Species and Habitat Conservation: Industry Fundamentals

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Introduction

The species and habitat conservation fundamentals presented in this bulletin are processes and practices utilized by the oil and natural gas industry to manage potential risks of project-related impacts on wildlife and habitats while responsibly developing the nation's oil and natural gas resources. The industry employs a wide variety of operational practices in conjunction with environmental site screening and baseline environmental surveys to identify and mitigate adverse impacts during the exploration and production project life cycle. These processes and practices represent a continuously improving evolution of industry's exploration and production activities in areas where species and habitat of conservation concern occur.

Oil and natural gas operators' business management efforts during exploration and development activities inherently support effective species and habitat conservation practices by emphasizing extensive planning and scheduling. Industry has adopted the key concepts of the mitigation hierarchy into their business planning and operating practices; however, to be most effective in applying species and habitat conservation practices, the regulatory policies and requirements addressing conservation should be fit for purpose, readily allow innovation, and to the extent possible, encourage voluntary actions by operators and landowners.

Operators should foster broad stakeholder engagement through every phase of project development including land and mineral owners, state and federal regulatory and wildlife agencies, and the public in the communities where oil and natural gas operations occur. Oil and natural gas development activities should be aligned with local and regional concerns and grounded in responsible practices and lessons learned from species and habitat conservation experience.

1 Scope

This Species and Habitat Conservation Processes & Practices bulletin is intended to provide oil and natural gas operators with information on conservation measures to support planning and execution of onshore oil and natural gas projects in the United States for conventional and unconventional (shale) developments. The processes and practices described herein are aimed primarily at industry professionals responsible for managing the potential risks of project impacts on biodiversity, but may also be utilized by contractors, sub-contractors, and vendors. The benefits of employing consistent conservation practices include increased conservation efficiency and stakeholder acceptance.

Oil and natural gas operators acknowledge activities associated with the development of oil and natural gas resources have the potential to impact wildlife and habitats. These activities can include, but are not limited to, field exploration and production work such as geophysical and seismic surveys, drilling operations, well completion activities and operations/production activities, as well as construction of well production facilities and related infrastructure, and produced water management facilities.

This bulletin provides flexible and adaptable strategies, acknowledging that the application will vary between operators and environmental settings. Many operators already apply the same or similar practices or processes within their operations. The use of this bulletin is at each individual operator's discretion.

This document provides a brief explanation of the typical technology, practices and processes employed by the oil and natural gas industry to identify, explore, develop, and produce hydrocarbon resources. Conservation processes and practices utilized by the oil and natural gas industry are discussed in more detail.

This document provides general discussion of exploration, construction, development and production and facilities operations, but does not provide an extensive discussion of applicable local, state, and federal regulatory requirements. It is the responsibility of the operator to review local, state, and federal regulatory requirements applicable in their areas of operation, and if needed, consult with third parties having appropriate regulatory, scientific, technical, and legal expertise. Operators should consider referencing other available industry standards and guidance that can provide additional information.

In addition to this document, API has developed other environmentally related standards specifically applicable to shale development, including:

- API 51R [1], an environmental guidance document for use by the oil and natural gas industry.
- API 100-1 [2], which contains recommended practices for well construction and fracture stimulation design and execution as it relates to well integrity, groundwater protection and fracture containment for onshore wells.
- API 100-2 [3], which contains recommended practices regarding the management of the environmental aspects of shale development during planning site selection; logistics; mobilization, rig-up, and demobilization; and well stimulation operations.
- API 100-3 [4], which contains recommendations for engaging the communities where oil and natural gas development occurs.

2 Normative References

This document contains no normative references

3 Terms, Definitions, and Abbreviations

3.1 Terms and Definitions

For the purposes of this document, the following terms and definitions apply.

3.1.1
anti-perching devices
Technologies that reduce the occurrence of roosting and nesting of larger birds, such as raptors.

3.1.2
at-risk species
Endangered Species Act-listed, candidate or unlisted declining, state-listed and species identified by states as 'species of greatest conservation need'.

3.1.3
baseline condition(s)
The physical, chemical, biological, social, economic, regulatory and/or cultural setting in which the proposed project is to be located, and where local impacts (both positive and negative) can be expected to occur.

3.1.4
biodiversity
The variability among living organisms from all sources including, among other things, terrestrial, marine, and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems [1].

NOTE This term can be used more specifically to refer to all of the species in one region or ecosystem.

3.1.5
closed loop system
A process that cycles and confines fluids required or produced during the drilling process; this technique eliminates the need for reserve pits to hold drilling fluids.

3.1.6
common corridors
Linear areas in an oil or natural gas field where roads, pipes and transmission lines are concentrated to minimize disturbance.

3.1.7
compensatory mitigation
To offset the surface impacts at a mineral development site by preservation, restoration, enhancement, or in-lieu fee to establish habitat of approximately equivalent value at another location.

3.1.8
conservation easement
An agreement that restricts surface land use and provides conservation for a specified term.

NOTE Conservation easements can be used as mitigation or otherwise compensated and are often in perpetuity.

3.1.9
cooperative agreement
A voluntary conservation agreement between a government or quasi-government entity and a private entity, or between private entities.

3.1.10
data quality parameters
Data features that can be quantified or assessed with defined standards (e.g., accuracy, completeness, consistency etc.) to ensure statistical strength of data analysis.

3.1.11
directional drilling
A drilling technique that intentionally deviates from a vertical orientation to guide the wellbore to a subsurface target. (See horizontal drilling)

3.1.12
disturbance
An event of environmental stress occurring over time and spatial scales that alters an affected ecosystem.

3.1.13
ecosystem
The dynamic complex of the biotic (living plant, animal, and micro-organism communities) and the abiotic (non-living) environment interacting as a functional unit.

3.1.14
ecosystem services
The benefits that ecosystems contribute towards human well-being.

NOTE Ecosystem services can be divided up into four categories:

a) Provisioning services – products or goods such as water, food or timber;

b) Regulating services – ecosystem functions such as flood control and climate regulation;

c) Cultural services – non-material benefits such as recreational, aesthetic, and spiritual benefits; and

d) Supporting services – fundamental processes such as nutrient cycling and photosynthesis that support the above three categories [2].

3.1.15
enhancement
A conservation activity that improves the quality of habitat.

3.1.16
environmental risk
Actual or potential threat of adverse effects on living organisms and the environment by effluents, emissions, wastes, resource depletion, etc., arising out of an organization's activities.

3.1.17
environmental site screen
An iterative planning process of (desktop and field) data gathering, analysis and informed decision-making.

3.1.18
fragmentation
A process by which large and contiguous habitats become divided into smaller or isolated smaller habitats.

NOTE The creation of these smaller habitats can impact the species utilizing the habitats and their community structure.

3.1.19
geographic information systems
GIS
Computer system that allows for the storage, capture, analysis and illustration of geographic spatial data.

3.1.20
geophysical
Subsurface rock layers and structure that identify mineral reservoirs contained within the rock structures and layers.

3.1.21
habitat
A geographic area, either occupied or not occupied by the species, on which (1) are found physical and biological features necessary to support long-term survival of the species during the species' life stages that occur in that area, and on which (2) the species can survive through successive generations during the species' life stages that occur in that area.

3.1.22
habitat type
Describes a set of biotic and abiotic features on a landscape on varying levels of scale.

3.1.23
horizontal drilling
A directional drilling technique where the wellbore deviation from vertical exceeds 80 degrees. This technology allows operators to access oil or natural gas reservoirs that occur a distance away from the well site, resulting in reductions of operational footprint, especially when multiple horizontal wells are installed at a single pad location.

3.1.24
hydraulic fracturing
A completion or workover technique used to recover oil or natural gas in low-permeability reservoirs. Fracture fluids are pumped into the well under pressure and at designed rates to expand openings in the subsurface geology resulting in increased hydraulic conductivity.

3.1.25
hydrocarbons
Compounds of hydrogen and carbon that occur in crude oil and natural gas.

3.1.26
landscape level approach
A development strategy to reduce the risk of cumulative surface impacts to ecosystems, or special habitat areas of larger geographic scale, and the services they provide.

3.1.27
listed species
A species federally listed as threatened or endangered under the ESA.

NOTE A 'state listed' species is warranted for management prescribed by and within that state.

3.1.28
mineral
Commercially saleable materials such as oil, condensate, and natural gas.

3.1.29
mitigation
Projects, programs, processes, or practices intended to lessen identified impacts to an existing historic or natural resource such as wildlife and habitats.

3.1.30
mitigation hierarchy
The sequence of actions to anticipate and avoid, and where avoidance is not possible, minimize, and, when impacts occur, restore, and where significant residual impacts remain, offset for biodiversity-related risks and impacts on affected communities and the environment.

3.1.31
monitoring
Activities that characterize and document the condition of a project site to establish baseline and trend data that may include, wildlife, plants, soils, air, or water.

3.1.32
multi-well pad
An oil or natural gas location (pad) with more than one well.

3.1.33
oil or natural gas field
A geographic area with identified boundaries that has commercial petroleum deposits; most commonly references an area that is already in the production phase.

3.1.34
operator
The company, whether representing itself or another such as on behalf of a joint venture or other operating agreement, that handles the day-to-day operations for maintaining and producing an oil and gas property.

3.1.35
priority species
A species that has been selected due to concerns over its long-term survival warranting management efforts to conserve.

3.1.36
project region
An area of land that encompasses an oil and natural gas development.

3.1.37
reclamation
Returning land to baseline condition or other land-use objective.

3.1.38
sensitive receptor
Species or organisms, populations, communities and ecosystems and officially designated critical habitats and threatened or endangered species that may be impacted by activities associated with development.

3.1.39
sustainable development
Successful practices, processes and technologies that support ongoing development goals and provide for the conservation of ecosystem functions to benefit future generations of society and wildlife.

3.1.40
topsoil
The upper, outermost layer of soil with the highest concentration of organic matter and microorganisms where most of the biological activity, including plant growth occurs.

NOTE Typically the top 5 in. to 10 in. of soil.

3.1.41
undesirable plants
Any plants that result in effects that are not consistent with conservation goals.

3.2 Abbreviations

BES biodiversity and ecosystem services

BLM Bureau of Land Management

CCA candidate conservation agreements

CCAA candidate conservation agreement with assurances

CFR Code of Federal Regulations

ESA Endangered Species Act

FWS Fish and Wildlife Service

HCP habitat conservation plan

ITP incidental take permit

GIS geographic information systems

NEPA National Environmental Policy Act

SCADA supervisory control and data acquisition

WAFWA Western Association of Fish and Wildlife Agencies

4 Project Planning

4.1 General

There are ecological, regulatory, economic, and reputational drivers for operators to apply conservation practices. The conservation measures are often unique to the circumstances of a project and/or location. When feasible, sites that have been previously disturbed or are otherwise of low habitat value should be considered

first for development. In this section, common elements of oil and natural gas activities and perspectives relevant to species and habitat conservation are reviewed. The key principle is to consider risk management early in the planning of the project.

4.2 Life Cycle of Development

The typical lifecycle of a well can be defined by activities associated with planning, construction, drilling, completion, production, plugging and abandonment (P&A) and reclamation. The average life of a typical well is 20 to 30 years, most of which is spent in the production phase. Construction, drilling and completion phases account for the major scope of disturbance, yet normally occupy only 2 to 6 weeks of the lifetime of the well. Exploration and production projects for oil and natural gas are unique in that they generally disturb habitat and displace wildlife on a temporary (life of the project or operation) rather than on a permanent basis. In the case of drilling and production operations when the mineral resource does not meet production criteria, the well is decommissioned, all the well infrastructure is removed, and the area is reclaimed.

4.3 Regulatory Engagement

Operators should work with regulatory agencies to identify shared conservation goals and objectives that can affect project siting, scheduling, design, routes of access, mitigation measures, and decommissioning and reclamation requirements. Regulatory agencies can either have authority to issue permits or can offer recommendations or requirements to the agencies with such authority. This level of advance planning will afford predictability and efficient execution of the project.

4.4 Environmental Site Screening

The environmental site screen is an iterative process of information gathering, analysis, communication and decision making. The process generally consists of stages that progressively screen project locations for impacts associated with natural resources. Impacts can then be addressed through the mitigation hierarchy. Each level of analysis can be included in the project development timeline to inform early planning decisions and mitigate the risk of delays and disruptions to projects.

The optimum timing to inform development planning is early, preferably prior to staking a site. This approach allows for maximum flexibility, informing where the project site can be located on the landscape to avoid potential constraints and minimize impacts.

Each level of analysis can include desktop analysis, field surveys, and consultations with governmental agencies and non-governmental stakeholders. This section reviews key elements of planning and approach that the industry can use to have a positive benefit on the conservation of species and habitat.

4.5 Factors Influencing Project Planning

The costs, approach, and strategy of minimizing and/or mitigating disturbance from a project to its surrounding environment will vary with the project location (i.e., habitat type, distance to resources etc.), the land area disturbed (footprint), and regulatory requirements. These factors will drive the mitigation strategy incorporated into the project plan. Specific requirements of owners of the surface estate, whether private or public/governmental, and whether arising through lease terms and conditions or through subsequent negotiations, can also have a significant impact on project design, execution, and mitigation. Effective siting and efficient site design have straightforward logistical parameters. Operators prefer effective, innovative, efficient conservation practices that are fit for purpose. Implementation of conservation practices can be dependent on the practices' applicability to the specific conditions and context of the mineral development. Mitigating land disturbance can be more complex where regulatory requirements exist that set a mitigation standard and procedures for how the standard is met. In situations where agency regulation describes a performance standard rather than prescribing specific measures or approaches, operators may have greater

flexibility in developing the mitigation solution. For example, a common agency prescribed method for monitoring vegetation trends is the time and labor-intensive line point intercept approach. When allowed the flexibility, alternate and statistically comparable techniques can be created or applied to achieve comparable or superior results.

4.6 Management Systems

Management systems are a critical part of implementation to improve performance and to manage cost, and to enable operators and contractors to achieve regulatory compliance. Management systems can also be an integral component of sustainable development. An effective management system employs conservation, monitoring and reporting protocols that are well-defined in the planning phase of a new development. Management systems should include early planning provisions to engage communities and stakeholders towards a successful outcome for multiple land uses.

4.7 Community Considerations

Stakeholders within the community near a project can have a wide variety of interests, issues, and levels of concern regarding new or existing oil and natural gas operations. The success of a project planning effort, and the predictability of a project schedule will often depend upon successful integration of stakeholder concerns with regulatory and permitting requirements in design and execution of a project. Operators recognize the importance of engaging and working together with the community to find mutually agreeable solutions. Operators can have different procedures to resolve stakeholder concerns (see API 100-3 [4])for more information). Successful community engagement is beneficial to meet the community and operator needs while also fostering cooperation with the public at the local, state, and national level.

5 Typical Development Process for Oil and Natural Gas Projects

5.1 General

Oil and natural gas operators typically follow a multi-phase approach for projects. These phases most often include entry, exploration, development, production, and exit. Due to the wide variety of circumstances encountered in carrying out oil and natural gas projects, the following practices are common though not universally implemented. Species and habitat conservation practices are applied throughout the development phases and as appropriate during any single phase. In addition, reclamation can also occur at any phase of the project lifecycle. Depending on the circumstances of a prospective project, operators may initiate public and stakeholder engagement for any or all phases of oil and natural gas development (see API 100-3 [4]).

5.2 Entry

In the entry phase, an operator investigates and analyzes geological data, oil and natural gas reservoirs, environmental risk, topography, surface land ownership, infrastructure logistics, health and safety, and community considerations at a potential development site.

If geologic data and surface conditions meet site development and approval criteria, operators pursue acquiring an initial leasehold. Landowners are engaged to obtain oil and gas leases as well as surface use agreements. In addition, regulatory requirements are identified, and initial permits are obtained. Considerations during this phase include selection of project areas that promote successful and safe operations, while also eliminating or reducing potential impact to species and habitats.

5.3 Exploration

In the exploration phase, operators assemble data on the likelihood of finding reservoir quality rock to justify drilling a well, including technical characteristics, geologic parameters, and reservoir producibility. In the exploration phase, pre-construction site characterization, baseline environmental studies, and species and habitat characterization also occur prior to an initial disturbance. Other operational activities begin, such as seismic (geophysical) or other field related surveys, which are conducted to further determine the viability of resource development and to guide drilling programs.

A seismic survey is typically conducted to provide data to generate reasonable models and predictions about the properties and structures of the subsurface (seismic data). Geophysical surveys are a temporary, transitory, and minimally intrusive means to understanding where recoverable oil and gas resources likely exist.

Drilling may begin in the exploration phase, as well as flow testing and initial production. Operators begin to construct access roads, develop well pads, and conduct exploratory drilling, all of which have associated surface disturbance. A well pad is constructed at the chosen site and sized to accommodate the drilling equipment. A pad for a single exploration well occupies approximately 4 to 5 acres. Multi-well pads are typically 10 acres or larger depending on the number of wells. However, on an acre disturbed per wellbore basis, multi-well pads create less overall surface disturbance per wellbore. The type of pad construction depends on terrain, soils, and seasonal constraints.

Drilling operations are typically conducted continuously until complete. The time required to drill an exploratory well varies with the depth of the hydrocarbon-bearing formation, the geological conditions, and logistical factors. Once reservoir characteristics have been well defined, the amount of time to drill a well is normally significantly reduced. Where a formation is found to contain hydrocarbons, initial well tests (possibly lasting another month) are conducted to establish flow rates and formation pressure. These tests can generate oil, gas, and formation water, commonly referred to as produced water, each of which requires proper disposal. After drilling and initial testing, the rig is moved to the next drilling location. If the exploratory drilling has discovered commercial quantities of hydrocarbons, a wellhead may be installed on the exploration wells. Based on the structure and characteristics of the formation encountered through drilling one or more exploration wells, a development plan is created. Well decommissioning and final reclamation are carried out on the exploratory well(s) if the yield is inadequate for production goals.

5.4 Development

The development phase consists of the construction of one or more wells, associated production facilities, and infill drilling to effectively recover the mineral asset from the hydrocarbon-bearing reservoir. Several aspects of development are like those of exploration (e.g., environmental analysis and monitoring, well pad construction, drilling, completions, well testing, and production). The primary difference is the amount of those activities during the development phase. The construction of new facilities, pipelines, and compressor stations for production, processing, and transportation of oil and natural gas typically occurs during development. Simultaneously, the scope of pre-construction site characterization, baseline environmental studies, and habitat characterization increase during this phase.

The largest amount of activity and resulting land disturbance occurs at the development phase and can include loss of, or reduction in the value of terrestrial habitat, restrictions to wildlife movement, soil erosion, sedimentation, and the inadvertent establishment of undesirable plant species. In many cases, operators may also need to consider the possible visual impact of production facilities during design to minimize impacts. The design may be able to take advantage of the existing topography and vegetation to reduce noise and visual impacts. The use of low-profile facilities and storage tanks (if technically feasible) can also reduce visual impacts. In addition, operators can consider paint color for large structures, selecting colors that blend with the background features.

5.5 Production

The production phase consists of extracting, separating, and transporting hydrocarbons to processing and refining facilities. Production operations maximize delivery of hydrocarbons to sales for the life of the project. As the well and facility installations are completed, interim reclamation commences on land that was disturbed during development and is not required for ongoing oil or natural gas production operations. Additional land disturbances are minimal as construction transitions to the operation of facilities. Annual monitoring and environmental compliance activities are initiated during this phase of development.

Typically, development of a reservoir requires drilling additional production wells. Multiple wells are often drilled from one pad to reduce operational footprint and land requirements. The number of wells required to produce the hydrocarbon reservoir varies with the size of the reservoir and its geology. There can be diverse mineral and surface ownership and more than one operator developing the reservoir. Production fields can require anywhere from a few hundred wells to less than ten wells. The drilling and completion processes involve similar techniques to those described for exploration; however, with a larger number of wells being drilled, the scale of activity increases. The well sites will be occupied for longer periods of time to accommodate completion strategies.

The properties of the reservoir rock, the reservoir pressure, the viscosity of the oil, and other factors determine the well's performance. Once the production stream reaches the surface, the production is sent to a facility which separates the produced fluids (oil, gas and water). The oil and natural gas have sales pipeline specifications that can require additional treatment and equipment to stabilize the production streams and to remove impurities, such as water, CO_2, H_2S, etc. Routine production operations include monitoring activities, safety inspections, and maintenance tasks. Over the well's lifetime, downhole maintenance (using a wireline unit or a workover rig to maintain production) is occasionally required. Site design for the production phase should accommodate safe and efficient use and maintenance of these various facilities and activities in a manner that minimizes the project footprint and long-term disturbance to the project's surrounding environment.

Primary recovery will extract only a small percentage of the original hydrocarbons present. However, as initial production declines, a wide range of enhanced recovery technologies are available. Secondary recovery typically relies upon waterflood or gas injection. After these strategies have been employed and the production declines further, tertiary methods employing chemicals and gases may also be used to increase oil recovery. The equipment and operations needed for development drilling are similar to that described for exploration. Horizontal drilling and multi-well pads efficiently recover more resources with a smaller environmental footprint than drilling multiple vertical wells. Typically, each producing well requires an operational footprint area of less than two acres.

5.6 Exit

This exit phase consists of either cessation of production operations and final site reclamation, or legal transfer of production operations to another operator. The exit or decommissioning of production fields typically includes well plugging and abandonment, removal of buildings and surface production equipment, proper disposition of support infrastructure, and reclamation of the site. Reclamation, discussed in detail in Section 9, can include implementation of site re-vegetation and continued monitoring of the site after closure. Planning for decommissioning is a critical step within the overall production process. Planning for final abandonment and reclamation is typically considered at the onset of the project. Downhole formations are sealed off with cement plugs to prevent upward movement of wellbore fluids. The wellhead is removed, and the surface casing is cut below the ground level. Cement is brought to the top of the casing that is cut off. At this point, the well location and road surface is reclaimed to its pre-construction condition.

In some cases, the landowners can place a contract requirement for the operator to reclaim the land to a defined condition or request that roads or other support infrastructure remain intact. The reclamation process involves ongoing monitoring and necessary interventions until the location meets the requirements of the operating

permits and contract obligations. In addition, the community should be prepared for the withdrawal of services, including any economic, social, and environmental programs that were supported during the well lifecycle. A key consideration of the exit phase is regular engagements with potentially affected communities and key stakeholders to minimize adverse economic impacts.

6 Mitigation

6.1 General

Operators should coordinate with appropriate state and federal agencies to evaluate options to manage impacts to species or habitat, resulting in a plan for the operator to implement an effective conservation strategy.

6.2 Mitigation Hierarchy

The mitigation hierarchy is a framework for managing risks and potential impacts related to biodiversity and ecosystem services (BES), which include natural resources such as wildlife and habitats. The framework provides a risk-based approach that involves the deliberate sequence of key actions – “avoid”, “minimize” and “mitigate”, which includes, “restore” or “offset” – and provides a best practice approach to address conservation needs and project priorities. Mitigation may be in the form of avoidance, minimization, conservation, restoration, enhancement and/or creation. A description of common terminology describing these approaches as follows.

a) Avoid: Measures are taken to anticipate and prevent adverse impacts on biodiversity before actions or decisions are taken that could lead to such impacts, to the maximum extent practicable. Avoidance can take on many forms, temporally (through time) and spatially (space, or distance). Temporal avoidance can include scheduling of certain activities outside of critical periods for wildlife. Spatial avoidance can include site selection away from sensitive areas (wildlife habitats, water features, etc.).

b) Minimize: Measures are taken to reduce the duration, intensity, significance and/or extent of impacts that cannot be completely avoided, to the extent appropriate and practicable. Examples of minimization methods include reduction in project footprint, noise and /or light abatement or curtailment of activities during sensitive time periods.

c) Restore: Measures are taken to reclaim or restore landscape features, such as habitats or stream channels, following project impacts that cannot be completely avoided and/or minimized. The most common approach is to reclaim the land to its pre-construction use such as crop production, wildlife habitat or other use. This can differ from a restoration model where the land is returned to a defined condition that can be different or of higher quality than the pre-construction condition.

d) Offset: Identifiable conservation outcomes resulting in actions applied to areas not impacted by the project that compensate for adverse impacts of a project that cannot be avoided, minimized and/or restored. The resources that replace or substitute for those impacted may not always occur within the direct project boundaries and can include the use of compensatory mitigation.

6.3 Avoid and Minimize

The most efficient and effective conservation strategy for an oil and natural gas development project is to avoid or minimize potential adverse impacts to wildlife and habitats. Where avoidance and minimization are not feasible or possible, other forms of mitigation should be implemented to compensate for the impacts.

Site selection is an important component of the mitigation strategy, enabling an operator to avoid impacts to protected and/or sensitive species and habitat. When possible, well placement on previously disturbed land or away from sensitive environments is often the most effective conservation strategy. After avoidance is

considered, minimizing impact to species and/or habitat is an essential mitigation strategy. Strategies to minimize impact include directional drilling, timing of construction and activity, well site design, and effective preservation of viable soil. Employing these strategies reduces potential impacts to species and habitat.

6.4 Compensatory Mitigation

Compensatory mitigation addresses unavoidable impacts by replacing or providing substitute resources or environments that are equal to or greater than the habitat that will be impacted by an oil and gas development. It is normally implemented prior to the impact or before development begins. Standards for compensatory mitigation programs are established by federal, state, and local agencies (see Annex A) when a regulatory nexus exists. Regulatory authorities typically have provisions for the scale, duration, monitoring, and oversight of compensatory mitigation site activity.

Compensatory mitigation programs are typically established in advance of development; therefore, planning is essential for regulatory certainty and selection of the appropriate mitigation approach. In planning the mitigation strategy there are various options available to compensate for impacts that cannot be avoided or minimized. Compensatory mitigation for numerous development sites can be consolidated in a single mitigation approach, providing predictability for permitting and development activities. Companies may implement their own mitigation, pay an in-lieu fee, or otherwise secure from a third party via a conservation bank or other crediting system that generates specific conservation outcomes. Regulatory agencies typically require demonstration of ability to provide resources, administration, and capital to satisfy conservation objectives and the terms of a compensatory agreement. A description of some of the more common compensatory opportunities are included here; but operators are encouraged to perform more in-depth evaluation and consult with regulatory authorities.

a) Conservation banking: Conservation banking is a system regulated by state or federal agencies. Banking allows individuals or permit holders engaged in energy development to fund the creation, restoration, preservation, or enhancement of habitat at one location, a mitigation bank, as a means of offsetting the disturbance at other locations.

b) In-lieu fee: Payment of fees as a means of compensating for the disturbance caused by mineral development and extraction activities. These funds are dedicated to conservation efforts relevant to the species and/or habitat impacted by the mineral development.

c) Third-party landowners: Private property owners can be compensated for the conservation of land as a means of offsetting impacts or generating credits for mitigation of impacts by development in other locations. These third-party agreements usually specify performance objectives, conservation actions and duration.

7 Conservation Approaches

7.1 Ecological Assessment

Ecological assessments span a variety of sensitive receptor types including a species or organism, priority species, populations, communities and ecosystems, and officially designated critical habitats, threatened or endangered species. The scope of an ecological assessment depends on the specific context of the potential mineral development. For example, if a development occurs on land under agriculture production, the ecological assessment can be simple compared to developments near a higher habitat value wetland that provides resources for numerous species. Sensitive receptors that are relevant to a mineral development are a critical component of a landscape level development strategy. Identifying and analyzing sensitive receptors involves delineating the extent of the area (project region) requiring an ecological assessment that both encompasses an energy development and contains features that have the potential to be considerably impacted due to the mineral development activity. The scale of a project region is relative to the specific location and context of the

development and can range in size from a fraction of a square mile to an entire ecosystem. Defining the scale of a project region can be accomplished by a variety of strategies, including, but not limited to information resources, regional extent of other mineral developments, pre-established geographic areas, and other scientific methods.

7.2 Information Resources

High-level online tools are available that facilitate the delineation of project regions and their corresponding sensitive receptors. Two examples are the United States Fish and Wildlife Service (FWS), Information for Planning and Consultation (IPaC) (https://ecos.fws.gov/ipac), and the Western Association of Fish and Wildlife Agencies, Crucial Habitat Assessment Tool (CHAT) (https://www.wafwachat.org).

7.3 Landscape Level Planning

Supported by the field of landscape ecology, the concept of a landscape level planning originally emerged in the late 1980s. Landscape ecology involves the study of landscape patterns, their interactions, and changes over time. Landscape level planning, as underpinned by landscape ecology, encompasses the application of landscape ecology principles to manage landscape composition, structure, and function, including their role in biodiversity conservation. Landscape level planning considers scientific processes such as landscape permeability, connectivity, and fragmentation.

In recent years landscape level planning has received renewed attention given increased federal and state agency actions associated with reducing the risk of cumulative surface impacts. While historically, project-related impacts have been assessed on the scale of a single well pad or pipeline route, increasingly the challenge is to consider impacts in the context of their potential contribution to cumulative effects upon the broader landscape or ecosystem.

Currently landscape level planning can be an elective, regulatory and/or, project-driven development strategy. This strategy involves conducting an ecological assessment to identify sensitive receptors in a project area, including BES, water, air, soil, etc. In this process, the boundaries of landscape level planning are risk-based, i.e., refer to the point where no significant risks or impacts to the natural or socioeconomic environment remain. Within those boundaries, risks are managed through the mitigation hierarchy. This strategy is most effective when stakeholders and regulatory agencies work collectively toward a mutually beneficial outcome for multiple uses. In this section, prudent measures will be reviewed that operators can take to assess project impacts at an appropriate scale to identify sensitive receptors that can require special considerations in project development.

7.4 Landscape Level Conservation Opportunities

Landscape level mitigation and conservation involves identifying sensitive receptors in a project region and then applying the mitigation hierarchy to address impacts to those sensitive receptors. After an appropriate project region and the sensitive receptors contained within are defined, operators can then apply proven conservation strategies of avoidance, minimization, and mitigation to a mineral development's impacts.

The landscape scale model can be effective, although it can be challenging to define and implement. A landscape level mitigation or conservation strategy may be applied when specifically relevant to a project or mandated by law and is most effective when stakeholders and regulatory agencies work collectively towards a successful outcome for multiple uses. Examples of public and private conservation initiatives that provide landscape level approaches include the following:

— Candidate Conservation Agreements for the Lesser Prairie Chicken (LPC) and Dunes Sagebrush Lizard (DSL) in New Mexico - Center of Excellence (CEHMM);

- Candidate Conservation Agreements for the Dunes Sagebrush Lizard (DSL) in Texas;
- Western Association of Fish and Wildlife Agencies (WAFWA) LPC Range-wide Conservation Plan and CCAA;
- WAFWA Range-wide aerial survey effort and population estimation for the LPC funded by industry;
- Pecos Watershed Conservation Initiative (PWCI) – National Fish and Wildlife Foundation (NFWF) industry and agency partnership; and,
- Candidate Conservation Agreements for the Texas Hornshell Mussel and other species—NM State Lands Office, CEHMM, BLM.

Scientific methods can be employed to define boundaries and gain knowledge relevant to a project region, either by direct investigation by operators, or by collaboration and partnerships with third parties. With this approach, the range and/or habitat distribution of a specific animal or plant species or multiple life forms or species can be measured and used to both define the project region and develop practices to reduce a project's footprint at the landscape level.

Industry collaborations and partnerships with academia and other research groups can effectively promote conservation by developing science to protect species and habitat. Grants are often instrumental in achieving objectives. General grants are donated for conservation research without any guidance or control on allocation. These are useful to develop conservation science and promote cooperation for multiple use of lands. Specific grants are donated to further the understanding of a targeted conservation topic. A few examples are provided in the following.

- The Pecos Watershed Conservation Initiative, a partnership formed by the National Fish and Wildlife Foundation to provide conservation across habitats that benefits multiple species. The partnership has expanded to include numerous industry partners, government, and conservation partners.
- The Greater Sage Grouse Mapping Project in Colorado overseen by the Associated Governments of Northwest Colorado and Colorado Parks and Wildlife Department. The project's goal is to improve planning and conservation of Sage Grouse by mapping their priority and general habitat in Northwest Colorado.
- A conservation campaign to better understand the impact of oil and natural gas developments to improve conservation of Colorado's Mule Deer, Sage Grouse, and other wildlife. Industry's donation supports 20 different studies through and overseen by Colorado State University.
- Partnerships with the Intermountain West Joint Venture, USDA, and USDOI to improve sage habitats across the entire range of the sage grouse. Industry is working with a collaboration of eight joint ventures covering the shortgrass prairie from Canada to Mexico to understand grassland bird population trends and habitat needs for declining species.

7.5 Monitoring and Management

Access agreements allow valuable conservation research on lands leased or owned by the oil and natural gas industry. To achieve the success of a landscape level conservation strategy, agencies can develop information through monitoring. Operators can contribute through funding, providing agency access, collaboration, and participation in voluntary initiatives. Monitoring can inform decisions when the conservation results are different than expected and enable adaptive management. Monitoring can be used to measure success of conservation actions and to collect species specific data such as population counts and distribution, expansion, and

contraction, and lek utilization. Effective monitoring requires robust survey designs, data quality parameters and a proven statistical approach and considers long term trends.

8 Site-specific Planning

8.1 General

Planning should start with a review of applicable regulations and limitations for the project development. Documentation can include project activities, activity timelines and performance standards. Risk factors can be applied to inform development scheduling. Information for this review is available from historical geologic surveys, map resources, public records, agency regulations and applicable permit conditions of approval, and other desktop tools.

Environmental site screening is more focused on the environmental aspects of the project area and extends to other land uses including wildlife needs. State and federal agencies maintain databases that provide information on sensitive species and other resource related uses. Adequate screening informs effective conservation practices.

8.2 Project Site Assessment

8.2.1 General

An assessment identifies potential impacts associated with proposed project activities and will inform ongoing management decisions. Components of the site assessment can include initial screening and review of potential impacts, field evaluation, identifying project impacts and evaluation during project activities.

8.2.2 Field Evaluation

Field evaluation consists of a qualitative (visual) and quantitative (baseline) assessment of the habitat at the project site. The field evaluation gives operators information about the quality of the pre-development habitat. This information is used as a standard to return the land to a similar condition when the land is no longer required for construction or operation. The habitat baseline information is also referenced with the habitat needs of a targeted species as a sensitive receptor. This baseline referencing gives operators valuable information to assess the relative risk to a sensitive receptor resulting from a given mineral development activity.

8.2.3 Identify Potential Impacts

Identifying potential project impacts and sensitive receptors that could be negatively impacted allows operators to employ conservation measures that avoid, minimize, and mitigate those potential impacts. For example, if a sensitive species relies on a resource that will be impacted, avoiding, and minimizing that impact should be given priority.

8.3 Develop Conservation Strategy

The greatest conservation opportunities are often found during project planning. Integrating surface risks into planning is accomplished by effectively identifying surface risks such as sensitive receptors and then taking proven avoidance, minimization, and mitigation measures. In a scenario where multiple options exist to locate a well or to develop a prospect or reservoir, choosing locations that avoid potential sensitive areas can be a powerful strategy to reduce the cumulative impact of operations within a project region.

Site selection criteria to avoid or reduce impact can include sites that are already disturbed or otherwise are of low habitat value; sites that are farthest away from high value habitat; or sites that facilitate effective soil

management due to the favorable topography for construction. Minimizing a project's impact during planning can be achieved by evaluating opportunities to co-locate production facilities or design transportation corridors to accommodate current and future traffic to reduce the cumulative footprint over a project region. Surface impacts that are unavoidable can be minimized or mitigated.

9 Operational Practices

9.1 General

Oil and gas operational practices include technologies and processes to achieve operational efficiency, reliability, and investment return. Many responsible operators incorporate practices to maximize habitat and wildlife conservation as well.

Early development decisions often determine ongoing operational flexibility and subsequent footprint of a mineral development. In this section, specific technological improvements and proven practices that operators can use to minimize the footprint of a mineral development will be reviewed.

Operators should review API 100-2 [3] for recommended practices applicable to the management of the environmental aspects of shale development during planning site selection; logistics; mobilization, rig-up, and demobilization; and well stimulation operations including hydraulic fracturing. To inform operators in managing environmental aspects, API 100-2 also includes recommendations for the following topics:

a) baseline groundwater sampling;

b) source water management;

c) material selection;

d) transportation of materials and equipment;

e) storage and management of fluids and chemicals;

f) management of solid and liquid wastes;

g) air emissions;

h) site planning;

i) training;

j) noise;

k) visual resources.

API 100-2 provides a general discussion of exploration and production operations, which does not supersede the review of applicable regulatory requirements. Operators should consider available industry standards and guidance that can provide additional information.

It is the responsibility of the operator to review local, state, and federal regulatory requirements applicable in their areas of operation, and if needed, consult with third parties having appropriate regulatory, scientific, technical, and legal expertise.

9.2 Conservation Measures – Toolbox of Opportunities

Practices described in this document are utilized when appropriate for certain projects, development locations, and operational needs, in accordance with regulations and terms of applicable lease or contractual agreements. Some common practices include:

a) control of non-native and invasive plant species;

b) maximize use of existing developed areas and rights-of-ways for infrastructure;

c) utilize common corridors; co-locate or centralize facilities;

d) directional drilling;

e) closed loop systems for drilling and completion;

f) reduce venting and flaring (in compliance with regulatory requirements or voluntarily);

g) appropriate fencing to meet conservation need (e.g., marking, type, placement);

h) anti-perching devices;

i) low visibility facilities (e.g., color or height to blend with natural surrounding);

j) netting, flagging, or fencing on ponds and open tankage;

k) preventing entry to equipment stacks (e.g., caps or screens);

l) planning seismic and land surveys for habitat or species conservation needs;

m) spill and release prevention programs;

n) training of personnel and contractors.

9.3 Technology Advances

9.3.1 General

Technological advances that aid in conservation continue to emerge. Through planning and by employing these technologies, the development phase can be more efficient, habitat conservation measures improved, and potential impacts reduced.

9.3.2 Computer-Aided Landscape Level Planning

Geospatial technology can be used to enhance the effectiveness and efficiency of a landscape level planning. By using geographic information systems (GIS) and decision support tools (e.g., the WAFWA Crucial Habitat Assessment Tool (CHAT)), landscape level habitat and species data can be spatially analyzed and represented in maps, charts, and tables. These tools are effective for land development and conservation planning due to both the ease of data management and access, especially when applied to multiple habitats over a landscape.

9.3.3 Drilling Technology

Technological advances in oil and natural gas development over the last decade have resulted in substantial reduction in surface disturbances and habitat fragmentation. The advances of horizontal and directional drilling, coupled with advances in hydraulic fracturing, have resulted in an increase in reservoir recovery rate while decreasing habitat disturbance and fragmentation. Multi-well pad development is one benefit of advances in technology of directional drilling. The grouping of surface location of wells allows for reduction in operational footprint and overall total acreage disturbed. In some circumstances it allows for flexibility in the placement of well pads to avoid or minimize impact to protected, sensitive or high-quality habitat. A single well pad can average four to five acres, whereas multi-well pads can accommodate up to sixty-four wells with a marginal increase in pad size. A single horizontal well in some reservoirs can now take the place of eight to sixteen vertical wells depending on downhole spacing. In some cases, surface disturbance has been reduced by as much as 70% through use of horizontal drilling technologies.

9.3.4 Remote Monitoring and Supervisory Control and Data Acquisition

Remote monitoring and supervisory control and data acquisition (SCADA) collect data from remote well and facility locations. SCADA monitors infrastructure such as wells, pipelines, pump stations and storage tanks, transmitting data to an operations control center resulting in decreased field traffic. SCADA alerts the operator if there is an equipment related incident, allowing for a timelier response and increased environmental protection.

Unmanned aerial systems (drones), are an emerging technology that can also support surveying and reclamation efforts such as monitoring vegetation trends.

9.4 Operational Management Practices

9.4.1 General

The following best management practices should be reviewed in conjunction with applicable federal, state, and local planning requirements.

9.4.2 Infrastructure and Road Planned Development

When planning project areas, operators may consider using centralized tank locations for production and water handling, along with computer-assisted traffic monitoring and planning, to reduce miles traveled, minimize associated road dust and emissions, and manage traffic volume and timing of traffic for enhanced safety. Practices that are fit for purpose, such as the use of construction mats or two-track roads, can help control the severity of disturbance. Construction mats are primarily used during installation of pipelines to limit rutting and allow access to sensitive habitats such as a wetlands. Two-track roads can be appropriate in areas of low volume or temporary traffic, on low relief topography or stable soils, and where roads are primarily used under dry conditions. Preplanning roads and infrastructure for a project site or region increases both conservation and reclamation efficiency.

9.4.3 Traffic Minimization

Managing traffic in or near an oil field is important to protect wildlife, humans, and the environment. Vehicles can impact wildlife through collision and disturbance and the environment by contributing to dispersal of dust and gravel from roads. In addition, traffic dust that enters surface water resources can lead to increased water turbidity and can act as an allergen to humans. Establishing speed limits reduce these potential consequences. SCADA, unmanned aerial vehicles, or remote sensing may be used to monitor and manage logistics of well site maintenance and site visits. Infrastructure such as pipelines and centralized facilities help reduce truck

hauls. Managing traffic patterns and dust suppression (e.g., restricting access, reducing speed limits, watering roads, etc.) can also reduce impacts.

9.4.4 Water Management

Conservation of water used in mineral development is an important component of an operator's natural resource stewardship. Operators can take several factors into consideration when selecting a water source including proximity, cost efficiency, adequacy of volume and quality, and minimal impact to other uses. Similarly, water disposal programs are designed to handle volume and quality in compliance with regulatory requirements and to avoid impairment of water resources. Contingent upon regulation and contractual agreements, characteristics of the produced water and the development strategy, there can be several options for water management. These include treatment for reuse of produced water in operations, evaporation, injection to a disposal well and recycle for other uses. See API 51R [1] for additional information.

9.4.5 Watercourse Crossings and Protective Measures

Linear infrastructure such as pipelines, roads, and utilities are regulated for watercourse crossings. In sensitive habitats such as wetlands, rivers, creeks, streams, and swamps additional regulatory requirements can be imposed that address the conditions of construction, operations, and any mitigation. The operator should be aware of other areas that can be defined as sensitive in agency planning documents or by local zoning. Wherever construction of watercourse crossings is taking place, it is essential to determine which regulatory procedures to follow and which permits to procure.

9.4.6 Waste Management

Waste management involves the minimization, collection, transport, treatment, and disposal of waste produced during drilling, completions, and production.

Proper waste management minimizes the attraction of wildlife and livestock to the site. Waste management and good housekeeping practices also increase safety by removing slip, trip and fall hazards. Waste management planning should include consideration of the following:

a) product selection;

b) equipment design and maintenance;

c) establishing processes or procedures;

d) managing water use;

e) source reduction (reducing the generation of waste and potential pollutants);

f) pit design;

g) trash management;

h) closed loop systems;

i) waste collection systems;

j) production facility siting;

k) design and construction;

l) support infrastructure;

m) product take away or delivery decisions;

n) spill prevention and control;

o) equipment process design for efficiency in separation;

p) emission control equipment;

q) water management processes;

r) procedures for facility maintenance, workovers and well servicing.

9.4.7 Noise Management

Multiple options exist to eliminate or reduce noise associated with oil and gas activities. Methodologies to reduce noise include options to establish physical barriers that absorb or reflect sound such as sound reducing devices like mufflers and silencers on equipment. When feasible, using electric equipment is quieter. Noise is typically regulated by county laws and city ordinances, although in some circumstances, state and federal agencies regulate noise. Monitoring of noise levels or restriction of activities may be required to demonstrate avoidance or minimization of impact. When noise associated with construction cannot be avoided or minimized, timing stipulations may be required in areas with sensitive and protected species.

9.4.8 Light Management

Similar to sound, light disturbances from drilling, completions and production operations can also be reduced or eliminated. Successful light management is achieved by shielding, diffusing, and directing operational lighting away from nearby communities, night skies and wildlife. In addition, lights shown to have minimal spectral interference, such as sodium lamps, are commonly used, especially where operations occur in the light range of sensitive habitats. Light is typically regulated by county laws and city ordinances, but other regulatory ordinances may be in place. Managing light is another practice that has proven effective in reducing the overall disturbance from continuous operations.

9.4.9 Erosion, Sediment and Spill Control Measures

Control measures are important in protecting natural resources and conserving habitat. Sand, silt and clay that enter a water body can reduce spawning habitat for fish by filling the open spaces between gravel and cobble. In addition, fine particles suspended in the water that block light and pollutants that affect water quality or flow, change the way aquatic plants grow and degrade habitat for aquatic organisms. Preventing pollutants, soil and sediments from moving off an oil or natural gas site can be accomplished with appropriate erosion, sediment, and spill control measures.

Spill control measures can include inspection, maintenance programs, lined containment cells, drip pans, berms, and booms.

Sediment control measures can include check dams, diversion dikes, fiber rolls, silt busters, sandbag barriers, sediment basins, sediment traps, silt fences, storm drain inlet protection, straw bale barrier, and turbidity curtains.

Erosion control measures can include buffer strips, cellular confinement systems, contour bunding, contour plowing, fiber rolls, gabions, hydroseeding, mulching, riprap, fences, wattles, and windbreaks.

Soil erosion that occurs before adequate vegetation is re-established at a site can impede reclamation efforts due to the loss of a viable growing medium required for plant growth as well as changes to surface flow patterns. Compacted or composite materials can be used to stabilize sites. At the time of reclamation, the site will be amended as appropriate to re-establish vegetation.

9.4.10 Pipeline or Truck Hauling

Pipeline and trucking are regulated by local, state, and federal agencies. Depending upon the project area, production type, delivery constraints and location, it may be practical to utilize both pipeline and truck hauling. Oil and natural gas are transported by either pipeline or truck from the well or field gathering system to the sales point, additional processing or refinery point of delivery. Production fluids, produced water, drilling and frac fluids, treatment chemicals and other materials may be delivered or removed via pipeline or truck hauling. Lines within the field that transport well production to the gathering system are typically referred to as flowlines. Pipelines and flowlines are designed for the application, composition and volume of fluids, and lines may be buried or laid on the surface. The environmental impact, economics and appropriate application of either transportation method is best evaluated during the planning stage.

9.5 Conservation Practices

9.5.1 General

The oil and natural gas industry continues to develop initiatives around conservation practices. Stakeholder collaboration in programmatic conservation agreements is an example that has proven highly successful in mitigating the impact of mineral development to species and habitat. Depending on federal, state, and local laws, practices may be required by regulation or utilized on a voluntary basis. Comprehensive planning early in the development process promotes increased flexibility, reliability, and the efficacy of conservation practices. Operators should consider practices that are most applicable to the conditions and circumstances of their mineral development.

9.5.2 Health, Safety and Environment Training Programs for Employee and Public Protection

Operators are encouraged to promote education and an overall culture of health, safety, and environment within their organization. Employees should receive ample training to satisfy their employment obligations in a manner that places the highest priority on the health and safety of the workforce, and the protection of assets, communities, and the environment. Ongoing training to operators, service contractors and equipment vendor employees will promote proper and safe operation of equipment and facilities, as well as prevent incidents. Additionally, training on environmental protection, ecology and proven conservation practices are encouraged, including specific training on compliance with conservation commitments and to avoid impacts to sensitive habitats and species.

9.5.3 Regularly Scheduled Monitoring, Inspections and Maintenance

As a general rule, good business practices support environmental protection. These practices include regular inspections, routine monitoring of operations and directed, remedial and preventative maintenance of facility sites, equipment, and roads to verify their proper and safe operation. Regulations, permit conditions, contractual agreements, company procedures and policies, spill prevention, control, and countermeasure (SPCC) plans, and stormwater permits clearly define obligations such as the frequency and duration required for specific activities.

9.5.4 Seasonal Constraints or Stipulations

Protected and sensitive species can have seasonal periods where construction, operations, and traffic disturbance are limited or prohibited. These seasonal or timing stipulations are important to protect wildlife and

habitat. Weather constraints can also affect access to facilities for maintenance and operations. Weather and seasonal constraints should be taken into consideration during the planning and design process.

9.6 Protection of Birds

Through project design, construction and operations, there are opportunities for project planners to incorporate protections for birds. Birds can be subject to regulation under the ESA, Bald and Golden Eagle Protection Act and Migratory Bird Treaty Act. The oil and gas industry uses a variety of operational practices and conservation measures to manage potential impacts to bird species. The measures implemented are dependent upon site specific considerations and applicable regulations. Common conservation practices employed by industry include the following:

a) surveys prior to construction;

b) protocols for ongoing sightings and/or reporting of fatalities;

c) avoiding designated high-quality areas of avian habitat;

d) concentrating habitat disturbance (i.e., construction) outside of nesting season;

e) avoiding active nests;

f) outside of nesting season, using mowing, brush-hogging, etc. to clear potential nesting substrate in areas slated for construction;

g) avoiding and minimizing habitat fragmentation;

h) assessing and using existing infrastructure (such as pads, roads, pipeline rights-of-way, etc.);

i) maximizing use of disturbed land whenever possible to minimize project footprint;

j) restricting offsite traffic;

k) avoiding water features including wetlands and riparian areas, establish and maintain a minimum spatial buffer between required sensitive areas and construction boundaries;

l) using nets, screens, or covers for secondary containment;

m) minimizing accumulation of precipitation inside secondary containment or trays;

n) using deterrents such as netting, flagging or audio devices on open tanks and pits;

o) using exclusionary devices on equipment openings to minimize nesting opportunity or entrapment.

10 Reclamation

10.1 General

Reclamation, or returning the site to its pre-existing state and function, can also occur as interim reclamation throughout a project lifecycle. Land impacted by oil and natural gas developments is normally regulated by an agency and/or surface use agreement. Establishing site stability and stock piling topsoil as appropriate in the

construction phase supports effective reclamation. Over the long term, the objective of reclamation is to return the site to its approximate pre-construction contour and condition. Timelines for reclamation are generally specified by agency requirements and can also be dependent on climate, growth characteristics of the target vegetation and the quality of soil. Qualified individuals should be used for all aspects of the reclamation process, including surveys and monitoring. Where appropriate, operators should coordinate with landowners and state and federal agencies.

10.2 Regulatory and Contractual Requirements

Reclamation activities are regulated by state and federal agencies, (e.g., state oil and natural gas regulatory agencies, the BLM, tribal governments). Regulations typically impose reclamation requirements on mineral developers and can vary between public, state trust, private lands (surface use agreements), and/or states. Regulation governs the reclamation activity and financial responsibility (e.g., bonding). If a reclamation plan is required, it generally outlines specific actions to mitigate environmental impact throughout all phases of oil and natural gas development. Bonds are established to ensure that successful abandonment and reclamation occurs. Regulations typically define, in detail, performance standards and criteria that must be met before an oil and natural gas authority will release an operator from further obligation and liability at a site. Surface use agreements can dictate damage assessments and final reclamation requirements, which can include leaving infrastructure such as roads in place.

10.3 Reclamation Considerations

Reclamation is supported by both direct intervention such as redistribution of preserved topsoil, soil amendments and seeding, and by natural processes such as plant propagation and precipitation. The criteria and parameters for reclamation often include; equipment and material removal, soil management, site stability, surface reconstruction or contouring, hydrologic function, subsurface integrity, waste material handling, revegetation, aesthetics and management of invasive plants and pests. These criteria should be assessed against pre-construction baseline data, current surrounding landscape, and land use. In areas where the baseline conditions supported native vegetation, the reclamation plan should include re-establishment of native vegetation, topography and overall ecological function. Equipment, associated infrastructure, debris, and other materials should be removed and properly disposed. Existing erosion features such as gullies, headcuts, soil creep, and sheet erosion (or rills) should be addressed in the reclamation plan. The site should be graded or contoured to blend into the surrounding topography and establish stable water drainage. Sites that contain soils which are susceptible to erosion, and/or occur on steep terrain, may require additional reclamation activities to achieve stabilization. To re-establish a site's form and function, reclamation may require incorporating features such as boulders, stones, and organic materials. Prior to planting, soil amendments may be needed to re-establish vegetation. Resources such as the USDA Natural Resources Conservation Service provide guidance on appropriate soil amendments and native seed mixes. Native vegetation should be re-established with adequate concentration and diversity to provide habitat resources that approximate the site's pre-construction condition and visual appeal. Desirable vegetation should also be re-established to outcompete non-native, or otherwise undesirable plants, and stabilize the soil. Reclaiming vegetation, soil, topography, and resource complexity all contribute to returning the site's ecological function to the site's pre-construction condition.

10.4 Baseline Conditions

Characterizing the pre-construction condition of a site is a necessary component of reclaiming lands disturbed by mineral developments. Baseline data describes the land use, soils, and vegetative community existing prior to development. Pre-construction surveys at the development area/site include topography features, soil types and plant types, species composition, and density. If a pre-construction survey is not available, an adjacent or proximate reference location can be used to determine reclamation objectives.

10.5 Interim Reclamation

Interim reclamation is conducted to provide site stability and reclaim the surface area that is no longer required to support production or other activity. Interim reclamation provides an opportunity to reduce the overall surface disturbance earlier in the project life cycle. The process for interim reclamation and final reclamation (described below) is the same.

Depending on proximity to resources and other feasibility factors, soil conditioners and/or fertilizers can be applied to the soil to promote a viable plant growing medium. Incorporating a form of organic material into the soil is common for developments that occur on low-quality soils. In many cases soils can be unavoidably degraded to some degree in the construction process if soil is stockpiled. Organic materials provide a source of carbon for essential microbially-mediated nutrient cycling and nutrient retention and improve the water infiltration and storage capacity of the soil. Ideally, the organic material or combination of materials used contains a balance of both labile (readily mineralizable) and recalcitrant (stable or slow release) nitrogen-containing components to reduce mobilization of nitrogen and to provide a mineralizable nitrogen and carbon source in the short and long terms. These labile and recalcitrant soil fractions promote successful plant establishment, growth, and resistance to pests. Surface impacts that occur on high or intermediate quality soil typically require fewer amendments.

After an adequate plant growing medium is established, seeding or live planting can be performed. Seed mixes and seed amounts should be based on baseline plant data to achieve desired plant frequency and diversity. Live planting is a capital-intensive technique and is typically implemented to establish trees or when the circumstances warrant expedited shrub, forb, and grass re-establishment. Sufficient water inputs, usually in the form of precipitation, are required to germinate seeds and establish live plants. If plant re-establishment is unsuccessful due to drought, seeding and/or live planting can be required again. Non-native or otherwise undesirable plants can be controlled by mechanical or chemical means. A non-selective herbicide may be applied to the entire disturbance site before seeding or live planting to provide a soil environment free of plant competition. During the life of the reclamation project, non-selective herbicides can be targeted on problem plants or a selective herbicide can be broadcast applied. In some circumstances, pesticide applications may be necessary to control insect pressure that can inhibit revegetation success. Additionally, temporary fences may be necessary to prevent plant grazing or other damage from wildlife and/or range animals.

After measures to re-establish vegetation are complete, interim reclamation monitoring begins. The purpose of monitoring is to inform ongoing reclamation efforts when the reclamation results are different than expected, and to measure reclamation success. Effective monitoring requires robust survey designs, data quality parameters and a proven statistical approach. Operators should consult a surface land management agency or landowner for conditions if the interim reclamation is re-disturbed, either through an incident or as necessity for development or production operations.

10.6 Final Reclamation

Final reclamation occurs when operations cease. Surface owners can determine the reclamation objectives and can stipulate that certain facilities remain (e.g. access roads or water wells). Final reclamation is performed following the same progression as interim reclamation previously discussed. Successful outcome is achieved when a decommissioned oil and natural gas area/site returns to a state acceptable to the landowner .

Annex A
(informative)
Operational and Regulatory Information and Requirements

A.1 State- Oil and Gas Authority, Environmental Agency, Fish and Wildlife Service, and Land Office

The following is a listing of state agencies that regulate the environmental aspects of oil and gas activities in their jurisdictions.

— **Alabama**: Oil and Gas Authority: State of Alabama Oil and Gas Board, Environmental Agency: Alabama Department of Environmental Management, Fish and Wildlife Service: Wildlife and Freshwater Fisheries and Land Office: State Lands Division

— **Alaska**: Oil and Gas Authority: Alaska Oil and Gas Conservation Commission, Environmental Agency:, Alaska Department of Environmental Conservation, Fish and Wildlife Service: Alaska Department of Fish and Game and Land Office: Division of Mining, Land and Water

— **Arizona**: Oil and Gas Authority: Arizona Oil and Gas Conservation Commission, Environmental Agency: Arizona Department of Environmental Quality, Fish and Wildlife Service: Arizona Game and Fish Department and Land Office: Arizona State Land Department

— **Arkansas**: Oil and Gas Authority: Arkansas Oil and Gas Commission, Environmental Agency: Arkansas Department of Environmental Quality, Fish and Wildlife Service: Arkansas Game and Fish Commission and Land Office: Commissioner of State Lands

— **California**: Oil and Gas Authority: Division of Oil, Gas, & Geothermal Resources, Environmental Agency: State of California Department of Conservation, Fish and Wildlife Service: California Department of Fish and Wildlife and Land Office: California State Lands Commission

— **Colorado**: Oil and Gas Authority: Colorado Oil and Gas Conservation Commission, Environmental Agency: Colorado Department of Public Health and Environment and Colorado Department of Natural Resources Fish and Wildlife Service: Colorado Parks and Wildlife and Land Office: Colorado State Land Board

— **Florida**: Oil and Gas Authority: Florida Oil and Gas Program, Environmental Agency: Florida Department of Environmental Protection, Fish and Wildlife Service: Florida Fish and Wildlife Conservation Commission and Land Office: Division of State Lands

— **Idaho**: Oil and Gas Authority: Idaho Oil and Gas Conservation Commission, Environmental Agency: Idaho Department of Environmental Quality, Fish and Wildlife Service: Idaho Department of Fish and Game and Land Office: Idaho Department of Lands

— **Illinois**: Oil and Gas Authority: Illinois Oil and Gas Resource Management, Environmental Agency: Illinois Environmental Protection Agency Fish and Wildlife Service: Illinois Department of Natural Resources and Land Office: Illinois Department of Natural Resources

- **Indiana**: Oil and Gas Authority: Indiana Department of Natural Resources, Environmental Agency: Indiana Department of Environmental Management Fish and Wildlife Service: Indiana Department of Natural Resources: Division of Fish and Wildlife and Land Office: Indiana Department of Administration

- **Iowa**: Oil and Gas Authority, Environmental Agency, Fish and Wildlife Service and Land Office: Iowa Department of Natural Resources

- **Kansas**: Oil and Gas Authority: Kansas Corporation Commission Conservation Division, Environmental Agency: Kansas Department of Health and Environment, Fish and Wildlife Service: Kansas Wildlife, Parks and Tourism

- **Kentucky**: Oil and Gas Authority: Kentucky Department of Natural Resources Division of Oil and Gas, Environmental Agency: Kentucky Department of Environmental Protection, Fish and Wildlife Service: Kentucky Department of Fish and Wildlife Resources, and Land Office: Secretary of State Kentucky Land Office

- **Louisiana**: Oil and Gas Authority: State of Louisiana Department of Natural Resources, Environmental Agency: Louisiana Department of Environmental Quality, Fish and Wildlife Service: Louisiana Department of Wildlife and Fisheries and Land Office: Office of State Lands

- **Michigan**: Oil and Gas Authority and Environmental Agency: Michigan Department of Environmental Quality, Fish and Wildlife Service: Michigan Department of Natural Resources, and Land Office: Michigan Department of Natural Resources

- **Mississippi**: Oil and Gas Authority: Mississippi State Oil an Gas Board, Environmental Agency: Mississippi Department of Environmental Quality, Fish and Wildlife Service: Mississippi Wildlife Fisheries and Parks and Land Office: Secretary of State Public Lands Division

- **Missouri**: Oil and Gas Authority: Oil and Gas Council, Environmental Agency: Missouri Department of Natural Resources Fish and Wildlife Service: Missouri Department of Conservation

- **Montana**: Oil and Gas Authority: Montana Board of Oil and Gas, Environmental Agency: Department of Environmental Quality, Fish and Wildlife Service: Montana Fish, Wildlife and Parks

- **Nebraska**: Oil and Gas Authority: Nebraska Oil and Gas Conservation Commission, Environmental Agency: Nebraska Department of Environmental Quality, Fish and Wildlife Service: Nebraska Game and Parks

- **Nevada**: Oil and Gas Authority: State of Nevada Commission on Mineral Resources-Oil and Gas, Environmental Agency:Nevada Department of Conservation and Natural Resources and Nevada Division of Environmental Protection, Fish and Wildlife Service: Nevada Department of Wildlife, and Land Office: Nevada Division of State Lands

- **New Mexico**: Oil and Gas Authority: New Mexico the Oil Conservation Commission, Environmental Agency: New Mexico Environment Department, Fish and Wildlife Service: New Mexico Department of Game and Fish, and Land Office: New Mexico State Land Office

- **New York**: Oil and Gas Authority: Division of Mineral Resources, Environmental Agency: New York State Department of Environmental Conservation, Fish and Wildlife Service: Division of Fish and Wildlife, and Land Office: Division of Lands and Forests

- **North Carolina**: Oil and Gas Authority: North Carolina Environmental Quality Oil and Gas Program, Environmental Agency: NC Department of Environment and Natural Resources and NC Division of

Pollution Prevention and Environmental Assistance, Fish and Wildlife Service: Wildlife Resource Commission

— **North Dakota**: Oil and Gas Authority: Oil and Gas Division, Environmental Agency: North Dakota State Water Commission, North Dakota Geologic Survey and North Dakota Department of Health-Environmental Health Section Fish and Wildlife Service: North Dakota Game and Fish Department and Land Office: North Dakota Department of Trust Lands

— **Ohio**: Oil and Gas Authority: Division of Oil and Gas Resources, Environmental Agency :Ohio Department of Natural Resources and Ohio Environmental Protection Agency, Fish and Wildlife Service: Division of Wildlife

— **Oklahoma**: Oil and Gas Authority: Oil and Gas Division**,** Environmental Agency: Oklahoma Conservation Commission and Oklahoma Department of Environmental Quality, Fish and Wildlife Service: Oklahoma Department of Wildlife Conservation and Land Office: Commissioners of the Land Office

— **Pennsylvania**: Oil and Gas Authority: Office of Oil and Gas Management, Environmental Agency: Pennsylvania Department of Conservation and Natural Resources, Fish and Wildlife Service: Pennsylvania Game Commission

— **South Dakota**: Oil and Gas Authority: South Dakota Department of Environmental and Natural Resources, Environmental Agency: South Dakota Department of Environmental and Natural Resources Fish and Wildlife Service: South Dakota Game Fish and Parks

— **Tennessee**: Oil and Gas Authority: Tennessee Department of the Environment & Conservation, Environmental Agency: Tennessee Department of Environment and Conservation, Fish and Wildlife Service: Tennessee Wildlife Resource Agency

— **Texas**: Oil and Gas Authority: Railroad Commission of Texas, Environmental Agency: Texas Commission on Environmental Quality, Fish and Wildlife Service: Texas Parks and Wildlife Service and Land Office: The Texas General Land Office

— **Utah**: Oil and Gas Authority: Division of Oil, Gas and Mining, Environmental Agency: Utah Department of Environmental Quality, Fish and Wildlife Service: Utah Division of Wildlife Services, and Land Office: State of Utah School and Institutional Trust Lands Administration

— **Virginia**: Oil and Gas Authority: Division of Oil and Gas, Environmental Agency: Virginia Department of Environmental Quality, Fish and Wildlife Service: Virginia Department of Game and Inland Fisheries

— **West Virginia**: Oil and Gas Authority: Office of Oil and Gas, Environmental Agency: West Virginia Department of Environmental Protection, Fish and Wildlife Service: West Virginia Division of Natural Resources-Wildlife Resources

— **Wyoming**: Wyoming Oil and Gas Conservation Commission, Environmental Agency: Wyoming Department of Environmental Quality, Fish and Wildlife Service: Wyoming Game and Fish Department, and Land Office: Office of State Lands and Investments

A.2 U.S. Federal Agencies

The primary federal agencies that regulate oil and natural gas development are as follows:

— Environmental Protection Agency;

- Fish and Wildlife Service;
- Bureau of Land Management;
- Department of Transportation;
- Pipeline and Hazardous Materials Safety Administration;
- Forest Service;
- National Park Service;
- Occupational Safety and Health Administration;
- Bureau of Indian Affairs;
- Department of Homeland Security.

A.3 Local County and City Ordinances

County laws typically regulate landscape issues such as noise, odor, light at night, aesthetics, and other similar issues. Refer to county of interest to find out more about specific county laws.

City ordinances typically establish rules related to road construction standards, traffic and routing rules, and speed limits on roads. In areas with dense populations, city ordinances become more significant in regulating oil and natural gas development. Refer to city of interest to find out more about specific city ordinances.

A.4 Habitat Conservation and Mitigation Regulatory Information

A.4.1 Local/State Programs

There are numerous local and state habitat conservation programs. As an example, the following are some of Wyoming's local habitat conservation programs: Wind River-Bighorn Basin District Sage-Grouse Conservation Initiatives and Wyoming Sage Grouse Conservation Campaign. In addition, the following are some of Wyoming's state habitat conservation programs: Partners for Fish and Wildlife Program in Wyoming, Wyoming Animal Damage Management Board and Wyoming Conservation Stewardship Program. Refer to a local area or state of interest to find out about their specific habitat conservation programs.

A.4.2 Federal Actions

A.4.2.1 Candidate Conservation Agreements (CCA)

Voluntary conservation agreements between the United States Fish and Wildlife Service and one or more public or private parties. The Fish and Wildlife Service works with its partners to identify threats to candidate species, plan the measures needed to address the threats and conserve these species, identify willing landowners, develop agreements, and design and implement conservation measures and monitor their effectiveness. CCAs can include plant and animal species that have been proposed for listing or are candidates for listing, and at-risk species. They can apply to single or multiple species but are not required by law. A CCA is a proactive conservation effort that can eliminate the need to list a species under ESA.

A.4.2.2 Candidate Conservation Agreement with Assurances (CCAA)

Expansion on the traditional CCAs by providing non-federal landowners with additional incentives for engaging in voluntary proactive conservation through assurances that limit future conservation obligations. One of the primary reasons for developing the CCAA program was to address landowner concerns about the potential regulatory implications of having a listed species on their land. On May 4, 2016 FWS published, for comment, a draft revised CCAA Policy. CCAAs can include plant and animal species that have been proposed for listing or are candidates for listing, and at-risk species. They can apply to single or multiple species. The program is only for non-federal lands.

A.4.2.3 Differences between CCA and CCAA

A CCA can be between FWS and other federal, state, or local agencies, or with private sector parties, and can include both federal and non-federal lands and waters. No Enhancement of Survival Permit is issued. That means there is no permit that authorized incidental take of the covered species in the event listing occurs, and no assurances are provided by the Service. CCAA is only for non-federal property owners. Enhancement of Survival is issued at same time as CCAA which provides assurances that, if the species is subsequently listed and no other changes have occurred, the FWS will not require the permittee to conduct any additional conservation measures without consent. Additionally, the permit authorizes a specific level of incidental take of the covered species, should listing occur. CCAs and CCAAs can be used in a complementary fashion to address threats on federal and non-federal lands.

A.4.2.4 Habitat Conservation Plans (HCP)

HCPs are planning documents required as part of an application for an incidental take permit. They describe the anticipated effects of the proposed taking; how those impacts will be minimized or mitigated; and how the HCP is to be funded. In addition to listed species, HCPs can also cover non-listed species, including those that are candidates or have been proposed for listing. Conserving species before they are in danger of extinction or are likely to become so can also provide early benefits and prevent the need for listing. On June 29, 2016, FWS proposed revisions to the HCP Handbook.

A.4.2.5 Consultation

The Endangered Species Program of the FWS uses Section 7 tools in partnership with other service programs and other federal agencies to collaboratively solve conservation challenges, as well as create opportunities, using Section 7 consultations, to recover the ecosystems of listed species. Consultations also provide ways to implement recovery tasks by addressing threats to listed species that can result from federal agency programs and activities.

A.4.2.6 Grants

Available under the ESA to help states and landowners plan and implement projects to conserve species. One of the tools, the Cooperative Endangered Species Conservation Fund (Section 6 of the ESA), provides grants to states and territories to participate in a wide array of voluntary conservation projects for candidate, proposed, and listed species.

A.4.2.7 Conservation Grants

Provide financial assistance to states and territories to implement conservation projects for listed species and at-risk species. Funded activities include habitat restoration, species status surveys, public education and outreach, captive propagation and reintroduction, nesting surveys, genetic studies, and development of management plans.

A.4.2.8 Habitat Conservation Planning Assistance Grants

Provide funds to states and territories to support the development of HCPs through support of baseline surveys and inventories, document preparation, outreach, and similar planning activities.

A.4.2.9 HCP Land Acquisition Grants

Provide funding to states and territories to acquire land associated with approved HCPs. Grants do not fund the mitigation required of an HCP permittee; instead, they support land acquisition by the State or local governments that complement mitigation.

A.4.2.10 Recovery Land Acquisition Grants

Provide funds to states and territories for the acquisition of habitat for endangered and threatened species in support of draft and approved recovery plans. Acquisition of habitat to secure long-term protection is often an essential element of a comprehensive recovery effort for a listed species.

A.4.3 Reclamation Resources

The following references provide information on reclamation activities.

- BLM Surface Operating Standards and Guidelines for Oil and Gas Exploration and Development (The Gold Book) [5];
- BLM Handbook H-1601-1, *Land Use Planning* [6];
- BLM Handbook H-1790-1, *National Environmental Policy Act* [7];
- DOI Departmental Manual 522 DM 1, *Adaptive Management Implementation Policy* [8];
- DOI Departmental Manual 600 DM 6, *Landscape-Scale Mitigation Policy* [9];
- *Handbook of Western Reclamation Techniques* [10];
- University of Wyoming Reclamation and Restoration Center (www.uwyo.edu/wrrc).

A.5 Legal Foundation of United States Species and Habitat Conservation

A.5.1 General

Government regulation provides an opportunity for operators to meet oil and natural gas demands while also meeting the species and habitat conservation needs defined by the public. This system gives the public a meaningful avenue to contribute to the management and conservation of our nation's natural resources. The oil and natural gas industry is one of the most intensely regulated industries in the United States The following section briefly describes some of the major environmental regulations requiring compliance from the oil and natural gas industry.

A.5.2 Endangered Species Act

Federal law establishing that endangered or threatened species and the ecosystem on which they depend are conserved throughout all or a significant portion of their range.

A.5.2.1 Section 9 of ESA

Prohibits take of any fish or wildlife species listed as endangered. 50 Code of Federal Regulations (CFR) 17.31(a) states that all prohibitions for endangered species also apply to threatened species. Section 9 of the ESA prohibits damage or destruction of listed plants only on federal property or when doing so in violation of any state or other law on non-federal property. Take is defined as harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct. Take is further defined under 50 CFR 17.3 as “an act which actually kills or injures wildlife”. Such act may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavior patterns such as breeding, feeding or sheltering. The National Marine Fisheries Service 50 CFR 222.102 definition is similar, though it adds terms related to aquatic species.

A.5.2.2 Section 10 of ESA

Provides exceptions to the section 9 prohibitions via take for scientific purposes or to enhance propagation or survival of a listed species pursuant to Section 10(a)(1)(A). Incidental take permits (ITP) issued pursuant to section 10(a)(1)(B) for otherwise lawful activities. 50 CFR 17.22(b), 17.32(b), 222.307(b), and 222.307(c)) Section 10(a)(2)(A) lists the elements that must be contained in a conservation plan (e.g., CCA/A, HCP, or safe harbor agreement) as part of an application for an ITP. Section 10(a)(2)(B) specifies the criteria that must be met before the services can issue an ITP.

A.5.2.3 Section 7 of ESA

Directs federal agencies to work to conserve endangered and threatened species and to use their authorities to further the purpose of the act. Each federal agency shall in consultation ensure that any action authorized, funded, or carried out by the agency is not likely to jeopardize the continued existence of any endangered or threatened species or result in destructive or adverse modifications of designated critical habitat 16 United States Code §1537(a)(2). Consultation is carried out first informally then formally before a jeopardy determination is made. Some potential scenarios requiring consultation include; drilling activities on Bureau of Land Management or U.S. Forest Service lands and pipeline crossings or certain other oil and gas activities affecting waters of the United States.

A.5.2.4 Section 6 of ESA

Promotes the role the states play in conserving species and habitat. Section 6 provides funding to states for species and habitat conservation actions on non-federal lands. Through cooperative agreements, states can receive funding for a variety of conservation actions that contribute towards listed species recovery. See Annex A for information concerning cooperative agreements.

A.5.2.5 Section 4 (d) of ESA

Extends the take prohibition to threatened species, in the absence of a special rule under ESA §4(d). 50 CFR §17.31.

A.5.3 National Environmental Protection Act (NEPA) and State Counterparts

Environmental legislation to prevent or eliminate damage to the environment. Since its establishment NEPA or similar state laws have regulated federal, state, and local projects as well as permits issued by government agencies. Prior to the Bureau of Land Management approving any oil or natural gas exploration or production activity on leased federal land, it must conduct environmental analysis under NEPA.

A.5.4 Federal Land Policy and Management Act

Federal law establishing how the Bureau of Land Management manages public lands. The act covers management activities including land-use planning, land acquisition, fees and payments, administration of federal land, range management, and right-of-ways on federal land. The law also establishes that public lands should be managed to protect ecological, environmental, water resources and archaeological heritage, and under some circumstances, preserved in its natural condition to produce food and habitat for fish and wildlife. The Bureau of Land Management manages mineral rights on 258 million acres of BLM and other federal lands, in addition to private lands where mineral rights are owned by the federal government.

A.5.5 Mineral Leasing Act

Federal law that promotes the leasing of public lands for extraction of coal, phosphates, oil, gas, potassium, oil shale, bituminous rock, and other hydrocarbons. The law also establishes requirements for restoration, revegetation, erosion control and to prevent the damage of fish and wildlife habitat.

A.5.6 National Historic Preservation Act

Legislation to promote the preservation of archaeological and historic sites. Section 106 of the National Historic Preservation Act, as amended (16 U.S.C. 470(f)), requires government agencies to take into account the effect of a proposed project on any historic property and to afford the Advisory Council on Historic Preservation an opportunity to comment on projects if required under 36 CFR 800. Section 101(d)(6)(B) of the Act requires government agencies to consult with any Indian tribe that considers a portion of land, regardless of location, to have significant historic or religious value that can be impacted by a development.

A.5.7 Administrative Procedures Act

A federal statute that establishes procedures of federal administrative agencies when proposing or enacting regulations. This ensures procedures to regulate the industry follow a standard and executable format.

A.5.8 Federal Advisory Committee Act

Federal law that establishes rules for the Federal Advisory Committee on open meetings, chartering, public involvement, and reporting. The purpose of the act is to ensure that advisory committees are objective and open to the public. Chartered under the act are oil and/or natural gas committees advising on a wide variety of industry topics at the national, state, and local levels.

A.5.9 Freedom of Information Act

A federal law that establishes the release of documents held by the United States government. The act defines the documents that are subject to release. This law ensures public access to industry and government documents related to oil and natural gas developments.

A.5.10 Migratory Bird Treaty Act

Federal law that protects migratory birds. The act requires a waiver to pursue, hunt, take, capture, kill, or sell listed migratory birds. This law includes the protection of feathers, eggs, and nests.

A.5.11 Bald and Golden Eagle Protection Act

Federal law that protects Bald and Golden Eagles. The law requires a permit from the Secretary of the Interior in order to take, possess, sell, purchase, barter, transport, export or import, at any time or any manner, any Bald or Golden Eagle. This law includes the protection of feathers, eggs, and nests.

A.5.12 Clean Water Act

Federal law that regulates pollutant discharges into United States water. In this regard oil and natural gas developments are primarily regulated by The National Stormwater Permit Program (NSPP) authorized by the Clean Water Act. The NSPP established that construction sites are required to control stormwater runoff pollutants. Under the NSPP, Stormwater Pollution Prevention Plans were mandated for mineral developments. Stormwater Pollution Prevention Plans are used to identify and control potential sources of pollution that can impact the quality of stormwater leaving a construction site.

A.6 White House Memorandum and Resulting Agency Policy Changes

A.6.1 General

This information is subject to change in response to presidential directives. At the time of creating the document, this was the memorandum in effect.

A.6.2 Mitigating Impacts on Natural Resources from Development and Encouraging Related Private Investment

In November 2015 the memorandum Mitigating Impacts on Natural Resources from Development and Encouraging Related Private Investment was issued to encourage private investment in restoration and public-private partnerships and helps foster opportunities for businesses or non-profit organizations with relevant expertise to successfully achieve restoration and conservation objectives. It also encourages agencies to share and adopt a common set of best practices to mitigate harmful impacts to natural resources.

A.6.3 Agency Mitigation Policies Changes

A.6.3.1 Fish and Wildlife Service mitigation Policy

FWS revised its Fish and Wildlife Service Mitigation Policy in accordance with Secretarial Order 3330. The revised policy provides a framework for applying landscape scale approach to achieve, through application of the mitigation hierarchy, a net gain in conservation outcomes, or at a minimum, no net loss of resources and their values, services, and functions resulting from proposed actions.

A.6.3.2 Fish and Wildlife Service Compensatory Mitigation Policy

As a result of the Presidential memorandum, the FWS revised its Fish and Wildlife Service Compensatory Mitigation Policy. The policy revises existing guidance concerning compensatory mitigation mechanisms promoted by the FWS under the ESA. These revisions involve permittee-responsible mitigation, conservation banking, in-lieu fee programs and habitat credit exchanges. The changes to these mitigation programs are intended to promote federal agencies and applicants to develop agreements that compensate for adverse impacts species.

A.6.3.3 Fish and Wildlife Service Pre-listing Conservation Actions

As a result of the Presidential memorandum, the FWS developed the Fish and Wildlife Service Pre-listing Conservation Actions promoting voluntary conservation actions to protect at risk species. The policy provides states a mechanism to incentivise agencies, landowners, and industry to voluntarily conserve species that are not threatened or endangered. These incentives are in the form of credits that can later be applied to offset or mitigate activity to a species if it is later listed under the ESA.

A.6.3.4 Bureau of Land Management Mitigation Policy

As a result of the Presidential memorandum the Department of the Interior, through the BLM, expanded upon the guidance Manual Section 1794 by developing a Mitigation Handbook MS-1794-1 and Mitigation Manual MS-1794. Additions to the previous policy are in large related to expanding compensatory mitigation actions and agency management thereof.

A.6.3.5 Forest Service Mitigation Policy

The Presidential memorandum requires the Department of Agriculture, through the U.S. Forest Service, to develop and implement additional manual and handbook guidance that addresses the agency's approach to avoidance, minimization, and compensation for impacts to natural resources within the National Forest System. The Forest Service released the policy white paper for public comment April of 2016 and is expecting the final directive to be complete in the near future.

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[3] API Recommended Practice 100-2, *Managing Environmental Aspects Associated with Exploration and Production Operations Including Hydraulic Fracturing*

[4] API Bulletin 100-3, *Community Engagement Guidelines*

[5] U.S. Bureau of Land Management (BLM)[1], *Surface Operating Standards and Guidelines for Oil and Gas Exploration and Development (The Gold Book)*

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