

DES 12-01

# **Draft Programmatic Environmental Impact Statement and Possible Land Use Plan Amendments for Allocation of Oil Shale and Tar Sands Resources on Lands Administered by the Bureau of Land Management in Colorado, Utah, and Wyoming**

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January 2012

*Volume 4: Chapters 7, 8, & 9, and Appendices A-J*

U.S. Department of the Interior  
Bureau of Land Management



## **MISSION STATEMENT**

It is the mission of the Bureau of Land Management (BLM), an agency of the Department of the Interior, to manage BLM-administered lands and resources in a manner that best serves the needs of the American people. Management is based upon the principles of multiple use and sustained yield taking into account the long-term needs of future generations for renewable and nonrenewable resources.

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## NOTATION

The following is a list of acronyms and abbreviations, chemical names, and units of measure used in this document. Some acronyms used only in tables may be defined only in those tables.

### GENERAL ACRONYMS AND ABBREVIATIONS

11	ACEC	Area of Critical Environmental Concern
12	AGFD	Arizona Game and Fish Department
13	AGR	aboveground retort
14	AIRFA	American Indian Religious Freedom Act
15	AMSO	American Shale Oil LLC
16	ANFO	ammonium nitrate and fuel oil
17	API	American Petroleum Institute
18	APLIC	Avian Power Line Interaction Committee
19	APP	Avian Protection Plan
20	AQRV	air quality related value
21	ARCO	Atlantic Richfield Company
22	ATP	Alberta Taciuk Process
23	ATSDR	Agency for Toxic Substances and Disease Registry
24	AWEA	American Wind Energy Association
25		
26	BA	biological assessment
27	BCD	barrels per calendar day
28	BLM	Bureau of Land Management
29	BMP	best management practice
30	BO	biological opinion
31	BOR	U.S. Bureau of Reclamation
32	BPA	Bonneville Power Administration
33	BSD	barrels per stream day
34	BTEX	benzene, toluene, ethylbenzene, and xylenes
35		
36	CAA	Clean Air Act
37	CAPP	Canadian Association of Petroleum Producers
38	CARB	California Air Resources Board
39	CASTNET	Clean Air Status and Trends NETWORK
40	CBOSC	Cathedral Bluffs Oil Shale Company
41	CCW	coal combustion waste
42	CDC	Centers for Disease Control and Prevention
43	CDOT	Colorado Department of Transportation
44	CDOW	Colorado Division of Wildlife
45	CDPHE	Colorado Department of Public Health and Environment
46	CDW	Colorado Division of Wildlife

1	CEQ	Council on Environmental Quality
2	CFR	<i>Code of Federal Regulations</i>
3	CHL	combined hydrocarbon lease
4	CIRA	Cooperative Institute for Research in the Atmosphere
5	COGCC	Colorado Oil and Gas Conservation Commission
6	CPC	Center for Plant Conservation
7	CRBSCF	Colorado River Basin Salinity Control Forum
8	CRSCP	Colorado River Salinity Control Program
9	CWRQIP	Colorado River Water Quality Improvement Program
10	CSS	cyclic steam stimulation
11	CSU	Controlled Surface Use
12	CWA	Clean Water Act
13	CWCB	Colorado Water Conservation Board
14		
15	DoD	U.S. Department of Defense
16	DOE	U.S. Department of Energy
17	DOI	U.S. Department of the Interior
18	DOL	U.S. Department of Labor
19	DOT	U.S. Department of Transportation
20	DRMS	Division of Reclamation Mining & Safety (Colorado)
21		
22	EA	environmental assessment
23	EGL	EGL Resources, Inc.
24	EIA	Energy Information Administration
25	E-ICP	bare electrode in situ conversion process
26	EIS	environmental impact statement
27	EMF	electric and magnetic field
28	E.O.	Executive Order
29	EOR	enhanced oil recovery
30	EPA	U.S. Environmental Protection Agency
31	EPRI	Electric Power Research Institute
32	EQIP	Environmental Quality Incentives Program
33	ESA	Endangered Species Act of 1973
34	EUB	Alberta Energy and Utilities Board
35		
36	FAA	Federal Aviation Administration
37	FLPMA	Federal Land Policy and Management Act of 1976
38	FONSI	Finding of No Significant Impact
39	FR	<i>Federal Register</i>
40	FTE	full-time equivalent
41	FY	fiscal year
42		
43	GCR	gas combustion retort
44	GHG	greenhouse gas
45	GIS	geographic information system
46	GPO	Government Printing Office

1	GSENM	Grand Staircase–Escalante National Monument
2		
3	HAP	hazardous air pollutant
4	HAZCOM	hazard communication
5	HFC	hydrofluorcarbon
6	HMA	Herd Management Area
7	HMMH	Harris Miller Miller & Hanson, Inc.
8		
9	I-70	Interstate 70
10	IARC	International Agency for Research on Cancer
11	ICP	in situ conversion process
12	IEC	International Electrochemical Commission
13	IPPC	Intergovernmental Panel on Climate Change
14	ISA	Instant Study Area
15	ISWS	Illinois State Water Survey
16	IUCNNR	International Union for Conservation of Nature and Natural Resources
17		
18	JMH CAP	Jack Morrow Hills Coordinated Activity Plan
19		
20	KOP	key observation point
21	KSLA	Known Sodium Leasing Area
22		
23	LAU	Lynx Analysis Unit
24	LETC	Laramie Energy Technology Center
25	LPG	liquefied petroleum gas
26	L <sub>dn</sub>	day-night average sound level
27	L <sub>eq</sub>	equivalent sound pressure level
28	LWC	lands having wilderness characteristics
29		
30	M&I	municipal and industrial
31	MFP	Management Framework Plan
32	MIS	modified in situ recovery
33	MLA	Mineral Leasing Act
34	MMC	Multi Minerals Corporation
35	MMTA	Mechanically Mineable Trona Area
36	MOU	Memorandum of Understanding
37	MPCA	Minnesota Pollution Control Agency
38	MSDS	Material Safety Data Sheet
39	MSHA	Mine Safety and Health Administration
40	MSL	mean sea level
41	MTR	military training route
42		
43	NAAQS	National Ambient Air Quality Standards
44	NADP	National Atmospheric Deposition Program
45	NAGPRA	Native American Graves Protection and Repatriation Act
46	NCA	National Conservation Area

1	NCDC	National Climate Data Center
2	NEC	National Electric Code
3	NEPA	National Environmental Policy Act of 1969
4	NHPA	National Historic Preservation Act of 1966
5	NFS	National Forest Service
6	NLCS	National Landscape Conservation System
7	NMFS	National Marine Fisheries Service
8	NNHP	Nevada Natural Heritage Program
9	NOI	Notice of Intent
10	NORM	naturally occurring radioactive materials
11	NOSR	Naval Oil Shale Reserves
12	NPDES	National Pollutant Discharge Elimination System
13	NPS	National Park Service
14	NRA	National Recreation Area
15	NRHP	<i>National Register of Historic Places</i>
16	NSC	National Safety Council
17	NSO	No Surface Occupancy
18	NWCC	National Wind Coordinating Committee
19		
20	OHV	off-highway vehicle
21	OOSI	Occidental Oil Shale, Inc.
22	OPEC	Organization of Petroleum Exporting Countries
23	OSEC	Oil Shale Exploration Company
24	OSEW/SPP	Oil Sands Expert Workgroup/Security and Prosperity Partnership
25	OSHA	Occupational Safety and Health Administration
26	OSTS	oil shale and tar sands
27	OTA	Office of Technology Assessment
28		
29	PA	Programmatic Agreement
30	PADD	Petroleum Administration for Defense District
31	PAH	polycyclic aromatic hydrocarbon
32	PCB	polychlorinated biphenyl
33	PEIS	programmatic environmental impact statement
34	PFC	perfluorocarbons
35	PFYC	Potential Fossil Yield Classification
36	P.L.	Public Law
37	PM	particulate matter
38	PM <sub>2.5</sub>	particulate matter with an aerodynamic diameter of 2.5 µm or less
39	PM <sub>10</sub>	particulate matter with an aerodynamic diameter of 10 µm or less
40	PPE	personal protective equipment
41	PRLA	preference right lease area
42	PSD	Prevention of Significant Deterioration
43		
44	R&D	research and development
45	R&I	relevance and importance
46	RBOSC	Rio Blanco Oil Shale Company

1	RCRA	Resource Conservation and Recovery Act of 1976
2	RD&D	research, development, and demonstration
3	RF	radio frequency
4	RFDS	reasonably foreseeable development scenario
5	RMP	Resource Management Plan
6	ROD	Record of Decision
7	ROI	region of influence
8	ROS	Recreation Opportunity Spectrum
9	ROW	right-of-way
10		
11	SAGD	steam-assisted gravity drainage
12	SAMHSA	Substance Abuse and Mental Health Services Administration
13	SDWA	Safe Drinking Water Act of 1974
14	SFC	Synthetic Fuels Corporation
15	SHPO	State Historic Preservation Office(r)
16	SIP	State Implementation Plan
17	SMA	Special Management Area
18	SMP	suggested management practice
19	SPR	Strategic Petroleum Reserve
20	SRMA	Special Recreation Management Area
21	SSI	self-supplied industry
22	STSA	Special Tar Sand Area
23	SWCA	SWCA, Inc., Environmental Consultants
24	SWPPP	Stormwater Pollution Prevention Plan
25	SWWRC	States West Water Resources Corporation
26		
27	TDS	total dissolved solids
28	THAI	toe to head air injection
29	TIS	true in situ recovery
30	TL	timing limitation
31	TMDL	Total Maximum Daily Load
32	TOSCO	The Oil Shale Corporation
33	TSCA	Toxic Substances Control Act of 1976
34	TSDF	treatment, storage, and disposal facility
35		
36	UDEQ	Utah Department of Environmental Quality
37	UDNR	Utah Department of Natural Resources
38	UDWR	Utah Division of Wildlife Resources
39	UIC	underground injection control
40	USACE	U.S. Army Corps of Engineers
41	USC	<i>United States Code</i>
42	USDA	U.S. Department of Agriculture
43	USFS	U.S. Forest Service
44	USFWS	U.S. Fish and Wildlife Service
45	USGCRP	U.S. Global Change Research Program
46	USGS	U.S. Geological Survey

1	VCRS	Visual Contrast Rating System
2	VOC	volatile organic compound
3	VRI	visual resource inventory
4	VRM	Visual Resource Management
5		
6	WDEQ	Wyoming Department of Environmental Quality
7	WGFD	Wyoming Game and Fish Department
8	WRAP	Western Regional Air Partnership
9	WRCC	Western Regional Climate Center
10	WRI	World Resources Institute
11	WRSOC	White River Shale Oil Corporation
12	WSA	Wilderness Study Area
13	WSR	Wild and Scenic River
14	WTGS	wind turbine generator system
15	WYCRO	Wyoming Cultural Records Office

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**CHEMICALS**

CH <sub>4</sub>	methane	N <sub>2</sub> O	nitrous oxides
CO	carbon monoxide	NO <sub>x</sub>	nitrogen oxides
CO <sub>2</sub>	carbon dioxide	O <sub>3</sub>	ozone
CO <sub>2e</sub>	carbon dioxide equivalent		
		Pb	lead
H <sub>2</sub> S	hydrogen sulfide		
		SF <sub>6</sub>	sulfur hexafluoride
NH <sub>3</sub>	ammonia	SO <sub>2</sub>	sulfur dioxide
NO <sub>2</sub>	nitrogen dioxide	SO <sub>x</sub>	sulfur oxides

**UNITS OF MEASURE**

1	ac-ft	acre foot (feet)	ft <sup>3</sup>	cubic foot (feet)
2				
3	bbbl	barrel(s)	g	gram(s)
4	Btu	British thermal unit(s)	gal	gallon(s)
5			GJ	gigajoule(s)
6	°C	degree(s) Celsius	gpd	gallon(s) per day
7	cfs	cubic foot (feet) per second	gpm	gallon(s) per minute
8	cm	centimeter(s)	GW	gigawatt(s)
9			GWh	gigawatt hour(s)
10	dB	decibel(s)		
11	dB(A)	A-weighted decibel(s)	h	hour(s)
12			ha	hectare(s)
13	°F	degree(s) Fahrenheit	hp	horsepower
14	ft	foot (feet)	Hz	hertz

*Draft OSTIS PEIS*

1	in.	inch(es)	MMBtu	thousand Btu
2			mph	mile(s) per hour
3	K	degree(s) Kelvin	MW	megawatt(s)
4	kcal	kilocalorie(s)		
5	kg	kilogram(s)	ppb	part(s) per billion
6	km	kilometer(s)	ppm	part(s) per million
7	kPa	kilopascal(s)	ppmv	part(s) per million by volume
8	kV	kilovolt(s)	psi	pound(s) per square inch
9	kWh	kilowatt-hour(s)		
10			rpm	rotation(s) per minute
11	L	liter(s)		
12	lb	pound(s)	s	second(s)
13			scf	standard cubic foot (feet)
14	m	meter(s)		
15	m <sup>2</sup>	square meter(s)	yd <sup>2</sup>	square yard(s)
16	m <sup>3</sup>	cubic meter(s)	yd <sup>3</sup>	cubic yard(s)
17	mg	milligram(s)	yr	year(s)
18	mi	mile(s)		
19	mi <sup>2</sup>	square mile(s)	µm	micrometer(s)
20	mm	millimeter(s)		

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## ENGLISH/METRIC AND METRIC/ENGLISH EQUIVALENTS<sup>a</sup>

The following table lists the appropriate equivalents for English and metric units.

Multiply	By	To Obtain
<b><i>English/Metric Equivalents</i></b>		
acres	0.4047	hectares (ha)
cubic feet (ft <sup>3</sup> )	0.02832	cubic meters (m <sup>3</sup> )
cubic yards (yd <sup>3</sup> )	0.7646	cubic meters (m <sup>3</sup> )
degrees Fahrenheit (°F) –32	0.5555	degrees Celsius (°C)
Feet (ft)	0.3048	meters (m)
gallons (gal)	3.785	liters (L)
gallons (gal)	0.003785	cubic meters (m <sup>3</sup> )
inches (in.)	2.540	centimeters (cm)
miles (mi)	1.609	kilometers (km)
miles per hour (mph)	1.609	kilometers per hour (kph)
pounds (lb)	0.4536	kilograms (kg)
short tons (tons)	907.2	kilograms (kg)
short tons (tons)	0.9072	metric tons (t)
square feet (ft <sup>2</sup> )	0.09290	square meters (m <sup>2</sup> )
square yards (yd <sup>2</sup> )	0.8361	square meters (m <sup>2</sup> )
square miles (mi <sup>2</sup> )	2.590	square kilometers (km <sup>2</sup> )
yards (yd)	0.9144	meters (m)
<b><i>Metric/English Equivalents</i></b>		
centimeters (cm)	0.3937	inches (in.)
cubic meters (m <sup>3</sup> )	35.31	cubic feet (ft <sup>3</sup> )
cubic meters (m <sup>3</sup> )	1.308	cubic yards (yd <sup>3</sup> )
cubic meters (m <sup>3</sup> )	264.2	gallons (gal)
degrees Celsius (°C) +17.78	1.8	degrees Fahrenheit (°F)
hectares (ha)	2.471	acres
kilograms (kg)	2.205	pounds (lb)
kilograms (kg)	0.001102	short tons (tons)
kilometers (km)	0.6214	miles (mi)
kilometers per hour (kph)	0.6214	miles per hour (mph)
liters (L)	0.2642	gallons (gal)
meters (m)	3.281	feet (ft)
meters (m)	1.094	yards (yd)
metric tons (t)	1.102	short tons (tons)
square kilometers (km <sup>2</sup> )	0.3861	square miles (mi <sup>2</sup> )
square meters (m <sup>2</sup> )	10.76	square feet (ft <sup>2</sup> )
square meters (m <sup>2</sup> )	1.196	square yards (yd <sup>2</sup> )

<sup>a</sup> In general in this PEIS, only English units are presented. However, where reference sources provided both English and metric units, both values are presented in the order in which they are given in the source. Where reference sources provided only metric units, only those units are presented.

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