Mineral Occurrence and Development Potential Report

LOCATABLE AND SALABLE MINERALS

Eastern Interior Resource Management Plan

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BLM Alaska State Office

Branch of Energy and Solid Minerals

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LIST OF ABBREVIATIONS

AEIDC - Arctic Environmental Information and Data Center

AMIS - Alaska Minerals Information System

AMRAP - Alaska Mineral Resource Assessment Program

ANCSA - Alaska Native Claims Settlement Act of 1971

ANILCA - Alaska National Interest Conservation Act

ARDF - Alaska Resource Data File

BLM - Bureau of Land Management

DGGS - State of Alaska, Division of Geological and Geophysical Surveys

DNR - Alaska Department of Natural Resources

EIRMP - Eastern Interior Resource Management Plan

FLPMA - Federal Land Policy and Management Act of 1976

KMDA - Known Mineral Deposit Areas

LMP - Locatable Mineral Potential

MAS/MILS - Mineral Availability System/Mineral Industry Location

MODPR - Mineral Occurrence and Development Potential Report

Ma - Mega-annum, millions of year ago

MTA - Mineral Terranes of Alaska

NEPA - National Environmental Policy Act

NGDB - National Geochemical Database

NURE - National Uranium Resource Evaluation

RASS - Rock Analysis Storage System

RDI - Research Data Institute

REE - Rare Earth Element

RFD - Reasonably Foreseeable Development Scenario Report

RMP - Resource Management Plan

SEDEX - Sedimentary Exhalative lead-zinc deposit

USBM - U.S. Bureau of Mines

USGS - U.S. Geological Survey

VMS - Volcanogenic Massive Sulfide deposit

Mineral Terranes of Alaska (MTA) Mineral Terrane Units

IGA - Alkali Granitic Rocks

IGF - Felsic Granitic Rocks

IGI - Intermediate Granitic Rocks

IGU - Undivided Granitic

IMA - Mafic Intrusive

IUM - Ultramafic Rocks

VFU - Felsic Intrusive Rocks, undivided

VSF - Sedimentary and Felsic Volcanic Rocks, undivided

VSM - Sedimentary and Mafic Volcanic Rocks

VOP - Ophiolitic

SLS - Limestone and Shale

SBS - Black, Carbonaceous Shale and Limestone

Elemental Abbreviations

Ag = silver

Au = gold

Co = cobalt

Cr = chromium

Cu = copper

Mo = molybdenum

Ni = nickel

Pb = lead

PGE = platinum group elements (e.g., platinum, palladium, iridium)

Pt = platinum

Sn = tin

REE = rare earth elements (eg, lanthanum, cerium, neodymium)

U = uranium

W = tungsten

Zn = zinc

I. INTRODUCTION

The Eastern Interior Field Office of the Bureau of Land Management in Alaska (BLM-Alaska) is preparing an Eastern Interior Resource Management Plan (RMP).This plan will provide a comprehensive framework to manage and allocate uses of public lands and resources in the east-central portion of Alaska (Figure 1). The planning process meets National Environmental Policy (NEPA) requirements through a detailed description of management alternatives and the environmental consequences that can result from each alternative.

Regulatory Authority

The BLM's authority for land use planning on federally managed public lands is in the Federal Land Policy and Management Act of 1976 (FLPMA), as amended. Sec. 202(a) of FLMPA requires the Secretary of the Interior, with public involvement, to develop, maintain, and (when appropriate) revise land use plans that provide by tracts or areas for the use of those public lands. Procedures and guidance for the planning process are contained in the Code of Federal Regulations Title 43 Section 1610 and in BLM Manuals 1601 (Land Use Planning) and H-1601-1 (Land Use Planning Handbook). This *Mineral Occurrence and Development Potential Report* for Eastern Interior follows guidance provided in BLM Manual Section 3031 (Energy and Mineral Resource Assessment).

Mineral Resources – Locatable, Leasable, Salable

Mineral resources on BLM-managed surface and subsurface lands are divided into three categories: locatable, leasable, and salable. These categories are based on provisions of various mining laws.

In the late 1800's, the U.S. Department of the Interior defined hardrock minerals as "locatable" if they could be found on public lands in quantity and quality sufficient to make the land more valuable by their existence. The General Mining Law of 1872 established the authority for locatable mineral mining claims. That law also provides the basis for subsequent mining laws that, over time, substantially reduced the number of minerals considered locatable.

Two primary laws, the Mineral Leasing Act of 1920 and the Materials Act of 1947, exclude certain mineral types that could only be acquired through a federal leasing program or disposed of by sale.

"Leasable" minerals include oil and gas, coalbed methane, geothermal fluids, and certain solid minerals such as potassium, sodium, phosphate, and oil shale.

"Salable" minerals include common varieties of mineral materials such as construction aggregate (sand and gravel), building stone, pumice, clay, and limestone.

Mineral types remaining in the locatable category following these modifications include metallic and certain nonmetallic industrial minerals generally found in lode or placer deposits. Under certain circumstances, mineral materials can be considered locatable minerals.

A. Overview

The goal of the planning process, with respect to locatable and salable minerals, is to identify areas open or closed to mining, mining laws, and mineral material disposal within the planning area. In open areas, the goal is to identify any area-wide terms, conditions, or other special considerations needed to protect resource values.

This report provides land use planners with the basic locatable and salable minerals information that BLM-Alaska uses to develop the various alternatives analyzed in NEPA documents. It identifies areas of "high, medium, and low" mineral potential within the Eastern Interior planning area. Leasable minerals and energy resources are beyond the scope of this report.

B. Lands Involved and Land Status

The Eastern Interior planning area encompasses approximately 31.3 million acres in east-central Alaska. BLM-Alaska administers approximately 7.8 million of those acres of the planning area, managed by the Eastern Interior Field Office (**Figure 2**). A portion of these BLM-managed public lands includes lands selected by, but not yet conveyed, to the State of Alaska and Alaska Natives. These lands are referred to as State-selected and Native-selected lands. Alaska's state lands came about through the Alaska Statehood Act of 1959 that gave the new state selection rights to federal land to foster development and state independence.

Under the Alaska Statehood Act, federal land conveyance process in Alaska was supposed to end in 1984. However, in the Alaska Native Claims Settlement Act (ANCSA) of 1971 superseded the Alaska Statehood Act. ANCSA designated Native lands and provided for Native claims to traditional lands in Alaska. ANCSA and the Alaska National Interest Conservation Act (ANILCA) of 1980 froze state selection rights to previously open federal lands.

ANILCA granted a 10-year extension to 1994 to complete the state-selection process for land transfers. Due to initial over-selection of by the State and Alaska Native Corporations, at the completion of the conveyance process the BLM will retain management of some of these selected lands as "unencumbered" public lands. Alaska Native Corporations and the State of Alaska have finalized their prioritized lists for federal land conveyances.

BLM-Alaska is responsible for administering subsurface minerals on 10.2 million acres of federal split estate lands in the Eastern Interior planning area, these lands include 7.6 million acres of U.S. Fish and Wildlife Service (USFWS), 2.6 million acres of National Park Service (NPS), and military land. Mineral development and surface activities on split estate lands are managed by the appropriate surface agency, but BLM-Alaska is responsible for administrative functions such as mining claim filings, adjudications, and record keeping (Cody, 1995 and Nichols, 1999). Thus, the management decisions in the Final Eastern Interior RMP will not include management of subsurface estate under NPS, USFWS, or military lands.

The Eastern Interior planning area is a wedge-shaped area bordered by Canada on the east. The area extends southwest across the Tanana River, and the northwest border follows the course of the Porcupine and then Yukon Rivers. A portion of the extreme western border follows the Dalton and Elliott Highways from Fairbanks to the Yukon River. (**Figure 1**)

C. Scope and Objective

This report describes known, existing mineral resources, current resource management in the planning area, and identifies areas of High, Medium, and Low mineral potential. This report incorporates a wide variety of available geologic information, including federal and state reports, to present a summary of mineral occurrence and development potential for the entire Eastern Interior planning area, regardless of land status. This assessment provides an intermediate level of detail, as required by Manual Section 3031 for all BLM land use plans (BLM, 1985). BLM-Alaska will also use the information in this report to construct a Reasonably Foreseeable

Development Scenario Report (RFD) detailing the type, location, and manner of potential environmental disturbance due to locatable minerals extraction within the Eastern Interior planning area.

D. Occurrence and Development Potential

Mineral potential assessments require understanding two components: (1) the potential for mineral occurrence and (2) the potential for their economic development. The potential for mineral occurrence is a prediction of the likelihood of the presence of these resources. Mineral occurrence potential does not necessarily imply that the mineral can be economically exploitable or that the quality and quantity of the resource is known. When mineral occurrence is known, the current and projected development potential is part of the mineral resource assessment. For the Eastern Interior RMP, this report considers development potential as whether or not a mineral occurrence is likely to be explored or developed within the 10- to 15-year lifespan of the RMP area under given geologic and non-geologic assumptions and conditions (BLM, 1985).

E. Organization

This report is organized as follows:

Section I. Introduction: Identifies regulatory justification and guidance for the planning process and presents background information related to locatable and salable minerals;

Section II. Description of Geology: Summarizes a description of planning area geology and an overview of data types and resources that comprise the geologic data for this report;

Section III. Description of Mineral Resources: Describes mineral resources; identifies and summarizes minerals information for the development of potential ratings; and, identifies how each information type is applied to the determination of mineral potential;

Section IV. Development of Potential Ratings: Rationale for generating potential ratings and explains the level of confidence criteria;

Section V. Potential for the Occurrence of Mineral Resources: Summarizes mineral occurrence and development potential for the planning area;

Section VI. Statement of Qualification (authors);

Section VII. Specific Mandates and Authority;

Section VIII. Conformance with Existing Land Use Plans; and,

Section IX. References.

II. DESCRIPTION OF GEOLOGY

The following sections summarize Eastern Interior planning area geology, and provide an overview of geochemical and geophysical data available for the planning area.

A. Physiography

The Northern Plateaus Physiographic Province dominates the Eastern Interior planning area. This province consists of a series of uplands and lowlands between Alaska's two great mountain ranges – the Brooks Range and the Alaska Range (Wahrhaftig, 1965) (See **Figure 1**). The largest portion of the province is the Yukon-Tanana Uplands, typified by an extensive section of rolling hills and broad river valleys bordered by the Yukon River and Tanana River lowlands to the north and south, respectively.

Underlying the Northern Plateau portion of the Eastern Interior planning area is discontinuous permafrost, especially in lowland areas and north-facing slopes. This portion was not extensively glaciated during the Quaternary. Elevation ranges from below 300 feet (91.44 meters) on the Yukon and Tanana rivers, to higher than 6,000 feet (1.8 kilometers) in the central Yukon-Tanana Uplands along the Charley River. The area is entirely within the Yukon River drainage.

The Tanana-Kuskokwim section of the Western Alaska Province and the Alaska Range (Alaska-Aleutian Province) occupies a narrow portion of the planning area's south and west margin. The Tanana-Kuskokwim Section is restricted to the main Tanana River drainage, which flows west-northwest at an elevation of over 450 feet (137 meters). The Alaska Range portion is generally capped by glaciers, some existing at over 10,000 feet (3 kilometers).

B. Rock Units–Lithology and Stratigraphy

The following summarizes Eastern Interior planning area rock units, organized in a loosely chronologic order from oldest to youngest lithologies. **Figure 3** is a generalized geologic map for the planning area after Beikman (1980) and an index for the 1:250,000-scale U.S. Geological Survey (USGS) Quadrangles.

1. Precambrian (>550 Ma (mega-annum)) to Triassic (200 Ma) Sedimentary Rocks of the North American Continent

Alaska comprises a diverse assemblage of geologic terranes (units) that were progressively accreted onto the margin of the North American Continent. Rocks interpreted as deposited on the Continental shelf essentially in their current relative position, exist north of the Tintina Fault along the Canadian Border, extending through the eastern portions of the Charley River and Black River Quadrangles, and into the Coleen Quadrangle. The lithologies represent a Middle Proterozoic to Triassic sequence of marine shelf sedimentary rocks; including limestone, quartzite, shale, and minor basalt, which were subjected to low-grade greenschist metamorphism (Dover, 1992).

2. Precambrian (~550 Ma) through Permian (250 Ma) Metamorphic Rocks

Precambrian to late-Paleozoic metamorphic rocks of the Yukon Tanana Terrane (YTT) underlies the largest portion of the planning area, generally occupying the intervening area between the Tintina and Denali Fault systems. The YTT consists of greenschist and amphibolite-grade regionally metamorphosed meta-sedimentary and meta-igneous rocks (Dusel-Bacon, et. al., 2006). Rock types are generally quartz-rich, dominated by biotite schist and gneiss, phyllite, slate, and augen gneiss. Within the YTT are narrow, fault-bounded slices of ocean crust consisting of ultramafic peridotite, greenstone, limestone and metachert.

3. Paleozoic (~550 Ma) to Mesozoic (65 Ma) Sedimentary Rocks

Paleozoic and early Mesozoic sedimentary strata are prominent in two portions of the Eastern Interior planning area: (1) the Livengood area north of Fairbanks and (2) in the southern portion of the planning area along the Denali Fault.

The Livengood area consists of lower Paleozoic marine chert, limestone, shale, and quartzite, with a component of continent-derived clastic rocks (Jones, et. al, 1981). Lower Paleozoic mafic volcanic rocks, quartzite, argillite and limestone underlie the White Mountains east of Livengood.

Along the Denali Fault in the southern planning area, Mesozoic chert and conglomerate overlie exposed upper Paleozoic marine sediments, gabbro and pillow basalt.

4. Middle Paleozoic (~350 to 450 Ma) Volcanics

A number of large, extensive areas of exposed extrusive and shallow intrusive volcanic rocks are mapped north of the Tintina Fault. The Woodchopper Volcanics in the northwestern Charley River Quadrangle consists of Devonian basaltic flows and tuffs, with volcano-sediment interbeds. Middle Paleozoic mafic volcanic in the northern Livengood Quadrangle and in the northeastern Circle Quadrangle are correlative. (Foster, et. al., 1983)

5. Intrusive Rocks

A series of Jurassic (144-208 Ma) and Cretaceous-age (65-144 Ma) granitic intrusive suites, generally ranging from granodiorite to monzonite in composition, intrudes the Tanana Uplands (Dusel-Bacon, 2006). These granitic rocks are quite variable in geographic extent, ranging from small plugs and dikes to large batholiths.

6. Cenozoic (younger than 65 Ma) Alluvial Deposits

Young river floodplain; glacial, alluvial, and lake deposits; and local volcanic rocks underlie a large portion of the northern planning area (Beikman, 1980). These young continental sediments generally exist in the lowlands of the Yukon River Basin, but are also present in restricted areas on the Tanana River near Fairbanks and above Delta Junction.

C. Geologic Framework–Structural Geology and Tectonics

Alaska is composed of accreted terranes assembled by the motion of the Pacific Tectonic Plate subducting under ancient North America crust. In other words, various island chains or micro-continents formed during the Precambrian in the Paleozoic Pacific Ocean and, over time, these islands or micro-continents plowed into the ancient North American continent. Thermal currents in the Earth's mantle drove the denser oceanic crust below the lighter continental crust.

There is a wedge-shaped region of Precambrian North American continental crust in the middle of the Eastern Interior planning area. Subsequent terranes were emplaced upon this sliver of ancient crust subsequent terranes. The Yukon Tanana Terrane (YTT) is the predominant terrane in the planning area. This terrane is a heterogeneous regional metamorphic suite with mafic to felsic intrusives (See **Figure 3** inset).

The YTT is bordered on the north by the Tintina Fault, roughly parallel to the Yukon River, and the Denali Fault, which roughly follows the southern border of the Eastern Interior planning area. Since Mesozoic times, the YTT has moved north and west along the Tintina Fault a few hundred miles; again driven by the tectonic forces of the Pacific Plate (Dusel-Bacon and others, 2006). At the northern end of the YTT, identified as the Livengood Ter-

rane on the Lithologic Terranes inset map in **Figure 3**, is an area of thin terrane slivers bounded by northeast trending faults that run parallel to the Porcupine Fault. These terranes are Minook, Wickersham, White Mountain, Livengood, and Manley, and include a wide range of lithologies from course- to fine-grained sediments, chert, and various intrusive.

The Porcupine Fault is another bounding fault in the planning area. The Porcupine Fault splays off the Tintina Fault and roughly traces the northeast trending Porcupine River and the northern boundary of the planning area. The Porcupine Fault is also the geologic boundary between the formations of the Brooks Range and the Porcupine Terrane. Craton,

The formations of the Porcupine Terrane are a complex assemblage of carbonate and fine-grained clastic rocks (Jones and other, 1987), but younger Tertiary sediments cover much of the western portion of the terrane. There are few reported metallic mineral deposits in the Porcupine Terrane.

Between the northern Porcupine Terrane and the wedge of North American Craton is the Kandik River Terrane. This Cretaceous terrane is comprised of weakly-metamorphosed thick sequences of shale and sandstone. Again, there are few reported metallic mineral occurrences in the Kandik River Terrane.

The fused wedge of the North American Craton and the Kandik River, Porcupine, greater Livengood, and Yukon Tanana Terranes constitute the bulk of the Eastern Interior planning area's regional geologic construction. A sliver of the Pingston Terrane, north of the Denali Fault and south of the YTT, is composed of Paleozoic oceanic crust and sediments that contain numerous base metal occurrences in the Delta District. With the exception of the clusters of mineral occurrences in the Pingston Terrane and a cluster of occurrences in the Livengood Terrane, the greatest density of mineral occurrences is within the YTT and the wedge of the North American Craton.

D. Geophysical Data

The following is an inventory and brief description of the geophysical data readily available for the Eastern Interior planning area. These data sets are routinely used in the identification/interpretation of mineral resources and potential.

1. Alaska Department of Natural Resources (ADNR), Division of Geological & Geophysical Surveys (DGGS)

The DGGS conducts detailed airborne geophysical surveys in areas of Alaska that are prospective for mineral deposits and, in many instances, are spatially associated with state or State-selected lands. Since 1995, the DGGS has completed eight separate surveys that at least partially include lands within the Eastern Interior planning area. Much of this work focused on the Fairbanks, Big Delta, Circle, Eagle, Tanacross, and Mount Hayes Quadrangles. Only limited geophysical coverage exists for the Fort Yukon, Coleen, Black River, and Charley River Quadrangles. A number of additional Eastern Interior areas, mainly along the Alaska Highway in the south planning area, are being considered for future geophysical survey depending on state funding levels.

2. U.S. Geological Survey (USGS)

The USGS has published a number of small-scale, statewide geophysics data sets. Many of these data sets provide regional context to geologic interpretations and have been applied to mineral resource determinations in a broad context.

E. Geochemical Data

The initial data set considered to assess mineral potential at any scale is geochemical sample surveys. Sample surveys are designed to typify areas of land by analyzing samples of water, vegetation, stream sediment, rock, or soil. Both the State and USGS maintain databases summarize geochemical results of various geologic resource studies. Much of this data is readily available through government web sites.

Mineral resource assessments have extensively used this publicly available geochemical data. Most of the significant results from these geochemical investigations have been evaluated as site-specific mineral occurrences in available government resource assessments. Much more geochemical data exists as proprietary exploration.

Following is a brief description of geochemical data available for the Eastern Interior planning area. These data sets, along with geophysical surveys as noted above, are used routinely in the identification and interpretation of mineral resources; numerous studies are also available documenting the petrology and chemical composition of various rock types in the planning area.

1. USGS National Geochemical Databases

USGS's National Geochemical Database (NGDB) is comprised of several online databases. These various databases provide results of approximately elemental geochemical analyses from rock, sediment, soil, water, and vegetative samples collected within the United States.

Data sets include:

NURE: The U.S. Department of Energy's National Uranium Resource Evaluation (NURE) conducted an extensive regional geochemical evaluation in Alaska between 1974 and 1981. NURE data, mainly stream and lake sediment samples, include analyses of elemental uranium concentrations and numerous other elements (USGS, 1997).

RASS: The USGS's Rock Analysis Storage System (RASS) provides elemental geochemical data from stream sediments, soils, waters, and organic material that can be downloaded on a quadrangle basis. RASS is intended as a reconnaissance tool used in mineral exploration or environmental baseline studies, for purposes such as identifying the regional geochemical signature of an area. The data set primarily contains analyses generated from assessments and investigations of the non-fuel mineral resources. Stream sediments are the principal sample medium for these regional programs because they represent the weathering products of many rock sources within the larger drainage basin, which allows for lower sample density. (USGS, 1999 and 2000).

PLUTO: PLUTO is a USGS database that provides the results of geochemical analyses on plutonic and volcanic igneous rock samples. PLUTO contains data generated from many disparate investigations such as geologic mapping, volcanic hazards, and energy resources (Baedecker and others, 1998).

2. State of Alaska, DGGS and former Alaska Division of Mines and Geology

The State of Alaska has made geochemical data from state projects available through the DGGS web site (http://www.dggs.dnr.state.ak.us/webgeochem/). The State's "WebGeochem" is a searchable database containing the results of about 18,000 separate geochemical analyses. Sample types include rock, soil, stream sediment, pan concentrate, drill core, and other media.

III. DESCRIPTION OF MINERAL RESOURCES

The USGS, U.S. Bureau of Mines (USBM), and the BLM have published a considerable body of Alaska geologic research. Many studies document specific mineral resources or occurrences and describe additional discovery potential. Resource development potential has been an important factor in the selection of federal lands by the State and, with the passage of ANCSA and ANILCA, for the Native Corporations. As a result, many recent State and Native Corporation investigations assess the potential for mineral resource development in selected areas. The following use many of these sources to describe known mineral resources and to provide the basis for mapping mineral potential within the Eastern Interior planning area.

A. Locatable Minerals

Locatable minerals include primarily metallic and certain nonmetallic industrial minerals generally found in lode or placer deposits. Cox and Singer (1987) define "mineral occurrence" as *a concentration of a mineral considered to have some value or scientific interest*, and "mineral deposit" as *an occurrence of sufficient size and grade that it could have economic development potential*.

With this in mind, the following present (1) an overview of the information that is used to describe locatable minerals, (2) summarize the existing mineral occurrences and deposits within the planning area, and (3) discuss criteria to determine the level of mineral development potential for the occurrences.

1. Mineral Occurrences

There is an abundance of publicly available information detailing mineral occurrences within the Eastern Interior planning area. Two databases were used to provide site-specific mineral occurrence information on a statewide basis, the USGS's Alaska Resource Data File (ARDF) and BLM's Alaska Minerals Information System (AMIS).

The ARDF database was the primary source of site-specific data for this report. The ARDF is an online public database that records locations and descriptions for metallic mineral mines, prospects, occurrences, and certain other high-value industrial mineral commodities (USGS, 2008A). USGS contract geologists compile and review the mineral and geologic information available for individual quadrangles. These geologists generally have local expertise. There are published ARDFs for each quadrangle in the Eastern Interior planning area, save for the Yukon Flats quadrangle that has no ARDF mineral occurrences. Much of the data is based on earlier systematic listings compiled by USGS geologists (e.g., Cobb, 1984 and 1975) and are updated as funding is available.

The Circle quadrangle ARDF published in 1998 has the most dated information. In 2008, the USGS updated its ARDF database with new mineral occurrences, but did not amend existing files (Grybeck, 2008). Within the Eastern Interior planning area, eight properties discovered or developed from 2006 through 2008 were added to the ARDF database.

The AMIS database project was developed to enable mineral occurrence information storage and retrieval for the BLM-Alaska Mineral Assessments program. AMIS is based on the original Mineral Availability Sys-

tem/Mineral Industry Location (MAS/MILS) database developed by the USBM from 1975 to 1995. BLM's AMIS database contains spatial and commodity data for documented mineral occurrences, deposits, mines, mining claims, and processing plant sites in Alaska (BLM, 2008). The data is stored and can be accessed through the BLM-Alaska State Office, Division of Resources, Branch of Energy and Solid Minerals. Until the demise of the Alaska Mineral Assessment program in 2007, the data was updated on an area-by-area basis.

The AMIS database has more locally thorough information for specific historical mine production, ownership and claim data. The ARDF data set has more editing in the Eastern Interior planning area and is more concise. After filtering, the AMIS database supplemented the ARDF data when drawing the higher resource potential boundaries.

For this assessment, the AMIS database was filtered to remove occurrences where there were only references to mining claim locations without further documentation. Within the Eastern Interior planning area, there are currently 685 ARDF sites and 1,113 AMIS sites, filtered to 910 AMIS sites. Many mineral occurrences are clustered around state lands near historic mining districts. This reflects where most mining activity is centered, since most BLM lands have been withdrawn from mining claim locations. See **Figure 1** for ARDF site locations.

Table 5 presents the number of ARDFs identified by the USGS as "Active" and is sorted by planning area subunit.

Several online USGS databases contain geochemical analyses of mineral materials, mainly stream sediment samples. These analyses can help to delineate mineral occurrences. However, no comprehensive evaluation of geochemical data was completed for this report, as geochemical anomalies generated are generally documented in various government databases as mineral locations.

2. Types of Mineral Deposits (Cox and Singer Models)

The science of mineral prediction is based partly on classifications derived from mineral deposit models. Mineral deposit models describe the essential attributes of different classes of deposits, including the origin of the mineral-hosting rocks and their relationship to the commodity types found. Such models have been developed for numerous mineral types by the USGS and other researchers (e.g., Cox and Singer, 1986; Orris and Bliss, 1991; Mosier and Bliss, 1992), and have been refined and expanded for Alaska-specific lode and placer deposits by Nokleberg and others (1987 and 1994). The models presented by Cox and Singer (1986) form the basis for the following discussion.

The authors of each ARDF open-file report assigns deposit models to most mineral occurrences where enough evidence is available to make a determination. Approximately 423 mineral sites in the Eastern Interior planning area have been assigned a deposit model in the ARDF database. An additional 113 sites lacking an ARDF-specified deposit model were assigned a practical model by the authors based on an evaluation of supplemental information available in the ARDF and other sources. A total of 143 ARDF mineral sites contained no explicit or practical deposit type information. Appendix A contains a copy of the complete descriptive text for each Cox and Singer model type occurring in the planning area. **Table 1** presents a summary of the geological setting for those deposit model occurrences in the Planning area. Deposit Model occurrences in the Eastern Interior planning area are presented with the Locatable Mineral Potential Areas in **Figure 4**.

Table 1 – Cox and Singer (1986 and 1992) deposit model classifications for the Eastern Interior - Planning Area.

Lithotectonic/Lithologic setting		**Deposit model occurring in EI Planning Area (see note)**	**No. of ARDF sites**	**Associated commodities**
Mafic and ultramafic intrusions				
Tectonically unstable areas	Ophiolites	**Major podiform chromite (8b)**	1	Cr-(Ni)
		Listwaenite Au	4	Au
		Alaskan PGE (9)	1	Pt (PGE)
		(Placer Au-PGE) (39a)	236	Au-PGE
	Serpentine	**Serpentine-hosted asbestos (8d)**	3	Asbestos(Cr-Au)
		(Low-sulfide Au-quartz vein) (36a)	83	Au (Ag)
Felsic Intrusives				
Mainly phanero-crystalline textures	Wallrocks are calcareous	**W skarn (14a)**	22	W
		Sn skarn (14b)	1	Sn (U-Be-F)
	Other wallrocks	**Sn greisen (15c)**	2	Sn (F-Be)
Porphyro-aphanitic intrusions present	Deposits near contact	**Zn-Pb skarn (18c)**	2	Ag-Pb-Zn (Cu)
		Fe skarn (18d)	1	Fe, Cu
		Cu skarn (18b)	12	Cu (Au)
	Deposits far from contact	*Polymetallic replacement (19a)*	5	Ag-Pb-Zn-Cu
	Deposits within intrusions	**Porphyry Cu-Mo (21a)**	16	Cu-Mo
		Mesothermal Plutonic Related Gold (N/A)	9	Au
		Porphyry Cu-Au (20c)	1	Au
		Porphyry Mo, low-F (21b)	6	Mo-Pb-Zn
	Deposits within wallrocks	**Polymetallic veins (22c)**	39	Au-Ag-Pb-Cu-Zn
		(Low-sulfide Au-quartz vein) (36a)	83	Au (Ag)
Extrusive rocks				
Felsic-mafic extrusive rocks	Deposits in older clastic sedimentary rocks	**Simple Sb (27d)**	8	Sb (Au)
	Deposits in felsic to intermediate volcantic rocks	**Comstock epithermal veins (model 25c)**	9	Au (Ag)
	Marine	**Cyprus massive sulfide (24a)**	2	Cu-Zn

		Kuroko massive sulfide (28a)	53	Cu-Pb-Zn (Au-Ag)
		(Low-sulfide Au-quartz vein) (36a)	83	Au (Ag)
Sedimentary rocks				
Clastic sedimentary rocks	Shale-siltstone	**Sedimentary exhalative Zn-Pb [SEDEX] (31a)**	6	Zn-Pb (Ag-Ba)
	Sandstone	**Sandstone Uranium (30c)**	2	U-Th
Carbonate rocks	No associated igneous rocks	*SEDEX (31a)*	6	Zn-Pb (Ag-Ba)
		Carbonate-hosted Zn-Pb (32b)	8	Zn-Pb
	Igneous heat sources present	**(Polymetallic replacement) (19a)**	5	Ag-Pb-Zn-Cu
Chemical sediments	Restricted basin	**Upwelling-type phosphate deposit (34c)**	1	P
Regionally metamorphosed rocks (Derived mainly from eugeosynclinal rocks)				
		(Serpentine-hosted asbestos) (8d)	3	Asbestos(Cr-Au)
		Low-sulfide Au-quartz vein (36 a)	83	Au (Ag)
Surficial and unconformity-related (Deposotional)				
		Placer Au-PGE (39a)	236	Au (PGE)
		Total number of Deposit Model determinations in EI Planning Area	**537**	
		Sites where Deposit Model is Unknown or Undetermined	**143**	
		Number of ARDF sites in EI Planning Area	**680**	

Note – Bold deposit models are considered the primary mode of classification.

– Italics denote an "Alternative Classification" – a deposit type setting is less favored by Cox and Singer (1987).

3. Historic Production

An inventory of historic mining activity is used to identify specific commodities and deposit types most likely to be developed or discovered and in what areas in the future. Furthermore, the lands encompassed by the Eastern Interior planning area reflect a substantial history of mining and mineral exploration. Placer gold is the main historic commodity produced in the planning area, although numerous historic producing lode deposits exist. The following subsections briefly describe the historic production of locatable resources, by deposit type and/or resource, in the Eastern Interior planning area. **Figure 1** presents the locations of historical lode producers. **Table 2** presents an estimated summary of placer and lode gold produced in the Eastern Interior planning area described in terms of Mining Districts (Ransome and Kerns, 1954). **Figure 3** presents the historic placer deposits and summarizes those areas, where the most significant production has occurred (Nokleberg and others, 1993;

and USGS, 2008A). **Table 3** presents a summary of historic lode producers based on a query of the ARDF database (USGS, 2008A).

Placer Gold: The first significant discovery of gold in the planning area and in Alaska was in 1887 on Franklin Creek, a tributary to the Fortymile River. Gold has been mined in the region continually ever since. The ARDF database contains information on 236 placer gold occurrences existing in the Eastern Interior planning area. This report considers all placer occurrences to be at least past producers. In its 2007 Mineral Industry Report, the DGGS lists 101 separate companies or individuals as producing gold in the planning area (Szumigala and others, 2010).

Table 2. Ounces of gold produced in the EI Planning Area by mining district, through 2009**.**

District[1]	Total gold produced in EI Planning Area[2]	Placer Gold	Lode Gold	Placer gold since 2001[5]	Lode gold since 2001[5]
Rampart[3]	0	N/A	N/A	N/A	N/A
Tolovana	530,233	530,233	0	767	0
Yukon Flats	0	0	0	0	0
Circle	1,097,134	1,097,134	0	38,691	0
Black	2	2	0	2	0
Eagle	52,121	52,121	0	121	0
Fortymile	573,027	573,027	0	26,593	0
Chisana[3]	0	N/A	N/A	N/A	N/A
Tok	280	280	0	0	0
Goodpaster	1,112,561	2,050	1,110,511	0	1,110,511
Fairbanks[4]	9,387,708	7,946,562	4,321,592	31,117	2,144,147
Delta River	8,270	8,270	0	0	0
Sheenjak	0	0	0	0	0
Total	11,525,626	10,757,820	4,763,876	195,778	2,517,331

[1] District boundaries established by Ransome and Kerns, 1954.
[2] Source: Szumigala (2010).
[3] Gold produced in the Rampart and Chisana Districts was out of the EI Planning Area.
[4] Production includes gold produced in the Richardson Subdistrict of the Fairbanks Mining District.
[5] 2001 production data from Swainbank and others (2002).

The EI Planning Area includes all or portions or all of the 13 mining districts, as established by Ransome and Kerns (1954). Circle, Tolovana, Eagle, Fortymile and Fairbanks districts are classified as major gold producing districts, with Fairbanks the largest producer in Alaska (Nokleberg, 1993).

The Eastern Interior planning area boundary bisects the Fairbanks mining district, segregating the mining around Ester and half of the dredged areas on Goldstream Creek. The Fairbanks mining district produced a total of 13 million troy ounces of gold from 8.3 million placer and 4.7 million hard rock sources (including the Richardson Subdistrict). About 11.2 million ounces of gold is produced in the planning area, with rough estimates that half of the placer gold produced in the Fairbanks district is within the Eastern Interior planning area boundary and the entire results of lode gold. As of 2007, the Tolovana, Eagle, Fortymile and Circle mining districts contribute a combined total of about 1.7 million ounces of gold.

Low-sulfide Au-quartz veins (model 36a: 83 occurrences): The ARDF database has 29 quartz veins that were past producers of gold in the Eastern Interior planning area. The Cleary Hill/Summit, Henry Ford, and

McCarty Shaft mines were the largest producers of quartz vein deposit types – all located in the Fairbanks mining district. Cleary Hill (ARDF# LG119) produced an estimated 100,000 fine ounces of gold since the early 1900's when it was first mined, and may yet contain an additional 100,000 ounces of gold in steeply dipping high-grade quartz veins. The McCarty Shaft (ARDF# LG150) and the Henry Ford Mine (ARDF # LG153) were both mines on the McCarty/American Eagle vein system just east of Cleary Hill. These mines were assigned a Low-Sulfide Au-quartz vein model when one was not listed in the ARDF database, although a polymetallic vein (model 22c) description may be well-suited. The ore from these mines consisted of native gold in quartz and arsenopyrite (FeAsS) veins within a northeast striking shear and vein system.

Fort Knox porphyry gold (1 occurrence): The Fort Knox Mine (ARDF# LG115) has been the largest producer of gold in Alaska since its commissioning in 1996. As of the end of 2006, Fort Knox had produced 2.7 million ounces of gold from a low sulfide granodiorite/quartz monzonite pluton (Szumigala, 2008). An additional 1.3 million ounces of measured and indicated gold reserves remain at the mine, in ore grading 0.018 oz/ton, with mining expected to continue through 2014. There is no Cox and Singer model for the Fort Knox model. The deposit is best described by an excerpt from Quandt and others, 2008):

The Fort Knox gold deposit is hosted by a granitic body that intruded the Fairbanks Schist. The surface exposure of the intrusive body is approximately 1,100 meters in the east-west direction and 600 meters north-south. Gold occurs in and along the margins of pegmatite veins, quartz stockwork veins and veinlets, quartz-veined shear zones, and fractures within the granite. The stockwork veins strike predominantly east and dip randomly. Stockwork vein density decreases with depth. Shear zones generally strike northwest and dip moderately to the southwest. Gold mineralization in the quartz-filled shears is distributed relatively evenly, and individual gold grains are generally less than 100 microns in size. The gold occurrences have a markedly low (less than 0.10%) sulphide content.

Polymetallic Veins (Cox and Singer deposit model #22c: 39 occurrences): There were 14 mines – all in the southeast corner of the Livengood quadrangle northeast of Fairbanks – that produced gold from polymetallic veins. The largest producer was the Hi-Yu (ARDF# LG182) that produced over 22,000 ounces of gold in the 1930's and an unknown amount of gold earlier in the last century. These historic mines typically exploited narrow (a few inches to a few feet wide) high-grade gold and sulfide-bearing quartz veins.

Simple Antimony (Cox and Singer deposit model #27d: 8 occurrences): Four mines in the Eastern Interior planning area produced antimony (Sb) from small stibnite (Sb2S3) deposits. This includes the Hindenberg mine on what is now the True North deposit. During World War II, 200 tons of stibnite ore was mined at grading 38% Sb. Production from the other mines was small or consisted of bulk samples.

Tungsten (W) Skarns (Cox and Singer deposit model #14a: 22 occurrences): Two mines near Gilmore Dome northeast of Fairbanks produced scheelite (CaWO4) ore from contact of metamorphic rocks. The Yellow Pup mine (ARDF# FB118), a shallow surface mine, produced a small amount of ore from carbonaceous schist. The Stepovich mine (ARDF# FB13) produced about 300 tons of ore from crystalline marble in contact with quartz pegmatite from 1915 through 1956.

Polymetallic Replacement (Cox and Singer model #19a: 5 occurrences): Cheechako No. 1 mine (ARDF# LG107) produced 1,083 ounces of silver and 3.67 tons of lead from 24 tons of galena, chalcopyrite, stibnite, and sphalerite ore. The ore was mined in 1916. In 1980, Cheechako mine produced 186 dry tons of ore of unknown grade and shipped it to a smelter, but there are no current reports of production.

Comstock epithermal veins (model #25c: 1 occurrence): The only significant lode mine in the Fortymile Mining District was the Purdy mine (ARDF# EA121) a few miles north of Chicken, Alaska. The Purdy deposit was high grade, but small and quickly mined out.

Shear-hosted, plutonic-related mesothermal Au-quartz veins (1 occurrence.) The Pogo mine (ARDF# BD033) consists of several high-grade stacked shallow-dipping low-sulfide free gold bearing quartz veins in gneiss. From 2006 when mining began at Pogo, through 2009, the mine produced 1.1 million ounces of gold (Szumigala and others, 2008). Pogo has 3.7 million ounces still in reserves as mining continues.

Plutonic-related gold [(USGS, 2008a): 8 occurrences]: At the Democrat Lode, Richardson Subdistrict, Fairbanks Mining District, a highly-altered sulfide-bearing rhyolite was mined sporadically, but development ceased in recent years. Discovered in 1913, the site is now an open cut about 900 feet long that has had several phases of mining, including a 100,000 ton bulk sample mined at the Democrat Lode in 1998. It is unknown how much gold was recovered. This deposit type does not have a Cox and Singer model, but McCoy and others describe it well in the Mineral Deposits of Alaska Monograph 9 (1997).

Thorium-Rare-Earth veins [model #11d (USGS, 1991)]: One occurrence. At the Roy Creek intrusive REE, thorium and uranium minerals are in veins within a syenite pluton. It is believed there are smaller syenite intrusives east of the Roy Creek pluton that are genetically related to the main body. These veins were sampled and drilled in the late 1970's and early 1980's. Recent forecasts of world-wide shortages in REE supplies have increased industry interest in REE deposits. This deposit model is used as the nearest comparison to the Roy Creek deposit.

Table 3 – Historic Lode Producers, Eastern Interior Planning Area

Name	Quadrangle	ARDF #	Deposit type[1]	Commodity[2]	Production[3]
Blue Lead; Blue Lead Extension	Big Delta	BD003	Low-sulfide Au-quartz veins (36a)	Au	Small
Democrat Lode; John Mitchell Lode	Big Delta	BD014	Plutonic Related Au (USGS, 2008)	Au	Small
Gray Lead	Big Delta	BD017	?	Au	Small
Grizzly Bear; Yellow Jacket	Big Delta	BD018	Low-sulfide Au-quartz veins (36a)	Au	Small
Michigan Lode; Michigan Lead	Big Delta	BD025	Low-sulfide Au-quartz veins (36a)	Au	Small
Molly Creek; My Creek	Eagle	EA100	Simple Sb (27d)	Sb	Small
Purdy	Eagle	EA121	Comstock epithermal veins (25c)	Ag, Au, Cu	Small
Stepovich	Fairbanks	FB113	W skarn deposit (14a)	W	Small
Voght; Melba Creek; Monte Cristo; Granite Hill	Fairbanks	FB116	?	Au	Small
Yellow Pup	Fairbanks	FB118	W skarn deposit (14a)	W	Small
American; American Eagle; Perrault; Perrault and Murphy	Fairbanks	FB120	Low-sulfide Au-quartz veins (36a)	Au	Small
Brumfield	Fairbanks	FB154	Low-sulfide Au-quartz veins (36a)	Au	Small
Hudson; Sunshine No. 2	Livengood	LG015	?	Hg	Small
Unnamed (Livengood Creek)	Livengood	LG022	Simple Sb (27d)	Sb	Small
Gilmer	Livengood	LG046	?	Sb	Small
Frederich	Livengood	LG047	?	Au	Small

Name	Quadrangle	ARDF #	Deposit type[1]	Commodity[2]	Production[3]
Soo; Spaulding; Wild Rose; Chief; Waterbury; Waverly; Inspiration; Carnation	Livengood	LG052	Polymetallic veins (22c)	Au	Small
Hindenburg; Markovich	Livengood	LG054	Simple Sb (27d)	Sb	Small
Silver Fox; Silvertone; Busty Belle	Livengood	LG062	?	Ag	Small
Burnet	Livengood	LG074	Low-sulfide Au-quartz veins (36a)	Au	Small
Independence	Livengood	LG075	Low-sulfide Au-quartz veins (36a)	Au	Small
David	Livengood	LG078	Low-sulfide Au-quartz veins (36a)	Au	Small
North Star Extension	Livengood	LG081	?	Au	Small
Whitman & Murray	Livengood	LG083	Low-sulfide Au-quartz veins (36a)	Au	Small
Rainbow	Livengood	LG084	Polymetallic veins (22c)	Au	Small
Hirschberger and Zimmerman	Livengood	LG087	Low-sulfide Au-quartz veins (36a)	Au	Small
White Elephant	Livengood	LG088	Polymetallic Replacement Deposits (19a)	Ag	Small
Wackwitz; Silver King; Little Jim	Livengood	LG090	?	Ag, Pb, Sb	Small
Emma; Overgard; Kathrine	Livengood	LG093	Polymetallic veins (22c)	Au	Small
Robinson; Mohawk; Franklin; Rose; Heilig and Creighton	Livengood	LG095	Polymetallic veins (22c)	Au	Small
Hidden Treasure	Livengood	LG098	Low-sulfide Au-quartz veins (36a)	Au	Small
Newsboy	Livengood	LG100	Low-sulfide Au-quartz veins (36a)	Au	Small
RV	Livengood	LG101	Low-sulfide Au-quartz veins (36a)	Au	Small
Cheechako No. 1; Eldorado; Westonvitch	Livengood	LG107	Polymetallic Replacement Deposits (19a)	Au	Small
Tolovana	Livengood	LG110	?	Au	Small
Stepovich #1	Livengood	LG115	Low-sulfide Au-quartz veins (36a)	Au	Small
Bedrock Creek	Livengood	LG116	Low-sulfide Au-quartz veins (36a)	Au	Small
Wyoming	Livengood	LG118	Low-sulfide Au-quartz veins (36a)	Au	Small
IXL	Livengood	LG126	Low-sulfide Au-quartz veins (36a)	Au	Small
Scott Reese; Rex	Livengood	LG127	Low-sulfide Au-quartz veins (36a)	Au	Small
Blue Moon Mazeppa; Pioneer; Blue Bell	Livengood	LG128	?	Au	Small
Foster Hungerford; Empire; Alaska Group	Livengood	LG140	Low-sulfide Au-quartz veins (36a)	Au	Small
Alaska; Gladstone; Jupiter-Mars; Grace E#2?	Livengood	LG141	Polymetallic veins (22c)	Au	Small
Empire	Livengood	LG142	Low-sulfide Au-quartz veins (36a)	Au	Small
Quemboe Bros.	Livengood	LG144	Low-sulfide Au-quartz veins (36a)	Au	Small
Harris and Brown; Sky High; Grace E#1	Livengood	LG145	Polymetallic veins (22c)	Au	Small
Christina; Vetter; Shelden	Livengood	LG146	Low-sulfide Au-quartz veins (36a)	Au	Small
Chatham	Livengood	LG147	Polymetallic veins (22c)	Au	Small
McCarty	Livengood	LG152	Polymetallic veins (22c)	Au	Small
Pioneer	Livengood	LG155	?	Au	Small
Pennsylvania	Livengood	LG156	?	Au	Small
Rexall	Livengood	LG159	Low-sulfide Au-quartz veins (36a)	Au	Small
Ohio; Early Bird; Mayflower; Connors and Stevens	Livengood	LG165	Low-sulfide Au-quartz veins (36a)	Au	Small
Whitehorse	Livengood	LG170	Low-sulfide Au-quartz veins (36a)	Au	Small

Name	Quadrangle	ARDF #	Deposit type[1]	Commodity[2]	Production[3]
Rob Roy; Saucy; Wolf	Livengood	LG173	?	Au	Small
Nars Anderson; Dorando	Livengood	LG174	Polymetallic veins (22c)	Au	Small
Mizpah; Black Joe	Livengood	LG180	Polymetallic veins (22c)	Au	Small
Eureka	Livengood	LG190	Low-sulfide Au-quartz veins (36a)	Au	Small
Charles	Livengood	LG192	Polymetallic veins (22c)	Au	Small
Tok Antimony; Stibnite; A Lucky Leak; Gamblin; Caulk	Tanacross	TC029	Simple Sb (27d)	Sb	Small
McCarty shaft	Livengood	LG150	Low-sulfide Au-quartz veins (36a)	Au	Medium
Henry Ford	Livengood	LG153	Low-sulfide Au-quartz veins (36a)	Au	Medium
Homestake	Livengood	LG157	?	Au	Medium
Hi-Yu; Crites and Feldman	Livengood	LG182	Polymetallic veins (22c)	Au	Medium
Pogo; Liese Creek	Big Delta	BD033	Shear-hosted Mesothermal veins (USGS, 2008A)	Au	Large
Fort Knox	Fairbanks	FB115	Fort Knox type porphyry Au	Au	Large
Cleary Hill; Summit; Cleary; Freegold	Livengood	LG119	Low-sulfide Au-quartz veins (36a)	Au	Medium

[1] Deposit models based on Cox and Singer, (1987); Cox and Singer deposit models are summarized in Section III.2), all others are small producers (USGS, 2008A)
Bold denotes "Significant Deposit" (Nokleberg and others, 1993

4. Significant Deposits

Although the AMIS and ARDF electronic databases list all reported occurrences and deposits regardless of economic potential, Nokleberg and Others (1987, 1993, and 1994) provided summaries of lode deposits they considered most significant based on size, favorable geology, likelihood of economic development, and industry interest at that time. The DGGS annual Alaska's Minerals Industry Report series provides some updating to the list of significant mineral deposits (Szumigala, 2008). The updated list uses ARDF data (USGS, 2008) along with the DGGS Special Report series. This update includes additional sites not known or fully developed at the time of Nokleberg's publications and highlights occurrences with resource volume data. The final list of 15 deposits is referred to as the "Significant Deposits" data set. Significant Deposit locations are presented on Figure 1; Table 4 presents a summary of Significant Deposits of the Planning Area. It should be noted that the Significant Deposits data includes only lode projects; a summary of significant placer production by district was presented above in Section III. 3- Placer Gold.

Table 4 – "Significant Deposits", Eastern Interior Planning Area

Deposit Name	**Quadrangle**	**Deposit model type[1]**	**Commodity**	**Production**
Fort Knox[2]	Fairbanks	Fort Knox type porphyry Au	Au	Large
Delta District (MID)[2]	Mount Hayes	Kuroko massive sulfide (28a)	Pb, Zn	None
Blue Lead; Blue Lead Extension[2]	Big Delta	Low-sulfide Au-quartz veins (36a)	Au	Small
Cleary Hill; Summit[3]	Livengood	Low-sulfide Au-quartz veins (36a)	Au	Medium
Livengood/Money Knob[4]	Livengood	Low-sulfide Au-quartz veins (36a)	As, Au, Fe, Sb	None

Democrat; Mitchell Lode[2]	Big Delta	Plutonic Related Au (No Model #)	Au	Small
Pogo; Liese Creek[3]	Big Delta	Mesothermal Shear hosted Quartz veins	Au	Large
LWM[4]	Eagle	Polymetallic Replacement Deposits (19a)	Ag, Au, Hg, Pb, W, Zn	None
Taurus[2]	Tanacross	Porphyry Cu-Mo (21a)	Cu, Mo	None
Slate Creek Asbestos	Eagle	Serpentine-hosted asbestos (8d)	Asbestos	None
LMS[4]	Big Delta	Undetermined	Au	None
Roy Creek (formerly Mt. Prindle)[25]	Livengood	Thorium-REE veins (11d)	REE, U	None
True North[3]	Livengood	Undetermined	Au	Large
Dolphin[3]	Livengood	Undetermined	Au	None
Gil[3]	Livengood	Undetermined	Au	None

[1] Deposit models based on Cox and Singer (1987).
[2] Based on descriptions from Nokleberg et al (1993)
[3] Based on descriptions from Szumigala et al, Special Report 62 (2008)
[4] Based on descriptions from USGS Open-File Report 2008-1225 (Grybeck, 2008)
[5] Located on BLM managed lands

Significant Deposit locations are presented on **Figure 1** and **Table 4** presents a summary of Significant Deposits of the planning area. The Significant Deposits data includes only lode projects (see Section III—Placer Gold for a summary of significant placer production by district).

5. Mining Claims

Statewide mining claim locations are available electronically from BLM-Alaska (federal) and DNR (state). Mining claim activities show industry interest in a region or locality to delineate areas of high-mineral occurrence and development potential. Federal and state claims are shown on **Figure 2**. **Table 5** presents a summary of current claim activity coincident to the Eastern Interior planning area.

Federal Mining Claims

Federal mining claim locations generally indicate a level of mineral potential and exploration known prior to 1971. Due to ANCSA 17(d)(1) and ANILCA land withdrawals, there has been no opportunity to stake federal mining claims on most–if not all–BLM-managed lands within the Eastern Interior planning area since that time.

The BLM has maintained an electronic record of federal mining claim locations since 1999. Before 1999, agencies kept the outlines of federal mining claims on paper maps. Many mining claims locations staked before emplacement of withdrawals but closed before 1999 have not been tracked, as they were never converted to electronic formats. Although these mining claims closed for various reasons, they endow some level of mineral development potential because they represent the mining-related activity before the withdrawals. These claims may show areas of activity if withdrawals were lifted.

Closure of mining claims may have resulted from low gold prices, failing to make annual filings, or transfers. Some federal claims converted to state claims when conveyances occurred. Other claims were transferred to

Native Corporations, by the claim owner through a mineral patent, or declared invalid through a mineral examination.

BLM's Alaska Land Information System (ALIS) electronic database contains all BLM-Alaska records related to federal lands and all transactions related to them. A query of ALIS from 1979 to 1999 before mining claim locations were tracked on digital maps, show that there were 6,212 placer and 8,866 lode claims within the planning area. ALIS contains the section, township, and range from the Public Land Survey System (PLSS) for each mining claim. All of the closed mining claims from 1979 to 1999 can be mapped to at least the nearest square-mile section, if not the nearest quarter-section, from the recorded PLSS location information.

If federal claims on BLM-managed public lands withdrawn in the 1970's are isolated, ALIS shows at one time there were 6,713 federal claims on BLM-managed lands. There are now 910 federal mining claims in the planning area, with 797 of those outside of National Park lands. Most BLM lands within the Eastern Interior planning area were closed since the early 1970's. ALIS closed mining claim records were used to refine mineral potential boundaries.

State Mining Claims

Some federal mining claims are, at least partially, covered (over-staked) by later state mining claim activity on State-selected and dually State- and Native-selected lands. In the final conveyance, some of these dually claimed parcels will not remain under federal ownership if they are converted to State claims.

There are two types of state mining leaseholds generally termed a "claim": (1) The 40-acre mining claim and (2) the 160-acre prospecting site. A legal mining claim is located (staked) to acquire the locatable mineral rights in an area.

A mining claim necessitates the prior discovery of locatable minerals within the claimed area. A prospecting site grants the owner an exclusive right to explore a parcel up to 160 acres of State land. During a prospecting sites' two-year term, owners have an exclusive right to record mining claims or leasehold locations within the boundaries of the site. The main difference between the prospecting site and a mining claim is that no legal "discovery" is necessary for locating a prospecting site.

Table 5 - Mining Claims and Prospecting Sites, Eastern Interior Planning Area

Type	Acres claimed[1]	No. of individual claims[2]	No. of unique owners[3]
Federal mining claims (unpatented) outside National Parks	**21,200**	**797**	**81 names**
State prospecting sites	1,500	14	6 names
State mining leases	12,700	26	14 names
State mining claims	1,250,500	16,062	437 names
State claims Total	**1,264,700**	**16,169**	**457 names**
Grand Total	**1,285,900**	**17,107**	**538 names**

[1]State claims data based on a 5/18/2011 extract from State of Alaska database.

[2]Federal claims data based on the most current 5/16/2011 version of the data set.

[3]Unique names represent large mining companies, Native Corporations, individuals, or small associations.

Claims and prospecting sites staked on State-selected federal lands do not require the annual maintenance fees until the final land ownership is resolved. Once the final land ownership status is determined, whether federal or Native, these State mining claims will be declared null and void. Those claims on State-conveyed lands will begin to require annual payments and assessments.

6. Mining Operations

Each year in Alaska, hundreds of annual placer mining permit applications are filed for federal and state placer, dredging, and surface exploration activities. BLM-Alaska accepts these permit applications as Plans of Operation or Notices of Operation. Mining operations that require submission of a Plan are typically in full production, disturbing over five acres or located on lands under special management. Notice level operations are typically exploration activities disturbing less than five acres.

As of November 2010, there were 68 active mining operations in the Eastern Interior planning area required to file Plans of Operation or Notices with BLM-Alaska. An ALIS database query shows an additional 92 case files pertaining to Plans of Operation opened and closed between 1979 and May 2011.

Table 6 presents both the number of active and closed mining claims and “Active” ARDF sites. There were also 136 Notices filed and closed within the same period. “Active” mining operations and “Active” ARDF sites represent areas of high mineral occurrence and development potential. When determining mineral potential boundaries, closed plans and notices were also given weight when combined with federal mining claims.

Table 6 - Mining Claims, Mining Plans of Operations and Notices, and Active ARDF Sites by EIRMP Area Subunit.

EIRMP Subunit	Active Federal Mining Claims	Closed Federal Mining Claims	Active Federal Plans or Notices	Closed Federal Plans or Notices	Active ARDF Sites
Forty Mile	378	7210	44	106	67
Black River	0	42	0	0	12
Steese	247	5,149	17	102	9
White Mtn.	172	2,670	7	20	2
Totals	**797**	**15,071**	**68**	**228**	**90**

7. Mineral Terranes of Alaska and Known Mineral Deposit Areas

The word “terrane” is typically used for an assemblage of related rocks that occupy a certain geographic area (Thrush, 1968). Mineral terrane maps depict rock associations whose geologic settings are considered highly favorable for metallic mineral resources. Specific commodities and mineral deposit types are more likely to exist within each terrane based on a terrane’s particular geologic nature. Unmapped areas are generally evaluated as

“poor to only moderate” mineral potential. The USBM originally described and mapped Mineral Terranes of Alaska (MTA), which was subsequently revised and published several times by the Arctic Environmental Information and Data Center (AEIDC) (1979); Hawley and AEIDC (1982); Resource Data, Inc. and others, (1995); and Szumigala and others (1999). **Table 7** and **Figure 5** describe the MTAs identified in the Eastern Interior planning area.

Mineral deposit types are categorized by formation process and rock type. Syngenetic mineral deposits form about the same time as the rocks they are encased in, while epigenetic deposits form by metamorphic or hydrothermal alteration processes following host rock deposition (AEIDC, 1979). Further subdivisions of mineral terranes into rock types recognize that certain kinds of minerals are associated with certain kinds of host rocks. For example, the metallic elements copper, nickel, chromium, and the nonmetallic mineral asbestos are typically associated with mafic igneous rocks or gabbro; while copper and zinc are typically associated with layered submarine volcanic rocks and sulfide-rich sediments, referred to as volcanogenic massive sulfide (VMS) deposits (AEIDC, 1979; Hawley and AEIDC, 1982).

Known Mineral Deposit Areas (KMDAs) are described as a management tool to determine the likelihood of future discoveries in a particular area (RDI and others, 1995). These area features are based on a high concentration of historic mines and prospects, mineral occurrences in the AMIS database, and favorable geologic trends determined by MTA mapping. KMDAs have a high concentration of mineral occurrences of a single type, suggesting an increased likelihood of hosting significant mineral deposits compared to other areas. The KMDA Deposit sites include those labeled as Significant Deposits in this report, except for several newer deposits (see Section 4). The most recent version of KMDA data is electronically available with the MTA (RDI and others, 1995). **Figure 5** shows KMDAs in the Eastern Interior planning area.

Table 7 - Mineral Terranes of Alaska (MTA) Units Eastern Interior Planning Area

Map unit (% of EI Planning Area covered)	Rock type	Favorable commodities
SYNGENETIC DEPOSITS		
Intrusive Terranes		
IGA (0.2%)	ALKALIC GRANITIC ROCKS – syenite, and locally peralkaline granite and monzonite.	Favorable for deposits of uranium and REE[1].
IGF (2.1%)	FELSIC GRANITIC ROCKS – granite and quartz monzonite.	Favorable for deposits of tin, tungsten, molybdenum, uranium, and thorium.
IGI (1.1%)	INTERMEDIATE GRANITIC ROCKS – granodiorite and quartz diorite.	Favorable for deposits of copper, gold, and molybdenum.
IGU (8.8%)	UNDIVIDED GRANITIC ROCKS – granite.	Favorable for deposits of the three above groups.
Mafic-ultramafic Rocks		
IUM (0.3%)	ULTRAMAFIC ROCKS – peridotite and dunite.	Favorable for deposits of chromium, nickel, and PGE[2], with by-product cobalt.
IMA (0.10.2%)	MAFIC INTRUSIVE ROCKS – gabbro, and locally mafic-rich intermediate rocks such as mafic monzonite and diorite.	Favorable for deposits of copper and nickel, with by-product platinum and cobalt.
Volcanic – Sedimentary Terranes		
VFU (1.4%)	FELSIC VOLCANIC ROCKS, UNDIVIDED – rhyolite and quartz latite.	Favorable for deposits of copper, lead, and zinc, with by-product silver and gold.
VSF (2.8%)	SEDIMENTARY AND FELSIC VOLCANIC ROCKS, UNDIVIDED – rhyolite, quartz latite, and associated sediments.	Favorable for deposits of copper, lead, and zinc, with by-product silver and gold.
Mafic Volcanic Rocks		
VSM (3.3%)	SEDIMENTARY AND MAFIC VOLCANIC ROCKS, UNDIVIDED – basalt and associated sediments.	Favorable for deposits of copper and zinc, with by-product silver and gold.
VOP (4.2%)	OPHIOLITIC TERRANE – pillow basalt and associated mafic and ultramafic intrusives with minor chert and other pelagic sediments.	Favorable for deposits of copper, nickel, and chromium, with by-product PGE[2] and gold.
Sedimentary Terranes- Marine rocks		
SLS (4.8%)	LIMESTONE AND SHALE – limestone and dolomite with interbedded shale.	Favorable for deposits of copper, lead, and zinc.
SBS (5.4%)	BLACK, CARBONACEOUS SHALE AND LIMESTONE – limestone, dolomite, black shale, and chert.	Favorable for deposits of zinc, lead, and barium, with by-product silver.

Sources: AEIDC (1979); Hawley and AEIDC (1982); RDI and others (1995)

[1]REE = rare earth elements (e.g., lanthanum, cerium, neodymium)

[2]PGE = platinum group elements (e.g., platinum, palladium, iridium)

The KMDA area information includes two subsets of site-specific data. The first subset shows 149 specific deposits considered significant in the Eastern Interior planning area -- this set of specific deposits are “KMDA Deposits.” The KMDA Deposits data represents a derivative of the AMIS data. Where AMIS includes all documented mineral occurrences regardless of significance, KMDA Deposits represent sites with noteworthy exploration or development histories and some indications of resource potential. The second subset from the KMDA data is “KMDA Placer Commodities” that highlights the most significant stream courses for placer production. Forty-three separate stream portions comprise the planning area’s KMDA Placer Commodities subset.

8. Undiscovered Mineral Occurrence Potential

USGS Circular 1178 discusses Undiscovered Mineral Occurrence Potential, specifically gold, silver, copper, lead, and zinc (USGS, 1998). Summary information from the circular did not affect the mineral potential ranking contained in this report. However, the circular's list of important mineral deposits was reviewed for consistency with those described in Section III.A.4, Significant Deposits.

9. Mineral Resource Reports

The DGGS, USBM, BLM, and USGS conducted a number of investigations specific to mining districts and specific deposit localities over the past few decades. In the early 1970's DGGS mapped and described mineral deposits, metalliferous provinces, and mining activity throughout the state (Selkregg, 1974a). The USBM and BLM have conducted mining district and site-specific studies throughout Alaska. The USGS has conducted numerous Alaska Mineral Resource Assessment Program (AMRAP) and other geologic studies throughout Alaska. The following discusses the most significant mineral resource reports.

White Mountain Area Mineral Resource Potential

Of particular interest to this mineral potential assessment are the mineral and geological resource assessments of the White Mountain National Recreation Area ((NRA) after ANILCA mandated the appraisal of minerals before adopting the final management plans for the respective areas in 1980 (Smith and Wiltse, 1987). The DGGS, USGS, and USBM divided up the White Mountains NRA; with each agency studying, sampling, and assessing the mineral potential for their assigned areas. These study results are emphasized because they identify mineral potential in areas closed to mineral development activities for over 30 years.

The USGS sampled and mapped the balance of the White Mountains NRA that the DGGS did not study. The USGS concluded their field studies with probabilistic estimates of undiscovered mineral deposits. Their general conclusion was that undiscovered mineral potential was low with the exception of placer gold (in the Nome Creek drainages), tin-greisen deposits (Cache Mountain pluton), thorium, and rare earth elements (REE) veins (Roy Creek pluton). The USGS identified other mineral deposit models as potential for occurring in the study area, but these four with the highest probability for development were used in this assessment.

In addition to these deposits, the USGS sampled and identified the Tolovana Limestone formation as an enormous potential resource for high-quality limestone. Tolovana Limestone makes up the core of the "White Mountains." Their random samples of the formation, averaging 98.6 percent calcium carbonate, rank it among the highest quality limestone in the United States. The results infer there is at least 8 billion tons of high-quality limestone in the formation, but its remote location makes it uneconomical to mine.

The USBM investigated the placer resources of the White Mountains area (Fechner and Balen, 1988) and recommended three areas of high mineral development potential, including portions of Nome Creek and the upper portions of Beaver Creek. The DGGS studied Lime Peak and Mt. Prindle areas (Smith et al., 1987) and identified several areas of anomalous mineral potential. Like the USGS, DGGS ranked several tin-greisen bearing granite intrusives in their study area as having high lode deposit potential. Although identified as tin deposits, they may be more valuable for their silver, tantalum, and tungsten content. Much of the tin, silver, and tungsten potential are in six prospect areas in the Lime Peak pluton.The second area identified through proba-bilistic estimates as having potential are the small REE and Uranium bearing syenite intrusive in the southwest corner of their study area. These intrusive are likely related to the larger Roy Creek pluton immediately to the west. In attributing mineral potential in this study, the USGS and the DGGS identified resources are combined.

These reports all suggest a high probability of small gold bearing quartz veins coincident with the historic placer mining areas. There are many reports of thin gold bearing quartz veins throughout the historic placer districts in the Eastern Interior management area. High mineral potential boundaries are often extended to the headwaters of placer bearing streams and bench gravels to reflect the potential for development of the lode source of the respective placers.

Other Mineral Resource Reports

For more than 20 years as part of its "Special Report" series, DGGS has produced a series of annual reports documenting the status of exploration, development, and production for the Alaska mining industry (Bundtzen and others, 1986 and Szumigala and others, 2008). In addition to documenting significant past activities, these annual reports provide an update of current mineral resource development and production activities. "Selected significant mineral deposits and mineral districts in Alaska" are summarized as an Appendix in the more recent Special Report volumes, with current resource figures provided where available.

Mineral Deposits of Alaska (Goldfarb and Miller, 1997) presents an overview of Alaska's mineral deposits through a series of 15 separate papers. These papers focus on describing general deposit types or commodity assemblages that occur in the state. Deposit-specific information available for the state's most significant deposits is also summarized, often providing resource tonnages and grades complete with citations.

10. Strategic and Critical Minerals

Certain mineral commodities have been termed "strategic" or "critical" by the U.S. Government. Strategic minerals are those that are essential to national defense, for which we are mostly dependent on foreign sources for during war, and for which strict measures controlling conservation and distribution are necessary. Critical minerals are also essential to national defense, but their procurement during war is less serious because they are either produced domestically or can be obtained through more reliable foreign sources (Thrush, 1968).

Bundtzen and others (1980 and 1982) summarize significant sources and reserves of strategic and critical minerals in Alaska. In addition, the AMIS database (through its precursor MAS/MILS) was initially developed as a systematic assessment of strategic and critical minerals. Of the 17 strategic minerals known to occur in Alaska, 10 have been identified within the Eastern Interior planning area; four of the seven critical minerals found in significant concentrations in Alaska also exist within the planning area. **Table 8** presents a summary of planning area strategic and critical mineral occurrences, based mainly on primary commodities related to ARDF sites.

Table 8 – Strategic and Critical Mineral Occurrences, EIRMP

Commodity	Strategic/ Critical	No. of occurrences	Major deposits[1]
Antimony	Strategic	18	Molly Creek (EA100), Gilmer (EA046), Hindenberg (LG054)
Asbestos	Strategic	3	Slate Creek (EA043)
Chromium	Strategic	6	Parker (LG026)
Fluorine	Strategic	1	Hope Creek (CI078)
Mercury	Strategic	6	Hudson (LG015), near Amy Dome (LG025)

Nickel	Strategic	1	Fox Creek (FB086)
Platinum Group	Strategic	1	American Creek (EA054), Woodchopper Creek (CY038)
Rare Earth	Strategic	3	Hot Springs Creek (CI027), Roy Creek REE (No ARDF #)
Tin	Strategic	9	Ketchum Dome (CI032), Lime Peak Pluton (CI079)
Tungsten	Strategic	37	Stepovich (FB113), Yellow Pup (FB118) Cleary Creek (LG135)
Barium	Critical	4	CC Barite (MH348)
Gold	Critical	458	Fort Knox (FB115), Pogo (BD033)
Silver	Critical	61	Silver Fox (LG062), White Elephant (LG088)
Zinc	Critical	61	Hi-Yu (LG182)

[1]Significant Deposits (Nokleberg and Others, 1993) underlined.

B. Salable Minerals

The local demand in the Eastern Interior planning area for salable minerals, also called mineral materials, is generally met by producers located on private lands. The primary mineral material commodity is sand and gravel used in construction and road maintenance. The ARDF database does not evaluate mineral materials, but the AMIS database lists 20 sites as producing sand and gravel, or stone. The twelve sand and gravel sites are along major highways and provided sites for road construction. The eight sites listed in AMIS as “stone” occurrences are most likely also used for construction material.

Mineral Materials production has gradually decreased since construction of the Trans-Alaska Pipeline System. DGGS surveys sand, gravel, and stone production and reports results in the annual Alaska Mineral Industry reports. From 1967 to 1986, the state produced an average of 40 million tons per year of sand and gravel. From 1987 to 2007, the state producted an average of 14 million tons. The higher production levels in the seventies and eighties are related to the Trans-Alaska Pipeline System construction, with annual production peaking in 1974 at 119 million tons.

Current plans to construct a natural gas pipeline along the Dalton, Richardson, and/or Alaska highways will drive the materials demand higher, but engineering design (buried or above ground) will ultimately drive the level of demand. Because the proposed pipeline routes are mostly on state land, it is foreseeable that most resources for this portion of the proposed gas pipeline route will come from state or private lands in the Eastern Interior planning area.

The Alaska Mineral Industry reports also provide production by region. In 2007, 4.4 million of the reported 14.2 million tons of sand and gravel produced for the entire state came from the DGGS Eastern Interior region (Szumigala and others, 2008). Statewide production of building stone (e.g., crushed stone, D-1, riprap) has averaged about 3 million tons over the last 20 years. Of the 2.2 million tons of building stone reported for 2007, only 105 thousand tons came from the entire DGGS Eastern Interior region (Szumigala and others 2008). The DGGS Eastern Interior region is about twice as large of an area as the BLM’s Eastern Interior planning area for the RMP.

There are currently 10 active, BLM-managed mineral material sites within the Eastern Interior planning area. The sites have a total production of less than 150,000 cubic yards per year of sand and gravel. Again, these sites are utilized for local consumption and are generally located along the road system.

IV. RATIONALE FOR THE DEVELOPMENT OF POTENTIAL RATINGS

This section provides the rationale for generating potential ratings and explains the level of confidence criteria. The final result of this process is the generation of mineral occurrence and development potential map(s) for locatable and salable mineral resources in the area. This section outlines the how the rationale is used in generating mineral potential ratings and explains the level of confidence criteria for both locatable and salable mineral commodities. Areas of High and Medium Locatable Mineral Potential (LMP) will be tabulated and described in Section V – Mineral Occurrence and Development Potential.

A. Locatable

As stipulated under the 1872 mining law, locatable minerals include a variety of uncommon minerals such as precious metals (e.g.,Au and Pt) and base metals (e.g.,Cu, Pb, and Zn). Minerals containing these common metals, and the rock they are contained in, are considered locatable. Locatable minerals can also include uncommon varieties of rock that are considered rare such as precious stones (e.g., jade and diamonds), industrial stones (e.g., garnet and quartz sand), or building/decorative stones (e.g., marble and high granite) that have building-stone quality.

1. Potential Ratings

Occurrence potential ratings for locatable minerals are based on the following rationale:

High Locatable Mineral Potential [High LMP].

Areas of High LMP delineated based on available data including (in order of priority):

Containing a BLM active Plan or Notice level operation

Containing a past producing mine or mining area, closed BLM Plan or Notice level operation

Location of federal active mining claims

Location of State of Alaska mining claims or leasesConcentration of ARDF sites

Location of historic federal mining claims

Containing a Significant Deposit

Concentration of AMIS sites

Containing a KMDA site

Overlapping with a Known Mineral Deposit Area (KMDA)

Overlapping with a designated Mineral Terrane Area (MTA)

Overlapping with a historically producing placer district

For example, areas within the Eastern Interior planning area are mapped as High LMP where active mining operations occurred on federal or state mining claims and are coincident with Significant Deposits, KMDAs, or where existing mineral potential investigations have identified areas of high mineral potential. Areas with only one or two overlapping data sets implying high mineral potential are typically assigned a Medium LMP.

Medium Locatable Minerals Potential [Medium LMP]

Areas mapped as Medium LMP include MTAs, placer mining districts, closed mining claims without ARDF sites, KMDAs, and other areas not specifically mapped as areas of high mineral potential by previous authors. The combined High and Medium LMP categories encompass most of the mineral locations and occurrences identified in the AMIS and ARDF databases.

Low Locatable Mineral Potential [Low LMP]

All areas outside of the High and Medium LMP boundaries are interpreted to have Low LMP ranking for locatable mineral occurrences. No areas of the Eastern Interior planning area are considered to have a 'No' LMP ranking, since all geologic units have some measure of future mineral potential.

2. Application of Potential Ratings

A rating of High LMP based on the rationale outlined above embodies a specific set of data qualities. The bulk of this designation is based on the data provided in Section II (Description of Geology) and Section III (Description of Mineral Resources) - each information source listed in these two sections plays a role in assigning Potential Rating. **Table 9** presents a summary of the most pertinent site specific factors involved with assigning potential. The High LMP rating areas encompass all except one Significant Deposits, most KMDA Deposits, and KMDA Placer Commodity streams; Medium LMP areas contain most remaining KMDA Deposits and Placer Commodities, in addition to most production sites and mining claims not included within the High LMP areas. The main attributes influencing the extension of specific LMP outlines from those areas with the highest densities of significant occurrences are known producing mines, actively claimed areas, areas of recent activity, and areas with mineral potential documented in other studies.

Table 9 – Significance and Frequency of Deposit Models Eastern Interior Planning Area

Deposit Model[1]	Commodities[1]	No. of individual occurrences[2]	Production		Significant Deposit[3]
			Current	Past	
Placer Au (model 39a)	Au (Ag-Sn-W-Pt)	236	Yes	Yes	Yes
Low-sulfide Au-quartz veins (model 36a)	Au (Ag)	83	Yes	Yes	Yes
Kuroko massive sulfide (model 28a)	Cu-Pb-Zn (Au-Ag)	53			
Polymetallic veins (model 22c)	Au-Ag-Pb-Cu-Zn	39		Yes	Yes
W skarn deposit (model 14a)	W	22		Yes	Yes
Porphyry Cu-Mo (model 21a)	Cu-Mo-Au (Pb,Zn)	16			Yes
Cu skarn (model 18b).	Cu-Au-Ag	12			Yes
Comstock epithermal veins (model 25c)	Au-Ag (Cu, Pb)	9		Yes	Yes
Carbonate-hosted Zn-Pb (model 32b)	Zn-Pb (Ag)	8			
Simple Sb (model 27d)	Sb	8		Yes	Yes
Pluton related Au	Au	8			Yes
Sedimentary exhalative massive sulfide (model 31a)	Zn-Pb-Ag (Ba)	6			Yes
Porphyry Mo (model 21b)	Mo (Cu, Au, W)	6			Yes
Polymetallic Replacement De-posits (model 19a)	Ag-Pb-Zn-Cu	5		Yes	Yes
Listwaenite Au (Newberry and others, 1998)	Au	4			Yes
Serpentine-hosted asbestos (model 8d)	Asbestos	3			Yes
Cyprus massive sulfide (model 24a)	Cu-Zn	2			Yes
Sn greisen (model 15c)	Sn (F-Be)	2			Yes
Zn-Pb Skarn (model 18c)	Ag-Pb-Zn (Cu)	2			
Mississippi Valley type lead-zinc deposit (model 32)	Pb-Zn-Ag	2			
Roll-front uranium (model 30c)	U (REE)	2			
Fort Knox porphyry	Au	1	Yes	Yes	Yes

Shear hosted mesothermal pluton related Au	Au	1	Yes	Yes	
Porphyry Cu-Au (model 20c)	Cu-Au-Mo	1			
Podiform chromite (model 8b)	Cr-(Ni)	1			
Alaskan PGE (model 9)	Cr-PGE-Au	1			
Sn skarn (model 14b)	Sn, (Zn,Cu)	1			
Superior Fe (model 34a)	Fe	1			
Upwelling-type phosphate deposit (model 34c)	P	1			
Iron skarn (model 18d).	Fe (Cu,Au,Sn)	1			

[1]Cox and Singer, 1986 and 1992

[2]ARDF

[3]Nokleberg and others, 1987 and 1994

3. Confidence Level

The level of certainty with which determinations of mineral potential were made is termed Confidence Level. The Confidence Level for the LMP areas is reflected by the High, Medium, and Low LMP designations. The mere density of data reflects various levels of activity in respective areas, which reflects the level of confidence for the assigned LMP designation. In other words, a high density of mines, prospects and occurrences is usually surrounded more mining claims or is more likely to contain a KMDA, or a Producing Placer District designation. The resulting LMP boundary will have a higher level of confidence than a Low LMP with less data to evaluate. A High LMP boundary has a high Confidence Level, a Medium LMP will have a medium Confidence Level and a Low LMP will have a low Confidence Level.

B. Salable

As stated in Section III.B – Salable Mineral Resources, the local demand for mineral materials in the Eastern Interior planning area is generally being met by producers located on private lands. Because these private producers will continue to provide larger portions of future mineral material requirements, there will be less future demand from public lands.

V. MINERAL OCCURRENCE AND DEVELOPMENT POTENTIAL

Areas of High LMP are tabulated and described in the following sections, and graphically presented in Mineral Potential map **Figure 6**.

A. LOCATABLE OCCURRENCE AND DEVELOPMENT POTENTIAL

This section describes the delineated High and Medium LMP areas. A tabular summary of specific deposit and occurrence information is provided with each High LMP area discussion. Sources for additional deposit-specific information (resource/reserve grade, tonnage, economics, etc.), are identified where possible.

1. Areas with High LMP Rating

The following section presents the rationale and occurrence information used in the delineation of each High LMP Area presented on map **Figure 6** (MODPR Locatable Mineral Potential). It should be noted that only those mineral Deposit Models that are actually documented to occur in a given High LMP area are tabulated and discussed. Additional deposit model occurrences – while possibly based on Mineral Terrane mapping and other strictly geologic characteristics – are not substantiated by any documented exploration or development information, and are not addressed in this section. **Figure 6** contains the High LMP Map outlines.

Livengood High LMP Area

The Livengood High LMP area contains the Tolovana historic placer district that still contains an estimated 1,000,000 ounces of low grade placer resources along Livengood Creek. Just south of Livengood Creek, on Money Knob, over 10,000,000 ounces of gold resources have been indicated from drill results according to International Tower Hill Inc. (Carew and others, 2010). Besides the larger resources, several smaller placer operations are still reported to be in operation (Szumigala and others, 2008).

Table 10a - Livengood High LMP Area: Deposit Model Occurrences

Deposit Model[1]	Commodities[1]	No. of individual occurrences[2]	Production		KMDA Deposit[4]	Significant Deposit[5]
			Active	Past		
Placer Au (model 39a)	Au (Ag-Sn-W-Pt)	13	1	13	1	--
Low-sulfide Au-quartz veins (model 36a)	Au (Ag)	2	--	1	2	X
Simple Sb (model 27d)	Sb	1	--	1	1	--

Table 10b - Livengood LMP Area: Occurrences

Site Name	ARDF #	Deposit Model[1]	Commodities[2]	Producer[3]	Deposit Class	
					KMDA[4]	Significant[5]
Myrtle Creek	LG007	39a	Au	Small	X	--
Livengood Creek	LG008	39a	Au	Large	X	--
Ruth Creek	LG009	39a	Au	Small	X	--
Lillian Creek	LG010	39a	Au	Small	X	--
Lillian Creek	LG011	Unknown	Au	--	X	--
Ruth Creek	LG012	36a	Au	--	X	--
Griffin	LG013	Unknown	Au	--	X	--
Old Smoky	LG014	Unknown	Au	--	X	--
Hudson; Sunshine No. 2	LG015	Unknown	Hg	Small	X	--
Olive Creek	LG016	39a	Au	Small	X	--
Glen Gulch	LG017	39a	Au	Small	X	--
Gertrude Creek	LG018	39a	Au	Small	X	--
Franklin Creek	LG019	39a	Au	Small	X	--
Lucille Creek	LG020	39a	Au	--	X	--
Amy Creek	LG021	39a	Au	Small	X	--
Unnamed (upper Livengood Creek)	LG022	27d	Sb	Small	X	--
Lucky Creek (also known as Goodluck Creek)	LG023	39a	Au	Small	X	--
Ester Creek	LG024	39a	Au	Small	X	--

Unnamed (near Amy Dome)	LG025	Unknown	Hg	--	X	--
Parker	LG026	Unknown	Cr	--	X	--
Alabam Creek	LG029	39a	Au	Small	X	--
Livengood; Old Smoky; Ruth Creek; Lillian Creek	LG202	36a	As, Au, Fe, Sb	--	X	Yes

[1]Cox and Singer, 1986 and 1992

[2] ARDF (USGS, 2008A)

[3]ARDF: Large= >1,000,000 ounces of gold, Medium= 1,000,000 to 2,000 ounces, Small= < 2,000 ounces

[3]DGGS reports on Alaska's mineral industry (Bundtzen and others, 1986; Szumigala and others, 2004)

[4]Site is within KMDA boundary, RDI and others, 1995

[5]Nokleberg and others, 1993

Roy Creek High LMP Area

The Roy Creek - REE granitic body lies about 15 miles west-northwest of Mount Prindle. A definitive report by Armbrustmacher (1989) shows the mapped boundaries of the REE and Uranium anomalous Syenite Granite at the head waters of Roy Creek. An excerpt from USGS Open File Report 89-146 (Armbrustmacher, 1989) states:

> *"Interest in the syenite complex stems from the fact that it is genetically and spatially associated with several small deposits that are extremely high in thorium and rare-earth elements (REE)."*

The location of REEs in this area was backed up by anomalous geochemical sampling results collected by the USGS (Weber et al. 1988) from trenches and drill core. The DGGS published the results of their *Mineral Assessment of the Lime Peak – Mt. Prindle Area* and found additional syenite intrusives to the east of the Roy Creek intrusive (Smith and other, 1987). This area lacks any ARDF sites but does include one Significant Mineral Deposit (Nokleberg and others, 1987) and two AMIS sites related to REEs and the location of lode claims that covered the area in the late 1970's. Based on the positive occurrence of REE's and increased industry interest in possible shortages of these elements for use in hybrid automobiles and wind turbine generators the potential for claim location, exploration and development is considered high.

Table 11– Roy Creek High LMP Area: Mines, Prospects, and Occurrences

Site Name	ARDF #	Deposit Model[1]	Commodities[2]	Producer[3]	Deposit Class	
					KMDA[4]	Significant[5]
Roy Creek	--	Unknown	REE, U	Small	--	X

Nome Creek High LMP Area

The Nome Creek area within the WMNRA had a long history of placer mining before the area was withdrawn in the 1970's. It also contains the two streams considered by the USBM as having high potential to support a profitable mining operation. The Bureau of Mines reported minable resources in the stretch of upper Beaver Creek from its confluence with Nome Creek to its confluence with Bear Creek and Nome Creek upstream from its

confluence with Moose Creek to its headwaters southwest of Mount Prindle. The USGS (Weber et al., 1988) also delineate anomalous placer gold in the drainages of the area.

The Nome Creek area contained 80 federal mining claims and 9 BLM mining plans of operation that closed prior to this report.

Table 12a – Nome Creek High LMP Area: Deposit Model Occurrences

Deposit Model[1]	Commodities[1]	No. of individual occurrences[2]	Production		KMDA Deposit[3]	Significant Deposit[4]
			Current	Past		
Placer Au (model 39a)	Au (Ag-Sn-W-Pt)	3	1	3	3	--

Table 12b – Nome Creek High LMP Area: Mines, Prospects, and Occurrences

Site Name	ARDF #	Deposit Model[1]	Commodities[2]	Producer[3]	Deposit Class	
					KMDA[4]	Significant[5]
Nome Creek	LG036	39a	Au	Small	**X**	**--**
Ophir Creek	LG035	39a	Au	Small	**X**	**--**
Nome Creek Area: Sumner Creek	CI041	39a	Au	Small	**X**	**--**

[1]Cox and Singer, 1986 and 1992

[2] ARDF (USGS, 2008A)

[3]ARDF: Large= >1,000,000 ounces of gold, Medium= 1,000,000 to 2,000 ounces, Small= < 2,000 ounces

[3]DGGS reports on Alaska's mineral industry (Bundtzen and others, 1986; Szumigala and others, 2004)

[4]Site is within KMDA boundary, RDI and others, 1995

[5]Nokleberg and others, 1993

Faith Creek High LMP Area

The Faith Creek High LMP Area contains at least one ongoing large placer operation and has several documented Uranium and REE lode occurrences around Mt. Prindle. The area includes 14 active federal mining claims on Preacher and Bachelor Creeks, one active plan of operation near the head of Hope Creek, 19 AMIS documented occurrences and 13 ARDF sites. There were also 269 federal lode mining claims and 187 federal placer claims in the area before 1999 and 9 plans of operations or notices closed prior to this report.

Table 13a – Faith Creek High LMP Area: Deposit Model Occurrences

Deposit Model[1]	Commodities[1]	No. of individual occurrences[2]	Production		KMDA Deposit[3]	Significant Deposit[4]
			Current	Past		
Placer Au (model 39a)	Au (Ag-Sn-W-Pt)	7	1	7	7	--
Low-sulfide Au-quartz veins (model 39a)	Au (Ag)	1	--	--	--	--
Polymetallic veins (model 22c)	Au-Ag-Pb-Cu-Zn	1	--	--	1	No

Table 13b – Faith Creek High LMP Area: Mines, Prospects, and Occurrences

Site Name	ARDF #	Deposit Model[1]	Commodities[2]	Producer[3]	Deposit Class	
					KMDA[4]	Significant[5]
Bachelor Creek	CI002	39a	Au	Small	**X**	--
Charity Creek	CI011	39a	Au	Small	**X**	--
Deep Faith	CI015	22c	Au	--	**X**	--
Dempsey Pup	CI016	36a	Sb	--	**X**	--
Faith Creek; Deep Creek	CI018	39a	Au	Medium	**X**	--
Homestake Creek	CI025	39a	Au	Small	**X**	--
Hope Creek	CI026	39a	Au	Small	**X**	--
Roy Creek; Little Champion Creek	CI051	Unknown	U	--	**X**	Yes
Sourdough Creek	CI054	39a	Au	Small	**X**	--
Unnamed	CI067	Unknown	U	--	**X**	--
Unnamed (headwaters of Nome Creek)	CI075	Unknown	Ag	--	**X**	--
Unnamed (in headwaters of Little	CI076	Unknown	U	--	**X**	--

Champion Creek)						
Unnamed (near head of Hope Creek)	CI078	Unknown	F	--	X	--

[1]Cox and Singer, 1986 and 1992

[2] ARDF (USGS, 2008A)

[3]ARDF: Large= >1,000,000 ounces of gold, Medium= 1,000,000 to 2,000 ounces, Small= < 2,000 ounces

[3]DGGS reports on Alaska's mineral industry (Bundtzen and others, 1986; Szumigala and others, 2004)

[4]Site is within KMDA boundary, RDI and others, 1995

[5]Nokleberg and others, 1993

Fairbanks High LMP Area

The Fairbanks area has very high potential for locatable mineral discovery and development. The High LMP area includes the highest producing placer district although much of the placer resources have been depleted; there are several medium size placer mining operations. The area also includes the Fort Knox deposit, the largest gold producer in Alaska. A new heap-leach facility at Fort Knox, to be commissioned in 2009, will extend the life of mine until 2014.

Excerpts from Alaska's Mineral Industry 2007 (Szumigala and others, 2008):

Fairbanks mining district—*nationally ranked Au-producing district; largest producer in Alaska. Produced about 8,197,458 oz Au from placer deposits (1902–2006). Major lode Au and lode Sb producer; produced more than 4,094,196 oz Au and over 2000 tons Sb from veins and shear zones through 2006. Production of W exceeded 4,000 short ton units since 1915, all derived from skarn near Cretaceous quartz Monzonite.*

Fort Knox—*Disseminated Au deposit within granodiorite/quartz monzonite pluton near Fairbanks. Proven and probable reserves as of December 31, 2006, open at depth, are 2,705,000 oz of Au in 176.0 million tons of rock at an average Au grade of 0.015 oz/ton. Measured and indicated resources are 70.69 million tons grading 0.018 oz/ton Au containing 1,289,000 ounces of gold, with 1,573,000 ounces of measured and indicated gold resources in the Fort Knox area. Fairbanks Gold Mining Inc. at Fort Knox and True North mines produced 3,676,284 oz of Au from 1996 to 2006*

True North—*Au occurs in siderite-quartz veins in carbonaceous quartzite and schist within a terrane containing eclogitic rocks. An indicated resource of 188,000 oz Au at grade of 0.040 oz/ton Au in 4,665,000 tons of rock as of December 31, 2006. 11.04 million tons of 0.04 oz/ton ore were processed at Fort Knox mill from 2001 through 2004.*

Other significant lode occurrences include:

The Dolphin occurrence (ARDF# LG112), which includes a drill hole intercept of 330 ft of 0.049 oz/ton (Szumigala and other 2008).

The Cleary Hill/Golden Summit mine/occurrence, formerly a major lode gold producer with over 100,000 ounces mined in the 1930's. The area has undergone extensive exploration in recent years.

The Gil deposit (ARDF# LG200) has a resource of 433,000 ounces of gold. It is being considered as a possible satellite mine to Fort Knox.

The True North (ARDR # LG055), was mined as a satellite of the Fort Knox mine. Although an 188,000 oz gold resource remains in the deposit, mining at True North stopped in 2004.

Table 14a - Fairbanks High LMP Area: Deposit Model Occurrences

Deposit Model[1]	Commodities[1]	No. of individual occurrences[2]	Production		KMDA Deposit[3]	Significant Deposit[5]
			Current	Past		
Fort Knox Porphyry Au	Au	1	1	1	1	X
Placer Au (model 39a)	Au (Ag-Sn-W-Pt)	41	2	41	40	X
Low-sulfide Au-quartz veins (model 36a)	Au (Ag)	70	1	26	70	X
Polymetallic Replacement Deposits (model 19a)	Ag-Pb-Zn-Cu	4	0	2	4	--
Polymetallic veins (model 22c)	Au-Ag-Pb-Cu-Zn	28	--	12	28	--
Porphyry Cu-Au (model 20c)	Cu-Au-Mo	1	--	1	1	--
Simple Sb (model 27d)	Sb	5	--	1	5	--
W skarn deposit (model 14a)	W	13	--	2	13	--

Table 14b - Fairbanks High LMP Area: Mines, Prospects, and Occurrences

Site Name	ARDF #	Deposit Model[1]	Commodi-ties[2]	Produc-er[3]	Deposit Class	
					KMDA[4]	Signifi-cant[5]
Flat Creek	CI019	39a	Au	Small	X	--
Sorrels Creek	CI053	39a	Au	--	--	--
Goldstream Creek	FB085	39a	Au	Large	X	--
Fox Creek	FB086	39a	Au	Small	X	--
Engineer Creek	FB087	39a	Au	Medium	X	--
Engineer	FB088	36a	Au	--	X	--
McGrath	FB089	36a	Au	--	X	--
Janiksela	FB090	Unknown	Sn(?)	--	X	--
First Chance Creek	FB091	39a	Au	Small	X	--
Ridge; Isaacson	FB092	36a	Au	--	X	--
Flume Creek	FB093	39a	Au	Small	X	--

Site Name	ARDF #	Deposit Model[1]	Commodities[2]	Producer[3]	Deposit Class	
					KMDA[4]	Significant[5]
Pedro Creek	FB094	39a	Au	Small	X	--
Tanana; Grant; Hirshberger	FB095	14a	Au	--	X	--
Anderson	FB096	14a	W	--	X	--
Tungsten Hill; Grand Duke Nikolas; Tungsten No. 1; General Joffre	FB097	14a	W	--	X	--
Blossom; Black Bear; Lundbled and Anderson	FB098	14a	W	--	X	--
Rose Creek; New Year's Pup	FB099	39a	Au	Small	X	--
Gilmore Creek	FB100	39a	Au	Small	X	--
Spruce Hen	FB101	14a	W	--	X	--
Columbia; Meier	FB102	14a	W	--	X	--
Green Mountain	FB103	36a	Au	--	X	--
Woodpecker	FB104	20c	Au	--	X	--
Rose Creek; Ogram	FB105	27d	Sb	--	X	--
Steele Creek	FB106	39a	Au	Small	X	--
Leidy	FB107	36a	Au(?)	--	X	--
Unnamed (in the headwaters of Steele Creek)	FB108	36a	Au	--	X	--
Hill Creek	FB109	39a	Au	Small	X	--
Nugget Creek	FB110	39a	Au	Small	X	--
Schubert	FB111	14a	W	--	X	--
Franklin; Ptarmigan; Zimmerman	FB112	14a	W	--	X	--
Stepovich	FB113	14a	W	Small	X	--
Colbert; Big Chief; Pearl; Triangle	FB114	14a	W	--	X	--
Fort Knox	FB115	Fort Knox	Au	Large	X	Yes

Site Name	ARDF #	Deposit Model[1]	Commodities[2]	Producer[3]	Deposit Class	
					KMDA[4]	Significant[5]
Voght; Melba Creek; Monte Cristo; Granite Hill	FB116	Unknown	Au	Small	X	--
Monte Cristo Pup; Monte Cristo Creek	FB117	39a	Au	Small	X	--
Yellow Pup	FB118	14a	W	Small	X	--
Stepovich	FB119	36a	Au	--	X	--
American; American Eagle; Perrault; Perrault and Murphy	FB120	36a	Au	Small	X	--
Yellow Pup Creek	FB121	39a	Au	Small	X	--
White	FB122	14a	W	--	X	--
Pearl Creek	FB123	39a	Au	Small	X	--
Last Chance Creek	FB124	39a	Au	Small	X	--
Smallwood Creek	FB125	39a	Au	Small	X	--
Brumfield	FB154	36a	Au	Small	X	--
Unnamed (lower Dome Creek in the Chatanika flats)	LG044	39a	Au	Small	X	--
Unnamed (lower Little Eldorado Creek in the Chatanika flats)	LG045	39a	Au	Medium	X	--
Gilmer	LG046	Unknown	Sb	Small	X	--
Frederich	LG047	Unknown	Au	Small	X	--
Dome Creek	LG049	39a	Au	Small	X	--
Mother Lode; Dome Creek	LG050	19a	Cu	--	X	--
Woods; Alpha; Omega	LG051	36a	Au	--	X	--
Soo; Spaulding; Wild Rose; Chief; Waterbury; Waverly; Inspiration; Carnation	LG052	22c	Au	Small	X	--
Spruce Creek	LG053	36a	Au	--	X	--

Site Name	ARDF #	Deposit Model[1]	Commodities[2]	Producer[3]	Deposit Class	
					KMDA[4]	Significant[5]
Hindenburg; Markovich	LG054	27d	Sb	Small	X	--
True North	LG055	Unknown	Au	Medium	X	Yes
Little Eldorado Creek	LG056	39a	Au	Small	X	--
Fran	LG057	36a	Au	--	X	--
Alaska Flyer	LG058	36a	Au	--	X	--
Old Glory-Seattle Creek; Leslie	LG059	14a	W	--	X	--
Freeman and Scharf	LG060	22c	Au	--	X	--
Fox Creek	LG061	39a	Au	Small	X	--
Silver Fox; Silvertone; Busty Belle	LG062	Unknown	Ag	Small	X	--
Flume Creek	LG063	39a	Au	Small	X	--
Pedro Creek	LG064	39a	Au	Small	X	--
Steamboat Creek	LG065	39a	Au	Small	X	--
Lundgren-Rowley	LG066	Unknown	W	--	X	--
Nightingale	LG067	Unknown	Ag	--	X	--
Steamboat Creek	LG068	22c	Ag	--	X	--
Hoover	LG069	36a	Au	--	X	--
Zimmerman (near junction of Twin and Pedro Creeks)	LG070	36a	Au	--	X	--
Steese Highway; Mile 17.5	LG071	Unknown	Au	--	X	--
Eagan; Eagan Twin Creek	LG072	Unknown	W	--	X	--
Burnet Galena	LG073	22c	Ag	--	X	--
Burnet	LG074	36a	Au	Small	X	--
Independence	LG075	36a	Au	Small	X	--
Goepfert	LG076	36a	Au	--	X	--
Twin Creek	LG077	39a	Au	Small	X	--

Site Name	ARDF #	Deposit Model[1]	Commodities[2]	Producer[3]	Deposit Class	
					KMDA[4]	Significant[5]
David	LG078	36a	Au	Small	X	--
S.S.	LG079	36a	Au	--	X	--
Thompson and Burns	LG080	36a	Au	--	X	--
North Star Extension	LG081	Unknown	Au	Small	X	--
North Star; Skoogy Gulch; Big Lead	LG082	36a	Au	--	X	--
Whitman & Murray	LG083	36a	Au	Small	X	--
Rainbow	LG084	22c	Au	Small	X	--
Moonlight	LG085	36a	Au	--	X	--
Zimmerman (near Skoogy Gulch)	LG086	Unknown	Au	--	X	--
Hirschberger and Zimmerman	LG087	36a	Au	Small	X	--
White Elephant	LG088	19a	Ag	Small	X	--
Unnamed	LG089	36a	Au	--	X	--
Wackwitz; Silver King; Little Jim	LG090	Unknown	Ag, Pb, Sb	Small	X	--
Jackson	LG091	22c	Au	--	X	--
Cheyenne; Vergil	LG092	22c	Au	--	X	--
Emma; Overgard; Kathrine	LG093	22c	Au	Small	X	--
Mother Lode	LG094	27d	Au	--	X	--
Robinson; Mohawk; Franklin; Rose; Heilig and Creighton	LG095	22c	Au	Small	X	--
Dome View	LG096	22c	Au	--	X	--
Thompson	LG097	36a	Au	--	X	--
Hidden Treasure	LG098	36a	Au	Small	X	--
Sunrise #2	LG099	36a	Au	--	X	--

Site Name	ARDF #	Deposit Model[1]	Commodities[2]	Producer[3]	Deposit Class	
					KMDA[4]	Significant[5]
Newsboy	LG100	36a	Au	Small	X	--
RV	LG101	36a	Au	Small	X	--
Newsboy Extension	LG102	36a	Au	--	X	--
Steil	LG103	Unknown	Sb	--	X	--
Moore-Sheldon	LG104	19a	Sb	--	X	--
Stibnite	LG105	Unknown	Ag, Pb, Sb	--	X	--
Johnson; Johnson and Martin	LG106	27d	Sb	--	X	--
Cheechako No. 1; Eldorado; Westonvitch	LG107	19a	Au	Small	X	--
Herschberger; Beall; Phipps	LG108	36a	Au	--	X	--
Willow Creek	LG109	27d	Sb	--	X	--
Tolovana	LG110	Unknown	Au	Small	X	--
Marshall Dome	LG111	Unknown	Au	--	X	--
Dolphin	LG112	Unknown	Au	--	X	Yes
Hess and Burnett	LG113	Unknown	Ag	--	X	--
Crosscut	LG114	22c	Sb	--	X	--
Stepovich #1	LG115	36a	Au	Small	X	--
Bedrock Creek	LG116	36a	Au	Small	X	--
Wyoming	LG118	36a	Au	Small	X	--
Cleary Hill; Summit; Cleary; Freegold	LG119	36a	Au	Medium	X	Yes
Paupers Dream	LG120	36a	Au	--	X	--
California	LG121	36a	Au	--	X	--
Cunningham	LG122	22c	Au	--	X	--
Sunrise #1	LG123	36a	Au?	--	X	--
Butler and Petree	LG124	22c	Au	--	X	--

Site Name	ARDF #	Deposit Model[1]	Commodities[2]	Producer[3]	Deposit Class	
					KMDA[4]	Significant[5]
Chatham Creek	LG125	39a	Au	Small	X	--
IXL	LG126	36a	Au	Small	X	--
Scott Reese; Rex	LG127	36a	Au	Small	X	--
Blue Moon Mazeppa; Pioneer; Blue Bell	LG128	Unknown	Au	Small	X	--
Bobbie	LG129	22c	Ag, Au	--	X	--
Anna Mary	LG130	Unknown	Au	--	X	--
Tamarack	LG131	36a	Ag, Au	--	X	--
Colbert and Warmbold	LG132	36a	Au	--	X	--
Chatanika River	LG133	39a	Au	Small	X	--
Cora Bluff	LG134	39a	Au	--	X	--
Cleary Creek	LG135	39a	Au	Large	X	Yes
Wolf Creek	LG136	39a	Au	Small	X	--
Morgana	LG137	36a	Au	--	X	--
Wolf Creek	LG138	36a	Au	--	X	--
Sky High; Quemboe #2	LG139	Unknown	Au	--	X	--
Foster Hungerford; Empire; Alaska Group	LG140	36a	Au	Small	X	--
Alaska; Gladstone; Jupiter-Mars; Grace E#2?	LG141	22c	Au	Small	X	--
Empire	LG142	36a	Au	Small	X	--
Nils Genki	LG143	36a	Au	--	X	--
Quemboe Bros.	LG144	36a	Au	Small	X	--
Harris and Brown; Sky High; Grace E#1	LG145	22c	Au	Small	X	--
Christina; Vetter; Shelden	LG146	36a	Au	Small	X	--
Chatham	LG147	22c	Au	Small	X	--

Site Name	ARDF #	Deposit Model[1]	Commodities[2]	Producer[3]	Deposit Class	
					KMDA[4]	Significant[5]
Bellows Creek	LG148	22c	Au	--	X	--
Roughneck	LG149	Unknown	Au	--	X	--
McCarty shaft	LG150	36a	Au	Medium	X	--
Saddle	LG151	36a	Au	--	X	--
McCarty	LG152	22c	Au	Small	X	--
Henry Ford	LG153	36a	Au	Medium	X	--
Ebbert	LG154	22c	Au	--	X	--
Pioneer	LG155	Unknown	Au	Small	X	--
Pennsylvania	LG156	Unknown	Au	Small	X	--
Homestake	LG157	Unknown	Au	Medium	X	--
Banner	LG158	36a	Au	--	X	--
Gil	LG200	Unknown	Au	--	X	Yes
Fish Creek	LG201	39a	Au	Small	X	--
Coffee Dome	LG204	Unknown	Au, Bi, Te	--	X	--
Rexall	LG159	36a	Au	Small	X	--
Solomon	LG160	Unknown	Sb	--	X	--
Goose Creek	LG161	36a	Au	--	X	--
Circle Trail	LG162	22c	Au	--	X	--
Kellen	LG163	Unknown	Au	--	X	--
Gilmore	LG164	36a	Au	--	X	--
Ohio; Early Bird; Mayflower; Connors and Stevens	LG165	36a	Au	Small	X	--
Schaefer	LG166	Unknown	Ag	--	X	--
Unnamed (on Fairbanks Creek)	LG167	36a	Au	--	X	--
Plumbum	LG168	Unknown	Au	--	X	--
Too Much Gold Creek	LG169	39a	Au	Small	X	--

Site Name	ARDF #	Deposit Model[1]	Commodities[2]	Producer[3]	Deposit Class	
					KMDA[4]	Significant[5]
Whitehorse	LG170	36a	Au	Small	X	--
Iowa	LG171	Unknown	Au	--	X	--
Governor	LG172	36a	Au	--	X	--
Rob Roy; Saucy; Wolf	LG173	Unknown	Au	Small	X	--
Nars Anderson; Dorando	LG174	22c	Au	Small	X	--
McNeil; Branholm-Jenkins	LG175	22c	Sb	--	X	--
Unnamed (on the ridge at the headwaters of Too Much Gold Creek)	LG176	36a	Au	--	X	--
Basham	LG177	36a	Au	--	X	--
Too Much Gold	LG178	Unknown	Au	--	X	--
Excelsior; Cross Vein	LG179	22c	Au	--	X	--
Mizpah; Black Joe	LG180	22c	Au	Small	X	--
Perrault	LG181	36a	Au	--	X	--
Hi-Yu; Crites and Feldman	LG182	22c	Au	Medium	X	--
Creeks	LG183	36a	Au	--	X	--
Crane Creek	LG187	39a	Au	Small	X	--
Queen	LG188	Unknown	Au	--	X	--
Alder Creek	LG189	36a	Au	--	X	--
Eureka	LG190	36a	Au	Small	X	--
Coffee Dome	LG191	22c	Au	--	X	--
Charles	LG192	22c	Au	Small	X	--
Coffee East	LG193	36a	Au	--	X	--
Eagan and Eagan	LG194	36a	Au	--	X	--
Kokomo Creek	LG195	39a	Au	Small	X	--
Alder Creek	LG196	39a	Au	Small	X	--
Walnut Creek	LG197	39a	Au	Small	X	--

Site Name	ARDF #	Deposit Model[1]	Commodities[2]	Producer[3]	Deposit Class	
					KMDA[4]	Significant[5]
Fairbanks Creek	LG198	39a	Au	Medium	X	--
Deep Creek	LG199	39a	Au	Small	X	--

[1]Cox and Singer, 1986 and 1992

[2] ARDF (USGS, 2008A)

[3]ARDF: Large= >1,000,000 ounces of gold, Medium= 1,000,000 to 2,000 ounces, Small= < 2,000 ounces

[3]DGGS reports on Alaska's mineral industry (Bundtzen and others, 1986; Szumigala and others, 2004)

[4]Site is within KMDA boundary, RDI and others, 1995

[5]Nokleberg and others, 1993

Circle High LMP Area

The Circle High LMP Area was assigned primarily due to a history of frequent placer mining activity combined with abundant active placer claims and 22 mine operators listed in the Alaska Mining Industry 2008 report (Szumigala and others, 2008). The boundary surrounds where ARDF sites coincide with active mining claims and extends to the limits of local drainages. A few non-producing lode occurrences also exist within the Circle High LMP Area. There are 183 AMIS occurrences in the area of which 161 were reportedly producing placer occurrences.

There are currently 17 active or pending plans of operation or notices on 232 federal placer claims on land managed by the BLM. Many claims were located in the 1970's but some date as far back as 1921. Before 1999, there had been at some point as many as 1,132 federal placer claims and 141 lode claims. Prior to this report was 28 plans of operation and 69 notices that have now closed.

Table 15a - Circle High LMP Area: Deposit Model Occurrences

Deposit Model[1]	Commodities[1]	No. of individual occurrences[2]	Production		KMDA Deposit[3]	Significant Deposit[5]
			Active	Past		
Placer Au (model 39a)	Au (Ag-Sn-W-Pt)	29	7	29	29	--
Low-sulfide Au-quartz veins (model 36a)	Au (Ag)	1	--	--	1	--
Polymetallic veins (model 22c)	Au-Ag-Pb-Cu-Zn	1	--	--	1	--
Sn greisen (model 15c)	Sn (F-Be)	1	--	--	1	--
W skarn deposit (model 14a)	W	1	--	--	1	--

Table 15b - Circle High LMP Area: Significant Deposits, KMDA Deposit Occurrences, and Lode Producers

Site Name	ARDF #	Deposit Model[1]	Commodities[2]	Producer[3]	Deposit Class	
					KMDA[4]	Significant[5]
88 Group	CI001	Unknown	Au	--	X	--
Bear claims	CI003	Unknown	Au	--	X	--
Bedrock Creek	CI004	Unknown	U	--	X	--
Birch Creek	CI005	39a	Au	Medium	X	--
Bonanza Creek	CI006	39a	Au	Small	X	--
Bottom Dollar Creek; Nugget Gulch; Greenhorn Creek	CI007	39a	Au	Small	X	--
Boulder Creek	CI008	39a	Au, Sn	Small	X	--
Butte Creek	CI009	39a	Au	Small	X	--
Clums Fork	CI012	Unknown	Diamond	--	X	--
Crooked Creek	CI013	39a	Au	Small	X	--
Deadwood Creek; Forty Three Pup; Twenty Five Pup; Discovery Gulch; Tommy's Pup; Switch Creek;	CI014	39a	Au	Small	X	--
Eagle Creek; Mastodon Fork; Miller Fork; Cripple Creek	CI017	39a	Au	Medium	X	--
Frying Pan Creek	CI020	39a	Au	Small	X	--
Gold Dust Creek	CI022	39a	Au	Small	X	--
Greenhorn Gulch	CI023	39a	Au	Small	X	--
Half Dollar Creek; Two-Bit Gulch	CI024	39a	Au	Small	X	--
Hot Springs Creek	CI027	Unknown	U, REE, Th, W	--	X	--
Yankee Creek	CI028	39a	Au	Small	X	--
Independence Creek	CI029	39a	Au	Medium	X	--
Ketchem Creek; Holdem Creek	CI031	39a	Au	Small	X	--
Ketchem Dome	CI032	15c	Sn	--	X	--
Ketchem Dome Area	CI033	39a	Au	Small	X	--
Mammoth Creek	CI036	39a	Au	Small	X	--
Mastodon Creek; Forty Two Gulch; Baker Gulch	CI037	39a	Au	Small	X	--

Site Name	ARDF #	Deposit Model[1]	Commodities[2]	Producer[3]	Deposit Class	
					KMDA[4]	Significant[5]
Mastodon Dome Area (includes Mammoth Creek, Miller Creek, Eagle Creek, and Mastodon Creek)	CI038	39a	Au	Medium	**X**	--
Miller Creek	CI039	39a	Au	Small	**X**	--
Miller House	CI040	Unknown	Au	--	**X**	--
North Fork Harrison Creek; South Fork Harrison Creek	CI042	39a	Au	Small	**X**	--
Ox Group	CI043	Unknown	Sb	--	**X**	--
Porcupine Creek	CI046	39a	Au	Small	**X**	--
Portage Creek	CI047	39a	Au	Medium	**X**	--
Ptarmigan Creek (tributary of Birch Creek)	CI048	39a	Au	--	**X**	--
Rebel Creek	CI050	39a	Au	Small	**X**	--
Squaw Creek; Squaw Gulch	CI055	39a	Au	Small	**X**	--
Switch Creek	CI056	39a	Au	Small	**X**	--
Top Dollar	CI058	Unknown	Au	--	**X**	--
Traverse Creek	CI059	39a	Au	--	**X**	--
Unnamed	CI061	14a	W	--	**X**	--
Unnamed	CI065	Unknown	Au	--	**X**	--
Unnamed (between Table and Pinnell Mountains)	CI073	Unknown	Sn	--	**X**	--
Unnamed (headwaters of Inde-pendence Creek)	CI074	Unknown	Ag	--	**X**	--
Unnamed (near Mastodon Dome)	CI080	Unknown	Au	--	**X**	--
Unnamed (near Porcupine Dome)	CI081	Unknown	Au	--	**X**	--
Unnamed (or upper Deadwood Creek)	CI084	36a	Au	--	**X**	--
Wietchy Prospect	CI088	22c	Au	--	**X**	--
Willow Creek	CI089	39a	Au	Small	**X**	--

[1]Cox and Singer, 1986 and 1992

[2] ARDF (USGS, 2008A)

[3]ARDF: Large= >1,000,000 ounces of gold, Medium= 1,000,000 to 2,000 ounces, Small= < 2,000 ounces

[3]DGGS reports on Alaska's mineral industry (Bundtzen and others, 1986; Szumigala and others, 2004)

[4]Site is within KMDA boundary, RDI and others, 1995

[5]Nokleberg and others, 1993

Chena River High LMP Area

The overlap of the KMDA, a Mineral Terrane boundary, active mining claims and clusters of ARDF and AMIS sites lends the head waters of the Chena River to be a High LMP area. Although the area is contiguous with the Circle High LMP area the Chena River High LMP was segregated because of the drainage divide. The boundary incorporates the placer occurrences and two sedimentary exhalative occurrences as well as several active mining claim blocks.

Table 16a – Chena River High LMP Area: Deposit Model Occurrences

Deposit Model[1]	Commodities[1]	No. of individual occurrences[2]	Production		KMDA Deposit[3]	Significant Deposit[5]
			Current	Past		
Placer Au (model 39a)	Au (Ag-Sn-W-Pt)	4	--	3	3	--
Sedimentary exhalative massive sulfide (model 31a)	Zn-Pb-Ag (Ba)	2	--	--	--	--

Table 16b – Chena River High LMP Area: Mines, Prospects, and Occurrences

Site Name	ARDF #	Deposit Model[1]	Commodities[2]	Producer[3]	Deposit Class	
					KMDA[4]	Significant[5]
Gold Creek	BD015	39a	Au	--	--	--
Unnamed (near Ohio Creek)	BD045	Unknown	Ag	--	--	--
Unnamed (near Wheeler Creek)	BD047	Unknown	Cu	--	--	--
Teuchet Creek; TC	BD050	31a	Pb, Zn	--	--	--
Drone Creek; DC	BD051	31a	Pb, Zn	--	--	--
Unnamed	BD052	Unknown	Pb, Zn	--	--	--
Palmer Creek	CI044	39a	Au	Small	X	--
Shamrock Creek	CI052	39a	Au	Small	X	--
Van Curlers Bar (Middle Fork Chena River)	CI087	39a	Au	Small	X	--

[1]Cox and Singer, 1986 and 1992

[2] ARDF (USGS, 2008A)

[3]ARDF: Large= >1,000,000 ounces of gold, Medium= 1,000,000 to 2,000 ounces, Small= < 2,000 ounces

[3]DGGS reports on Alaska's mineral industry (Bundtzen and others, 1986; Szumigala and others, 2004)

[4]Site is within KMDA boundary, RDI and others, 1995

[5]Nokleberg and others, 1993

Charley River High LMP Area

The Charley River High LMP Area, part of the Circle Mining District, covers the Woodchopper Creek drainage and follows a placer producing district boundary (Nokleberg, 1993) that has many active mining claims.

Table 17a – Charley River High LMP Area: Deposit Model Occurrences

Deposit Model[1]	Commodities[1]	No. of individual occurrences[2]	Production		KMDA Deposit[3]	Significant Deposit[5]
			Current	Past		
Placer Au (model 39a)	Au (Ag-Sn-W-Pt)	14	6(?)	14	14	--

Table 17b - Charley River High LMP Area: Mines, Prospects, and Occurrences

Site Name	ARDF #	Deposit Model[1]	Commodities[2]	Producer[3]	Deposit Class	
					KMDA[4]	Significant[5]
Alder Creek	CY001	39a	Au	Small	X	--
Alice Gulch	CY002	39a	Au	Small	X	--
Ben Creek	CY003	39a	Au	Small	X	--
Boulder Creek	CY004	39a	Au	Small	X	--
Coal Creek	CY006	39a	Au	Medium	X	--
Colorado Creek	CY007	39a	Au	Small	X	--
Dome Creek (tributary of Wood-chopper Creek)	CY010	39a	Au	Small	X	--
Grouse Creek	CY016	39a	Au	None	X	--
Iron Creek	CY019	39a	Au	Small	X	--
Mineral Creek	CY020	39a	Au	Small	X	--
Ruby Creek	CY026	39a	Au	Small	X	--
Sawyer Creek; Sawyer Gulch	CY028	39a	Au	Small	X	--

Webber Creek; Weber Creek	CY037	39a	Au	None	X	--
Woodchopper Creek Area	CY038	39a	Au	Medium	X	--

[1]Cox and Singer, 1986 and 1992

[2] ARDF (USGS, 2008A)

[3]ARDF: Large= >1,000,000 ounces of gold, Medium= 1,000,000 to 2,000 ounces, Small= < 2,000 ounces

[3]DGGS reports on Alaska's mineral industry (Bundtzen and others, 1986; Szumigala and others, 2004)

[4]Site is within KMDA boundary, RDI and others, 1995

[5]Nokleberg and others, 1993

Eagle High LMP Area

The Eagle High LMP Area boundary follows the local KMDA boundary but is expanded to incorporate claims on Dome Creek, Mission Creek and to include the Flume Creek area. The Eagle area has been small but consistent placer gold producer for many years with four occurrences listed by the ARDF as active and listed by the Mineral Industry Report as actively producing gold. The area also contains several small lode occurrences including four gold bearing hydrothermally altered mafic ophiolite occurrences around Flume Creek (USGS, 2008A). The Flume Creek occurrence (ARDF# EA009) is estimated to have 2,500 ounces of gold mined from outcrops and talus. In 1998, an inferred resource of 1,000,000 ounces of gold was estimated based on 0.025 ounces per ton of rock.

Table 18a - Eagle High LMP Area: Deposit Model Occurrences

Deposit Model[1]	Commodities[1]	No. of individual occurrences[2]	Production		KMDA Deposit[3]	Significant Deposit[5]
			Current	Past		
Comstock epithermal veins (model 25c)	Au-Ag (Cu,Pb)	4	--	--	4	--
Listwaenite Au (Newberry and others, 1998)	Au	4	--	1	4	--
Placer Au (model 39a)	Au (Ag-Sn-W-Pt)	29	4	29	27	--

Sed-ex massive sulfide (model 31a)	Zn-Pb-Ag (Ba)	1	--	--	1	--

Table 18b – Eagle High LMP Area: Mines, Prospects, and Occurrences

Site Name	ARDF #	Deposit Model[1]	Commodities[2]	Producer[3]	Deposit Class	
					KMDA[4]	Significant[5]
Derwent	CY008	31a	Zn	--	X	--
Dome Creek (tributary of Washington Creek)	CY009	39a	Au	Small	X	--
Eagle Creek	CY012	39a	Au	--	X	--
Fourth of July Creek; Bauer; Ellington; Fourth f Julys Co.; July Creek Mining Co.; July Creek Placer Co.	CY015	39a	Au	Medium	X	--
Nugget Creek	CY023	39a	Au	Small	X	--
Rose Creek; Rosebud	CY025	39a	Au	Small	X	--
Surprise Creek	CY031	39a	Au	Small	X	--
Washington Creek	CY035	39a	Au	--	X	--
Arctic Creek	EA004	39a	Au	--	X	--
Flume Creek	EA008	39a	Au	Small	X	--
Flume Creek (lode)	EA009	Listwae. Au	As, Au	Small	X	--
Bonanza Creek (lode)	EA010	Listwae. Au	Au	--	X	--
Alder Creek	EA011	39a	Au	Medium	X	--
Placer Creek; Pleasant Creek	EA012	39a	Au	Small	X	--
Alder Creek (lode in Eagle D-3 quadrangle)	EA013	Listwae. Au	Au	--	X	--
Nugget Creek	EA014	39a	Au	Small	X	--
Flanders	EA015	Listwae. Au	Au	--	X	--
Kill Zone 2	EA016	25c	Ag, Au	--	X	--
Deep Creek	EA017	25c	Ag, Au	--	X	--
Barney Creek	EA019	39a	Au	Small	X	--
Lucky Gulch	EA020	39a	Au	Small	X	--
Fox Creek	EA021	39a	Au	Small	X	--

Site Name	ARDF #	Deposit Model[1]	Commodities[2]	Producer[3]	Deposit Class	
					KMDA[4]	Significant[5]
Sonickson Creek	EA022	39a	Au	Small	X	--
Little Washington Creek; Washington Creek	EA023	39a	Au	Small	X	--
Broken Neck Creek	EA024	39a	Au	Small	X	--
Seventymile River	EA025	39a	Au	Medium	X	--
Crooked Creek	EA026	39a	Au	Medium	X	--
Canyon Creek; Gold Creek	EA027	39a	Au, Hg	Small	X	--
Ptarmigan Hill	EA028	25c	Ag, Au	--	X	--
Mogul Bluff	EA029	25c	Ag, Au	--	X	--
Rock Creek	EA030	39a	Au	Small	X	--
Excelsior Creek; Twelvemile Creek	EA032	39a	Au	--	X	--
Mission Creek	EA033	39a	Au	Small	X	--
Eagle Bluff	EA034	Unknown	Cu	--	--	--
Colorado Creek; Boulder Creek	EA035	39a	Au	Small	X	--
Wolf Creek	EA052	39a	Au	Small	X	--
Boundary Creek	EA053	39a	Au	Small	--	--
American Creek; Teddys Fork; Discovery Fork; Alder Gulch	EA054	39a	Au	Medium	X	--
Dome Creek	EA055	39a	Au	Small	--	--

[1]Cox and Singer, 1986 and 1992

[2] ARDF (USGS, 2008A)

[3]ARDF: Large= >1,000,000 ounces of gold, Medium= 1,000,000 to 2,000 ounces, Small= < 2,000 ounces

[3]DGGS reports on Alaska's mineral industry (Bundtzen and others, 1986; Szumigala and others, 2004)

[4]Site is within KMDA boundary, RDI and others, 1995

[5]Nokleberg and others, 1993

Democrat High LMP Area

The Democrat High LMP covers the primary placer gold producing area of the Richardson Subdistrict of the Fairbanks Mining District. From 1905 through 1921, 95,000 ounces of gold was produced primarily through drift mining. Tenderfoot Creek was the primary producer in the district. The Democrat Lode mine has been sporad-

ically developed since its discovery in 1913 including a short adit and a 100,000 ton bulk sample in the 1980's. A resource of 1,000,000 ounces has been estimated at the mine, which is now a 900 foot long open-cut but not currently being mined (USGS, 2008A).

Table 19a – Democrat High LMP Area: Deposit Model Occurrences

Deposit Model[1]	Commodities[1]	No. of individual occurrences[2]	Production		KMDA Deposit[3]	Significant Deposit[5]
			Current	Past		
Placer Au (model 39a)	Au (Ag-Sn-W-Pt)	9	1	9	8	--
Pluton Au	Au	4	--	1	2	X

Table 19b - Democrat High LMP Area: Mines, Prospects, and Occurrences

Site Name	ARDF #	Deposit Mod-el[1]	Commodities[2]	Producer[3]	Deposit Class	
					KMDA[4]	Significant[5]
Banner Creek	BD001	39a	Au	Small	**X**	**--**
Buckeye Creek; Martha; Moore Creek	BD005	39a	Au	Small	**X**	**--**
Campbell-Monroe; Campbell	BD007	39a	Au	Small	**X**	**--**
Canyon Creek	BD008	39a	Au	Small	**--**	**--**
Democrat Creek; Democrat Gulch; Democrat Pup	BD013	39a	Au	Small	**X**	**--**
Democrat Lode; John Mitchell Lode	BD014	Pluton Au	Au	Small	**X**	Yes
Hinkley Gulch	BD019	39a	Au	Small	**X**	**--**
Junction Creek	BD021	39a	Au	Small	**X**	**--**
Redmond Creek; Mosquito Creek	BD035	39a	Au	**--**	**X**	**--**
Shamrock Creek; VABM Buck	BD038	Pluton Au	Au	**--**	**X**	**--**
Tenderfoot Creek	BD039	39a	Au	Medium	**X**	**--**
Banner Dike Zone	BD046	Pluton Au	Au	**--**	**X**	**--**
Buckeye Zone	BD048	Pluton Au	Au	**--**	**X**	**--**

[1]Cox and Singer, 1986 and 1992

[2] ARDF (USGS, 2008A)

[3]ARDF: Large= >1,000,000 ounces of gold, Medium= 1,000,000 to 2,000 ounces, Small= < 2,000 ounces

[3]DGGS reports on Alaska's mineral industry (Bundtzen and others, 1986; Szumigala and others, 2004)

[4]Site is within KMDA boundary, RDI and others, 1995

[5]Nokleberg and others, 1993

LWM High LMP Area

The high LMP designation of the "LWM" area is based on drill results from Full Metal Minerals; the company has intercepted a high grade Carbonate Replacement Deposit (CRD) near the headwaters of Little Whiteman Creek. Drilling has intercepted up to 15 meters of massive sulfides grading in the 10 to 20% zinc and silver in the hundreds of grams per ton over 700 meters of strike length. The LWM High LMP Area also contains a cluster of copper skarn deposits, like LWM, are related to local felsic intrusive. The area has no mining claims since it is mostly Doyon patented land.

Table 20a -LWM High LMP Area: Deposit Model Occurrences

Deposit Model[1]	Commodities[1]	No. of individual occurrences[2]	Production		KMDA Deposit[3]	Significant Deposit[5]
			Current	Past		
Cu skarn (model 18b).	Cu-Au-Ag	5	--	--	2	--
Placer Au (model 39a)	Au (Ag-Sn-W-Pt)	3	--	3	--	--
Polymetallic Replacement Deposits (model 19a)	Ag-Pb-Zn-Cu	1	--	--	0	X
Porphyry Mo (model 21b)	Mo (Cu,Au,W)	1	--	--	--	--
Simple Sb (model 27d)	Sb	1	--	1	1	--
Zn-Pb Skarn (model 18c)	Ag-Pb-Zn (Cu)	1	--	--	--	--

Table 20b – LWM High LMP Area: Mines, Prospects, and Occurrences

Site Name	ARDF #	Deposit Model[1]	Commodities[2]	Producer[3]	Deposit Class	
					KMDA[4]	Significant[5]
Fish Creek	EA059	39a	Au	--	--	--
Little Whiteman Creek	EA060	39a	Au	Small	--	--
Texas Creek	EA061	39a	Au	--	--	--
Fish	EA062	18c	Ag, Cu, Pb, Zn	--	--	--
Oscar	EA096	18b	Ag, Au, Cu, Pb, Zn	--	--	--
Oscar West	EA097	18b	Ag, Cu, Pb, Zn	--	--	--

Site Name	ARDF #	Deposit Model[1]	Commodities[2]	Producer[3]	Deposit Class	
					KMDA[4]	Significant[5]
East Eva	EA098	18b	Ag, Au, Cu, Pb	--	--	--
Eva Creek; Ruby Silver	EA099	18b	Ag, Cu, Pb, Zn	--	X	--
Molly Creek; My Creek	EA100	27d	Sb	Small	X	--
Mitchell; Ketchumstuk	EA101	18b	Ag, Au, Cu, Zn	--	X	--
LWM	EA102	19a	Ag, Au, Hg, Pb, W, Zn	--	--	Yes
Little Enchilada	EA103	21b	Cu, Mo, Pb	--	--	--

[1]Cox and Singer, 1986 and 1992

[2] ARDF (USGS, 2008A)

[3]ARDF: Large= >1,000,000 ounces of gold, Medium= 1,000,000 to 2,000 ounces, Small= < 2,000 ounces

[3]DGGS reports on Alaska's mineral industry (Bundtzen and others, 1986; Szumigala and others, 2004)

[4]Site is within KMDA boundary, RDI and others, 1995

[5]Nokleberg and others, 1993

Fortymile High LMP Area

The Fortymile River area, being within the Tintina Mineralized Belt, has several small lode occurrences but the area is known for having been placer mined continually since gold was discovered on Franklin Creek in 1887. There is active placer mining ranging in scale from panning to large mechanized operations with about 3,000 ounces being produced in the Fortymile District in 2006. The ARDF database (USGS, 2008A) lists 16 active placer occurrences and the Alaska Mineral Industry 2007 report (Szumigala, 2008) lists 36 individual people or companies that produced gold in 2007. The LMP boundary is based on ARDF and AMIS occurrences and mining claim locations. As a reinforcement of the mineral potential boundary are thousands of lode claims in the Yukon Territory the lie in trend with the Tintina Mineralized Belt.

There are 89 ARDF sites and 144 AMIS sites, and a majority of these are placer occurrences in the Fortymile High LMP. There are also 34 active or pending plans of operation or notice level operations on 209 federal placer claims on lands managed by the BLM. Between 1979 and 2010 there were 32 plans of operation and 9 notice level operations that are now closed. There had been 1,206 federal placer claims, and 202 lode claims that have now closed due to abandonment, conveyance, or operation of law.

Table 21a – Fortymile High LMP Area: Deposit Model Occurrences

Deposit Model[1]	Commodities[1]	No. of individual occurrences[2]	Production		KMDA Deposit[3]	Significant Deposit[5]
			Current	Past		
Comstock epithermal veins	Au-Ag (Cu,Pb)	3	--	1	1	--

(model 25c)						
Cu skarn (model 18b).	Cu-Au-Ag	1	--	--	--	--
Cyprus massive sulfide (model 24a)	Cu-Zn	2	--	--	1	--
Low-sulfide Au-quartz veins (model 36a)	Au (Ag)	1	--	--	--	--
Kuroko massive sulfide (model 28a)	Cu-Pb-Zn (Au-Ag)	1	--	--	1	--
Placer Au (model 39a)	Au (Ag-Sn-W-Pt)	48	16	48	43	--
Pluton Au	Au	2	--	--	1	--
Sed-ex massive sulfide (model 31a)	Zn-Pb-Ag (Ba)	3	--	--	3	--

Table 21b - Fortymile High LMP Area: Mines, Prospects, and Occurrences

Site Name	ARDF #	Deposit Model[1]	Commodities[2]	Producer[3]	Deposit Class	
					KMDA[4]	Significant[5]
Unnamed (north of Montana Creek)	EA064	25c	Au	--	--	--
Unnamed (near Montana Creek)	EA065	25c	As, Pb, Sn	--	--	--
Hutchinson Creek	EA066	39a	Au	Small	X	--
Montana Creek	EA067	39a	Au	Small	X	--
Confederate Creek; Coldfoot Creek	EA068	39a	Au	Small	X	--
Wilson Creek; Joe Wilson Creek	EA070	39a	Au	--	--	--
Fortymile River (from mouth of Franklin Creek to Canadian border)	EA071	39a	Au	Medium	X	--
Howard	EA072	24a	Ag, Au, Cu, Pb, Zn	--	X	--
South Liberty	EA073	24a	Ag, Au, Hg, Sb	--	X	--
Unnamed (near mouth of Co-lumbia Creek)	EA074	31a	Cu, Pb, Zn	--	X	--
Unnamed (near O'Brien Creek)	EA075	31a	Ba, Pb, Zn	--	X	--
Unnamed (near O'Brien Creek)	EA076	31a	Ba, Pb, Zn	--	X	--
Unnamed (at head of King Creek)	EA077	Unknown	Pb, Zn	--	--	--

Site Name	ARDF #	Deposit Model[1]	Commodities[2]	Producer[3]	Deposit Class	
					KMDA[4]	Significant[5]
Unnamed (near Dome Creek)	EA078	Unknown	Au?	--	X	--
Dome Creek; Little Miller Creek	EA079	39a	Au	Medium	X	--
Lower Dome Creek	EA080	39a	Au	Small	X	--
Unnamed (in headwaters of Nugget Gulch)	EA081	Unknown	Au	--	--	--
Weston	EA082	Unknown	W	--	X	--
Flat Creek	EA083	39a	Au	Small	X	--
Discovery Creek	EA084	18b	Ag, Au, Cu, Zn	--	--	--
Moose Creek (tributary to lower Fortymile River)	EA085	39a	Au	Small	--	--
Twin Creek	EA086	39a	Au	Small	X	--
Nugget Gulch	EA087	39a	Au	Small	X	--
Unnamed (east of Bonanza Bar)	EA088	Unknown	Ag, Au, Cu, Pb	--	X	--
Smith Creek	EA089	39a	Au	Small	--	--
Unnamed (southwest of Dead-man Island)	EA090	Unknown	Pb, Zn	--	--	--
Fortyfive Pup; Fortyfive Gulch; Fortyfive Pass	EA104	39a	Au, W	Small	X	--
Moose Creek (tributary to Mos-quito Fork of the Fortymile River)	EA105	39a	Au	Small	X	--
Tweeden	EA106	Unknown	Au	--	X	--
Unnamed (head of Ingle Creek)	EA107	Unknown	Au	--	X	--
Lilliwig Creek	EA108	Unknown	Ag, Au, Cu	--	X	--
Lilliwig Creek; Lilling Gulch	EA109	39a	Au	Small	X	--
Unnamed (midpoint of Ingle Creek)	EA110	Unknown	Au, Cu	--	X	--
Ingle Creek	EA111	39a	Au	Small	X	--
Uhler Creek	EA112	39a	Au	Small	X	--
Buckskin Creek	EA113	39a	Au	Small	X	--
Unnamed (on ridge between Buckskin and Franklin Creeks)	EA114	Unknown	Pb, Zn	--	X	--
Napoleon	EA115	36a	Ag, Au, Pd, Pt	--	X	--

Site Name	ARDF #	Deposit Model[1]	Commodities[2]	Producer[3]	Deposit Class	
					KMDA[4]	Significant[5]
Franklin Creek; Franklin Gulch	EA116	39a	Au	Small	X	--
Unnamed (east of South Fork)	EA117	Unknown	Pb, Zn	--	X	--
Unnamed (north of Napoleon Creek)	EA118	Unknown	Mo, Pb, W, Zn	--	X	--
Unnamed (northwest of Purdy Mine)	EA119	Pluton Au	Au	--	X	--
Unnamed (northeast of Stonehouse Creek)	EA120	Unknown	Au	--	X	--
Purdy	EA121	25c	Ag, Au, Cu	Small	X	--
Stonehouse Creek; Irene Gulch	EA122	39a	Au	Small	X	--
Napoleon Creek	EA123	39a	Au	Small	X	--
Myers Fork	EA124	39a	Au	Small	X	--
Unnamed (along South Fork of the Fortymile River)	EA125	Unknown	Au	--	X	--
Unnamed (Walker Fork)	EA126	Unknown	Au	--	X	--
Unnamed (north of South Fork bridge)	EA127	Unknown	Au	--	X	--
Chicken Creek	EA128	39a	Au	Medium	X	--
Cameron; Chicken West; Opal	EA129	Unknown	Ag, Au	--	X	--
Highway Copper; Bruce	EA130	Unknown	Ag, Au, Cu	--	X	--
Lost Chicken Creek; Lost Chicken Hill	EA131	39a	Au	Medium	X	--
Wall Street	EA132	Unknown	Au?	--	X	--
Unnamed (northeast of Wall Street Creek)	EA133	Unknown	Au	--	X	--
Unnamed (east of Walker Fork)	EA134	Unknown	Mo, Pb	--	X	--
Mosquito Fork; South Fork of the Fortymile River; Atwater Bar	EA135	39a	Au	Small	X	--
Dennison Fork	EA136	39a	Au	--	X	--
Atwater Creek	EA137	39a	Au	Small	X	--
Unnamed (southeast of hill 3560)	EA138	Unknown	Au	--	X	--

Site Name	ARDF #	Deposit Model[1]	Commodities[2]	Producer[3]	Deposit Class	
					KMDA[4]	Significant[5]
Unnamed (along Wall Street Creek)	EA139	Unknown	Zn	--	X	--
Unnamed (head of Steele Creek)	EA140	Pluton Au	Au	--	--	--
Gilliland Creek	EA141	39a	Au	Small	X	--
Robinson Creek	EA142	39a	Au	Small	X	--
Canyon Creek	EA143	39a	Au	Small	X	--
Jack Wade Creek; Wade Creek	EA144	39a	Au	Small	X	--
Jefferson Creek	EA145	39a	Au	Small	X	--
Kal Creek; Kalamazoo Creek	EA146	39a	Au	Small	X	--
Squaw Gulch	EA147	39a	Au	Medium	X	--
Baby Creek	EA148	39a	Au	Small	X	--
Unnamed (on ridge south of Kal Creek)	EA149	Unknown	Au	--	X	--
Arkansas Creek; Camp Creek	EA150	39a	Au	Small	X	--
Woods Creek	EA151	39a	Au	Small	X	--
Boundary	EA152	28a	Pb, Zn	--	X	--
Twelvemile Creek	EA153	39a	Au	Small	X	--
Unnamed (on Davis Dome)	EA154	Unknown	Au	--	X	--
Davis Creek	EA155	39a	Au	Small	X	--
Walker Fork	EA156	39a	Au	Medium	X	--
Lowery's Ledge	EA157	Unknown	Au	--	X	--
Poker Creek	EA158	39a	Au	Small	X	--
Younger Creek; Walker Fork	EA159	39a	Au	Small	X	--
Turk Creek	EA160	39a	Au	Small	X	--
Unnamed (at head of Turk Creek)	EA161	Unknown	Fe	--	X	--
Unnamed (along McKinley Creek)	EA162	39a	Au?	Small	--	--
No Name Creek	EA163	39a	Au	Small	X	--
Crow Creek; Owl Creek	EA164	39a	Au	Small	X	--

Site Name	ARDF #	Deposit Model[1]	Commodities[2]	Producer[3]	Deposit Class	
					KMDA[4]	Significant[5]
Cherry Creek	EA165	39a	Au	Small	**X**	**--**
Liberty Creek	TC013	39a	Au	Small	**--**	**--**

[1]Cox and Singer, 1986 and 1992

[2] ARDF (USGS, 2008A)

[3]ARDF: Large= >1,000,000 ounces of gold, Medium= 1,000,000 to 2,000 ounces, Small= < 2,000 ounces

[3]DGGS reports on Alaska's mineral industry (Bundtzen and others, 1986; Szumigala and others, 2004)

[4]Site is within KMDA boundary, RDI and others, 1995

[5]Nokleberg and others, 1993

Pogo High LMP Area

The Pogo High LMP Area is covered with state mining claims and prospecting sites. The area incorporates several exploration projects surrounding the Pogo Mine but only a small amount of placer sites.

Excerpt from the Alaska DGGS-Alaska Mineral Industry 2007 Special Report 62:

Pogo—*Au hosted in at least three sub-parallel and tabular, gently dipping, quartz vein zones hosted by Paleozoic gneisses intruded by Cretaceous felsic plutonic rocks. Au in the 3 ft to 60 ft thick quartz bodies has a strong correlation with Bi.Other high-grade Au targets have been identified along an 8-mi-long trend southeast of the Liese zones.*

On October 6, 2009 the Pogo Mine poured its one millionth troy ounce of gold. As of 2010, the Pogo Mine still had 3.7 million ounces of proven or probable reserves. (Szumigala and others, 2010).

Local exploration projects include:

The Blue Lead mine (ARDF# BD003) and the Gray Lead deposit (ARDF# BD017) also known as the ROB Project which have been drilled in recent years by Freegold Ventures Ltd resulting in mineralized quartz vein intervals grading up to a half ounce per ton of rock over 13.5 feet.

The LMS (ARDF# 056) (USGS, 2008) is a shallow dipping pyrite-rich silicified and brecciated schist bearing gold deposit. It has been drilled by exploration companies annually since 2005. A resource of 167,000 ounces of gold has been inferred from drill results.

Table 22a - Pogo High LMP Area: Deposit Model Occurrences

Deposit Model[1]	Commodities[1]	No. of individual occurrences[2]	Production		KMDA Deposit[3]	Significant Deposit[5]
			Current	Past		
Low-sulfide Au-quartz veins (model 36a)	Au (Ag)	6	--	3	4	X
Placer Au (model 39a)	Au (Ag-Sn-W-Pt)	3	--	3	3	--

Pluton Au	Au	2	--	2	--	--
Pogo	Au	1	1	1	--	X
Porphyry Mo (model 21b)	Mo (Cu,Au,W)	1	--	--	1	--

Table 22b - Pogo High LMP Area: Mines, Prospects, and Occurrences

Site Name	ARDF #	Deposit Model[1]	Commodities[2]	Producer[3]	Deposit Class	
					KMDA[4]	Significant[5]
Blue Lead; Blue Lead Extension	BD003	36a	Au	Small	**X**	Yes
Boulder Creek	BD004	21b	Mo	**--**	**X**	--
Carrie Creek; Lynx Saddle; Missing Lynx; Tripper Ridge; West Carrie Creek	BD010	36a	Au	**--**	**--**	--
Central Creek	BD011	39a	Au	Small	**X**	--
Gray Lead	BD017	Unknown	Au	Small	**X**	--
Grizzly Bear; Yellow Jacket	BD018	36a	Au	Small	**X**	--
Jackie; Granite Creek; Granite Creek Lode	BD020	36a	Au	**--**	**X**	--
Last Chance Creek	BD022	39a	Au	Small	**X**	--
Michigan Lode; Michigan Lead	BD025	36a	Au	Small	**X**	--
Pogo; Liese Creek	BD033	Pogo	Au	Large	**--**	Yes
Tibbs Creek; Lucky Star	BD040	39a	Au	Small	**X**	--
Sonora Creek Ridge	BD049	Pluton Au	Au	--	**--**	--
Tan Creek Ridge	BD053	Pluton Au	Au	**--**	**--**	--
Rainbow; Aurora; Indian	BD054	36a	As, Au	**--**	**--**	--
West Pogo; ER	BD055	Unknown	Au, Bi, Te	**--**	**--**	--
LMS	BD056	Unknown	Au	**--**	**--**	Yes

[1]Cox and Singer, 1986 and 1992

[2] ARDF (USGS, 2008A)

[3]ARDF: Large= >1,000,000 ounces of gold, Medium= 1,000,000 to 2,000 ounces, Small= < 2,000 ounces

[3]DGGS reports on Alaska's mineral industry (Bundtzen and others, 1986; Szumigala and others, 2004)

[4]Site is within KMDA boundary, RDI and others, 1995

[5]Nokleberg and others, 1993

Taurus High LMP Area

The Taurus High LMP are is comprised of the area around the Taurus and Bluff deposits in the east-central Tanacross quadrangle. They are both relatively large but low grade copper-molybdenum porphyry related deposits. Although claims are maintained around the area little activity has taken place in recent years.

Excerpt from the Alaska DGGS-Alaska Mineral Industry 2007 Special Report 62:

> ***Taurus****—Significant major porphyry Cu–Au prospect of Paleocene age. East Taurus Zone contains inferred reserves of 140 million tons grading about 0.30% Cu and 0.01 oz/ton Au, and 0.03% Mo.*

Table 23a - Taurus High LMP Area: Deposit Model Occurrences

Deposit Model[1]	Commodities[1]	No. of individual occurrences[2]	Production		KMDA Deposit[3]	Significant Deposit[5]
			Current	Past		
Porphyry Cu-Mo (model 21a)	Cu-Mo-Au (Pb,An)	2	--	--	2	X

Table 23b - Taurus High LMP Area: Mines, Prospects, and Occurrences

Site Name	ARDF #	Deposit Model[1]	Commodities[2]	Producer[3]	Deposit Class	
					KMDA[4]	Significant[5]
Bluff	TC005	21a	Pb, Zn	--	X	--
Taurus; East Taurus; West Taurus	TC027	21a	Cu, Mo	--	X	Yes

[1]Cox and Singer, 1986 and 1992

[2] ARDF (USGS, 2008A)

[3]ARDF: Large= >1,000,000 ounces of gold, Medium= 1,000,000 to 2,000 ounces, Small= < 2,000 ounces

[3]DGGS reports on Alaska's mineral industry (Bundtzen and others, 1986; Szumigala and others, 2004)

[4]Site is within KMDA boundary, RDI and others, 1995

[5]Nokleberg and others, 1993

Delta District High LMP Area

The Delta District is not a single deposit but a region with a high density of steep dipping massive sulfide deposits up to 40 feet thick offset by strike-slip faulting.

Excerpt from the Alaska DGGS-Alaska Mineral Industry 2007 Special Report 62:

> ***Delta massive sulfide belt****—contains at least 30 known volcanogenic massive sulfide deposits and occurrences. Grades from 0.3 to 1.1% Cu, 1.7 to 5.7% Zn, 0.5 to 2.3% Pb, 0.7 to 2.0 oz/ton Ag, and 0.018 to 0.061 oz/ton Au;*

estimated potential reserve of 40 million tons for all deposits. Recent exploration has identified several gold prospects associated with silicified structures in the White Gold trend.

Table 24a - Delta District High LMP Area: Deposit Model Occurrences

Deposit Model[1]	Commodities[1]	No. of individual occurrences[2]	Production		KMDA Deposit[3]	Significant Deposit[5]
			Current	Past		
Iron skarn (model 18d).	Fe (Cu,Au,Sn)	1	--	--	--	--
Kuroko massive sulfide (model 28a)	Cu-Pb-Zn (Au-Ag)	50	"	--	--	X
Polymetallic veins (model 22c)	Au-Ag-Pb-Cu-Zn	6	--	--	--	--
Simple Sb (model 27d)	Sb	1	--	1	1	--

Table 24b – Delta District High LMP Area: Mines, Prospects, and Occurrences

Site Name	ARDF #	Deposit Model[1]	Commodities[2]	Producer[3]	Deposit Class	
					KMDA[4]	Significant[5]
Unnamed (south side of the West Fork Robertson River valley)	MH244	28a	Cu, Pb, Zn	--	--	--
Unnamed (near the mouth of Rock Candy Creek)	MH245	28a	Cu, Pb, Zn	--	--	--
Lo Goat	MH246	28a	Fe	--	--	--
Zygoat	MH247	28a	Fe	--	--	--
Unnamed (southwest of the head of Snowslide Creek)	MH248	22c	Ag, Pb, Sb (?), Zn	--	--	--
Unnamed (on Rock Candy Creek)	MH249	28a	Ag, Cu, Pb, Zn	--	--	--
RC West	MH250	28a	Pb, Zn	--	--	--
Goat	MH251	28a	Fe	--	--	--
EEK (southwest of the Kimball Glacier)	MH252	28a	Fe	--	--	--
Unnamed (near peak 7360)	MH253	22c	Ag, Pb, Sb, Zn	--	--	--
RC	MH254	22c	Ag, Cu, Pb, Zn	--	--	--
RC East	MH255	22c	Pb, Zn	--	--	--
Unnamed (north of Kimball Glacier)	MH256	22c	Cu, Pb, Zn	--	--	--
Unnamed (northeast of peak 7360)	MH257	22c	Ag, Pb, Sb, Zn	--	--	--

Site Name	ARDF #	Deposit Model[1]	Commodities[2]	Producer[3]	Deposit Class	
					KMDA[4]	Significant[5]
PG West	MH258	28a	Pb, Zn	--	--	--
PG	MH259	28a	Ag, Au, Cu, Pb, Zn	--	--	--
PGX	MH260	28a	Ag, Pb, Zn	--	--	--
PG Northeast	MH261	28a	Zn	--	--	--
PG East	MH262	28a	Fe	--	--	--
PG Southeast	MH263	28a	Fe	--	--	--
Unnamed (southeast of peak 7057)	MH264	28a	Cu, Pb, Zn	--	--	--
DG	MH265	28a	Zn	--	--	--
Epidote Glacier	MH318	Unknown		--	--	--
DD North	MH319	28a	Au, Cu, Zn	--	--	--
DDY	MH320	28a	Cu, Zn	--	--	--
DDX	MH321	28a	Ag, Pb, Zn	--	--	--
ED	MH322	28a	Cu, Zn	--	--	--
Tiger Paw	MH323	28a	Cu, Pb, Zn	--	--	--
TA	MH324	28a	Zn	--	--	--
DD South	MH325	28a	Ag, Au, Cu, Pb, Zn	--	--	--
Big Mac	MH326	28a	Fe	--	--	--
LZ	MH327	28a	Cu, Pb, Zn	--	--	--
LZ East	MH328	28a	Cu, Pb, Zn	--	--	--
SB	MH329	28a	Pb, Zn	--	--	--
MB	MH330	28a	Pb, Zn	--	--	--
Super Cub Ridge	MH331	18d	Fe	--	--	--
SC East; Super Cub East	MH332	28a	Au, Ag, Cu, Pb, Zn	--	--	--
Trio	MH333	28a	Ag, Au, Zn	--	--	--
Val	MH334	28a	Zn	--	--	--
DW East	MH335	28a	Pb, Zn	--	--	--
Trio West	MH336	28a	Zn	--	--	--

Site Name	ARDF #	Deposit Model[1]	Commodities[2]	Producer[3]	Deposit Class	
					KMDA[4]	Significant[5]
Trio East	MH337	28a	Ag, Pb, Zn	--	--	--
DW	MH338	28a	Pb, Zn	--	--	--
Nunatak	MH339	28a	Pb, Zn	--	--	--
MID(Delta District)	MH340	28a	Pb, Zn	--	--	Yes
LP	MH341	28a	Pb, Zn	--	--	--
Rum North	MH342	28a	Cu, Pb, Zn	--	--	--
Rum South	MH343	28a	Ag, Pb, Zn	--	--	--
LBB	MH344	28a	Ag, Cu, Pb, Zn	--	--	--
PP2	MH345	28a	Pb, Zn	--	--	--
LPH	MH346	28a	Pb, Zn	--	--	--
LPH South	MH347	28a	Pb, Zn	--	--	--
CC Barite	MH348	28a	Ba	--	--	--
CC South	MH349	28a	Zn	--	--	--
Cascade	MH350	28a	Cu, Zn	--	--	--
UPP	MH351	28a	Cu, Pb, Zn	--	--	--
PP	MH352	28a	Cu, Pb, Zn	--	--	--
LPP	MH353	28a	Cu, Pb, Zn	--	--	--
Tok	TC028	36a	Au	--	--	--
Tok Antimony; Stibnite; A Lucky Leak; Gamblin; Caulk	TC029	27d	Sb	Small	X	--

[1]Cox and Singer, 1986 and 1992

[2] ARDF (USGS, 2008A)

[3]ARDF: Large= >1,000,000 ounces of gold, Medium= 1,000,000 to 2,000 ounces, Small= < 2,000 ounces

[3]DGGS reports on Alaska's mineral industry (Bundtzen and others, 1986; Szumigala and others, 2004)

[4]Site is within KMDA boundary, RDI and others, 1995

[5]Nokleberg and others, 1993

McArthur Creek High LMP Area

McArthur Creek is a cluster of mining claims at the head waters of a McArthur Creek, which drains, into Canada. The occurrences have a long history of mining (USGS, 2008A) and include the Move occurrence, which consists

of gold-bearing quartz veins. There is no current lode gold production reported in the area but there are numerous mining claims on the Yukon Territory side of the border.

Table 25a – McArthur Creek High LMP Area: Deposit Model Occurrences

Deposit Model[1]	Commodities[1]	No. of individual occurrences[2]	Production		KMDA Deposit[3]	Significant Deposit[5]
			Current	Past		
Low-sulfide Au-quartz veins (model 36a)	Au (Ag)	1	--	1	1	--
Placer Au (model 39a)	Au (Ag-Sn-W-Pt)	2	--	2	1	--

Table 25b - McArthur Creek High LMP Area: Mines, Prospects, and Occurrences

Site Name	ARDF #	Deposit Model[1]	Commodities[2]	Producer[3]	Deposit Class	
					KMDA[4]	Significant[5]
B.C.	TC002	39a	Au	Small	--	--
McArthur Creek	TC014	39a	Au	Small	X	--
Move	TC016	36a	Au	--	X	--

[1]Cox and Singer, 1986 and 1992

[2] ARDF (USGS, 2008A)

[3]ARDF: Large= >1,000,000 ounces of gold, Medium= 1,000,000 to 2,000 ounces, Small= < 2,000 ounces

[3]DGGS reports on Alaska's mineral industry (Bundtzen and others, 1986; Szumigala and others, 2004)

[4]Site is within KMDA boundary, RDI and others, 1995

[5]Nokleberg and others, 1993

2. Areas with Medium Potential Rating

In the Eastern Interior planning area, many areas outside of the High LMP area, south of the Yukon River have at least medium locatable mineral potential. Those areas designated in this report as Medium LMP may have active mining claims, portions of KMDA areas, AMIS occurrences, ARDF occurrences, or contain MTAs, although in less density or significance than the High LMP areas.

Livengood Medium LMP Area

Surrounding the Livengood High LMP, the Livengood Medium LMP has overlapping active mining claims, mineral terranes, and KMDA placer districts. In addition, there are scattered AMIS occurrences and one past producing ARDF placer occurrence.

Table 26 – Livengood Medium LMP Area: Deposit Model Occurrences

Deposit Model[1]	Commodities[1]	No. of individual occurrences[2]	Production		KMDA Deposit[3]	Significant Deposit[5]
			Current	Past		
Placer Au (model 39a)	Au (Ag-Sn-W-Pt)	1	--	1	1	--

Cache Mountain Medium LMP Area

Cache Mountain was identified by the USGS as containing several anomalous mineral samples collected within the 10 square miles of exposed granite. Stream sediment samples indicate the granite is anomalous in tin, silver and tungsten and its location coincides with three AMIS mineral occurrences. The boundary is based on Tract "I" on Plate – V of USGS Open – File Report 88-284 (Weber and others, 1988). The boundary also roughly outlines a large block of federal lode mining claims, which were closed before 1999.

Lime Peak Medium LMP Area

The DGGS identified the Lime Peak/Rocky Mountain area as having potential but with abundant accessory silver, tantalum and tungsten. The outline follows the boundary of the Lime Peak Pluton labeled "LPP" on Figure H-2 of Miscellaneous Publication 29 (Smith and others, 1987). The boundary includes 2 AMIS occurrences and 2 tin-greisen related ARDF sites. The area also includes a block of closed federal lode claims.

Table 27 – Lime Peak Medium LMP Area: Deposit Model Occurrences

Deposit Model[1]	Commodities[1]	No. of individual occurrences[2]	Production		KMDA Deposit[3]	Significant Deposit[5]
			Current	Past		
Sn skarn deposit (model 15c)	Sn (Ag,Ta,W)	2	--	--	--	--

Trail Creek Medium LMP Area

The USGS (Weber and others, 1988) and the USBM (Fechner and Maas, 1988) both recognized that Trail Creek is placer gold bearing. The USGS found anomalous gold in samples and the USBM found it gold bearing but concluded that it had low development potential using 1988 economics. The area also includes some closed federal placer claims on Belle Creek just outside the WMNRA. The Trail Creek ARDF site is included in the area.

Table 28 – Trail Creek Medium LMP Area: Deposit Model Occurrences

Deposit Model[1]	Commodities[1]	No. of individual occurrences[2]	Production		KMDA Deposit[3]	Significant Deposit[5]
			Current	Past		

Placer Au (model 39a)	Au	1	--	--	--	--

West Prindle Medium LMP Area

The USGS (Weber and others, 1988) and the USBM (Fechner and Maas, 1988) both recognized that the upper Champion Creek draining west from the Prindle Mountain area is placer gold bearing. It also contains portions of closed federal lode claims and 14 closed federal placer claims.

Birch Creek Medium LMP Area

The Birch Creek Medium LMP covers a middle section of Preacher Creek that has multiple closed federal placer claims and a few closed lode claim in the Preacher Creek area. The central portion contains 8 ARDF sites associated with anomalous sample results collected by the USGS sampling program in the Circle Quadrangle (Foster and others, 1984). The ARDF sites are also related to the Table Mountain granite, which has both gold bearing tourmaline-quartz veins and silver and tin bearing dikes surrounding the intrusive. The southern portion of this LMP area contains where 80 federal placer claims had been located prior to 1999. There are also 7 placer related AMIS occurrences.

Table 29 – Birch Creek Medium LMP Area: Deposit Model Occurrences

Deposit Model[1]	Commodities[1]	No. of individual occurrences[2]	Production		KMDA Deposit[3]	Significant Deposit[5]
			Current	Past		
Unknown	Au, Ag, Sn,	8	--	--	--	1

Puzzle Gulch Skarns Medium LMP Area

Southeast of the Circle High LMP Area, the Puzzle Gulch Skarns Medium LMP Area surrounds six ARDF sites of which there are four tungsten skarns, four Mineral Terrane Areas, and two KMDAs. The area does not contain any active mining claims and only contains one small closed federal Plan level operation however it does contain 9 placer related AMIS occurrences and 3 exploration related AMIS occurrences. The area is about 80 withdrawn BLM lands and 80 percent open State of Alaska land. Despite the mixed land status, this area contains no state or active federal mining claims. Between 1979 and 1999 there were 409 placer mining claims and 2,843 federal lode claims – those are all now closed.

Table 30 – Puzzle Gulch Skarns Medium LMP Area: Deposit Model Occurrences

Deposit Model[1]	Commodities[1]	No. of individual occurrences[2]	Production		KMDA Deposit[3]	Significant Deposit[5]
			Current	Past		
W skarn deposit (model 14a)	W	4	--	--	--	--

Caribou Creek Medium LMP Area

The Caribou Creek Medium LMP Area is designated to capture the juxtaposed but non-overlapping attributes of numerous state mining claims, KMDAs, MTAs, Placer producing areas, one KMDA Placer Producing Stream and a cluster of placer type ARDF occurrences including the Caribou Creek placer. The Caribou Creek placer was historically a moderate sized gold producer.

Table 31 – Caribou Medium LMP Area: Deposit Model Occurrences

Deposit Model[1]	Commodities[1]	No. of individual occurrences[2]	Production		KMDA Deposit[3]	Significant Deposit[5]
			Current	Past		
Placer Au (model 39a)	Au (Ag-Sn-W-Pt)	5	2	5	4	--

Three Castle Medium LMP Area

Northeast of the Yukon River is a carbonate terrane that constitutes the only area of the North American Craton in Alaska and contains several Zinc and Lead mineral occurrences. There are no mining claims or KMDAs but most of the Medium LMP Area is made of MTAs.

Table 32 – Three Castle Medium LMP Area: Deposit Model Occurrences

Deposit Model[1]	Commodities[1]	No. of individual occurrences[2]	Production		KMDA Deposit[3]	Significant Deposit[5]
			Current	Past		
Roll-front uranium (model 30c)	U	1	--	--	--	--
Carbonate-hosted Zn-Pb	Zn, Pb, Ag	6	--	--	--	--
Superior Fe (model 34a)	Fe	1	--	--	--	--

Slate Creek Medium LMP Area

The Slate Creek Medium LMP Area was designated to recognize a significant deposit of an insignificant commodity: asbestos. The Slate Creek Asbestos occurrence has a 60 million ton resource of Serpentine containing 6.4% high quality asbestos (USGS, 2008A).

Table 33 – Slate Creek Medium LMP Area: Deposit Model Occurrences

Deposit Model[1]	Commodities[1]	No. of individual occurrences[2]	Production		KMDA Deposit[3]	Significant Deposit[5]
			Current	Past		
Serpentine-hosted asbestos (model 8d)	Asbestos	1	--	--	--	X

Champion Medium LMP Area

This area has a cluster of ARDF Copper skarns, a KMDA, all or portions of KMDAs but no mining claims or producing ARDF placers.

Table 34 – Champion Medium LMP Area: Deposit Model Occurrences

Deposit Model[1]	Commodities[1]	No. of individual occurrences[2]	Production		KMDA Deposit[3]	Significant Deposit[5]
			Current	Past		
Cu skarn (model 18b).	Cu-Au-Ag	4	--	--	--	--

Zn-Pb skarn (model 18c)	Ag-Pb-Zn (Cu)	1	--	--	--	--

Delta Medium LMP Area

This area surrounds the Delta District High LMP Area on three sides and contains several scattered ARDF sites that are covered by active mining claims. Most of the mining claims are coincident with MTAs.

Table 35 – Delta Medium LMP Area: Deposit Model Occurrences

Deposit Model[1]	Commodities[1]	No. of individual occurrences[2]	Production		KMDA Deposit[3]	Significant Deposit[5]
			Current	Past		
Placer Au (model 39a)	Au (Ag-Sn-W-Pt)	2	--	--	--	--
Polymetallic veins (model 22c)	Au-Ag-Pb-Cu-Zn	1	--	--	--	--
Porphyry Cu-Mo (model 21a)	Cu-Mo-Au (Pb,An)	1	--	--	--	--

Fairplay-Peternie Medium LMP Area

The Fairplay-Peternie Medium LMP covers a large swath of the southern Eastern Interior planning area and incorporates several Porphyry Copper- Molybdenum occurrences that coincide with several KMDA's, large claim blocks, MTAs and surround the Taurus High LMP Area.

Table 36 – Fairplay-Peternie Medium LMP Area: Deposit Model Occurrences

Deposit Model[1]	Commodities[1]	No. of individual occurrences[2]	Production		KMDA Deposit[3]	Significant Deposit[5]
			Current	Past		
Porphyry Cu-Mo (model 21a)	Cu-Mo-Au (Pb,An)	11	--	--	1	No

Mosquito Medium LMP Area

The Mosquito Medium LMP Area like the Fairplay-Peternie covers an area of scattered Porphyry occurrences and coincidental MTAs and KMDAs but with no active mining claims.

Table 37 – Mosquito Medium LMP Area: Deposit Model Occurrences

Deposit Model[1]	Commodities[1]	No. of individu-al occurrences[2]	Production		KMDA Deposit[3]	Significant Deposit[5]
			Current	Past		
Porphyry Cu-Mo (model 21a)	Cu-Mo-Au (Pb,An)	2	--	--	1	No
Porphyry Mo (model 21b)	Mo (Cu,Au,W)	3	--	--	0	No

W skarn deposit (model 14a)	W	3	--	--	0	No

VI. STATEMENT OF QUALIFICATION

Report text and graphics were prepared by John Hoppe (Geologist), Robert M. Ellefson (Geologist), and Robert Brumbaugh (Physical Scientist) for BLM's Division of Resources, Branch of Energy and Solid Minerals, headquartered at the Alaska State Office in Anchorage.

VII. Specific Mandates and Authority

A. Laws

1. The Federal Land Policy and Management Act (FLPMA) of 1976, as amended, 43 U.S.C.1701 et seq. provides the authority for BLM land use planning. FLPMA specifically affects locatable minerals by changing withdrawal procedures, requiring recordation of mining claims with BLM, and authorizing regulations for surface protection of the public lands.

a. Section 201 requires the Secretary of the Interior to prepare and maintain an inventory of all BLM administered lands and their resource and other values, giving priority to Areas of Critical Environmental Concern (ACECs); and, as funding and workforce are available, to determine the boundaries of the public lands, provide signs and maps to the public, and provide inventory data to state and local governments.

b. Section 202 (c) (9) requires that land use plans for BLM administered lands be consistent with tribal plans and, to the maximum extent consistent with applicable federal laws, with state and local plans. The State and most of the Native Corporations have been aggressively promoting mineral development on their lands.

c. Section 204 (c)(1) establishes that a withdrawal from the public land laws is effective for a period of not more than twenty years (also established a procedure for extensions).

d. Section 209 (a & b), establishes rules and procedures for reservation and conveyance of the mineral estate.

e. Section 302 (a) requires the Secretary to manage the BLM administered lands under the principles of multiple use and sustained yield, in accordance with, when available, land use plans developed under Section 202 of FLPMA, except that where a tract of BLM administered lands has been dedicated to specific uses according to any other provisions of law, it shall be managed in accordance with such laws.

f. Section 302 (b) recognizes the entry and development rights of mining claimants, while directing the Secretary to prevent unnecessary or undue degradation of the public lands.

2. The Recreation and Public Purposes (R&PP) Act of 1926, as amended, 43 U.S.C. 869 et seq., authorizes the Secretary of the Interior to lease or convey BLM administered lands for recreational and public purposes under specified conditions. This includes providing for community free use permits for mineral materials.

3. The General Mining Law of 1872, as amended, 30 U.S.C. 21 et seq., allows the location, use, and patenting of mining claims on sites on public domain lands of the United States. As the 1872 Mining Law established few details on how to regulate mining on the public lands, rules and regulations have been developed largely in response to extensive mineral case law established through IBLA and the courts.

4. The Mining and Mineral Policy Act of 1970, 30 U.S.C. 21a, establishes a policy of fostering development of economically stable mining and minerals industries, their orderly and economic development, and studying methods for disposal of waste and reclamation.

5. The Materials Act of July 31, 1947 (61 Stat. 681), authorized the disposal of sand, stone, gravel and common clay through a contract of sale.

6. Act of July 23, 1955; 69 Stat. 934, removed common varieties of sand, gravel, cinders, pumice, pumicite and clay from the category of locatable minerals and placed them under the Materials Act of 1947. This established mineral materials as salable minerals. The 1955 Act also provides for multiple uses of the lands and surface resources on mining claims (primarily affected public access across mining claims and the use and development of timber resources on mining claims).

7. The Alaska Native Claims Settlement Act (ANCSA), 1971, Public Law (PL) 92-203 (85 Stat. 688). One of the primary selection criteria for the Native Corporations has been to select lands with mineral potential.

Sections 17(d)(1) and 17(d)(2)(A), directed the Secretary to withdraw from all forms of appropriation, including the mining laws, up to but not to exceed eighty million acres.

Section 11(a)(1), 43 USC 1610, provides that certain lands surrounding and adjacent to native villages are withdrawn, subject to valid existing rights, from all forms of appropriation, including the mining laws.

Section 22(h), 43 USC 1621, provides that withdrawals made under this Act shall terminate within four years of December 18, 1971, provided that lands selected by Natives under section 1611 of the Act shall remain.

Section 17(b)(2), protects the rights of mining claimants for access across Native lands as a valid existing right.

8. The Alaska Statehood Act of July 7, 1958, grants to the State the right to select 102,550,000 acres of vacant, unappropriated and unreserved public lands. One of the primary selection criteria for the State has been to select lands with mineral potential.

9. Alaska National Interest Lands Conservation Act (ANILCA), 1980, PL 96-487, Section 1110(b), assures in holders, including mining claimants, in National Conservation Units or Wilderness Study Areas, adequate and feasible access for economic and other purposes.

B. Executive Orders (EO)

EO 13084 (consultation and Coordination with Indian Tribal Governments) provides, in part, that each federal agency shall establish regular and meaningful consultation and collaboration with Indian tribal governments in the development of regulatory practices on federal matters that significantly or uniquely affect their communities. This would include the development of mineral resources on the public lands.

C. Regulations

The 43 CFR 3600 regulations, establish procedures for the exploration, development and disposal of mineral material resources.

D. Policy

IM Memorandum No. 2001-032, December 7, 2000, Mineral Materials Inspection and Enforcement, Production Verification, and Appraisal Policy (expires 9/30/2002).

VIII. Current Management and Existing Land Use Plans

Fortymile MFP

The Fortymile MFP has been in effect since September 1980. There are references to minerals in the plan, most notably the mineral related objectives directed toward locatables and salables. Although the following objectives and decisions indicate that unnecessary withdrawals would be lifted and public lands in the planning area would be reopened to mineral leasing, location, and entry, this decision was never implemented. Most of the land in the Fortymile unit remains closed to locatable mineral entry through a series of public land orders enacted in the early 1970's. The only ongoing mining on BLM land is on preexisting federal mining claims.

Objectives from the Fortymile MFP (1980):

Provide additional sources of sand and gravel/or aggregate to meet local construction needs and for highway, railway, airfield, and pipeline construction and maintenance purposes.

By 1990, all land that is public land or reverts to public land, and is closed to mineral entry by unnecessary withdrawals, should be reopened to mineral entry.

All public land should be inventoried for its mineral potential before any action is taken which will prohibit entry.

Some of the Decisions to support these objectives are outlined in the bullets below:

M 2.1: A, five acre community pit should be established in the community of Chicken.

M 2.2: A five acre community pit should be established in Eag1e.

M 2.4: Material sites should be provided for the construction and maintenance of highways, railways, airfields, and pipelines.

M 3.1: By 1985, all public land, which has been withdrawn by PLO 5250, and has not been recommended to Congress, should be restored to public land, open to mineral entry. The major lands affected are those within the Fortymile River drainage basin (e.g.,Butte Creek, Canyon Creek, Walker Fork, and Slate Creek). This decision has not been implemented.

M 4.1: Conduct inventories as funding permits. Give special emphasis to areas being considered for withdrawal from mineral entry.

Steese National Conservation Area (SNCA)RMP

The SNCA Record of Decision (ROD) was signed in February 1986. Like the Fortymile MFP, the SNCA ROD indicates that portions of the Steese NCA would be reopened to locatable mineral entry through the revocation of withdrawals. However, this decision has never been implemented and BLM land in the planning area remains closed to locatable mineral entry except on preexisting federal mining claims. The following excerpts are taken from the Steese ROD under the Minerals Management heading.

All Management Units

Locatable Minerals

The following requirements apply to valid existing claims as well as to any new mining claims that might be located in areas opened to entry: (Note: no areas have been reopened to entry at this time.)

Each operator in the SNCA will be required to file a Plan of Operation or Notice of Operation depending on location and acreage disturbed. An operator who disturbs more than five acres per year or who is operating in an area closed to further mineral location is required to file a Plan of Operation. The plan or notice shall include the name and mailing address of the operator (and of the claimant if the two are not one and the same), a map showing existing or proposed access, the name and serial number of the claim(s) to be mined, proposed operation and dates of activity, type and degree of the operation, measures to prevent undue and unnecessary degradation, and a plan to reclaim disturbed lands. A reclamation plan must be included as a part of the Plan of Operation or Notice of Intent.

Within the SNCA, wintertime cross-country moves would be preferred for the transport of equipment onto claims. Any cross-country movement of heavy equipment would have to be approved in advance by the Authorized Officer.

Close coordination with adjacent land owners or managers will be made where the potential exists to affect the lands under their control.

All operators producing water-borne effluent must obtain a National Pollutant Discharge Elimination System permit and meet the requirements of that permit. In cooperation with ADEC and EPA, water quality will be monitored along streams to ensure compliance.

Reclamation. All operations in the SNCA will be reclaimed to the satisfaction of the Authorized Officer.

BLM will develop a program of erosion abatement and satisfactory reclamation on disturbed ground in the headwaters of Birch Creek. This program will involve federal claims outside of the SNCA in order to help improve the water quality of the Birch Creek NWR.

Saleable Minerals. Disposal of sand, gravel, rock, and other saleable minerals will be based on need and on conformance with the RMP.

Decision:

To ensure compliance with approved mining plans of operation or mineral lease requirements, at least three inspections per year should be made of all operations. This will require a, full-time surface protection specialist at a cost of approximately $40,000 per year and approximately $7,500 per year for aircraft use.

Note: This has been implemented but only two inspections are made yearly.

Rationale: The Area contains mineral resources that are presently of economic value to the Fairbanks community. The mineral potential within the SNCA could provide a base for future economic development. Regulations are necessary to ensure that development occurs in an environmentally sound manner. Caribou habitat and the Birch Creek NWR must be protected. ANILCA and Bureau policy address multiple use and allow for development where compatible with other land uses.

There are areas in the SNCA RMP where restrictions are imposed upon locatable minerals. These areas include the Primitive Management Unit, Semi-Primitive Motorized Restricted Special Management Unit, Semi-Primitive Motorized Special Management and Research Natural Areas. As stated above, the decisions to open areas to locatable mineral entry were never implemented.

Primitive Management Unit

Locatable minerals in The Primitive Management Unit (the high country adjacent to the White Mountains National Recreation Area and the Pinnell Mountain Trail Corridor) will remain closed to mineral entry under the 1872 Mining Law and to the leasing of oil and gas, non-energy minerals and geothermal resources

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EXPLORATION. Anyone proposing to explore for minerals within the SNCA must contact the Authorized Officer. Activities which conform to the management prescriptions for this unit and which will not impair the unit's primitive values will be allowed. Permits will generally not be required for helicopter landings. However, the use of off-road vehicles (except snow machinessnowmachines) will not be permitted.

Rationale: This management unit contains areas of high mineral potential. It also contains important caribou range, which is required by ANILCA to be a special consideration in this plan. The roads, equipment, and structures associated with mineral development are not compatible with primitive recreation and the primitive values present in this unit. Section 1010 of ANILCA directs the Secretary to «assess the oil, gas, and other mineral potential on all public lands in the State of Alaska in order to expand the data base with respect to the mineral potential of such lands.» The Secretary is also directed, to allow for access by air for such activities. The BLM is working with the Alaska Division of Geological/ Geophysical Survey, the Bureau of Mines, and the U. S. Geological Survey to develop further mineral assessments of these and other lands in Alaska. Any proposed study will also receive review and comment by the mineral industry, so the best utilization of government and private mineral assessment capabilities can be made. Information gathered through exploration by private companies would also assist the Bureau in meeting this legal requirement. Such information, in combination with information that will be collected on wildlife and other resources, would be very useful in evaluating possible amendments to this plan. In accordance with Section 1010, all exploration will be carried out in an environmentally sound manner, with no appreciable alteration of the natural character or ecological systems of the Area.

The Semi-Primitive Motorized Restricted Management Unit

The Semi-Primitive Motorized Restricted Management Unit will remain closed to mineral entry under the 1872. Mining Law and to leasing of oil and gas, non-energy minerals, and geothermal resources.

EXPLORATION. Anyone proposing to explore for minerals within the SNCA must contact the Authorized Officer. Activities which conform to the management prescriptions for this unit and which will not impair the unit's values will be allowable. Permits will generally not be required for helicopter landings.

Rationale: This management unit contains caribou calving grounds, an area of crucial importance to that species. Congress has directed that caribou range be a special consideration in this plan. This management unit also contains important habitat for a small population of Dall sheep in the Big Windy Creek/ Puzzle Gulch area. In view of the possible detrimental effects of mineral development on these two species, the area should remain closed to mineral entry.

Section 1010 of ANILCA directs the Secretary to «assess the oil, gas, and other mineral potential on all public lands in the State of Alaska in order to expand the data base with respect to the mineral potential of such lands.» The Secretary is also directed, to allow for access by air for such activities. The BLM is working with the Alaska Division of Geological/ Geophysical Survey, the Bureau of Mines, and the U. S. Geological Survey on developing further mineral assessments of these and other lands in Alaska. Any proposed study will also receive review and comment by the mineral industry, so the best utilization of government and private mineral assessment capabilities can be made. Information gathered through exploration by private companies would also assist the Bureau in meeting this legal requirement. Such information and data on wildlife and other resources would be very useful in evaluating possible amendments to this plan. In accordance with Section 1010, all exploration will be carried out in an environmentally sound manner, with no appreciable alteration of the natural character or ecological systems of the Area.

The Semi-Primitive Motorized Special Management Unit

The Semi-Primitive Motorized Special Management Unit will be opened under the 1872 Mining Law to mineral entry (43 CFR 3800). It will also be open to oil and gas leasing (43 CFR 3100), geothermal leasing (43 CFR 3200) and to leasing of non-energy minerals (43 CFR 3500). All operations on leases and mining claims are subject to the following special stipulations.

Prior to commencing operations, the operator shall demonstrate that his operation will have no long-term, significant, adverse, effects on caribou habitat or caribou populations.

Seasonal restrictions will be imposed between May 1 and June 15, or between August 15 and September 30, if the operation will interfere with caribou calving or caribou migration.

Note: This decision has not been implemented. The Semi-Primitive Motorized Special Management Unit remains closed to locatable mineral entry.

Rationale: This management unit contains areas of high mineral potential. It also contains important caribou range, which is required by ANILCA to be a special consideration in this plan. Mineral development can be allowed to occur in this management unit only if such development has no long-term impacts on caribou.

Semi-Primitive Motorized Management Unit

This management unit will be opened to entry under the 1872 Mining Law. It will also be opened to oil and gas leasing (43 CFR. 3100), geothermal leasing (43 CFR 3200), and the leasing of non-energy minerals (43 CFR 3500). All leasing will be under standard stipulations.

Note: This decision has not been implemented. The Semi-Primitive Motorized Management Unit remains closed to locatable mineral entry.

Rationale: This area contains existing placer gold mines and shows potential for other types of mineral development. Mineral development is compatible with other resource uses proposed for this area, and standard stipulations will be adequate to protect known resource values

Research Natural Areas:

Two Research Natural Areas (RNA) will be designated. One RNA on Mount Prindle includes 2,800 acres in the SNCA, and the other RNA encompasses the 160-acre Big Windy Hot Springs withdrawal.

All Research Natural Areas will remain closed to mineral entry and all types of mineral leasing.

Rationale: The establishment of Research Natural Areas is part of the Ecological Reserve System and an interagency program for establishing areas useful for scientific research. These areas were selected because they contain typical representations of ecosystems or unusual natural features.

The following excerpt from the Steese National Conservation Area Record of Decision evaluates the mineral assessment needs for future monitoring and evaluation of the RMP.

MINERALS

Mineral assessment of all federal lands within the SNCA is needed to expand the data base with respect to the mineral potential of the Area. The mineral assessment program may include, but would not be limited to, such techniques as side-looking radar imagery, airborne magnetometer surveys, and heli-copter-borne core and test drilling. A mineral program consisting of gathering and analyzing rock and chip samples, stream sediment samples, and pan concentrates could be accomplished during a five-year period. The cost of such an effort would be approximately $915,000 ($183,000 per year).

The mineral resource assessment program discussed here is in keeping with the intent of Congress as identified in Section 1010 of ANILCA. All proposals for this assessment, whether conducted by public or private groups, would be accomplished in an environmentally sound manner that would prevent any lasting impacts, which would appreciably alter the natural character of the SNCA, or the biological or ecological systems found in it. Protective restrictions on access and operations during calving, spawning, migration, or other critical periods shall be imposed.

The BLM is working with the Alaska Division of Geological/Geophysical Survey, the Bureau of Mines and the U.S. Geological Survey to further develop mineral assessments of these and other lands in Alaska. Any proposed study will also receive review and comment by the mineral industry so to make the best utilization of government and private mineral assessment capabilities.

New data generated from the mineral inventory will be incorporated into the three-year evaluation/revision process. If new land use decisions are needed, they will be proposed at that time.

The BLM will cooperate fully with the State in a joint commitment to improve placer mining methods and technologies that seek ways to achieve water quality standards and retain an economically viable mineral industry. The BLM will accept the opportunity to participate in the State's ongoing placer mining studies. The BLM will evaluate and consider the results of such studies and use this data when formulating land management decisions.

Birch Creek Management Plan

ANILCA established the Birch Creek Wild and Scenic River in 1980, and the river has been managed under the Birch Creek Wild and Scenic River Management Plan since 1983. The following excerpt from that plan addresses mineral potential and management actions affecting locatable minerals. At the time of the plan's publication there were 5,000 placer claims located within the drainages of Birch Creek.

HISTORY and GEOLOGY

Placer gold deposits were first dis-covered on Birch Creek in 1893. This led to the formation of the Circle Mining District, a mining district which has remained active. In terms of known value and production levels, gold is the most important mineral resource within the river corridor. Placer deposits are located on most tributaries of Birch Creek and recent interest has led to exploration into new areas. There is potential for future dis-coveries and development, particularly on the south side of Birch Creek. The river corridor lies in a regional belt of mineralization that occupies this portion of interior Alaska. A major tungsten deposit south of the river corridor has been located in the vicinity of Puzzle Gulch, Caribou Creek, and the Upper Salcha River.

The existing mining claims under this river management plan are authorized reasonable access to their claims as consistent with the regulations found in Titles 43 of the Code of Federal Regulations, Subpart 3809 (43 CFR 3809). Inclusion of mining claims within the river corridor boundary of Birch Creek National Wild River should not be construed as being an administrative action challenging the rights of claim holders under the U.S. Mining Laws. Lands within one half mile of the bank of any Alaskan river designated a "wild" river have been withdrawn, subject to valid existing rights, from all forms of appropriation under the mining laws and the mineral leasing laws by Section 606 of ANILCA.

Mining equipment has been driven within the river corridor to access claims located both inside and outside the river corridor. Mining access primarily takes place in winter and early spring, but may occur during other times of the year along the State-maintained Portage Creek and Harrison Creek roads.

Placer mining activity occurs in the headwaters of Birch Creek on Butte, Gold Dust, and Eagle creeks, and on the tributaries to Birch Creek including Harrison, Deadwood, Crooked, Bottom Dollar, and Ketchum creeks. During the last decade, improvements in mining technology and a significant rise in the price of gold has caused an increase in mining activity in the area. Mining activities have caused localized surface disturbances along these creeks. The effluent from these placer mining operations drains into Birch Creek, the only drainage for the Circle Mining District. Placer mining operations provide employment and a base for service industries located in Fairbanks.

Management Actions Affecting Locatables

Access to mining claims located prior to ANILCA and with acceptable proof of discovery will be managed under existing regulations in 43 CFR 3809.

Discussion: 43 CFR 3809 requires a “Plan of Operations” from all mining claimants planning surface disturbing activities within the Steese NCA or the [Birch] river corridor, regardless of acres disturbed. These plans must include a detailed description of access needs. The Bureau will specify vehicle types, season of use, reclamation, and mining plans to minimize adverse impacts.

Mining claims properly located and maintained prior to inclusion in the Wild and Scenic Rivers System will be managed under the mining laws and 43 CFR 3809. Plans of Operations required under 43 CFR 3809 will address a logical sequence of mineral development and extraction. Changes may be made at any time subject to approval of an amended plan of operations.

Discussion: The Bureau will assess each proposed plan with the intention of achieving an optimum balance between reasonable and necessary operations and their effects on the environment. A plan of operations should present a logical sequence of discrete stages from exploration through development to extraction and ensuing reclamation for a period of five years or mine life, whichever is less. Professional evaluation of the development of a mine, especially operations utilizing mechanized earth moving equipment, necessitates the emphasis on pre- development exploration. Activities to establish and de-lineate mineral reserves will be stressed by the BLM before plans involving large scale mechanical stripping operations within the river corridor will be authorized.

Continued implementation of existing surface management regulations within the river corridor shall be a BLM priority for minerals management. A minimum of one field visit will be made for each operation in the river corridor annually.

Improperly located mining claims will be adjudicated in a timely fashion.

Discussion: The river corridor will be designated as a priority area for mineral adjudication. Adjudication will determine if claims are located in compliance with existing land orders and issue any necessary de-cisions. If any claims improperly located and operating, they will constitute mineral trespass.

White Mountains National recreation area (White mountains NRA)

General Guidance

LOCATABLE MINERALS-VALID EXISTING CLAIMS. There are no longer any valid claims in the White Mountains NRA.

LOCATABLE MINERALS-NEW DISPOSALS. In accordance with ANILCA, new disposals of locatable minerals within the White Mountains NRA can only be made through a leasing process. No lands within the NRA will be opened to the leasing of placer deposits. However, the leasing of lode deposits will be allowed. This decision has never been implemented. Like the Steese National Conservation Area, the White Mountains NRA remains withdrawn from leasing and locatable mineral entry.

SALEABLE MINERALS. Disposal of sand, gravel, rock, and other saleable minerals under 43 CFR 3600 will be made if such disposals are compatible with the other provisions of this plan.

EXPLORATION. Because of the multiplicity of exploration methods that might be employed, anyone proposing to explore for minerals within the White Mountains NRA must contact the Authorized Officer.

RECLAMATION. All operations in the White Mountains NRA will be reclaimed to the satisfaction of the Authorized Officer.

Rationale: Under the provisions of ANILCA, holders of valid existing rights can develop their claims in accordance with the Surface Management Regulations that provide for the protection of the environment.

In certain areas outside the primitive unit, new mineral development can be permitted under the leasing provisions of ANILCA as long as it does not significantly impair recreational values or use. Note: this decision has never been implemented.

Extensive placer mining on Beaver Creek or its principal tributaries would be in conflict with recreational purposes because of degradation to natural and primitive values of the Beaver Creek NWR corridor and damage to arctic grayling habitat.

Section 1010 of ANILCA directs the Secretary to “assess the oil, gas, and other mineral potential on all public lands in the State of Alaska in order to expand the data base with respect to the minerals potential of such lands.” The Secretary is also directed to allow for access by air for such activities. The BLM is working to develop further mineral assessments with the State Division of Geological/Geophysical Survey, the Bureau of Mines, and the U.S. Geological Survey of these and other lands in Alaska. Any proposed study will also receive review and comment by the mineral industry, so the best utilization of government and private mineral assessment capabilities can be made. Information gathered through exploration by private companies will assist the Bureau in, meeting this legal requirement. Such information, combined with data collected on wildlife and other resources, will be very useful in evaluating possible amendments to this plan. In accordance with Section 1010, all exploration will be carried out in an environmentally sound manner, with no appreciable alteration of the natural character or ecological systems of the Area.

Primitive Management Unit

The Primitive Management unit will remain closed to all mineral leasing.

Exploration for minerals is subject to the decision of the Authorized Officer. Activities which conform to the management prescriptions for this unit and which will not impair the unit’s primitive values will be allowed. Permits will generally not be required for helicopter landings. However, the use of off-road vehicles (except snow machines) will not be permitted.

Rationale: The primary objective in the Primitive Management Unit is to provide opportunities for primitive recreation. The roads, structures, and heavy equipment necessary for mineral development are not compatible with the primitive recreational experience.

Prescriptions for Semi-Primitive Management Unit

In accordance with Section 1312 of ANILCA, new disposals of locatable minerals within the WMNRA may only be accomplished through a leasing program.

Lode deposit leasing will be permitted within the Semi-Primitive Motorized Management Unit. Placer mining, except for those claims with prior rights, will not be permitted. See Proposed Plan map in map pocket. Note: this decision was never implemented.

Under both 43 CFR 3809 and the draft hardrock leasing regulations, special attention is given to all existing and proposed operations within the WMNRA to ensure, that the water quality of Beaver Creek is preserved in its present state. All operations must employ the latest technology to mitigate downstream effects. Terms of the National Pollutant Discharge Elimination System permits must be met or the operations will not be allowed to proceed. Note: there are no longer any valid claims in the White Mountains NRA.

EXPLORATION. Because of the multiplicity of exploration methods which might be employed, anyone proposing to explore for minerals within the White Mountains NRA should contact the Authorized Officer. In this unit, exploration activities that use mechanized equipment, explosives, etc., require an approved plan of operations or a prospecting permit prior to any activity.

Rationale: Lode mining or oil and gas development within the Semi-Primitive Motorized Management Unit is compatible with the recreational objectives for that unit and with the intent of ANILCA. Improved access associated with mineral development will benefit some recreational users. This area includes several geologic zones with mineral potential. The Surface Management Regulations (43 CFR 3809) and the proposed leasing regulations, coupled with the standards set by EPA, provide for sufficient controls on mining operations.

To ensure compliance with existing and anticipated mining plans of operation or mineral lease requirements, at least three inspections per year should be made of all operations within the WMNRA. This will require a full-time surface protection specialist at a cost of approximately $40,000 per year, and approximately $9,600 per year for aircraft use.

All Research Natural Areas will remain closed to all types of mineral leasing.

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Appendix A

EAST INTERIOR PLANNING AREA

DOCUMENTED MINERAL DEPOSIT MODELS [COX AND SINGER (1986) AND COX (1992)]