Final Report

Northwest Colorado Socioeconomic Analysis and Forecasts

- Socioeconomic Forecasts
- Fiscal Projections
- Model Documentation

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April 4, 2008

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Prepared for

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EXECUTIVE SUMMARY

Northwest Colorado Socioeconomic Analysis
EXECUTIVE SUMMARY

Northwest Colorado is in the first decade of an extraordinary period of challenges, risks and opportunities. As the focal point of one of the largest "gas plays" in North America—as well as the center of potential U.S. oil shale production further in the future—economic activity in this mostly rural region is rapidly expanding. But the region is severely challenged by the pace, locations and nature of these growth pressures. County and municipal governments and the private sector are also confronted with many risks—ranging from the uncertainties of national energy markets, and the possibility of changes in state revenue allocations, to the potential implications of failure to keep up with planning and the infrastructure upgrades needed to serve fast growing demands. With proactive regional efforts, local commitment to solving difficult challenges and ongoing technical and financial support from state and federal sources, the region has the potential to capitalize on this extraordinary period, maintain economic diversity and develop high quality, sustainable communities.

Background

In June 2007, the Associated Governments of Northwest Colorado (AGNC) with support from the Colorado Department of Local Affairs (DOLA) retained BBC Research & Consulting (BBC) to analyze existing socioeconomic conditions in northwest Colorado and forecast how those conditions may change with future natural resource (e.g. natural gas and oil shale) development. The study area focused on Mesa, Garfield, Rio Blanco and Moffat counties while recognizing the influences of major resorts in some adjoining counties and the interrelationship with similar natural resource development occurring in nearby areas of Wyoming and Utah. Exhibit ES-1 depicts the study area and surrounding edges of the region.

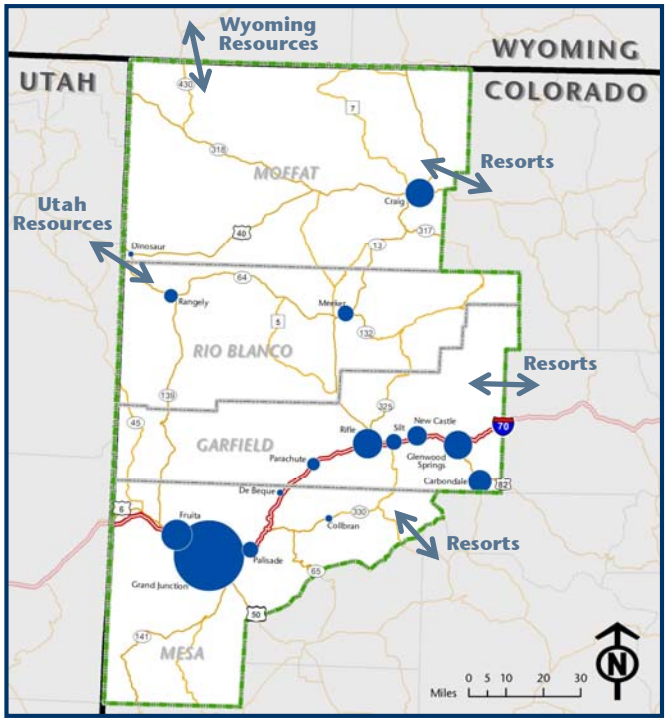
Exhibit ES-1. Northwest Colorado Study Region

Note:

Circles for cities and towns are sized in proportion to current population.

Source:

BBC Research & Consulting, 2008.



This project was funded by the State of Colorado and overseen by a committee of local government officials from the study area as well as representatives of affected state agencies. Day-to-day project management was provided by Ms. Judy Jordan, Energy Liaison for Garfield County and Mr. Aron Diaz, Director of the AGNC. Advisory board meetings were held approximately once per month during the eight-month analysis period. Extensive data, assistance and review was also provided by the Colorado State Demography Office (SDO).

The following is an overview of the key findings from this study. Implications and potential next steps are discussed at the end of this section.

Current Conditions and Recent Trends

Pre-2000 socioeconomic conditions: The economy of northwest Colorado was hit hard by the collapse of the oil shale industry in 1982. By the late 1990's, however, the region had experienced an economic resurgence based on multiple factors:

- Reasonable cost of living. Low housing costs and generally low costs of living, coupled with access to I-70, environmental quality and proximity of recreation, attracted businesses, small entrepreneurs and retirees.
- **Flourishing regional tourism.** Tourism, a longstanding component of the economy in the region and in the nearby resort areas, benefitted from strong national and international economic conditions.
- **Local tourism complemented agriculture and hunting.** Agriculture, ranching and hunting improved as beef prices rose, fruit orchards and wineries expanded, and wildlife management supported a strong local hunting and outdoor recreation industry.
- **Housing availability and cost meshed with demand from resort areas.** Housing for resort workers developed in response to the high cost of housing in nearby resort area (Pitkin, Routt and Eagle counties) economies.

This economic growth was not uniformly spread within the region, although virtually all areas witnessed some expanded economic activity.

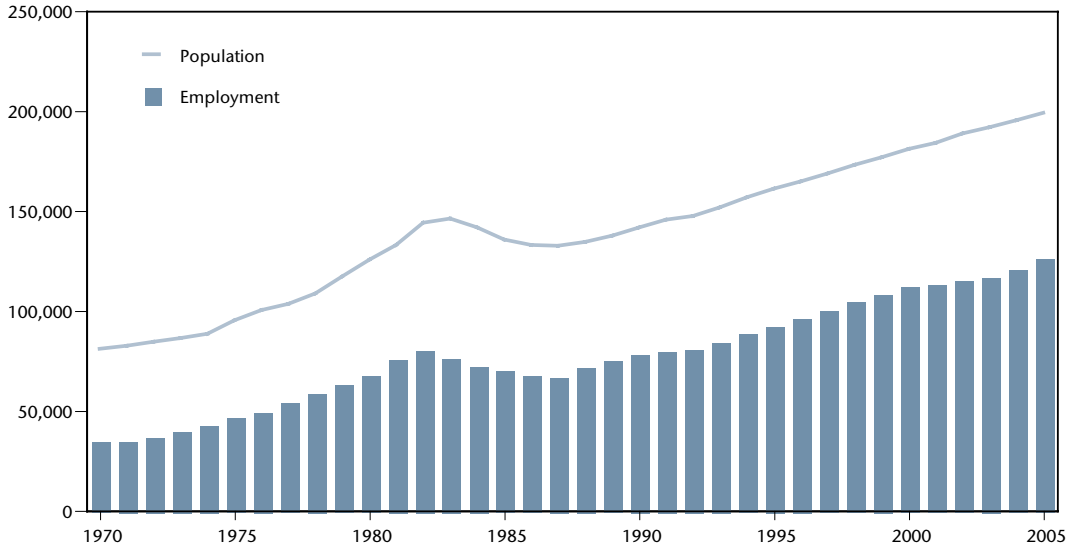
Changes since 2000: Since 2000, rapidly increasing natural gas development has been the most visible change in the region.

- **Energy emerges as a major economic driver.** Natural gas development and other natural resource industries are playing an increasingly important role in the northwest Colorado economy. In 2006, these industries accounted for 15 percent of total direct and secondary employment in the overall region but a far more concentrated proportion in various subareas of the four county region.
- **Skepticism remains concerning the long-term.** After many years of frustration over the collapse of the last energy boom, there remains considerable local skepticism regarding long-term growth forecasts. Nevertheless, the steadfast pace of current gas exploration and related employment growth is leading to growing acceptance that recent increases in gas development activity are predicated on fundamentally different economics than the 1978-1982 situation.

- **Dramatic increases in local housing and labor costs.** Housing costs in the study area, roughly 35 percent below comparable Denver metropolitan area costs just six years ago, now often match or exceed Denver area prices. Housing affordability issues, once considered a challenge of resort areas only, have become one of the study area's most pressing problems, particularly given the influx of young gas workers and the difficulties many businesses have in finding workers. Wages, particularly in occupations related to or competing with natural gas development, have also increased substantially.

Exhibit ES-2 depicts total employment and population in the region from 1970 through 2005.

Exhibit ES-2.
Four County Population and Employment Growth, 1970–2005



Source: U.S. Bureau of Economic Analysis.

Socioeconomic effects reach beyond the four county region: Although this analysis focuses on a four-county area, the implications of the area's economic growth extend beyond these boundaries:

- **Eagle, Pitkin and Routt counties**. These resort and retiree dominated economies sit on the periphery of the study area. For many years, study area communities offered a relief-valve for resort driven employee housing. This absorption capacity is largely gone and the resort area counties will have to act much more aggressively to find and house workers.

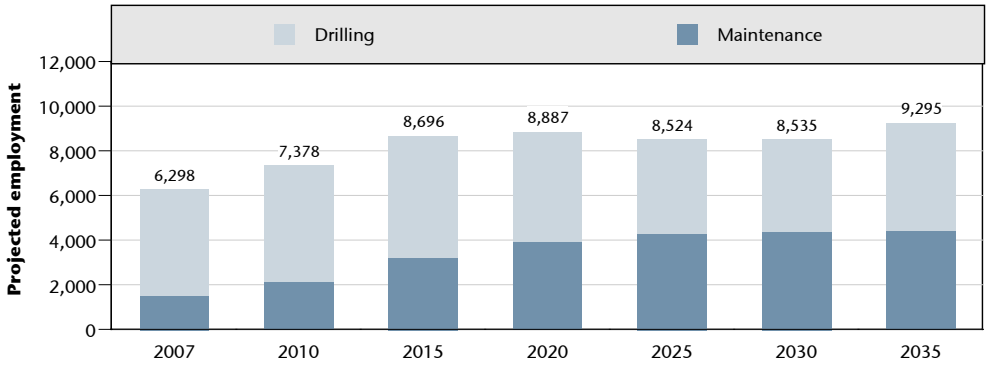
- **Northeast Utah and Southern Wyoming.** Northwest Colorado is part of an emerging regional economy. Vernal, Utah is becoming a major regional service community as the area's economy matures and may exert increasing influence in northwest Colorado. Traffic between Rock Springs, Wyoming and portions of the study region is increasing, particularly through Moffat and Rio Blanco counties.

Anticipated Future Natural Gas Activity

Gas drilling activity will expand, and then stabilize: Gas drilling is projected to continue to increase through 2015 then remain relatively stable through the end of the forecast period (2035).

- **Gas-related employment will continue to help drive the economy.** New drilling technology requires fewer workers per well than just a few years ago. Over time, more and more of the gas-related jobs in the region will be tied to maintaining and reworking existing wells. There are currently about 7,500 operating wells in the region. Even with stable drilling activity, an estimated 50,000 additional wells may be drilled over the next 30 years. All wells will require support, gas processing, maintenance and distribution. Barring unforeseen changes in the national supply and demand for natural gas, the industry will provide a long-term supply of jobs. Exhibit ES-3 below depicts projected direct natural gas-related employment through 2035.

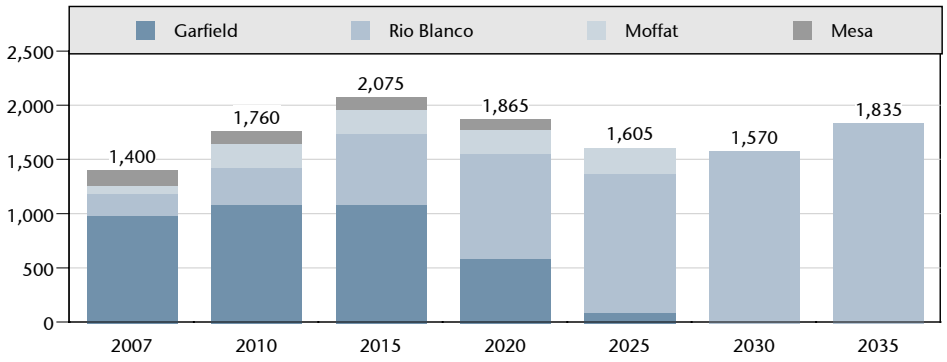
Exhibit ES-3.
Projected Natural Gas-Related Employment in Northwest Colorado, 2007–2035



Source: BBC Research & Consulting, 2008.

- **Geographic focus will shift to the north.** Gas development and the myriad of support services and secondary growth that accompanies this development will be a primary force behind growth in the region, particularly in Rio Blanco, Garfield and Moffat counties. Over the next two decades, the focus of new well development will shift north, from Garfield County to Rio Blanco County. Exhibit ES-4 below depicts the projected number of new wells drilled and completed by year and by county.

Exhibit ES-4.
Projected Annual Natural Gas Wells Drilled in Northwest Colorado, 2007–2035



Source: BBC Research & Consulting, 2008.

- **Risk of downturns in natural gas activity.** The gas development scenario developed for this study portrays expected overall activity levels over the next three decades. However, well drilling activity will vary from year to year in an unpredictable fashion. Changing market conditions and price levels may also lead to periods of faster or slower gas development within the region and corresponding fluctuations in local retail sales, employment and fiscal conditions. Although all current indications suggest gas development will be ongoing for the next several decades, it remains possible that unforeseen changes in markets, other supply sources or other factors could curtail development sooner than expected. Eventually, development of new wells will inevitably decline as production capacity approaches the limits of the economically recoverable gas resources in the region.

Baseline Growth—Without Commercial Oil Shale

Regional population will double: Approximately 210,000 persons lived in the four county region in 2006. Based upon projected growth in energy activity and growth in the other components of the region's economic base, the total population is forecast to nearly double to 417,000 residents by 2035—without development of a commercial oil shale industry. The most rapid growth will occur in the rural areas of western Garfield, Rio Blanco and Moffat counties, though Mesa County will gain the most total residents.

Exhibit ES-5. Population and Other Growth, 2005–2035 (Baseline Scenario)

Source:
Northwest Colorado Socioeconomic Projection model, BBC Research & Consulting, 2008 and State Demography Office, 2008.

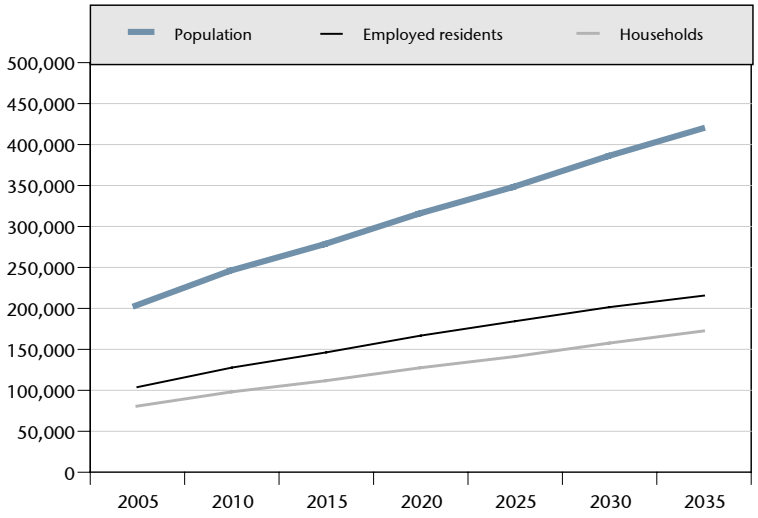


Exhibit ES-6 depicts projected population growth by county. Both Garfield County and Mesa County have their own long-term population forecasts (developed previously). In both cases, the county's forecast of future population growth is greater than the baseline forecast from this study. Consequently, both counties feel the baseline scenario may be conservative and could understate potential growth-related impacts.

Exhibit ES-6.
Population by County, Baseline Scenario

		Projected Population					
County	2005	2010	2015	2020	2025	2030	2035
Garfield	50,673	67,253	78,393	95,860	109,894	119,979	136,697
Mesa	130,662	148,594	166,410	182,170	196,824	220,594	235,272
Moffat	13,426	17,705	19,798	22,014	24,257	25,483	26,356
Rio Blanco	6,073	9,753	11,360	13,055	14,724	16,822	18,624
Total	**200,834**	**243,305**	**275,961**	**313,099**	**345,699**	**382,878**	**416,949**

Note: Excludes commercial oil shale activity.

Source: Northwest Colorado Socioeconomic Projection Model, BBC Research & Consulting, 2008 and Colorado State Demography Office, 2008.

- **Communities will be challenged to absorb growth.** Under the baseline scenario, the foreseeable capacity of existing local municipalities to absorb growth is largely consumed. Consequently, a large share of future growth is assigned to unincorporated areas. This level of development in places like unincorporated Rio Blanco and Moffat counties may be infeasible, given zoning and practical development limitations, and may well be undesirable. Local municipalities, with state, federal and private industry assistance, may find ways to overcome some of the barriers constricting development and expanding capacities to accommodate another level of growth. Those communities capable and willing to accommodate demand will grow at rates far greater than the regional average.

- **New communities may be needed.** Conversely, some local communities will be unable to solve capacity shortcomings or unwilling to accept the changes necessary to accommodate the demands foreseen in this analysis. In some instances, these constraints have to do with physical barriers or absence of private lands, which are difficult challenges to overcome. Under these circumstances, entirely new towns may be needed. Where, when and how these towns would be created and financed is unknown.

- **How growth will be accommodated is uncertain.** In all likelihood, much of the growth allocated to unincorporated areas (particularly in Rio Blanco County) will need to be accommodated by some combination of further expansion of the capacity of existing municipalities, planned higher density developments (or new towns) in currently unincorporated areas, employer provided housing and/or shifting population growth to other counties in the region. Some population growth may also shift to the Vernal, Utah area.

- **Agriculture and regional character will be impacted.** Growth of both incorporated and unincorporated populations will accelerate the conversion of agricultural lands to other purposes. This conversion will further change the character of parts of northwest Colorado.

- **Disproportionate impact will occur in some areas.** Gas drilling is expanding north into Rio Blanco County, and will create pressure for commercial and residential development, if capacity can be created. Nevertheless, a substantial share of support and regional services are likely to remain based in Mesa County and Grand Junction, the largest city in the region.

- **Dependency on gas-related employment will grow in certain areas.** Under the baseline scenario, the proportion of the region's economy related to natural resources (primarily natural gas) is forecast to increase from about 15 percent at present to around 16 to 17 percent between 2010 and 2015, then decline slightly through 2035. However, the vast majority of growth in Rio Blanco County will be gas-related. As shown in Exhibit ES-7, by 2035 over 80 percent of jobs in Rio Blanco County will be energy-related.

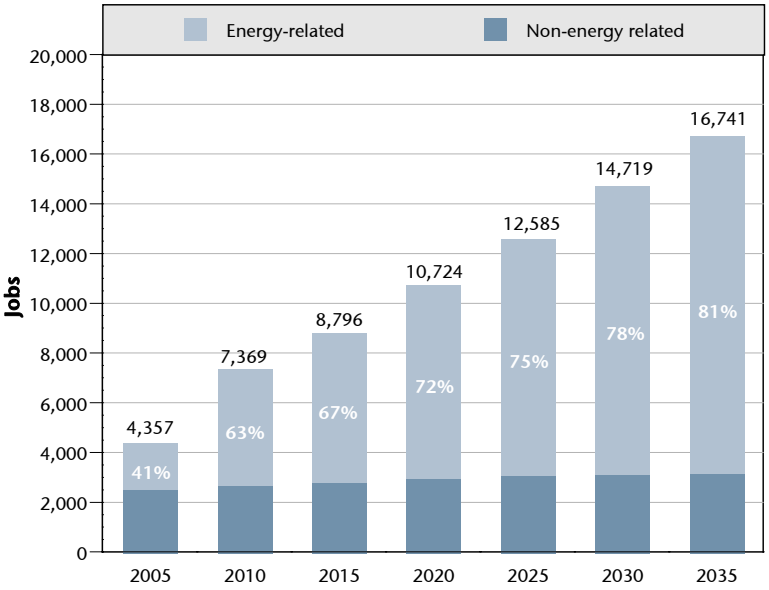
Exhibit ES-7. Total Jobs in Rio Blanco County, 2005–2035 (Baseline Scenario)

Note:

County energy job totals reflect work-site for natural gas jobs, not necessarily corporate office locations for the workers.

Source:

Northwest Colorado Socioeconomic Projection model, BBC Research & Consulting, 2008.



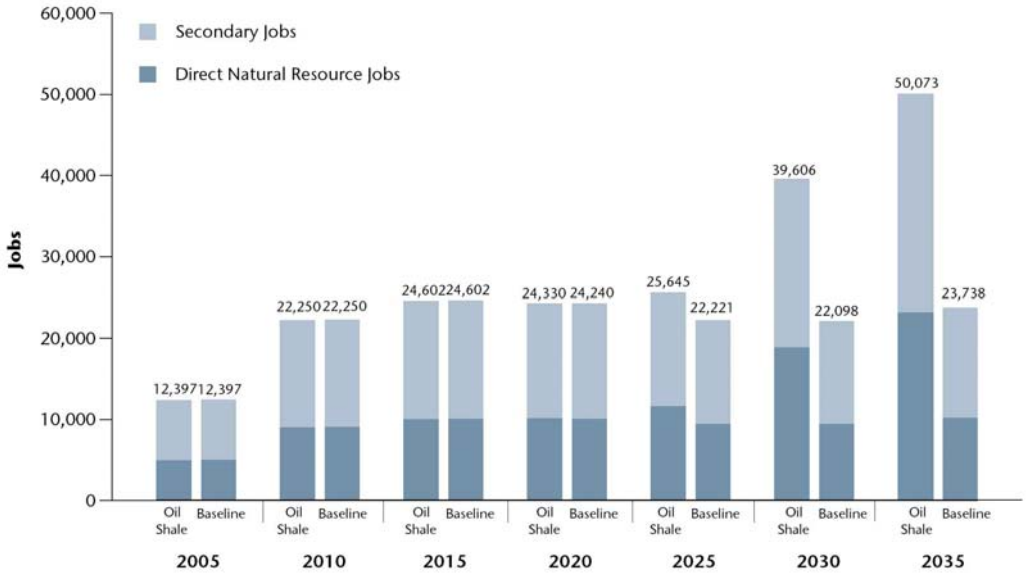
Potential Commercial Oil Shale Development

Commercial oil shale appears more likely than in the past: The viability of commercial-scale oil shale development remains uncertain, but the prospects appear better than in the past. Substantial private sector resources have been committed to solving the technical, environmental and economic issues associated with oil shale extraction and conventional oil supply, and price trends appear increasingly favorable to oil shale.

- **Initial commercial production is likely more than ten years away.** The study team expects the timing of future oil shale production to be consistent with estimates in the Draft Bureau of Land Management Preliminary Environmental Impact Statement (PEIS). The PEIS, however, does not estimate the magnitude of potential development. The study team has developed a scenario for rapid, yet reasonably foreseeable, oil shale development based on the experience with oil sands production in Alberta, Canada.

- **More than twenty-five thousand direct and secondary workers by 2035.** Within Colorado, commercial production is forecast to begin on a small scale in 2021. After 2025, about 50,000 barrels per day (bpd) of annual capacity is projected be added each year. All production will take place in Rio Blanco County. By 2035, oil shale development will require more than 9,300 direct workers. In addition, about 4,500 workers will be needed to produce additional natural gas as well as construct and maintain the electrical generation facilities necessary to meet oil shale's energy requirements. Over 12,000 secondary jobs would also be required to support the industry and its workforce. Exhibit ES-8 shows the additional direct and secondary energy-related jobs associated with commercial oil shale production compared to the baseline scenario.

Exhibit ES-8.
Direct and Secondary Energy-Related Jobs,
2005–2035 (Commercial Oil Shale Scenario versus Baseline Scenario)



Source: Northwest Colorado Socioeconomic Projection model, BBC Research & Consulting, 2008.

- **Oil shale challenges will grow beyond 2035.** The year 2035 is the end of the modeling period for this study, but does not represent the end of the surge in oil shale production. The commercial oil shale scenario embodied in the model anticipates production levels of about 500,000 bpd by 2035. The U.S. Department of Energy has called for development of an industry capable of producing 2 million bpd, and Colorado has the best oil shale resources in the nation.

- **Environmental and socioeconomic constraints.** The potential introduction of commercial oil shale development will exacerbate the environmental and socioeconomic concerns already associated with the study area's rapid development. Major challenges include water conservation, greenhouse gas (GHG) emissions, land disturbance, waste management and existing environmental standards and limits. From a socioeconomic perspective, major issues of concern include an overwhelming demand on a limited population of skilled laborers and the affordability and availability of housing in the region.

Economic and Demographic Effects of Commercial Oil Shale Production

Oil shale would add 50,000 residents by 2035: With the development of commercial oil shale, the population is forecasted to reach nearly 466,500 by 2035 — nearly 50,000 more people than under the baseline scenario. Exhibit ES-9 compares projected county populations under the Commercial Oil Shale scenario with the Baseline scenario projections.

Exhibit ES-9.
Projected County Populations, Commercial Oil Shale Scenario

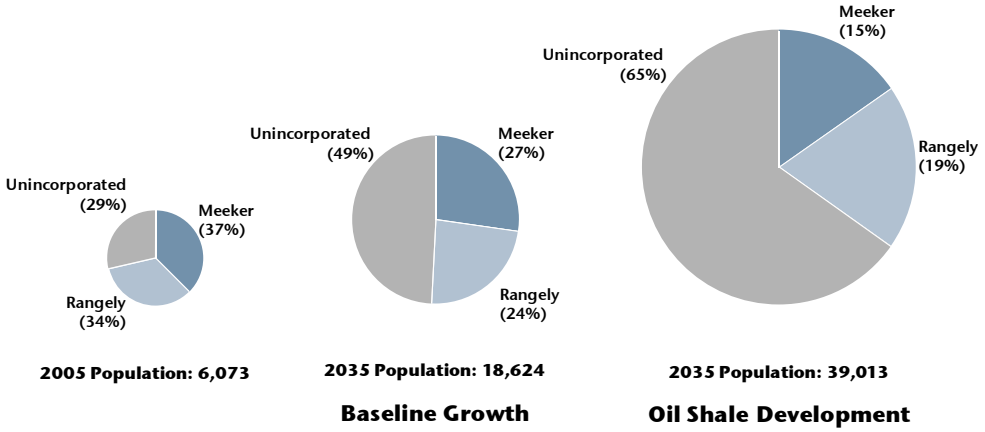
	2005 Population	2035 Population		Difference
		Baseline	*Oil Shale*	
Garfield County	50,673	136,697	154,301	17,604
Mesa County	130,662	235,272	241,746	6,474
Moffat County	13,426	26,356	31,487	5,131
Rio Blanco County	6,073	18,624	39,013	20,389
Total Region	**200,834**	**416,949**	**466,547**	**49,598**

Source: Northwest Colorado Socioeconomic Projection Model, BBC Research & Consulting, 2008 and Colorado State Demography Office, 2008.

- **Little room in existing towns for the added growth.** The region, and particularly Rio Blanco and Garfield counties, would already face significant challenges just to accommodate projected growth under the baseline scenario. There appears likely to be little additional capacity in existing local municipalities—except perhaps in Mesa County—to accommodate the additional residents associated with oil shale production, construction of new oil shale facilities, and development and operation of power plants to supply required electricity.

- **Rio Blanco County will face extraordinary growth pressures.** Northwest Colorado's most rural county will face extraordinary growth pressure if commercial oil shale develops as envisioned in this study. The county is unlikely to accommodate all of the growth pressure it will face under the baseline scenario, in which the population is forecast to triple between 2005 and 2035. With the development of commercial oil shale, Rio Blanco's population is projected to exceed 39,000 residents — more than double the baseline forecast of about 18,600 people. Exhibit ES-10 depicts the relative size and forecast distribution of Rio Blanco County's population in 2005 and 2035 under the baseline and commercial oil shale scenarios. The projected population levels in Meeker and Rangely reflect estimated capacity limits for each town, it is not known how or where the remainder of the population growth (shown in unincorporated) would be housed. (*Meeker recently re-examined its capacity in a new study and believes it could accommodate up to 10,000 people—which would take some pressure off of the rest of the county*).

Exhibit ES-10.
Rio Blanco County Population Distribution, 2005 and 2035



Source: BBC Research & Consulting, 2008.

- **Further rapid and unpredictable expansion is possible.** If commercialization progresses, the oil shale industry has the potential to expand very rapidly—very likely overwhelming the capacity of local governments to deal with growth requirements.

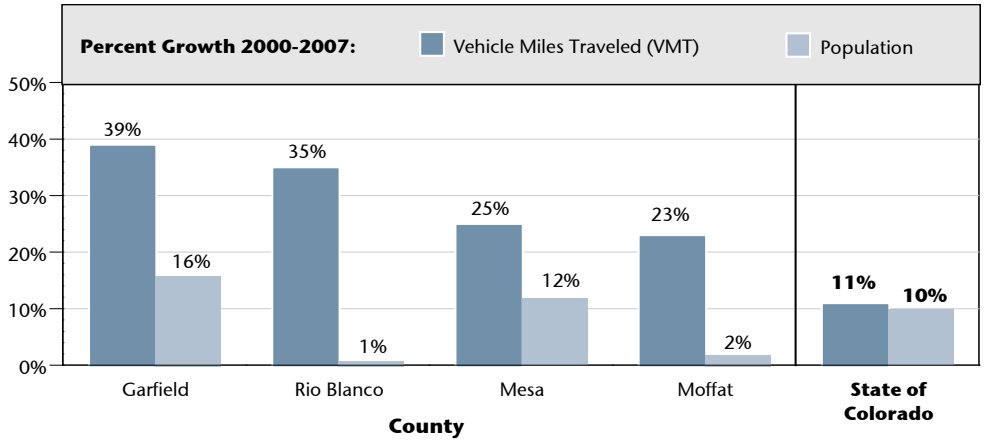
Public Sector Financial Implications

Municipal growth capacity and related financial support are pressing issues in Garfield, Rio Blanco and Moffat counties: The levels of growth anticipated in three of the four counties in the study area exceed the reasonably long-term capacity of existing communities. Rifle and nearby communities are already stretching to accommodate additional development, and Rio Blanco and Moffat counties have minimal growth capacity.

- **Accommodating growth in this region is very challenging.**
  - The area is among the most rural in the United States and local communities have very limited ability to absorb and service new development.
  - Public lands and topographic barriers can force inefficient development patterns.
  - Existing road systems were never intended to serve high levels of traffic and heavy trucks. Projected street maintenance and repair costs are staggering expenses for most communities.
  - Worker shortages, compounded by rising housing and cost of living expenses, make retention of service workers difficult and expensive. Similarly, the absence of contractors and the competition for their services along with shortages of materials drives up the costs of new projects and personnel.
  - Capital investment is needed far in advance of likely revenue. As a rule, residents arrive first and revenues follow, sometimes years later. Nevertheless, residents require public services, streets and utilities from the day of arrival.
  - The problems with TABOR expenditure limitations, which require population to be in place before increased spending can be allowed, compound service provision problems.

- **Gas activity produces high volumes of traffic in an area with limited road system capacity.** The gas industry is decentralized and highly mobile, and its employees and subcontractors commute each day to job sites in remote areas. High volumes of vehicle and truck traffic will continue even as activity turns from drilling to maintenance. Road expansion, a mixture of surface improvements, system expansions, safety enhancements, and on-going maintenance, are the most pressing needs. Funding for radical system alterations, such as new access routes into Rio Blanco County or additional bridges over the Colorado River are not included in these forecasts. Without the I-70 spine, which mitigated impacts in the recent gas development periods, growth in the next phase of resource development will be more difficult to accommodate.

Exhibit ES-11.
Traffic Congestion and Population Growth



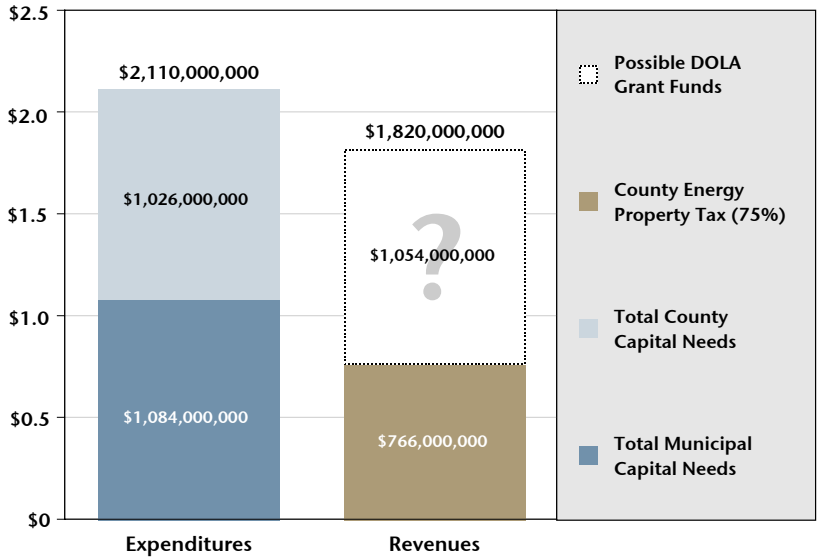
Source: Colorado Department of Transportation, 2007.

- **Housing and worker shortages will continue to restrict community development .** The gas industry has the ability to pay high wages and aggressively compete for workers. Although beneficial for local residents, this competition for workers and housing has strained many other local businesses and local governments, hospitals and schools. Housing costs have risen rapidly in the area and housing of any kind is scarce, making attraction of new residents difficult.

- **Funding and timing of critical capital infrastructure, such as roads, water, sewer and community amenities are the study area's primary fiscal challenges.** Under baseline conditions, BBC 's estimates suggest $2.1 billion dollars of necessary infrastructure investments (road, bridges, administrative facilities, water, sewer, parks and recreation) over the next 28 years with projected energy related property tax funding of about $1.0 billion. If past funding ratios hold true, there is the prospect of state discretionary grants for roughly an additional billion dollars. There is considerable uncertainty in capital cost estimates and the region-wide numbers obscure revenue/cost imbalances between jurisdictions.

Exhibit ES-12. Cumulative Capital Needs and Revenues

Source:
BBC Research & Consulting, 2008.

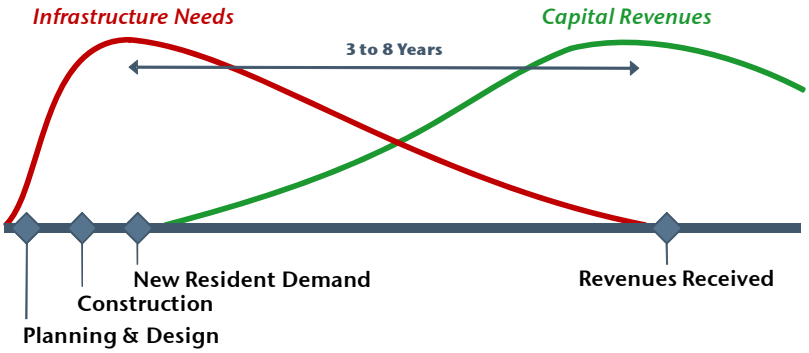


There remain about $300 million of capital investment needs that will require additional local, private, state or Federal participation

- **The lag -time between infrastructure need and tax revenue exacerbates funding problems.** Simply stated, residents need functioning communities when they arrive, but most revenue sources (property taxes, sales taxes and severance taxes) occur only after new workers are in place, drilling and production is complete, and tax-revenue flowing. This tax lag problem is further compounded by the need to plan, design and construct infrastructure even before resident relocation.

Exhibit ES-13. Public Investment Timing Issue

Source:
BBC Research & Consulting



- **Uncertainty undermines investment strategies.** Natural resource extraction has traditionally been a boom-and-bust business. Changes in gas development economics, rising or declining prices, and the uncertainty of tax revenue redistribution make infrastructure investment difficult. Gas prices are uncertain and the pace and value of extraction is subject to sudden swings. This makes both private and public investment decisions, which are often made in anticipation of future events, more difficult.

- **Resource derived property taxes will rise substantially as new wells come online.** Natural resource-based property taxes will rise rapidly as the region goes from nearly 8,000 to nearly 40,000 operating wells. In aggregate, the four counties will be in strong fiscal position to cover operating costs, but revenue timing and imbalances between service delivery responsibility and tax revenue collections will remain. Local communities will also benefit from expected increases in severance tax and federal royalty payments, which are distributed based on energy worker residence.

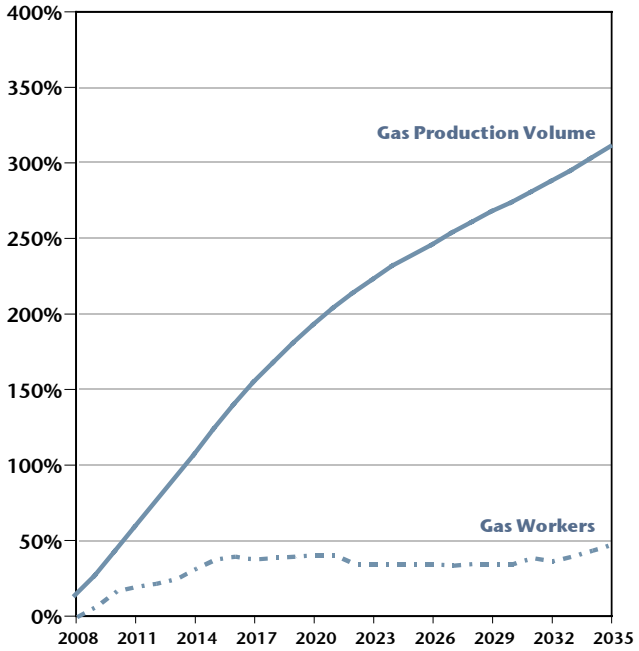
Exhibit ES-14. Projected Increases in Regional Gas Production and Workforce

Note:

Projected increased relative to 2006.

Source:

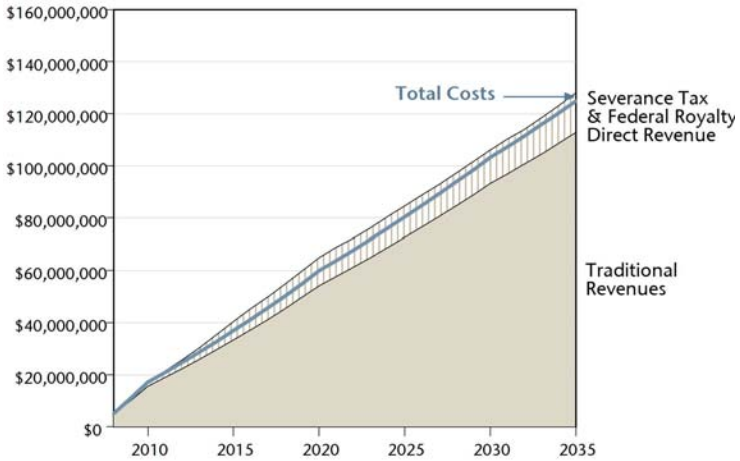
Northwest Colorado Socioeconomic Projection Model, BBC Research & Consulting, 2008.



- **Federal royalties and severance tax revenue production from northwest Colorado will grow rapidly, but distribution of revenues to this region is uncertain.** Northwest Colorado federal royalty and severance tax payments are projected to rise very rapidly in line with gas production. The percentage of production on federal lands (subject to federal royalty taxes) will more than double, stimulating federal royalty payments. As tax production in this area grows, other Colorado gas and oil fields will likely decline dampening the overall growth in statewide collections. If severance tax and Federal Royalty payments to local municipalities rise in line with state collections, local municipalities will be well positioned to meet operating obligations.

Exhibit ES-15
Annual Municipal Operation Costs and Revenues

Source:
BBC Research & Consulting, 2008.



These resource-based revenues will be substantial but local communities have no assurance that redistribution of production-based taxes will continue in the present manner or grow in proportion to local gas productivity.

- **Local ability and willingness to expand self-funding capacity is uneven.** Certain communities—larger cities with strong retail sales, towns that can attract higher value development and communities with aggressive impact fees—will be able to fund much of what is required to service rapid residential growth. As energy development migrates northward, affecting the smaller and more remote communities of Rio Blanco and Moffat counties, growth-financing capacities become more constrained and infrastructure solutions will require more regional or state support. Communities that retain TABOR limitations will be hard pressed to maintain services.

- **A commercial oil shale industry will overwhelm the area's rural public infrastructure.** Oil shale leasing costs are undetermined. Some form of major financial intervention and regional planning effort will be required to develop requisite infrastructure at the appropriate time in preparation for worker needs.

Potential Next Steps

This study provides economic, demographic and fiscal forecasts for northwest Colorado based on the best information available at this time. This effort has also produced an economic and demographic model that can incorporate revised data concerning future natural resource development as conditions change.

Perhaps most importantly, the information described in this report points out a number of risks and challenges confronting local governments in northwest Colorado. These challenges are well described in the words of the local governments in the region. Section VII of this report provides comments from several local governments based on the initial draft of this report.

While this study provides a starting point, much more work needs to be done to address the challenges facing this region over the next three decades. A regional perspective and Adaptive management that responds to changing conditions is essential. The collaborative Task Force of local government and state agency representatives that supervised development of this report has indicated a willingness to continue collaborative efforts. Productive areas for further research, analysis and policy development include, but are not limited to:

- Monitoring of resource management, development and extraction trends;
- Revising and updating socioeconomic data and forecasts as conditions change;
- Expanding regional transportation planning, modeling and impact analysis efforts;
- Monitoring and updating revenue and cost projections;
- Coordinating regional efforts for infrastructure planning, development and financing;
- Expanding partnerships with state government and industry;
- Evaluating local financing and impact mitigation strategies that could address capital needs, cash flow issues and risk management;
- Evaluating land use planning and growth management tools and identifying locations where growth may best be accommodated;
- Coordinating attainable and affordable housing efforts;
- Evaluating strategies to address issues and opportunities created by a large, transient workforce; and
- Identifying strategies for community sustainability in the eventual, post-production era.

SECTION I.
Introduction

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Introduction

This report documents the development and calibration of the Northwest Colorado Socioeconomic Projection (NWCSP) model and presents socioeconomic and fiscal forecasts for a multi-county region of northwest Colorado. This area is experiencing rapid growth associated with natural gas development and the expansion of regional services and other basic industries. The study area may eventually host a burgeoning oil shale industry, which is also a focus of this analysis.

The study area encompasses Mesa, Garfield, Rio Blanco and Moffat counties although economic projections recognize the resort influences in some adjoining counties and the interrelationship with similar resource development in nearby Wyoming and Utah. This report was published in April 2008.

Background and Objectives

In June 2007, the Associated Governments of Northwest Colorado (AGNC) with support from the Colorado Department of Local Affairs (DOLA) retained BBC Research & Consulting (BBC) to accomplish the following project objectives:

- Develop and document likely natural gas and commercial oil shale scenarios and employment projections.
- Forecast population growth for the region based on projections of underlying basic industries, including regional tourism, agriculture, retiree attraction and natural resource development.
- Document the growth capacity of area communities and distribute projected population growth in light of employment location as well as community capacity and attractiveness.
- Communicate the character and quantity of development effects in this area and describe the implications of growth and associated urbanization.
- Forecast fiscal consequences of development for local municipalities and counties.
- Create a flexible, updatable socioeconomic model that integrates with the Colorado State Demography Office's (SDO) internal modeling system, and can serve as a forecasting tool on a continuing basis.

State, Federal and local policy makers are faced with a series of decisions about the use of federal lands, regulation of traditional energy development and the effects of large-scale oil shale and tar sands development. This study, and the development of the NWCSP model, was initiated in response to the immediacy of these decisions, and the relative absence of authoritative information regarding the consequences of regional development alternatives.

This project was funded by the State of Colorado and overseen by a committee of local government officials from the study area and representatives of affected state agencies. Day-to-day project management was provided by Ms. Judy Jordan, Energy Liaison for Garfield County and Mr. Aron Diaz, Director of the AGNC. During the course of this analysis, interviews were conducted with representatives of most of the area counties, school districts and municipalities. Extensive data, assistance and review was provided by the SDO. Advisory board meetings were held approximately every six weeks during the eight month analysis period.

Report Organization

Following this introduction, Section II provides an overview of the area's economic base and socioeconomic conditions, including the study areas' economic relationship with energy development in surrounding states and resort influences in contiguous counties. Section III describes the natural gas development industry and prospective oil shale development. Section IV documents the socioeconomic and demographic effects of future development while Section V describes the projected distribution of regional employment and population growth. Section VI highlights conclusions regarding the fiscal impacts of growth. Section VII provides insights from local governments regarding the implications of the growth they are facing now and in the future. The appendix offers additional fiscal modeling details.

SECTION II.
Economic and Demographic Trends and Current Conditions in Northwest Colorado

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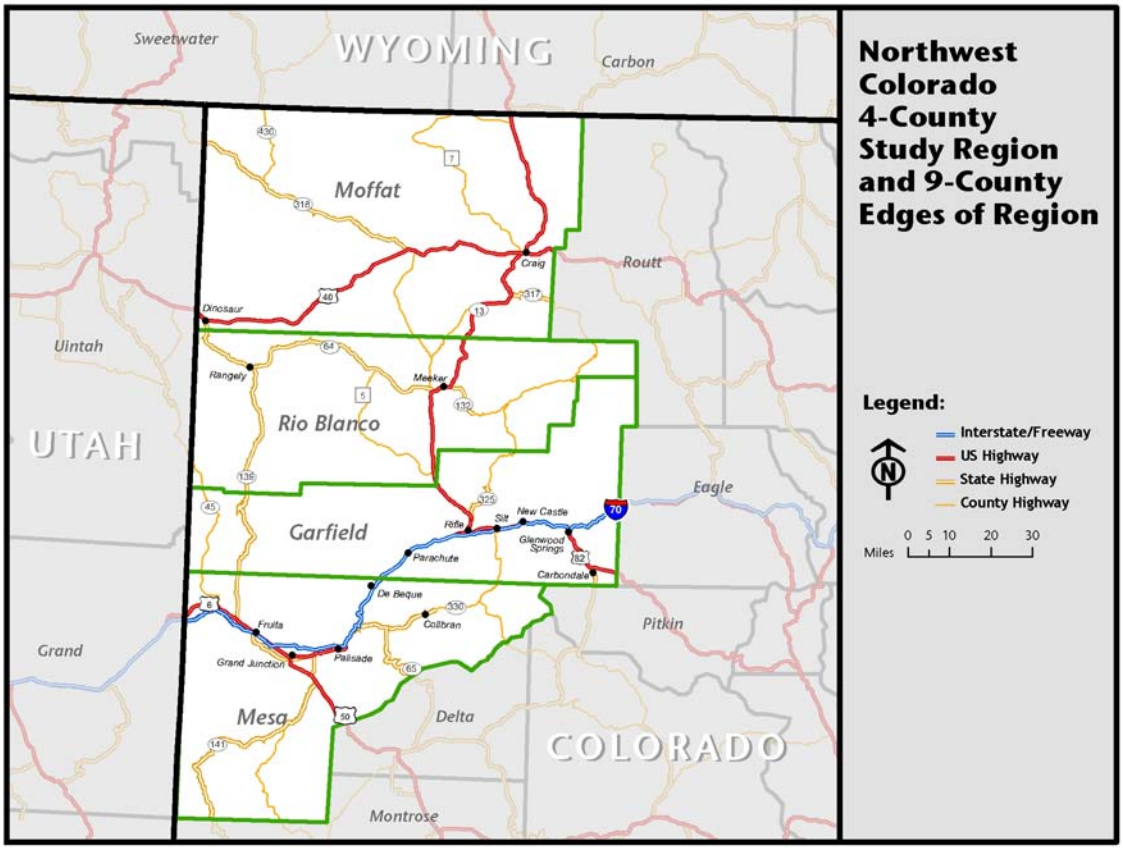
Economic and Demographic Trends and Current Conditions in Northwest Colorado

This section discusses economic, labor force and demographic trends and current conditions in the four county study area in northwest Colorado. It also provides information on the "edges of the region" — the nine counties in Colorado, Utah and Wyoming with commuting, trading and other economic ties to the primary study area.

Study Area

The four county study area, including Garfield, Mesa, Rio Blanco and Moffat counties, covers a total area of about 14,280 square miles in northwest Colorado. The largest communities in the region include Grand Junction, Craig, Rifle and Glenwood Springs. The four county primary study region and the surrounding nine county "edges of region" are shown in Exhibit II-1.

Exhibit II-1.
Four County Study Region and Nine County Edges of Region



Source: BBC Research & Consulting, 2008.

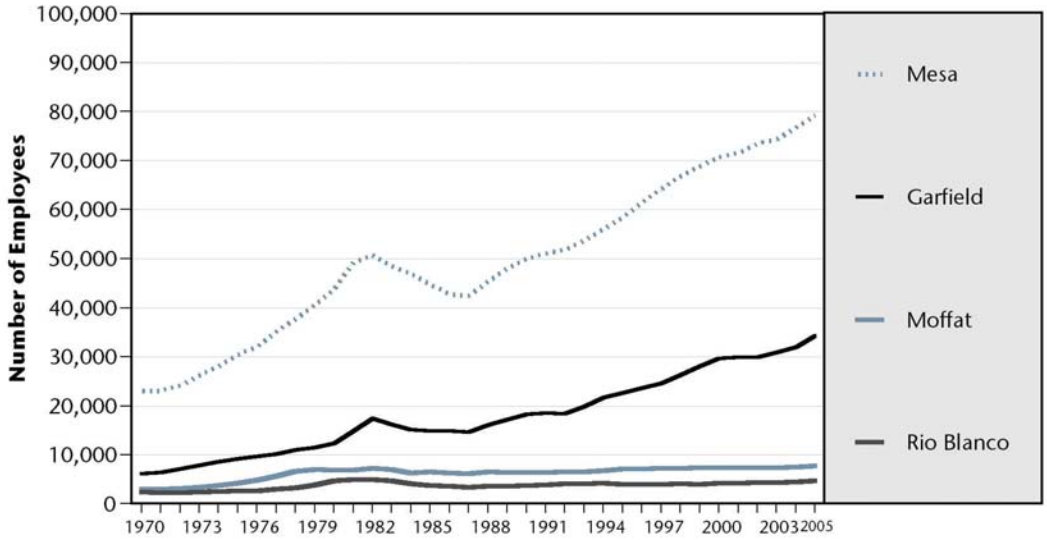
Economic Trends and Current Conditions

The following discussion describes historical economic and employment trends, including an overview of the "oil shale bust" and subsequent economic contraction in the region between 1982 and 1987. This subsection also describes the current economic base — activities that bring money in from outside the region and drive employment growth in the region.

Long-term employment trends. Between 1970 and 2005, employment throughout the four county region grew from 34,500 to 126,000 full- and part-time jobs (Bureau of Economic Analysis). This represents an increase of over 265 percent, or an annual growth rate of about 3.8 percent. This expansion outpaced employment growth statewide, which was almost 200 percent (3.2 percent compound annual rate) over the same period.

Some counties have experienced much stronger employment growth than others. Mesa County is home to roughly half of the jobs in the region. Between 1970 and 2005, employment in Mesa County grew at a compound annual rate of 3.6 percent. Garfield County experienced the strongest employment growth over the period at a compound annual rate of 5.1 percent. Moffat and Rio Blanco counties experienced slower employment growth with annual rates of 2.8 and 2.0 percent, respectively. Exhibit II-2 shows employment growth by county over this 35-year period.

Exhibit II-2.
Employment Totals, 1970–2005



Source: Bureau of Economic Analysis.

Employment in the "edges of the region." In the counties on the edges of the study region, Colorado resort communities experienced the strongest job growth. Employment in Eagle County grew most rapidly at 7.2 percent per year, followed by employment in Routt County (5.6 percent) and Pitkin County (4.8 percent). Employment growth in Sweetwater County in Wyoming as well as in Grand and Uintah counties in Utah were more modest at about 3.3 percent annually. Delta County in Colorado and Grand County in Utah experienced slower annual employment growth at 2.8 and 2.4 percent, respectively. Carbon County in Wyoming experienced very little employment growth over the 35-year period (0.9 percent annually) due to a contraction in employment starting in the early 1980s.

Job growth by sector. Because the NAICS industry classification system was implemented in 1997, examining long-term historical trends in employment requires use of the older SIC system. Exhibit II-3 shows job growth over the 30-year period between 1970 and 2000 by SIC sector for the four county region.

Exhibit II-3.
Industry Sector Growth, 1970–2000

Industry (SIC)	Employment 1970	Employment 2000	Numeric Change	Annual Percent Change	Statewide Annual Percent Change
Farm employment	3,142	3,659	517	0.5%	-0.1%
Agricultural services, forestry and fishing	220	1,670	1,450	7.0%	6.5%
Mining	1,656	1,892	236	0.4%	0.8%
Construction	2,076	12,110	10,034	6.1%	4.7%
Manufacturing	2,192	5,483	3,291	3.1%	2.0%
Transportation and public utilities	1,932	5,059	3,127	3.3%	3.6%
Wholesale trade	877	3,594	2,717	4.8%	3.1%
Retail trade	6,605	21,215	14,610	4.0%	3.7%
Finance, insurance and real estate	2,576	9,535	6,959	4.5%	4.1%
Services	6,568	33,057	26,489	5.5%	5.4%
Government	6,375	14,446	8,071	2.8%	1.7%
All industries	**34,467**	**111,931**	**77,464**	**4.0%**	**3.6%**

Source: Bureau of Economic Analysis.

Job growth by location. Between 1970 and 2000, the service sector experienced the largest total job growth, contributing about one-in-three of all new jobs in the four county region. Retail trade and construction saw large employment increases, and the latter saw the highest annual growth rate over the 30-year period of all major industries in the study area. Farm employment and mining experienced the smallest employment increases and the lowest growth rates over the 30-year period. Exhibit II-4 shows the growth of each sector by county over the 30-year period.

Exhibit II-4.
Absolute and Percent Annual Employment Growth by Industry, 1970–2000

Industry (SIC)	Garfield Number	Garfield Percent	Mesa Number	Mesa Percent	Moffat Number	Moffat Percent	Rio Blanco Number	Rio Blanco Percent
Farm employment	91	0.5%	549	1.1%	-79	-0.4%	-44	-0.4%
Agricultural services, forestry and fishing	673	10.7%	597	5.4%	191	7.7%	*	*
Mining	-118	-1.1%	-97	-0.5%	334	3.2%	117	0.9%
Construction	4,793	8.3%	4,974	5.6%	204	2.9%	63	0.9%
Manufacturing	539	5.8%	2,704	2.9%	1	0.0%	47	4.8%
Transportation and public utilities	543	3.5%	2,049	2.9%	*	*	4	0.1%
Wholesale trade	710	7.9%	1,756	4.0%	*	*	*	*
Retail trade	4,014	4.6%	9,525	3.9%	868	3.5%	203	1.7%
Finance, insurance and real estate	2,329	5.8%	4,270	4.1%	258	3.4%	102	3.0%
Services	7,385	6.8%	17,250	5.3%	1,391	5.5%	463	2.9%
Government	2,679	4.8%	4,026	2.2%	728	2.9%	638	2.7%
Total	**23,638**	**5.4%**	**47,603**	**3.8%**	**4,449**	**3.1%**	**1,774**	**1.9%**

Note: * Data suppressed
Source: Bureau of Economic Analysis.

Employment dynamics from 1982–1987. In the 5-year period from 1982 to 1987, the four county region experienced a significant decline in population and employment. This decline was due in large part to the abandonment of oil shale by the oil and gas industry. On May 2, 1982, now known as "Black Sunday," Exxon terminated its large oil shale project on the Western Slope, and TOSCO (The Oil Shale Company) and UNOCAL soon followed. The oil shale bust resulted in a large exodus of workers from the Western Slope. Among the remaining population in the four county study region, the rate of unemployment rose to over 10 percent through 1987.

Examining this period highlights the historical dependence of the region on energy development. The four county region experienced a 17 percent employment decline between 1982 and 1987. Exhibit II-5 shows changes in employment over the 5-year period spanning the oil shale bust.

Exhibit II-5. Employment changes, Four County Study Region, 1982–1987

Note:
Rows do not sum to "all industries."

Source:
Bureau of Economic Analysis.

Industry (SIC)	Employment 1982	Employment 1987	Numeric Change	Percent Change
Farm employment	3,384	3,277	-107	-3.2%
Agricultural services, forestry and fishing	735	920	185	25.2%
Mining	4,971	2,785	-2,186	-44.0%
Construction	10,243	3,855	-6,388	-62.4%
Manufacturing	3,368	3,655	287	8.5%
Transportation and public utilities	4,162	2,740	-1,422	-34.2%
Wholesale trade	2,710	2,143	-567	-20.9%
Retail trade	15,089	12,505	-2,584	-17.1%
Finance, insurance and real estate	7,254	5,769	-1,485	-20.5%
Services	16,687	16,901	214	1.3%
Government	9,688	10,332	644	6.6%
All industries	**80,208**	**66,570**	**-13,638**	**-17.0%**

Between 1982 and 1987, employment in the mining industry, including jobs in energy development, declined by almost 2,200 jobs, or about 44 percent. The effects of the oil shale bust were felt across all other industries as well. Hardest hit was the construction industry, in which almost two out of every three jobs (about 6,400) were lost. Other industries hit hardest by the economic decline included transportation and public utilities (34.2 percent), wholesale trade (20.9 percent) and finance, insurance and real estate (20.5 percent). In some areas, foreclosures more than quadrupled from their pre-1982 levels, and bankruptcies doubled.[1]

[1] Chakrabarty, Gargi. "Exxon puts the squeeze on gas." *Rocky Mountain News*. June 24, 2006.

Exhibit II-6 shows the industries and areas hardest hit within each county as a result of the oil shale bust.

Exhibit II-6.
Absolute and Percent Job Loss by Industry by County, 1982–1987

	Garfield		Mesa		Moffat		Rio Blanco	
Industry (SIC)	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Farm employment	59	9.7%	-175	-9.2%	-30	-5.2%	39	12.6%
Agricultural services, forestry and fishing	-33	-14.1%	124	29.2%	44	73.3%	50	312.5%
Mining	565	369.3%	-2,218	-83.6%	192	26.2%	-725	-50.6%
Construction	-2,622	-68.2%	-2,499	-52.4%	-648	-75.3%	-619	-80.1%
Manufacturing	212	66.0%	151	5.3%	-58	-42.3%	-18	-40.9%
Transportation and public utilities	-462	-47.1%	-816	-28.4%	*	*	-144	-46.2%
Wholesale trade	-20	-5.8%	-448	-22.0%	-85	-32.6%	-14	-20.9%
Retail trade	-371	-11.0%	-1,689	-17.0%	-366	-28.1%	-158	-32.8%
Finance, insurance and real estate	-137	-9.8%	-1,214	-23.2%	-84	-20.1%	-50	-26.2%
Services	32	0.8%	169	1.4%	*	*	13	2.8%
Government	50	2.4%	389	6.7%	149	15.6%	56	6.9%
All industies	**-2,727**	**-15.7%**	**-8,226**	**-16.2%**	**-1,115**	**-15.5%**	**-1,570**	**-32.1%**

Note: * Data suppressed.

Source: Bureau of Economic Analysis.

Rio Blanco County experienced by far the largest employment decline, losing almost one-in-three jobs over the 5-year period. Garfield, Mesa and Moffat counties all experienced a decline in total employment of about 16 percent.

In all counties, construction was one of the industries experiencing the greatest absolute job loss over this period. In Mesa and Rio Blanco counties, the mining industry also experienced very large decreases in employment.

2006 employment by sector. Exhibit II-7 shows the employment distribution by industry (NAICS) for the four county study region in 2006, based on wage and salary jobs reported by the Colorado Department of Labor. Bold sector titles indicate a significantly larger share of employment in the region than the state in these particular sectors, and the red figures show the state's share of employment in that sector for comparison.

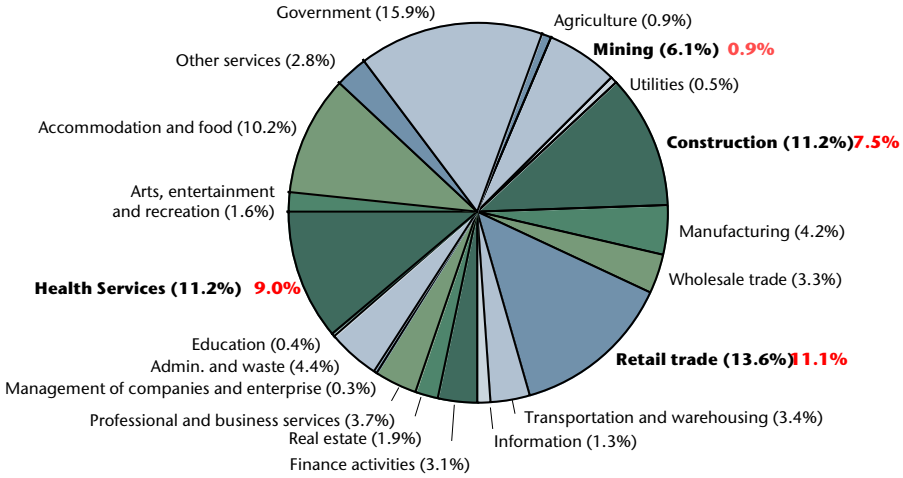
Exhibit II-7.
Wage and salary job distribution, 2006

Note:

Employment totals were suppressed in counties in sectors with very few employers. This data is interpolated from other years.

Source:

Colorado Department of Labor.



When compared with statewide employment data, the four county region has significantly larger shares of employment in the mining and construction industries.

Exhibit II-8 on the following page shows the employment distribution by NAICS industry classification for each county in the study region. The top three industries in terms of percentage of total employment are highlighted for each county.

Exhibit II-8.
Wage and Salary Employment Distribution by County, 2006

Industry (NAICS)	Garfield		Mesa		Moffat		Rio Blanco	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Agriculture	174	0.8%	530	1.0%	43	0.9%	37	1.2%
Mining	2,172	9.5%	1,859	3.3%	628	12.7%	982	31.6%
Utilities	201	0.9%	217	0.4%	*	*	70	2.3%
Construction	4,163	18.1%	5,383	9.7%	246	5.0%	541	17.4%
Manufacturing	455	2.0%	3,318	6.0%	74	1.5%	52	1.7%
Wholesale trade	638	2.8%	2,150	3.9%	227	4.6%	24	0.8%
Retail trade	3,452	15.0%	8,112	14.6%	666	13.5%	226	7.3%
Transportation and warehousing	819	3.6%	2,071	3.7%	96	1.9%	101	3.2%
Information	240	1.0%	926	1.7%	49	1.0%	17	0.5%
Finance activities	576	2.5%	2,123	3.8%	92	1.9%	47	1.5%
Real estate	590	2.6%	1,131	2.0%	44	0.9%	19	0.6%
Professional and business services	1,092	4.8%	2,129	3.8%	86	1.7%	58	1.9%
Management of companies	146	0.6%	93	0.2%	*	*	0	0.0%
Admin. and waste	788	3.4%	3,055	5.5%	186	3.8%	51	1.6%
Education	174	0.8%	228	0.4%	*	*	0	0.0%
Health Services	1,904	8.3%	7,837	14.1%	471	9.5%	50	1.6%
Arts, entertainment and recreation	364	1.6%	1,002	1.8%	51	1.0%	17	0.5%
Accommodation and food	2,698	11.8%	5,834	10.5%	526	10.6%	298	9.6%
Other services	716	3.1%	1,637	2.9%	162	3.3%	57	1.8%
Government	4,107	17.9%	8,317	15.0%	1,192	24.1%	981	31.6%
Total	**22,961**	**100%**	**55,560**	**100%**	**4,944**	**100%**	**3,108**	**100%**

Note: * Data suppressed.
Source: Colorado Department of Labor.

Government was one of the largest industries in terms of overall wages and salary in all counties. Construction represented one of the largest shares of employment in Garfield and Rio Blanco counties, while retail trade represented a larger share of employment in Mesa and Moffat counties. The mining industry was most significant in Rio Blanco County, representing almost one-in-three wage and salary jobs.

Current Economic Base

A number of economic activities bring dollars into northwest Colorado, providing the foundation for the regional economy. The economic base (sometimes also referred to as "primary jobs") includes:

- Activities that export a product or service to customers outside the region (such as natural gas production, agriculture and manufacturing);
- Activities that draw funds from visitors from outside the region (such as tourism, hunting and regional services); and
- Other sources of revenue from outside the region (such as wages earned by regional residents who work outside the four county study area, state and federal government jobs and local spending by retirees and second homeowners).

Over the past decade, the Colorado State Demography Office (SDO) has developed a systematic approach to analyzing and projecting economic base activities in each of Colorado's counties. The SDO essentially divides the economic base of each county into seven categories:

- Tourism;
- Regional services;
- Mining;
- Agriculture and agricultural services;
- Manufacturing;
- Government;[2] and
- Household direct basic.

In addition, the SDO has traditionally identified some other jobs as unassigned "indirect basic." These jobs support the other base activities but are not readily classifiable into one or more of the primary categories.

For the purposes of this study, BBC has maintained this classification system with a couple of modifications. In place of mining, this study considers the slightly broader category of "energy and natural resources." In addition to mining jobs, the energy and natural resources base activity, as defined for this study, includes jobs at electric generation facilities (i.e., such as Craig Station) serving areas outside the immediate region as well as construction jobs at drilling and other natural gas facility sites. This study also does not attempt to separately identify and project indirect basic jobs, instead relying on the use of input-output relationships to estimate such employment. The economic model developed for this study is discussed in Section IV.

[2] Only a portion of government jobs, primarily state and federal jobs, is considered part of the economic base. Most local government jobs are considered part of local services and are determined largely by local population levels, though the allocation can differ in communities with large second home and tourist industries.

The following discussion presents current (2006) activity in each component of the region's economic base.

Tourism. Tourism, broadly defined, makes up about one-sixth of the economic base of the four county region in terms of overall employment. Based upon 2006 employment by sector and the economic base to industrial sector relationships previously developed by the SDO, BBC estimates there were approximately 10,600 direct tourism jobs in the region. As defined by the SDO, tourism jobs include both activities associated with traditional short-term visitors and economic activity associated with second homes in the region. Tourism jobs span numerous industrial sectors, with the largest number of jobs in food services, accommodations and construction.

Regional services. Regional services includes a wide array of trade and service jobs supported, at least in part by sales to individuals and businesses based outside the four county region. Construction services provided to customers based outside the region (especially to Pitkin and Eagle Counties); health care; educational services; architecture, engineering and design services; and portions of wholesale trade and transportation make up the bulk of regional services employment. The regional services component of the four county economic base included about 12,800 jobs in 2006, representing about 20 percent of all direct basic employment.

Energy and natural resources. In 2006, there were about 7,400 direct jobs in energy and natural resources across the four county region. These jobs represent almost 12 percent of all direct basic employment in northwest Colorado. This sector is currently dominated by natural gas exploration and production, with gas-related activity accounting for about 6,300 of the 7,400 energy and natural resource jobs. Coal mining and electric generation accounted for most of the remaining jobs in this economic base component. Section III describes energy and natural resource activity in more detail.

Household direct basic. Non-wage-related income of northwest Colorado residents and earnings of regional residents that work outside the four county region are significant sources of funding that support retail, service and other jobs in northwest Colorado. Non-wage-related income includes retirement benefits, transfer payments and investment income. The primary work locations outside the region for northwest Colorado residents are Pitkin and Eagle counties (primarily for Garfield County residents), Routt County (primarily for Moffat County residents), and Delta and Montrose counties (for residents of Mesa County). There were over 18,000 household direct basic jobs in 2006, making this the largest single component of the four county study region's economic base.

Agriculture. The remainder of northwest Colorado's 2006 economic base consisted of jobs in agriculture, manufacturing and a portion of the government jobs in the four county region. Agricultural and agricultural services directly supported an estimated 5,400 jobs in the region. Most of these jobs were in livestock raising and crop production, with smaller numbers in farm services, wholesale trade and transportation services.

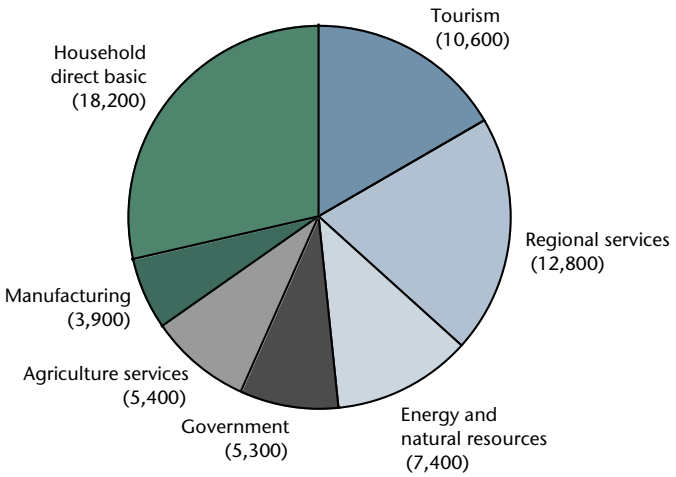
Manufacturing. Regional manufacturing jobs include jobs in several manufacturing sectors. In 2006, the largest manufacturing sectors were primary and fabricated metals; non-metallic mineral products; publishing; wood products and furniture; and machinery manufacturing. Overall, there were about 3,900 direct basic manufacturing jobs in the four county region.

Government. Most state and federal government jobs are considered part of the economic base (since their primary funding comes from outside the four county region) along with a portion of local government jobs. In 2006, we estimate there were about 5,300 direct basic government jobs in the four county region, mainly in Garfield and Mesa Counties.

Total employment. In total, there were an estimated 63,600 direct basic jobs in northwest Colorado in 2006. Exhibit II-9 depicts direct basic employment in each of the seven categories.

Exhibit II-9.
Estimated 2006 Direct Basic Employment in Northwest Colorado

Source:
BBC Research & Consulting, 2008 based on data provided by Colorado State Demography Office.



Local source employment. The various economic base activities just described support indirect basic and "local service" jobs in northwest Colorado. Local resident services include firms that sell goods and services to establishments engaged in the economic base activities as well as firms that sell goods and services to local households. The relationship between economic base jobs and the number of jobs they support throughout the economy (including both the base jobs and the local service jobs) is commonly termed the "multiplier." The study team used the IMPLAN regional economic model, along with the estimated economic base jobs by category and total employment across the region, to estimate the multipliers associated with each of the region's economic base activities.[3]

[3] The IMPLAN model is a widely used input-output regional economic model originally designed by the U.S. Forest Service. BBC used the IMPLAN model, along with 2006 customized data files created by IMPLAN, at the request of the SDO to develop estimated multipliers for each economic base activity. The multipliers were further adjusted to make the resulting total employment estimates correspond to actual 2006 employment across the region.

Exhibit II-10 summarizes the estimated number of jobs in each component of northwest Colorado's 2006 economic base. The exhibit also shows the estimated employment multipliers associated with each economic base activity and the total number of jobs directly and indirectly supported by each activity.

Exhibit II-10.
Estimated 2006 Northwest Colorado
Economic Base Jobs, Multipliers and Total Employment

Economic Base Activity	Direct Jobs	Estimated Multiplier	Total Jobs Supported
Tourism	10,600	1.69	17,900
Regional Services	12,800	2.07	26,500
Energy and Natural Resources	7,400	2.60	19,200
Government	5,300	1.68	8,900
Agriculture/Ag. Services	5,400	2.02	10,900
Manufacturing	3,900	2.52	9,800
Household Direct Basic	18,200	1.73	31,500
Total	**63,600**	**1.92**	**124,700**

Source: BBC Research & Consulting, 2008 based on data provided by Colorado State Demography Office.

In total, the study team estimates there were approximately 125,000 full- and part-time jobs based in northwest Colorado in 2006.[4] The average earnings per job were approximately $42,500.

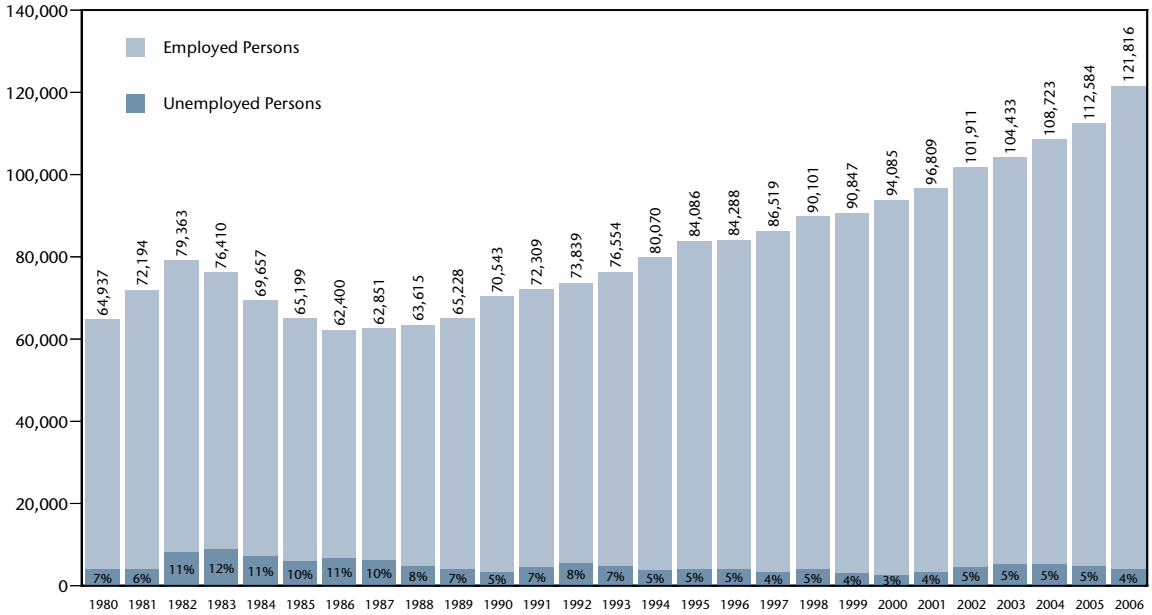
Labor Force Trends, Commuting and Temporary Workers

Over the past decade, northwest Colorado has shifted from being a region with unemployment rates higher than the state average to an area with very low unemployment. Many residents of the region commute long distances to work, both within and outside the region. As a result of current energy related growth, there are also a large number of temporary workers lodged at motels and RV camp sites within the four county area.

[4] These estimates include both full- and part-time jobs and include proprietors (business owners) as well as wage and salary employees. This definition of employment is consistent with that used by the SDO.

Unemployment. The Colorado Department of Labor and Employment (CDLE) tracks employment and unemployment statistics across the state. According to CDLE, unemployment in the four county study area increased significantly in the period between 1982 and 1987 to levels of over 10 percent. Unemployment reached a low of 3.2 percent in 2000, before increasing to 5.4 percent in 2003 and decreasing to 3.6 percent in 2006.

Exhibit II-11.
Total Labor Force and Unemployment Rate, 1980–2006

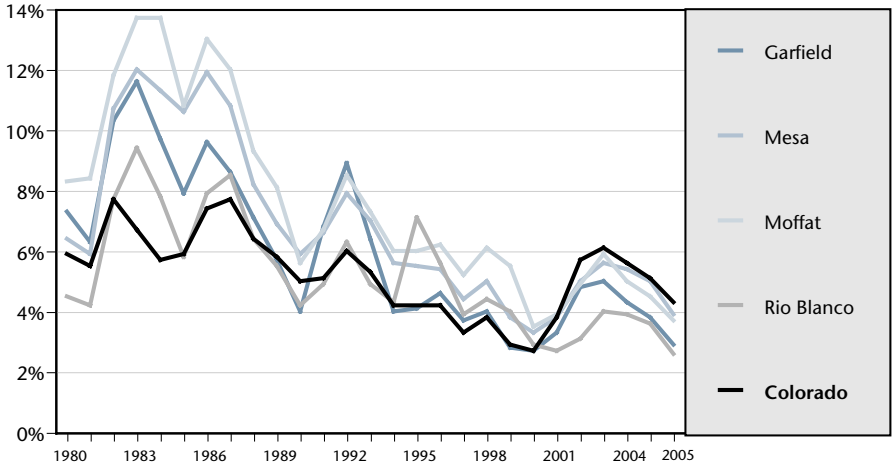


Source: Colorado Department of Labor and Employment, Labor Market Information.

Exhibit II-12 demonstrates that unemployment has been more pronounced in some counties than in others, but has generally declined over the past two decades. Moffat County has historically had the highest unemployment rate in the region, while Garfield and Rio Blanco counties have had the lowest. The regional unemployment rate was higher than the statewide unemployment rate until 2001, after which all counties have experienced unemployment rates lower than the statewide rate.

Exhibit II-12.
Unemployment Rates, 1980–2006

Source:
Colorado Economic and Demographic Information System, Colorado Department of Local Affairs.



Commuting patterns. Many residents of northwest Colorado drive long distances to work. Commuting, both within the region and to and from the counties on the edges of the region, is an important aspect of socioeconomic conditions in northwest Colorado.

Journey to Work data from the 2000 Census — gathered prior to current energy related growth in the region — indicated that about 2,850 of the nearly 80,000 people employed at jobs in the four county region commuted into the region from other areas. The largest numbers of these in-commuters were residents of Eagle and Pitkin counties commuting to work in Garfield County (over 900), residents of Delta and Montrose counties commuting to work in Mesa County (almost 600), residents of Routt County working in Moffat County (about 150) and residents of Uintah County (Utah) working in Rio Blanco County (almost 120).

In 2000, about 9,000 residents of the four county area worked outside the region. The largest numbers of out-commuters were Garfield County residents working in Eagle and Pitkin Counties (over 5,400) and Moffat County residents working in Routt County (over 1,300).

The four county region's economy has changed substantially since 2000 due to the regional growth in natural gas exploration and production. More recent data on commuting is not as comprehensive as the Journey to Work information from the decennial Census, but suggest that commuting patterns are also changing due to the proliferation in energy development. Exhibit II-13 depicts the estimated work-to-residence relationship for jobs in the four county study area as of 2004, based on a combination of 2004 Local Employment Dynamics data recently released by the U.S. Census Bureau and the 2000 Journey to Work data. This matrix indicates that about 14 percent of the jobs in Garfield County were filled by non-Garfield County residents, 5 percent of Mesa County jobs were filled by out-of-county residents and 9 percent of Moffat County jobs were filled by non-local residents. On a percentage basis, Rio Blanco County had the largest proportion of in-commuters with over 20 percent of the jobs in that county filled by residents of other locations.

Exhibit II-13.
Estimated 2004 Sources of Workers for Regional Jobs

	Worker Residence						
2004 Job Locations	Garfield County	Mesa County	Moffat County	Rio Blanco County	Edge of Region*	Other Areas	Total
Garfield County	86 %	6 %	0 %	1 %	6 %	1 %	100 %
Mesa County	1	95	0	0	3	1	100
Moffat County	1	2	91	1	4	1	100
Rio Blanco County	2	3	6	79	8	2	100

Note: *Edge of region includes: Eagle, Grand, Gunnison, Jackson, Montrose and Pitkin counties in Colorado; Grand and Uintah counties in Utah; and Carbon and Sweetwater counties in Wyoming.

Source: BBC Research & Consulting, 2008.

Natural gas is the most dynamic industry in northwest Colorado at the present time. The location of the work is continuously changing as wells are completed and new drilling commences in other locations. The gas work force is similarly mobile. Exhibit II-14 depicts the estimated relationship between work sites (e.g. well locations) and the residences of the natural gas workforce. This matrix was developed based on a combination of data on worker residence locations filed by energy companies for purposes of severance tax distribution and data on well drilling by location and demonstrates the mobility of the energy workforce. As shown in Exhibit II-14, the study team estimates that about 55 percent of the workers drilling wells in Garfield County live in other counties, while 75 percent of gas workers operating in Rio Blanco County commute from other counties. Commuting from the edges of the region is particularly significant for wells drilled in Rio Blanco County (primarily Utah workers) and Moffat County (primarily Wyoming workers).

Exhibit II-14.
Estimated Work Site-to-Residence Relationship for Natural Gas Drilling in Northwest Colorado

	Worker Residence					
Well Location	Garfield County	Rio Blanco County	Moffat County	Mesa County	Edge of Region	Total
Garfield County	45 %	5 %	0 %	50 %	0 %	100 %
Rio Blanco County	25	25	5	20	25	100
Moffat County	15	10	10	30	35	100
Mesa County	0	0	0	100	0	100

Source: BBC Research & Consulting, 2008.

The in-commuting patterns just discussed are important in examining socioeconomic conditions in northwest Colorado because they capture some of the relationship between job growth in one area and population growth in other areas. Out-commuting from the region remains an important influence on the region's economy and population as well. The number of regional residents commuting to jobs in other counties is expected to continue to increase over the next few decades and is discussed in detail in Section IV.

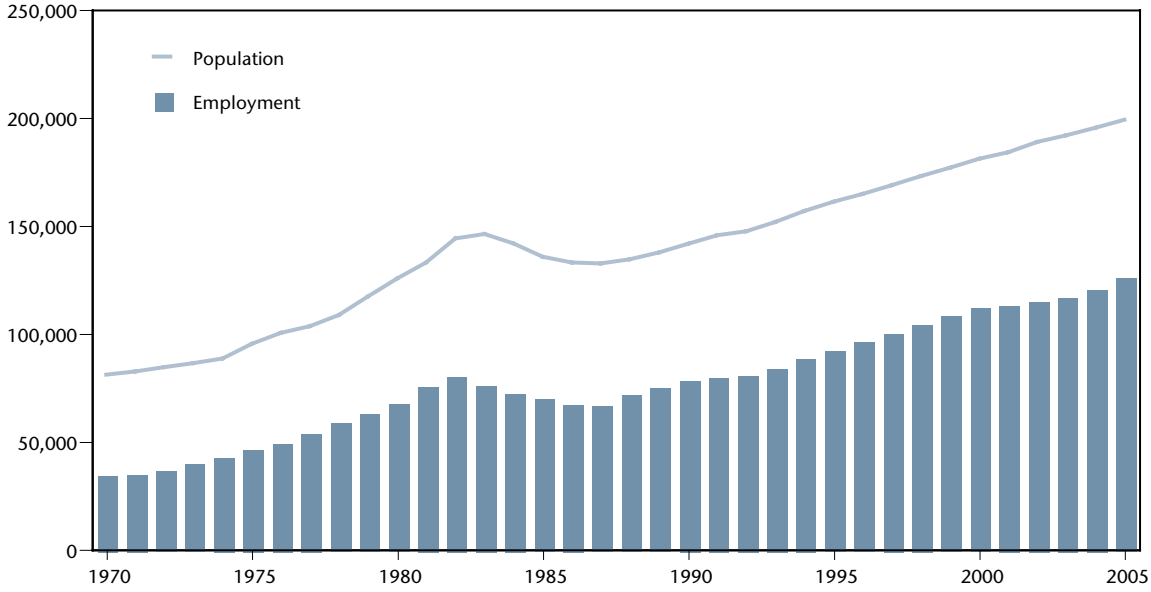
Temporary workers. Another distinctive aspect of the energy development currently taking place in northwest Colorado is the large number of temporary workers living out of motel rooms and RV campgrounds in the region. There is no data on the exact number of temporary workers working at job-sites in the study region. Based on interviews with local visitor bureaus, however, BBC estimates between 15 and 30 percent of the approximately 6,800 motel rooms and camp sites in the region are occupied by gas workers. Local officials in Garfield County report that the rate of gas worker occupancy is much higher in Rifle and Parachute. Allowing for the likelihood that some of these rooms are being used by workers that reside permanently in other counties within the region or at the edges of the region, these numbers still imply that perhaps 20 percent of the natural gas workforce is comprised of workers that do not have a permanent residence within the region or in the surrounding counties.

Demographic and Housing Trends

The following discussion of study area demography includes population trends for counties and cities, household size and composition, age distribution and the presence of individuals with limited English proficiency (LEP).

Population. Over the past 36 years, the population of the four county area has grown by almost 160 percent. This represents a compound annual growth rate of 2.7 percent, compared with 2.2 percent across the state as a whole. Growth in the region has been steady, with the exception of the period from 1982-1987 in which an economic downturn involving the "bust" of the oil shale industry led to a decline in population and employment. Exhibit II-15 shows the close relationship between population and employment growth in the four county study area between 1970 and 2005.

Exhibit II-15.
Four County Population and Employment Growth, 1970–2005



Source: U.S. Bureau of Economic Analysis.

Population growth has not been uniform throughout the study region. Exhibit II-16 demonstrates that population growth has been much stronger in some counties than in others.

Exhibit II-16.
Population Growth by County, 1970–2006

County	1970	1980	1990	2000	2006	Annual Growth Rate 1970-2000	Annual Growth Rate 2000-2006
Colorado	**2,209,596**	**2,889,733**	**3,294,394**	**4,301,261**	**4,813,536**	**2.2%**	**1.9%**
Garfield	14,821	22,514	29,974	43,791	53,020	3.7%	3.2%
Mesa	54,374	81,530	93,145	116,255	135,468	2.6%	2.6%
Moffat	6,525	13,133	11,357	13,184	13,729	2.4%	0.7%
Rio Blanco	4,842	6,255	5,972	5,986	6,288	0.7%	0.8%
Total	**80,562**	**123,432**	**140,448**	**179,216**	**208,505**	**2.7%**	**2.6%**

Source: Colorado Department of Local Affairs.

Between 1970 and 2000, Garfield County experienced the most rapid population growth in the four county region (3.7 percent annually). Growth in Mesa County slightly outpaced growth across the state as a whole (2.6 percent versus 2.2 percent annually). Growth in Moffat County was slightly higher than the statewide rate, while Rio Blanco County saw by far the slowest growth in the region over this period (0.7 percent annually).

Between 2000 and 2006, population growth across the four county region was slightly slower than in decades prior — 2.6 percent per year over this 6-year period versus 2.7 percent per year between 1970 and 2000. Garfield and Mesa counties experienced the strongest growth between 2000 and 2006 at 3.2 and 2.6 percent per year, respectively. Moffat and Rio Blanco experienced very little population growth over this 6-year period.

In all counties, most cities and towns experienced stronger population growth than unincorporated areas over the 30-year period between 1970 and 2000. Grand Junction, the major urban center of the region, experienced the greatest numeric population growth. The cities experiencing the fastest growth rates between 1970 and 2000 were Carbondale, New Castle and Fruita; the cities experiencing the fastest growth rates between 2000 and 2006 were New Castle and Fruita. Exhibit II-17 shows the major cities within each county and their population totals between 1970 and 2006.

Exhibit II-17.
Population Growth of Largest Cities and Towns, 1970–2006

City	1970	1980	1990	2000	2006	Population Change (1970-2006)	Annual Growth Rate 1970-2000	Annual Growth Rate 2000-2006
Carbondale (Garfield)	726	2,084	3,004	5,196	6,088	5,362	6.8%	2.7%
Glenwood Springs (Garfield)	4,106	4,637	6,561	7,736	8,743	4,637	2.1%	2.1%
New Castle (Garfield)	499	563	679	1,984	3,443	2,944	4.7%	9.6%
Rifle (Garfield)	2,150	3,215	4,636	6,784	8,706	6,556	3.9%	4.2%
Fruita (Mesa)	1,822	2,810	4,045	6,478	10,349	8,527	4.3%	8.1%
Grand Junction (Mesa)	20,170	27,956	29,034	41,986	51,631	31,461	2.5%	3.5%
Craig (Moffat)	4,205	8,133	8,091	9,189	9,260	5,055	2.6%	0.1%
Meeker (Rio Blanco)	1,597	2,356	2,098	2,242	2,357	760	1.1%	0.8%

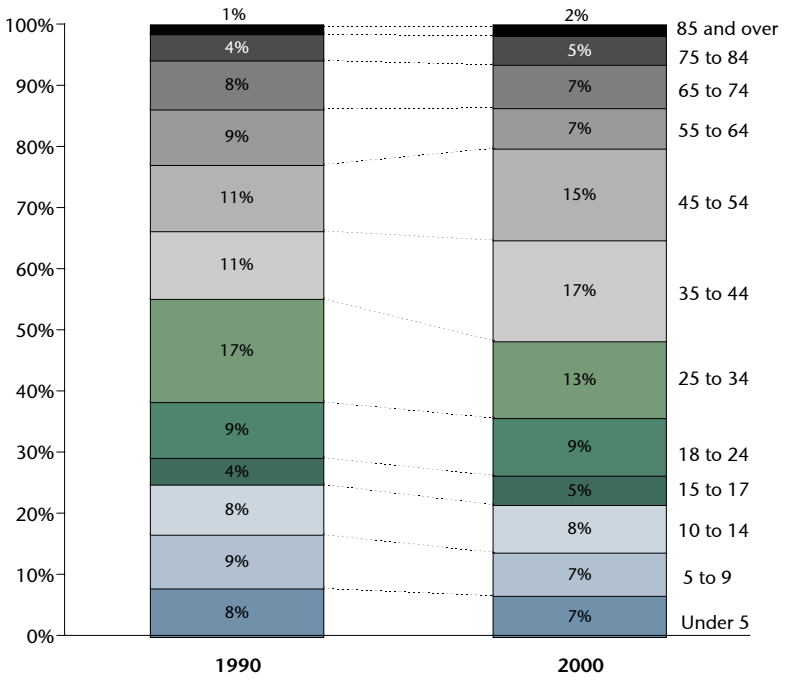
Source: Colorado State Demography Office.

Population growth in the "edges of the region." The most rapidly growing areas on the edges of the region are Colorado resort communities, namely Eagle County (where compound annual population growth between 1970 and 2006 was 5.5 percent) as well as Routt County (3.4 percent) and Pitkin County (2.7 percent). Montrose and Delta counties in Colorado had more modest growth of about 2 percent annually. In Utah, Uintah County experienced modest annual growth of 2.2 percent per year over the 36-year period, while Grand County experienced slower annual population growth of 0.8 percent. In Wyoming, Sublette County experienced annual growth of 1.9 percent over the period, while Carbon County experienced very little net growth due to a sharp population decline starting in the early 1980s.

Age. The age distribution in the four county region between 1990 and 2000 reflects an aging population, consistent with state and nation trends. Over this 10-year period, the proportion of people between the ages of 35 and 54 increased from 22 percent to 32 percent, reflecting the aging of the Baby Boomer generation. This was offset by decreases in the proportion of persons between ages 25 and 34 and children below age 9. Exhibit II-18 highlights these changes in age distribution.

Exhibit II-18.
Four County Study Region Age Distribution, 2000

Source:
U.S. Census Bureau.



Population with limited English proficiency (LEP). Residents with LEP constitute an increasingly sizeable portion of the four county population — 4.1 percent in 2000, up from 1.9 percent in 1990. The proportion of the total Colorado population with LEP was higher at 3.6 percent in 1990 and 6.7 percent in 2000. The vast majority of LEP individuals (roughly 9 in 10 in the four county region) speak Spanish as their native language. Exhibit II-19 demonstrates the growth of the LEP population over this 10-year period.

Exhibit II-19.
Population with Limited English Proficiency, 1990–2000

	1990		2000		Percent growth (1990-2000)	
	Population age 5 and above	Percent of population age 5 and above	Persons with LEP	Percent of population age 5 and above	Total population age 5 and above	Persons with LEP
Colorado	**109,889**	**3.6%**	**267,504**	**6.7%**	**31.7%**	**143.4%**
Garfield	446	1.6%	3,191	7.9%	46.9%	615.5%
Mesa	1,742	2.0%	3,002	2.8%	25.9%	72.3%
Moffat	141	1.4%	473	3.8%	18.7%	235.5%
Rio Blanco	92	1.7%	162	2.9%	1.9%	76.1%
Four County Region	**2,421**	**1.9%**	**6,828**	**4.1%**	**28.8%**	**182.0%**

Note: This data considers a person with limited English to be one who reports being able to speak English anything other than "very well."
Source: U.S. Census Bureau.

In all counties, the growth of the LEP population has outpaced the growth of the overall population. In Garfield County, the LEP population grew by over 615 percent between 1990 and 2000, compared to growth of less than 50 percent in the total population. In Moffat County, growth in the LEP population has also far outpaced growth of the overall population — 236 percent versus 19 percent between 1990 and 2000. In Mesa and Rio Blanco counties, the growth of the LEP population has been greater than the growth of the total population but less than the growth rate of the LEP population statewide.

It is important to note that the LEP population is closely correlated with the population of undocumented workers and residents, who are often missed by the Census or are less inclined to participate. As a result, Census figures are widely believed to understate the number of persons with limited English proficiency.

Household size and composition. Like the total population, the number of households in the four county region has grown steadily since the 1970s with a dip spanning about 5 years in the mid-1980s.

The average household size in the four county region has decreased slightly from 2.80 persons per household in 1985 to 2.55 persons per household in 2006, as shown in Exhibit II-20. This is consistent with state and national trends.

Exhibit II-20. Average Household Size, 1985–2005

Source:

Colorado Department of Local Affairs, Colorado Economic and Demographic Information Systems.

	1985	1990	1995	2000	2006
Garfield	2.68	2.61	2.66	2.65	2.66
Mesa	2.58	2.52	2.52	2.47	2.46
Moffat	2.89	2.69	2.71	2.58	2.59
Rio Blanco	3.06	2.67	2.45	2.50	2.49
Four County Region	**2.80**	**2.62**	**2.59**	**2.55**	**2.55**

Exhibit II-21 compares the household composition of the four counties. The slightly smaller proportion of single-person households in Rio Blanco and Moffat counties reflects their more rural, agricultural base.

Exhibit II-21.
Household Composition by County, 2000

	1-person and non-family	Married couples with children	Married couples without children	Other families with children	Other families without children
Colorado	**34.6%**	**24.4%**	**27.4%**	**8.4%**	**5.3%**
Garfield	30.5%	29.0%	28.6%	8.2%	3.8%
Mesa	31.1%	22.7%	32.6%	8.7%	4.9%
Moffat	28.2%	28.4%	30.3%	9.8%	3.3%
Rio Blanco	28.6%	27.5%	32.6%	8.1%	3.2%
Four County Region	**30.7%**	**24.8%**	**31.5%**	**8.6%**	**4.5%**

Source: U.S. Census Bureau.

Housing stock. In 2000, the four county region had almost 75,000 housing units, according to the U.S. Census Bureau. Exhibit II-22 categorizes housing units based on their year of construction in order to demonstrate the distribution of new housing development across the four county region.

Exhibit II-22.
Housing Units by Year Built, 2000

	Total housing units, 2001	Built since 1970		Built since 1980		Built since 1990	
		Number	Percent	Number	Percent	Number	Percent
Garfield	17,336	12,704	73.3%	8,763	50.5%	5,337	30.8%
Mesa	48,427	32,913	68.0%	20,329	42.0%	11,627	24.0%
Moffat	5,635	3,832	68.0%	1,855	32.9%	884	15.7%
Rio Blanco	2,855	1,771	62.0%	963	33.7%	381	13.3%
Total	**74,253**	**51,220**	**69.0%**	**31,910**	**43.0%**	**18,229**	**24.5%**

Source: U.S Census Bureau.

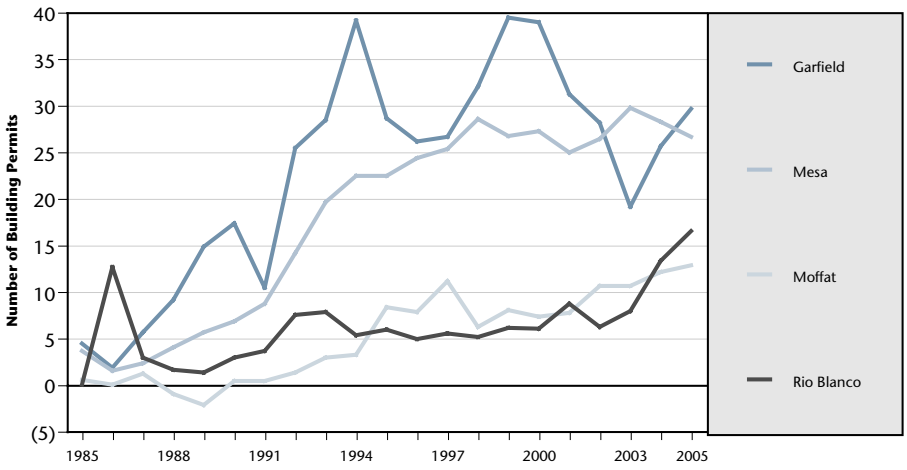
At the time of the 2000 Census, one-fourth of the housing stock in the four county region had been constructed or renovated since 1990, 43 percent since 1980, and 69 percent since 1970. Garfield County had the newest housing stock with almost one-in-three units built since 1990 and one-in-two units built since 1980. Moffat and Rio Blanco counties had the oldest housing stock with less than one-in-six housing units built since 1990 and about one-in-three built since 1980.

Building activity. Net building permits per year (calculated as building permits issued minus demolition permits) is another indicator of development activity. When taken as a proportion of the existing housing units in the county, it can be used to compare building activity among counties of different sizes. Exhibit II-23 shows building permits per 1,000 existing housing units, from 1985 to 2005, for each of the four counties in the region.

Exhibit II-23. Net Building Permits per 1,000 Existing Housing Units, 1985–2005

Source:

Colorado Economic and Demographic Information System, Colorado Department of Local Affairs.

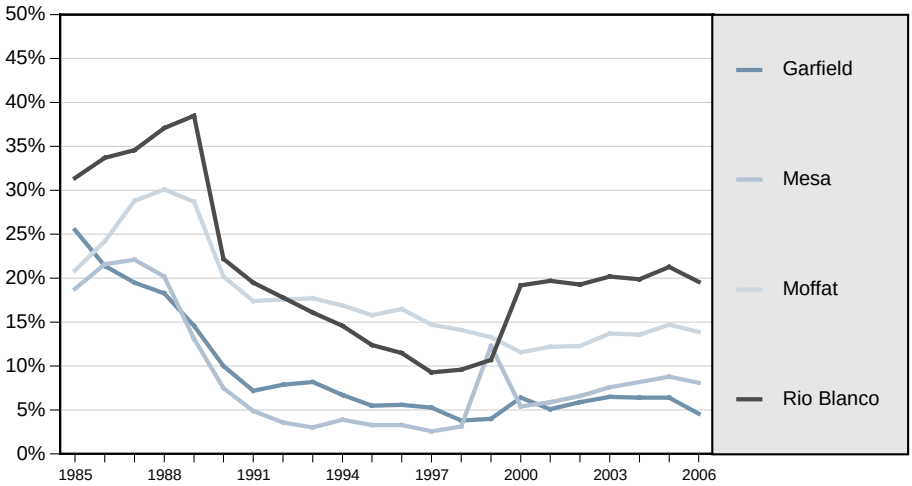


This comparison confirms that Garfield and Mesa counties have consistently experienced a greater concentration of housing development activity than Moffat and Rio Blanco counties.

Vacancy rates. The following Exhibit II-24 shows vacancy rates throughout the four county study region. Rio Blanco and Moffat Counties have had higher vacancy rates, ranging between 10 percent and 20, percent since 1990. Vacancy rates in Mesa and Garfield Counties have been lower, generally staying below 10 percent since 1990. Vacancy rates in these counties gradually declined from 1990 to 1998 but have increased between 2000 and 2005. The decline in vacancy rates for all counties in 2006 reflects recent effects from growth in regional energy development. Note that vacancy rates reported here include second homes which are often not available for rent. Local authorities in both Garfield and Rio Blanco counties report housing and rental markets are now very tight.

Exhibit II-24. Vacancy Rates, 1985–2006

Source:
Colorado State Demography Office, Colorado Department of Local Affairs.



SECTION III.
Current and Future Natural Resource Development in Northwest Colorado

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Current and Future Natural Resource Development in Northwest Colorado

This section describes current natural resource-related activity in the northwest Colorado region and outlines potential future activities that will influence local economic, demographic and fiscal conditions.

Overview of Recent Natural Resource Activity

Northwest Colorado has a long history of natural resource extraction. Most of Colorado's coal production takes place within the four county study region or at mines located in the edges of the region in Delta and Gunnison Counties. Two of Colorado's largest coal-fired power plants are located at Craig (in the region) and Hayden (in Routt County at the edge of the four county region). Additionally, the Bonanza Power Plant is located just outside the region in Uintah County, Utah.

Oil and gas activity has also been a long-standing part of the study region's economic mix. Initial exploration activity dates to the late 1800s and commercial oil and gas drilling has occurred in every decade since the early 1900s. Until recently, the largest center for oil and gas activity was the Rangely Field in western Rio Blanco County.[1]

In 2002, large scale energy development began within the study region. New technology, rising demand and rising prices for natural gas have made northwest Colorado an attractive opportunity for national energy development companies such as Williams, Encana, Exxon-Mobil, Conoco-Phillips and Chevron-Texaco. Initially focused primarily in Garfield County, annual gas production in the region has grown from 179 billion cubic feet (Bcf) in 2002 to 421 Bcf in 2006.[2] As discussed later in this section, gas development activity is likely to continue for some time.

Northwest Colorado is also home to the largest unconventional oil resources in the United States. An estimated 1 to 2 trillion barrels of oil are locked in oil shale deposits in the Piceance Basin, primarily in Rio Blanco County. Many long-time residents of the region have unpleasant memories associated with this resource. A combination of federal and private plans to develop oil shale in the late 1970s and early 1980s, along with considerable private sector speculation, ultimately led to Black Sunday on May 2nd 1982. When Exxon terminated the Colony Oil Shale Project, the region experienced a severe socioeconomic shock that lasted through the 1980s and into the early 1990s.

[1] BLM WRFO RFD, pp. 19-21.

[2] COGCC statistics.

The federal government is again encouraging oil shale development. The Energy Policy Act of 2005 directed the Department of Interior to aggressively lease federal lands for oil shale development. This support, coupled with sustained high oil prices and the prospect that world conventional oil production may now be in decline, may provide the conditions necessary to overcome the numerous challenges associated with developing this resource. Five research, development and demonstration (RD&D) projects are currently underway on lands administered by the Bureau of Land Management (BLM) in Rio Blanco County.

Potential Future Natural Gas Development

Natural gas drilling, and related activities, has accelerated rapidly in northwest Colorado since 2003. As noted in a recent series published by the Rocky Mountain News:

> *"A decline in traditional natural gas fields elsewhere, including the Gulf of Mexico; the strong sentiment for greater energy independence; the push by the Bush administration to open more western lands for drilling; and a breakthrough in technology called "fracing," the hydraulic fracturing of deep rock formations to release gas, have all pushed Colorado to the main stage."*[3]

The number of gas wells drilled in the study area increased rapidly from 2003 through 2006. While the total number of wells drilled in 2007 is not yet known, it appears that 2007 activity occurred at roughly the same level as 2006, with growth slowed by a temporary lack of pipeline capacity and a corresponding drop in prices for Colorado natural gas.[4]

Although drilling activity in the region may have reached a temporary plateau, it is anticipated that gas development will continue for an extended period into the future. In order to project future natural gas development, the study team combined information from interviews with Garfield County natural gas operators conducted in 2006 with the extensive research and analysis undertaken for the BLM's White River Resource Management Plan Amendment EIS (RMPA).

The general view within the industry is that Garfield County well development will continue forward at a fairly consistent rate of about 1,000 wells per year over the next 10 to 15 years. Given about 3,900 wells at present, this implies an ultimate total of about 15,000 to 20,000 wells in the county by 2023.

Sufficiently high long-term contract prices are the key to continued drilling viability. In 2006, the minimum price needed to support drilling in Garfield County was reportedly around $3 per million BTU. In the short-run, industry representatives noted that the rate of gas well development is primarily constrained by worker availability. Additional pipeline and processing capacity is being developed as needed. Regionally, the Rockies Express pipeline will soon open up new markets for Northwest Colorado gas and both Enterprise Products Partners and Williams Energy have built or are planning major natural gas processing plants in the region. Newer drilling rigs, gradually replacing the more traditional rigs used up to now in Garfield County, are up to 30 percent more efficient in terms of labor requirements, which should accelerate gas development over time.

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[3] "Stakes high as billions head Colorado's way", *Rocky Mountain News*, December 10, 2007.

[4] "GarCo gas operators cite uncertain rules in planning for 2008", *Grand Junction Daily Sentinel*, December 24, 2007.

Based on meetings with the industry representatives, the study team determined that gas-related employment could best be projected by dividing the workforce into two components: drilling and on-going maintenance. Drilling-related employment is estimated at approximately 35 workers per well, with that number gradually diminishing as the more efficient newer rigs replace older rigs. Maintenance related employment, including work over crews, pumpers and manpower for the gas plants, is estimated to require about one worker per six completed wells.

During the 2006 interviews conducted by the study team, industry sources suggested that over the next two decades the focus on drilling activity would gradually shift northward from Garfield County into Rio Blanco County. In 2007, the BLM conducted extensive research with the natural gas industry to identify a Reasonably Foreseeable Development Scenario (RFDS) for natural gas activity in the White River Field Office (WRFO), primarily encompassing Rio Blanco County. BLM's RFDS, based on the agency's assessment and input from the industry, anticipates the completion of more than 17,000 wells in the WRFO area by 2027, with well production rising continuously over the next two decades. The RFDS forecasts that nearly 1,400 wells will be drilled in 2027.

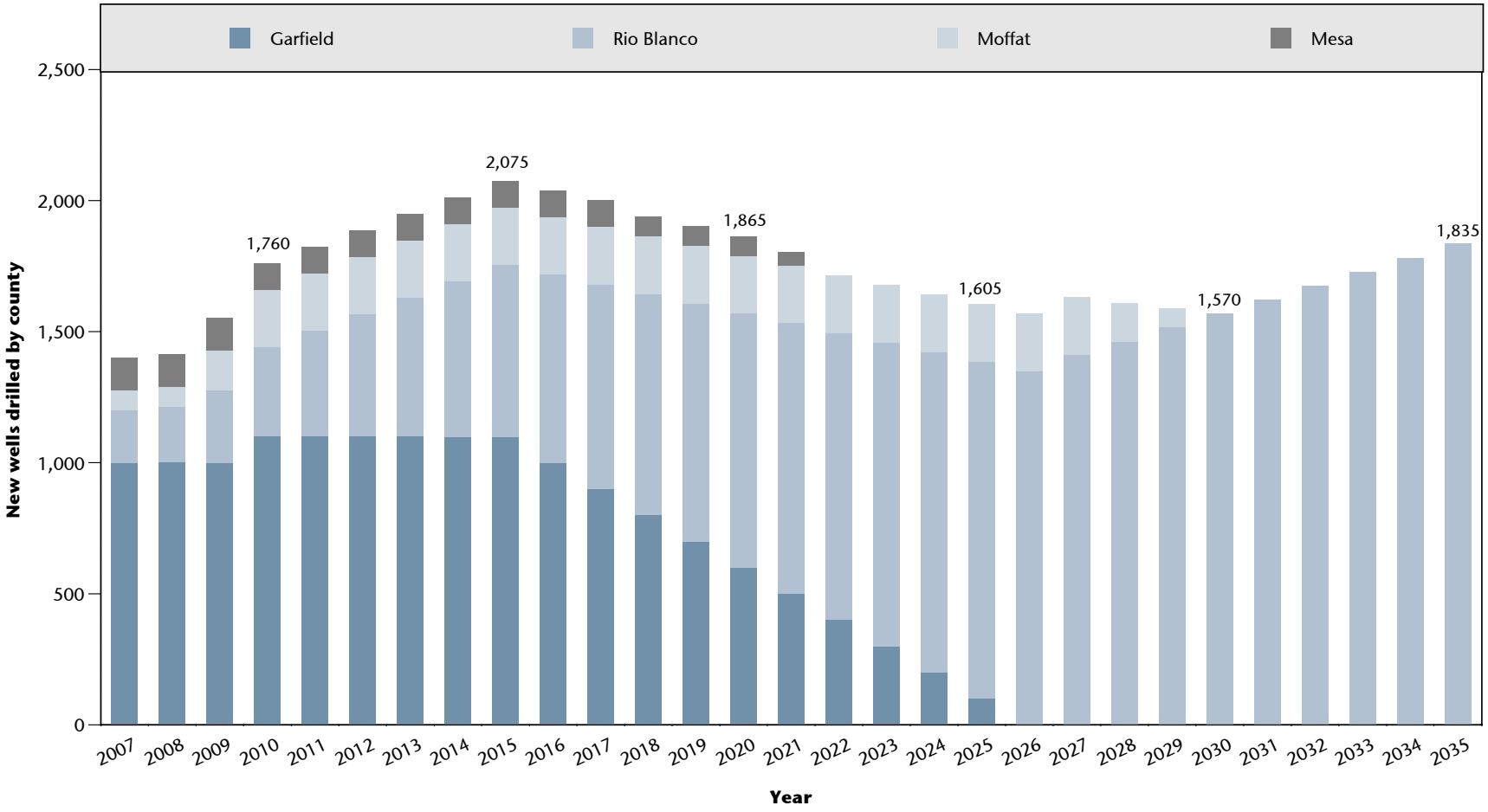
In addition to drilling activity on private, split-estate lands in Garfield County and on public and private lands in the WRFO area, smaller numbers of wells are likely to be drilled on lands in Mesa County and lands within the Little Snake Resource Management Area in northern Moffat County. There has been great controversy surrounding proposed drilling on the Roan Plateau in Garfield County, though the actual number of wells likely to be drilled on the Roan is relatively small. The study team has assumed a total of 1,600 wells will be drilled on the Roan Plateau between 2010 and 2025.

Exhibit III-1 on the following page depicts the annual number of wells projected to be drilled in the study area, by county, from 2007 through 2035. Under this Baseline Scenario, about 50,000 wells would be drilled in the study area over the 29-year period.

Under this scenario of relatively consistent drilling activity from year to year, the workforce required for drilling is also anticipated to remain fairly stable despite some continuing productivity gains. An increasing number of workers will be needed to maintain existing wells as the cumulative number of producing wells increases throughout the study region. Typically, Piceance Basin gas wells are expected to produce for between 20 and 40 years (various sources including industry reports and BLM information). Exhibit III-2 on page 5 depicts the workforce projected to be employed by regional natural gas drilling and well maintenance activity from 2007 through 2035.

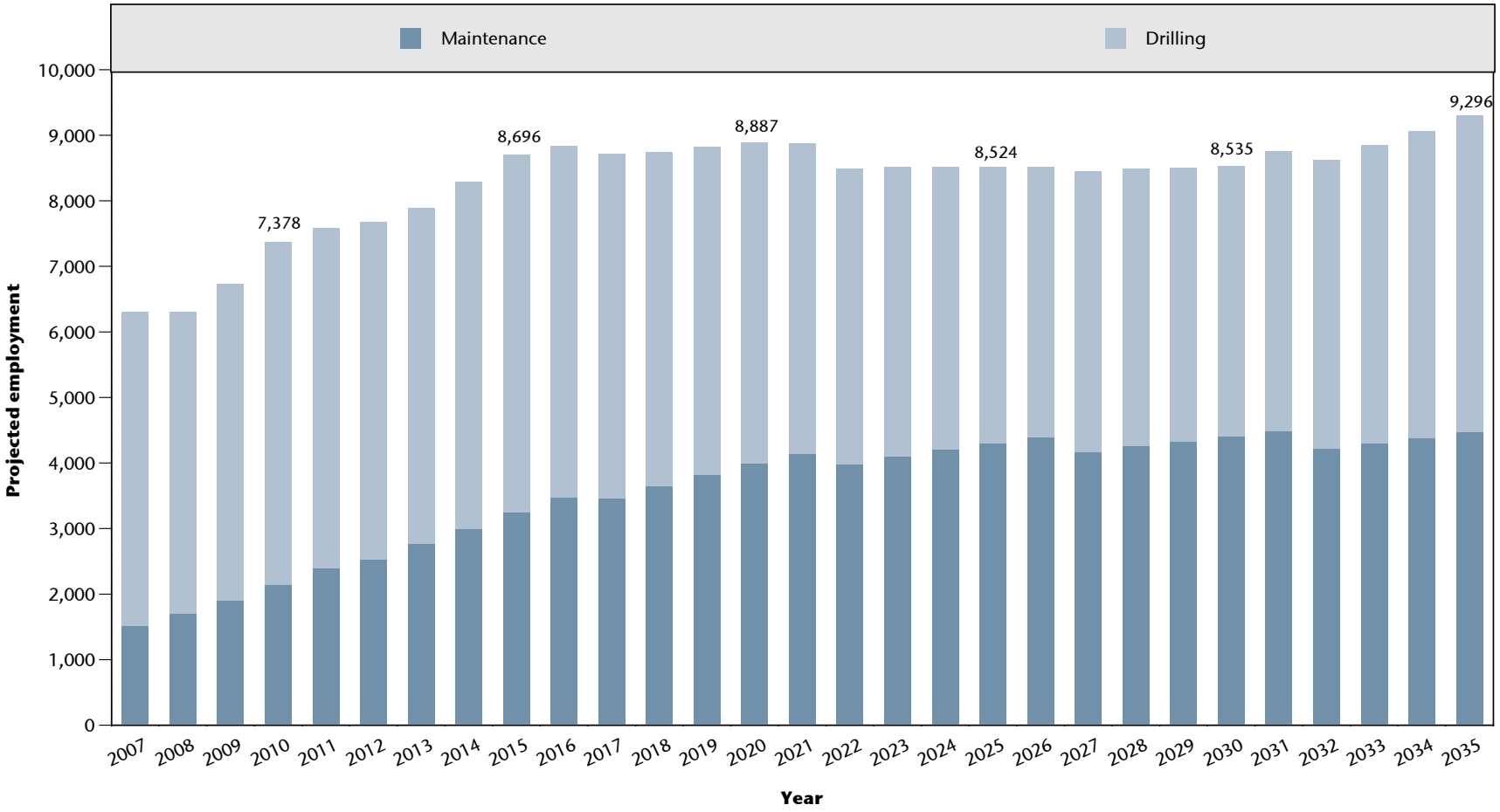
•The gas development scenario developed for this study provides an overview of expected activity levels over the next three decades. Well drilling activity will vary, however, from year to year, in ways that cannot be forecast at present. Changing market conditions and price levels may also lead to periods of faster or slower gas development within the region and corresponding fluctuations in local retail sales, employment and fiscal conditions. Although all current indications suggest gas development will be ongoing for the next several decades, it remains possible that unforeseen changes in markets, other supply sources or other factors could curtail development sooner than expected. Development of new wells will eventually decline as production capacity approaches the limits of the economically recoverable gas resources in the region.

Exhibit III-1.
Projected Annual Natural Gas Wells Drilled in Northwest Colorado, 2007–2035



Source: BBC Research & Consulting, 2008.

Exhibit III-2.
Projected Natural Gas-Related Employment in Northwest Colorado, 2007–2035



Source: BBC Research & Consulting, 2008.

Potential Oil Shale Development

Whether or not a commercial scale oil shale industry will develop in northwest Colorado during the coming decades is both difficult to predict and potentially critical from the standpoint of regional planning. As noted earlier, previous efforts to develop oil shale (and the expectations that went along with those efforts) led to rapid growth followed by a lengthy regional recession during the 1980s. In December 2007, the BLM issued its Draft Programmatic EIS (PEIS) for resource management plan amendments to allow for leasing lands for commercial oil shale and tar sands development in Colorado, Utah and Wyoming. The PEIS concluded that the BLM did not have, at this time:

> *"adequate information on the (1) magnitude of commercial development and pace of that development, (2) potential locations of commercial leases, (3) technologies that will be employed, (4) size or production level of individual commercial projects, and (5) development time lines for individual projects to support decisions about lease issuance."* [5]

The prospects for development of a commercial oil shale industry in northwest Colorado during the foreseeable future may depend on at least three critical factors:

- Growth or decline in world oil production and reserves from conventional sources and existing unconventional resources (including Alberta oil sands production discussed later);
- Changes in world oil demand, including both growth in demand in developing economies and potential reductions in demand in developed economies due to higher prices; and
- Whether or not the current RD&D projects can identify ways to overcome significant technical, economic and environmental challenges.

Despite the many uncertainties surrounding the prospects for oil shale, it is prudent to begin considering the implications of a commercial-scale oil shale industry in northwest Colorado. Though many residents of northwest Colorado remain skeptical due to memories of the 1980s oil shale bust, there is a very real possibility that commercial oil shale development will finally move forward. While both the scale of such an industry and the number of jobs it would create are not known, they are likely to be substantial. Two recent forecasts, from the Strategic Unconventional Fuels Task Force and from the Utah Bureau of Business and Economic Research, along with information for a hypothetical representative facility from the Draft BLM PEIS, illustrate both the scale of possible activity and the wide range of estimates surrounding production levels and employment forecasts. Exhibit III-3 on the following page summarizes information from these sources.

[5] BLM PEIS, page 2-50.

Exhibit III-3.
Varied Expectations of Future Commercial Oil Shale Activity

Source	Timing/Magnitude	Direct Employment
Task Force on Strategic Unconventional Fuels		
Base Case:	500,000 Bpd by 2020	9,000 jobs
Accelerated Case	1,000,000 Bpd by 2020	24,000 jobs
Utah Bureau of Economic and Business Research	100,000 Bpd by 2020	5,000 - 10,000 jobs
BLM Draft PEIS, December 2007	Pilot testing 2021 - 2026 Potential 200,000 Bpd in-site facility and 50,000 Bpd underground mine by 2029	Construction: 5,000-6,000 jobs* Operations: 3,000 jobs*

Note: *Approximate totals include coal mines and power plants, but exclude housing construction.
Source: Strategic Unconventional Fuels Task Force, 2007; Utah BEBR, 2006; and BLM, 2007.

Current Research, Development and Demonstration projects (RD&D). On January 1st, 2007, the BLM issued five RD&D leases on lands in Rio Blanco County to Shell Frontier Oil and Gas (three separate leases), Chevron Shale Oil Company and EGL Resources Inc.[6] All three companies are using these leases to further investigate in situ processes for extracting and recovering oil shale.

Information from the lease applications, environmental assessments of the lease applications and BBC's interviews with representatives of the companies indicates that the RD&D programs will have a fairly modest effect on local economic conditions. Shell anticipates a peak construction workforce of about 700 jobs at each of their three leasing sites, but these peaks would not overlap. The Shell operating workforce was projected at about 150 jobs on each of the three sites. EGL's lease application indicates a construction workforce of 10 to 100 workers and an operating workforce of 10 to 40 workers. Chevron indicated to the study team that they anticipate a very limited on-site presence over the next 10 years, with most of the work being done on sample materials sent to other corporate locations. Overall, BBC estimates that RD&D employment will ramp up to about 800 jobs by 2010 and remain fairly stable at 500 to 800 jobs over the duration of the 10-year leases.

Commercial oil shale. A good indicator of how the commercial scale oil shale industry might actually develop in northwest Colorado is the development over the past few decades of a large industry producing oil from oil sands in Alberta, Canada. The Alberta oil sands industry employs a mix of mining and surface retorting with in situ production of the unconventional resource in that province. Given the uncertainties discussed earlier this section regarding the specific technology, rate of development and magnitude of production that would be employed for oil shale in Colorado, it is instructive to draw upon the Alberta experience with the production of unconventional fuels.

Alberta oil sands activity. With an estimated initial volume of approximately 1.7 trillion barrels of crude bitumen in-place, Alberta's oil sands constitute one of the largest hydrocarbon deposits in the world. Alberta's three major oil sand regions are located in the northeastern part of the province. The largest deposit, containing about 80 percent of total reserves and the only one suitable for surface mining, is the Athabasca Oil Sands along the Athabasca River. The mineable area covers about 1,300 square miles north of the town of Fort McMurray.

[6] BLM PEIS, pages 1-9 and 1-10.

The Alberta Government estimates that about 11 percent (178 billion barrels) of total reserves are recoverable under current economic conditions. Of this total, about 20 percent is accessible through surface mining technologies. Remaining reserves will require in situ recovery methods such as cyclic steam stimulation (CSS) and steam assisted gravity drainage (SAGD). At current rates, initial established reserves would be sufficient to satisfy Canadian crude oil demand for approximately 250 years.

The Canadian oil sands have been in commercial production since the original Great Canadian Oil Sands (now Suncor) mine began operation in 1967. A second mine, operated by the Syncrude consortium, began operation in 1978 and is the biggest mine of any type in the world. The third mine in the Athabasca Region, the Albian Sands consortium of Shell Canada, Chevron Corporation and Western Oil Sands Inc., began operation in 2003. Numerous other projects are currently in the regulatory approval process, while others have either broken ground or are nearing first production.

Commercial in situ production commenced in 1985 when Imperial Oil and Petro-Canada initiated operations in Alberta's Cold Lake region. In the following year, Shell began operations at its Peace River Project. Since then, Encana, Canadian Natural, Petro Canada and others have started a number of in situ projects on the Athabasca, Cold Lake, and Peace River deposits.

Until the mid-1990s, development of the oil sands was considered risky and unprofitable. But as a result of preferential fiscal policies (low provincial royalties and federal tax breaks) and new technologies that reduced operating costs, oil sands investment began to rapidly increase. Between 1995 and 2004, oil sands production more than doubled to approximately 1 million barrels per day. According to the Canadian Association of Petroleum Producers (CAPP), oil sands production accounted for 62 percent of Alberta's total crude oil and equivalent production in 2004.

At a world price of only $50 per barrel, the Canadian National Energy Board (NEB) estimates an integrated mining operation would make a rate of return of 16 to 23 percent, while an in situ SAGD operation would return 16 to 27 percent. Prices in 2006 have been considerably higher than that. As a result, anticipated capital expenditures for the period 2006 to 2015 exceed $100 billion. Due to increasing costs for materials and an acute labour shortage in Alberta, it is not likely that all these projects can be completed.

A report by the Canadian Energy Research Institue (CERI) demonstrates the economic impact of oil sands development in Alberta. The report estimates that between 2000 and 2005, oil sands activities supported an average of 108,000 jobs per year in Alberta, including direct and indirect employment. Between 2016 and 2020, this number is expected to increase to about 240,000 jobs per year.

The study team used CERI estimates to determine the total number of direct jobs associated with oil sands development and production. Based on this analysis, between 2000 and 2005, approximately 27,400, or about 25 percent of the 108,000 jobs annually supported by oil sands activities are considered direct development and production jobs. Between 2016 and 2020, average annual direct employment is expected to reach 71,600 jobs.

In situ production and development will account for approximately 27 percent of total direct oil sands jobs through 2020. Employment associated with in situ production was just over 9,000 in 2006 with estimated production levels of more than 510,000 barrels per day (about 1,800 employees per 100,000 bpd). Forecasts show direct in situ employment increasing to more than 20,000 jobs in 2020. Estimated in situ production for 2020 is nearly 1.5 million barrels per day (1,400 employees per 100,000 bpd).[7]

The economic potential of Canada's oil sands is undisputed, but the fast pace and large scale of its development has considerable environmental and social impacts. Major challenges include water conservation, greenhouse gas (GHG) emissions, land disturbance and waste management. From a socioeconomic perspective, a major issue of concern is overwhelming demand on a limited population of skilled laborers. Oil sands development has provided economic benefits but these benefits are accompanied by costs to the social well being of the surrounding communities.

At present, the area around Fort McMurray, Alberta has experienced the greatest effects from increased activity in the oil sands. Although jobs are plentiful, housing is in short supply and expensive. People seeking work often arrive in the area without arranging accommodation, driving up the price of temporary accommodation. The area is isolated, with only a two-lane road connecting it to the rest of the province, and there is pressure on the government of Alberta to improve road links as well as hospitals and other infrastructure. The town of Fort McMurray will need $1.2 billion in infrastructure to accommodate growth, including funds for a new water treatment plant, police station, recreation center and fire hall.[8]

Limited affordability and availability of housing in Fort McMurray are detrimental to recruitment for oil sands companies. In order to address these issues, several companies have applied for fly-in and fly-out permission for their projects, which would allow workers to live in larger centers (e.g., Edmonton, Calgary and other metropolitan areas in Canada) and commute to the worksite via airplane. This approach has the potential to assist companies with recruitment and reduce stress on accommodation, infrastructure and services; however, in the long-term this approach may compromise the sustainability of communities (such as Fort McMurray).

[7] BBC 2007, CERI 2005.

[8] Canadian Press, December 28, 2006. "Oil and growth beyond regulator's reach: analysis."

Scenario for potential commercial oil shale development in northwest Colorado. As noted earlier, development of a viable commercial oil shale industry in Colorado is highly uncertain. At one end of the spectrum of possibilities, development efforts may come to a halt during, or at the conclusion of, the current RD&D projects.

For planning purposes, the study team has attempted to project the other end of the spectrum – or the most rapid, reasonably foreseeable development scenario over the next three decades. We have drawn heavily on the information just discussed concerning the Alberta oil sands experience. This scenario anticipates commercial production to begin on a small scale in 2021, reaching 50,000 barrels per day (bpd) by 2025. After 2025, 50,000 bpd of annual capacity would be added each year. All production would take place in Rio Blanco County, Colorado.

The study team also used data from Alberta's experience to estimate the number of workers associated with estimated production[9]. Exhibit III-4 shows employment assumptions used in this analysis.

Exhibit III-4. Commercial Employment Per 100,000 bpd

Source:
BBC Research & Consulting from CERI, 2005.

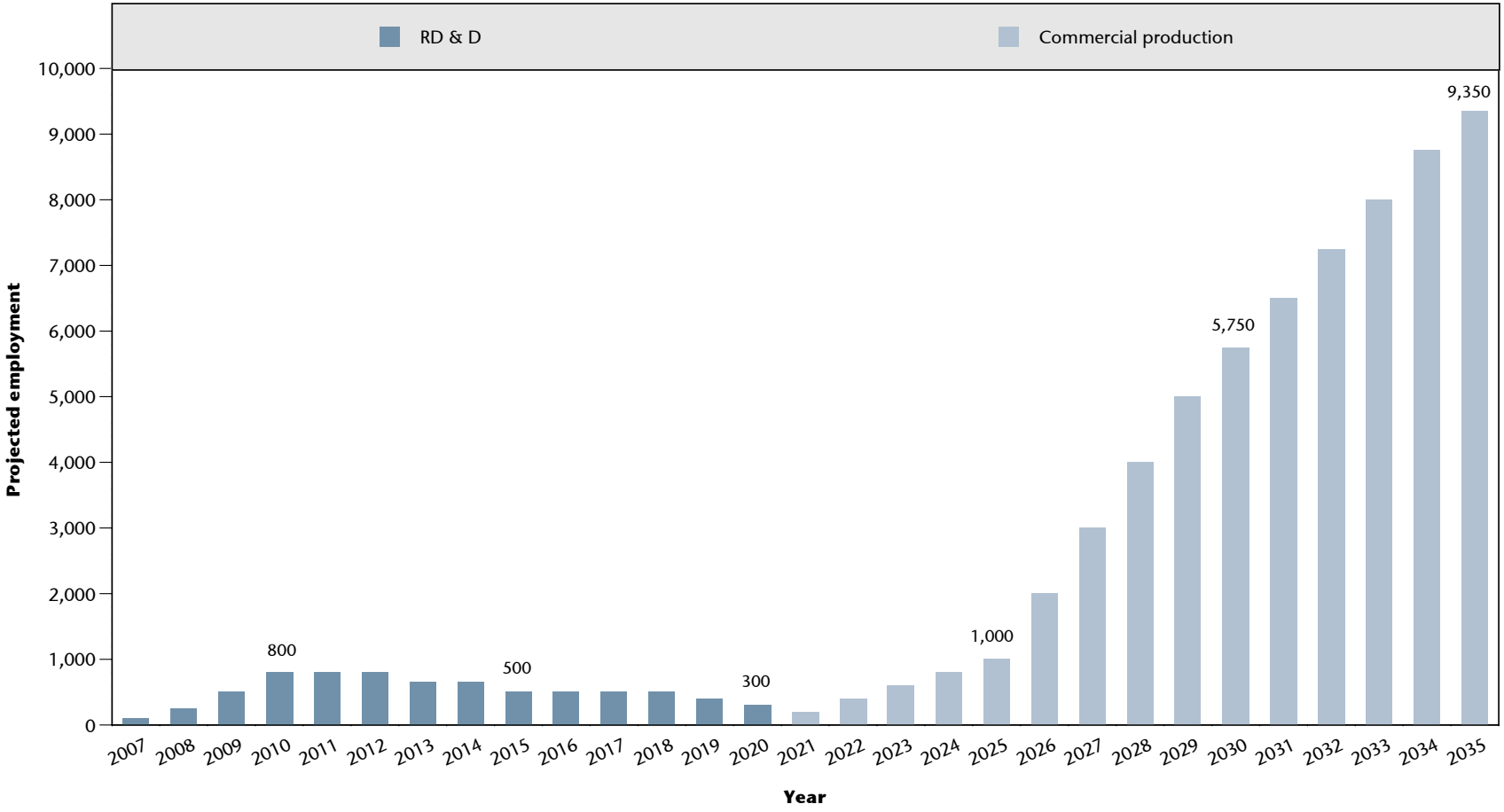
Level of production	Commercial employment per 100,000 bpd
Up to 250,000 bpd	2,000
250,000 to 500,000 bpd	1,500
500,000 to 1,000,000 bpd	1,200

Based on Exhibit III-4, commercial employment would amount to about 200 employees in 2021. Employment would steadily increase to match production with about 1,000 employees by 2025. By 2035, estimated commercial employment would amount to more than 9,300 workers.

Total employment. Exhibit III-5 shows total oil shale employment under the study team's production scenario including RD&D and commercial production. As discussed in the next section, numerous additional workers will be needed to construct and maintain electrical generation facilities necessary to meet energy requirements associated with oil shale production.

[9] CERI 2005.

Exhibit III-5.
Projected Direct Oil Shale-related Employment in Northwest Colorado, 2007–2035



Source: BBC Research & Consulting, 2008.

Other Natural Resources in Northwest Colorado

Power generation. The four county northwest Colorado study region currently accounts for 13 to 14 percent of total Colorado electric generation capacity. There are currently two coal-fired power plants in the four county study region. The Craig power plant, located in Moffat County, is one of the state's largest. With a generating capacity of more than 1,300 megawatts (MW), Craig makes up close to 90 percent of the study region's total capacity. The Cameo power plant, located in Mesa County is a much smaller facility with a nameplate capacity of 66 MW. A third generation facility, the Hayden power plant, is located at the edge of the region in Routt County. Hayden's production capacity is about 465 MW, placing it among the top five coal-fired generation facilities in the state.[10] The Craig and Hayden power plants employed 300 and 100 workers in 2006, respectively. The smaller Cameo power plant had only four employees. Additionally, the 510 MW Bonanza power plant, just outside the study area in Utah, is planning an expansion. This may have a minimal impact on out-commuting from Rangely, Colorado.

Rifle Generating Station, located in Garfield County, is the only natural gas generation facility in the four county study region. The station is owned by Tri-State Generation and Transmission and has a generation capacity of close to 70 MW. In 2006, The Rifle Station employed about 13 workers.

Hydroelectric facilities account for the region's remaining generation capacity of about 70 MW.[11] Other renewable energy sources currently make up a very small amount of generation in the northwest Colorado region.

Personal interviews with state and regional agency representatives indicate that northwest Colorado will meet increased demand through new and upgraded transmission facilities. Colorado is in the Rocky Mountain Power Area (RMPA) of the Western Electricity Coordinating Council (WECC). WECC is one of the ten electric reliability councils in North America. The WECC is geographically widespread with significant distance between load and generation areas, making transmission constraints a significant factor when considering reliability and when planning new capacity additions.

There are currently no known coal-fired generation facilities slated to come on-line within the four county study region in the foreseeable future. Personal communications with industry representatives indicate that it may be difficult to build new coal-fired power plants in Colorado due to more stringent regulations and environmental opposition. In October 2007, the Kansas Department of Health and Environment became the first government agency in the United States to cite carbon dioxide emissions as the reason for rejecting an air permit for a proposed coal-fired electricity generating plant.

Renewable energy requirements are also affecting utilities' plans for expansion or continuation of current plants. In response to Colorado's Renewable Energy Standards, Excel has decided to close it's coal-fired Cameo power plant in Mesa County. Without new clean coal technologies, there may be a decreased demand for coal-fired electricity generation in future years.

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[10] CGS, 2005.

[11] CGS, 2005.

Colorado has been adding a large amount of new natural gas-fired electric generation capacity in the last 14 years. While natural gas-fired generation has some advantages with respect to other fuel sources (lower capital costs, shorter construction lead times, greater efficiency and fewer emissions concerns), sharp gas price increases and unstable price volatility in recent years have been of significant concern.[12] No known new natural gas generation facilities are planned for the northwest Colorado region. (Though the study team has assumed that new natural gas-fired generation facilities would be built in the region if commercial oil shale development occurs.)

Renewable energy is a major focus of Colorado's New Energy Economy proposed by Governor Bill Ritter. Colorado Amendment 37 requires that 10 percent of retail sales by Colorado's largest utilities be from renewable sources by 2015. Interviews with state energy representatives indicate that the majority of renewable energy will be generated through wind resources on the Eastern Plains. Some communities in the northwest Colorado study region are beginning to promote solar power generation through local economic development initiatives. Renewable energy sources are not expected to be developed on a large scale within the region.

Demand for additional capacity and upgraded transmission lines may result from population increases in northwest Colorado. Given no new generation facilities planned to serve electricity demands outside of the study region, employment projections for the electric power generation sector are estimated through the study team's employment model as indirect jobs associated with general regional growth.

Power for oil shale. In light of the extensive energy requirements associated with potential oil shale development, the study team estimated the electric generation employment necessary to meet increased demand. Under this scenario, oil shale development would be powered by natural gas-fired electric generation and a large amount of new capacity would be required. The study team projects about 7,000 MW of capacity would be needed to produce 500,000 barrels of oil shale per day by 2035. The construction of these facilities would employ the majority of workers associated with the increased demand for electricity. Based on previous studies, the study team estimates that the construction and planning of natural gas generation facilities would employ about 125 workers in 2020, with this workforce growing to nearly 1,300 workers by 2026.

The operation and maintenance of new generation facilities would also employ a substantial number of workers through 2035. In 2021, a small number of operational workers would come on-line to support necessary power generation. Operational electric generation workers would steadily increase to more than 700 workers by 2035.

The study team has assumed gas-fired electric generation over coal-fired generation for several reasons. First, the region obviously has an abundant supply of natural gas in immediate proximity to the areas where future commercial oil shale production facilities might be located. Second, natural gas-fired generation is generally easier and quicker to permit and construct than coal-fired power plants. Finally, air quality regulations are widely viewed as an important constraint on new power plant development in northwest Colorado. While natural gas-fired electric generation emits carbon, NOx and other pollutants like coal-fired generation, it avoids the SO2 emission issues associated with conventional coal-fired power plants. It is important to note, however, that the assumption that

[12] CEF, 2007.

natural gas would be used to produce electricity for oil shale is a fundamental difference between this analysis and the evaluation prepared by BLM for the commercial oil shale leasing Draft EIS. The DEIS assumed coal-fired generation – which would have the effect of shifting some of the economic and demographic impacts this study anticipates for Rio Blanco County to the major coal production areas in northwest Colorado – including Delta, Gunnison and Moffat Counties.

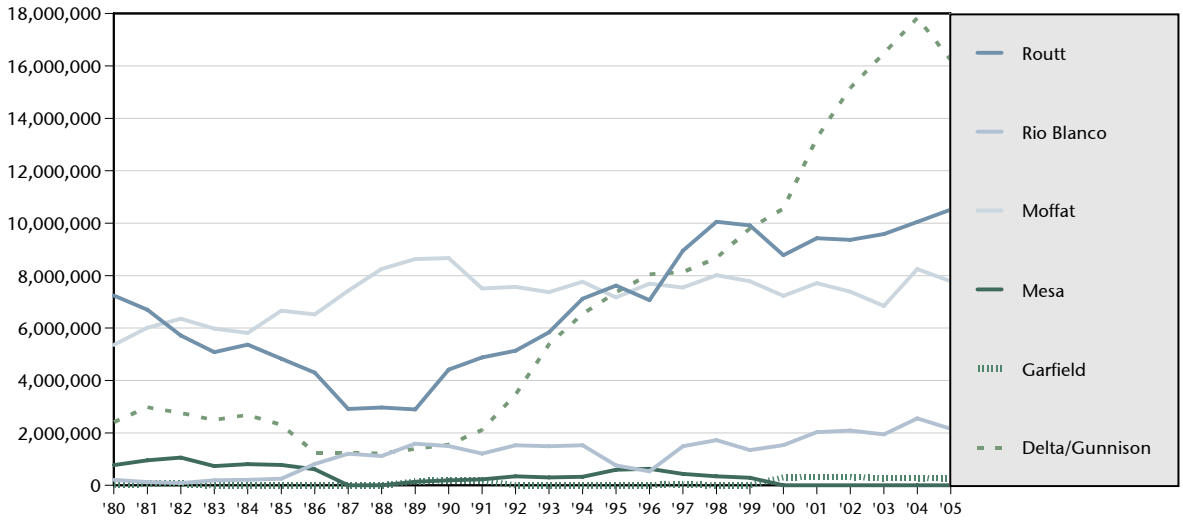
Coal production. Colorado is currently the seventh ranked coal-producing state in the nation. In 2006, Colorado's coal industry had its fourth best production year as the state's ten active coal mines produced a total of 35.5 million short tons of coal. Production has dropped 11 percent from the record high of nearly 40 million tons in 2004. The Colorado Geological Survey expects production to rebound in coming years. As of March 2007, Colorado coal production was already more than 40 percent ahead of production compared to the same time in 2006.

Eight of the ten active coal mines in Colorado are located within the four county study region or at the edges of the region in Delta, Gunnison and Routt Counties. This includes six underground mines: McClane Canyon in Garfield County; Deserado in Rio Blanco County; Bowie #3 and Elk Creek in Delta County; West Elk in Gunnison County; and Twenty-mile Mine in Routt County; as well as two surface mines, Colowyo and Trapper Mines, in Moffat County. The Seneca Mine - a surface mine located in Routt County - was closed in December 2005 but produced a small amount of coal through February 2006.

County production data available from 1980 through 2005 indicates that coal mines within northwest Colorado (including Delta, Gunnison and Routt Counties) have historically accounted for about 91 percent of the State's total production. Since 1980, annual production in the region has grown by more than 130 percent. Colowyo Surface Mine in Moffat County, Twenty-mile Mine in Routt County and West Elk Mine in Gunnison County have traditionally produced the majority of the region's coal. In recent years, Delta County has also accounted for a large percentage of total production. This is attributed to a major increase in production at Bowie Mine as well as Elk Creek Mine, which primarily produced in Gunnison County until early 2004.

Both Deserado and McClane Canyon Mines in Rio Blanco and Garfield Counties have increased production dramatically on an annual percentage basis. However, production in these counties remains relatively low compared to the rest of the study region. There has been little production in Mesa County since the closing of Roadside Mine in 1999, though an EIS is underway for the proposed Red Cliff Coal Mine which would be a larger producer. Exhibit III-6 shows production by county from 1980 through 2005.

Exhibit III-6.
Coal Production in Northwest Colorado, 1980–2005



Source: BBC Research & Consulting from Colorado Department of Local Affairs, 2007.

Active mines within the four county study region and the Colorado counties on the edge of the region produced more than 34 million short tons of coal in 2006, approximately 97 percent of the state's total production. Of that total, about 26.1 million tons came from underground mines, while 8.5 million came from surface mines in Moffat County. Mines within the four county study region produced about 10.4 million short tons, about 30 percent of the northwest Colorado total.

Coal mines within northwest Colorado annually employed an average of 1,805 miners between 2001 and 2006.[13] During this time, mine employment increased by about 16 percent in the study region, ranging from 1,674 miners in 2001 to 1,944 miners in 2006. The majority of these workers are employed in Delta, Gunnison and Routt Counties on the edges of the region. Mine employment in the four county study area remained relatively stable from 2001 through 2006 at about 566 miners per year.

The Energy Information Administration's 2007 Annual Energy Outlook suggests that demand for western coal will continue to increase as coal use is expected to grow substantially throughout the United States. For states east of the Mississippi River, coal demand is projected to increase 39 percent, from 2005 to 2030. Much of this increase is expected to be met by western coal. West of the Mississippi River, coal demand is projected to increase 79 percent by 2030, with western coal producers as the primary source of supply.

[13] CGS Coal Reports.

The majority of coal production in the western region is expected to come from the Wyoming Powder River Basin, which will account for about 68 percent of western coal production through 2030. The Rocky Mountain region, which includes Colorado and Utah, will make up the next largest portion of total production. The Rocky Mountain region is expected to produce about 10 percent of western coal through 2030.[14]

Based on EIA's forecasts and CGS coal reports for 2001-2006, coal production in the four county study region could increase to more than 23 million short tons by 2030, a 98 percent increase from 2004. Under such a scenario, direct coal employment in the region would increase by about 80 percent (based on a 0.5 percent annual productivity gain) over the same period. In light of subsequent information gathered by the study team, these projections represent a relatively high growth scenario.

Addition of the proposed Red Cliff Mine in Mesa County could increase production levels close to those reflected in EIA's forecast. In June 2006, the BLM published a Notice of Intent (NOI) to prepare an environmental impact statement (EIS) for the proposed Red Cliff Coal Mine. According to the NOI, CAM Mining Company plans to produce 8 million tons per year at the proposed underground mine. No information is currently available regarding when the Red Cliff Mine might start production.

Interviews with agency and industry representatives suggest the greater likelihood of a relatively stable production scenario. The constraint in the existing rail infrastructure in Colorado is a limiting factor for coal production in the state. Both the Union Pacific (UP) and the Burlington Northern/Santa Fe (BNSF) railroads transport coal through Colorado. The UP moves most of the coal out of western Colorado through the Moffat Tunnel to customers in the Midwest.

In 2006, over 15.5 million tons of coal moved from the Somerset Coal Field to the Front Range and further east. Stockpiles at the three North Fork mines decreased because of slowdowns at the mines, but in early 2007 stockpiles began increasing again. This is directly related to the number of coal trains that can move in and out of the one-way tunnel on the UP Railway. Costs to build a twin Moffat Tunnel are at least $500 million, an investment that the railroads can only undertake with partnerships.[15] Personal communications with Vince Matthews, CGS Director, indicate that railroad companies currently have no plans to expand the tunnel.

Air quality regulations and renewable energy requirements may also affect future production. Although requirements for new technologies are uncertain, some believe they may cut emissions to such an extent that eastern power plants will no longer require Colorado's low sulfur and high BTU content coal. Without the demand for the specific characteristic of Colorado coal, Colorado cannot compete with lower prices and greater production capacity in the Powder River Basin and other western states.

[14] EIA, 2007.

[15] CGS, 2006.

On the other hand, clean coal technologies may increase the need for production in the west. Advanced coal technologies are seen by many as a primary component of a zero-emissions system. As these technologies become more advanced, coal-fired power plants may offer advantages over other methods including gas and nuclear power. However, the technology remains unproven on a widespread commercial scale and will require a large investment by utilities.

Given production constraints and the regulatory and technological uncertainties described above, the study team believes that significant production increases beyond the addition of Red Cliff Mine are unlikely. Stuart Sanderson, President of the Colorado Mining Association, agrees that at a current capacity of around 40 million short tons per year, production in Colorado has reached somewhat of a plateau. The scenario used by the study team for the purposes of this analysis, holds production in Colorado relatively constant at about 36 million tons per year. Productivity (employees per ton) increases modestly throughout the study period with a 0.5 percent efficiency gain built into in the model.

Based on these assumptions, we estimate an annual average of about 544 direct jobs in coal mining through 2030 at existing mines in the four county study region, declining from 553 jobs in 2006 to 527 jobs in 2030. Assuming the addition of Red Cliff Mine by 2012, average annual employment could increase to more than 823 jobs, with 906 mine employees in 2030.

Uranium mining. In response to recent price increases, there has been considerable recent interest in the exploration and development of uranium properties in Colorado near the Uravan Mineral Belt. The Uravan Mineral Belt is the oldest uranium mining area in the U.S., and historically the most productive uranium and vanadium region in Colorado. The region is primarily located south of the four county study region but extends northward into both Rio Blanco and Mesa Counties. From 1948 to 1978, the Uravan mineral belt's 1,200 historic mines produced over 63 million pounds of uranium and 330 million pounds of vanadium. Colorado ranks third among the states in uranium reserves, behind Wyoming and New Mexico.

The Colorado Geological Survey (CGS) estimates total 2005 Colorado uranium production at 255,544 pounds. All production came from resumed operations at four mines owned by the Englewood-based Cotter Corporation. The company closed all four of these mines in November 2005, laying off 49 workers at the mine sites and more workers at its ore processing mill in Canon City. Higher energy costs and the long haulage distance (about 300 miles) from the mines to the mill contributed to the economic difficulties of the operations. There was no Colorado uranium production in 2006 due to the Cotter closure. Denison Mines Corporation produced a small amount of uranium in 2007.

In 2006, more than 3,400 uranium claims were filed with the BLM Colorado state office. While identification of the mineral commodity is not required for a claim, 60 percent of claims filed in 2006 (3,404 of 5,693) were located in Dolores, Mesa, Moffat, Montezuma, Montrose, Rio Blanco, and San Miguel Counties and are almost certainly for uranium. The majority of these claims are in San Miguel (1,731) and Montrose (995) Counties. Within the northwest Colorado study region, a total of 363 claims were filed including 110 in Rio Blanco County and 253 in Mesa County.[16]

[16] BLM, 2007.

There are 35 permitted uranium projects in Colorado. Among these projects, one is in temporary cessation, one is awaiting warranty (which means activity on the ground cannot occur), one application is in review and 32 are active (but not producing). The majority of these permits are in San Miguel and Montrose Counties. There are currently no active permits within the northwest Colorado study region. The Division of Reclamation, Mining and Safety anticipates that additional uranium mines may resume operations.

Compared to other natural resource extraction industries, uranium production supports relatively few employees on site. For example, in 2005, Cotter employed 126 people, only 37 of whom worked at the mine. The majority worked at Cotter's Mill in Canon City, and the rest were employed at the corporate office in Lakewood. The most recent Directory of Colorado Uranium and Vanadium Mining and Milling Activities (1978) showed a relatively small number of mines with greater than 10 employees.

The future of uranium production in Colorado remains largely uncertain. According to some industry representatives, development of uranium still "has a long way to go." Currently one of the bottlenecks in the U.S. uranium supply chain is in milling capacity. At the end of 2006, there was only one active mill capable of processing conventionally-mined uranium ore in the U.S. According to CGS, discussions with professionals in the mining industry reveal that a number of uranium mines could begin production rather quickly if mill facilities existed to receive their product.

Mine permitting and regulations have changed significantly since the last uranium development in the 1970's. Colorado's rigorous permitting and bonding requirements (which have changed significantly since some of these uranium mining operations were previously in production) could be sources of concern to potential uranium mine operators.[17] Environmental groups now closely monitor all mining activities.

Given the increased demand for "clean" energy and electricity generation in general, future growth in the uranium industry seems to be a reasonable assumption. However, the relatively small number of employees on site, the location of potential mining activity (mostly south of the study region) and other environmental concerns will limit the industry's socioeconomic impact in northwest Colorado.

For the purposes of this analysis, the study team assumed that half of the active permits in the western Colorado would resume operations by 2020. This includes 1 mine in Mesa County, 9 in Montrose County and 7 in San Miguel County. The study team assumes an average of 10 employees per mine and that no companies are headquartered within the region. In total, uranium production employees in western Colorado (including San Miguel and Montrose Counties) would amount to about 425 workers under this scenario, with 10 workers employed directly in the study region (in Mesa County).

[17] CGS, 2007.

SECTION IV.
Economic and Demographic Effects of Natural Resource Development

SECTION IV.
Economic and Demographic Effects of Natural Resource Development

This section begins with an overview of the Northwest Colorado Socioeconomic Projection model (NWCSP model) used to estimate the economic and demographic effects of anticipated natural resource development in the four county study region. The model is then used to forecast regional economic and demographic growth, including the direct and secondary effects of projected conventional natural resource development, non-energy related growth and commercial oil shale development.

Overview of Northwest Colorado Socioeconomic Projection Model

The NWCSP model provides resident employment and population forecasts for the four county study region based on projected economic activity and commuting patterns. After developing county-level population estimates, the model allocates population on a sub-county level based on the geographic allocation method discussed in Section V.

As mentioned in Section II, the study team worked with the SDO to analyze the current economic base for the four county study region. Each year the SDO provides an updated estimate of current county economic conditions in addition to forecasts of future growth. For non-natural resources sectors, the study team used employment projections made by the SDO. The study team combined this information with detailed forecasts of economic activity for industries related to energy and natural resources based on the analyses presented in Section III.

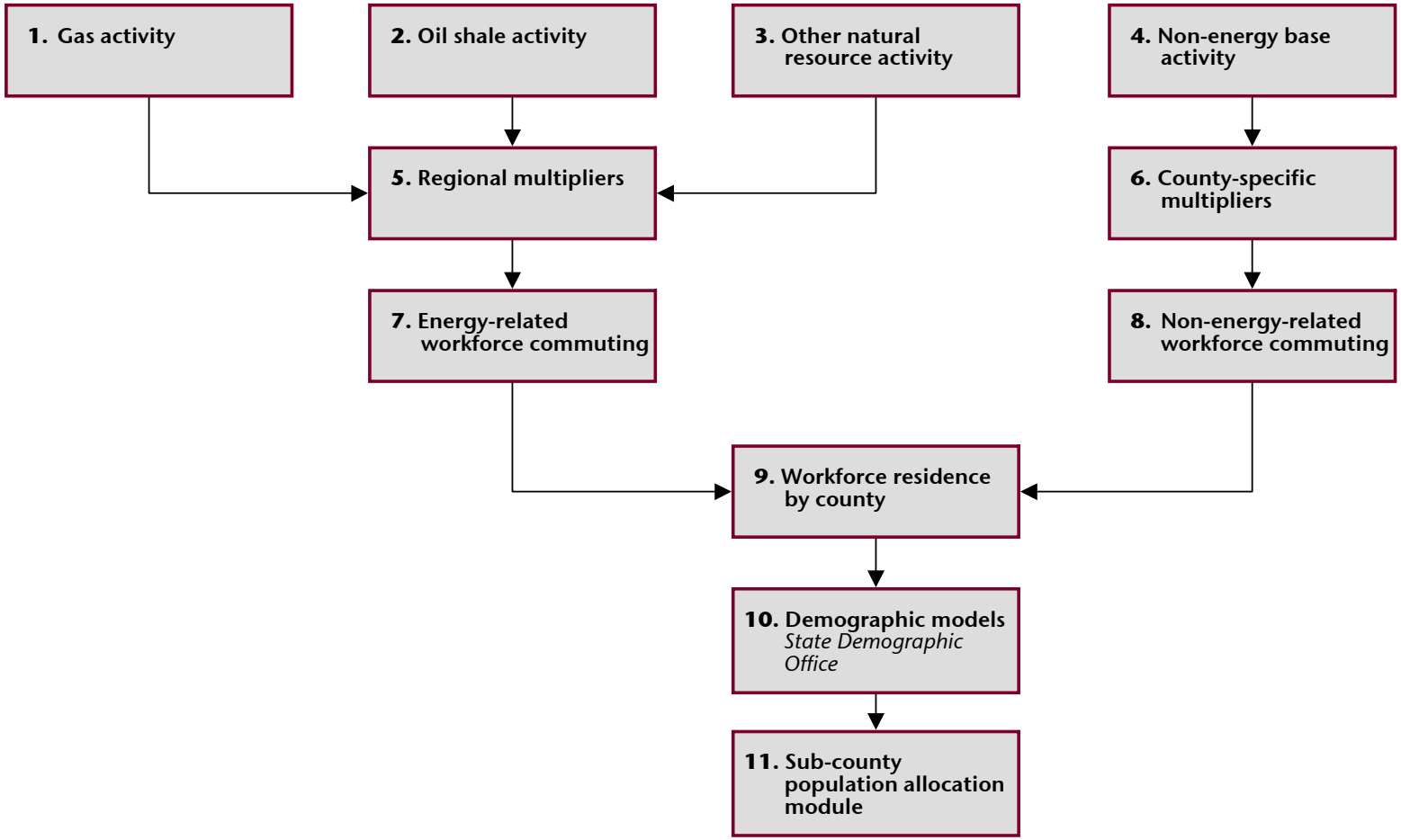
Exhibit IV-1 on page IV-3 provides an overview of the socioeconomic model used for the analysis. The study team used a regional approach for modeling industries related to energy and natural resources (boxes 1, 2 and 3 in Exhibit IV-1) and a county by county approach for modeling economic activity generated in other base industries (box 4). Both models used multipliers based on the 2006 IMPLAN data set for the region to determine total employment (boxes 5 and 6).[1] The regional approach to modeling energy and natural resource-related jobs reflects the extensive county to county flows of workers and services associated with this industry, while the county by county approach to modeling other base industries allowed the study team to make use of the extensive experience of the SDO in analyzing and projecting the economic base structures of the individual counties.

[1] IMPLAN is a county-level, economic input-output model originally developed by the U.S. Forest Service to analyze the economic implications of resource management decisions. IMPLAN is widely used in regional economic studies such as this one.

After estimating the total number of jobs produced by each base industry, BBC used the commuting distributions discussed in Section II to determine the total number of employed residents in each county (boxes 7, 8 and 9). As noted in Exhibit IV-1, the SDO estimated the total population for each county given BBC's forecast of employed residents (box 10) using their demographic modeling of labor force participation and multiple job holding. The study team then used the geographic allocation model (box 11) discussed in Section V to allocate the population on a sub-county basis.

The remainder of this section provides an overview of the model results along with a discussion of factor competition.

Exhibit IV-1.
Overview of NWCSP Model Structure



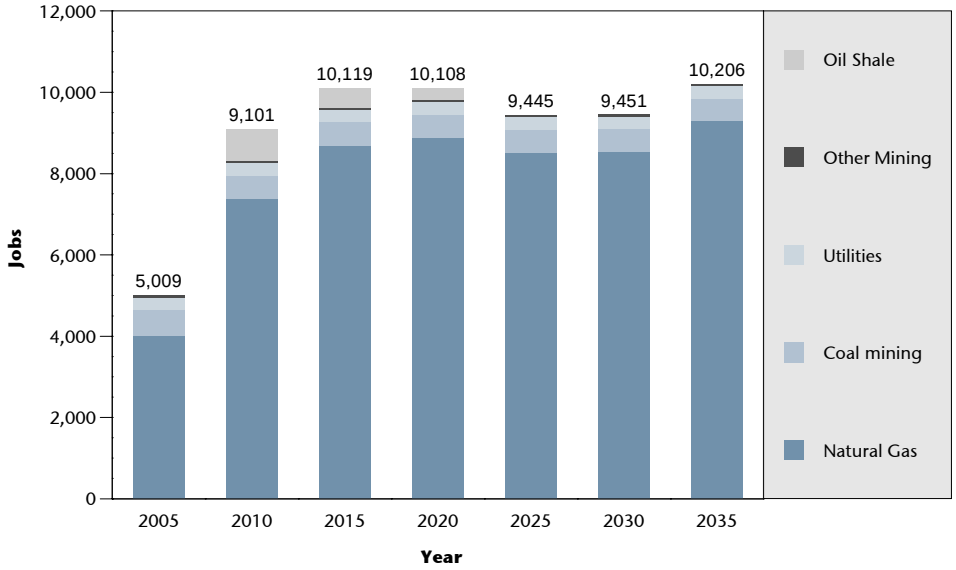
Source: BBC Research & Consulting, 2008.

Baseline Scenario (Without Commercial Oil Shale)

Expansion of gas and other conventional natural resource activity will contribute to a substantial increase in employment in the four county study region through 2035. The baseline scenario considers projected growth in all sectors, but excludes growth due to potential full-scale commercial oil shale development. The economic and demographic effects of commercial oil shale are discussed later in the section.

Projected direct natural gas and conventional natural resource-related jobs. The NWCSP model incorporates projected direct natural resource-related job growth in five categories: natural gas, coal mining, utilities, other mining and oil shale. Exhibit IV-2 shows forecasts of the number of jobs in each energy subsector and the total number of these jobs over the 30-year period from 2005 to 2035. The oil shale jobs shown in Exhibit IV-2 represent projected activity due to planned research, development and demonstration (RD&D) projects.

Exhibit IV-2.
Direct Energy Jobs by Subsector, 2005–2035 (Baseline Scenario)



Source: Northwest Colorado Socioeconomic Projection model, BBC Research & Consulting, 2008.

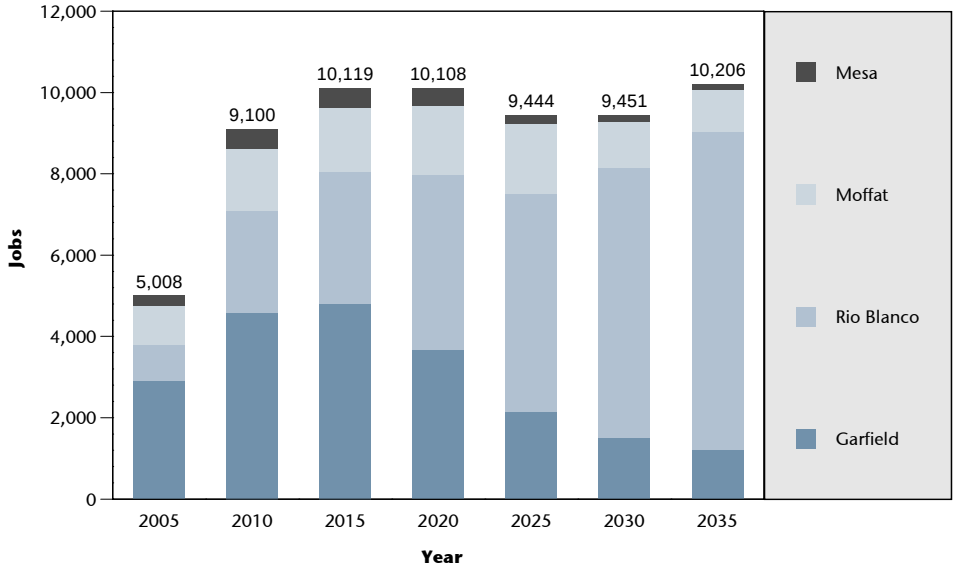
The total number of direct jobs in the energy sector is forecast to increase to over 9,100 between 2005 and 2010, an increase of almost 4,100 jobs or 82 percent. The number of direct energy jobs is anticipated to peak at almost 10,120 in 2015 before decreasing to 9,450 by 2030 and increasing again to over 10,200 by 2035.

The natural gas sector will experience the bulk of this growth, expanding from about 4,020 jobs in 2005 to 7,380 jobs in 2010, an increase of over 3,360 (84 percent). The number of utilities jobs will remain at 315 over this period, other mining jobs will remain at 45, and coal mining jobs will decrease from about 630 in 2005 to 550 in 2035. Although commercial oil shale development does not occur under this scenario, a modest level of employment is anticipated through 2020 for the RD&D projects in Rio Blanco County.

The natural gas industry is highly mobile. At present, many of the regional workers in this industry live in different counties than where the wells are being drilled and serviced. Often, these workers are employed by companies based in still another location (often in Mesa County for the natural gas industry). Consequently, projected jobs in the natural gas industry are identified by work-site in the NWCSP model – rather than where the companies are based. Anticipated locations of worker residences are discussed later in this section.

Exhibit IV-3 demonstrates how total direct, energy-related job growth would be distributed in the four county study region under the baseline scenario by the location of these jobs (by work-site).

Exhibit IV-3.
Direct Energy Jobs by County, 2005–2035 (Baseline Scenario)



Note: County energy job totals reflect work-site for natural gas jobs, not necessarily corporate office locations for the workers.
Source: Northwest Colorado Socioeconomic Projection model, BBC Research & Consulting, 2008.

Garfield County. Between 2005 and 2010, the number of energy jobs in Garfield County will grow substantially from 2,910 to 4,580, an increase of over 57 percent. The number of jobs will peak at 4,810 in 2015 and decrease to 1,210 by 2035. Over the 30-year period, the number of energy jobs Garfield County residents will decrease by 1,700. Virtually all of this job growth and contraction will occur in the natural gas sector.

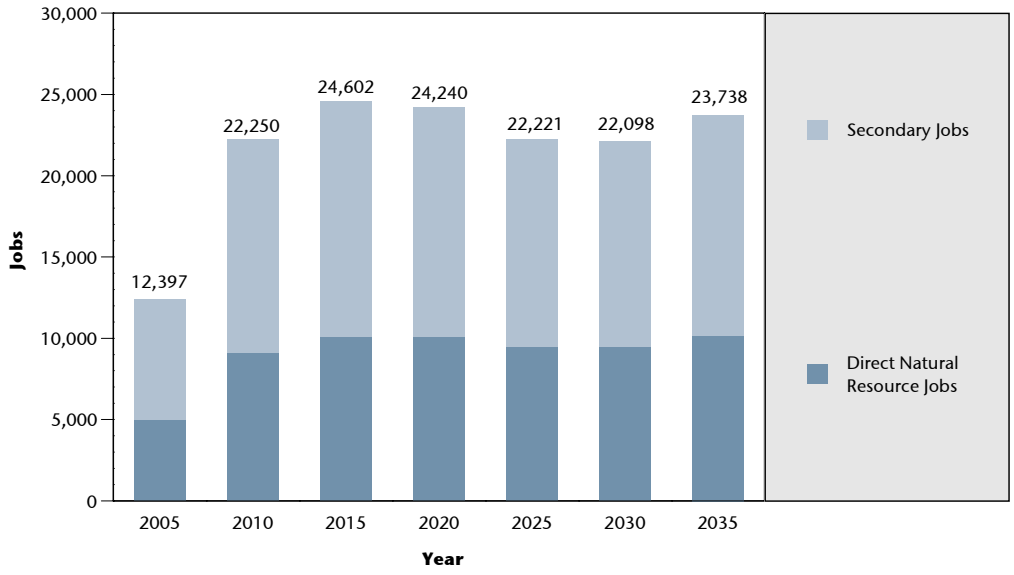
Mesa County. The number of energy jobs (by work site) in Mesa County is expected to increase from 250 to 470 between 2005 and 2010. These jobs will peak at 486 in 2015 before decreasing to 130 by 2035. Over the 30-year period, the total number of energy jobs in Mesa County will decrease by almost 120. This job growth and contraction will take place almost entirely in the natural gas sector. Although relatively few jobs are located in Mesa County by work site, many of the natural gas related companies are based in the Grand Junction area.

Moffat County. The number of energy jobs in Moffat County under the baseline scenario is forecast to increase from 970 to 1,530 between 2005 and 2010. All of this growth will take place in the natural gas sector. Total energy jobs will peak at about 1,740 in 2025 before declining to 1,050 by 2035 due to contraction in the natural gas and coal mining sectors. Coal mining will remain a large provider of energy jobs in Moffat County, but the number of these jobs will decline from almost 450 to 390 between 2005 and 2035.

Rio Blanco County. The number of energy jobs in Rio Blanco County will grow rapidly by almost 188 percent between 2005 and 2010, from 880 to 2,520 jobs. Growth is forecast to continue thereafter as the focus of natural gas well development moves northward from Garfield County into Rio Blanco County. By 2035, the number of energy jobs in Rio Blanco County will reach 7,820, which represents the greatest energy-related job growth of all four counties over the 30-year period at almost 800 percent. Energy job growth will take place almost entirely in the natural gas sector, besides some oil shale-related RD&D jobs between 2010 and 2020. Utilities and 'other mining' job numbers are expected to remain constant, and the number of coal mining jobs is projected to decrease from 156 to 136.

Secondary employment effects (multiplier effects). Natural resource development activity will spur job creation in related support industries through increased demand for resources and services (indirect jobs) as well as in non-related industries through new local spending by new workers (induced jobs). Together, these jobs constitute the secondary employment effects of natural resource development produced in addition to direct jobs in the natural resource industry.
Exhibit IV-4 demonstrates the direct, secondary and total energy-related jobs forecasted from 2005 through 2035.

Exhibit IV-4.
Direct and Secondary Energy-Related Jobs, 2005–2035 (Baseline Scenario)

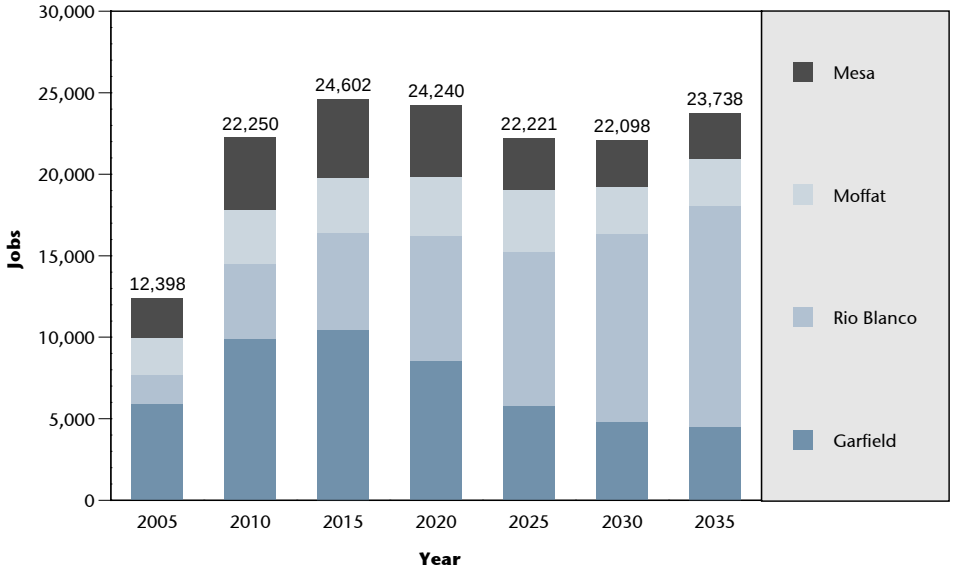


Source: Northwest Colorado Socioeconomic Projection model, BBC Research & Consulting, 2008.

The total number of direct and secondary energy-related jobs in the study area is expected to increase from 12,400 in 2005 to 22,250 by 2010, an increase of 9,850. The number of energy-related employed residents is expected to peak at 24,600 in 2020 before decreasing to about 22,100 by 2030 and increasing again to 23,740 by 2035.

Exhibit IV-5 depicts the forecast distribution of all energy and natural resource related jobs (direct and secondary) within the region under the baseline scenario. Although the number of direct and secondary energy-related jobs throughout the region is not forecast to change dramatically from 2015 through 2035 under the baseline scenario, this apparent stability is somewhat misleading. During this period, the focus of natural gas drilling activity is expected to move northward from Garfield County to Rio Blanco County – shifting growth pressure from a relatively developed area to an area that has historically been much less densely populated.

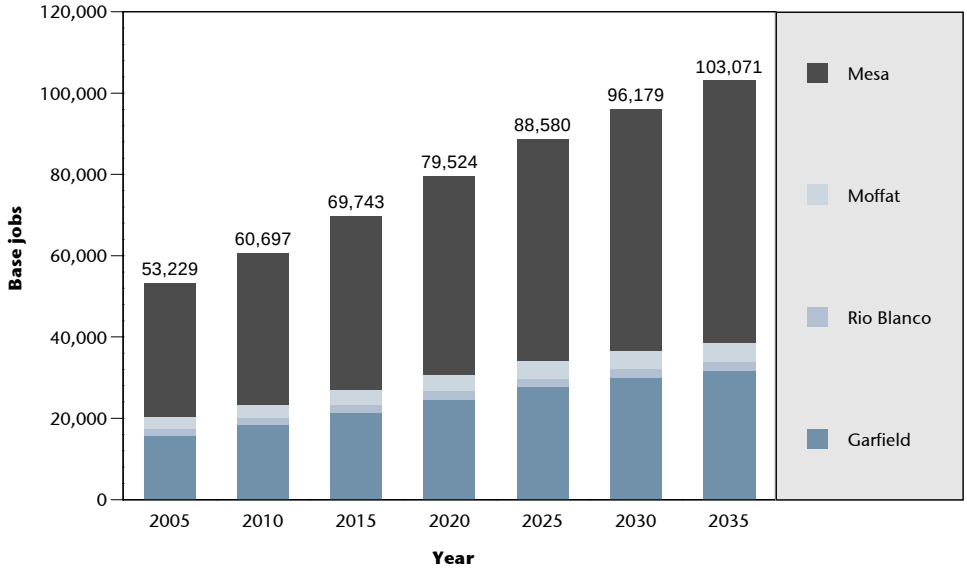
Exhibit IV-5.
Direct and Secondary Energy-Related Jobs by County, 2005–2035 (Baseline Scenario)



Note: Includes direct and secondary (multiplier effect) employment.
Source: Northwest Colorado Socioeconomic Projection model, BBC Research & Consulting, 2008.

Projected growth in non-energy related economic base. The study team used direct job projections provided by the SDO to forecast employment growth in non-energy related sectors. Working with the SDO, the study team produced IMPLAN-based multipliers to determine secondary employment created by these jobs. According to the NWCSP model, non-energy related base jobs in the four county study region are expected to increase from 53,230 to 103,100 over the 30-year period between 2005 and 2035.[2] Exhibit IV-6 shows how these jobs are distributed among these four counties.

Exhibit IV-6.
Direct Non-Energy Related Jobs by County, 2005–2035



Source: Northwest Colorado Socioeconomic Projection model, BBC Research & Consulting, 2008.

Non-energy related jobs in Mesa County will increase by 31,690 over the 30-year period, the greatest absolute increase in the region, followed by Garfield (16,020 jobs), Moffat (1,660 jobs) and Rio Blanco County (470 jobs). On a percentage basis, the most rapid growth in non-energy jobs will take place in Garfield County (102 percent growth over the 30-year period), followed by Mesa (97 percent), Moffat (54 percent) and Rio Blanco County (27 percent).

In all counties, the greatest non-energy job growth will take place in jobs created from non-wage sources, including second homeowners, retirement income and transfer payments. This is largely a demographic effect, reflecting the anticipated aging of the population and anticipated gains in wealth. Over the 30-year period, these jobs are forecast to increase by 7,880 (208 percent) in Garfield County, 13,170 (106 percent) in Mesa County, 1,070 (75 percent) in Moffat County and 320 (119 percent) in Rio Blanco County.

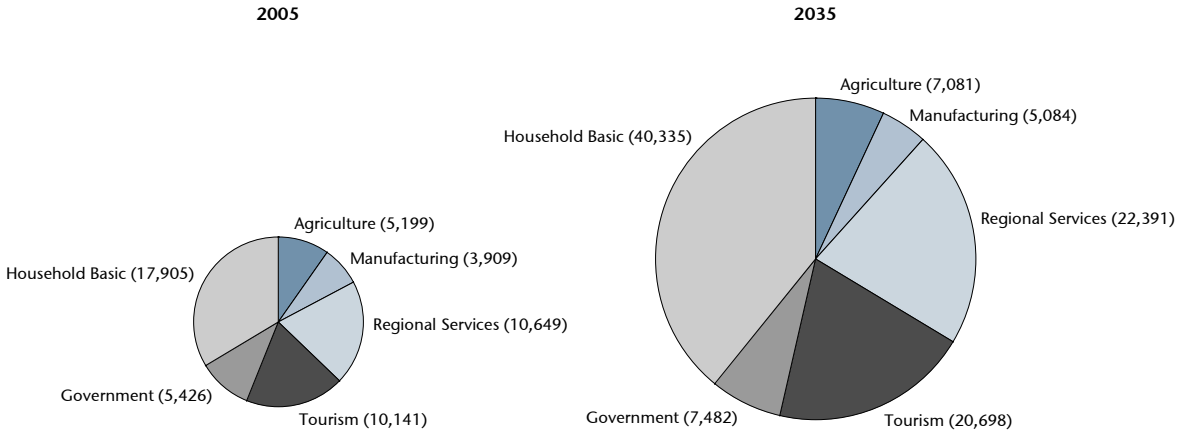
[2] Consistent with practices by the SDO, numbers regarding total non-energy related employment exclude the military population.

The tourism sector will also contribute a large share of employment growth by 2035, especially in Garfield and Mesa counties where tourism-related base jobs will increase by 4,370 and 5,770, respectively – more than doubling over the 30-year period. The regional service sector will contribute a significant number of new base jobs over the 30-year period: 1,500 in Garfield County (43 percent increase), 6,000 in Mesa County (88 percent) and almost 100 in Moffat County (41 percent). Regional service jobs will decline slightly in Rio Blanco County over the 30-year period.

Manufacturing base jobs will increase modestly in Garfield and Mesa counties and decrease in Moffat and Rio Blanco counties over the 30-year period. Agriculture base jobs will increase moderately in Garfield and Mesa counties and more modestly in Rio Blanco and Moffat counties.

Exhibit IV-7 depicts the distribution of non-energy base jobs, by sector, in the study region in 2005. The exhibit also shows the forecast distribution of non-energy base jobs in 2035 under the SDO's forecasts (incorporated in the NWCSP model).

Exhibit IV-7.
Forecast growth in non-energy economic base (Baseline Scenario)

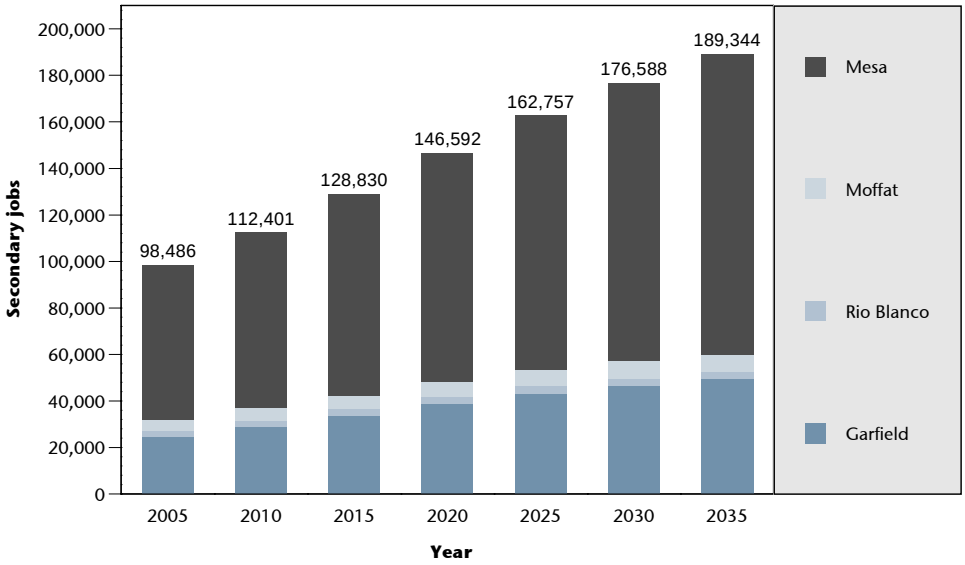


Source: BBC Research & Consulting, 2008.

Secondary employment effects of non-energy base jobs. New non-energy base jobs will spur job creation in related sectors due to new goods and services demanded by expanding businesses and new resident employees. Each type of base job has a unique multiplier, representing the magnitude of its effect on secondary employment creation. Similar to the growth patterns of non-energy base jobs, secondary jobs will grow the most in Mesa County by almost 31,280 over the 30-year period, followed by Garfield (8,640 jobs), Moffat (880 jobs) and Rio Blanco County (220 jobs). On a percent basis, growth of secondary jobs will be the greatest in Garfield County (95 percent), followed by Mesa County (93 percent), Moffat County (48 percent) and Rio Blanco County (27 percent).

Exhibit IV-8 demonstrates how the combined effects of growth in non-energy base jobs and secondary employment effects related to those base jobs are forecast to be distributed among the four counties under the baseline scenario.

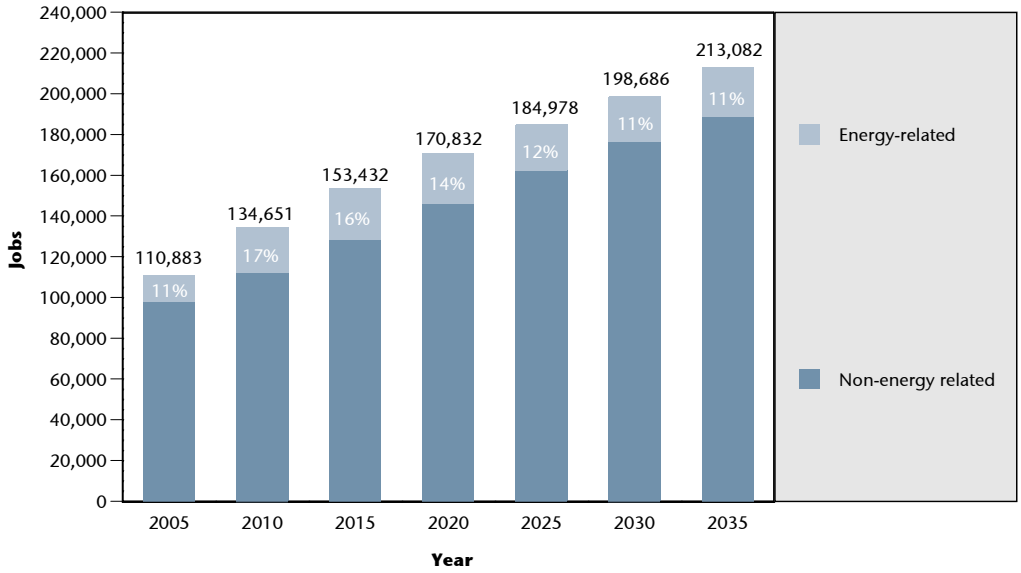
Exhibit IV-8.
Direct Non-Energy Related Base and Secondary Jobs by County, 2005–2035



Source: Northwest Colorado Socioeconomic Projection model, BBC Research & Consulting, 2008.

Total regional employment. Exhibit IV-9 combines the forecasts of energy-related and non-energy related employment in the four county study region to demonstrate total employment for the entire region through 2035.

Exhibit IV-9.
Total Jobs, 2005–2035 (Baseline Scenario)

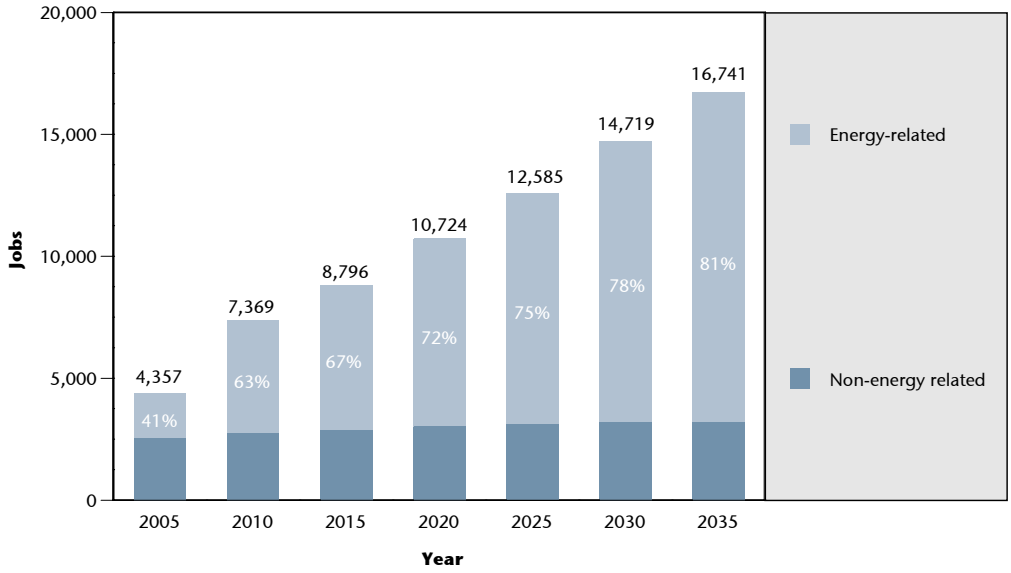


Source: Northwest Colorado Socioeconomic Projection model, BBC Research & Consulting, 2008.

The number of total jobs in the four county study region is forecast to almost double between 2005 and 2035, growing from 110,880 to 213,080. This represents a compounded annual growth rate of 2.2 percent. Growth will be the most rapid between 2005 and 2010 and will slow gradually thereafter. Energy-related direct and secondary jobs will constitute the greatest share of total jobs in the region in 2010 (17 percent), and this share is forecast to decline to about 11 percent by 2035.

The most profound effects of energy-related activities in the northwest Colorado region are anticipated to occur in Rio Blanco County as the focus of natural gas development shifts northward from Garfield County. Exhibit IV-10 shows the projected total number of jobs in Rio Blanco County throughout the forecast period and the rapidly expanding proportion of those jobs that are directly or secondarily related to energy activity. As noted earlier, natural gas jobs included in Exhibit IV-9 are based on work-site location and the corporate offices for some of these jobs may be located in other counties or other states. Many of these jobs are currently base in Mesa County.

Exhibit IV-10.
Total Jobs in Rio Blanco County, 2005–2035 (Baseline Scenario)



Note: County energy job totals reflect work-site for natural gas jobs, not necessarily corporate office locations for the workers.
Source: Northwest Colorado Socioeconomic Projection model, BBC Research & Consulting, 2008.

Commuting under the baseline scenario. Translating projected regional employment growth into numbers of employed residents, and ultimately into population and households, requires consideration of commuting patterns. Commuting, both from one county to another within the region and into and out of the region, is anticipated to become an even more important aspect of socioeconomic conditions in the future. As indicated earlier in this section, the natural gas industry is highly mobile—and many of the workers at a particular job site (e.g. well drilling location) may live in another county (and may work for companies headquartered in still another location). As the focus of regional natural gas development moves north into Rio Blanco County and (to a lesser degree) Moffat County, an increasing number of workers are expected to commute to well sites from eastern Utah (Vernal area) and southern Wyoming (Rock Springs area).

Commuting patterns for all sectors excluding natural gas and oil shale jobs were based on Local Employment Dynamics (LED) data provided by the U.S. census along with previous regional studies. This commuting distribution was discussed in Section II and summarized in Exhibit II-23. Natural gas related jobs were distributed based on Exhibit II-24.

Between 2005 and 2020, the number of workers living outside the region—but directly or secondarily employed by energy activity within the four county study region—is forecast to grow from about 760 to more than 3,000 under the baseline scenario. By 2035, over 4,400 residents on the edges of the region are forecast to be employed as a result of regional energy activity. These commuters are anticipated to make up about 20 percent of the total workforce directly and secondarily employed by regional energy activity in 2035.

In addition, a portion of the workers "residing" within the study region will likely continue to be temporary residents whose permanent homes may be in other parts of Colorado or even other states. While the size of this temporary workforce is not fully understood, the study team estimates that about 20 percent of the current natural gas workforce consists of temporary workers from outside the study region and "edges of the region" (as described in Section II).

Commuting outside the four county study region. Working with the SDO, the study team adopted out-commuting forecasts reflecting a continuation of current trends for Mesa, Moffat and Rio Blanco Counties. The study team forecast 1 percent annual out-commuting growth in Rio Blanco County. Moffat County workers are expected to fill 15 percent of new Routt County jobs and Mesa County residents are forecast to maintain their current share of employment in Montrose, Delta, and Gunnison Counties.

For Garfield County, the study team used a modified version of the Alternative Commuting Scenario developed by BBC in 2006 for the Garfield County Socioeconomic model. This scenario assumes slower growth in Garfield out-commuting when compared with out-commuting forecasts developed during the 2005 Watershed Collaborative Growth Scenarios project. The study team chose these reduced out-commuting forecasts based on the recent increases in housing prices and job growth within Garfield County. This growth has made it more difficult for individuals employed outside the county to find affordable housing and has provided in-county additional employment opportunities for residents. The projected out-commuters from Garfield County in the model fill jobs in Eagle and Pitkin Counties.

Even given the reduced Alternative Commuting Scenario from the Garfield County report, the study team projects over 26,500 out-commuters from Garfield County in 2035. Exhibit IV-11 shows study team forecasts for out-commuting for the four counties between 2005 and 2035.

Exhibit IV-11.
Out-Commuting Outside the four county study region (Baseline Scenario)

		Out-commuting					
County	**2005**	**2010**	**2015**	**2020**	**2025**	**2025**	**2035**
Garfield	4,287	6,500	9,000	15,000	21,227	23,956	26,500
Mesa	2,210	2,049	2,336	2,596	2,819	2,993	3,116
Moffat	858	2,144	2,732	3,269	3,676	3,960	4,177
Rio Blanco	-192	114	120	126	132	139	146
Total	**7,163**	**10,807**	**14,188**	**20,991**	**27,854**	**31,048**	**33,939**

Source: Northwest Colorado Socioeconomic Projection model, BBC Research & Consulting, 2008.

Number of workers forecast to live in the region under the baseline scenario. The number of employed residents within the four-county region is projected to grow from about 104,000 in 2005 to over 215,000 by 2035 based on the baseline scenario employment projections and the commuting assumptions discussed earlier in this section.[3] Mesa County will continue to house the largest number of employed persons in the region (about 122,000 in 2035), followed by Garfield County (almost 70,000) and Moffat County (13,100).

While Rio Blanco County is forecast to house the smallest number of employed residents in the four-county region (projected at just over 10,000 in 2035), under the baseline scenario it would experience the most rapid workforce growth within the region. In 2005, Rio Blanco County was home to just 3,400 workers.

Exhibit IV-12 below shows these projected numbers of employed persons by county.

Exhibit IV-12.
Employed Persons by County, 2005–2035 (Baseline Scenario)

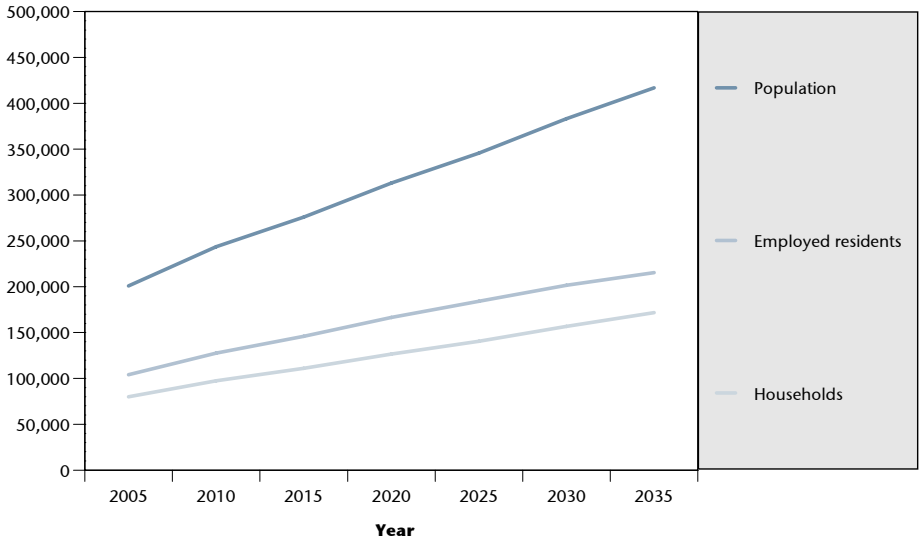
		Total Employed Residents					
County	**2005**	**2010**	**2015**	**2020**	**2025**	**2025**	**2035**
Garfield	27,917	36,511	43,009	52,017	60,314	65,346	69,844
Mesa	65,609	76,421	86,414	95,869	103,282	114,212	122,170
Moffat	6,956	9,130	10,212	11,409	12,395	12,717	13,142
Rio Blanco	3,387	5,462	6,274	7,290	8,225	9,258	10,263
Total	**103,869**	**127,524**	**145,909**	**166,585**	**184,216**	**201,533**	**215,420**

Source: Northwest Colorado Socioeconomic Projection model, BBC Research & Consulting, 2008.

[3] These forecasts also incorporate the SDO's projections of multiple job-holding rates for each of the counties. In 2005, the estimated rates of multiple job holding ranged from 6.7 percent in Rio Blanco County to 12.6 percent in Garfield County. By 2035, the multiple job holding rate is projected to range from 8.0 percent in Rio Blanco County to 15.0 percent in Garfield County.

Anticipated population and household growth under the baseline scenario. Population forecasts were calculated by the SDO based on the employed resident numbers generated by the NWCSP model. Household forecasts through 2035 were based on projected changes in persons per household for the region developed by the SDO and 2006 persons-per-household figures for each county. Exhibit IV-13 shows forecasts of employed residents, population, and households throughout the four county study region over the 30-year period.

Exhibit IV-13.
Population and Other Growth, 2005–2035 (Baseline Scenario)



Source: Northwest Colorado Socioeconomic Projection model, BBC Research & Consulting, 2008.

The total population, number of households and number of employed residents are all forecast to more than double over the 30-year period. Growth is projected to be most rapid between 2005 and 2010 (around 22 percent over this 5-year period) and slow gradually thereafter.

By 2035, the four county study region in forecast to have a population of over 417,000, up from about 201,000 in 2005. Over the 30-year period, the population is projected to increase from 50,670 to 136,700 in Garfield County, from 6,070 to 18,620 in Rio Blanco County, from 13,420 to 26,360 in Moffat County and from 130,660 to 235,270 in Mesa County.

While growth is expected to be substantial throughout the region, the most rapid growth on a percentage basis is forecast to take place in Rio Blanco County, where population, employed residents and households could triple over the 30-year period. Garfield County population will grow by almost 170 percent over this period, while the number of employed residents will grow somewhat less (150 percent). In Moffat County, the population is forecast to almost double by 2035, and the employed resident population will grow by 89 percent. Mesa County will experience the slowest population growth of all four counties at 80 percent, but the number of employed residents will grow more rapidly at 86 percent over the 30-year period. Exhibit IV-14 on the next page provides a summary of the forecasted regional growth in population, employed residents and households during the study period.

Exhibit IV-14.
Regional population, employed residents and households.

Regional Totals	2005	2010	2015	2020	2025	2025	2035
Employed Residents	103,869	127,524	145,909	166,585	184,216	201,533	215,420
Population	200,835	243,485	275,960	313,098	345,699	383,207	416,949
Households	79,873	93,359	111,045	126,575	140,506	156,810	171,583

Source: Northwest Colorado Socioeconomic Projection model, BBC Research & Consulting, 2008.

Note that the population growth forecasts all presume the development of sufficient housing and other infrastructure in each of the counties to accommodate projected growth. As discussed in Section V, this is a potential issue for several of the counties in the region and particularly a concern for Rio Blanco County which currently has very limited ability to accommodate growth.

Commercial Oil Shale Scenario

As outlined in Section III, there are many uncertainties associated with the prospect of commercial oil shale development. Pending the results of ongoing research, demonstration and development projects underway in the region (and in Utah and Wyoming)—as well as future changes in the supply, demand and price for conventional oil—the timing, magnitude, technology, economics and other characteristics of development cannot be forecast with confidence at this time. Nonetheless, there is a very real possibility that commercial oil shale development will finally move forward within the next few decades. According to a recent article in Fortune magazine, Shell alone is investing at least $200 million in oil shale research and has made oil shale the largest piece of the company's research and development efforts.[4]

Section III provided a description of the most aggressive scenario for commercial oil shale development that appears reasonably foreseeable at this time. The commercial oil shale scenario envisions the initial commercialization of oil shale to begin around 2021 with commercial production exceeding 500,000 barrels per day by 2035 and continuing to grow thereafter. The following analysis describes the additional economic and demographic effects through 2035 that could be associated with the commercial development of oil shale in northwest Colorado.

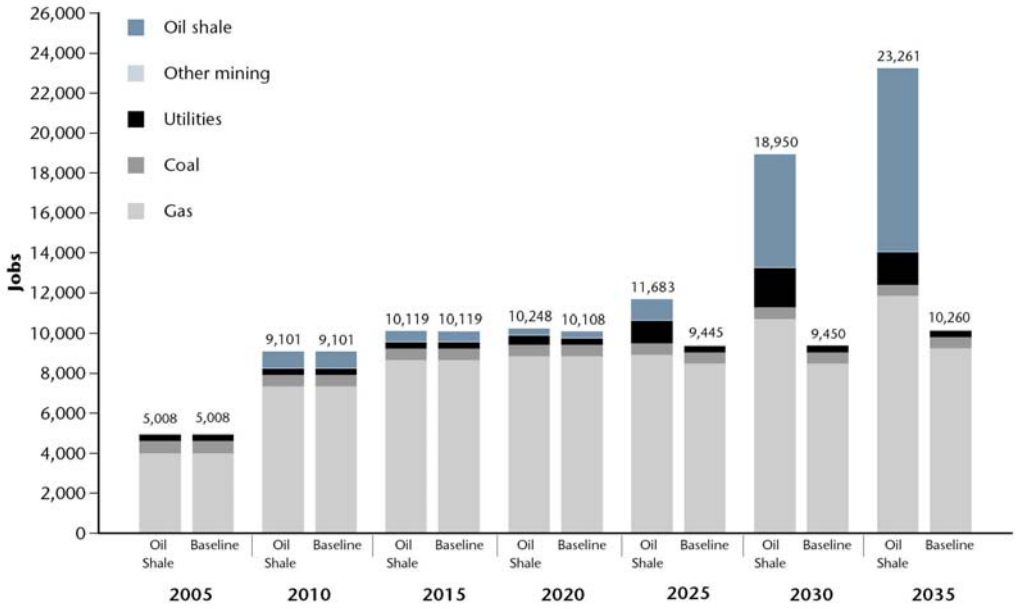
Direct economic effects. In addition to workers directly employed in constructing and operating oil shale facilities, commercial development would also create other direct jobs in building and operating power plants to supply electricity required for oil shale extraction. As discussed in Section III, the study team has projected the need for development of 7,000 megawatts of additional electric generation capacity to service a 500,000 barrel per day oil shale industry. Under the assumption that the additional generating facilities will be fired with local natural gas, additional gas wells (and corresponding increases in natural gas workforce) have also been included in the commercial oil shale scenario.

[4] "Oil from a Stone", *FORTUNE* (November 12, 2007).

By 2035, commercial oil shale production is forecast to create almost 14,000 direct jobs in the region. This total includes 9,350 jobs to operate oil shale facilities (and construct ongoing increases in facility capacities), about 1,300 jobs to continue building additional gas-fired power plants, 700 jobs to operate the additional power plants added by that year and about 2,600 jobs to drill and maintain additional natural gas wells.

Exhibit IV-15 compares the number of direct jobs in each energy subsector under the commercial oil shale scenario from 2005 to 2035 to the baseline scenario. The commercial development of oil shale is expected to have a significant effect on employment starting in 2025. Additional jobs in power plant construction and operations are shown under utilities, while additional jobs in natural gas production and maintenance are shown under natural gas.

Exhibit IV-15.
Direct Energy Jobs by Subsector, 2005–2035
(Commercial Oil Shale Scenario versus Baseline Scenario)

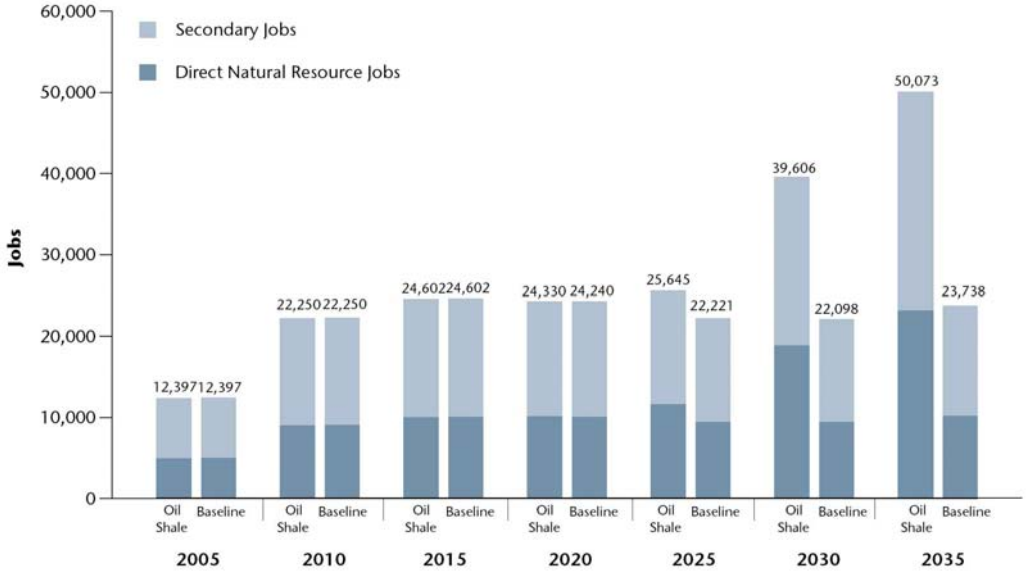


Source: Northwest Colorado Socioeconomic Projection model, BBC Research & Consulting, 2008.

Through 2020, there is no real difference between the commercial oil shale scenario and the baseline scenario. Rapid growth in commercial oil shale development begins between 2020 and 2025. By 2025, the industry will support about 2,240 direct jobs (including utility construction and additional natural gas development) in that year. By 2030, the oil shale sector will support over half the number of jobs that the natural gas supports, and by 2035 it will support over 75 percent of the number of jobs supported by the natural gas sector.

Secondary effects. Commercial oil shale development would have significant secondary (multiplier) effects in other sectors of the local economy, causing growth in related industries and economy-wide through spending by new workers. Exhibit IV-16 compares the total forecasted employment due to energy and natural resource activity (direct and secondary jobs) under the commercial oil shale scenario to the baseline scenario.

Exhibit IV-16.
Direct and Secondary Energy-Related Jobs,
2005–2035 (Commercial Oil Shale Scenario versus Baseline Scenario)



Source: Northwest Colorado Socioeconomic Projection model, BBC Research & Consulting, 2008.

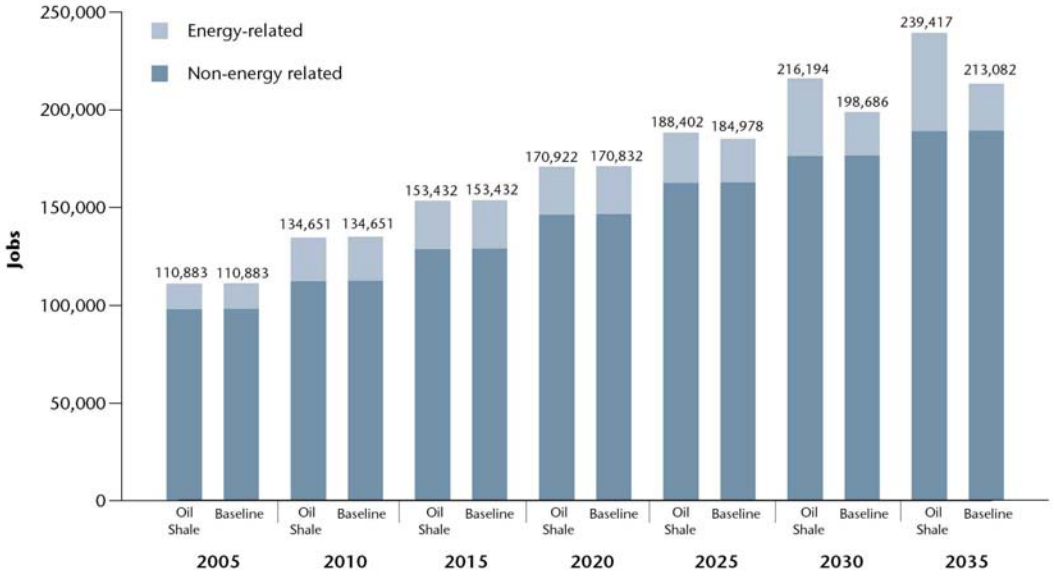
As seen in Exhibit IV-16, The secondary employment effects of energy development are greater than the direct employment effects of energy development under either the baseline scenario or the commercial oil shale scenario. Total jobs are expected to increase from 12,400 in 2005 to 24,600 by 2015. This number is forecast to decline slightly before commercial oil shale activity begins in 2020-2025 and creates significant secondary employment effects through 2035. Under the commercial oil shale scenario, total energy-related employment (direct and secondary) is projected to reach over 50,000 jobs by 2035—compared to less than 24,000 jobs under the baseline scenario.

Total employment comparison to baseline scenario. In addition to direct and secondary energy and natural resource-related jobs, other sectors will continue to contribute to the economy in northwest Colorado under the commercial oil shale scenario. The study team has maintained the same assumptions regarding the growth of other base industries in the region (e.g. tourism, regional services, household direct basic, manufacturing, agriculture and government) incorporated into the baseline scenario.

As shown earlier, in Exhibit IV-17, base jobs outside of energy and natural resources are projected to increase from about 53,200 in 2005 to more than 103,100 by 2035. Like base jobs in energy and natural resources, other base jobs also support secondary employment throughout the economy due to the purchases of goods and services by firms engaged in base activities and due to the spending of employee households. Secondary jobs supported by base activities (other than energy and natural resource activities) are forecast to rise from approximately 45,300 in 2005 to almost 86,300 by 2035.

Exhibit IV-17 depicts projected total employment in northwest Colorado under the commercial oil shale scenario and compares this forecast with the baseline scenario described earlier. The exhibit combines four broad components—direct energy and natural resource-related jobs, secondary energy and natural resource-related jobs, direct jobs in other base sectors and secondary jobs supported by other base activities. The exhibit also shows the share of total employment that is directly or secondarily attributable to energy and natural resource activity under both scenarios.

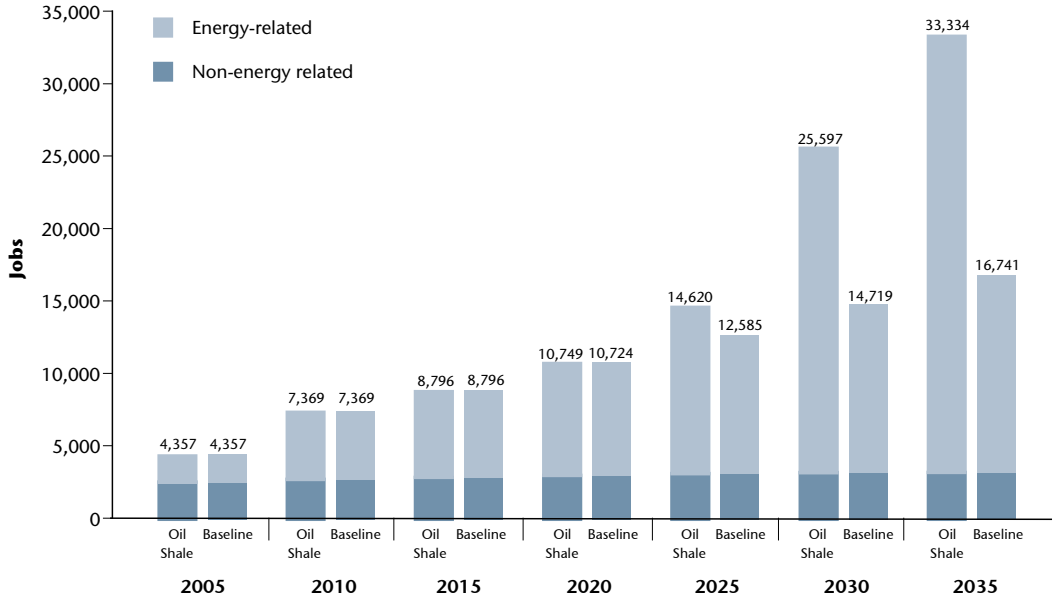
Exhibit IV-17.
Total Regional Employment and Proportion of Employment Attributable to Energy and Natural Resources, 2005–2035 (Commercial Oil Shale versus Baseline Scenario)



Source: Northwest Colorado Socioeconomic Projection model, BBC Research & Consulting, 2008.

The development of commercial oil shale would substantially increase total employment in northwest Colorado after 2025—and the regional economy would be substantially more dependent on energy and natural resources under the commercial oil shale scenario. These effects are most pronounced in Rio Blanco County, where the vast majority of the economy is forecast to be directly or secondarily tied to energy and natural resource-related activity in 2035 under the commercial oil shale scenario. Exhibit IV-18 depicts total forecast employment, and the proportion of employment related to energy and natural resources, for Rio Blanco County under both the commercial oil shale scenario and the baseline scenario.

Exhibit IV-18.
Total Rio Blanco County Employment and Proportion of Employment Attributable to Energy and Natural Resources, 2005–2035 (Commercial Oil Shale versus Baseline Scenario)



Source: Northwest Colorado Socioeconomic Projection model, BBC Research & Consulting, 2008.

Commuting under the commercial oil shale scenario. As described earlier for the baseline scenario, forecasting employed residents (and population) based on total employment requires consideration of commuting patterns within the region, out-commuting of regional residents to jobs outside the region and the rate of multiple job holding (individuals holding more than one job). In general, the assumptions used for the commercial oil shale scenario do not differ from those used under the baseline scenario. However, the commercial oil shale scenario also required further assumptions regarding the residence patterns of employees at commercial oil shale facilities and employees involved in constructing and operating electric generation facilities tied to commercial oil shale production.

Jobs related to oil shale development were distributed based on the matrix in Exhibit IV-19. This distribution assumes a commuting pattern for power plant construction workers similar to that of natural gas-related workers, but less long distance commuting for more permanent jobs in power plant operations and oil-shale operations. The study team projected that all oil shale operations jobs would be located in Rio Blanco County and that the majority of oil shale workers (70 percent) would reside in Rio Blanco and Garfield Counties.

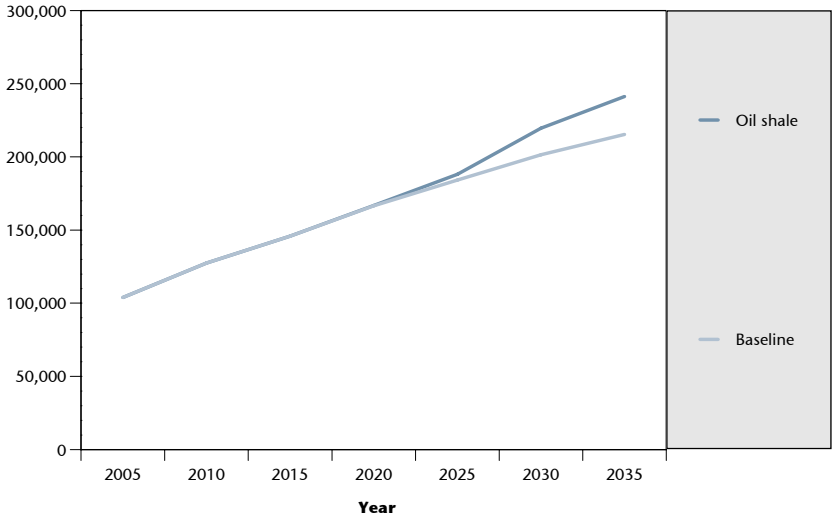
Exhibit IV-19.
Estimated Work Site to Residence Relationship for Oil Shale Jobs in Northwest Colorado

	Worker Residence						
Job Type	Garfield County	Mesa County	Moffat County	Rio Blanco County	Edge of Region*	Other Areas	Total
Oil Shale Operations	35 %	10 %	10 %	35 %	8 %	2 %	100 %
Power Generation	35	10	10	35	8	2	100
Power Plant Construction	25	20	5	25	25	0	100

Source: BBC Research & Consulting, 2008.

Employed residents in northwest Colorado under the commercial oil shale scenario. Exhibit IV-20 compares the growth in total employed residents under the commercial oil shale and baseline scenarios. The effects of oil shale development can be seen starting in 2025.

Exhibit IV-20.
Total Regional Employed Residents,
Commercial Oil Shale Scenario versus Baseline Scenario, 2005–2035



Source: Northwest Colorado Socioeconomic Projection model, BBC Research & Consulting, 2008.

Under the commercial oil shale scenario, the number of employed residents will reach 241,200 in 2035 compared to 215,400 under the baseline scenario, a difference of 25,800 individuals.

The magnitude of the economic and demographic effects from development of commercial oil shale is anticipated to vary considerably among the four counties in the study region. Forecasts of employed residents, and corresponding population forecasts, assume that each of the counties will find ways to accommodate the projected growth. Some of the issues associated with this assumption are discussed in Section V of this report.

The differences between the forecast number of employed residents under the commercial oil shale scenario and the baseline scenario are by far the greatest in Rio Blanco County. In that county, the number of employed residents is projected to reach 21,140 under the commercial oil shale scenario compared to 10,260 under the baseline scenario, a difference of 10,880. In Garfield County, the difference in employed residents between the two scenarios is also significant at 78,810 versus 69,840, a difference of 8,960.

These differences are smaller in Moffat and Mesa counties. In Mesa County, 125,590 employed residents are projected under the commercial oil shale scenario versus 122,170 under the baseline scenario, a difference of 3,420. In Moffat County the number of employed residents is forecast to be 15,700 versus 13,140, a difference of 2,550.

Exhibit IV-21 compares the number of employed residents forecast in each of the four counties under the commercial oil shale scenario with the corresponding forecast from the baseline scenario in 2035.

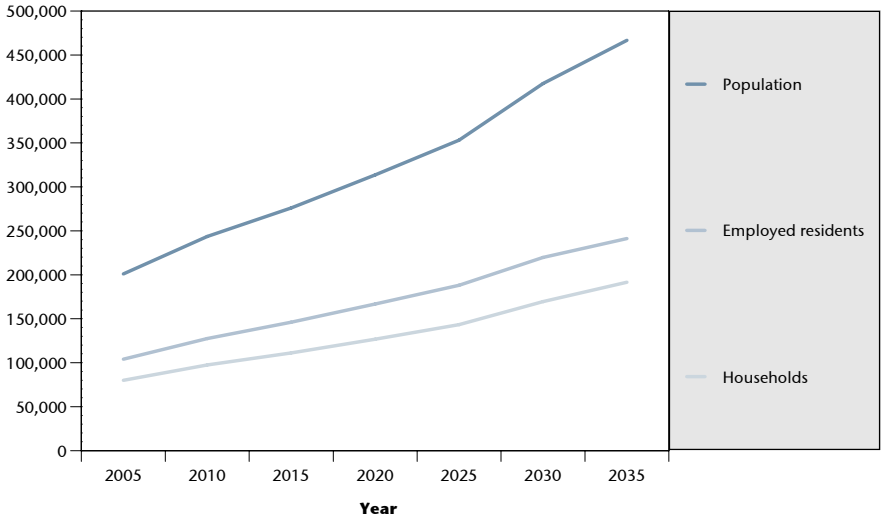
Exhibit IV-21. Comparison of projected employed residents, 2035 (Commercial Oil Shale Scenario versus Baseline Scenario)

Source:
Northwest Colorado Socioeconomic Projection model, BBC Research & Consulting, 2008.

County	Total Employed Residents in 2035		Percent Difference
	Baseline	Oil Shale	
Garfield	69,844	78,805	12.8%
Mesa	122,170	125,588	2.8%
Moffat	13,142	15,696	19.4%
Rio Blanco	10,263	21,142	106.0%
Total	**103,869**	**127,524**	**22.8%**

Projected county level employment, population and household projections. Exhibit IV-22 shows forecasts of employed residents, population, and households throughout the four county study region over the 30-year period under the commercial oil shale scenario. Population forecasts were calculated by the SDO and based on the employed resident numbers generated by the NWCSP model. Household forecasts through 2035 were based on projected changes in persons per household for the region developed by the SDO and 2006 persons-per-household figures for each county.

Exhibit IV-22.
Population and Other Growth, Commercial Oil Shale Scenario, 2005–2035



Source: Northwest Colorado Socioeconomic Projection model, BBC Research & Consulting, 2008.

The total population, number of households and number of employed residents are all projected to grow by almost 130 percent over the 30-year period. Growth will be most rapid between 2005 and 2010 (around 22 percent over this 5-year period) and slow somewhat in following 5-year periods but stay strong due to the projected effects of oil shale development.

By 2035, the four county study region in projected to have a population of almost 466,500 under the commercial oil shale scenario, up from almost 201,000 in 2005. Over the 30-year period, the population is projected to increase from 50,670 to 154,300 in Garfield County, 6,070 to 39,010 in Rio Blanco County, 13,430 to 31,490 in Moffat County and 130,660 to 241,750 in Mesa County. Exhibit IV-23 provides a summary of the regional growth forecasts.

Exhibit IV-23.
Regional population, employed residents and households.

Regional Totals	2005	2010	2015	2020	2025	2025	2035
Employed Residents	103,869	127,524	145,909	166,765	188,114	219,682	241,231
Population	200,835	243,485	275,960	313,531	353,017	417,552	466,547
Households	79,873	93,359	111,045	126,746	143,251	169,408	191,516

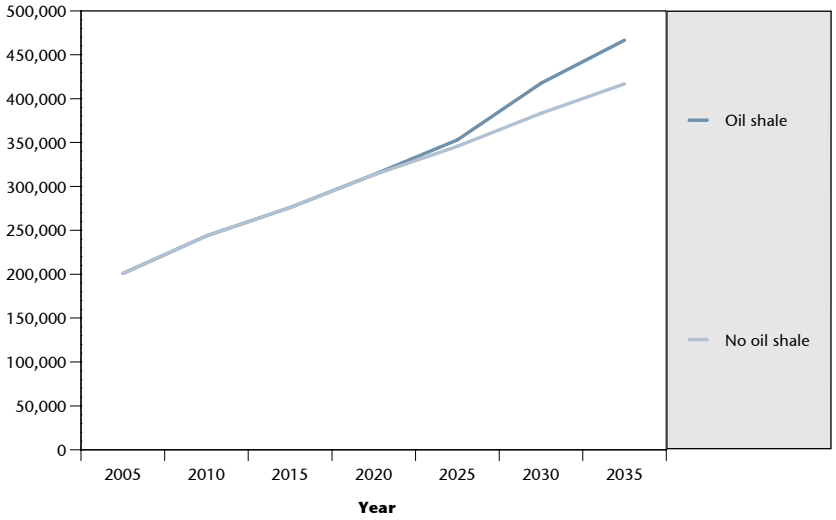
Source: Northwest Colorado Socioeconomic Projection model, BBC Research & Consulting, 2008.

The greatest percent growth will take place in Rio Blanco County, where population, employed residents and households are projected to increase six fold over the 30-year period. Oil shale would be the major component of this growth and will cause employment, population and households to be over twice their levels under the baseline scenario.

The Garfield County population is forecast to more than triple over this period under the commercial oil shale scenario, while the number of employed residents will grow somewhat less at almost 182 percent. In Moffat County, the population is forecast to grow by 135 percent by 2035, and the employed resident population will increase by about 125 percent. Mesa County is forecast to experience the slowest population growth of all four counties at 85 percent, but the number of employed residents will grow more rapidly at 91 percent over the 30-year period.

Exhibit IV-24 compares the population projections for the four county study region under the commercial oil shale and baseline scenarios. The major effects of oil shale on regional demographics can be seen to begin in 2025.

Exhibit IV-24.
Population Growth,
Commercial Oil Shale Scenario versus Baseline Scenario, 2005–2035



Source: Northwest Colorado Socioeconomic Projection model, BBC Research & Consulting, 2008.

Under the commercial oil shale scenario, regional population is projected to reach 466,500 in 2035 compared to 416,900 under the baseline scenario, a difference of 49,600 individuals.

The effects of commercial oil shale development are projected to be by far the greatest in Rio Blanco County where the population will reach 39,010 under the commercial oil shale scenario compared to 18,620 under the baseline scenario, a difference of 20,390. In Garfield County, the difference is significant as well—154,300 with oil shale compared to 136,700 without oil shale, a difference of 17,600.

The population differences between the two scenarios are smaller for Moffat and Mesa counties. In Mesa County, the population will be 241,750 under the commercial oil shale scenario versus 235,272 under the baseline scenario, a difference of 6,470. In Moffat County the population will be 31,490 versus 26,360, a difference of 5,130.

Energy development implications for growth of other portions of the economic base ("factor competition"). The influx of jobs and workers often associated with the rapid development of extractive natural resource industries can have both positive and negative effects on local economies. An increased demand for labor can result in low unemployment rates and increased wages in some sectors. Alternatively, service industries and other sectors often experience declining growth because they cannot compete for labor and other resources.

The impacts of factor competition related to natural gas development contributed to the study team's decision to project fewer out-commuters from Garfield County than in previous forecasts. The study team used the lower projections in the Alternative Commuting Scenario from the 2006 Garfield County Socioeconomic Impact Study rather than the 2005 Watershed Collaboratives based commuting projections. As discussed earlier in Section IV, increasing wage and housing pressure from has made in-county jobs more attractive and restricted the housing options for commuters.

Increased wages. In northwest Colorado, unemployment levels are well below the state average in counties affected by recent natural gas development and other natural resource industries. In 2007, unemployment rates in the four county study region ranged from just over 2 percent in Rio Blanco County to about 3.2 percent in Mesa County. This compares to a state average of close to 3.8 percent.

Most economists place full employment, the unemployment rate where most people can find a job in a reasonable amount of time, at between 4.5 percent and 5.0 percent. Tight labor markets usually lead to wage pressures, as bargaining power shifts from employers to workers. Higher wages provide local residents with bigger paychecks and a wider array of options for employment.

Recent wage data shows evidence of wage pressures in northwest Colorado. Wages in sectors that typically compete with the natural gas industry for labor have increased substantially in some counties. For example, in Garfield County, the average weekly wage for workers in the heavy construction industry increased by more than 48 percent from 2000 to 2006, coinciding with the time frame for the introduction of natural gas development. This compares to a 14 percent increase statewide over the same period. Garfield County workers in the heavy construction industry now earn about 94 percent of the average wage of a natural gas employee. Statewide, heavy construction industry workers earn about 40 percent as much as oil and natural gas employees.

Exhibit IV-25 shows Garfield County and state wage increases for sectors competing for labor with the natural gas industry from 2001 through 2006. Inflation over this time period is assumed to be about 17 percent.

Exhibit IV-25. Average Weekly Wage for Select industries in Garfield County, 2001 & 2006

Source:
Quarterly Census of Employment and Wages, Colorado Department of Labor and Employment and BBC Research & Consulting, 2008.

Industry	Average Weekly Wage Garfield County		Percent Increase Garfield County	Percent Increase Colorado
	2001	2006		
Construction of Buildings	$724	$898	24.0 percent	16.2 percent
Heavy Construction	889	1,318	48.3	14.7
Mining Support	721	1,250	73.4	26.3
Mining (except oil and gas)	1,021	991	-2.9	13.7
Truck Transportation	487	1,053	116.2	18.7

With the exception of the mining industry (excluding natural gas), wages increased substantially relative to the state average from 2001 through 2006. Wages in Mesa and Rio Blanco Counties generally follow the same trends, but to a lesser degree.

Lagging growth in some industries. The introduction of an extractive industry into a small economy can result in adverse effects for some sectors. Many studies have documented the effects of "Dutch disease" whereby growth in the extractive industry "crowds out" the development of other industries through the appreciation of local prices and competition for labor and other resources.

The potential of resource extraction to discourage the growth of non-related industries has most recently been noted in Sublette County, Wyoming, which has experienced record growth in recent years as a result of natural gas development near the town of Pinedale. Since the beginning of the boom, the county has experienced severe labor shortages in industries that cannot afford to pay higher wages. Qualitative reports suggest that Sublette County has a smaller and less diverse array of small businesses than it did before the gas boom, and state figures show the number of retail and entertainment businesses and employees declined from 2000 – 2006, while the food service industry remained stagnant despite boomtown growth.[5]

Tourism in Sublette County currently suffers from a lack of lodging options, at least 75 percent of rooms are booked nightly by industry workers and prices for rooms have increased dramatically. A further concern for tourism is that recreational activities in the region may seem less appealing as drilling takes place in areas once used for hiking and other outdoor pursuits.

Analysis of employment in select northwest Colorado industries indicates that natural gas development may be suppressing growth in some sectors. For example, in Garfield County employment in the natural gas industry increased by more than 76 percent from 2001 to 2006. This compares to a statewide increase of only about 33 percent. At the same time, the number of employees in the entertainment industry (amusement, gambling and recreation in the NAICS sector) decreased by 1 percent while industry employment growth continued statewide.

[5] Jacquet, 2007.

As shown in Exhibit IV-26, employment in the entertainment and recreation industry in Garfield County increased at a faster rate than the state average from 1995 through 2000. Exhibit IV-27 shows that in 2001, Garfield County employment in this sector began to decline or stagnate while statewide growth continued. This coincides with the beginning of increased gas development in the region.

Exhibit IV-26. Colorado and Garfield County Average Annual Employment in the Entertainment and Recreation Sector (SIC), 1995–2000

Note:

Graph for 1995–2000 is shown separately from graph for 2001 – 2006 due to SIC to NAICS conversion.

Source:

Quarterly Census of Employment and Wages, Colorado Department of Labor and Employment and BBC Research & Consulting, 2008.

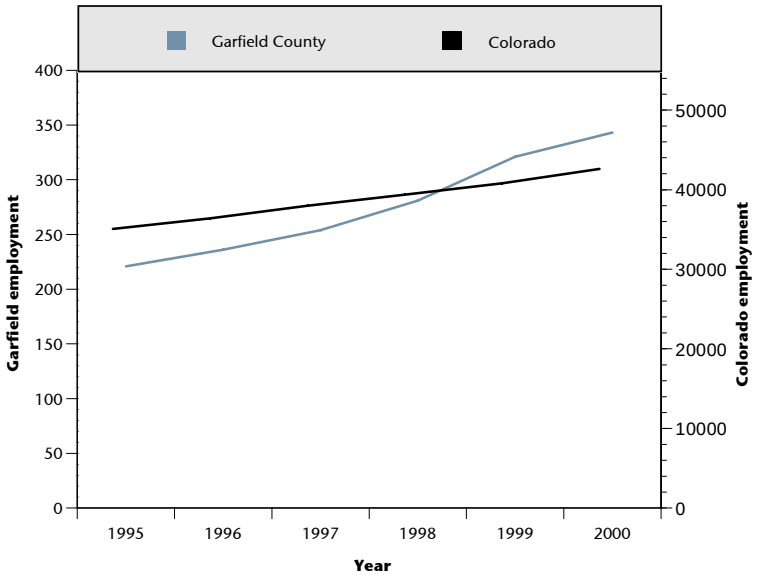
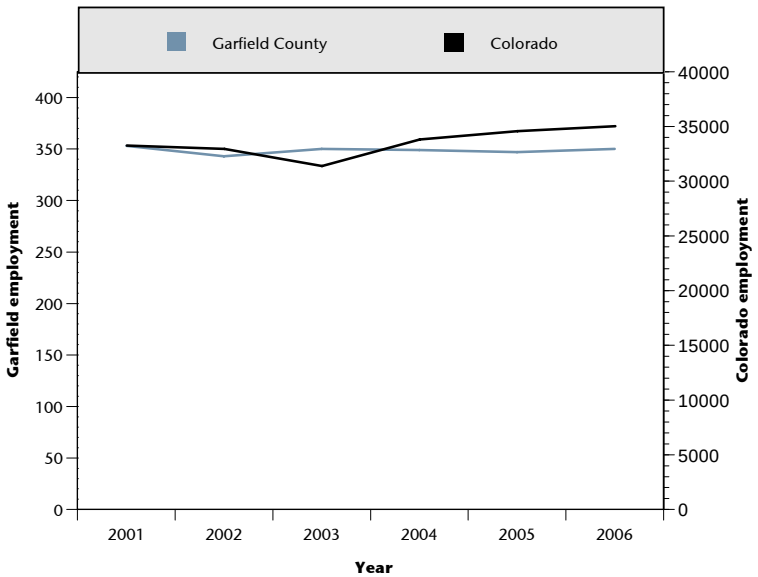


Exhibit IV-27. Colorado and Garfield County Average Annual Employment in the Entertainment and Recreation Sector (NAICS), 2001–2006

Source:

Quarterly Census of Employment and Wages, Colorado Department of Labor and Employment and BBC Research & Consulting, 2008.



At this point in time, there is insufficient data to reliably predict the degree to which "factor competition" may reduce the growth of other portions of the region's economic base – such as tourism or agriculture. To the extent that labor competition, higher housing prices, reduced availability of hotel rooms and more general crowding affect the prospects for other sectors, the employment and population growth of the region may be reduced relative to the projections described earlier in this section. The study team assumes this effect would be exaggerated by commercial-scale oil shale development although it is difficult to predict the magnitude.

SECTION V.
Projected Population Growth by Community

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Projected Population Growth by Community

The Northwest Colorado Socioeconomic Projection Model (NWCSP model) was used to forecast the distribution of population growth into sub-county areas and communities. This section describes the methodology used to allocate regional population growth and presents community population forecasts under the baseline scenario and the commercial oil shale scenario.

Methodology for Allocating Population Growth to Sub-County Regions

The sub-county areas included in the model include five incorporated cities in Mesa County, six incorporated cities in Garfield County and two incorporated cities in both Rio Blanco and Moffat counties. They also include unincorporated portions of each county.

The amount of population growth that occurs in each of the cities and in the unincorporated areas is based on:

- Projected population growth in each county;
- Relative "attraction coefficients" for each sub-county area; and
- Population capacity of each area and how close the area is to its estimated capacity.

Attraction coefficients. The growth allocation process begins with the study team's projection of the relative attractiveness of different communities within each county for new growth. Higher "attraction coefficients" represent locations where new residents would choose to live (without, at this point, considering the available capacity in the community or its relative affordability). They are based on recent population distribution trends, interviews with county officials and projected growth and employment activity within each community. Exhibit V-1 shows the "attraction coefficient" for each sub-county area. The coefficients are relative to other communities, and the unincorporated area, within the same county. Attraction coefficients cannot be compared between counties.

Exhibit V-1. Unconstrained "Attraction Coefficients"

Note:
County columns add to 100 percent.
Attraction coefficients are not comparable between counties.

Source:
BBC Research & Consulting, 2008.

Study Area	Unconstrained Attraction Coefficients	Study Area	Unconstrained Attraction Coefficients
Mesa County		**Garfield County**	
Collbran	1%	Carbondale	14%
De Beque	< 1%	Glenwood Springs	17%
Fruita	18%	New Castle	15%
Grand Junction	55%	Parachute	4%
Palisade	2%	Rifle	17%
Unincorporated	24%	Silt	7%
		Unincorporated	25%
Rio Blanco County			
Meeker	45%	**Moffat County**	
Rangely	15%	Craig	45%
Unincorporated	40%	Dinosaur	5%
		Unincorporated	50%

Population capacity. The estimated maximum number of people that can live in each sub-county area (incorporated or unincorporated) is an important assumption in the model. The community capacity provides an absolute limit on the number of people that the model will allocate to each area. The capacity factor is also used to simulate the decreasing ability of more crowded communities to capture new residents due to factors such as higher costs for land and housing and greater difficulty in accommodating new developments.

BBC interviewed municipal and agency representatives to derive study area capacities for each of the 18 sub-county areas. The capacity numbers are intended to reflect a combination of physical limitations (such as the limits of developable land) and the current political climate (with regard to growth boundaries and zoning limitations), but not short-term infrastructure constraints that will likely be overcome through investment in basic infrastructure.

In general, it is easier for most people to visualize the potential build-out capacity of cities and towns than to anticipate the ultimate capacity of the unincorporated areas within each county. The study team has set the capacities in the unincorporated areas to be large enough to accommodate the projected population that would accompany forecast economic growth in each county, beyond the available capacities in the existing cities.

With the exception of Mesa County, which has considerable available capacity within its existing cities and towns, most of the existing communities in the region begin to approach capacity under the baseline scenario by 2035 or earlier. Municipal capacity is even more of a limitation under the commercial oil shale scenario.

Consequently, a substantial amount of growth in the latter part of the forecast period is allocated to the unincorporated areas in the counties. While this type of growth in unincorporated areas is theoretically possible, it is unlikely and could present difficulties in planning and service delivery for the county governments in the region.

There are several possibilities regarding the large number of future residents allocated to unincorporated locations outside of the region's cities and towns:

- The region's municipalities may expand their boundaries or redevelop at higher densities, enlarging their capacities beyond the current anticipated limits;
- New cities or planned, higher density developments (such as Battlement Mesa) are developed over the next three decades;
- Some new residents live in employer provided housing. This possibility is discussed in the Draft EIS for commercial oil shale leasing recently developed by BLM;
- Portions of the workforce are comprised of temporary residents housed in motels and campgrounds; and/or
- Some of the projected county population winds up living in adjacent counties. In particular, some shift of population from Rio Blanco County to Moffat County and from Garfield County to Mesa County appears plausible.

The following exhibit shows estimated population capacities currently incorporated in the model.

Exhibit V-2.
Estimated Study Area Population Capacities

Study Area	Estminated Capacity	Approximate 2006 Population Share of Total Capacity
Mesa County	**359,000**	**37.7%**
Collbran	1,500	**43.8%**
De Beque	1,500	**33.9%**
Fruita	25,000	**41.4%**
Grand Junction	125,000	**41.3%**
Palisade	6,000	**49.0%**
Unincorporated	200,000	**34.7%**
Rio Blanco County	**52,000**	**12.1%**
Meeker*	5,000	**47.1%**
Rangely	7,000	**30.2%**
Unincorporated	40,000	**4.6%**
Garfield County	**158,250**	**33.5%**
Carbondale	8,250	**73.8%**
Glenwood Springs	12,500	**69.9%**
New Castle	10,000	**34.4%**
Parachute	10,000	**14.9%**
Rifle	30,000	**29.0%**
Silt	10,000	**24.2%**
Unincorporated	77,500	**28.6%**
Moffat County	**48,000**	**28.6%**
Craig	15,000	**61.7%**
Dinosaur	3,000	**11.2%**
Unincorporated	30,000	**13.8%**

Note:

*After the completion of this study's quantitative analyses, the Town of Meeker completed a long-range water planning study that included a further look at the Town's potential to absorb new growth. Meeker representatives indicate that Meeker may be able to grow to as many as 10,000 residents – rather than the 5,000 resident capacity indicated during study development.

Source:

BBC Research & Consulting, 2008.

To simulate the greater difficulty of development and the rising cost of land and housing as areas approach capacity, this constraint is modeled as an increasing restriction as the population approaches the capacity limit. The following formula describes the population allocation algorithm:

$$\Delta Pop_x = S_x\,(1-(Pop_x/Cap_x)^2)\,\Delta Pop_c$$

Where:

ΔPop_x = change in population in area x for the year;

S_x = the geographically weighted attraction coefficient for area x (as described earlier);

Pop_x = the previous year's population in area x;

Cap_x = the population capacity of area x; and

ΔPop_c = change in population in the overall county for the year.

The effect of incorporating relative capacity constraints into the geographic allocation process is to reduce the geographically weighted attraction coefficients for all sub-county areas, with the greatest reduction occurring in areas that are already relatively crowded and comparatively expensive. For an area such as Carbondale (which is currently at 74% of estimated capacity), the formula reduces the attraction coefficient to approximately one-half of its unconstrained value. After calculating revised attraction coefficients for each study area using the processes just described, the model then "rebenches" all of the attraction coefficients to sum to 100 percent.

Baseline Scenario

The following describes projected growth by community under the baseline scenarios. As discussed in Section IV, the population of the four-county region is projected to increase from about 201,000 residents in 2005 to nearly 417,000 residents by 2035 under the baseline scenario. This scenario includes extensive natural gas development over the next three decades and growth in other economic base activities such as tourism and regional services. The baseline scenario does not include the development of a commercial oil shale industry in northwest Colorado.

Mesa County. Overall, Mesa County is forecast to grow from about 131,000 residents in 2005 to over 235,000 residents by 2035. This is both the largest number of new residents under the baseline forecast and the lowest annual growth rate among the four counties in the region (because Mesa County's population is by far the largest at present). Mesa County planners have previously developed independent forecasts of future county population that anticipate 285,000 residents by 2035. Consequently, Mesa County has indicated they believe the population projection for Mesa County may be conservative.

In general, there appears to be sufficient capacity among the existing municipalities in Mesa County to handle the county's projected growth under the baseline scenario. Of all the towns in Mesa County, Fruita will experience the highest percent growth through 2035. Total population is expected to increase from 9,400 residents in 2005 to about 23,600 residents by 2035. Much of this growth is forecast to occur over the next 12 years, with Fruita projected to reach 18,000 residents by 2020.

Many new Mesa County residents will choose to live in Grand Junction. Northwest Colorado's largest city is projected to add more than 50,000 residents by 2035. Grand Junction is projected to exceed 75,000 residents by 2020 and 100,000 residents by 2035.

The populations of the smaller communities of Colbran, De Beque and Palisade will increase by 127, 77 and 66 percent by 2035, respectively. Together, these towns are forecast to add an additional 3,100 residents. Unincorporated areas of the County are expected to increase by about 1.3 percent each year, reaching more than 100,000 residents in 2035.

Exhibit V-3 shows population projections for Mesa County municipalities through 2035. The table identifies changes in the location and timing of population growth. For example, Colbran shows a high annual rate of growth relative to most other towns through 2030. As the town nears estimated build out, average annual growth declines relative to all other areas. Unincorporated areas show the lowest percent growth in Mesa County.

Exhibit V-3.
Projected Mesa County Population by Sub-county area, 2005–2035

	Projected Population							30-year	Annualized
	2005	2010	2015	2020	2025	2030	2035	Growth	Growth
Mesa County									
Collbran	642	882	1,088	1,234	1,337	1,419	1,459	127%	2.8%
De Beque	504	560	618	673	728	825	894	77%	1.9%
Fruita	9,393	12,636	15,656	18,065	20,028	22,514	23,629	152%	3.1%
Grand Junction	49,422	59,069	68,608	76,995	84,714	97,152	104,224	111%	2.5%
Palisade	2,842	3,151	3,461	3,740	4,005	4,450	4,730	66%	1.7%
Unincorporated	67,859	72,296	76,979	81,463	86,012	94,234	100,336	48%	1.3%
Total County	**130,662**	**148,594**	**166,410**	**182,170**	**196,824**	**220,594**	**235,272**	**80%**	**2.0%**

Source: BBC Research & Consulting, 2008.

Garfield County. Garfield County is the second most populous county in the northwest Colorado study region and is forecast to experience the second most population growth through 2035, after Mesa County. In terms of either percentage growth or average annual growth, rate Garfield County is forecast to grow more rapidly than Mesa County under the baseline scenario. Like Mesa County, Garfield County's planners have an independent projection of future county population that is higher than the baseline projection from the NWCSP model and believe this baseline projection may be a conservative forecast of future county growth.

By 2015, both Glenwood Springs and Carbondale are projected to approach their estimated build out capacities of 12,500 and 8,250, respectively. Continuing recent trends, the focus of population growth is forecast to keep moving westward towards the New Castle, Silt, Rifle and Parachute areas.

Under the baseline scenario, Rifle is projected to become the largest city in Garfield County, home to over 27,000 residents by 2035. Silt, New Castle, Parachute and unincorporated areas of the County are also projected to experience substantial growth.

Carbondale and Glenwood Springs are forecast to experience the lowest percent growth in Garfield County through 2035 while Parachute is projected to have the highest percent growth, with a 490 percent increase from 2005. From 2005 through 2010, average annual growth in Parachute is projected at 11 percent. The average annual growth rate in New Castle is close to 14 percent during the same time period. New Castle's growth is forecast to taper off as the town begins to approach build out capacity in 2015. As Silt and Rifle begin to reach capacity in 2030, growth pressures are expected to increase in unincorporated areas of the county.

Exhibit V-4 shows population projections for different communities and the unincorporated areas of Garfield County through 2035. As noted later in this section, Garfield County may experience even greater growth pressure than forecast under the baseline scenario if Rio Blanco County is unable to accommodate some of the growth anticipated to occur to the north.

Exhibit V-4.
Projected Garfield County Population by Sub-county area, 2005–2035 (Baseline Scenario)

	Projected Population							30-year	Annualized
	2005	2010	2015	2020	2025	2030	2035	Growth	Growth
Garfield County									
Carbondale	5,881	7,066	7,658	7,954	8,102	8,176	8,213	40%	1.1%
Glenwood Springs	8,603	10,486	11,349	11,925	12,212	12,356	12,428	44%	1.2%
New Castle	3,148	5,941	7,574	8,787	9,394	9,697	9,848	213%	3.9%
Silt	2,319	3,776	4,851	6,626	7,966	8,779	9,390	305%	4.8%
Rifle	8,118	11,454	13,957	18,209	21,735	24,206	27,103	234%	4.1%
Parachute	1,360	2,258	2,965	4,224	5,391	6,329	8,008	489%	6.1%
Unincorporated	21,244	26,273	30,039	38,136	45,094	50,436	61,707	190%	3.6%
Total County	**50,673**	**67,253**	**78,393**	**95,860**	**109,894**	**119,979**	**136,697**	**170%**	**3.4%**

Source: BBC Research & Consulting, 2008.

Moffat County. Moffat County population is expected to increase by about 12,900 residents between 2005 and 2035, almost doubling the county's population. Growth pressure on Moffat County is expected to increase as natural gas development accelerates in Rio Blanco County and most of the increase in Moffat County population is projected to occur by 2025.

Most of the growth in Moffat County is expected to occur in Craig and in the unincorporated portions of the county. Under the baseline scenario, Craig is projected to grow to more than 13,000 residents by 2035. The population living in unincorporated portions of Moffat County is forecast to exceed 10,000 people by 2025 and 12,000 people by 2035. Relative to Rio Blanco County, Moffat County has a relatively large amount of developable, private land. This growing unincorporated population, however, could both strain the County's ability to provide services and accelerate the conversion of agricultural land to residential and commercial uses.

The small community of Dinosaur is forecast to grow from about 334 residents in 2005 to over 1,200 residents by 2035. In terms of absolute population, growth in Dinosaur amounts to a relatively small increase. However, projected growth represents almost a 300 percent increase from 2005, which may have implications for town services and infrastructure requirements.

Exhibit V-5 shows population projections for Craig, Dinosaur and the unincorporated areas of Moffat County through 2035.

Exhibit V-5.
Projected Moffat County Population by Sub-county area, 2005–2035 (Baseline Scenario)

	Projected Population							30-year	Annualized
	2005	2010	2015	2020	2025	2030	2035	Growth	Growth
Moffat County									
Craig	9,131	10,622	11,274	11,925	12,538	12,847	13,057	43%	1.2%
Dinosaur	334	594	734	890	1,059	1,159	1,234	269%	4.5%
Unincorporated	3,961	6,489	7,790	9,199	10,660	11,477	12,065	205%	3.8%
Total County	**13,426**	**17,705**	**19,798**	**22,014**	**24,257**	**25,483**	**26,356**	**96%**	**2.3%**

Source: BBC Research & Consulting, 2007.

Rio Blanco County. Rio Blanco County faces strong growth pressure as the focus of natural gas development begins to move north from Garfield County. Given the seemingly limited capacity of Meeker and Rangely, it appears that accommodating this growth may be challenging. The NWCSP model allocates most of the projected growth in Rio Blanco County to unincorporated areas beginning in 2015.

In 2005, Meeker had about 2,300 residents while Rangely was home to about 2,100 people. By 2035, the populations of Meeker and Rangely are expected to increase by more than 100 percent, totaling 4,900 and 4,400 residents, respectively.

Meeker initially begins to grow at a much faster rate than Rangely and continues to do so through about 2015, when Meeker begins to approach build out capacity.[1] From 2015 through 2035, average annual growth in Meeker declines by about 0.5 percent every five years. Rangely's growth remains relatively constant through 2030 at around 2 percent.

There will need to be considerable development of housing and other infrastructure for Rio Blanco County to accommodate the projected growth under the baseline scenario. Despite evidence of mounting growth pressure in the past few years, county sources have indicated that private developers have been wary of making large investments in the county because of the traditional "boom and bust" nature of natural resource extraction. In the absence of such investment – and without expansion of the capacity of Meeker and Rangely and possibly the development of relatively dense planned communities or new towns in currently unincorporated areas – some of the projected population growth in Rio Blanco County may have to be accommodated in Garfield and Moffat Counties or in Uintah County, Utah.

[1] After the completion of this study's quantitative analyses, the Town of Meeker completed a long-range water planning study that included a further look at the Town's potential to absorb new growth. Meeker representatives indicate that Meeker may be able to grow to as many as 10,000 residents – rather than the 5,000 resident capacity indicated during study development. Incorporating this larger capacity into the NWCSP model would allocate more of the anticipated growth in Rio Blanco County to the Town of Meeker and less to unincorporated areas.

Exhibit V-6.
Projected Rio Blanco County Population by Sub-county Area, 2005–2035 (Baseline Scenario)

	Projected Population							30-year	Annualized
	2005	2010	2015	2020	2025	2030	2035	Growth	Growth
Rio Blanco County									
Meeker	2,273	3,637	4,100	4,477	4,728	4,864	4,932	117%	2.6%
Rangely	2,068	2,660	2,941	3,257	3,587	4,028	4,392	112%	2.5%
Unincorporated	1,732	3,456	4,319	5,321	6,409	7,930	9,300	437%	5.8%
Total County	**6,073**	**9,753**	**11,360**	**13,055**	**14,724**	**16,822**	**18,624**	**207%**	**3.8%**

Note: See footnote on previous page regarding Meeker population projections.
Source: BBC Research & Consulting, 2008.

Commercial Oil Shale Scenario

Development of commercial oil shale in northwest Colorado would place additional growth pressure on the four county study area, particularly in the latter years of the forecast period (and beyond). The NWCSP model was used to evaluate how the projected population growth distribution of the region would change if commercial oil shale production were to take place in the region. As detailed in Section IV, adding commercial oil shale development to other anticipated growth factors included under the baseline scenario would lead to a projected population in the four county study region of over 466,000 residents by 2035, an increase of over 130 percent from 2005. Under the commercial oil shale scenario there would be about 50,000 additional residents in 2035 compared to the baseline scenario. Rio Blanco and Garfield counties are forecast to experience most of the additional growth associated with oil shale development.

Mesa County. Under the commercial oil shale scenario, Mesa County is not forecast to experience substantial population increases beyond the baseline scenario. Under this scenario, the population of Mesa County would increase from 131,000 residents in 2005 to 242,000 residents in 2035. This compares to a 2035 population of 235,000 residents under the baseline scenario. By and large, Mesa County population centers represent a long commute to potential long-term oil shale work sites in Rio Blanco County. Given the uncertainties regarding the ultimate technology that may be employed for commercial oil shale, however, potential secondary impacts on supporting industries are also not well understood at this time. It is possible that supporting industries in Mesa County might experience more of the growth associated with commercial oil shale than assumed in this forecast.

Colbran, De Beque, Fruita and Palisade are anticipated to be largely unaffected by population increases under the commercial oil shale scenario. Together, these towns would see an additional 330 residents in 2035 compared to the baseline scenario. Total population in these communities would reach about 31,000 residents, over a 130 percent increase from 2005.

The majority of the additional Mesa County residents anticipated under the commercial oil shale scenario would move to Grand Junction or unincorporated areas of the County. By 2035, the population of Grand Junction would exceed 107,000 residents and unincorporated areas would be home to about 103,000 people. This compares to 104,000 and 100,000 residents under the baseline scenario, respectively. Under the commercial oil shale scenario, population in these areas would grow by 117 percent and 52 percent from 2005, respectively.

Exhibit V-7 depicts the current population of each area in Mesa County and the projected population in 2035 under the commercial oil shale scenario and the baseline scenario.

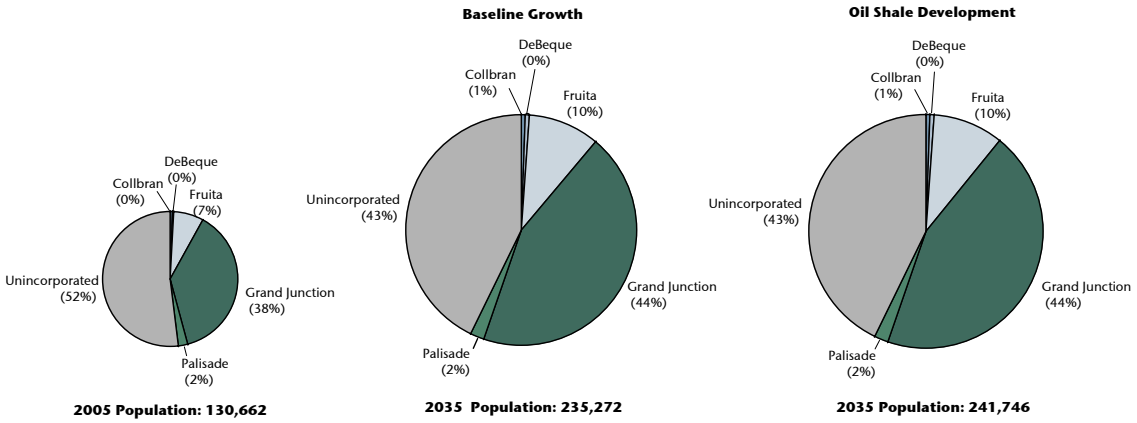
Exhibit V-7.
Mesa County Population by Sub-county Area, 2005 and 2035

Source:
BBC Research & Consulting, 2008.

	2005 Population	2035 Population		Difference
		Baseline	Oil Shale	
Mesa County				
Collbran	642	1,459	1,462	3
De Beque	504	894	925	31
Fruita	9,393	23,629	23,798	169
Grand Junction	49,422	104,224	107,443	3,219
Palisade	2,842	4,730	4,860	130
Unincorporated	67,859	100,336	103,258	2,922
Total County	**130,662**	**235,272**	**241,746**	**6,474**

Exhibit V-8 provides a graphic depiction of Mesa County population and distribution of residents for 2005 and 2035 under the baseline and commercial oil shale scenarios. There is very little difference between the scenarios in the distribution of projected growth across communities.

Exhibit V-8.
Mesa County Population Distribution, 2005 and 2035



Source: BBC Research & Consulting, 2008.

Garfield County. After Rio Blanco County, Garfield County is forecast to experience the most effects from commercial oil shale development. Under this scenario, Garfield County population would exceed 154,000 residents by 2035, more than triple the county's 2005 population. Compared to the baseline scenario, commercial oil shale development is forecast to add almost 18,000 additional residents to Garfield County's population between 2020 and 2035.

Most of the additional growth projected to result from oil shale development would occur in unincorporated areas of Garfield County, as many towns would already approach estimated build out under the baseline scenario. Silt, Rifle and Parachute are projected to house about 1,800 more residents under the commercial oil shale scenario than under the baseline scenario, but these communities are not far from build out by 2035 under either scenario. By 2035, unincorporated Garfield County is projected to house more than 15,000 additional residents under the commercial

oil shale scenario than under the baseline scenario. The total unincorporated population is forecast to reach almost 77,500 residents, a 265 percent increase from 2005. Accommodating this large unincorporated population would require planned developments at urban or suburban densities. As discussed later in this section, Garfield County could face even greater growth pressure under the commercial oil shale scenario if Rio Blanco County is unable to accommodate all of the growth pressure facing that county.

Exhibit V-9 depicts the population of Garfield County communities in 2005 and 2035 under the commercial oil shale and baseline scenarios.

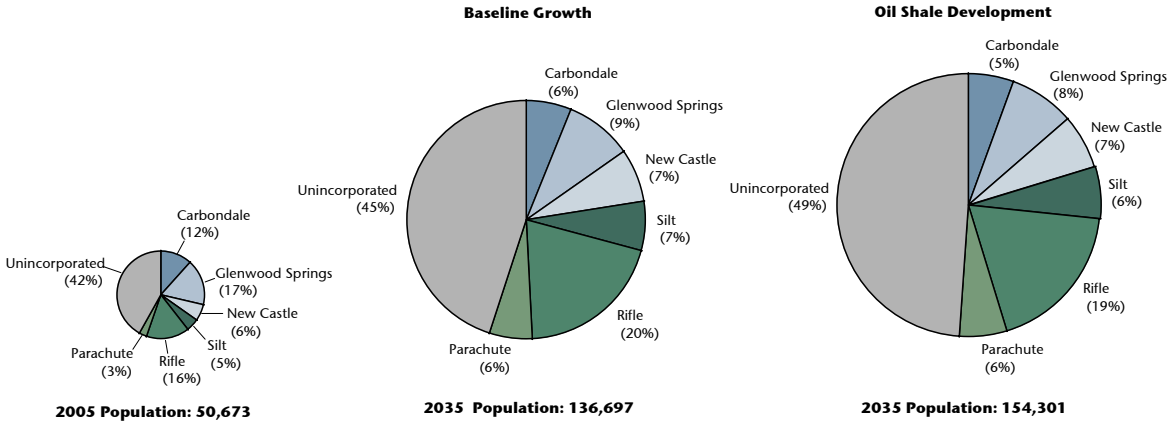
Exhibit V-9.
Garfield County Population by Sub-county Area, 2005 and 2035

Source:
BBC Research & Consulting, 2008.

	2005 Population	2035 Population		Difference
		Baseline	Oil Shale	
Garfield County				
Carbondale	5,881	8,213	8,213	0
Glenwood Springs	8,603	12,428	12,428	0
New Castle	3,148	9,848	9,848	0
Silt	2,319	9,390	9,549	159
Rifle	8,118	27,103	28,084	981
Parachute	1,360	8,008	8,692	684
Unincorporated	21,244	61,707	77,487	15,780
Total County	**50,673**	**136,697**	**154,301**	**17,604**

Exhibit V-10 shows the forecast distribution of Garfield County population for 2005 and 2035 under the baseline and commercial oil shale scenarios.

Exhibit V-10.
Garfield County Population Distribution, 2005 and 2035



Source: BBC Research & Consulting, 2008.

Moffat County. By 2035, the population of Moffat County is projected to reach about 31,500 residents under the commercial oil shale scenario, a 135 percent increase from 2005. Compared to the baseline scenario, commercial oil shale is forecast to add about 5,000 residents to the population of Moffat County by 2035. Like Garfield County, Moffat County could experience additional increases in population from the development of commercial oil shale if Rio Blanco County cannot accommodate expected growth pressures.

By 2035, Craig is forecast to have more than 14,000 residents under the commercial oil shale scenario and be approaching its estimated buildout capacity of 15,000. With commercial oil shale development, and other anticipated growth factors in Moffat County, the population of Dinosaur would increase from about 330 residents in 2005 to over 1,700 residents by 2035.

Unincorporated areas of Moffat County would experience the largest increase in residents compared to the baseline scenario. As Dinosaur and Craig approach capacity, approximately 3,500 additional residents (beyond the baseline scenario) will move to unincorporated areas than under the baseline scenario. The total population of unincorporated areas is forecast to exceed 15,500 residents by 2035, nearly four times the 2005 population in unincorporated Moffat County.

Exhibit V-11 depicts the population of Moffat County communities in 2005 and 2035 under the commercial oil shale and baseline scenarios.

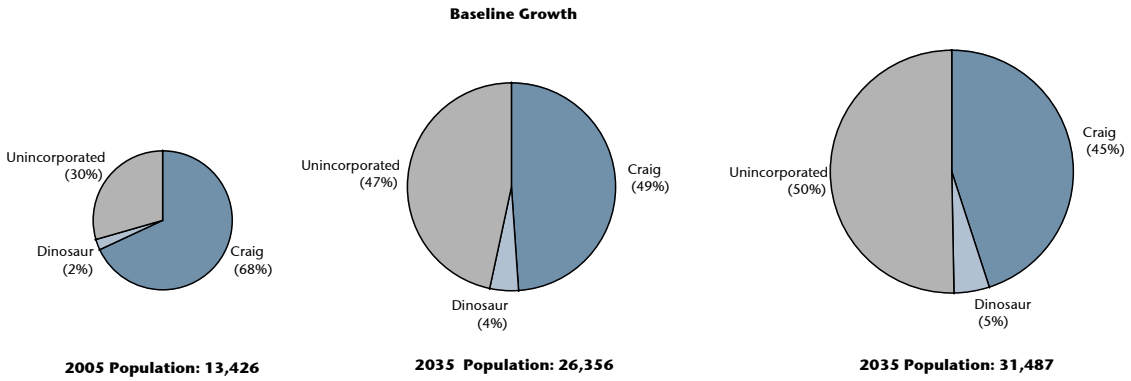
Exhibit V-11. Moffat County Population by Sub-county Area, 2005 and 2035

Source:
BBC Research & Consulting, 2008.

	2005 Population	2035 Population		Difference
		Baseline	Oil Shale	
Moffat County				
Craig	9,131	13,057	14,209	1,152
Dinosaur	334	1,234	1,707	473
Unincorporated	3,961	12,065	15,571	3,506
Total County	**13,426**	**26,356**	**31,487**	**5,131**

Exhibit V-12 shows Moffat County population and distribution of residents for 2005 and 2035 under the baseline scenario and the commercial oil shale scenario.

Exhibit V-12. Moffat County Population Distribution, 2005 and 2035



Source: BBC Research & Consulting, 2008.

Rio Blanco County. As discussed earlier in this section, Rio Blanco County already faces substantial growth pressure under the baseline scenario. Development of commercial oil shale, along with gas-fired power plants in the county and additional wells to fuel the electric generation required by oil shale, would substantially increase growth pressures on the county.

By 2035, the population of Rio Blanco County is projected to reach 39,000 residents under the commercial oil shale scenario. This projection is more than double the anticipated population under the baseline scenario and more than six times the county's population in 2005. Under the commercial oil shale scenario, Rio Blanco County's population would more than double in the ten year period between 2025 and 2035.

The magnitude of the growth pressure on Rio Blanco County under the commercial oil shale scenario would clearly pose daunting challenges. As discussed earlier for the baseline scenario, the two incorporated cities in the county appear to have limited capacity to accommodate substantial growth. As Meeker approaches estimated build out capacity after 2020, additional growth begins to shift towards Rangely and unincorporated Rio Blanco County. Rangely also has limited capacity relative to the magnitude of projected growth under the commercial oil shale scenario.

Although the projected 2035 population of Rio Blanco County under the commercial oil shale scenario is roughly 20,000 residents more than under the baseline scenario, most of the projected growth attributable to oil shale would have to either be accommodated in currently unincorporated portions of the county or shifted to other counties more distant from oil shale developments (e.g. Garfield County and Moffat County) . By 2035, almost 28,000 residents are projected to live in unincorporated Rio Blanco County under the commercial oil shale scenario. A portion of this population, particularly workers involved in building power plants, may be temporary workers – although the ongoing development path for oil shale outlined in Section III suggests this type of work could continue for many years. Potentially, some of this population could live in either employer developed housing near oil shale facilities or in other higher density developments constructed in the county.

Exhibit V-13 depicts the population of Rio Blanco County communities in 2005 and 2035 under the commercial oil shale and baseline scenarios.

Exhibit V-13.
Rio Blanco County Population by Sub-county Area, 2005 and 2035

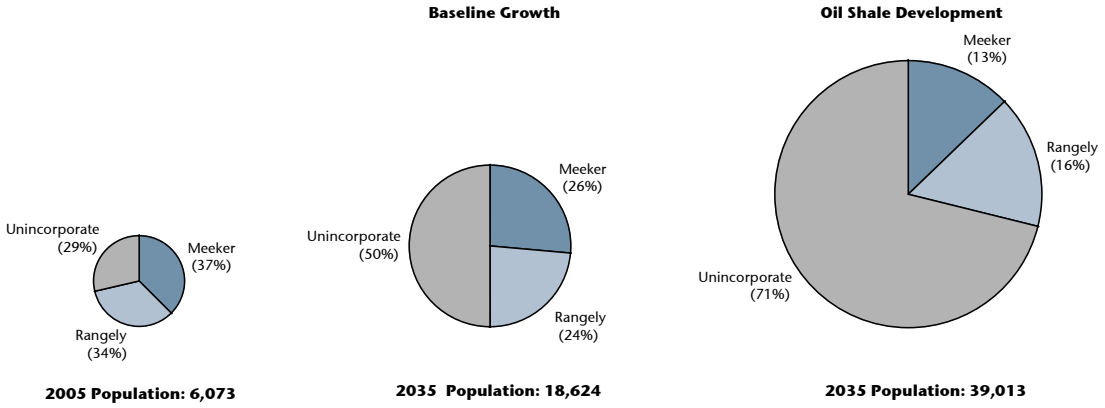
Note: See footnote on page V-8 regarding Meeker population projections.

Source:
BBC Research & Consulting, 2008.

	2005 Population	2035 Population		Difference
		Baseline	Oil Shale	
Rio Blanco County				
Meeker	2,273	4,932	4,938	6
Rangely	2,068	4,392	6,296	1,904
Unincorporated	1,732	9,300	27,780	18,480
Total County	**6,073**	**18,624**	**39,013**	**20,389**

Exhibit V-14 graphically depicts the distribution of Rio Blanco County residents in 2005 and 2035 under the baseline and commercial oil shale scenarios.

Exhibit V-14.
Rio Blanco County Population Distribution, 2005 and 2035



Source: BBC Research & Consulting, 2008.

SECTION VI.
Fiscal Effects

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Fiscal Effects

This section presents findings on the fiscal consequences of two energy development scenarios defined earlier in the report. Guidance for the interpretation of fiscal data is also provided at the end of this section.

This section provides summary results, Appendix A offers a compete discussion of fiscal modeling methodology, assumptions and process.

Fiscal Issues

The NWCSP model projects public sector operating costs, prospective capital costs and key revenues under various scenarios of local development. The NWCSP model develops forecasts of employment growth in basic and service industries, allocates employment spatially and projects population growth based on proximity to employment, local housing opportunities and the growth capacity of local communities. Based on this allocation of jobs and residents, the fiscal element of the model projects the fiscal position of municipal and county operations and long-term capital expansion needs, Data are compiled and reported in aggregate, as well as by three sub-areas within the four county region.

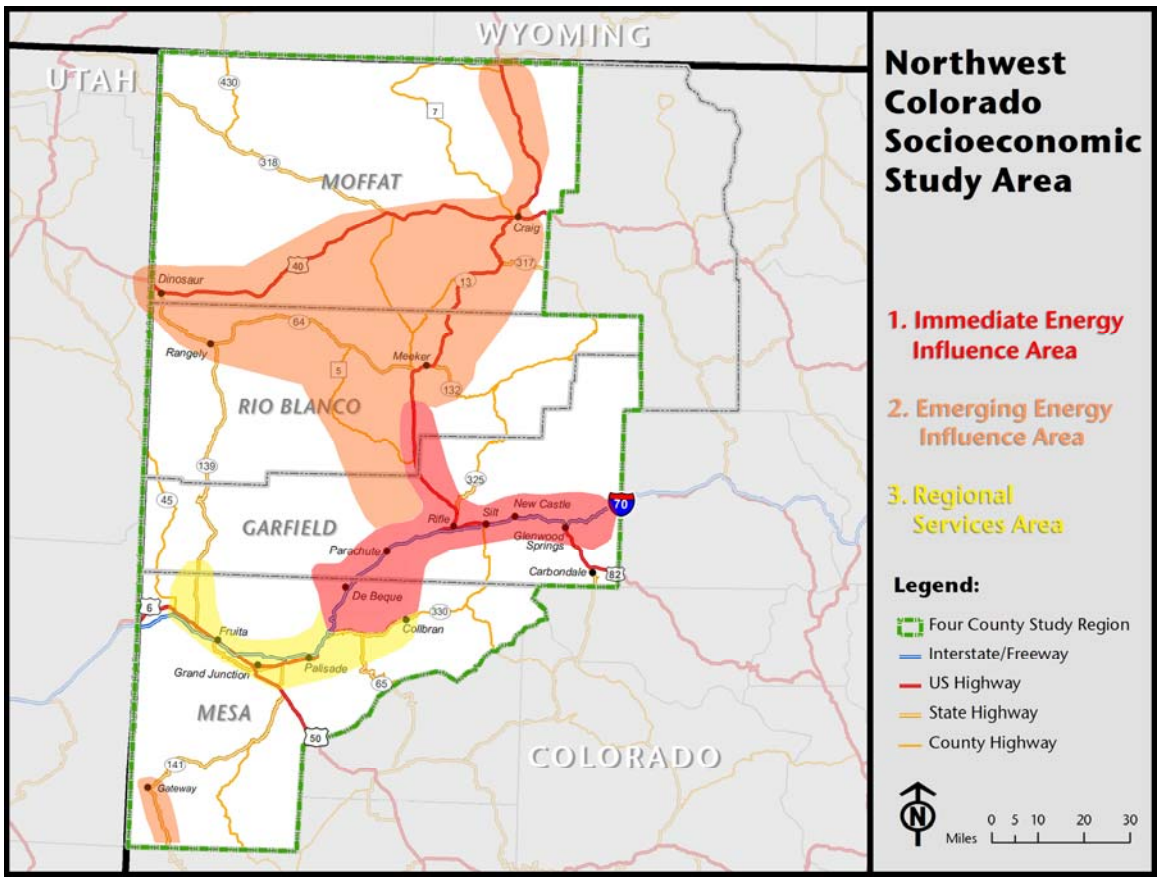
Fiscal environment. There is very wide variation in the size and capabilities of local governments in the study area and accordingly individual communities will respond differently to the service demands associated with rapid growth. For example, Grand Junction may have the staff, scale and experience to accommodate reasonable levels of new growth without undue burden. Other smaller communities, which lack these attributes but may experience strong growth, will face more difficult and likely more expensive challenges. Similarly, some northwest Colorado communities have a full array of taxes, fees, charges and growth related impact fees—leaving them well prepared to benefit fiscally from most forms of development. Other communities, particularly the area's more remote locations or small towns that have not experienced recent growth, lack these growth-financing mechanisms. It is noted that the nature of growth impacts will also vary even within relatively small areas. The location of retail development and sales taxes is a critical component of growth financing. Some communities, with full commercial services and a broad retail base, are reasonably well positioned to accommodate growth. Other communities, perhaps ones that receive more pass-through traffic or disproportionate residential growth but lack a mature retail base, will struggle to maintain service levels.

Northwest Colorado faces significant challenges in providing public services. These include: the unique road impacts associated with gas drilling and truck activity; the limitations of small communities; the cost of manpower, housing and resources in this sparsely populated area; and the absence of public lands and difficulty geography of the area, which can be severely limiting to communities looking to expand. In general, these considerations will inflate the cost of service provision from 10-25 percent. These costs are factored into this analysis. Balancing these exceptional costs are unique revenues, notably resource related property taxes and state redistributions of severance tax and related fees. A full accounting and explanation of this process is provided in Appendix A.

Regional Considerations. As noted in prior Section IV, the NWCSP model apportions development to local communities based on job location, community attractiveness and community capacity. The growth allocation process apportions households to both the incorporated and unincorporated portions of the region according to "attraction coefficients." The volume of anticipated growth, particularly with oil shale development, would likely require considerable development in the unincorporated portions of the study area. Although many counties have the private land available to accommodate rural growth, low-density, rural land use patterns raise many social, service and environmental issues. The development of new towns or urbanized subdivisions, much like Battlement Mesa, is a distinct prospect. If a new municipality or urban subdivision occurs in the region, then the fiscal impact projections for county operating and capital expenditures will be very different than those presented here.

The fiscal analysis recognizes three socioeconomic sub-areas within the Study Area (Exhibit IV-1).

Exhibit VI-1.
Study Area Socioeconomic Sub-Areas



Source: BBC Research and Consulting.

From a fiscal modeling perspective, the following are key considerations:

Current energy impact area — Garfield County. Garfield County has experienced substantial and rapid population growth over the past decade and serves as something of a case study for the kinds of impacts likely to occur as traditional energy development and possibly oil shale operations expand. Glenwood Springs and Carbondale are on the periphery of the energy impact area but are still closely tied with the resort and recreation industries in Eagle and Pitkin counties. Both towns also have substantial physical and public land barriers to further development. Parachute and Rifle are in the heart of the energy development area and are currently dealing with both rapid population growth and significant pass through traffic. Newcastle and Silt are small communities and lack substantive sales tax base. Garfield County is benefitted by rising property assessments associated with gas development but also pressed to provide police, road maintenance and emergency services.

Regional services area — Mesa County. This area is dominated by Grand Junction, which generally has the necessary scale and institutional support to manage its strong but not overwhelming pace of growth. As the site of the key regional airport and the largest city, Mesa County communities have attracted a large share of the management, consulting and regional supply side of the area's energy development industry. This influx of jobs and commercial business tends to stabilize the local economy. Grand Junction is also the long-standing regional service center with a robust retail component. Retail sales taxes have risen about 12 percent per year over the past three years, allowing a cushion of public sector financial support.

Emerging energy impact area — Moffat and Rio Blanco Counties. This two-county area is sparsely populated with very limited public services but extensive road networks that are heavily impacted by traditional energy development and related commuter traffic. Thus far, recent population growth has been modest but greater development activity is anticipated as gas drilling moves northward and increased activity is allowed in the BLM White River District and the Roan Plateau. This area would be heavily impacted by prospective oil shale development. The western portions of the county have economic ties with Vernal, Utah; the northern sections around Craig are affected by pass through traffic and southern Wyoming gas field development.

There is considerable variation in the nature of public services and the cost of providing services within the four county region. Each of these sub-areas has common qualities and challenges in providing growth related services. The NWCSP model attempts to recognize those commonalities and reports fiscal impact results by these geographic and economic sub-areas of common experiences.

Modeling Approach

Modeling projections document municipal and county general fund operations and related capital (infrastructure) needs. The modeling approach incorporates a few key assumptions:

- In theory, standard community revenue sources—fees, charges for service, sales taxes and non-energy related property taxes, should support traditional levels of local government services without undue burden on current or future residents. Historically, across the state of Colorado, the traditional array of revenue sources have proven capable of supporting local governments services with local service levels varying based on the economic and tax productivity of each jurisdiction. The NWCSP model begins with this premise.

- There are unusual challenges in servicing growth in this area. The lack of current public infrastructure; the migration of the gas industry into more rural areas; difficulties attracting and retaining workers, housing shortages and rising costs and the likely pace and scale of growth will result in service delivery and capital costs that are higher than the per household costs of local government in other areas of the state. In short, providing for growth in this relatively undeveloped area of Colorado, under these conditions, is expensive. The NWCSP model utilizes assumptions about municipal and county costs of services that will occur above average levels experienced elsewhere in Colorado.

- Somewhat moderating the "expensive service" assumption, the NWCSP model also recognizes that communities will, as they grow, become more effective and efficient providers of services. In essence, municipalities will likely experience modest economies of scale and become more effective service providers as they gain experience, infrastructure and scale. In this same vein, the present model also acknowledges that accommodating growth in larger communities is generally more cost effective than the expansion of the area's smallest cities and towns.

- Finally, the NWCSP model develops forecasts of municipal and county operating costs and comparable traditional revenues, and compares these costs with the unique or nontraditional revenues that also occur with the energy industry development. These energy driven revenues include prospective mineral leasing and severance tax distributions and resource driven property tax revenues.

Results are presented for the region as whole and for both long term capital investment needs and operating expenses. Results reflect the fiscal effects of new growth that will occur in addition to current (2007) baseline conditions.

Fiscal Projections—Municipal Operations

In order to project community service costs and prospective revenues associated with growth in this area, the NWCSP model translates future employment and population growth into additional service provision costs at both a county and municipal level—results are communicated by sub-area and ultimately in aggregate for the four county study area. Per household service multipliers are derived from a Colorado Department of Local Affairs (DOLA) database of all Colorado communities. The NWCSP model projects the annual operational costs associated with growth related demands in the four county area that are likely to occur in excess of traditional local government expenses, which are covered by traditional revenues. The model also projects non-traditional or natural resource driven revenues that will be available to help cover these regionally specific operating and capital costs.

The NWCSP model allows adjustment of underlying relationships so that over time key assumptions can be readily modified in this rapidly changing socioeconomic environment.

Operating costs. The municipal operations forecasting element of the NWCSP fiscal model has the following components, which are detailed in Appendix A:

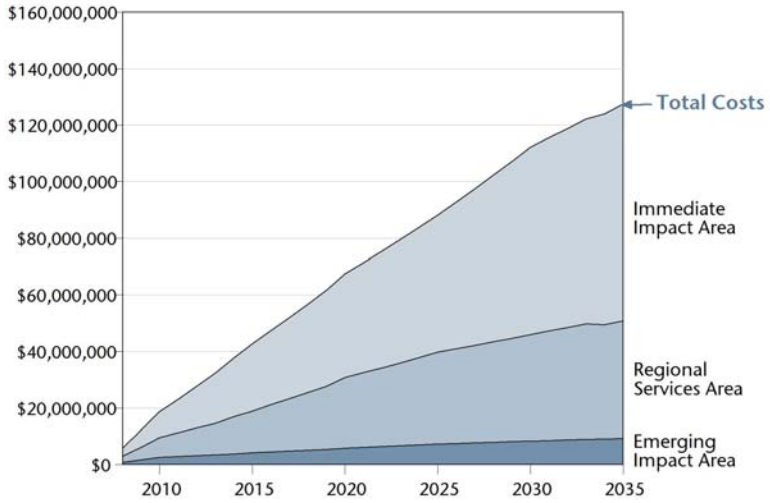
- A process for **calculating average annual municipal service costs** by community size for comparable communities throughout Colorado;
- A process for **classifying the municipalities of Northwest Colorado** by size and attributing applicable public service costs;
- A process for **organizing the municipalities into the sub regions** described above;
- A process for **projecting service costs and incremental traditional revenues** associated with projected growth in the area; and
- A process for **calculating the nontraditional or resource derived revenues** generated by gas development and distributed to study area jurisdictions by the state.

Results are presented below for the baseline scenario.

Exhibit VI-2 on the following page shows projected annual municipal general fund operating costs for the area's 14 municipalities by sub-area under the baseline scenario. These costs are for servicing new growth beyond current population levels. Total *new* municipal operating costs will rise to over $120 million in 2035. The Regional Services and Immediate Energy Impact sub-areas combine to account for 90 percent of new municipal operating costs in 2035, although the percentage growth is far faster in the communities within the Emerging Energy sub-area.

Exhibit VI-2. Annual Municipal Operational Costs—Baseline Scenario

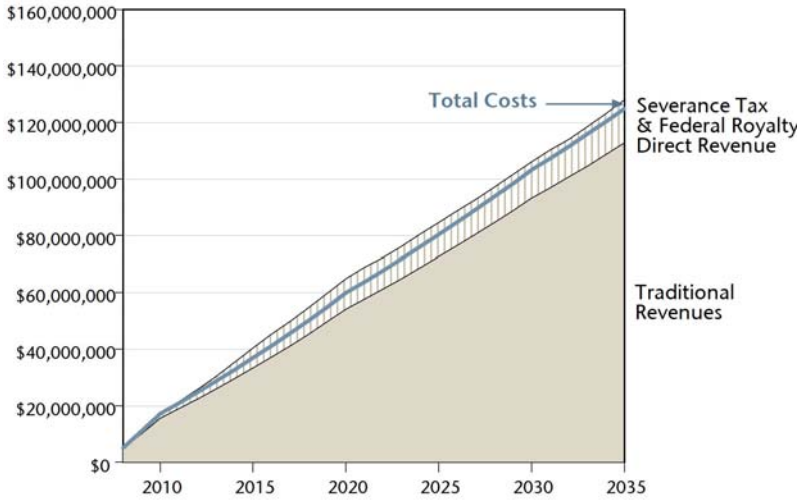
Source:
BBC Research & Consulting, 2008.



Operating revenues. The following Exhibit VI-3 shows projected traditional revenues: municipal sales taxes, property taxes, fees and charges against the backdrop of projected regional municipal expenses. These costs and revenues are compared with projections of possible employee based redistributions of severance tax and federal royalty revenues (DOLA Direct Qualified Employee Payments) to identify whether a municipal operations funding gap is present.

Exhibit VI-3. Annual Municipal Operation Costs and Revenues

Source:
BBC Research & Consulting, 2008.



As shown above, municipal revenues are expected to cover projected operating costs by a narrow margin.

Revenue uncertainty. Although projections show sufficient total revenue for municipalities to cover costs, municipalities are vulnerable to changes in severance tax and federal royalty revenue collections and distributions. Production variables include drilling activity levels, well productivity and the price of natural gas. This model presumes a continuation of redistribution to the area by DOLA grants and employee payments that reflect the growth in local production. Variables that might influence this revenue prospect includes gas prices; Federal lease rates and bonuses; Federal distributions to the state of Colorado; revenues from other areas that influence the size of the state's overall collections; and State distributions back to this area.

The following further describes the resource-based revenues that will supplement the communities' traditional revenue base.

State collections of severance tax and Federal mineral royalties are tied largely to the value and amount of resource extraction activity. Local distribution of these funds through state entities, most notably the Department of Local Affairs (DOLA) is determined by a complex formula by which multiple state agencies and local jurisdictions are beneficiaries. BBC's funding assumptions and modeling process are full described in Appendix A. A few considerations are noteworthy:

- Although this region has and will continue to generate a very large share of the state's severance tax and Federal royalty revenues, these receipts are combined with other revenues and support many state funds. The source of revenue generation is not related to the location of its distribution. Only a portion of the locally generated resource based state revenues are distributed to local governments and there is no direct relationship between the value of resource-based taxes collected in an area, and the value of those receipts that are redeployed in the same area.

- Currently, there are three sources of severance tax and Federal royalties for local governments: formula based distributions of Federal royalties; DOLA Direct Employee Payments, which are based on the residency of qualified energy workers; and DOLA Discretionary Grants, which are competitive but are intended to address the impacts of energy related growth.

- In this model, DOLA discretionary funds are assumed to be used for capital projects (see later part of this section) not to cover ongoing operating costs. Conversely, DOLA per-employee redistributions are assumed to be used for operating costs.

- Although severance tax and Federal royalties, which support the DOLA funds, will rise significantly with gross regional production and increased drilling on Federal land, the increase in per worker distributions will be muted by the allowance for property tax deductions from severance tax obligations and the decline in productive of other state sources that feed the DOLA accounts.

- As of February 2008, there are a number of bills within the Colorado Legislature that would change these distribution formulae.

Fiscal Projections—County Operations

Colorado counties are generally responsible for sheriff's services, road maintenance, human services and a variety of mandated assessor, finance and clerk functions.

Operating costs. The county operations forecasting model is similar to the prior municipal operations model. The model for forecasting county operational costs has the following components:

- A process for calculating **average annual county service costs** for each of the four counties using individual county budgets;
- A process for **organizing the counties** into the energy influence sub-areas;
- A process for **estimating the long term costs** of new service delivery expenditures based primarily on unusual human service, road maintenance and sheriff's costs; and
- A process for estimating and **overlaying the traditional county revenues, and the unique revenues** associated with natural resource development.

Results for the county operations fiscal model are shown in Exhibit VI-4 and Exhibit VI-5 in the same fashion as municipal revenue.

Exhibit VI-4. Annual County Operational Costs — Baseline Scenario

Source:
BBC Research & Consulting, 2008.

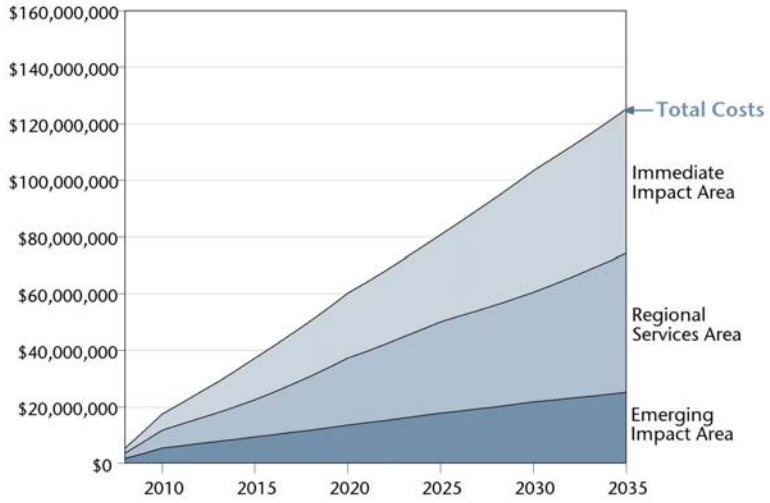


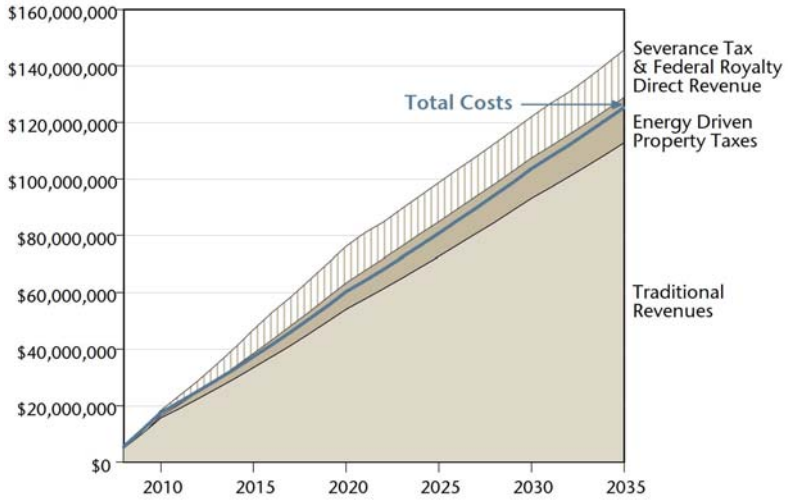
Exhibit VI-4 shows projected annual county general fund operating costs for the area's four counties by sub-area under the baseline scenario. These costs are for servicing new growth beyond current population levels. Total *new* county operating costs based on prior employee residence will rise to over $120 million in 2035.

Operating revenues. The study area counties will receive the traditional revenues that support all counties in the state: property tax on residential and commercially assessed property, sales taxes and various fees, grants and charges for service. Additional revenues that accompany natural resource industry development, including redistribution of federal royalties and state severance taxes, and resource driven property taxes[1] are also available.

The following Exhibit VI-5 shows projected traditional revenues with projections of employee based redistributions of DOLA direct payments and natural resource driven property taxes.

Exhibit VI-5. Annual County Operational Costs and Revenues—Baseline Scenario

Source:
BBC Research & Consulting, 2008.



Under these assumptions and projections of gas development, the counties will be significant beneficiaries of rapidly increasing property taxes. Assuming 25 percent of these new property tax receipts are allocated to operations, revenue will be sufficient to support county operational needs.

The following describes the resource-based revenues that will supplement the counties' traditional revenue base.

[1] About 25 percent of resource derived county property tax revenue is allocated towards operations expenditures (shown above) and the remaining 75 percent is allocated to covering capital costs (Exhibit VI-6).

Resource based property taxes. Natural resource related property tax receipts, which accrue to counties and certain schools and special districts, but generally not to municipalities, will be a significant factor in determining the region's ability to provide necessary county services. Many factors influence property tax revenues on oil and gas resource—chief among these are: gas field formations and resultant well production levels; resource market value, access to national markets; assessment formulae and mill levies, and the affects of TABOR limitations on tax collections. The property tax forecasts presented here reflect a few key assumptions:

- Well productivity will be similar to other Piceance Basin wells, e.g. similar to the current per well production levels in Garfield County but above current average well production in Rio Blanco County;
- Continuation of gas prices at current national levels, functioning pipelines for national distribution, and continuation of present mill levies and assessment procedures; and
- Migration of new wells from private to public lands over the forecasts period, which dampens production based property tax receipts (although increases Federal royalties).[2]
- Collection of revenues by past or future de-Brucing of county property tax collections.

Severance tax and Federal royalties. The accrual and distribution of severance tax and other resource based revenues is described previously in this chapter under the municipal operating revenues heading. County receipts accrue in the same manner: energy worker residence is the most important factor. DOLA discretionary funds are assumed to accrue to the county capital funds.

As noted above, the property taxes on gas production are anticipated to become a large source of annual funding and sufficient, in combination with other traditional funding and state severance redistributions, to allow area counties to cover projected operating costs. Production based leasing and severance taxes will grow rapidly as production of new wells come on line.

[2] An energy company's Federal mineral royalty payments are deducted from property tax liability. The federal royalty rate is 12.5 percent of gas production value.

Fiscal Projections—Municipal and County Capital (Infrastructure) Costs

Projections of capital expenditures are based on relatively simple estimates of capital needs per household. These multipliers applied to expected new growth in the region. Capital costs are then compared with prospective sources of local and state revenues indicating what amounts of public capital investment must be developed from local sources, which would imply diverting operating funds or raising impact fees, or from additional state and Federal support.

Capital costs. The capital needs forecasting element of the NWCSP model has three components:

- A process for calculating the **average annual capital investment per household** using several available data sources;
- A process for **estimating the additional annual required expenditures** for capital expansion associated with municipal growth; and
- A process for **estimating the additional annual revenues** available from resource based state and local sources for capital expansion associated with energy related household growth.

Results are portrayed in Exhibit VI-6 for the entire region over the 27-year forecast period. The results assume 75 percent of county property tax collections will be available for capital as opposed to operating needs.

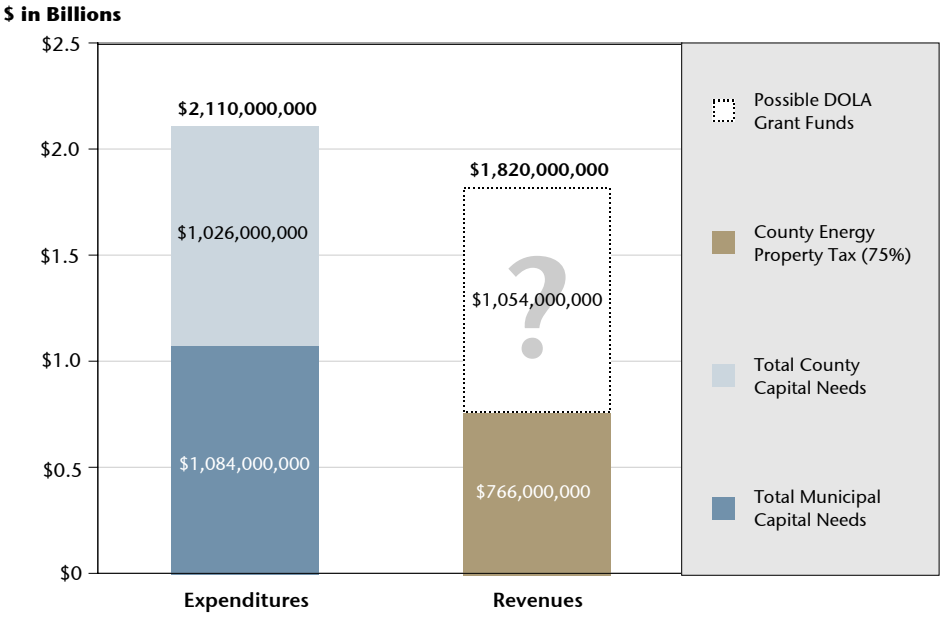
Exhibit VI-6. County and Municipal Capital Needs and Available Revenues

Note:

Growth associated costs only no repair and replacement of current facilities.

Source:

BBC Research & Consulting, 2008.



These calculations indicate the that region will need to invest over $2.1 billion to provide basic parks, recreation, water, sewer, roads, jails and administrative buildings for new development. Energy driven property taxes are likely to cover about $766 million of this need. DOLA grants are uncertain, but if local distributions grow in proportion to projected revenues, DOLA's discretionary funds may contribute an additional $1.0 billion. The remaining $300 million would have to be made up by additional municipal funds, impact fees or additional state, federal or private contributions.

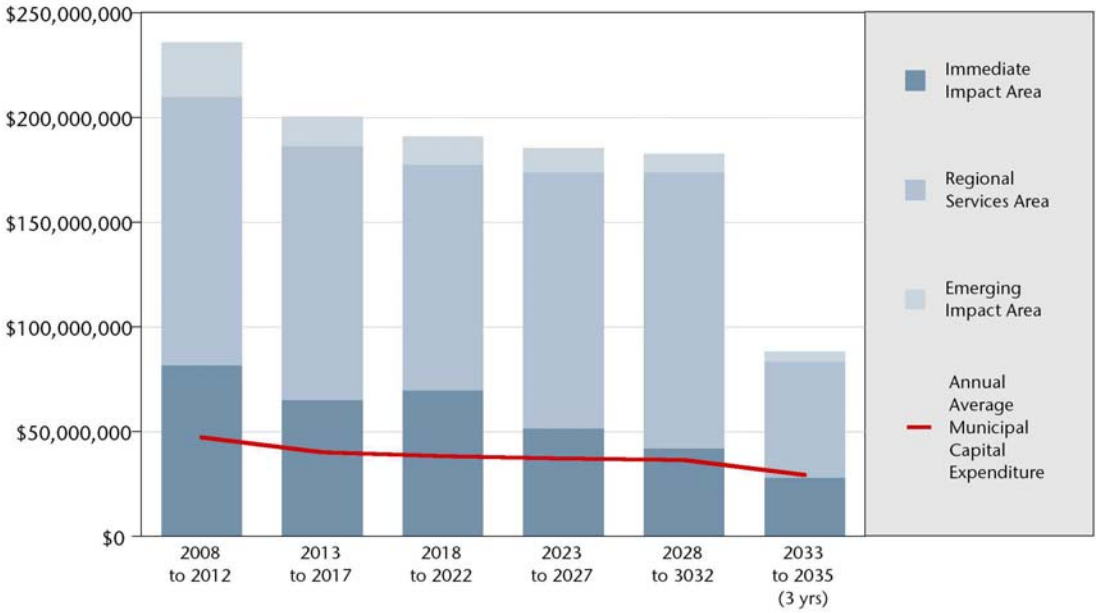
Capital funding issues. Expressing capital needs as total requirements de-emphasizes two problems with the practicality of capital investment:

- There is a mismatch between need and jurisdictional revenue, some communities will have very large needs but the funds may accrue to other areas. There is a notable imbalance between the needs of municipalities, which must serve most of the area residents, and the counties, which will collect the majority of resource driven property tax revenues.

- There is also a timing issue long recognized in rapid growth communities. Infrastructure is needed in anticipation of growth, while revenues tend to lag growth. Often this situation can be remedied by bond financing but the fundamental uncertainty of natural resource pricing can undermine bonding viability.

The following exhibit reflects municipal capital requirements over time, highlighting the problem of front-end demand for infrastructure.

Exhibit VI-7.
Municipal Capital Expenditure, Four County Study Area, 2008 to 2035



Source: BBC Research & Consulting, 2008.

Exhibit VI-7 shows that the most intensive capital needs will occur in the immediate future. Over time, as municipalities gain a "critical mass" of infrastructure, annual required capital investment is expected to diminish.

Commercial Oil Shale Scenario

Very rough estimates of operating and capital costs associated with oil shale development are provided in the exhibits that follow. As noted in the previous sections, these projections have significant caveats:

- The prospects for development of a commercial oil shale industry in northwest Colorado during the foreseeable future will depend on whether or not the current RD&D projects can identify ways to overcome significant technical, economic and environmental challenges.
- Completion of the baseline natural resource development scenario is expected to absorb virtually all currently foreseeable municipal growth capacity. According to the NWCSP model, most new growth in the later years of the baseline forecasts and virtually all oil shale related growth is allocated to the unincorporated portions of study area counties. The projected magnitude of population growth in the unincorporated county overwhelms the growth allocation module of the NWCSP model. For this reason, accurate operations cost forecasting is a futile exercise.
- In all likelihood, much of the growth allocated to unincorporated areas (particularly in Rio Blanco County) will need to be accommodated by some combination of further expansion of the capacity of existing municipalities, planned higher density developments in currently unincorporated areas, employer provided housing and/or shifting population growth to other counties in the region.
- It is uncertain how current energy related tax revenue streams would be affected by oil shale development. There is no current projection of industry market value or whether there will be any economic incentives offered by the Federal government to induce further private sector investment in oil shale extraction.

The NWCSP model provides a reasonable approximation of the potential direct and indirect employment related to oil shale and the anticipated growth in regional population. The total required county and municipal capital investment as a result of commercial oil shale development is shown in Exhibit VI-8 as an increment above capital requirements for the baseline energy development scenario.

Exhibit VI-8. County and Municipal Capital Needs 2008 to 2035—Oil Shale Scenario

Source:
BBC Research & Consulting, 2008.

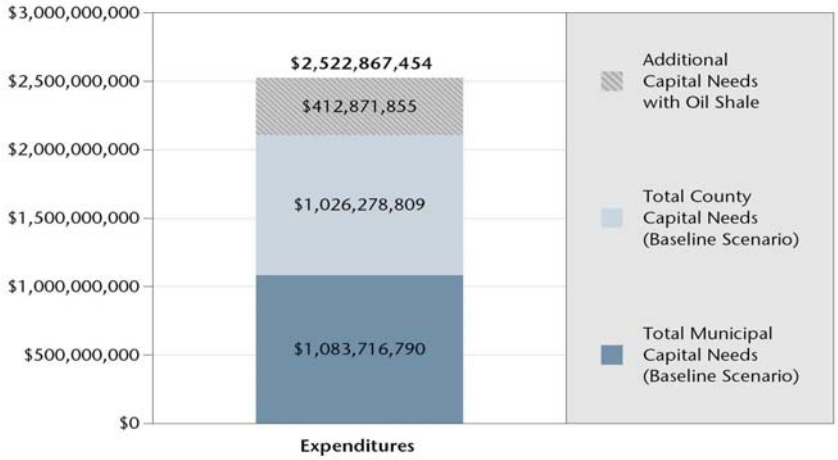


Exhibit VI-8 shows that commercial oil shale production could potentially require a 20 percent increase in capital costs over the baseline. It is important to note that should urbanization patterns change toward planned higher density development in the unincorporated counties, capital investment requirements could potentially be substantially different from the above projections. It should also be noted that 2035 marks the end of the modeling period for this study, but does not represent the end of the surge in oil shale production. Oil shale development in the study area could last for decades and require public capital investment in excess of the projections presented in Exhibit VI-8.

Interpreting Results

The results presented here focus on aggregated community funding prospects. Results are reported in three regional sub-areas and in aggregate for the four county study area. This aggregated reporting process serves two purposes: (1) it presents an appropriate level of detail, acknowledging imprecision in individual community projections; and (2) it serves as a reminder that service provision and capital investment are regional issues, where investment in one town may reduce burdens in a second community.

Although appropriate for the generalized goals of this model and for representing results across a wide variation of town and prospective futures, this process does not capture unique operating costs or capital costs that might be necessitated by long-term regional development. Road investments, which can dwarf all other expenditures, are particularly problematic. The need for, timing of and cost of major highway investments, e.g. possible new interchanges with I-70, bridges over the Colorado River, or solutions to traffic bottlenecks on north/south corridors, are unknown expenses with uncertain timing. Similarly, the prospect of private "man-camps" or entire new towns are not factored into these forecasts, although such developments may represent reasonable solutions to pressing needs under rapid growth scenarios.

In sum, the fiscal projections provided from this model are order of magnitude representations. These projections frame the public finance issues and provide approximations of long-term needs. The projections are generalized but reasonable benchmarks. It is appropriate that each individual community review its own taxation and capital funding systems in light of these anticipated costs and determine an appropriate course of action.

SECTION VII.
Local Government Responses

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Local Government Responses

The AGNC Task Force that worked with the study team during this project included representatives of each of the four counties in the study area and a number of the area's municipalities. Following the presentation and discussion of the first draft of this report, Task Force members (and their colleagues) assembled their thoughts regarding the implications of the study's information as well as the challenges they are already facing. This section presents these responses from Garfield County, Rio Blanco County, Mesa County, Moffat County and the City of Craig, the Town of Meeker, the City of Rifle and the Town of Rangely.

Comments on the Northwest Colorado Socioeconomic Projection Model
General Response from the Garfield County Planning and Oil and Gas Departments

1. *"Dutch Disease"* – As noted in the City of Rifle's comments, Garfield County in general is experiencing "Dutch Disease" as referred to within the report. Although this "Disease" is more prevalent in the western municipalities of the County, most notably Rifle and Parachute, it is conceivable that "Dutch Disease" is preventing the development of commercial establishments and hence creating a reduced tax base for the towns of Silt and New Castle. Since the eastern municipalities of Carbondale and Glenwood Springs are more economically diverse and less impacted by gas development than Rifle and Parachute, "Dutch Disease" is not as widespread in these eastern locations.

2. *Population Growth Distribution* – The report correctly points out that the cities and towns within Garfield County have generally seen stronger population growth than the unincorporated portions of the County. With Glenwood Springs and Carbondale approaching their estimated physical carrying capacities (69.9% and 73.8% respectively), the Roaring Fork Valley is understandably seeing increased pressures to develop unincorporated County parcels. Meanwhile, the municipalities of New Castle, Silt, Rifle and Parachute are quickly expanding and taking in much of the growth which is occurring in those areas. The report estimates that the unincorporated portion of Garfield County is approximately 28.6% built-out to its estimated carrying capacity of 77,500. Under current zoning, a build-out scenario of 77,500 is feasible, however it is unclear as to whether adequate water supplies are available to serve this level of development or if the road infrastructure can be financed and upgraded to support this kind of population within the timeframes outlined in the report. Garfield County does currently collect road impact fees on new residential development, however, it is unlikely that the fees collected will be able to adequately fund the necessary degree of capital improvements. To this end, although a population of 77,500 could feasibly reside in unincorporated Garfield County with current politics and zoning, it is likely that water and infrastructure limitations will restrain this population to a certain level. As a result, these limitations will put added pressure on Garfield County municipalities and Battlement Mesa (Consolidated Metro District) to accept a further increasing population. Garfield County could be at or near capacity by 2015 to 2020.

3. *In/Out Commuting* - Garfield County has seen an increasing trend away from out commuting from Glenwood Springs and Carbondale to the resort communities of Vail and Aspen to commuting from Glenwood Springs and Carbondale to Rifle and Parachute due to the increasing economic pull of the gas industry. It is also feasible that as more housing is built in the Roaring Fork Valley, Garfield County will continue to see a further increasing population commuting from Carbondale and Glenwood Springs to the Rifle and Parachute area for employment. As is correctly pointed out in the report, the economic pull of the gas industry is requiring that the resort communities of Aspen and Vail look within their own communities for employees rather than looking "down valley". This pressure is forcing these resort communities to further evaluate the needs of their workforce, the local wage scales and the affordability/availability of their local housing supply. As housing continues to increase in value throughout Garfield County,

an increasing number of residents employed within Garfield County choose to reside in Mesa County. The report identifies that as of 2004 a full 50% of the natural gas workers within Garfield County live in Mesa County. Further, only 45% of the natural gas workers within Garfield County reside in Garfield County. Garfield County is seeing an increase in in-commuting from Mesa County as a result of housing availability and affordability issues. Meanwhile, Mesa County is able to house an estimated 100% of their natural gas workers. However, as of 2004, Garfield County is able to house 86% of all regional jobs within the County. To this end, Garfield County is expected to continue, although to a lesser degree, as a bedroom community for both the resort communities up valley and to the gas industry down valley. As a result, commuting patterns are shifting from their historical norms and it is likely that Mesa County and Grand Junction will become a more important bedroom community to the burgeoning municipalities within Garfield County as they struggle to keep pace with the quickly expanding gas industry. As gas development tapers off in Garfield County around 2015 to 2020, it is likely that Garfield County municipalities and unincorporated areas will serve as a bedroom community to gas and potentially oil shale development in Rio Blanco County.

4. *Housing* – As noted earlier, housing is becoming increasingly expensive within Garfield County. Although it is still notably less expensive to purchase a home in New Castle, Silt, Rifle and Parachute, the discrepancy between "up valley" (Glenwood Springs and Carbondale) and "down valley" real estate values is decreasing due to the increase of wealth funneling into "down valley" locations from the gas industry. As housing prices increase in New Castle, Silt, Rifle and Parachute, an increasing number of workers are relocating to Mesa County to find affordability and even availability of housing. As gas development picks up in Rio Blanco County, Garfield County could become an increasingly important bedroom community to Rio Blanco County.
An area which was not taken into account within this study is the increasing number and importance of temporary housing for workers within the gas industry. Since November of 2006, Garfield County has permitted 47 "man-camps" (Temporary Employee Housing) facilities that are able to accommodate up to 24 people each. As housing becomes more scarce and expensive, and operators move to more remote locations, gas companies are installing more temporary housing facilities for their workers. These facilities are generally in place for less then one year, but in several cases these facilities can be renewed indefinitely. Interest from gas companies to construct larger and more permanent housing facilities is increasing as well. Given the results of the report, notably that the maintenance staff for the already completed wells (post 2015 operations) will be roughly equivalent to the drilling and completion employment levels we see today, it is evident that gas companies will need to construct permanent housing for their employees if they wish to continue operating within the economic, political and physical constraints of this region.

5. *Impact Fees* – To date, Garfield County has not passed any impact fees directly for gas Development (except for an "Overweight / Oversize" Permitting program that applies an annual fee to companies, which amounts to very little in revenue.) Instead, the costs for maintenance and improvements of Garfield County roads affected the oil and gas industry are defrayed by industry contributions on a case-by-case basis, or are paid for

through severance tax funds or by the Garfield County tax-payer. However, Garfield County does levy an impact fee based on study area to new residential development. It is unlikely that the impact fees collected from new residential development, severance taxes and independent negotiations will be able to maintain pace with the continued deterioration of the overall Garfield County road system. As with the impacts on the road system, the gas industry is affecting fire protection services, sheriff services and health and human services among others. Further study is needed to determine if a fee to cover these impacts is needed or feasible. Other energy-impacted counties (particularly, Rio Blanco) have taken a progressive approach by implementing impact fees per well so that the expenses are borne by those causing the impacts. Garfield County has discussed this approach but has not adopted any fee as of yet. Regardless of specific negotiations with some companies, not all companies (or the tangential support companies) participate in improvements to the County's road system.

6. *New Towns* – Provided the expected limitations on residential development within Garfield County, the development of new towns to accommodate growth is realistic. This is particularly foreseeable since the water in the Highway 13 corridor and the area north of Silt is generally of poor quality and unreliable quantity. The establishment of a new town or at least a water and/or sewer district may be necessary to secure and treat the amount of water and wastewater necessary to support the expected population in this area. The Garfield County Planning Department has received interest in such kinds of development in this area, but none have yet resulted in an application for development. It is also foreseeable that such a town or district would be developed within Rio Blanco County along the Highway 13 corridor. As the drilling activity moves northward into Rio Blanco, it is expected that those jobs will still draw from Mesa County but will add pressure to the Silt / Rifle area. This is likely due to the existing services in Rifle / Silt / Parachute. The City of Rifle continues to annex large tracts with approximately 3,200 units on the books presently. It remains unclear if the City can afford new water / wastewater facilities to handle this growth.

Rio Blanco County's response to the implications of growth projected in the AGNC/DOLA Socioeconomic study, 2007-08.

Rio Blanco County voters generally take a conservative approach toward the approval of bonding projects for public works and administration. This may be a reflection of the relatively older population of this county and the fact that the per capita income has generally been below that of the rest of the state.

Whatever the reason for this reluctance, the county and its towns have aging infrastructure of limited capacity. The infrastructure has served the rural economy reasonably well given the stable population and stagnant economy of the past two decades. Thus a relatively low mil levy reflects, given that the county population has not grown, what is required to maintain the levels of service (LOS) from the recent past.

Growth on the scale described within this report will require an unprecedented level of construction of new infrastructure and upgrading of existing infrastructure. To ask the 6,000 citizens of the county to bond and pay on this scale stretches the limits of credibility. Although the natural resources industry accounts for over 75% of the assessed valuation, the voters are not predisposed to shoulder the bonding costs of new development. The fact that 40% of this new growth, growth which is at a level to triple the county's population, is projected to occur outside of existing incorporated town limits.

Development impact fees are virtually unknown in Rio Blanco County but are on the horizon. While such fees place the burden of new infrastructure on the developers, they also increase their costs which are ultimately passed on consumers. This might very likely exacerbate the rapid inflation of housing costs we have seen recently.

This inflation of housing costs, coupled with relatively low wages in the non-energy sectors of the economy, are causing serious problems with public-sector employment. The County, as an example, has been seeking to hiring a professional planner for almost two years. The problem comes down to an inability to find acceptable housing given the salary being offered. This occurs in spite of twice raising the upper end of the salary range. Another example is the Rangely School District purchasing a four-plex for rentals available to new teachers. In addition, one energy company has made a home available for rent to new teachers only.

We are not likely to be able to reduce this housing crisis without large scale residential development projects within the county. Such projects have not occurred due to the risks of investing in such a limited economy far off the beaten path. The prospects seem rather low for such projects occurring, even with the high assessed valuation and low taxation levels we enjoy here.

Such development would almost certainly overwhelm the planning staffs of the two towns and the county. Energy development is consuming the majority of the county staff time and the prospects of hiring additional staff seem quite low. The county is in need of a master plan and land use regulation update and the towns most likely will also have significant planning needs. Quite frankly, no scenario for the tripling of resident population exists in anyone's master plan.

In the absence of acceptable housing for resident workers, the transportation problems will become more critically intractable. The current levels of energy development are defining new travel and commute patterns in the region and heavily impacting roads, many beyond their design capacity. The report correctly notes that only 25% of the workers in Rio Blanco County currently reside there. State Highway 13, our major north-south corridor, already handles twice the hazardous materials of any highway in the state; it is carrying heavy truck traffic in numbers beyond its safe capacity and this is in areas within the "emerging energy influence area". It is now moved to first priority on the regional STIP but there is no money to make any improvements. Needless to say, there are no plans for alternative or mass transit in a rural county of 6,000 residents.

The report notes a possibility of the development of new towns. Given the large proportion of public lands and the scarcity of good quality water, there are only a very few locations within Rio Blanco County where such development could occur and due to the isolation and cost of infrastructure, such development seems extremely unlikely.

A final note on the economy in Rio Blanco County is the stifling affect that energy development is having on attempts to diversify the economy. The heavy truck traffic, unavailability of hotel/motel accommodations, industrial activity in remote rural areas can only hurt the efforts at developing Cultural Heritage Tourism, wildlife-related businesses, and general recreation. Without the development of alternatives to the energy economy of this small, rural county, we will be constrained to participate in the boom-bust cycles of the energy economy which have dogged us for decades.

Clearly there is a need to build needed infrastructure ahead of or early within a boom cycle. For State Highway 13 and Rio Blanco County Road 5 north from Rifle into the Piceance Basin, it is on the verge of being too late. As the drilling activity moves north the congestion will only get worse and attempting to rebuild County Road 5 in the midst of this congestion, in a narrow canyon, will be extraordinarily challenging. As one index to the challenge, the RBC Sheriff responded to 5 calls in the Piceance Basin in 2003. In 2007, that office responded to 1675 calls with 10-11 rigs running and 3 major gas processing facilities under construction. That rig count is likely to double in the next 5 years and certainly there will be many more pipelines and gas processing facilities.

The study estimates that the Rio Blanco County General Fund's marginal operating cost of $450/household will be 1.5-4.5 times that of other counties in the region and the average annual capital expenditure of $5,593/household will be 6-20 times that of other impacted counties. To put this capital expenditure in perspective, this is the equivalent of Broomfield (2006 pop. 47,521) spending $101 million per year or Denver (2006 pop. 580,223) spending $1.2 billion per year on capital infrastructure.

In the past, potential growth of this kind has been accompanied by significant financial assistance to mitigate impacts. Given the current challenges to state and federal budgets and the economy, we fear this will not be the case this time around.

Comments on the Northwest Colorado Socioeconomic Projection Model
Response from Jon Peacock, Mesa County Planning Director

Overall, this is the most comprehensive report I have seen to date on the overall fiscal and demographic impacts we can expect to see as existing extraction activities mature and new activities (e.g. oil shale) ramp up. The report is a solid document for high level policy decisions as resource demands are placed on our region as extraction activities continue and grow. However, it is important for policy makers understand that Mesa County believes the report credible in estimating the minimum impact we are likely to see, and encourage policy makers to keep in mind that the long-term resource/need gaps will likely exceed the estimates in the report. Examples follow:

Population Estimates:

Currently, the study estimates Mesa County's 2035 population to be 219,980. Mesa County projects its population will be 285,000 to 309,000 by 2035 (2.6% and 3.2% projected growth rates). A population gap of 60,000+ by 2035 represents a significant difference in estimates of physical and social infrastructure, and costs, which will be required to support the additional population. Since we are developing a flexible model that can be updated and used to project long-term impacts, I hope we will continue to study impacts as suggested in the report.

Fiscal Assumptions:

The results are stated in today's dollars. This avoids the complexity of choosing and defending a discount rate. However, especially for capital expenditures, it is worth noting that capital costs are likely to rise at a higher rate than consumer inflation. This affects energy impacted jurisdictions two ways: First, capital construction costs are likely to grow at a faster rate than overall revenues, so the actual funding gap by 2035 will likely be much larger than presented in the report. Second, it is important to recognize TABOR's revenue limitations. Under TABOR revenue growth is tied to the Denver Boulder CPI. When the West Slope’s economy is growing faster than the Front Range economy (as is predicted in the report) it puts a greater constraint on our ability to retain revenues associated with the growth in energy impacted areas.
Third, it is always important to note that revenues related to energy development have different levels of elasticity. Put another way some revenue sources lag the impacts of growth more than others and proportionally responds differently to growth (e.g. property tax tends to react to economic changes less quickly and proportionately than sales tax or impact fees or grants). Policy makers need to take into account timing gaps and proportionality between revenue growth and infrastructure needs.

COMMENTS ON THE NW COLORADO SOCIOECONOMIC PROJECTION
General Response from Moffat County and the City of Craig
February 11, 2008

As per request of the Associated Governments of NW Colorado (AGNC) Socioeconomic subcommittee, Moffat County and the City of Craig provide the following list of general responses to the February 2008 Draft NW Colorado Socioeconomic Projection. We understand these comments will be incorporated along with the other counties and municipalities comments into a new chapter of the Socioeconomic Report which will generally highlight local government's ability to accommodate population growth projected in the Socioeconomic Report.

General Overriding Comment Regarding Data in the Draft Socioeconomic Report:

Considering the assumption that the Colorado Legislature will rely upon this report to help describe the need for severance tax dollars to be retained on the western slope, we suggest adding additional sections describing, in detail, other factors that will help clarify impacts of energy development. Population projections, location of those populations, and projected overall fiscal effects are very well defined. However other factors that would help the Legislature identify impacts of western Colorado energy development are less clearly defined. Road impacts are one issue in particular that more detail of their impacts would be beneficial. For instance, Moffat County is a major transportation corridor funneling traffic from Rock Springs, Wyoming and Vernal, Utah, south to the Piceance Basin. Increased gas development activity in Rio Blanco County and Garfield County will proportionally deteriorate Moffat County's road network without a proportional increase in royalties or mineral revenues. We hoped this report would provide a better understanding of the correlation between Piceance Basin development and impact on Moffat County and regional roads. Is it possible to add a section describing this correlation in terms of projected road damage and associated fiscal costs? In addition, housing costs are stated to be the same as front range costs, yet salaries per capita are lower than Denver costs, revealing a more strained economy on the western slope. We request additional topics be highlighted in the Draft Report to help the legislature understand that the full impact if energy includes other factors than population growth.

The following points are our basic responses to the Socioeconomic Report data:

1) Unincorporated Growth and Affordable Housing: Moffat County is concerned about the unincorporated growth trends projected in the Socioeconomic Report. The growth trends project unincorporated population equal to incorporated population by 2035. Evidence of unincorporated growth already exists. Since 2006, 12 minor subdivisions and 5 major subdivisions have occurred within unincorporated Moffat County. Less than 5 subdivisions have occurred in incorporated Moffat County. Lack of affordable housing in the City of Craig is currently evident. Population growth is outpacing housing lots available for building. As with most municipalities subdividers must pay the cost of building infrastructure such as streets, water, and sewer. The cost of infrastructure has

driven most growth toward the unincorporated areas of the County where infrastructure costs are less.

Counties are generally not established to provide services common in municipalities. The general City/County Master Plan identifies an urban development area around the City of Craig where growth and city expansion would be preferable. A shift in core political values would be required to encourage urban development within this area as it was intended in the master plan. Without this political shift, unincorporated growth will continue to grow faster than incorporated Moffat County. If general unincorporated growth does occur, it is logical to assume expansion of unincorporated communities such as Maybell, Elk Springs, and Blue Mountain, especially considering their location relative to the projected gas development in NW Colorado. Growth in communities such as these certainly place new demands on infrastructure such as sewer, water, and road networks, as well as basic planning, zoning, and building department staff workloads. Without relatively large impact fees, state or federal grants, tax increases, or new private/public partnerships road maintenance and law enforcement requirements will outpace the County's ability to service the projected unincorporated growth.

2) Transportation and Law enforcement: Moffat County is a major transportation corridor funneling traffic from Rock Springs, Wyoming and Vernal, Utah, south to the Piceance Basin. Increased gas development activity in Rio Blanco County and Garfield County will proportionally deteriorate Moffat County's road network without a proportional increase in royalties or mineral revenues. Generally state grants and industry partnerships have helped maintain Moffat County's roads. As pass-through traffic increases Moffat County will need to further develop funding mechanisms to assist in road maintenance and upkeep. Changing political environments and state priorities keep state road funding mechanisms in flux.

As unincorporated growth occurs, deputy staffing demands increase dramatically. What once was a ranch call for a sheriff's deputy, now shifts toward a domestic call. Increased unincorporated growth directly correlates to increased deputy calls. This is also true for emergency management services such as fire and rescue. With increased people, comes increased demands for emergency calls. As with every service provided by local government, elected leaders will choose to whether to serve more people on flat budgets thereby reducing services, or create additional funding mechanisms such as fees, taxes, state or federal funding, and public/private partnerships.

3) Water Treatment: The City of Craig conducted a study based on past population trends which projected similar population projections as the AGNC study. Based on the City of Craig population projections, the City has initiated a project to upgrade the water treatment plant to support to the projected populations in each report. Funding for upgrading the water treatment plant has been secured. Considering existing water rights and newly acquired water from the Elkhead Reservoir expansion, the City feels secure in its ability to provide water for the populations projected by the year 2030.

4) Waste Treatment: The City of Craig's wastewater treatment plant is capable of handling an additional 50% growth rate. Should the Socioeconomic Report population projections be realized, the waste water treatment plant would need upgrading within the next 15 years.

5) City Operation and Maintenance Costs- As the City of Craig grows, increased investments will be required to maintain the infrastructure systems currently in place. Six to seven hundred thousand dollars are currently expended annually to replace aging water and sewer lines as well as overlaying streets. Should this growth pattern continue, it is estimated that these maintenance costs will triple over the period analyzed in this report.

6) Social Services: In areas where population growth would spike dramatically due to large crews being utilized for specific projects, Moffat County Social Services has experienced dramatic increases in Child Welfare cases. During our last population boom in the late 1970's child abuse and neglect cases increased four times as much as pre-boom case loads. These situations are amplified by a 1-2 year lag time in state funding. During time of steady and predictable population growth state funding has traditionally backfilled funds necessary to operate the County's social service programs. Considering the current state of national and state budgets, backfill funding may become more variable.

If you have questions about our comments, please contact Jeff Comstock at 970.826.3400.

MEEKER COMMENTS – SOCIO-ECON REPORT

Unincorporated Growth and affordable Housing - Affordable housing is currently unattainable in the Town of Meeker and will only continue to get worse with the energy growth and population impacts that are predicted. However, Meeker has approximately 900 acres that is annexed into Town, it is just undeveloped. Even though the Town currently has no impact fees, the Town's infrastructure must be extended to this property, at the developers cost. Once the developer attaches those costs to the lots, more than likely, the lots will not be affordable. If the Town decides to implement impact fees or increase fees to help compensate for this growth, it will add greater costs for development and consequently greater housing costs, at a time that per capita income is not going up for many people living in the Town.

The Town would like to keep our populations centralized to minimize the impacts on our agriculture and tourism economies, however the cost of infrastructure and development in Town, tends to push the growth into the unincorporated areas of the County.

Employment -Finding staffing for any position other than one in the energy field is very difficult, if housing can be found. The Towns people are not able to pay the higher wages the energy companies can and in turn, employment is unavailable to the service community. Even the local governments are feeling the pain. The Town of Meeker will have to consider increased operation and maintenance costs due to the outlined population growth. As part of that, the planning department, public works and police departments are and will remain stretched to the limit. The Town is currently seeking a full-time planner, just as the County has been for the last 2 years.

Sanitation - Federal regulations requires a new waste water treatment plant when a facility reaches 80%. With the projected growth in Meeker, the facility does not have the capacity to run without significant upgrades, if the population increases as predicted.

Protection and emergency services -. The Town is currently served by volunteer emergency services, which are currently at their limit. When an ambulance is called out to the Piceance Creek area, they are unavailable for at least 2 to 3 hours, due to travel time. According to the report, over 40 percent of the growth in Rio Blanco County is going to be in the unincorporated areas. This will increase the burden to fire and emergency services.

Transportation- Transportation and traffic is also another major concern. Highway 13 which runs through the Town of Meeker as "Market Street" is currently being seriously impacted by energy related trucks and equipment. This carries over to the rest of the streets and Town. Pulling onto Market Street from arterial streets is becoming increasingly difficult. There are also serious safety concerns along highway 13 from Rifle to Meeker for the Town's residents. With the increasingly large number of trucks and over-sized vehicles on this highway, major accidents are becoming a common occurrence.

Another issue is that hotel-motel accommodations are full, due to the needs of energy workers in the area. Tourism, wild-life related businesses for fishing and hunting, and general recreation activities are being, and will be increasingly impacted negatively because there is not available hotel-motel space.

COMMENTS ON THE NW COLORADO SOCIOECONOMIC PROJECTION

General Response from Mike Braaten, Government Affairs and Energy Coordinator—City of Rifle
February 08, 2008

1. The City is already experiencing "Dutch disease" as referenced in the report. The multiple pages of job vacancies in the classifieds sections of local papers are an example of the crowding out effect being experienced in the Region due to energy development and production. Local Governments (and other sectors of the economy) compete with the energy sector for workers, materials, and contractors and given our limited budgets, we often loose.

   The Rifle area has historically has had to compete for employees with nearby resort communities in the Aspen/Roaring Fork and Vail valleys, now we have increased competition with the addition of the booming energy sector.

2. The City considers it unlikely that the unincorporated areas will be able to accommodate the projected growth due to numerous factors. It is more likely that the existing communities will expand to accommodate expected growth, much of which, as noted in the report, will move into more difficult topography with an increased cost of service.

3. The City has taken steps to ensure new growth and development pays its way. Currently, the fees imposed by the City that are required to build a new single family residence in Rifle average $20,000 to $30,000. Additionally, the City has recently increased numerous fees on all residents – most notably, a 105% increase water/wastewater fee. In late 2007, the city bonded for close to $19 M for completion of a new wastewater treatment plant that will have a total cost of $23 M and a few years earlier a smaller $4.2 million bond was approved for interchange and road improvements. Staff have identified approximately $60 million in additional infrastructure improvements needed in the City in the next 5 years. In addition to the recent bond measures, the City residents have approved a 2.5 percent lodging tax and a 1 percent sales tax for parks and trails in recent years. It is unlikely the residents of Rifle will continue to accept increased fees or approve tax proposals and debt. This will result in the City requiring assistance from outside sources to meet the projected levels and rates of growth, much of which a direct result of energy development.

4. The development fees imposed by Rifle for new homes are a catch-22 for the City: the fees are needed to ensure growth pays its way, but the costs of the fees are passed from the developer to the homebuyer, thus increasing the cost of new homes offered in the City and reducing affordability.

5. Decisions made at the federal level regarding leasing in addition to a reduction in federal assistance forces local governments and their residents to pick up the tab for decisions at the federal level that have dramatic impacts their communities.

6. After 20 years of local economic depression including out-migration and little to no development, the City was in the process of finally "catching-up" with needed improvements to over-built systems/infrastructure that came as a result of the boom in the late 70s and early 80s. The current and likely sustained energy boom in the region has again put a strain on Rifle's aging infrastructure and has caused replacements and improvements to be sped-up considerably – ie: Water and wastewater facilities that would have required replacement in the 2012-2015 time frame are in need today. Given the City's location in the region and the expected growth of the Rifle community as highlighted in the report, it is certain accelerated infrastructure replacement and major enhancements will be required in the near future.

7. Rifle is exploring ways to diversify its economy and insulate itself from another energy bust and economic recession. In the past three years the City has developed a "place-based strategy" to encourage and develop businesses that utilize resources available in the area. The City is crafting plans for a renewable energy innovations center that will house and showcase alternative energy businesses. It is also aggressively pursuing annexation around the regional airport for a business and industrial center and actively pursuing redevelopment of the downtown in an effort to attract non-energy sector business and revitalize the core of the city.

8. When much of the nation is in a housing slump, housing costs in Rifle and surrounding area are increasing at a steady pace. The cost of new homes in the Rifle area match or exceed the costs of similar homes in the Front Range Metro Areas. The unexpected growth of the industry in the Region has made it difficult for people employed outside the energy sector to find attainable/affordable housing in the Rifle area; an area that has historically been an affordable bedroom community for retirees and tourist and service industry workers employed up-valley. It used to be area residents had to "drive until they qualified" for housing, but there aren't many, if any, affordable places left to seek out. Normal population growth coupled with growth in the energy sector will mean attainable/affordable housing will continue to be an issue in Rifle and other parts of the region in the coming years.

COMMENTS ON THE NW COLORADO SOCIOECONOMIC PROJECTION

General Response from Jeff Devere, (formerly) Community/Economic Development,
Town of Rangely.
February 19, 2008.

While the report raises abundant questions about specific issues involving infrastructure, workforce, housing, education, environment, and transportation, these trepidations can be summarized into a simple set of concerns:

- One of the conclusions that must be admitted is that we are still caught in the grip of a potential boom or bust scenario. As we move forward we may have to contend with a boom (for which there may not be sufficient fiscal support) or if we moderate and overreact, and suppress development, we may have to contend with a bust.

- Everyone has the need to rationally understand what could happen and adjust their expectations so a community model emerges that is sustainable and complements the changes in the energy industry and needs of the nation. This will require willingness on the part of all stakeholders to compromise. Other alternatives will perpetuate the cycle of boom and bust.
- Hopefully broader partisan political battles and immediate fiscal demands will not sacrifice sustainable community development.

- Many of the fiscal impacts are related to the construction of infrastructure that present populations cannot bond or sustain with their existing fiscal capacity. The lag time before population and growth pays for planned facilities is a serious impediment to local support.

- How is this new information going to be incorporated into existing plans, such as for transportation that are projected thirty years into the future and now need to be modified?

- The fiscal considerations go way beyond those of concern to local governments as these projected changes will affect workforce, higher education, healthcare and other aspects that involve State and Federal funding.

APPENDIX A.
Public Services and Fiscal Effects

APPENDIX A.
Public Services and Fiscal Effects

This appendix documents the methodology and assumptions underlying the fiscal impact component of the Northwest Colorado Socioeconomic Projection (NWCSP) model. Quantitative results, reflecting traditional resource development and oil shale development forecasts are presented in prior Section VI.

Background

Prior sections of this report documented the prospect of significant growth in the northwest Colorado spurred primarily by natural gas exploration and possible future commercial oil shale development and with this growth, the prospect of rapid urbanization of local communities and counties. The pace and nature of this development, combined with the isolation and small size of the affected communities, presents unusual public service delivery and growth financing challenges. This phenomenon and the associated public service provision issues in rural areas have been well documented. Recently, the El Pomar Foundation funded a socioeconomic analysis (2007) by faculty at Mesa State University, which detailed current socioeconomic conditions and general issues in northwest Colorado.[1] In 2005 and 2006, BBC Research & Consulting (BBC) developed a forecasting model for Garfield County that also detailed economic trends and changing socioeconomic conditions.[2] Other studies have documented growth impacts in Utah, Wyoming and most recently in the Canadian tar sand developments.

Public Service Provision Issues

The NWCSP model projects employment growth in basic and service industries, allocates employment spatially and determines population distribution based on proximity to employment, local housing availability and the development capacity of local governments. Based on this allocation of jobs and residents, the fiscal component of the NWCSP model projects the net fiscal position of municipal and county operations and the long-term capital expansion requirements associated with the prospective growth. Data are presented in aggregate and by three sub-areas within the four county study region.

Complexity. From a fiscal perspective, individual communities will react differently to growth pressures based on a host of factors, ranging from their aggressiveness in charging fees and raising taxes to the unique cost of providing services in their respective locations. Some communities, for example, larger towns with a strong retail base and aggressive growth management programs, are well positioned to benefit from growth. Other communities, for example, towns that receive high levels of pass-through traffic but fewer retail sales, may struggle to maintain services, regardless of growth management policies or taxation efforts.

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[1] The Mesa State—El Pomar Study can be found online at the Mesa State University website. http://www.mesastate.edu/pdf/Socioeconomic%20Impacts%20of%20Growth.pdf

[2] BBC's Garfield County Study can be found online at the Garfield County website. http://www.garfield-county.com/Index.aspx?page=1027

In the same vein, some counties will see a rapid rise in assessed valuation, while municipalities may receive population growth far in excess of valuation growth. There is very wide variation in the size and capabilities of local governments in this region. Grand Junction may have the staff, scale and experience to accommodate continued growth with relatively minor burden. Other, smaller communities, which lack these attributes, may struggle. Similarly, some communities have a full array of taxes, fees, charges and growth related impact fees – leaving them well prepared to benefit from all forms of development. Many communities, particularly small towns that have not experienced recent growth, lack these same financing mechanisms. Additionally, some of the intricacies of Colorado's public financial systems, particularly assessed valuation procedures for natural gas well development and the uncertain interplay of TABOR and Gallagher Amendments make long-term forecasting of assessed value and tax revenues in rapidly changing environments a futile exercise. It is difficult to calibrate an economic model that can reflect all of these community variations and valuation subtleties with accuracy.

Interpretation of results. The results presented here focus on expected city and county operating costs and revenues as well as related capital infrastructure costs.

Results are reported by three regional sub-areas and as an aggregate. This reporting process serves two purposes: (1) it provides an appropriate level of detail, acknowledging imprecision in individual community projections; and (2) it serves as a reminder that service provision and capital investment are regional issues where investment in one area may reduce burdens in other communities. Again, conclusions about fiscal conditions in the region cannot necessarily be interpolated to any of the area's individual counties and towns.

By necessity, the NWCSP model uses ratios and per-household multipliers to forecast community costs and some community revenues. Although appropriate for the generalized goals of this model, this process does not capture any unique capital costs that, although unknown, will undoubtedly be necessitated by long-term regional development of the scale anticipated for the four county study area. Road investments, which can dwarf other expenditures, are particularly problematic. The need for, timing and cost of major highway investments (e.g., possible new interchanges with I-70, bridges over the Colorado River, or alternatives to traffic bottlenecks on north/south arterials) require unknown solutions and uncertain expenses. In sum, the fiscal projections provided from this model should be viewed as order of magnitude representations.

Finally, it should be noted that all of these factors – particularly local and state policies and taxation procedures – are subject to change given the long period of this analysis. As this report goes to press fundamental changes in mineral leasing distribution between the federal government and the state are under consideration as are dramatic changes to state redistribution formulae for severance taxes and mineral lease revenues.

Public Finance Overview

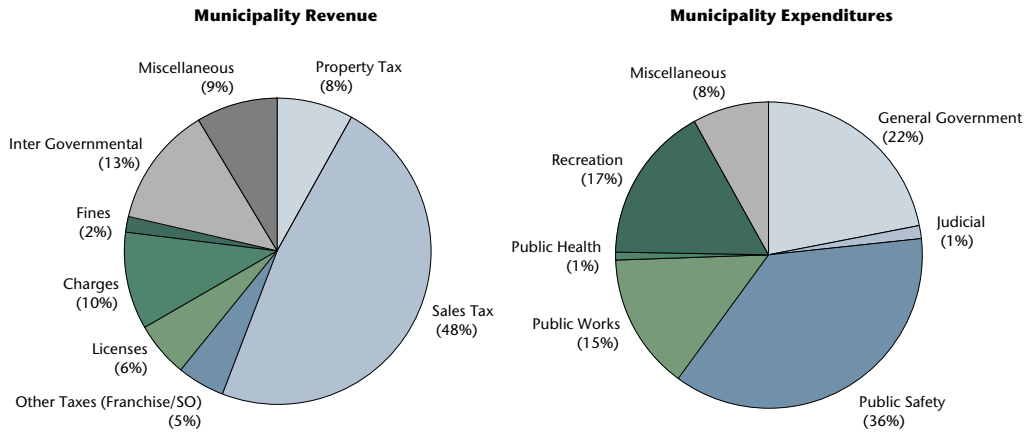
Municipalities. By constitutional authority and state statute, municipalities and counties in Colorado are afforded the right to levy certain taxes, fees and charges to support the provision of government services. Municipalities, counties and districts each have distinct taxing authority and defined public service responsibilities, and each is affected differently by growth and urbanization.

- There is considerable variation in how Colorado municipalities account for spending and public service provisions. A community's general fund typically accounts for the majority of core services, although there is no uniform practice. Beyond the general fund, municipalities often maintain special funds and enterprise funds with specific purposes and sometimes defined revenues. Special districts, often outside a municipality's control, are common for some services. Some communities account for capital spending through separate funds held apart from the general funds often with dedicated revenue. Conversely, many communities provide for capital repair, maintenance and expansion out of general fund receipts on an ad hoc basis.

- In the majority of instances, municipal water and sewer operations are separated from the general fund. These services are often operated as enterprise funds where service cost and capital needs are paid for by utility service users and not with transfers from other revenue sources. Often, water and sewer services are provided by a special district and operated separately from county or municipal operations.

- As a rule, Colorado municipalities rely on sales taxes, property taxes and charges for services to generate revenue. Although municipalities may have similar taxing structures and rates, revenue productivity – particularly sales tax – can vary substantially between communities. Profiles of typical funding sources and expenditures for general fund operations in Colorado communities are provided below in Exhibit A-1.

Exhibit A-1.
Typical Funding Sources and Expenditures
for General Fund Operation, Colorado Municipalities, 2003



Source: Colorado Department of Local Affairs, 2003, BBC Research, and Consulting.

The typical community expenditure profile emphasizes police and street maintenance (public works), but there is considerable variation between communities in what services they provide. Some, but not all, municipalities provide fire protection and emergency services; some offer very extensive parks and recreation programs, while others have airports, electric generating facilities and/or extensive open space acquisition programs.

- There is also substantial variation in the size of local municipalities. Within the four county study region (excluding Grand Junction), the 14 local municipalities average about 4,500 persons. Generally, smaller, rural communities provide fewer services and maintain more modest service standards. These towns may face greater difficulties dealing with growth pressures because they lack the planning staff and growth management experience.

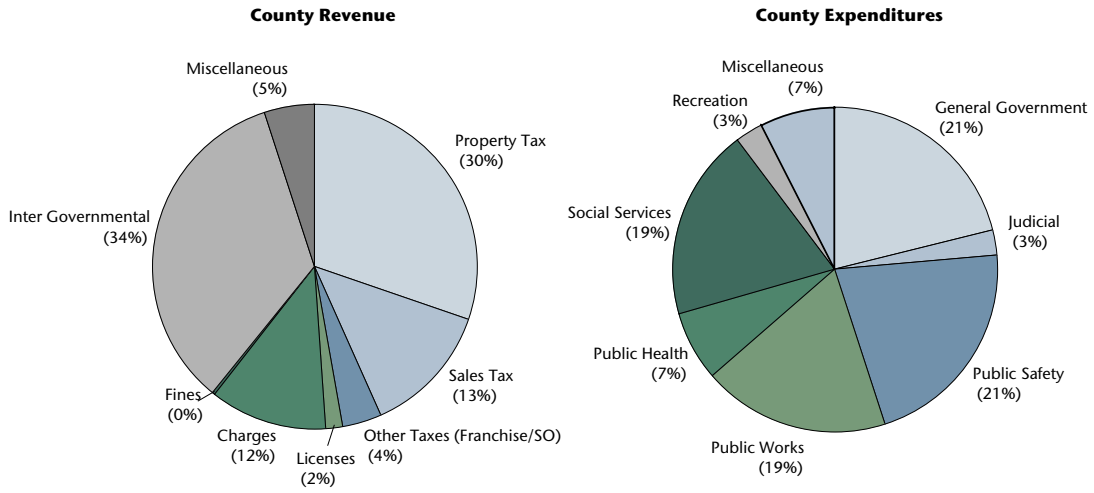
- It is difficult to compare and contrast Colorado communities without many caveats and adjustments for varying accounting and cost allocation practices, and for variations in service levels and service philosophy.

Counties. There are four counties in the study area that are among the largest and least populated counties in the state.

- Colorado counties tend to be more uniform in their accounting practices and are engaged in fewer public services, although many of the more urbanized counties, particularly along the Front Range, are heavily involved in broader service provision efforts and have adopted equally complex fund allocation practices.

- As a rule, counties are more dependent on property taxes than municipalities, and are more restricted in how much sales tax they can impose. Exhibit A-2 offers a profile of a typical Colorado county.

Exhibit A-2.
Typical Funding and Expenditure Profile of Colorado Counties, 2003



Source: Colorado Department of Local Affairs and BBC Research and Consulting. Data are for 2003

County expenditures emphasize road repair, public safety and social services. A large share of social and public health services are paid for with intergovernmental revenues that are not generated out of the local tax base. The county's reliance on property tax revenues is generally beneficial in the northwest Colorado area because of high assessed valuation associated with natural gas activity and redistribution of mineral leasing and severance tax revenues, although the ability of some area jurisdictions to capitalize on assessed valuation is limited by the TABOR amendment and related restrictions.

Special districts and school districts. The four county study region is served by nine school districts and well over 50 water, sewer, fire or metro districts, as well as a host of small special improvement, water conservation and cemetery districts. Most of these districts are supported by property taxes and subject to TABOR limitations. In most instances, an increase in population and property development will create sufficient revenues to maintain service levels. Districts benefiting from the high assessed value of mineral rights and drilling activity would be able to reduce overall tax rates because of abundant new revenues.

A small number of districts may have challenges maintaining service levels in areas where human activity and housing development levels rise, but new commercial development and high associated assessed valuation occurs elsewhere. On balance, most special purpose districts are reasonably well positioned to maintain service levels in the face of growth but service delivery problems are likely in areas with an increasing population but do not have attendant property or sales tax receipts.

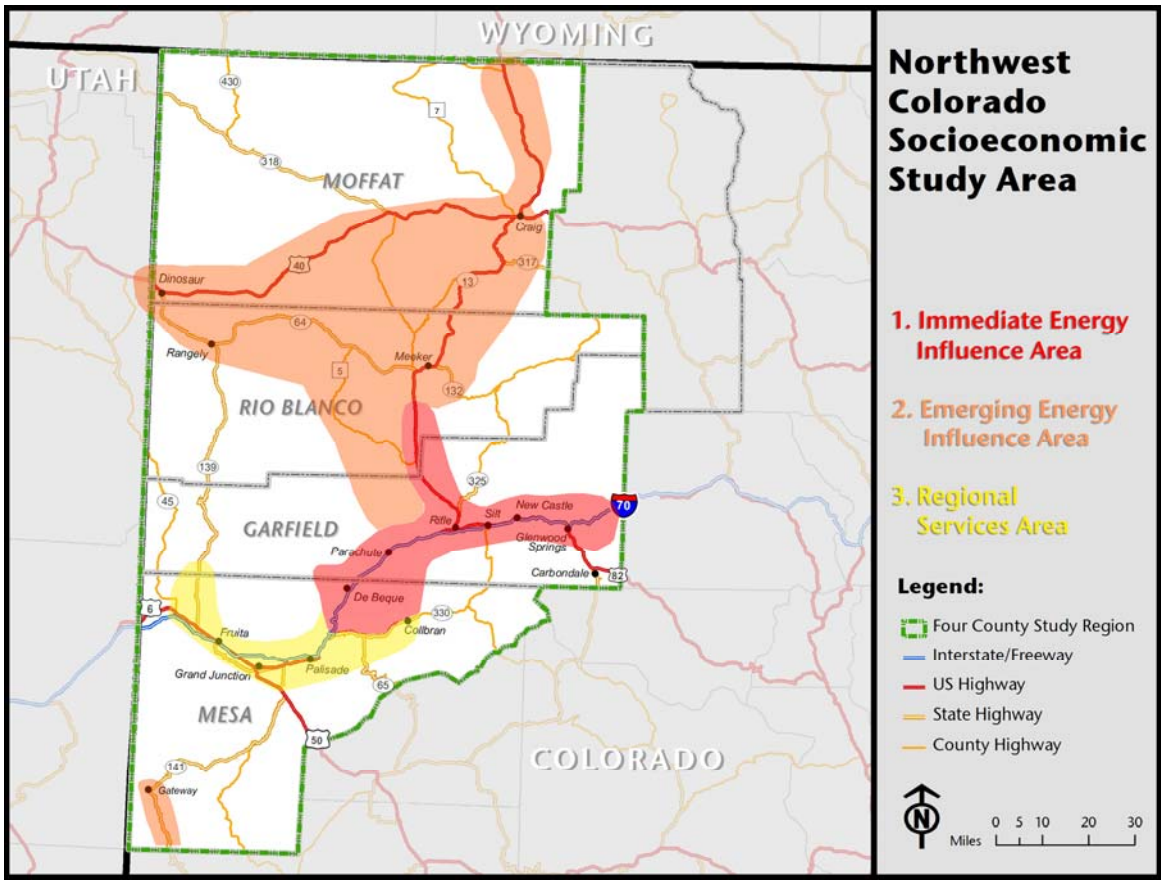
The NWCSP model does not calculate the fiscal impact of growth on individual special districts.

The four county study region's nine school districts represent a similar situation to the area's special purpose districts. There is great variation in the region as to how schools will be affected by energy development. School districts are analyzed in greater detail later in this appendix.

Regional Considerations

For fiscal impact projections, the four county study region is divided into three economic sub-areas based the primary basic industry that has the most influence over its economy. The Immediate Energy Influence sub-area, which includes Garfield County, is facing fast-paced growth of households and natural gas wells in the near-term and will likely see that trend continue. The Emerging Energy Influence sub-area, which includes Rio Blanco and Moffat counties, will be the focus of future energy-related growth. The Regional Services sub-area, which includes Mesa County, has recently experienced steady growth, as the "home base" of many area businesses and households. The Resort Influence Sub-area includes western Routt County, the eastern portion and Moffat County and the Roaring Fork Valley. These sub-areas are shown in Exhibit A-3 and described in the text that follows.

Exhibit A-3.
Study Area Socioeconomic Sub-Areas



Source: BBC Research and Consulting, 2008.

From a fiscal modeling perspective, the following are key considerations:

Immediate Energy Influence sub-area – Garfield County. Garfield County has experienced rapid population growth for about six years and serves as a case study for the kinds of impacts likely to occur as traditional energy development and possibly commercial oil shale operations expand. Glenwood Springs and Carbondale are on the periphery of the Immediate Energy Influence sub-area but are still closely tied with the resort and recreation industries in Eagle and Pitkin counties. Both towns also have physical and public land barriers to further development. Parachute and Rifle are in the heart of the Immediate Energy Development sub-area and are currently dealing with both rapid population growth and significant pass through traffic. Newcastle and Silt are small communities and lack substantive sales tax base. Garfield County has benefitted by rising property assessments associated with natural gas development but has also been pressed to provide police, road maintenance and emergency services.

Regional Services Sub-area – Mesa County. This area is dominated by Grand Junction, which generally has the necessary scale and institutional support to manage its strong but not overwhelming pace of growth. As the site of the key regional airport and the largest city in the four county study region, Mesa County communities have attracted a large share of the management, consulting and regional supply side of the area's energy development industry. This influx of jobs and commercial business tends to stabilize the local economy. Grand Junction is also the long-standing regional service center with a robust retail component. Retail sales taxes have risen about 12 percent per year over the past three years, allowing a cushion of public sector financial support.

Emerging Energy Influence sub-area – Moffat and Rio Blanco Counties. This two-county area is sparsely populated with very limited public services but extensive road networks, which are heavily impacted by traditional energy development and related commuter traffic. Thus far, recent population growth has been modest. However, greater development activity is anticipated as natural gas drilling moves northward and increased activity is allowed in the BLM White River District and on the Roan Plateau. This area would be heavily impacted by prospective commercial oil shale production. The western portions of the counties have economic ties with Vernal, Utah; the northern sections around Craig are affected by pass-through traffic; and southern Wyoming natural gas field development.

Summary. There is a surprising variation in the nature of public services and the cost of providing services within this relatively small, four county study region. Each of these sub-areas have common qualities and challenges in providing growth-related services. The NWCSP model attempts to recognize those commonalities and reports fiscal impact results by these geographic and economic sub-areas.

Northwest Colorado Growth Financing Challenges

Over the years, many Colorado municipalities in many locations across the state have faced periods of rapid growth and have accommodated growth-associated service demands using the standard array of taxes, fees and service charges allowed under the Colorado Constitution and associated statutes. It is a reasonable presumption that northwestern Colorado communities should be able to achieve similar results.

In practice, there are a number of compelling reasons why the situation currently facing northwestern Colorado presents a greater service and cost challenge than traditional growth in urbanizing areas elsewhere in the state.

Seven characteristics that distinguish northwestern Colorado and the current economy from other areas of the state are set forth in the following text.

1. **The energy industry has unique operating characteristics that make the provision of public services challenging.**

- Current growth patterns affect the four county study region's small towns, which most often have minimal infrastructure, planning services and service delivery capabilities.

- The impact of gas drilling is not concentrated in a single location as would be the case with a new power plant or manufacturing plant. These dispersed and often remote locations of drilling activity are difficult to serve, particularly for fire, police and emergency services. The natural gas industry, which occurs largely outside of municipal boundaries, is particularly demanding on county services, such as road maintenance and the sheriff's protection.

- The natural gas industry is institutionally decentralized. There are many subcontractors involved and the industry has fundamental uncertainty regarding pricing and location of new fields. All of this makes forecasting and anticipating service needs and growth difficult.

- The natural gas industry changes over time as it matures through exploration, completion and maintenance phases. Different development phases have significant effects on employment, personnel skill requirements and traffic patterns, and thus on public service provision and demand for housing.

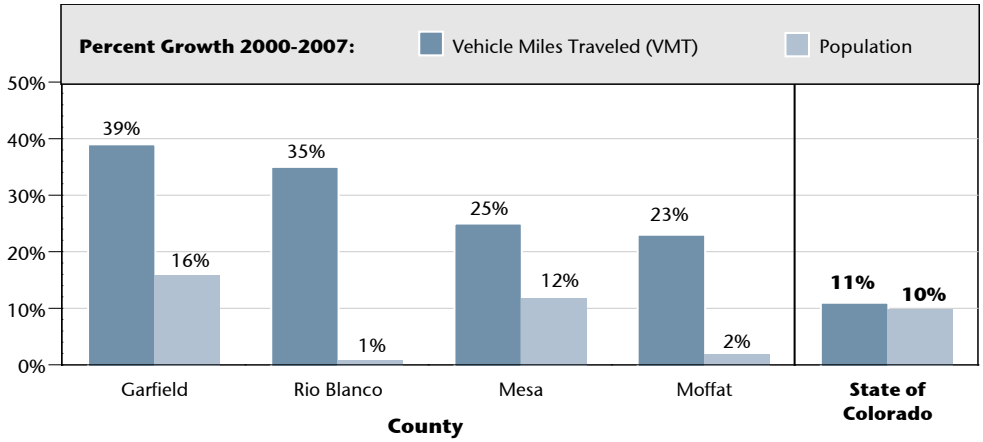
- The natural gas industry activity migrates; the location of activity changes over time. This migratory characteristic also contributes to public service delivery and planning complexity.

- The natural gas industry is road use intensive, and road maintenance is generally the single largest cost of local governments. The natural gas industry "moves its business on its back" and its employees and subcontractors commute each day to job sites in remote areas often supported by a road system that was designed to serve a ranching community. Many county roads were never designed for the drilling rigs and water supply trucks necessary for natural gas exploration. Vehicle and truck traffic actually increases as wells turn from exploration to production rigs.[3] The road maintenance burden falls particularly hard on counties but also on local communities, where in-town roads are often narrow and the only solutions to the new increases in pass through traffic involve bypasses and expensive system expansions. Traffic control and safety (traffic-lights, turn lanes, shoulders and roundabouts) are additional costs that were never previously required. All of these road systems require planning, engineering and long-term maintenance by the affected communities.

Exhibit A-4 on the following page shows the disparity between traffic congestion and population growth in the four county study region.

[3] Draft OSTS PEIS, op.cit.; pg. 3-219

Exhibit A-4.
Traffic Congestion and Population Growth



Source: Colorado Department of Transportation, 2007.

The above comparison of recent growth in the area's vehicle miles traveled (VMT) versus its population growth is indicative of the traffic trends in the four county study region.

2. Beyond the scale of the area's growth, the overall pace of growth, particularly in the emerging growth area is uniquely challenging.

- Generally, communities can accommodate modest growth rates without undue disruption. Regardless of funding levels, rapid growth tends to strain public services, public engagement processes and planning.

- Public institutions, which must operate by time consuming consensus and public involvement processes, cannot respond with sufficient speed to keep up with demands when population growth rates accelerate.

- Rapid growth, combined with small communities having limited growth management resources, is particularly challenging.

3. **Intensive energy operations tend to "crowd out" other basic components of the economy—increasing investment risk.**

- **Agriculture** is challenged by urbanization, rising land values, loss of critical mass and loss of support systems, although mineral lease payments can help many ranchers withstand these challenges.

- **Tourism activity** is hurt by declining esthetic values and absence of available hotel rooms; hunting and fishing hurt by increase pressures on fisheries and wildlife. Competition for employees challenges tourist service businesses ranging from restaurants to lodging.

- **Second home/retirees** are less likely to find the esthetic retreat, small town atmosphere and reasonable home prices that have supported this lifestyle. Drilling in remote areas, traffic congestion, pressure on wildlife and general loss of lifestyle quality also reduces appeal.

- **Businesses** are hurt by labor competition. The lack of economic diversification is truly a problem if, and when, the primary industry declines and the other supports for the area's economy have withered.

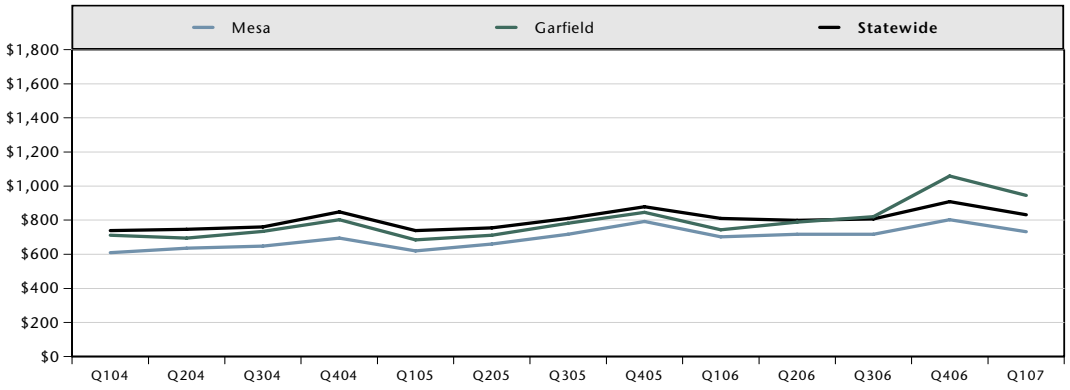
4. **The energy industry's economic strength provides the ability to compete aggressively for workers, materials and land. Local governments, constrained by annual budgeting processes or TABOR limitations, often lack the ability to respond quickly to changing conditions.**

   Competition for scarce land, materials and workers can result in higher incomes and general prosperity for local residents. However, when market imbalances occur, as they have in recent years, many local businesses and governments are forced to work short handed, limit hours of operations, raise prices or lower production. Private industry can usually cope because businesses can raise prices accordingly. Governments face a greater problem because their "prices" (tax rates) are generally set annually or limited by law.

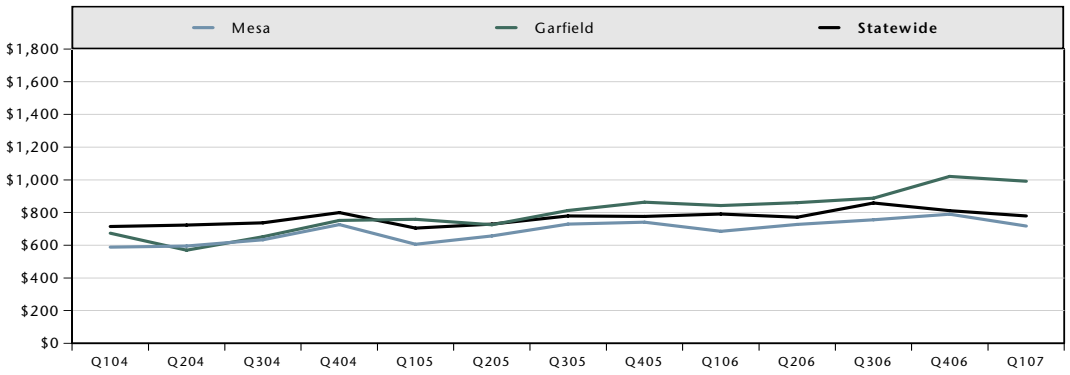
   Exhibits A-5 and A-6 on the following pages document rising labor costs in Garfield County and, to a lesser degree, Mesa County – the center of the current energy related growth. Exhibit A-5 shows industries directly tied to energy development. Exhibit A-6 demonstrates how the demand for labor, in excess of readily available supply, has also driven up local costs for health workers, services and retail workers. Further, anecdotal data suggests that this same scarcity of contractors and labor has increased the cost of government purchases. Schoolteachers, janitors, engineers and skilled support staff are difficult to attract and retain because of private demand. Worker turnover is very expensive.

Exhibit A-5.
Quarterly Census of Earnings and Wages, 2007

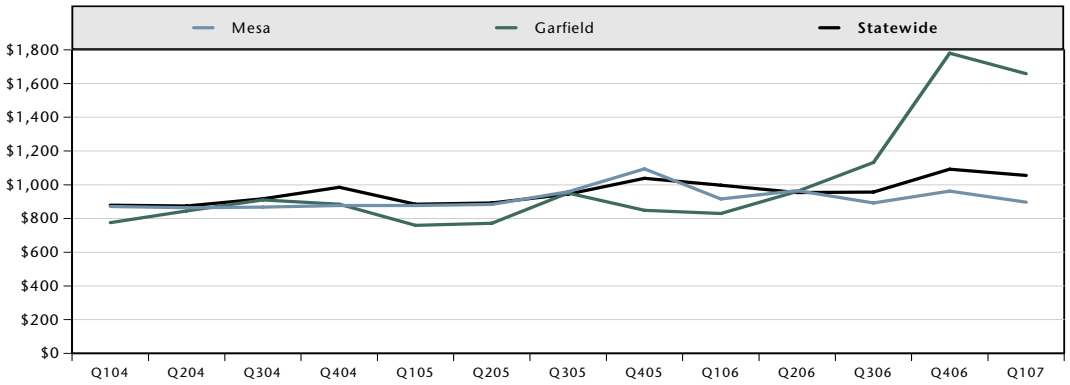
Construction



Transportation and Warehousing



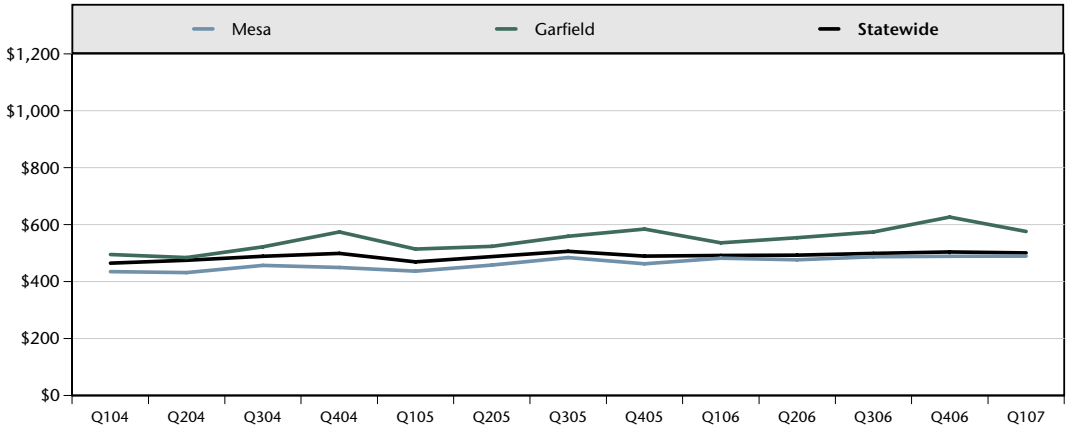
Heavy and Civil Engineering Construction



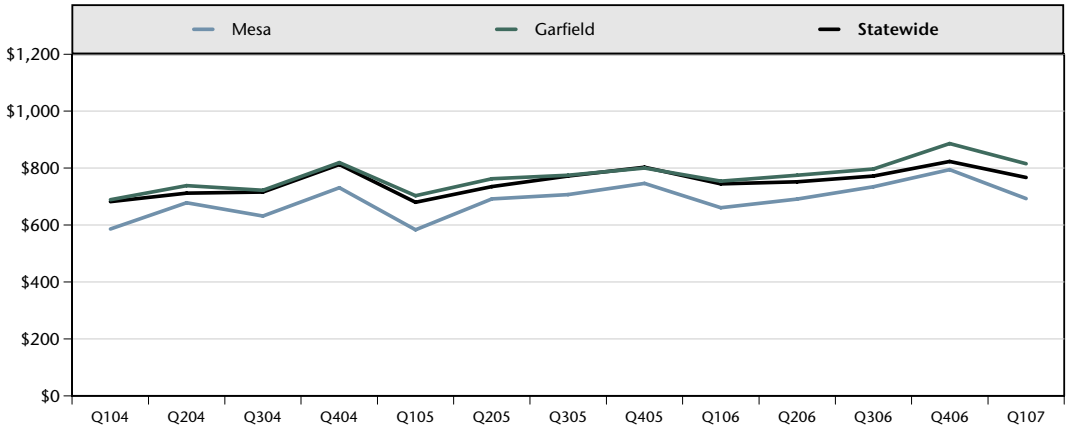
Source: Colorado Department of Labor.

Exhibit A-6.
Quarterly Census of Earnings and Wages, 2007

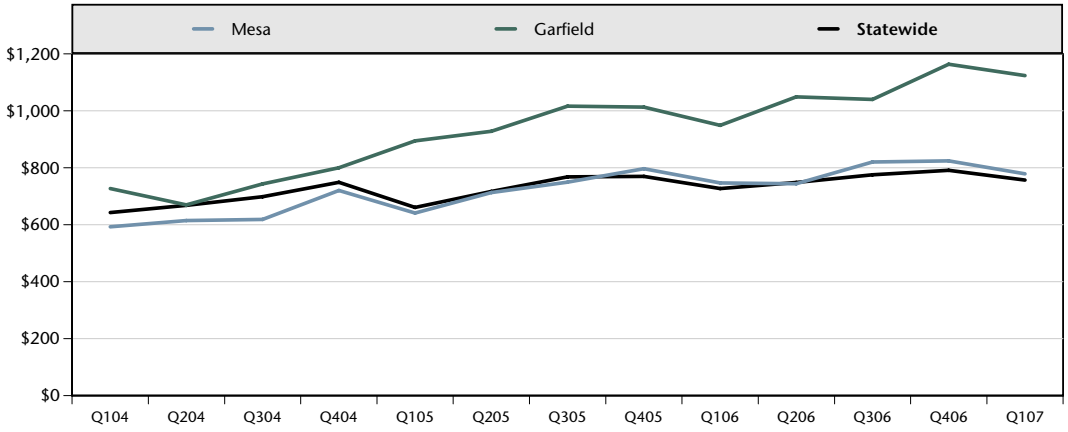
Retail Trade



Health Care and Social Services



Truck Transportation



Source: Colorado Department of Labor.

In recent years, government contract solicitations in northwest Colorado for roads, bridges, facilities, schools and services have commonly gone un-bid, or were bid at prices far greater than expectations. Commodities, such as cement and gravel, have been in short supply and quite expensive.

5. **Public sector service and capital costs associated with growth are often exaggerated by the region's geographic features and limited private lands.**

   Communities in the Colorado Front Range have generally developed in locations without significant geographic constraints; this is not the case in northwest Colorado. The majority of population in Garfield and Mesa counties live in the Colorado River Valley, which, as long as communities were small, represented only a modest constraint to development. As this area urbanized, the land suitable for development and the easily developed property along the river has been exhausted. Communities such as Rifle, Parachute, Silt and New Castle are being forced to expand onto nearby mesas. This creates expensive water, sewer and road issues. Grand Junction faces similar problems with limited ability to cross the Colorado River, which has recently been addressed with very expensive bridges and new road systems.

   North-south travel is particularly difficult because of geographic constraints. State Highway 13 (Rifle to Meeker) and State Highway 139 (Loma to Rangely) are the only roads in the area and will become highly congested under most foreseeable development scenarios. All contemplated solutions are very expensive because there are so few alternative routes for travel in this region.

   Finally, prospective community expansions are often limited by the prevalence of public lands in the area, which add additional barriers to efficient growth patterns.

6. **Rapid growth communities on the Western Slope are uniquely challenged by the spending limitations and tax prescriptions dictated by the TABOR and Gallagher Amendments.**

   Attempts to build infrastructure or expand services in advance of development is made more difficult because the TABOR limits spending by formulae that incorporate measures of growth and by costs that are often inaccurate (e.g., inflation standards tied to Denver inflation rates). As a result, governments cannot readily prepare for growth related demands. Rapid local increases in costs and the need to raise salaries and material purchase allowances to compete for scarce labor and supplies are undermined by TABOR's requirements to tie operating increases to measures of cost inflation and measures of local population growth.

7. **The history of western rapid growth communities indicates that the immediate fiscal imbalances and service provision challenges, which are so prominent in the initial growth years, are very likely to moderate over time as planning processes are improved, immediate infrastructure shortcomings overcome and as growth rates inevitably slow.**

   Relatively sudden growth and economic expansion tends to reveal long-standing shortcomings in infrastructure and service provision systems. Revenues – sales and property taxes as well as state redistributions – tend to lag the presence of new residents. Infrastructure, which should be in place as residents arrive, cannot be easily funded until revenues develop—the classic "boomtown financing" lag. Over time, planning efforts improve, development obstacles are removed and appropriate systems are implemented. Application for grants and state support require time and patience. However, severance tax redistributions are available and the tools and processes for managing growth is well tested elsewhere. Over time, communities become more adept and more cost effective in delivering necessary services.

Fiscal Impact Forecasting Methodology — Municipalities

In order to project community service costs associated with providing for growth in areas with modest underlying infrastructure and service levels, the NWCSP model employs a cost forecasting component that translates projected employment increases and population growth into additional municipal service provision costs. Results are communicated by sub-area. The model projects average costs and revenues for the region and the additional marginal costs, i.e., expenses associated with growth that occur beyond those costs expected to be covered by traditional revenue sources. The NWCSP model allows adjustment of underlying relationships so that over time key assumptions can be readily modified in this rapidly changing socioeconomic environment.

The municipal fiscal element of the NWCSP model has four components:

- A process for calculating **average municipal and county service delivery costs** by size of community for comparably sized communities through out Colorado. These resultant multipliers are applied to area growth projections;

- A process for **classifying the communities** of northwest Colorado by population size and attributing appropriate public service costs; and

- A process for **organizing the communities** into the sub regions described above; and

- A process for **projecting service costs and incremental revenues** associated with projected population growth and energy development in the area.

The resulting costs and revenues per household are projected forward using household growth projections from the NWCSP model.

Average municipal service costs. An accurate projection of municipal costs will recognize the unusual challenges of this environment, which were described previously in this appendix and the challenge of transforming small rural communities into full-service mid-sized communities. Fiscal projections should also acknowledge that new businesses and households will continue to pay the same tax rates, fees and charges that existing residents pay; thus, it is reasonable to start with a supposition that growth should be self-supporting by contributing in the same manner as existing residents and businesses have paid.

Most communities in the four county study area have had many years of relatively stable socioeconomic conditions and generally have not developed the service delivery systems that will be required with a sizeable increase in population. As a result, few communities have operating or capital improvement plans in place that can be used to develop realistic localized cost and revenue forecasts. Further, many of the communities in the area will be forced to fundamentally alter current service levels to accommodate large-scale development.

The region's isolated communities are generally the smaller towns that often lack the retail and commercial base necessary for sustainable sales and property tax support. As a rule, these smaller communities have modest government expenditures and face major system upgrade costs in order to provide the services necessary for extensive community expansion. Although the energy industry contributes substantially to the local property tax base, very little of that increased assessment occurs within municipalities.

Conversely, there is also evidence of some economies of scale in local government, which is to say that as communities increase in size some operating efficiencies can be expected – in the same manner that any business might achieve economies of scale as private operations grow.

Support for the position that the four county, northwest Colorado study region has modest public services, but faces higher marginal costs in raising local service standards, can be derived from government employment data produced by the Draft OSTS PEIS related to northwest Colorado commercial oil shale development impacts (Exhibit A-7). This research indicates a scarcity of fire and police services in comparison with state-wide averages. Research findings also indicate that total governmental services staffing is approximately 11 percent below the statewide averages.

Exhibit A-7.
State and Region of Influence (ROI), Government Employment per Household, 2006

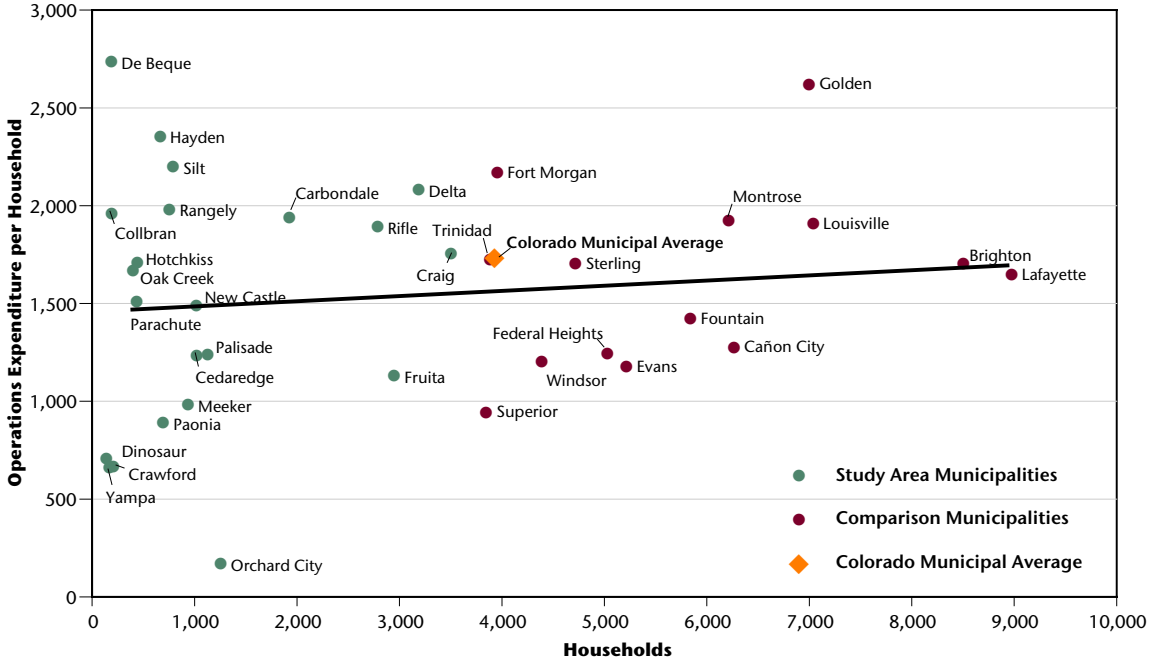
	Police		Fire		General		Total	
	Number of Emp.	Emp. per 1,000 Pop.	Number of Emp.	Emp. per 1,000 Pop.	Number of Emp.	Emp. per 1,000 Pop.	Number of Emp.	Emp. per 1,000 Pop.
Northwest Colorado Region	**400**	**1.7**	**160**	**0.7**	**3,263**	**14.1**	**3,823**	**16.5**
State of Colorado	13,112	2.8	5,170	1.1	66,682	14.4	84,964	18.3

Source: Draft. OSTS PEIS Op. Cit., December 2007.

Municipal operating cost assumptions. In order to calculate a reasonable average cost of operations for growing small towns, the study team utilized a database of municipal operations expenditure made available by the Colorado Department of Local Affairs (DOLA). By way of example, Exhibit A-8 shows average per household operating costs for select Colorado communities (excluding mountain resorts that have distorted per household ratios) that have fewer than 10,000 persons. The variation in costs per household is notable, and suggests that population size alone does not fully explain variations in service levels and spending. These data also suggest that, as municipalities grow to 10,000 households, per household costs of government rise and variation in per household costs narrow as a community grows.

Additionally, the study team also analyzed average per household operating costs in larger communities,[4] which is shown in Exhibit A-9. These data show a continued narrowing in per household operating cost expenditure variation as well as a downward trend suggesting that as communities grow larger than 10,000 households, they benefit from economies of scale.

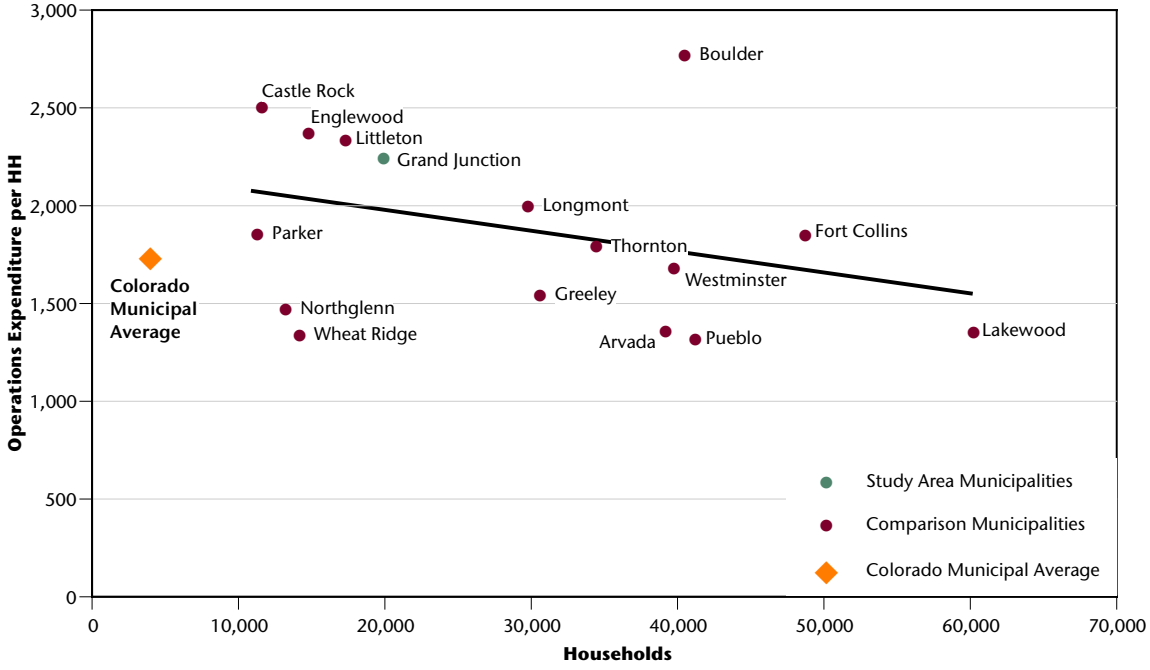
Exhibit A-8.
General Fund Operations Expenditure Per Household,
Study Area vs. Comparison Municipalities, Less Than 10,000 Households, 2003



Source: Colorado Department of Local Affairs, Municipal Financial Compendium, 2003. BBC Research & Consulting, 2007. Data are for 2003. Resort communities were eliminated from the sample.

[4] Denver and Broomfield are excluded from this analysis because they are both cities and counties, and not comparable to "pure" municipalities. Colorado Springs and Aurora are also excluded because they are too large to present in Exhibit A-8 and A-9. Colorado Springs and Aurora had 2003 per household operating costs of $1,400 and $1,900, respectively.

Exhibit A-9.
General Fund Operations Expenditure Per Household,
Study Area vs. Comparison Municipalities, Greater Than 10,000 Households, 2003

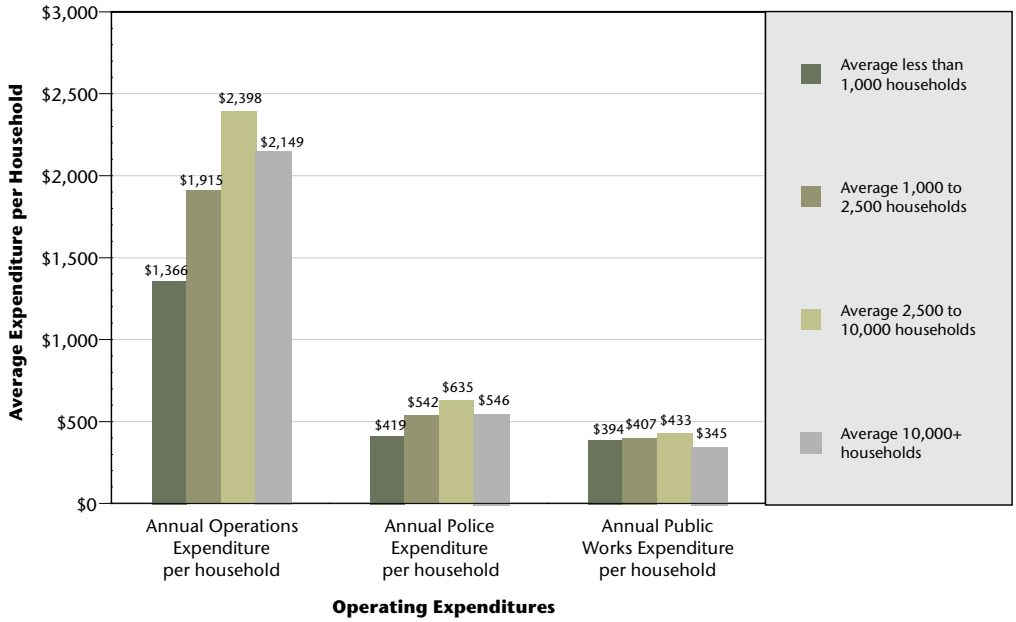


Source: Colorado Department of Local Affairs, Municipal Financial Compendium, 2003. BBC Research & consulting, 2007. Data are for 2003. Resort communities were eliminated from the sample.

In the process of developing this model, BBC analyzed Colorado municipal operating data for all Colorado communities and tested explanatory factors (i.e., miles of roads, location, square miles of service coverage, household income, etc.). Larger communities were examined and various samples of cities were tested (i.e., Western Slope, urban areas, eastern plains, etc.).

Exhibit A-10 offers a summary of this effort and a presentation of the average service costs of municipalities by population size, expressed in 2007 dollars. Police and public works costs are also shown to further test this economy of scale hypotheses for individual operations.

Exhibit A-10.
General Fund Municipal Operations
Expenditures by Household and Community Size, 2007



Source: Colorado Department of Local Affairs, Municipal Compendium, 2003. BBC Research & Consulting, 2007; data are inflated 3.5 percent per year to reflect 2007 cost levels.

The above per household cost levels are used with the household growth projections derived from the NWCSP economic modeling to project typical municipal service expenditures over time under varying growth scenarios.[5] The NWCSP model incorporates the above economies and diseconomies of scale, which are reflected in Exhibit A-10 cost of service estimates.

Traditional revenues. BBC projects average traditional municipal revenues in the same manner as average municipal service costs. Average per household revenue data were derived from DOLA's municipal financial compendium, assuming that in general Colorado municipalities strive to keep balanced annual budgets. Traditional revenues include sales tax, residential and commercial property tax, and general municipal fees and charges.[6] The per household revenue multipliers used in BBC's projections are averages across cities of like sizes and results are presented in aggregate for the study region. In reality, there is considerable variation in city revenue levels across the state. Variation may not entirely be explained by city size; geography, proximity to another established city, historical retailing patterns and other factors also determine a city's revenue profile. For the purposes of this study, BBC assumes that a city's future revenue productivity will match their similarly sized Colorado counterparts.

[5] Average municipal costs – derived from statewide data – are used in this model, as opposed to current operating costs for each of the subject communities, because current local municipal operating costs are not reflective of the level of services that will be required as communities mature and because utilizing multiple standards is unwieldy for regional modeling purposes.

[6] See Exhibit A-1 for detail on the components of traditional municipal revenue.

Community classification. Exhibit A-11 shows the distributions of area municipalities by category and total population. These classifications are used with the average municipal expenditure data to determine reasonable operating cost expectations for each community. Within the model, per household operating costs will change as communities mature and economies of diseconomies of scale are realized. Costs are for general fund operations only.

Exhibit A-11.
Distributions of Area Municipalities by Category and Total Population, 2008

	Regional Center	County Center	Small Town	Limited Service Community
Mesa County				
Grand Junction	■			
Fruita			■	
Palisade			■	
DeBeque				■
Collbran				■
Garfield Co.				
Rifle		■		
Silt			■	
New Castle			■	
Glenwood Springs		■		
Carbondale			■	
Parachute			■	
Rio Blanco County				
Rangely			■	
Meeker			■	
Moffat County				
Craig		■		
Dinosaur				■
Population 2007	**55,316**	**27,082**	**33,011**	**1,686**
Households	**24,805**	**10,750**	**12,521**	**655**
Per Household Operating Costs	**$ 2,149**	**$ 2,398**	**$ 1,915**	**$ 1,366**

Source: Colorado Department of Local Affairs and BBC Research & Consulting, 2008.

In 2007, municipalities in the four county study region had about 50,000 households in four classifications of municipalities. The operating costs shown in Exhibit A-11 are the average general fund costs for Colorado communities of that size.

Costs of future municipal operations. Fiscal projections from the NWCSP model reflect the observations regarding trends in the cost of local services expressed earlier in this appendix and the unusual costs of servicing population growth in the four county study region. The marginal additional cost of growth (i.e., costs in excess of those expenses to be covered by traditionally local government revenue sources) are estimated to range between 10 and 30 percent of average per household costs, depending on the size and characteristics of the communities in question.

Growth related municipal operating costs are forecasted with the following considerations:

- As current experience demonstrates, labor costs will rise in order to attract and keep local government workers. Labor costs typically represent 65 to 75 percent of local government general fund expenses. Across the four county study region, increased labor costs will contribute to a 5 to 15 percent rise in per household governmental operating costs, depending on the community's current situation, as local governments expand to serve growth.

- Small isolated communities, which predominate in the four county study region, will be particularly challenged to expand services, and these communities are generally starting at low cost levels. Expansion and modernization of services and catch-up costs will add another 10 to 15 percent per household to the cost of serving new growth.

- Scarcity of materials and generally higher costs in rural isolated areas are expected to add up to 5 percent to future operating costs.

- The pace of growth and the necessity to hire outside staff, plan and develop simultaneously, and operate under conditions where cost considerations are often sacrificed for immediacy, can add an additional 5 percent to general operating costs in areas experiencing the most rapid growth.

Exhibit A-12 builds upon the prior Exhibit A-11, repeating the classification of local communities and applying the estimated additional per household costs associated with each stage of growth. These per household costs are used to project the marginal costs of growth – the costs beyond those covered by traditional sources of revenue. This process recognizes that larger communities will achieve economies of scale while smaller communities will face a more challenging transition between the low cost/low service level of most small communities and the efficiency provided as towns reach scalable size.

Exhibit A-12.
Derivation of Per Household Marginal Costs by Town Size, 2007

	Regional Center	County Center	Small Town	Limited Service Community
Households	24,805	10,750	12,521	655
Per Household Operating Costs	$ 2,149	$ 2,398	$ 1,915	$ 1,366
Estimated Additional Marginal Costs of Growth*	10%	15%	20%	30%
Full Costs per Household	$ 2,364	$ 2,758	$ 2,298	$ 1,776

Note: * In excess of available local revenues, see text.
Source: BBC Research & Consulting, 2008.

In essence, the NWCSP model incorporates an assumption that standard revenue sources, service fees, charges, sales taxes and property taxes will support traditional levels of local government services without undue burden on current or future residents. The communities of northwest Colorado face additional challenges associated with the pace and nature of anticipated growth. The new, full costs forecasted in Exhibit A-12 are those expenses that determine future service levels.

Costs of future municipal capital expansion. In addition to the costs of providing general operating services to an expanding population, local municipalities will require significant expansion of capital facilities (i.e., administrative space, jails, road systems, libraries, parks and developed recreation systems) necessary to meet the needs of a growing resident population.

There is considerable variation between communities in their present infrastructure service capacity, the quality of existing facilities and the community systems in place for funding capital needs. Some communities have recently expanded facilities in anticipation of new growth while others have managed with undersized or antiquated facilities for a very long time.

There is also great variation in how communities pay for capital expansion. Some communities have informal systems that allow for capital investment in years when excess funds are available; other communities have annual allocations of certain taxes, fees and charges. A few communities have formal impact charges. Mesa County, for instance, has a road impact fee that is applied uniformly throughout the county, although it is set at a level considerably below what was deemed necessary to maintain road systems by the original analysis.

Capital cost ratios. The NWCSP model utilities standardized per household capital facility cost ratios to calculate expansion cost projections. These ratios offer reasonable standards for the projection of generalized capital facility needs. Capital costs for individual communities will vary in any given year or location. However, this process offers a reasonable approximation of long-term costs on a regional basis.

Multiple sources of capital cost estimates and utilization ratios were evaluated in order to develop capital standards. Local interviews were conducted with the subject communities, and municipal capital improvement plans (CIPs) were collected and reviewed. Local capital cost data, where available, were collected for police, fire, roads, parks and recreation, general government and water and sewer utilities. Generally, municipal capital infrastructure includes buildings, land, equipment, and specialized vehicles. Although some communities had thorough plans and funding schedules, most communities had no systemized capital requirements plan and some were more of a laundry list of possibilities than a realistic plan. Local projections of actual costs were of limited value for model calibration because virtually all public capital investment estimates involve some combination of repair and replacement costs, which are not growth-related expenses, as well as system expansion costs, which are entirely growth-related.

In addition to an evaluation of local spending needs, a second source of capital estimates was derived from the same Colorado Department of Local Affairs database used in the previous calculation of municipal spending ratios. This information provided capital expenditures for each Colorado community in a given year. Although, no single community may be entirely reflective of the experience of northwestern Colorado, the robust sample of over 200 Colorado communities offers a reasonable benchmark. As a simple proxy, the average Colorado community in one sample year spent approximately $775 per household ($2007) for general fund related capital investment. Assuming a third of that annual expenditure is for repair and replacement purposes, it is reasonable to extrapolate that Colorado communities pay approximately $500 per household per year for municipal general fund capital investment needs.

An additional source of information was derived from a community asset study completed by Aurora, Colorado in which the study team participated. In this analysis, the city undertook a comprehensive process of valuing its capital stock, ranging from administrative space to parks and open space. In essence, the city put a present replacement value on its entire portfolio of capital facilities. The following steps were taken to derive capital cost ratios from the Aurora study:

- As part of a study of Aurora's cost of development, city officials documented and valued city capital assets for general government, parks, public works, police, fire and library. These data were reviewed by the study team and adjusted to better reflect more rural western slope communities.[7]

- Adjustments included reducing open space and park land investments, because there is more public open land in northwest Colorado. Significant cultural facility investment, such as theaters and museums, were also eliminated.

- The Aurora asset replacement value data was then divided by current households in Aurora to calculate the embedded capital investment per household in Aurora.

[7] The primary change was to significantly reduce the cost ratio for parks and open space. Aurora has an extensive public parks program, which represents a high level of capital investment. This level of parks investment makes less sense in the subject where extensive public open space is required.

- Road investment costs were estimated by a different methodology, which involved averaging the cost replacement value of road impact fees designed for rural communities in Western United States. By law, road impact fees are designed to place the cost of road expansion on new development in a manner that is proportional to that development's share of the road system. BBC collected a sample of 20 rural communities in four Western states that had designed road impact fees under this methodology. On average, these communities calculated supportable road impact fees of $3,000 per single family home. The fee posited here was adjusted upward to $4,000 to account for the portions of costs attributed to commercial and other non-residential development.[8] Collector and local neighborhood roads are eliminated from the capital cost ratios because it is assumed that developers will provide them as a part of subdivision requirements.

- Funding for capital expansions and water acquisition can be very expensive—Grand Junction and its neighbors are currently evaluating a new sewer treatment facility with potential costs exceeding $25 million. Tap fees provide a good metric for the per household capital cost of serving new demand. Two of the fastest growing communities in the study area have recently updated their water and sewer tap fees. In November 2007, New Castle raised their in-town water and sewer fees from $3,500 to $6,000 per household (their out of town fees went from $6,500 to $10,000 per HH). In October 2006, Rifle raised their water fee from $3,000 to $4,500 per HH and their sewer fee from $3,500 to $5,000 to help finance a $23 million system expansion. Based on the recent experience of Rifle and New Castle, the per household capital investment requirement for water and sewer infrastructure is set at $5,000 each.

The following exhibit shows per household cost ratios for municipal infrastructure investment.

Exhibit A-13.
Municipal Capital Investment per Household, 2007

Municipal Service	Capital Investment Per Household
General Government	$ 1,668
Police	594
Fire	620
Public Works	578
Parks and Recreation	3,137
Library	463
Roads	4,000
Water	5,000
Sewer	5,000

Source:
Cities of Aurora; Rifle and New Castle; BBC Research & Consulting. 2008.

[8] The study team's sample included 20 communities in four western states. It should be noted that some communities applied fees that were lower than the amount calculated as development's proportional share.

The data from Exhibit A-13 indicate that a full-service community in a location such as northwestern Colorado can expect to invest roughly $21,000 per household (one time) in general fund infrastructure. This is a measure of infrastructure value, as opposed to the annualized expenditure described above in the discussion of operating costs. If this investment has a useful life of 30 years, this costs represents an annual charge of about $700/unit, which is comparable to the $500/unit derived from the DOLA data.

In order to develop rough approximations of capital investment requirements for general fund investment in municipal capital infrastructure the NWCS model applies a $21,000 per household charge (one time assessment, not annualized) and reports municipal capital requirements in aggregate alongside county capital needs for the 27-year study period.

Capital costs projections are for all growth-related capital. These costs could be covered by local sources such as dedicated capital revenues or impact fees, or by additional state, Federal or private participation. Water and sewer costs can be partially recovered from water and sewer operations and attendant tap fees or cost recovery charges.

All cost projections are purposefully generalized at a sub-regional level and do not address specific projects. Certain major initiatives, such as a new full interchange at I-70 ($30-50 million) or a new community bypass, would be in addition to these costs. Radical solutions to traffic and community development issues, such as a new north/south road into the Piceance Basin, or the development of a new town in the commercial oil shale district may be cost effective solutions to community issues, but are not included in these projections.

Fiscal Impact Forecasting Methodology – Counties

A process similar to that used for municipal cost forecasting is applied to develop county fiscal impact projections. Fiscal modeling efforts assume that traditional revenues will adequately cover traditional levels of governmental services, property taxes, sales taxes and charges for services. In the same manner as municipalities, the area's unique or unusual costs of growth – particularly new road maintenance – additional sheriff's costs and expanded human services, will largely be in excess of what can be generated by traditional revenue sources.

County operations. As is the case for municipal governments, northwest Colorado's four county study region have greatly differing capacities and service standards. By way of example, Mesa County has over 140,000 persons with roughly 70,000 persons in unincorporated areas, although most residents live in an urbanized area around Grand Junction and can utilize many of the city's facilities and shopping outlets. Conversely, Rio Blanco County and Moffat County combined have only 21,000 persons (6,500 are in unincorporated areas). The areas have more dispersed populations and no nearby large community (such as Grand Junction) to offer supplemental services. Mesa, Garfield and Rio Blanco Counties also have very high per capita assessed valuations, which mitigate the costs of service provision, although in some cases, the demands of TABOR and the Gallagher Amendment also limit the amount of available revenue.

In the NWCSP modeling process, county operational expenditures and traditional revenues are projected by using per household cost multipliers derived from current budgets and a marginal cost premium factor that represents the estimated portion of future costs that are tied to energy growth-related expenses. These additional expenses, much in the same fashion as the municipalities, are unlikely to be covered by standard county revenue sources. Estimates of that premium recognize the following two factors:

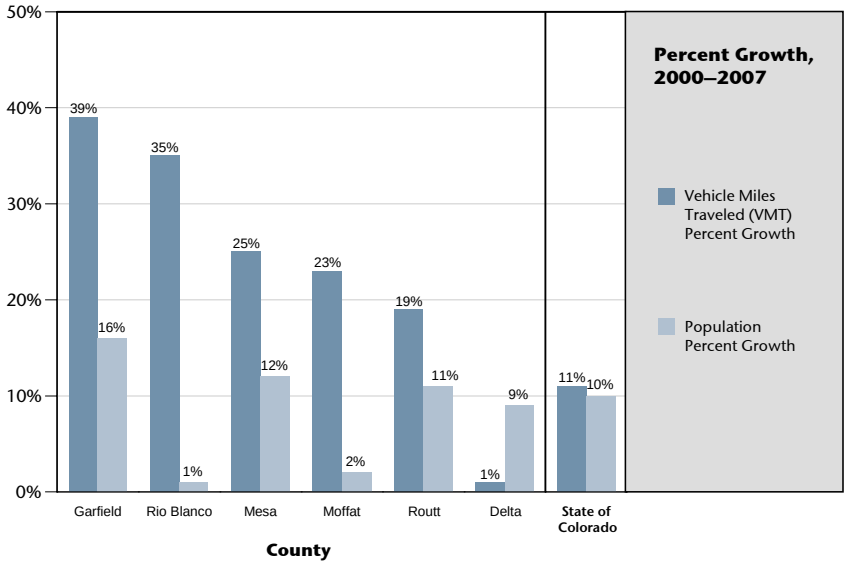
- Counties are dealing with the same growth challenges as municipalities: rising labor costs, high material costs and expenses associated with rapid growth in population; and

- Road maintenance, expansion and repair cost fall particularly hard on rural counties. The energy industry, particularly natural gas drilling and production, involves many personal vehicles and the transportation of heavy equipment – most often on rural road systems.

Exhibit A-14 shows recent data on population growth in comparison with vehicle miles traveled on local roads. The variation between these two measures in northwest Colorado is notable. The experience of Rio Blanco and Moffat Counties is particularly instructive. These counties have a great deal of pass-through traffic, but have not experienced commensurate population or revenue growth.

Exhibit A-14. Traffic Congestion and Population Growth is Highway Intensive, 2006

Source:
CDOT, 2006 and BBC Research and Consulting, 2008.



- Police protection presents similar issues in that future expenses are correlative not only to growth in local households, but also to growth in traffic and natural gas exploration in the unincorporated areas. Drilling activity and an expanded use of rural "man-camps" place additional people in dispersed rural areas and thus pressure on protection services.

- Counties are heavily reliant on property taxes, and as documented previously, northwest Colorado has benefited from the high assessed values associated with natural gas and energy developments. This is an important mitigating consideration, although in some cases, the limitations imposed by TABOR and the Gallagher Amendment tend to restrict revenue flows, substituting lower tax rates. Over time, the revenue capability of counties with natural gas development will grow significantly – as demonstrated by Mesa and Garfield Counties assessment increase.

In order to develop cost projection factors that reflect these considerations, the NWCSP model incorporates the following steps:

- In a process similar to that used for municipal governments, average per household costs are derived in order to set current service standards for county expenditures. Traditional revenues, i.e., sales tax, residential and commercial property tax and charges for services, are derived in the same manner. A marginal cost multiplier representing marginal unfunded costs for future services, related to the unique nature of the local economy and the rural nature of the counties, is derived and applied to household growth. This percentage reflects the particular circumstances of each county.

  - Mesa County, with a relatively balanced economy and tax base, a large population base that affords economies of scale, high assessed valuations and a relatively centralized urban development pattern, is well positioned to accommodate new growth. Marginal operating costs (apart from capital expenses), in excess of annual revenues, will be modest (5-10 percent of current per household spending averages).

  - Garfield County benefits from some of the same economies of scale, maturation and balanced economy that characterize Mesa County. Garfield also faces continued rapid growth, considerable new pass through traffic, social service demands and pressures to serve growing number of rural subdivisions. Garfield's unfunded operating costs are assumed be 5-10 percent of current per household expenditures.

  - Moffat and Rio Blanco counties have higher current expenditure levels on a spending per unit basis but also have very high road miles per household and face rapidly expanding costs associated with repair, upgrade and replacement of roads. Rio Blanco County has completed an extensive road improvement-planning program with forecasts that suggests over $10 million investment in road maintenance alone (repair and upgrading), a figure that suggests investments in the neighborhood of $2,500 per household per year. These rural counties face extraordinary service demands against a background of very modest service levels. Rio Blanco's strong tax base and resultant high expenditure levels are mitigating factors. Unfunded operating costs will be moderate. (10-15 percent).

The results of this allocation process are shown in Exhibit A-15 below:

Exhibit A-15.
County Operations Marginal Cost Derivation, 2007

County	Current 2007 Budget	Current Households	Current Per Household	Additional Marginal Cost Multiplier	Marginal Cost Per Household
Expenditure —General Fund					
Rio Blanco County	$ 8,217,593	2,944	$ 2,791	15%	$ 3,210
Moffat County	10,429,179	5,787	1,802	15%	2,072
Garfield County	30,410,000	21,300	1,428	10%	1,570
Mesa County	58,364,562	56,201	1,038	10%	1,142

Source: Rio Blanco, Moffat, Garfield and Mesa Counties; Colorado Department of Local Affairs and BBC Research & Consulting, 2008.

The resulting marginal unfunded county operations cost per household is projected forward using household growth projections from the NWCSP model.

County capital costs. County capital costs represent the most challenging projections. At best, rough approximations can be achieved as the variability in road improvement and road expansion expenses overwhelms estimation methodology particularly in high growth scenarios. Eventually, project specific detailed engineering will be required for individual projects, but this is currently unavailable. Projections of county capital needs utilize existing county Capital Improvement Plans (CIP's) for each of the four counties in the study region.

The following exhibit shows average annual projected capital expenditures by county for facilities and roads as specified in each county's respective CIP. The average annual figure is based on a 20-year projection from Rio Blanco County and 5-year projections from the other three counties in the study region.

Exhibit A-16. Average Annual Capital Expenditure

Source: BBC Research & Consulting, 2008.

County	Average Annual Capital Expenditure		
	Facilities	Roads	Total
Rio Blanco County	$ 899,693	$ 14,408,848	$ 15,308,541
Moffat County	2,281,444	1,887,351	4,168,795
Garfield County	10,726,363	8,253,233	18,979,596
Mesa County	4,797,745	11,089,459	15,887,204

The total capital investment cost (facilities and roads) over the analysis period is divided by current countywide households to calculate the current average annual capital expenditure per household. This methodology incorporates the theory that on a per household basis, future annual capital expenditure will be virtually the same as current annual capital spending. This process is shown in Exhibit A-17.

Exhibit A-17. Average Annual Capital Expenditure per Household

Source: BBC Research & Consulting, 2008.

County	Avg. Annual Capital Expenditure	2007 Households	Avg. Annual Cap. Exp. Per Household
Rio Blanco County	$ 15,308,541	2,944	$ 5,200
Moffat County	4,168,795	5,787	720
Garfield County	18,979,596	21,300	891
Mesa County	15,887,204	56,201	283

The per household capital expenditure figure is then applied to the NWCSP model household growth projections to show the required annual capital investment. County capital requirements are presented in aggregate alongside municipal capital needs for the 27-year study period. Municipal and county capital expenditure requirements are then compared to estimates of available revenue.[9]

[9] Revenues available for capital support include DOLA Energy Impact Grant funds and a portion of county property tax. A more detailed discussion of these and other non-traditional revenue generated by energy development can be found in Appendix A.

Non-Traditional Revenues

Although accommodating growth in northwest Colorado brings financial challenges, the presence of public lands and energy development spurs resource specific revenues, most notably severance tax, mineral leasing revenues (federal royalty payment) and resource based property taxes. Under certain growth and pricing circumstances, these tax sources offer the prospect of considerable additional revenue beyond those traditional revenues described here,

Severance Tax

Tax rates. Colorado severance tax applies to the extraction of nonrenewable natural resources, revenues are collected by the State of Colorado. For oil and natural gas, annual taxes are based on gross income produced by all wells except "stripper wells" (those producing less than 15 barrels of crude oil or 90,000 cubic feet of gas per year on average). Certain production costs, which include transportation, processing and manufacturing costs are deducted to account for the costs to move the gas from the point of severance (the wellhead; where valuation is supposed to occur) to the point of valuation (usually a regional gas gathering hub). The resultant value is and multiplied by a variable tax rate to determine gross severance tax due reduce this gross income. Taxpayers may credit 87.5 percent of ad valorem taxes paid to local governments on oil and gas production (not including taxes related to stripper wells or taxes on buildings, improvements and equipment) to determine the net severance tax due.[10]

Exhibit A-18.
Calculation of Severance Taxes

Gross Income fromall wells (excluding stripper wells) less transportation and processing costs

x

Tax Rate Schedule

Gross income	Tax rate
Under $25,000	2% of gross income
$25,000 - $99,999	$500 + 3% of gross income > $24,999
$100,000 - $299,999	$2,750 + 4% of gross income > $99,999
$300,000 and over	$10,750 + 5% of gross income > $299,999

-

87.5% of ad valorem tax paid to local government (excluding stripper wells, buildings, improvements and equipment

Source: Colorado Department of Revenue.

In 2005, total severance tax revenues form all sources collected by the state plus interest income was $146 million. In 2006, total revenues grew to $212 million. Severance tax revenue fell to $136 million in 2007.

Severance tax receipts have varied widely over the years the result of pricing fluctuation, uneven annual deductions for property tax and allowed production costs, and the lag between production and receipt of revenues.

[10] This credit is designed to eliminate the disincentive to invest in counties/jurisdictions with high property taxes.

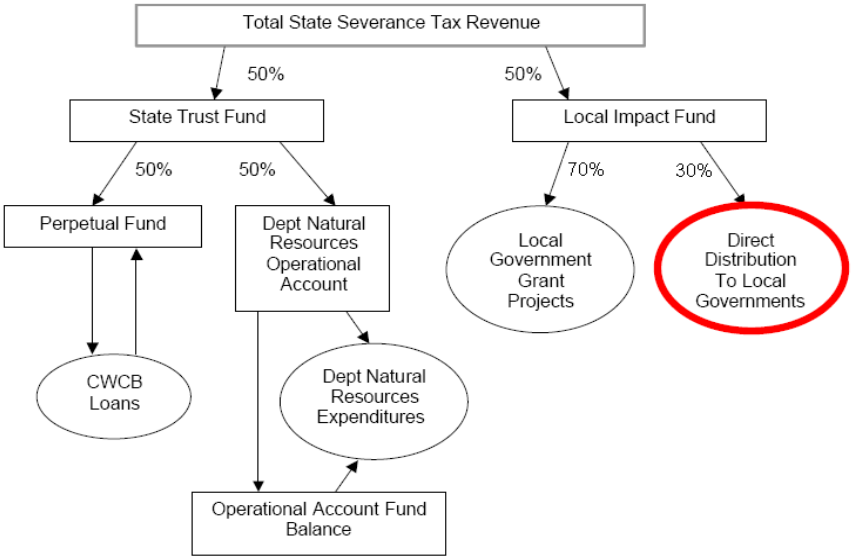
Tax distribution. Once collected, severance taxes are distributed through an complex state process. Colorado's severance tax revenues are first split 50-50 between State Trust Fund and the Local Impact Fund. The State Trust Fund provides funding for Water Conservation and Department of Natural Resources operations. The Local Impact Fund gives 70 percent (85 percent prior to 2008) of its collections to a local government grant program that awards funding through a competitive process. The other 30 percent is directly distributed to local governments (15 percent prior to 2008). It should be noted that Federal Mineral Leasing funds (revenues from leasing of Federal lands within the state) also contribute to the Local Impact Fund, thus total available funds are more than the severance tax distributions.

This direct distribution to local governments is based on energy employee residence and is designed to offset additional public service and infrastructure costs in areas where these workers live. This distribution translates to a per-resident-employee payment made to a jurisdiction in which industry-specific qualified employees reside. Per capita formulas differentiate between the resources paying the tax; thus, certain industries such as natural gas extraction generate more revenue per qualified worker than other industries. Significant changes to this distribution formula are anticipated from the 2008 Legislative session, but are not specified as of this writing.

Exhibit A-19. Severance Tax Distribution, 2008

Source:

Colorado Department of Local Affairs.



Severance tax collection process. Forecasting of the severance tax collections for future energy development is a challenging process. In addition to projecting the number, location, timing and productive of gas and other energy extraction processes, tax projections require forecasts of natural gas prices, total gas production; number and productivity of small wells and fluctuations in workers per well. Adjustments for production by exempted groups, estimation of applicable mill levies, deductions for property tax payments transportation, processing and manufacturing costs; and adjustment for timing lags between severance tax and associated property tax payments are also required.

Although revenue projections are a consideration for state planning, the issue for local government is how much tax revenue might come back to the area to offset costs. There is no direct relationship between local severance tax generation and state redistributions. Projections of locally generated severance tax are simply a check on the overall availability of funds within the DOLA accounts. As noted in ExhibitA-20, the NWCSP model provides annual forecasts of new wells and operating wells as well as associated drilling and maintenance employment. Estimates of long-term severance tax collection within the four county area are developed based on the following assumptions:

- NWCSP model forecasts of study area well development and employment;[11]
- Average per gas well production of 40 MMCF;[12]
- Production value of $6,000 per MMCF; and[13]
- Average effective severance tax rate of 1.25 percent[14]
- Erosion of statewide severance tax returns from other Colorado oil and gas fields as they mature, dampening statewide per worker returns by one percent in 2008 up to 40 percent at the end of the forecast period.

These production values are shown in attached Exhibit A-20.

Projection methodology. Projections of local revenue receipts rely on estimates of per capita worker distributions by jurisdiction and, most challenging, the study area's prospective success in attracting DOLA discretionary grants—the single largest source of severance tax redistributions.

In 2007, DOLA distributed approximately $28.0 million in grants into the four county area or about $4,400 per energy worker. [15] In addition to DOLA grant revenues, study area municipalities and counties receive a direct distribution of revenues based on the number of energy workers residing in each jurisdiction. In 2007, study area jurisdictions received about $11.2 million in direct distributions or about $1,800 per energy worker. Direct distributions will grow to about $30.1 million by 2017 and to approximately $43.3 million by 2035.[16]

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[11] See Section III

[12] BLM PEIS.

[13] BBC estimate based on current observed natural gas prices.

[14] Colorado Department of Local Affairs, Forecasting Colorado State Severance Tax, http://www.dola.colorado.gov/dlg/FA/eiaf/sev_proj.pdf

[15] In this instance, the "energy workers" are the BBC defined energy workers used in this model, which is a slightly different and broader classification than the state's definition of the energy workers that qualify for redistribution funds.

[16] The direct distribution figures in Exhibit A-20 include both severance tax and federal royalty payment distributions

Although mineral revenues and royalties may grow rapidly in this area, declining production in other gas and oil fields around the state will offset these gains. Based on the local gas development growth assumptions balanced by a modest decline in other state severance -taxable mineral extraction activity, per worker allocations of grant funds and direct distribution are projected to increase nearly three-fold over the next 27 years.[17] Exhibit A-20 documents the resultant projected available grant funds and direct worker payments.

Approximately 50 percent of all severance tax collections accrue to the local impact fund, which is either directly redistributed to the area through direct qualified employee payments, or indirectly available through a competitive grant process. The local impact fund also receives a share of the state's mineral leasing revenues.

Federal Royalties

The Minerals Management Service of the U.S. Department of the Interior collects mineral lease revenues from the leases of federal lands used for mineral extraction. Gross Federal Mineral Royalty (FR), sometimes referred to as mineral leasing revenue, is based on three components:

- **Rent** of $1.50 per acre annually for the first 5 years and $2.00 per acre annually thereafter.
- **Royalties** of 12.5 percent of the revenue generated from mineral extraction on these federal lands.
- **Bonuses** paid by companies to obtain mineral leases, based on a competitive bidding process.

[17] There will be an increase in gas production per worker as more wells move into the production phase and require only a maintenance workforce.

Exhibit A-20.
Wells, Gas Production, Employment, Severance Tax and Possible Revenue Transfer, Four-County Study Region, 2007 to 2035

Year	New Wells Drilled — Annual Regional Total	Cumulative Producing Wells	Projected Employment Total	Production (MMCF)	Production Value	Sev. Tax and Fed Royalty Per Worker Distribution	Possible Revenue Transfer to the Four County Region		
							Direct Distribution	DOLA Grants	Total Revenue
2007	1,400	9,092	6,299	363,680	$2,182,080,000	$1,778	$11,199,721	$27,854,295	$39,054,016
2008	1,415	10,234	6,310	409,360	2,456,160,000	1,597	10,076,149	24,768,969	34,845,117
2009	1,552	11,479	6,734	459,160	2,754,960,000	1,786	12,025,012	29,217,535	41,242,547
2010	1,760	12,895	7,378	515,800	3,094,800,000	1,999	14,751,192	35,433,697	50,184,889
2011	1,823	14,331	7,579	573,240	3,439,440,000	2,214	16,776,421	39,845,934	56,622,355
2012	1,886	15,787	7,680	631,480	3,788,880,000	2,429	18,653,631	43,809,740	62,463,372
2013	1,949	17,263	7,884	690,520	4,143,120,000	2,644	20,845,525	48,419,079	69,264,604
2014	2,012	18,757	8,289	750,280	4,501,680,000	2,859	23,698,255	54,445,261	78,143,516
2015	2,075	20,269	8,696	810,760	4,864,560,000	3,074	26,730,282	60,747,038	87,477,321
2016	2,038	21,699	8,828	867,960	5,207,760,000	3,272	28,888,398	64,951,825	93,840,223
2017	2,001	23,049	8,716	921,960	5,531,760,000	3,456	30,118,480	67,002,930	97,121,411
2018	1,939	24,296	8,740	971,840	5,831,040,000	3,620	31,635,462	69,643,581	101,279,044
2019	1,902	25,470	8,819	1,018,800	6,112,800,000	3,769	33,240,063	72,417,876	105,657,939
2020	1,865	26,570	8,887	1,062,800	6,376,800,000	3,904	34,694,935	74,814,589	109,509,525
2021	1,803	27,576	8,875	1,103,040	6,618,240,000	4,022	35,689,911	76,181,541	111,871,452
2022	1,716	28,465	8,495	1,138,600	6,831,600,000	4,118	34,983,762	73,926,439	108,910,201
2023	1,679	29,290	8,513	1,171,600	7,029,600,000	4,202	35,774,286	74,846,609	110,620,895
2024	1,642	30,053	8,523	1,202,120	7,212,720,000	4,274	36,425,747	75,459,421	111,885,168
2025	1,605	30,757	8,524	1,230,280	7,381,680,000	4,334	36,940,188	75,780,985	112,721,174
2026	1,568	31,402	8,517	1,256,080	7,536,480,000	4,382	37,319,308	75,820,910	113,140,218
2027	1,631	32,091	8,458	1,283,640	7,701,840,000	4,432	37,490,100	75,439,912	112,930,012
2028	1,609	32,737	8,484	1,309,480	7,856,880,000	4,474	37,955,004	75,652,977	113,607,981
2029	1,587	33,342	8,505	1,333,680	8,002,080,000	4,505	38,318,632	75,663,826	113,982,458
2030	1,570	33,912	8,535	1,356,480	8,138,880,000	4,529	38,652,354	75,614,449	114,266,803
2031	1,623	34,518	8,753	1,380,720	8,284,320,000	4,554	39,856,254	77,252,382	117,108,636
2032	1,676	35,158	8,623	1,406,320	8,437,920,000	4,579	39,487,276	75,839,386	115,326,662
2033	1,729	35,832	8,844	1,433,280	8,599,680,000	4,605	40,722,565	77,505,417	118,227,982
2034	1,782	36,539	9,068	1,461,560	8,769,360,000	4,630	41,986,061	79,195,904	121,181,965
2035	1,835	37,278	9,296	1,491,120	8,946,720,000	4,655	43,274,903	80,902,442	124,177,345
Totals	**50,672**	**37,278**	**9,296**	**29,605,640**	**$177,633,840,000**		**$888,209,879**	**$1,858,454,950**	**$2,746,664,829**

Source: BBC Research & Consulting, 2008.

The Bureau of Land Management is currently in the process of determining terms for leasing of Federal lands for oil shale and tar sands production

Approximately 49 percent of the mineral lease revenues collected in Colorado by the Federal government are provided to the state.[18] State mineral lease receipts are then distributed within the state based on a complex "cascading" formula. This cascade formula ensures that some recipients receive the same payment year after year in spite of fluctuations experienced in annual mineral lease revenue given to the state. The process involves cutting the pie in three intervals (see Exhibit A-21):

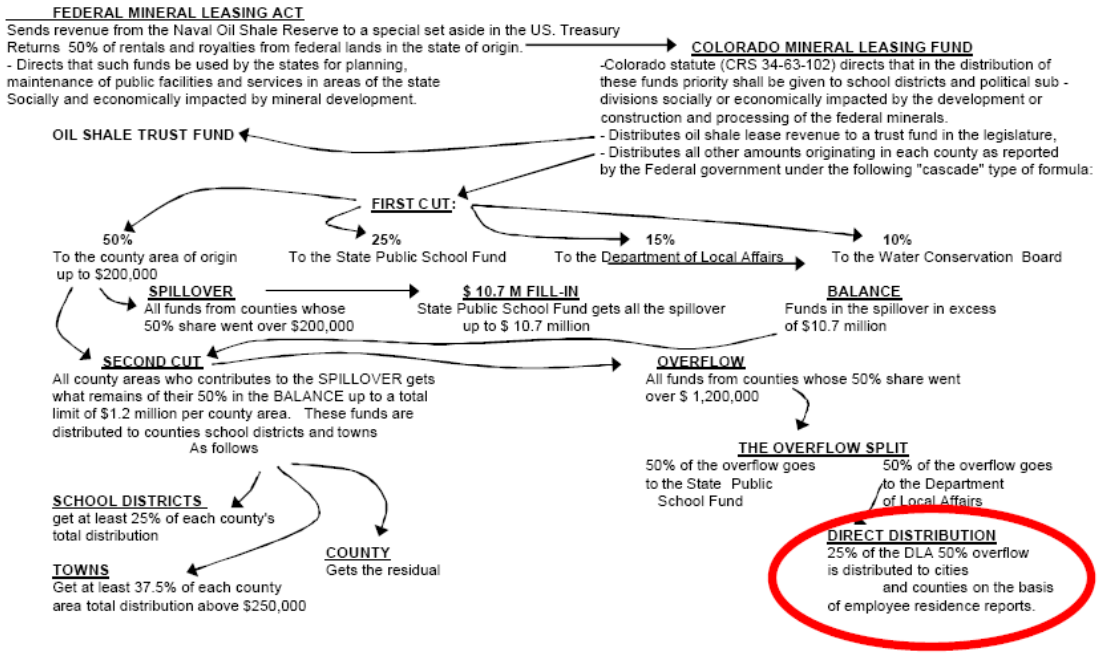
- **First cut**. Of total FR revenue 25 percent are transferred to the State School Fund of the Department of Education, 10 percent to the Colorado Water Conservation Board in the Department of Natural Resources and 15 percent to the Local Government Mineral Lease Funding in the Department of Local Affairs. Of the remaining 50 percent, each county is given a "first cut" of 50 percent of the lease revenue it produced up to $200,000. This is referred to as the "county of origin" distribution. The residual is pooled into the spillover, from which $10.7 million is deducted for the State School Fund. The remainder goes to a second cut for the counties.

- **Second cut**. Counties that claimed the maximum of $200,000 of 50 percent of their FR revenue contributions can claim up to $1 million of the balance in the second cut, which is also part of the county of origin distribution. Thus, the maximum amount given to counties in the first and second cuts is $1.2 million. Each county must then distribute its first and second cut revenue to school districts (at least 25 percent) and towns (at least 37.5 percent), whereupon the county can claim the residual (at most 37.5 percent). Spillover from the second cut goes to a third cut.

- **Third cut**. Of the spillover, 50 percent is given to the State Public School Fund, and the other 50 percent is given to the Department of Local Affairs. DOLA puts 75 percent of this spillover revenue toward the Local Government Mineral Impact Fund, and the other 25 percent is distributed to cities and counties based on where employees of mineral extraction industry reside.

[18] This distribution formula is a topic of current debate at the Federal level and subject to change.

Exhibit A-21.
Cascading Distribution of Federal Mineral Lease Revenue



Source: Colby, Stephen. Colorado Department of Local Affairs.

In 2005, of $114.8 million in federal royalty revenue given to Colorado, $55.9 million went to the Public School Fund, $29.6 to the Local Government Mineral Impact Fund and $11.5 to the Colorado Water Conservation Board Construction Fund. At the local level, $8.2 million went to counties (of which $2.0 million came from the final employee residence-based cut), $5.9 million to municipalities (of which $2.1 came from the final employee residence-based cut) and $3.7 million to school districts.

DOLA reports about $144 million in total federal royalty given to the state in 2007. Five-year forecasts by the Colorado Legislative Council staff suggest FY 2010-11 revenues of nearly $220 million. The four county study area generates roughly 70 percent of the state's FR receipts.

Future receipts. The study area jurisdictions have traditionally received considerable annual funding from the allocations devised by the first two "cuts" of mineral leasing revenues. These funds are largely incorporated into the operating budgets of the local jurisdictions and support the current general public service levels in the area. Under current formulae, these funds will not grow significantly because of the respective caps and cascading effects that divert new revenues in different proportions.

The portion of FR revenues that accrues to the direct employee distribution fund ($3.7 million in 2007) will rise in proportion to the overall increase in FR in a manner similar to severance tax distributions.

Estimates of future FR receipts under current formulae are combined with severance tax distributions provided in prior Exhibit A-20. These FR revenues will grow far faster than severance tax revenues because the great majority of future gas production will occur on Federal lands and thus be subject to FR charges. Currently the majority of production is on private land and not subject to FR charges. In the same manner as severance tax receipts, the formidable growth in northwest Colorado generated revenues will be partially offset by the reduced production of other existing wells elsewhere in the state.

A portion of FR revenues are redistributed by discretionary grants, which is has also been captured in the forecasts of possible discretionary funds. It should be noted that a highly competitive Fede4ral leasing effort in the future could result in additional available funds, deemed "bonus" funds; similarly, lessened demand could result is less productive leasing efforts and thus reduced FR receipts. This model assumes a continuation of current lease and bonus conditions.

The portion of FR funds that are distributed to general state agencies, such as the Colorado Water Conservation Board and the State Public School Fund, will benefit the study area in general in the same manner as all jurisdictions in the state are benefited.

Finally, it should be noted that some FR revenues that accrue to other state agencies are also available to fund growth impacts on a discretionary basis. For example in the period FY 2001-02 to 2005-06, Mesa County was the second largest recipient of Water Loans from the CWCB construction fund, receiving over $10.0 million in funding from FR revenues.

Property Tax

The following discussion describes the valuation, assessment and ad valorem taxation process for oil and gas production. Residential and commercial property tax is considered traditional revenue and described previously in this appendix.

Current conditions. Certain jurisdictions in the study area benefit from the high valuations afforded natural resources and oil and gas development and the resultant property tax receipts. These benefits can be mitigated by the effects of the Tabor and Gallagher amendments, which without a "debrucing" vote of the local constituency, will restrict revenue increases and effectively drive down local mill levies over time. This process reduces the property tax burden on local property owners but also reduces revenues available to affected jurisdictions. Natural resource valuations are affected by new drilling activity and the diminishment of resources as wells are depleted, and in this area are highly sensitive to the valuation of natural gas.

It should be noted that property taxes are critical for the operations of counties and school districts, and for some special districts. Generally, the local municipalities do not have energy activity within their borders; as a result, municipalities that provide the public services to the majority of residents do not collect property taxes directly from the growing resource extraction activities, although they do benefit from affiliated commercial operations that might locate within municipal boundaries.

In practice, the assessment procedures for developing "'actual value" for property assessment purposes on mineral leases and resource extraction operations is complex. There is considerable fluctuation in resource value (sales price at the wellhead) and considerable time lags between project construction, resource development, property assessment and tax receipts. In most instances, property tax payments are deducted from mineral severance taxes further clouding projections of total revenues.

Projections. The study area counties have commercial and residential assessment values similar to those of other comparable counties and these receipts are considered part of traditional revenues. Natural resource assessments are in addition to those other commercial and residential property values. Exhibit A-22 shows the four counties, their current mineral based assessed valuations, well activity, applicable county mill levies and recent property tax productivity per well.

Exhibit A-22.
Gas Production Property Tax Per Well, Four County Study Area, 2007

County	2007 Adjusted Assessed Value *	2007 Active Gas Wells	Assessed Value Per Well	2007 Mill Levy **	Property Tax Per Well
Garfield	$1,774,530,983	5,055	$351,072	13.295	$ 4,668
Rio Blanco	188,661,071	2,722	69,310	9.05	627
Mesa	60,172,616	620	97,053	17.465	1,695
Moffat	90,259,694	589	153,216	20.284	3,108

Note: *This is the value of oil and gas resources., adjusted to filter out the portion of assessed value that is attributed to oil production.
** Adjusted to include only general fund, road and bridge, public welfare and capital fund mill levies
Source: Garfield, Rio Blanco, Mesa and Moffat County Assessors; BBC Research & Consulting.

Exhibit A-23 on the following page offers projections of mineral assessed valuation and resultant study area mineral property tax revenues associated with future natural resource development. These projections assume the above per well tax productivity factor will continue, and that mill levies remain at current levels without rebates of tax collections. As noted previously well drilling and more importantly the well production that drives valuation is expected to rise continually for multiple decades. Production is migrating toward Garfield and Rio Blanco Counties that already have voter approval to retain revenues beyond TABOR limits. The property tax projection process differentiates between wells on Federal lands and those on state or private lands to allow for the deduction of Federal Mineral Royalty payments (12.5 percent of production value) from property tax.

The subject counties have considerable discretion in whether these receipts are used for ongoing operating costs or capital investments. Based on historic practice and anticipated future needs, BBC has assumed that 75 percent of receipts will be available for capital investment and 25 percent for operating expenses. Many factors could influence these projections, most notably the value of natural gas which determines resource value for assessment purposes.

The results of these forecast efforts are compared with project operating and capital costs in Section VI of this report to determine the net costs and revenues for taxing jurisdictions.

Exhibit A-23.
Gas Production General Fund Property Tax
Projection, Four County Study Area, 2008 to 2035

	2008	2009	2010	2011	2012	2020	2025	2030	2035
Cumulative Producing Wells[1]									
On Federal Land	395	853	1,403	1,996	2,630	8,531	11,864	15,069	18,791
On State/Private Land	748	1,535	2,400	3,243	4,065	8,948	9,801	9,751	9,395
Total Productive Wells	**1,143**	**2,388**	**3,803**	**5,239**	**6,695**	**17,479**	**21,665**	**24,820**	**28,186**
Assessed Value (millions)[2]									
Federal	$ 254	$ 530	$ 844	$ 1,162	$ 1,484	$ 3,849	$ 4,749	$ 5,415	$ 6,122
State/Private	222	464	738	1,017	1,298	3,368	4,155	4,738	5,357
Total Assessed Value	**$ 476**	**$ 994**	**$ 1,582**	**$ 2,178**	**$ 2,782**	**$ 7,217**	**$ 8,904**	**$ 10,153**	**$ 11,478**
Property Tax Revenue (millions)[3]									
Federal	$ -	$ -	$ 0.7	$ 1.5	$ 2.4	$ 9.3	$ 12.3	$ 14.2	$ 16.0
State/Private	$ -	$ -	$ 2.1	$ 4.4	$ 7.1	$ 27.9	$ 36.8	$ 42.7	$ 48.0
Total Property Tax Revenue	**$ -**	**$ -**	**$ 2.8**	**$ 5.9**	**$ 9.4**	**$ 37.2**	**$ 49.1**	**$ 57.0**	**$ 63.9**

Note: 1. Includes the total wells completed after 2007.
2. Assessed value per well derived from a weighted average of assessed values shown in Exhibit A-21.
3. The mill levy for the projection is based on a weighted average of current general fund mill levies in the region. Revenues generated by wells on Federal land are discounted to account for the deduction of Federal Mineral Royalty payments.

Source: BBC Research & Consulting, 2008.

The above calculations show a rapid rise in natural resource assessed value and property tax revenue over the 27-year study period.

School Districts

The four county study region's nine school districts present similar issues as the area's other public entities. The region's rapid population growth presents challenges with expanding enrollments, staff retention and increasing operating costs, while constitutional limitations and statewide school financing regulations restrict the districts' ability to retain revenues and take advantage of rising assessed valuations.

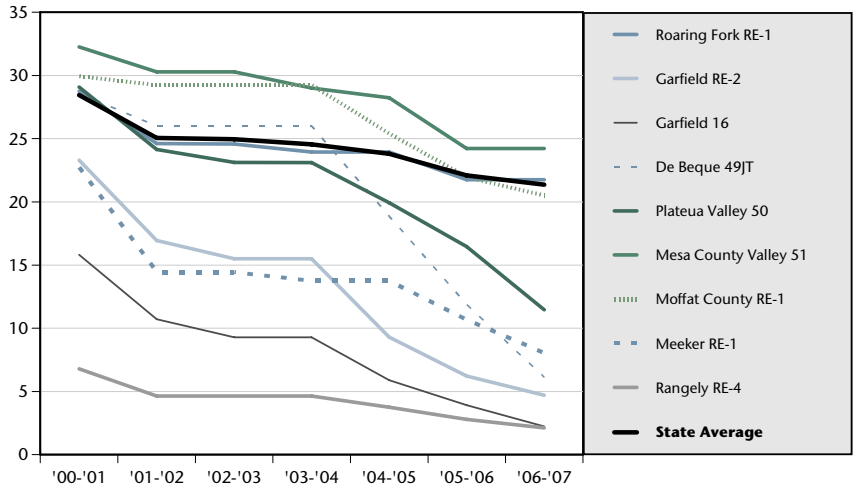
School district operations are funded primarily by local property tax revenue and equalization funding from the state. Those districts with active energy extraction or other industrial growth have generally witnessed a strong property assessed valuation, but are also subject to TABOR and 1994 School Finance Act limitations, which preclude the retention of windfall funds and require mill levy adjustments to compensate for assessed value increases.

Local funding. Exhibit A-24 below shows the basic program mill levy rates of the nine school districts in the four county study region over the past seven years. Districts in Garfield and Rio Blanco Counties have seen basic mill levies fall rapidly, primarily the result of increasing assessed value from natural gas development and associated industrial support.

Exhibit A-24. Basic Program Mill Levies, 2000-2007

Source:

Colorado Department of Education and BBC Research & Consulting, 2008.

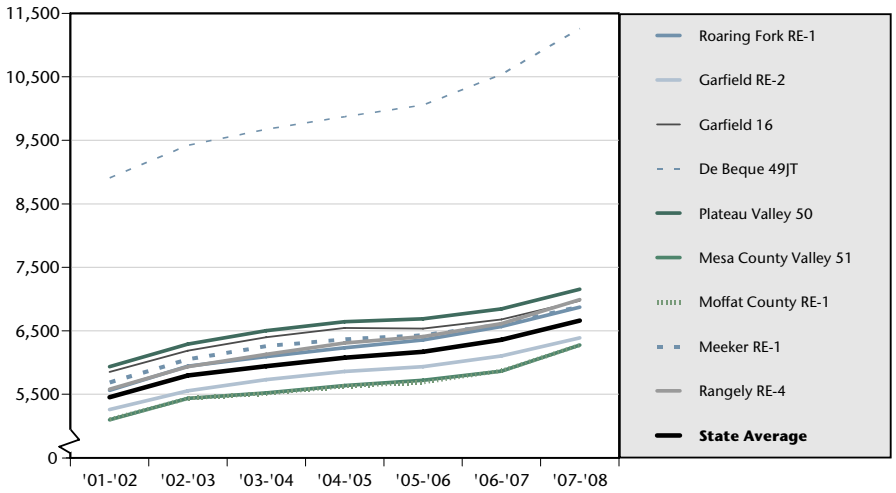


In the 2006-2007 fiscal year, Rangely School District RE-4 and Garfield School District 16 (Parachute) had the second and third lowest basic mill levies of all 178 school districts in Colorado, respectively. Garfield RE-2, DeBeque 49JT, Meeker RE-1 and Plateau Valley 50 were also among the 25 districts with the lowest basic mill levies. These districts have greatly lower tax rates but are also precluded from raising revenues beyond certain prescribed levels.

State equalization. Local property tax revenue to school districts is supplemented by state funding to produce the per-pupil funding allowance calculated for each district as determined by the 1994 School Finance Act. Per-pupil funding calculations consider the cost of living, number of students, and proportion of at-risk students within each district. Exhibit A-25 shows the total program per-pupil funding for each district between 2001 and 2008.

Exhibit A-25. Per-pupil Total Revenue, 2001–2008

Source:
Colorado Department of Education and BBC Research & consulting, 2008.



These data show that per-pupil funding among all nine school districts, despite local operating costs increases, has grown in tandem with average per-pupil funding across the entire state. DeBeque 49JT has higher per-pupil spending because, as a very small district it does not benefit from the economies of scale of larger districts and receives a size adjustment.

Mill levy freeze (2007). The 2007 mill levy freeze will allow the 175 districts that have "de-Bruced" (those that have voted to lift TABOR restrictions on school funding) to maintain current mill levies. The existing per-pupil funding calculation will remain, and increases in property tax revenues to school districts will be accompanied by corresponding decreases in state funding. The state funds that are "freed up" as a result of the mill levy freeze will go toward other education purposes.

Override levies. TABOR and the 1994 School Finance Act limit the growth in districts' basic program funding, but districts can take advantage of increasing assessed values through override levies and bond levies for capital construction. Override levies must be voter-approved and allow school districts up to 20 percent of their total program funding in additional property tax revenue. Typically, override levies have been used to increase teacher salaries.

Several school district representatives report they have already reached the 20 percent funding cap on override levies and still have trouble providing adequate salaries to retain employees and attract teachers given increasing costs of living and extreme competition for labor. Other districts that have not reached the override levy maximum fear "voter fatigue" in having to ask voters for additional override levies year after year.

Bond redemption levies. Bonds may be issued with voter approval for capital and building needs. Bonded indebtedness cannot exceed 20 percent of a district's total taxable assessed property value (25 percent for rapidly growing districts); therefore, bond limits for capital construction are greatly enhanced by the presence of natural gas development in a district. School districts with large and increasing assessed values from energy development have said it has been easier for them to get bond redemption levy approved by voters because the rapid increase in assessed value means the levies, if approved, would not cause a significant increase in individual property tax bills.

School District Challenges. Energy development in the four county study region spurred significant cost of living increases and competition for workers. The allowable per-pupil funding for each district under the 1994 School Finance Act considers cost of livings. However, none of the school districts in the four county study region have received a cost of living adjustment in the past 6 years. As noted above, well intended spending prohibitions have had unintended consequences.

Faced with rapidly increasing costs and slowly increasing funding, school district administrators argue that the area's energy development presents difficult circumstances. The challenges brought by energy development most frequently identified by school districts include the large influx of students, traffic increases, difficulty in employee retention and increased construction and operating costs.

Student influx. The majority of the nine school districts interviewed said they have experienced large increases in their student population over the past several years. Some districts have sufficient capacity to accommodate these students, while others have had to deal with crowded classrooms and have had to rely on modular buildings. Recent growth has brought a higher proportion of at-risk, limited English proficiency (LEP) and mobile (transient) students.

- One school district reported that the proportion of Hispanic students increased from 23 percent of all students in 2001 to 36 percent in 2007. The number of students receiving free and reduced lunches doubled during this same period.

- One school district reported a 12 percent increase in enrollment between the 2006-2007 and 2007-2008 academic years.

Employee retention. Almost all school districts have had significant problems retaining and recruiting maintenance staff and bus drivers. They specifically identify the higher wages paid by the natural gas industry and associated contractors for similar jobs as the direct cause of staffing shortages. In some districts more than others, the rising cost of housing has made it difficult to recruit teachers and has increased teacher turnover.

- One school district said its starting wage for bus drivers is $14 per hour, compared with $20 per hour for drivers employed by the gas companies and contractors.

- The same school district reported a turnover of 49 percent in the maintenance staff in 2006, with 86 percent leaving for higher-paying jobs. Currently, seven maintenance staff positions remain unfilled.

- Another school district reported that 20 teachers have turned down positions in their district in the past few years due to the high cost of housing.

None of the school districts has received an adjustment in its cost of living factor to its total program funding, which has prevented them from paying competitive wages and salaries to employees and teachers in their increasingly costly communities.

Construction costs. The four county study region's districts have also been impacted by rapidly increasing costs of construction. School districts have said that bids for new facilities have been much higher than the prices paid for facilities built only a few years ago due to the increasing costs of cement, steel and other construction materials and the competition for qualified contractors.

- One school district reported that bids for a new facility have been $200–$225 per square foot, compared with a cost of $110 per square foot for a facility built in 2001.

- A second school district successfully passed a bond for $35 million for the construction of a new school, but has since discovered from construction bids that the originally conceived facility will cost over $50 million.

Several districts have found that they greatly underestimated the cost of facilities scheduled to be built in the next few years. Increasing construction costs have made it difficult for school districts to find companies willing to construct school facilities at the price originally approved by voters.

- **Traffic.** Several school districts mentioned that natural gas development in their areas has congested roads with many heavy trucks, forcing administrators to alter bus routes and presenting increased safety concerns for children.

- **District disparity**. The school districts without significant natural gas exploration within their boundaries, such as those in Mesa County, experience similar problems related to increasing costs due to their proximity to drilling activity. However, they face a more resistant political climate when pursuing new bonds and levies. Whereas districts with rapidly increasing assessed values from energy development can pass bonds and override levies without raising individual property taxes, districts without similar development must rely more heavily on homeowners for these additional funds. Convincing voters to approve bond issuances is more challenging as a result.

School financing practices in Colorado, which emphasize state equalization and state funding, lessens the effect of changes in local property assessments on local district financial health. Northwest Colorado schools are faced with significant challenges in attracting and retaining teachers and staff, and enrollment growth is forcing capital expansion of facilities. For some local districts, state statutory provisions that allow override mill levies, coupled with escalating local assessed values, will continue to provide an adequate financial base, although rapid enrollment growth and challenges in attracting qualified staff will likely remain. Other districts that lack voter support for additional taxes and/or energy-based assessed valuation growth, will be severely pressed to meet staffing and facility needs.