 125 and the Rules and Regulations for Dam Safety Construction 2CCR-402-1. (See http://www.water.state.co.us/damsafety/dams.asp)

All monitoring wells, injection wells, freeze wells and heater wells must be permitted as monitoring wells pursuant to CRS 37-92-602. All de-watering wells and/or water supply wells, or wells that will be converted to de-watering wells and/or water supply wells, must be permitted pursuant to CRS 37-90-137.[1] All water well construction must be in compliance with the Water Well Construction Rules 2CCR-402-2, which may require submittal and approval of a variance from the rules. All wells permitted by the State Engineer must be constructed by a water well construction contractor licensed by the State of Colorado.[2] All permanent pump installations and cistern installations shall be completed by only a pump installation contractor licensed by the State of Colorado or a private pump installer (CRS 37-91-102(12.5) and 37-91-109(2)). Pumping equipment may be installed in wells constructed and used solely for purposes of aquifer remediation (recovery well) or temporary dewatering of the aquifer (dewatering well) by authorized individuals or anyone directly employed by or under the supervision of an authorized individual. (See http://www.water.state.co.us/boe/)

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[1] See http://www.water.state.co.us/groundwater/groundwater.asp.

[2] See Board of Examiner Rules 2 CCR 402-14.

In conclusion, note that due to the complexities of the hydrogeologic systems and the lack of information regarding the impacts of such projects, which are currently in the research and development phase, the detail provided by the PEIS is insufficient to allow for a complete and accurate determination of the effects to water resources that will occur from a specific Oil Shale and/or Tar Sands project. As such, each project must be reviewed based upon its own merits.

5) Colorado Water Conservation Board

The Colorado Water Conservation Board (CWCB) is the state agency charged with promoting, protecting, conserving and developing Colorado's water resources in order to secure the greatest utilization of those resources for the benefit of present and future generations, and to minimize the risk of flood damage and related economic losses. The CWCB, as the state water planning agency, has a long association with activities concerning the Colorado River Compact and the "Law of the River." The CWCB submits the following technical comments on the draft ***"Oil Shale and Tar Sand Sands Resource Management Plan Amendments to Address Land Use Allocations in Colorado, Utah, and Wyoming Programmatic Environmental Impact Statement" (PEIS),*** which comments will be included as part of the State's overall comment package**.** The CWCB has had the opportunity to review previous comments concerning the use of water for oil shale development and reaffirms their support of those comments. However, we feel it necessary to expand on those comments in certain areas.

While the document provides an estimate of the amount of water necessary for oil shale development and a discussion of water availability, there remains a need for additional information and clarity. The authors are advised to review and revise the estimates of water availability and uses by the State of Colorado based on information contained in the recently released Phase I Report done pursuant to Colorado's Statewide Water Supply Initiative (SWSI) and to utilize that information to better analyze the severity of various impacts. Not only is the amount of land impacted important, but with respect to water related impacts the amount of water used to support various levels of production at any given point in time is important in order to determine the impact to Colorado's water allocations under the Colorado River and Upper Colorado River Compacts. It would be much more useful to move Table 3.4.1-5 and the discussion of it to Section "3.4.1.1 Water Allocation" and expand that discussion to show the impact to states allocations at various levels of oil shale production. Without this type of analysis, the impacts of oil shale development can not be gauged with any real understanding.

The report while discussing water availability and some water features still does not adequately describe the water available to projects on the lands potentially leased. There needs to be a clear linkage between water available, the water remaining available to a state under the compacts, and some indication of the availability under various hydrologic conditions. It is not sufficient to simply say so much water is available at a given point without providing some broad estimate of the water available for appropriation under various levels of compact development. The maps would be more useful if there was better linkage to water supplies in addition to showing watersheds and features. The potential sources of water for oil shale development fail to identify and consider existing water rights in the Colorado and White River drainages that are decreed for such use. The PEIS also overlooks the potential administrative impacts on these

drainages (i.e. alteration of call periods, curtailment of junior water rights, etc.) by not considering water rights. Furthermore, the PEIS utilizes a hydrologic determination of water available to the Upper Colorado River Basin of 6.0 million acre-feet. However, the PEIS needs to also acknowledge that the Upper Basin has a legal entitlement to 7.5 million acre-feet and footnotes to that affect need to be made to the appropriate tables in the PEIS as well.

The CWCB is a participant in the Colorado River Salinity Control Program and while the discussion of the Program is very helpful it remains incomplete. The discussion does not identify any specific BLM salinity control projects in or near the potentially leased lands and whether or not those projects will be impacted or how they may be protected during development of an oil shale leasing program. While BMP's will be employed during a leasing program, there is no discussion or cross reference to those BMP's. There are also NPDES permitting requirements administered by the respective state health departments that must be complied with for salinity control and those policies should be referenced as part of this discussion. It is fine to state that these NPDES standards must be complied with, but additional discussion of those polices and BMP's jointly is necessary to understand the relationships and how help minimize impacts of oil shale development.

Colorado is also a participant in the Upper Colorado River Endangered Fish Recovery Implementation Program (UCRIP). While the purpose of the UCRIP is to offset the impacts of water development while recovering the Colorado River endangered fish, the UCRIP nevertheless is concerned about the potential impacts of oil shale development on the UCRIP efforts to recover the fish and the progress the Program has made to date. In addition to the very extensive discussion of threatened and endangered species already included, the PEIS needs to include a brief discussion of the UCRIP and the BMP's that BLM may require to help insure the recovery efforts of the UCRIP are supported and not adversely impacted.

The CWCB administers an Instream Flow Program and has some instream flow segments either on leased lands or on streams that may be impacted by oil shale development. Those stream segments have not been identified. Identifying and incorporating a list of impacted water rights along with consultations with the CWCB and BLM's instream flow coordinator will help identify the affected stream reaches and measures that can be taken to mitigate the impacts of oil shale development on those streams.

The PEIS needs to discuss whether or not there are any increases in flood potential resulting from oil shale development and whether or not any water users, agricultural operations or other communities will be impacted. If impacts are identified, what measures will be taken to mitigate those impacts?

STATE OF COLORADO

Bill Ritter, Jr., Governor
James B. Martin, Executive Director

Dedicated to protecting and improving the health and environment of the people of Colorado

4300 Cherry Creek Dr. S.
Denver, Colorado 80246-1530
Phone (303) 692-2000
TDD Line (303) 691-7700
Located in Glendale, Colorado

http://www.cdphe.state.co.us

Laboratory Services Division
8100 Lowry Blvd.
Denver, Colorado 80230-6928
(303) 692-3090

Colorado Department
of Public Health
and Environment

1) Water Quality Control Division

The PEIS contains insufficient data defining potential environmental impacts to justify moving forward with a lease program for 360,000 acres of land in Colorado for oil shale production. The BLM should commit to gathering baseline surface water and ground water quality data at locations in and around the RD&D project sites for appropriate parameters and monitor at those sites during the construction and operation of the RD&D projects to gather data that could be used to establish expected environmental impacts for a commercial-scale project.

We are concerned that the approach (Executive Summary – Page 5) of generally describing impacts in this PEIS and the proposal to identify detailed environmental impacts on a lease-by-lease basis will not address cumulative impacts to the environment on a geographic scale. The PEIS proposes that each EIS for a lease would have to describe off-site impacts but does not provide a process to address the cumulative impact of all leases on environmental conditions. For example, the impact on a watershed of discharges from sources on multiple leases would not be captured in an EIS for a single lease. As well, if power or water would need to be imported to support an in-situ project, this proposed approach would have each project proponent evaluating environmental impacts due to their proposal (e.g. power transmission lines, water pipe and reservoirs, etc.) without assessing the cumulative impact of these actions. Furthermore, this approach would not encourage consolidation of these types of infrastructure which could reduce the overall environmental impact. Of note, the cumulative impacts section (6.2.5) does not provide information of any value to allay the concern that the lease-by-lease approach will result in a reasonable assessment of cumulative impacts.

The PEIS does not address the impacts of additional growth on water and wastewater infrastructure in nearby communities nor does it address potential impacts of water withdrawals on flows upstream of wastewater facilities and the concomitant reduction in permits limits that might result. Similarly, detailed water supply projections would need to be compared to available stream flows to determine if there is a sufficient water supply. In order to address this issue, specific population growth projections would need to be made for all the potentially impacted communities. Then, the capacities of the water and wastewater infrastructure would need to be assessed to identify gaps. At that point, projections could be made about the cost and impact of the efforts that would be needed to fill the gaps.

A more meaningful environmental impact analysis should include regional numeric ground water modeling, including predictive simulations of both quantity and quality impacts.

Our involvement with other EIS investigations has included such modeling efforts, and it is not uncommon to assess regional groundwater and surface water impacts using numeric models. A regional numeric model to assess oil shale development impacts on surface and groundwater would allow some quantitative assessment of the development on the scale envisioned by BLM under their current preferred alternative. There is currently no attempt to quantitatively assess cumulative impacts to surface and groundwater resources within the PEIS. Without additional information regarding these impacts the only feasible alternative would be the no-action alternative.

General comment on socioeconomic analysis: State and local governments will need to invest significant resources to support these efforts, much of which (such as providing permits, etc.) would need to occur prior to actual commercial operations. The proposed socioeconomic studies do not appear to address funding for these efforts. This analysis is in Chapter 4. There is still no discussion of the impact on State and local governments. State approval is needed prior to constructing a new water or wastewater treatment system or expanding existing systems. Thus, if a city or town would need to expand its drinking water and/or wastewater treatment systems to meet the demands of the oil shale project workforce, either for direct service or water hauling, then that entity would need state approval prior to undertaking construction. The analysis suggested above could be evaluated to determine the number of systems needing to be constructed and/or expanded and the extent of the expansion, to estimate the levels of state and local government impacts.

The PEIS does not address that surface waters may also be used as drinking water supplies. Specifically, the PEIS should state that commercial development projects will be designed to avoid (if possible) or mitigate impacts to surface waters that are used as public water supplies.

Section 7.4 does not list CDPHE as a cooperating agency.

Water quality issues

On page 2-5, first paragraph, the Draft PEIS should state that any discharge of spent shale leachate into waters of the United States or waters of a state would require a National Pollutant Discharge Elimination System (NPDES) permit or the state equivalent. The discussion that follows that sentence on page 2-5 is irrelevant as any discharge to state waters would require a state-issued permit under Colorado law.

On page 2-5, second paragraph, this section should note that Colorado regulations prohibit the cumulative discharge of one ton per day or more of salinity from a commonly owned development unless amounts greater than one ton per day are mitigated elsewhere.

In Section 3.4.1.2 (page 3-60), the Draft PEIS seems to focus on salinity as the key water quality issue. Although salinity was discussed, we found no discussion of the potential for any contribution of selenium or other pollutants expected to be found in the native soils/formations to area waters. Selenium is a significant water quality issue in the Colorado River Basin and around Colorado in general. The Department is aware that, according to the USGS, the targeted oil shale rich layers are expected to be at least 6000' to 7000' above the Mancos shale which is

the significant source of selenium. That being said, in addition to identifying and addressing the issue of other potentially naturally occurring contaminants, the PEIS should address other sources of selenium as well.

In Section 3.4.1.3, addressing 303(d) listed water bodies does not address listed segments along the lower Colorado River. The current 303(d) list for the lower Colorado River includes 8 segments, and it is anticipated that the number of listed segments could easily double during the next listing cycle. The PEIS lacks any substantive discussion of potential ramifications of the proposed preferred alternative on 303(d) list water bodies. Until such analysis is conducted the only appropriate alternative is the no-action alternative.

Section 4.5 describes potential impacts from nonpoint source runoff, but does not attempt to quantify any potential impacts, nominally due to mining exemptions from NPDES requirements. However, Colorado does not exempt any construction activity from stormwater discharge permits impacting areas larger than one acre. Construction associated with oil shale development will represent a significant cumulative impact, especially in light of the increase emphasis on sedimentation impairments to surface water. The PEIS inadequately address the nonpoint source sedimentation impacts of the preferred alternative, and therefore until such impacts can be quantified the no-action alternative represents the only viable option.

In Section 4.5.1, the Draft PEIS indicates that runoff from surface disturbances related to the oil shale operations would be non-point sources. In fact, and disturbance of one acre or more during construction would require a point source stormwater permit. This error is repeated in section 4.5.1.1.

Section 4.5.1.2 states that the drawdown associated with ground water withdrawals from the shallow aquifers will impact springs, seeps, and surface water flows. The PEIS fails to address the magnitude of this impact, nor address the potential cumulative affect on both water availability and water quality. Significant dewatering associated with several of the currently envisioned oil shale production technologies will impact the timing and long term availability of water within the basin. These cumulative impacts are currently not addressed under the preferred alternative, and need to be considered. Therefore only the no-action alternative is appropriate.

In Section 4.5.1.3, second paragraph, the Draft PEIS incorrectly states “Since discharge of surface runoff at a mining site is exempted from NPDES permits, surface runoff not intercepted at these sites could create a nonpoint source of contaminants and degrade the water quality of downgradient surface water bodies.” As a mining activity, runoff from the mine site would require a Colorado stormwater permit.

Section 4.5.1.3 describes implementation of potential UIC disposal of poor quality water and states that EPA R8 is responsible for permitting. While this is true for Colorado, it is not necessarily true for Utah or Wyoming which have delegated UIC programs. Current Colorado ground water regulations also address several potential oil shale related ground water contaminants that would not be addressed through the Region 8 UIC permitting process. The

PEIS does not address Colorado's independent authority to regulate potential ground water contamination not addressed under the Region 8's UIC implementation of the SDWA.

Section 4.5.1.4 describes the potential of aquifer degradation due to alterations in the permeability and hydraulic conductivity of both aquifers and aquitards. This could have ramifications for contamination of ground water from pollutants remaining in after extraction activities at an in-situ operation are suspended and could lead to increased loadings, including TDS, in surface water bodies as well. Information to confirm that impacts from pollutant leaching due to increased porosity and permeability due to in-situ mining can be appropriately managed should be addressed at one or more RD&D projects before commercial development to determine whether ground water contamination will occur during production or after production when the aquifer in the zone of withdrawal becomes saturated.

Section 4.5.2 assumes that power requirements for a traditional mining scenario would not increase over current energy consumption levels. One of the largest consumptive uses of both power and water under a traditional mining scenario is associated with dewatering. This assumption cannot be validated until realistic estimates of the amount of traditional mining that would occur can be made. The preferred alternative inadequately estimates the amount and associated cumulative impacts associated with potential oil shale development utilizing traditional mining methods.

Section 6.1.2.4 states "The inability to predict specific locations for potential future commercial development and the lack of information regarding the type of technology that might be employed make it impossible to predict the specific impacts on water resources that could occur with commercial development. Quantification of such impacts would depend on the specific location of the lease area being developed, as well as the design of the project and associated infrastructure." Again, this underscores a the lack of information that should preclude moving forward with a selected alternative that proposes developing 360,000 acres of land in Colorado for oil shale production.

Drinking water and source water protection

Page 2-4 line 5 should indicate that compliance with Colorado Primary Drinking Water Regulations is required.

Page 2-4 lines 32 to 38 should indicate that compliance with state and local regulations and ordinances with respect to Source Water Protection is required.

Appendix A Pages A-27 (beginning on line 36) and A-29 (beginning on line 4) describe two recovery techniques, solvent flooding and chemically assisted recovery, which may be of concern if used near water supply aquifers. The PEIS should state that one of the criteria used to select recovery technique would be water supply protection.

Appendix A Pages A-69; A-71; A-72; A-72; A-78; all refer to "potable water" and the trucking or hauling of that water. Trucked or hauled water must meet the requirements of the Colorado Primary Drinking Water Regulations.

Appendix D should recognize that Colorado has primacy for implementing the Safe Drinking Water Act in Colorado. This has impacts throughout the document. All systems meeting the definition of public water system must comply with Colorado Primary Drinking Water Regulations which includes water hauling and the need for design approval prior to constructing a new system or expanding existing systems. Thus, if a city or town would need to expand its drinking water treatment system to meet the demands of the oil shale project workforce, either for direct service or water hauling, then that entity would need design approval prior to undertaking construction.

Table D-5 on page D-9 should refer to any of the Colorado regulations relating to groundwater or drinking water. Similarly, Tables D-12 and D-13 should specifically reference Colorado's regulations.

In Appendix D there should be sections under D.2 ADDITIONAL INFORMATION REGARDING THE REGULATORY AND POLICY ENVIRONMENT addressing each of the tables (this was done for Air Quality – it needs to be done for all).

The document refers vaguely to environmentally sensitive areas, but there does not seem to be specific approach to defining these areas or a method of selecting best management practices for sensitive areas (e.g.: around drinking water intakes, wells). Other questions come to mind like… will waste pits be allowed in environmental sensitive areas? This leads to question of how the BLM might incorporate locally driven source water protection plans in the potentially impacted areas and downstream. Is there a plan to develop a watershed protection plan with specific best management practices that will be implemented, enforced, and evaluated over the time frame of the project? The BLM's process to addressing local concerns and selecting Best Management Practices (BMPs) in environmentally sensitive areas should be clearly defined.

In the mass volume of information provided, source water protection is mentioned once in section 2-4, but there is no mention of a process for planned coordination. It also indicates that … "If hazardous chemicals or materials are used during the construction or operation of a project that is located within a wellhead protection area, reporting or control measures **may** apply". This language is very weak and does not significantly address potential drinking water impacts.

Table 2.2.3-1 indicates existing ACEC's Intersecting Oil Shale or Tar Sand Areas. There seems to be a fair amount of ACEC's in the oil shale areas, but no specific environmental plans for the ACEC areas. The document indicates it will be handled by the local BLM offices. Will a guidance document be prepared to assist these local offices? Will there be an effort to establish standardized BMP's?

2) Air Pollution Control Division

Overarching Comments

The scope of this one document is huge and the format, style of the writing and organization of the document seems to reflect a "business as usual approach" by the BLM. This

is disappointing, given the history of oil shale development in the west and the significance it now is taking on when considering it alongside the expansion of oil and gas and coal development. In our mind, a much more creative and informative approach should have been pursued. As a result of the document's size and organization, the interested reviewer must be highly motivated to seek out critical information so as to form conclusions. There is probably no way to easily remedy this at this stage but assessing this development proposal's impact over three states is not going to be easily accomplished with the document in its current form.

There are a number of significant issues that Colorado must have comprehensive and clearly written information about for the state to make any recommendation about the further development of this resource. For example, there are a number of air quality concerns that are not addressed in this draft PEIS to any substantive degree. These include:

1. **Regional air quality concerns** – There are several areas of concern not described to any sufficient degree in the document. These include: impacts from Mercury emissions; regional and local ozone impacts (both health and secondary impacts); impacts on regional haze; impacts on nitrogen deposition; and the impacts of hazardous air pollutants.

2. **Urban and small community air quality levels** – Currently the Denver metro area is developing a SIP revision for the 8-hour ozone NAAQS. The draft document should describe whether and how the proposed development will affect the attainment and maintenance of the ozone standard. Additionally, the state has been required to develop and submit air quality plans for PM10 in many western Colorado towns. The state, in cooperation with the western slope communities of Aspen, Steamboat Springs, Telluride and Pagosa Springs, has successfully developed and implemented air quality plans (SIPs) to address violation of the PM10 NAAQS. The draft document has not aqequately identified how these areas are going to maintain compliance with the NAAQS.

3. **Community exposure to Hazardous Air Pollutants** – Colorado has been implementing a state-wide air toxics program for several years and high on our list of source categories of concern are categories related to energy development. The Colorado Air Quality Control Commission adopted significant additional control requirements on oil and gas drilling and extraction operations and we are concerned about the levels of benzene and other HAPs compounds on the residents of Colorado. The impact of these pollutants deserves greater attention in the draft PEIS.

4. **Oil shale related electrical power generation development** – The draft PEIS identified the need for significant additional power generation capacity to drive the shale (and tar sands) extraction/refining process across the west. Then the BLM backs off this major issue entirely. Nowhere in the document is the role of alternative energy applications raised or discussed as an option in meeting the additional power needs for this proposal. Further, the impacts of energy development itself should receive more attention in this document. This is an issue of tremendous significance because of the impact of coal fired utility plants and their impact on air quality. The

PEIS should identify this issue a support a no action alternative until the overall energy needs and howi t will be provided can be more specifically detailed

5. **Cumulative impacts to air quality** – The overarching direction of the narrative in the air quality impacts section, Section 6.1.4.5 Air Quality Impacts, last paragraph, page 6-94 can only lead to the conclusion of supporting the No Action Alternative. This paragraph states that "Because of the need for project- and site-specific information, it is not possible to identify the nature and magnitude of regional air quality impacts of commercial oil shale development under either Alternative B or Alternative C." Given this, the only logical selection is Alternative A (No Action). This is the only proposed alternative that presents any substantial evidence that no significant, adverse direct or cumulative air quality impacts are likely to occur (analyzed under previous NEPA analyses for the six RD&D projects, which would proceed under Alternative A). The potential adverse impacts which could occur under Alternatives B and C may be unacceptable to Colorado and therefore these Alternatives can not be supported without further analysis and quantification of impacts. This again points to a need for a comprehensive dispersion modeling analysis that will address the near-field and far-field impacts of both the oil shale leasing program and cumulative sources (all existing and reasonably foreseeable non-oil shale/tar sands development sources, including existing and proposed oil and gas leasing on federal and private lands, and the expansion of electric utilities in the region). The current proposal lacks the comprehensive analysis necessary for Colorado to support either Alternative B or Alternative C.

6. **Baseline monitoring for Colorado's Class I areas** – This is a critical concern. The Draft PEIS misses a great deal of information about baseline ambient air quality monitoring currently being conducted in Colorado. As part of the PEIS, the BLM needs to discuss recent air quality monitoring in the prospective oil shale areas, and to commit to future ambient monitoring needed to assess the baseline environmental conditions. In Colorado, monitoring is needed both in the Piceance Basin itself, and in the Flat Tops Wilderness, a sensitive area that is likely to be impacted by industry emissions.

   For the Flat Tops area, we note the following history, and future needs.

   Recent AQRV Monitoring In and Near Flat Tops Wilderness Area
   Shell began baseline monitoring in the Ripple Creek Pass (RCP) area, north of the Flat Tops Wilderness Area (FTWA) in January 03. Shell is to be commended for contacting federal land managers, the Air Division, and the US Geological Survey back in 2002 for input about what parameters needed to be monitored and characterized. Some monitoring is scheduled to cease in March 08, while other work will continue.

   Flat Tops: What Should Be Monitored and Why

   1. Every-Third-Day chemically speciated fine particles with an IMPROVE II sampler at RCP (this was run at RCP from Jan 03 thru March 08). Purpose: Very

good indicator of type of particles in the air; excellent measure of visibility/haze; and very useful for trends as well as event/episode characterization.

2. Hourly Nephelometer at RCP (at RCP in past). Purpose: Very good high time resolution air quality indicator; very useful for better understanding of short-term episodes that are averaged over by the IMPROVE sampler.

3. Hourly meteorological parameters (at RCP in past): full suite of parameters necessary for AERMOD model. Purpose: Very useful as inputs to air quality modeling; very useful in understanding air flow trajectory and source area/receptor area relations on average and in episode characterizations.

4. Digital camera system, at least 3 images/day (9am, noon, 3pm). Purpose: Provides images of visual air quality; helps establish relationships between other quantitative measures and how the air actually looked; can help communicate with public and officials about haze/visibility concerns; can be used for trends over time.

5. Wet deposition by NADP/NDN (at RCP in past). Purpose: chemistry of precipitation (rain, snow etc) in bulk help understand sources, possible concerns about aquatic and terrestrial impacts of acids or metals, and is very useful tool to track changes in chemistry of wetfall over time. Dry Deposition is needed also.

6. In Situ Snow Pack Sampling (in and near FTWA and RCP, this has been and continues to be done by USGS). Purpose: chemical characterization of what chemicals, acids, metals are actually accumulated in the snowpack is essential to understanding what the ecosystem sees during snowmelt; also provides helpful trend information over time. Near or in FTWA and further downwind is essential.

7. Mercury sampling in bulk sampler (MDN) and in snowpack as well as other accumulators (some work has been done with this and may continue in RCP and FTWA by USGS). Purpose: mercury has the potential to be released in oil shale development. It is a potent neuro-toxin that needs to be tracked and better understood. USGS is very interested in sampling additional lakes in FTWA to learn whether they vary in mercury amount and sensitivity. USGS also looking at fish samples and potentially phytoplankton samples to test for mercury in lakes.

8. Lake sampling (Ned Wilson lake in FTWA was sampled in recent past). Purpose: chemical characterization of what ends-up in actual aquatic ecosystem after emissions are released, transported, deposited etc and ultimately end-up in a lake/pond. These areas are the locations where fish, salamanders etc are impacted. Several lakes should be sampled long-term after a lake reconnaissance has been conducted in and around FTWA.

For the Piceance Basin and Areas Affected by Oil Shale Development:

9. Additional long-term baseline monitoring sites are needed in both rural areas and within potentially affected communities. The monitoring network should be designed to support all applicable regulatory programs. Sites should monitor meteorology and the concentrations of criteria pollutants, particularly sulfur dioxide (SO2), ozone (O3), oxides of nitrogen (NOx), PM2.5, PM10, and carbon monoxide (CO). Meteorological data collection should include 10 meter towers, taller towers, and profilers. Meteorological instrumentation and collection should be designed to meet the needs of air quality modeling systems. In addition, meteorological data should be collected for purposes of evaluating the performance of the meteorological models.

10. A TSP sampler, to analyze for lead and other metals, is also suggested. Mercury evels in air should be sampled, to establish pre-industry levels of this air toxic. Due to recent oil and gas development, concentrations of benzene, toluene, ethylbenzene and other petroleum-related air toxics need to be determined.

11. In addition, monitoring short-term field studies should be designed and conducted to support application of regional air quality modeling systems. Specifically, baseline data is needed to evaluate baseline model performance.

All monitoring protocols should be developed in consultation with CDPHE and subject matter experts. Data should be publically available."

The Air division staff members have prepared additional general and specific comments in several areas. Critical comments relate to BLM commitments to address monitoring, dispersion modeling, and the emission impact from leasing and project development. These comments are included below.

1. In several areas, the Draft PEIS lacks a meaningful analysis that is necessary to make an informed decision about the appropriate scale of commercial oil shale development.

Comment/What is still needed
Until some or all of the Research Design and Development projects are underway and are able to provide information to inform a potential commercial leasing program the BLM will not have enough detailed information about the various processes to analyze the potential direct The Final PEIS must provide a clear direction to ensure that information that is currently lacking will be collected and evaluated. The BLM should indicate in the Final PEIS how a broad stakeholder process will be initiated.

Comment/What is still needed
Several sections of the document refer to additional project-specific NEPA analyses that would be performed, subject to public agency review and comment, prior to approval of commercial leasing programs. However, to ensure that cumulative impacts from commercial scale development are adequately addressed, the PEIS should emphasize and provide more detail regarding BLM commitment to performing a cumulative local and regional scale modeling assessment prior to issuing leases for commercial-scale development. The PEIS document should emphasize the importance of the stakeholder process and indicate that any decision by BLM to grant commercial leases would be made only after completion and acceptance of a comprehensive local and regional scale cumulative air quality modeling analyses that has been developed with input and approval from all affected federal, state, and local agencies.
Volume 2, Section 4.1.6 Expansion of Electricity-Generating Capacity, page 4-13 The Draft PEIS indicates, "Additional power generation capacity would need to be developed in the region to support commercial oil shale development; however, at this time, definitive information about the power requirements of commercial oil shale development is not available." even though the power requirements are not known at this time. The Final PEIS should set the standards for what is expected of the lease applicants as far as mitigation expectations for their power generation needs. Most of the Western States have established Renewable Portfolio Standard Programs, with the goal of increasing the percentage of renewable energy in the state's electricity mix to 20 percent over the next 20 years. This is the same time frame the BLM is considering in this Draft PEIS. The BLM should require that all leases obtain at least 20 percent of their energy needs from renewable energy. There are a number of rural residences in the area surrounding the proposed land use allocations that utilize renewable energy for nearly 100% of their energy needs.
Volume 2, Section 4.6.2 Mitigation Measures (Air Quality), page 4-5-- The Draft PEIS is 1460 pages long and about one-half of a page has been devoted to providing 5 possible mitigation measures for air quality. The Final PEIS needs to include a better discussion of the mitigation measures indicated and provide more examples of possible mitigations that will be required of lease applicants. Offset programs should be included in the list of potential mitigation programs.

Comment/What is still needed
Volume 2, Section 6.1.4.5 Air Quality, page 6-94According to the Draft PEIS, “Thus, compared to Alternative B, the areas where local air quality could be affected by future commercial oil shale development under Alternative C would be reduced by 89% in Colorado, 22% in Utah, and 70% in Wyoming.” Without more information about the potential direct, indirect and cumulative air quality impacts of the oil shale development in Colorado, we must support the alternative with less significant air quality impacts.
Comments Regarding the Next Step (Amendment of Specific Resource Management Plans) This Oil Shale PEIS provides the basis to amend specific Bureau of Land Management Resource Management Plans (RMPs) in Colorado, Wyoming, and Utah. The Colorado Air Pollution Control Division believes that these resource management plans should determine which areas of each BLM region should, or should not, be available for an oil shale leasing program. Therefore, the RMPs should carefully address the issue of which land areas are least sensitive to oil shale activities, and make only those areas available to the program. This is particularly important, since the current Utah oil shale research, development, and demonstration lease can be potentially expanded to include an area that is eligible for Wild and Scenic River status. According to lines 32 – 38 on page 2-28, major portions of the five Colorado RD&D “preference” lease areas for expansion to commercial scale would not be allowed for leasing under the present Alternative C, because they involve some sensitive areas. Lease areas should be delineated in ways that avoid such impacts in the future.
The Draft PEIS states “in situ processing does not involve mining, with limited waste material disposal , it does not permanently modify land surface topography and therefore produces fewer air pollutant emissions.” This is not so. Though this phase produces fewer *PM* emissions, it produces other criteria and hazardous air pollutants. These pollutants are not even addressed in this paragraph.
Volume 2, Sections 6.1.2.5, 6.1.3.5, 6.2.2.5, 6.2.3.5 Air Quality, pages 6-47, 6-71, 6-185, 6-211 These identical sections mention ”[o]perational releases of certain hazardous air pollutants (such as benzene, toluene, formaldehyde, and diesel PM) could also affect onsite workers and nearby residences (if any are present), but these impacts would be localized to the immediate project location and subject to further analyses prior to implementation.” No mention is made of mercury even though research indicates that mercury is a component released from oil shale with even more severe environmental and health impacts than the HAPs mentioned.

Comment/What is still needed
Volume 2, Section 6.1.1.5 Air Quality, pages 6-8 and 6-9 In this section, BLM states that "the EAs, prepared for the RD&D projects … predicted potential air quality impacts using atmospheric dispersion methods….The air quality analyses presented in the EAs indicate that no significant adverse direct, or cumulative air quality impacts are likely to occur." The air quality analyses presented in the EAs indicate that no significant adverse direct, or cumulative air quality impacts are likely to occur." These air quality analyses have already been deemed suspect and inadequate by the Division.
Appendix A Volume 3, Table A-10 EGL RD&D Project Air Emissions Summary, page A-66 EGL's sulfur dioxide emissions are unreasonable high. There is no discussion of how these could be reduced. Can they mitigate this by scrubbing the boiler emissions or using a lower sulfur fuel? Further, there is no mention of VOC or hazardous air pollutants in their emission inventory yet these are inevitable.
Volume 3, Table A-14 Phase 3 Estimated Emissions, page A-83 The estimate for hazardous air pollutants is 1.8% of VOC emissions This is an unreasonably low estimate and should be researched and verified in the Final EIS.

2. The Draft PEIS has indicated that substantial adverse impacts to air quality are likely to occur.

Impact identified/Level of certainty in PEIS
The overarching direction of the narrative in the air quality impacts section, Section 6.1.4.5 Air Quality Impacts, last paragraph, page 6-94 can only lead to the conclusion of supporting the No Action Alternative. This paragraph states that "Because of the need for project- and site-specific information, it is not possible to identify the nature and magnitude of regional air quality impacts of commercial oil shale development under either Alternative B or Alternative C." Given this, the only logical selection is Alternative A (No Action). This is the only proposed alternative that presents any substantial evidence that no significant, adverse direct or cumulative air quality impacts are likely to occur (analyzed under previous NEPA analyses for the six RD&D projects, which would proceed under Alternative A). The potential adverse impacts which could occur under Alternatives B and C may be unacceptable to Colorado and therefore these Alternatives can not be supported without further analysis and quantification of impacts. This again points to a need for a comprehensive dispersion modeling analysis that will address the near-field and far-field impacts of both the oil shale leasing program and cumulative sources (all existing and reasonably foreseeable non-oil shale/tar sands development sources, including existing and proposed oil and gas leasing on federal and private lands, and the expansion of electric utilities in the region). The current proposal lacks the comprehensive analysis necessary for Colorado to support either Alternative B or Alternative C. The overarching direction of the narrative in the air quality impacts section, Section 6.1.4.5 Air Quality Impacts, last paragraph, page 6-94 can only lead to the conclusion of supporting the No action alternative. This paragraph states that "Because of the need for project- and site-specific information, it is not possible to identify the nature and magnitude of regional air quality impacts of commercial oil shale development under either Alternative B or Alternative C." Given this, the only logical selection is Alternative A (No Action). This is the only proposed alternative that presents any substantial evidence that no significant, adverse direct or cumulative air quality impacts are likely to occur (analyzed under previous NEPA analyses for the six RD&D projects, which would proceed under Alternative A). The potential adverse impacts which could occur under Alternatives B and C may be unacceptable to Colorado and therefore these Alternatives can not be supported without further analysis and quantification of impacts. This again points to a need for a comprehensive dispersion modeling analysis that will address the near-field and far-field impacts of both the oil shale leasing program and cumulative sources (all existing and reasonably foreseeable non-oil shale/tar sands development sources, including existing and proposed oil and gas leasing on federal and private lands, and the expansion of electric utilities in the region). The current proposal lacks the comprehensive analysis necessary for Colorado to support either Alternative B or Alternative C.

3. **Several information gaps must be filled to support an informed decision regarding the feasible and appropriate scope of commercial oil shale development at a later date, when more information is available.**

Area of concern/What is needed to make decision
Regional air quality concerns – There are several areas of concern not described to any sufficient degree in the document. These include: impacts from Mercury emissions; regional and local ozone impacts (both health and secondary impacts); impacts on regional haze; impacts on nitrogen deposition; and, the impacts of hazardous air pollutants. Until some or all of the Research Design and Development projects are underway and are able to provide information to inform a potential commercial leasing program, the BLM will not have enough detailed information about the various processes to analyze the potential direct, indirect, and cumulative environmental, cultural, and socioeconomic impacts of a commercial leasing program. The Final PEIS must provide a clear direction to ensure that information that is currently lacking will be collected and evaluated. The BLM should indicate in the Final PEIS how a broad stakeholder process will be initiated. This stakeholder group should be utilized to collect and evaluate the data that is needed to inform future site-specific EIS's and develop regulations for potential commercial leasing. The information provided in the Draft PEIS does not provide the State of Colorado and others enough information to determine whether commercial oil shale leasing program in Colorado could be developed without significant direct, indirect and cumulative environmental, cultural, and socioeconomic impacts.
Oil shale related electrical power generation development – The EIS identified the need for significant additional power generation capacity to drive the shale (and tar sands) extraction/refining process across the west. Nowhere in the document is the role of alternative energy applications raised or discussed as an option in meeting the additional power needs for this proposal. Further, the impacts of energy development itself should receive more attention in this document. The draft PEIS identified the need for significant additional power generation capacity to drive the shale (and tar sands) extraction/refining process across the west. Then the BLM backs off this major issue entirely. Nowhere in the document is the role of alternative energy applications raised or discussed as an option in meeting the additional power needs for this proposal. Further, the impacts of energy development itself should receive more attention in this document. This is an issue of tremendous significance because of the impact of coal fired utility plants and their impact on air quality. The PEIS should identify this issue a support a no action alternative until the overall energy needs and how it will be provided can be more specifically detailed

Area of concern/What is needed to make decision
In the Draft PEIS Volume 1, Section 2.3.1, page 2-16, BLM commits to the following: "If and when applications to lease are received and additional information becomes available, the BLM will conduct NEPA analyses, including consideration of direct, indirect, and cumulative effects, reasonable alternatives, and possible mitigation measures, as well as what level of development may be anticipated." Only if these analyses contain approved analysis techniques, and if the cumulative effects include the appropriate sources, will the information be useful for stakeholders to make a determination of the potential impacts of the commercial leasing program.
Several sections of the document refer to additional project-specific NEPA analyses that would be performed, subject to public agency review and comment, prior to approval of commercial leasing programs. However, to ensure that cumulative impacts from commercial scale development are adequately addressed, the PEIS should Emphasize and provide more detail regarding BLM commitment to performing a cumulative local and regional scale modeling assessment prior to issuing leases for commercial-scale development. The PEIS document should emphasize the importance of the stakeholder process and indicate that any decision by BLM to grant commercial leases would be made only after completion and acceptance of a comprehensive local and regional scale cumulative air quality modeling analyses that has been developed with input and approval from all affected federal, state, and local agencies.
Volume 1, Section 3.5.3 Air Quality, page 3-101*:* The Draft PEIS states, "On the basis of limited monitoring data, air quality in the region is expected to be good (i.e., concentration levels for most criteria pollutants [except O3] are well below their applicable standards)." There is limited monitoring data in the region and background values will be crucial in making informed decisions on site-specific proposed commercial leasing projects in the future. It is time for the BLM to participate with other state, local and federal agencies in developing and funding a monitoring program in the region. A state must have better understanding of the contribution of oil and gas development to air quality emission levels, especially ozone, is needed. Since much of the oil and gas development is occurring on BLM lands and will be in the same areas as those proposed for oil shale development, BLM should take the lead in providing background monitoring for this region. Therefore to pile on the oil shale issue on top of this makes a decision to proceed with amending the documents to facilitate leasing premature.

4. Other areas of concern/comment

Topic- Climate change - Section 4.6.1 Common Impacts, last paragraph, page 4-48: The last two paragraphs of this section discuss greenhouse gas emissions (GHG) and potential impacts of direct emissions of GHG from oil shale activities. The statement is made that "increasing concentrations of GHG, however, are likely to accelerate the rate of climate change" but that "direct emissions of climate change air pollutants from oil shale development facilities are likely to be a small fraction of global emissions". Since the technology and potential emissions from future commercial oil shale development are virtually unknown, the last statement cannot be supported. Furthermore, even if these emissions will be a small fraction of global emissions, it is plausible that they will be a significant fraction of local and regional GHG emissions and may in fact be a significant contributor to climate warming on a regional level. Given the large uncertainty regarding commercial oil shale emissions and the implications for climate change, the "No Action" alternative should be supported until further evidence and analysis can be provided.
Volume 1, Table ES-1, page ES-5 The Colorado Air Pollution Control Division cannot support an alternative that will make areas identified as Areas of Critical Environmental Concern (ACEC) available for commercial oil shale leasing.
Page 2-51, Section 2.5.2, Lines 24-40. The No-Action Alternative**.** This section indicates that several comments received during the public scoping process "suggested that BLM should not move forward to establish commercial leasing programs for oil shale". The PEIS addresses these concerns by stating: "The no action alternatives for oil shale and tar sands (Alternatives A) effectively are no leasing alternatives. Any other alternatives in the PEIS that did not evaluate opening public lands for commercial leasing would not be consistent with the Energy Policy Act." Colorado notes that Alternative A includes the six research and development leases that currently exist on public lands. Therefore, the BLM has made public land leases available to the oil shale industry. The limited-size, developmental nature of these projects in appropriate, given that technology for processing oil shale is not mature. Colorado also notes that NEPA requires that for any contemplated action, the no-action alternative must be given serious consideration. Therefore, choosing the no-action alternative is feasible.

Page 4-17, Section 4.2.1.1. Lines 17 –26. This section states: "A significant portion of the land within the most geologically prospective oil shale areas is already undergoing mineral development, particularly for the development of oil and gas resources. Commercial oil shale development, using any technology under consideration in this PEIS, is largely incompatible with other mineral development activities and will likely preclude these other activities while oil shale development and production are ongoing."
Page 6-3, Section 6.1.12, lines 32 – 39 indicates that, due to natural gas flammability, gas wells cannot be allowed near an in-situ oil shale site.
If a goal of the Congress was to increase US energy independence, via the development of fuel from oil shale, then Colorado asserts that this goal is already being met by the large expansion of traditional oil and gas activity in the area. Indeed, oil shale, an unproven technology, can interfere with established operations for extracting oil and gas.

Volume 1, Section2.3.3.2, Alternative C, pages 2-28 and 2-32.
This section states,
"Although the White River and Book Cliffs RMPs allow commercial leasing for oil shale development, as shown in Figures 2.3.3.4, 2.3.3-5, and 2.3.3.-6, under Alternative C, portions of three of the five preference right lease areas for the Colorado RD&D leases are not available for application for commercial leasing. These include portions of the areas associated with the Chevron, EGL, and Shell Site 2 RD&D projects. For the other two Colorado RD&D projects, Shell Sites 1 and 3, none of the preference right lease areas coincide with the areas available for application for commercial leasing. As with Alternative B, for the OSEC RD&D project in Utah, portions of the area are not available for application for commercial leasing under Alternative C because they are excluded due to the presence of a potentially eligible WSR, Evacuation Creek (see Section 2.3.3.). Under the terms of the RD&D program, the federal government has a commitment to grant the RD&D companies leases for commercial development within the preference right lease areas, provided that all conditions of the program are met (See Section 1.4.1). As a result, all lands within the preference right lease areas would be available for issuance of commercial leases to the RD&D companies under Alternative C if they meet all conditions of the program. For commercial oil shale development to occur on lands excluded by Alternative C, the specific land use plans would need to be amended to consider the excluded area for potential leasing. The federal government is not under an obligation to grant leases for commercial development within these areas to any other applicants."

It is somewhat unclear as to what "under an obligation" means. In order for the RD&D areas to expand to their full preference areas, additional NEPA analyses are required, because the original Findings of No Significant Impacts addressed only the research scale of 160 acres, not the full-scale areas.

Most of the Western States have established Renewable Portfolio Standard Programs, with the goal of increasing the percentage of renewable energy in the state's electricity mix to 20 percent over the next 20 years. This is the same time frame the BLM is considering in this Draft PEIS. The BLM should require that all leases obtain at least 20 percent of their energy needs from renewable energy. There are a number of rural residences in the area surrounding the proposed land use allocations that utilize renewable energy for nearly 100% of their energy needs.

3) Hazardous Materials and Waste Management Division

Oil shale development offers tremendous potential to supplement the nation's energy supplies. Colorado's goal is that commercial oil shale development be done right – in a manner that avoids unacceptable impacts on Colorado's land, water and wildlife resources, and minimizes and mitigates those adverse environmental and socioeconomic impacts that would result from such development. If planning for and implementation of oil shale development efforts are not done responsibly and thoughtfully in the first instance, we all lose. There is a greater risk that development will be delayed and that any development that does occur will have unacceptable impacts.

In view of the potentially substantial adverse environmental impacts that the PEIS acknowledges could result from commercial oil shale development, and the lack of factual information and analysis to meaningfully assess likely impacts at this time, the only defensible alternative is the "no action" alternative. The information currently presented provides no support for amending the current Resource Management Plans to "facilitate" or "make possible" commercial oil shale development. Just as it was inappropriate for the BLM to select a leasing alternative in the Preliminary Draft PEIS that the State reviewed in June due to substantial uncertainties, it is inappropriate for the agency to select any alternative here that would make lands available for applications for commercial lease.

A Programmatic Environmental Impact Statement is intended to provide a meaningful analysis of the impacts of an overall program, in this case commercial oil shale development, prior to proceeding with project by project irretrievable commitments of resources. Because of the absence of information to allow a meaningful assessment of the potential impacts of commercial oil shale development at this time, the current draft PEIS does not satisfy its intended purpose. Therefore, BLM should commit to preparation of a supplemental PEIS at a later date, when adequate information is available, prior to proceeding with commercial oil shale leasing.

While the BLM claims that it will study the cumulative impacts of proposed oil shale development when it receives an application for a commercial lease, the proper time to evaluate the regional cumulative impacts of new oil shale development is at the PEIS stage. The BLM is proposing to make hundreds of thousands of acre open to oil shale leasing, which could lead to multiple applications for large-scale oil shale projects. The BLM cannot analyze the cumulative impacts of this decision when performing NEPA review on a project-specific, piecemeal basis.

Although BLM's plans regarding the development of commercial oil shale leasing regulations are unclear at this time, we note that the current PEIS also provides no meaningful analysis of environmental impacts that could form the basis to support the issuance of such regulations. For example, setting an appropriate royalty rate should be based on the feasibility and cost of oil shale development technology, the anticipated environmental impacts of such technology, and the costs of mitigation of such impacts. None of that information is included in this PEIS.

Oil shale development will use untested technology with potential long-term negative impacts to Colorado's environment and communities. Colorado therefore supports the RD&D approach. Colorado will not support any commercialization plan that calls for commercial leasing, or for the promulgation of leasing regulations, prior to a meaningful evaluation of the RD&D projects.

Specific Technical Comments:

Capacity: There is insufficient information to determine exactly what type or types of solid and/or hazardous waste treatment, storage and disposal facilities will be required for the RD&D projects. The information, such as geology, hydrology and engineering requirements may require substantial effort, resources and time. It is not clear that the resources and time were allocated, even in the RD&D process to define the needs and develop the capacity to support the RD&D project. This is important because all waste types and all waste volumes must be accounted for and managed appropriately. Without an understanding of the types and volumes of the wastes to be generated, it is not possible to determine the additional capacity for the waste storage, treatment and disposal facilities needed to support even the RD&D approach identified in #6 above.

Regulatory Compliance: While this comment pertains to the later aspect of commercial oil shale development, there appears toe be a flaw even in the RD&D phase identified in element #6 above. Page 2-18 Table 2.3.2-1 under the Regulatory and Operational Constraints for Alternative A (960 acres for 6 RD&D projects) where it states "[N]ot applicable; no commercial leasing would occur under this alternative." The federal, state and local solid and hazardous waste statutes and regulations must be adhered to for RD&D projects, even if no commercial leasing occurs. This would be applicable to the generation, storage, treatment, transportation and ultimate disposal of solid and/or hazardous waste.

4) Disease Control and Environmental Epidemiology Division

1. Current knowledge about in-situ and other oil shale (OS) technology is inadequate to fully assess associated environmental impacts or determine necessary mitigation measures. More detailed analysis of enhanced potential for community exposure and potential toxic impacts associated with different in-situ OS technologies is needed before an appropriate action alternative can be selected. Data gaps/inadequacies that need to be addressed to fully and adequately compare PEIS alternatives include:

    - Development of a chemical inventory associated with different OS technologies and select alternatives;

    - Assessment of the toxic potential of various chemically-assisted OS technologies, based on detailed R&D findings;

    - Identification of metrics to establish baseline conditions;

- Identification of metrics to assess baseline risks, analyze trends over time, and generally improve the scientific accuracy of the analysis of degradation to the human environment and potential risk to health associated with specific OS technologies;

- Determination of areas of greatest community impact anticipated during the active production phase of commercial OS development projects, through identification of significant exposure pathways associated with specific technologies;

- Quantitative estimate of exposure dose and potential health impacts to the affected public, due to direct impacts from air, water or surface contamination, or from indirect exposure to contaminated media, such as use of contaminated surface or ground water for drinking water, agricultural, or recreational use;

- Identification of methods to assess cumulative effects, where additive impacts are anticipated. Additional environmental studies are needed to be able to assess incremental impacts within the common geographic area. Establish risk-based systems to support decisions about avoidance or mitigation of adverse impacts to public health, and to allow meaningful comparison of alternatives in the future.

2. Development of the PEIS and leasing for commercial OS development should include sufficient detail to ensure stipulations for protection of resources and prevention or mitigation of impacts to the public that are consistent with other allowed energy uses, such as conventional oil and gas development.

Specific Comments

Page 2-50, section 2.5.1, 2nd paragraph - The PEIS states that published information is too dated to accurately describe commercial OS technologies of the future. This section of the report concludes that, under conservative assumptions, impacts could be significant, but uncertainties are currently too great to develop reliable assumptions. While this conclusion seems reasonable, it also appears to indicate there is very little basis to compare action alternatives at this time. For example, the lack of detailed process information makes it impossible to determine the degree of degradation, potential for exposure, or significance of toxic impacts associated with chemical-specific technologies prior to availability of RD&D results. No information is available to fully assess the long-term potential for health impacts to the affected public due to direct or indirect exposure to contaminated media (i.e., use of contaminated groundwater or surface water for drinking water or agricultural use; recreational contact with degraded surface water).

Page 4-2, Section 4– The paragraph at the top of the page states that information presented in section 4 "does not necessarily define the range of possible technologies and issues that may develop". Alternative technologies are anticipated to have different potential to cause significant impacts, due to differences in associated process methods and chemicals, and unique fate and transport characteristics. It is not possible to assess the effects of activity or evaluate actual outcomes with the general information available. Therefore, conclusions about potential risks and impacts to public health associated with the various alternatives are highly uncertain.

Table 4.14-2 - Estimated health risks for chemical exposure in workers fails to take into account systemic toxic effects, other than cancer, which may be associated with process chemicals, naturally-occurring pollutants, or other by-products of OS development.

Section 6 – Impact assessments of the OS alternatives are generally lacking in discussions of the toxic potential of process chemicals and wastes, or potential routes for offsite exposure. Impacts would depend on factors such as location and quantity of leases and technology-specific differences in fate and transport of contaminants, but no detailed analysis is provided in the discussion of the alternatives. Benchmarks to compare toxic potential for different technologies, under different conditions, are not provided or discussed. These data gaps preclude a firm scientific basis for selection of the preferred alternative.

5) Consumer Protection Division

Section 3.10, 4.10 and 4.11 Appendix I (Socioeconomic analysis methodology).

Statutory and regulatory oversight relative to the licensing, inspection, and enforcement specific to labor camps (man camps), retail food establishments, wholesale food firms, schools, childcare, mobile home parks, public accommodations (hotels/motels) and campgrounds are not addressed.

Inspections relative to mobile home parks, public accommodations and campgrounds are only done on a complaint basis. The increase in the number and use of these facilities will dictate the need for additional resources to respond to the associated complaints which are not addressed in the PEIS.

Labor camp housing is only inspected on a complaint basis, however the food service portion is addressed as indicated in the bullet below addressing retail food establishments. The labor camp regulations are the authority used to address man camps. The Labor Camp regulations were adopted in 1968 and a revision will be needed to address issues relative to man camps.

Retail food establishments (restaurants, grocery stores, school cafeterias, food service to summer camps) whether associated with man camps or are community-based require minimally, plan review and approval, pre-opening inspections, licensing, routine inspections on a semi-annual basis, and any additional regulatory activity needed for non-compliance. If an establishment moves from one location to another, which may occur more frequently with man camps, the license is non-transferable and all the plan review, pre-opening, etc. must be repeated. All these activities are resource intensive and additional increases needed to perform these functions are not addressed in the PEIS.

Schools are inspected on an annual basis. Any new construction must go through the plan review submittal and approval process. There are no statutory or regulatory fees required to be paid for the plan review and inspection services. The increase in resources needed to perform these functions are not addressed in the PEIS.

Child care facilities are inspected on an annual basis. There are no regulatory or statutory fees assessed for these facilities. The increase in resources needed to perform these functions are not addressed in the PEIS.

6) CDPHE Climate Change

Commercial development of oil shale will result in carbon dioxide emissions from production, refining and transportation. Because production of oil from oil shale is expected to be energy intensive, commercial oil shale development will have significant greenhouse gas implications. Most of these emissions will come from processing plants as well as power plants that provide electricity to oil shale facilities. While some of these emissions could be reduced by capturing carbon dioxide for enhanced oil recovery in nearby oil production areas and geological sequestration of the carbon dioxide, section 2.5.3 indicates that such an evaluation should occur at the time of site-specific NEPA analysis of a specific plan of development. In addition, there will be indirect greenhouse gas emissions from population growth and the commensurate demand for infrastructure and services, none of which is addressed.

While sections 3.5.1.2 and 4.6.1 offer brief tutorials on the science behind climate change and point out that increasing concentrations of greenhouse gas emissions are likely to accelerate the rate of climate change, section 4.6.1 goes on to merely conclude that "direct emissions of climate change air pollutants from oil shale development facilities are likely to be a small fraction of global emissions." It is irrelevant whether the emissions will be a small fraction of total global emissions. That is true for every major emitter. The PEIS offers no specificity or any analysis of the primary contributors of carbon dioxide emissions from oil shale development, such as the power plants needed to provide electricity to oil shale facilities. The PEIS is lacking a meaningful analysis of impacts from oil shale development to climate change and, accordingly, offers no substantive provisions on which to comment.

STATE OF COLORADO

EXECUTIVE DIRECTOR'S OFFICE
Department of Local Affairs
1313 Sherman Street, Suite 500
Denver, CO 80203
Phone: (303) 866-4904
FAX: (303) 866-4317
TDD: (303) 866-5300

Bill Ritter
Governor

Susan Kirkpatrick
Executive Director

Division of Local Government, State Demography Office

General Comments:
The Colorado Department of Local Affairs evaluated the Colorado socioeconomic components of the "Draft Oil Shale and Tar Sands Resource Management Plan Amendments to Address Land Use Allocations in Colorado, Utah and Wyoming and Programmatic Environmental Impact Statement". Due to the uncertainty of the oil shale development technology and resulting impacts the total socioeconomic effects of oil shale development cannot be properly evaluated. Making lands available through the resource management plans does not address the scope or magnitudes of oil shale development and its resulting socioeconomic impacts.

Additionally, the assumptions of socioeconomic impacts provided in the PEIS are very narrow and do not provide the reader the broad spectrum of potential production realities. The assumptions are for **one operation** with three different types of technology at **one level of production**. Chapter 6 which compares the alternatives does not discuss how likely one operation versus 10 operations would be or how different levels of production would increase or decrease employment levels.

Finally, after reviewing the Draft PEIS we strongly feel that the PEIS is missing important components. Below we have identified socioeconomic impacts that we feel have not been addressed or not addressed fully. These issues should be addressed prior to decisions being made.

Issue: A thorough, realistic, housing analysis must be included in the PEIS. The assumptions used concerning the use of "temporary" housing, especially the ability to locate buildable land and infrastructure for the housing and related structures seem very unrealistic. Additionally, a clearer discussion of the meaning of the concept "temporary", as it relates to workforce and housing, needs to be presented. One of the primary assumptions in Chapter 4.11 is that a high percentage of the workforce would be housed in temporary company housing. However, no data or research is presented that supports that assumption. The indirect and induced effect of the direct oil shale workers would create additional demand for housing that has not been adequately addressed in the PEIS. Affordable and attainable housing is a current concern in the ROI. Even a moderate spike in demand for housing will impact the entire community.

Recommendation: Include a complete, realistic, housing impact analysis in the PEIS. Research and present information from other similar projects throughout the world. Identify the elements included in the concept of "temporary" as it relates to workforce and housing needs and present

information and research regarding this "temporary" assumption when the timeline appears longer term. Present information or support documents regarding workers choosing to live in temporary work camps when the time frame may be longer term. Present information on the strengths and threats of this "temporary" or not so temporary workforce. Include in the "mitigation measures" the need for a housing program that would engage the industry, the community, and where necessary the state or federal government.

Issue: The baseline information related to housing vacancy is not a true picture. Vacant housing units can either be truly vacant and for sale or for rent, they can be "seasonal" housing or they can be second homes and not a primary residence. In this case and especially in this ROI it would be very wrong to assume that all vacant homes are available for use. Additionally, the BLM PEIS suggests that up to 15 % of the workforce would be accommodated in rental housing and motels - this seems unrealistic in a market with 1 - 3% vacancy rates.

Recommendation:
Review the Census Bureau vacancy data to identify what percentage of the housing units could be considered available for a local workforce and are not a part of the growing second home cohort. Review and revise assumptions that the local housing market could absorb 15% of the workforce.

Issue: There is no baseline data presented for community infrastructure capacity. (water, sewer, water treatment, energy, schools, hospitals, emergency management etc.) Without this baseline data it is impossible to evaluate what the community infrastructure demands will be with oil shale development. For example, will population increases due to oil shale development push local infrastructure capacity over their current planning horizon and create major unforeseen costs to local governments.

Recommendation: A standard state and local government fiscal analysis is needed which would include:

1) Community facility capacity over the period of analysis.
2) Baseline facility utilization rate (is there available capacity or a deficit?)
3) Project facility capacity requirements over time
4) Capital costs of facility capacity required by project impacts
5) Public revenues generates by the project
6) Discussion of the net of cost and revenues with regard to timing or jurisdictional mismatch.

Issue: One of the primary socioeconomic impacts resulting from population change is the impacts to local governments. Chapter 3 mentions that maintenance of county roads is the largest dollar impact to Rio Blanco County yet, in Chapter 4.11. there are no transportation/infrastructure costs included in the impact assessment. Additionally, other impacts to local governments are noted in terms of social disruptions (4.11.) and again, no costs are included in the analysis.

Recommendation: A more complete set of costs to local governments needs to be included in the analysis to enable an adequate evaluation of the total costs of oil shale development.

Issue: A cumulative socioeconomic analysis must be performed when more information is available. It does make sense to evaluate the magnitude and extent of the impacts at the project level, which it states in Chapter 2.6, however it is just as important to look at the cumulative impacts across all projects.

Issue: The socioeconomic data is not broken down by county in the PEIS and it is therefore impossible to accurately evaluate the impacts. The counties in the ROI in Colorado are very different from each other and their current conditions and policies will influence how the potential growth from oil shale development will impact their county and municipalities. The distribution of the socioeconomic impacts is very important to consider because it will impact resources and costs to the counties and municipalities differently.

Recommendation: Break the region of influence down by state and county to estimate the economic impacts.

Issue: One of the key assumptions is that the local economy in each ROI would minimally provide materials, goods, and services related to the construction and operation of oil shale facilities therefore reducing the risk of local inflation. The Draft PEIS makes the assumption that 50% of the materials and labor for the construction of temporary employer-provided housing and housing provided by local communities would come from each ROI. However, the price inflation created both in the labor market as well as in the housing materials/construction market are not included in the socioeconomic analysis. Current impacts from gas development in the ROI show that local factor price inflation does occur especially in the labor market, housing and housing/construction materials. Chapter 3 of the PEIS discusses the historical and current factor price issues yet it is not included in Chapter 4 of the PEIS.

Recommendation: The socioeconomic analysis must include a component that reflects the impact of the oil shale development on local prices in the labor, goods and services, and construction materials markets.

Issue: The total employment impact from a direct construction or direct operation job is not complete. The socioeconomic sections of the PEIS present the direct and indirect employment and income impacts using IMPLAN as the model source. We do not see that the work has included the "induced"effect, the spending of the income earned locally. Chapter 3 of the PEIS which presents the history of the prior oil shale boom and acknowledges that when the direct oil shale jobs pulled out that there were the indirect suppliers effected as well as the local businesses that provided services to the workers. The PEIS states in Chapter 3 "Exxon decided to close leaving 2100 oil shale workers and 7500 support workers unemployed. Our current research using IMPLAN shows that the employment multiplier for an oil and gas job is around 2.5 (each 1 direct oil and gas job creates an additional 1.5 indirect and induced jobs). The data in the PEIS shows the multiplier closer to 1.6 which is underestimating the true total impact of oil shale jobs by almost 100%.

Recommendation: Review the work from IMPLAN and provide information supportive of the low multipliers being used or adjust the multiplier to acknowledge the true total impact.

Issue: The impact to an area from a large new project(s) is not just in the "Boom" but also in the risk of the "Bust". Chapter 3 of the PEIS describes the historic context of the oil shale "boom and bust" yet no attention is paid to the risk of a "bust" in the impact analysis sections or in terms of mitigation. The ROI suffered a 20 year recession due to the last oil shale boom/bust.

Recommendation: The socioeconomic analysis must address the risk and impacts of a bust and what mitigation measures will be put in place to keep the ROI from suffering similar impacts from the previous oil shale boom and bust.

Issue: There is a cost to the loss of economic diversification which is related to the ability of a region to bounce back from either a bust or change in the business cycle. The socioeconomic analysis does discuss the impact of oil shale development on agriculture and on tourism in terms of total jobs and income but does not address how the loss of economic diversification increases the economic risks of the region.

Recommendation: Address the risks and/or costs of the loss of economic diversification caused by oil shale development on tourism, agriculture or other industries.