CHECKLIST ENVIRONMENTAL ASSESSMENT

Project Name:	Tank Coulee Gravel Pit
Proposed Implementation Date:	Fall 2023
Proponent:	Knife River Corporation
Location:	N2 of Sec. 26, T22N, R1W
County:	Teton
Trust:	Montana Tech

I. TYPE AND PURPOSE OF ACTION

Knife River Corporation henceforth referred to as the proponent, has applied for a Trust Lands aggregate take and remove permit in Teton County, approximately 2.4 miles northwest of Gordon, MT, see Attachment A, Project Location Maps. The proposed action being evaluated is the issuance of an aggregate take and remove permit, which would allow the proponent the ability to mine, crush, and remove gravel from State Trust Lands as well as operate an asphalt plant within the boundaries of the permitted area. An aggregate take and remove permit is valid for approximately 2 years, with renewal ability. The application is for approximately 130.0 acres included in the permit area, all 130.0 acres would be bonded through MT DEQ opencut section. This document will analyze the impacts of issuing an aggregate take and remove permit, and subsequent renewals of the same area. If there are significant changes to total acreage, or operating plans within a renewal application, the project may require an additional environmental analysis. The final reclamation date listed in the DEQ dryland opencut permit is the year 2047.

The proponent has obtained a DEQ Opencut Mining Dryland Permit through the Montana Department of Environmental Quality's Opencut Mining Section. The proponent must obtain the proper permits for both crushing operations and asphalt emissions through the Montana DEQ's Air Quality Bureau.

II. PROJECT DEVELOPMENT

1. PUBLIC INVOLVEMENT, AGENCIES, GROUPS OR INDIVIDUALS CONTACTED:

Provide a brief chronology of the scoping and ongoing involvement for this project.

The proponent applied for an aggregate take and remove permit in April of 2023.
The Conrad Unit Office has been notified of the application.
The Ag & Grazing lease #9672 Dave Barta has been notified of the application.
Scoping letters were sent out to adjacent landowners, the surface lessee, Teton County Commissioners, and MT FWP, comments received are attached in Attachment B.

2. OTHER GOVERNMENTAL AGENCIES WITH JURISDICTION, LIST OF PERMITS NEEDED:

To mine gravel on Montana State Trust Lands the operator must obtain and keep current the following permits:

- Aggregate Take and Remove Permit – Montana DNRC – Forestry and Trust Lands Division(MMB)
- Opencut Mining Permit – Montana DEQ Opencut Section
- With respect to Air Quality the operator must obtain and comply with:
    - An air quality permit from the MT DEQ Air Resources Management Bureau
    - An operator must comply with Federal Clean Air Act

- An operator must comply with Montana Clean Air Act

At the time of the construction of this document, the proponent does not plan to utilize an on-site groundwater well. If a well is desired in the future, the operator must apply to and obtain the proper water right from the Montana DNRC's Water Rights Bureau and coordinate with Montana State Trust Lands.

3. ALTERNATIVES CONSIDERED:

No Action Alternative: The aggregate take and remove permit would be denied and the proponent would not be authorized to -mine or utilize sand & gravel from the proposed area, located on the Montana State Trust Lands tract northwest of Gordon, MT.

Action Alternative: The aggregate take and remove amendment would be approved and the proponent would be authorized to mine, crush, and remove sand & gravel from the proposed location on Montana State Trust Lands. The proponent would also be allowed to operate an asphalt plant within the permitted area.

SUMMARY OF POTENTIAL IMPACTS TO THE PHYSICAL AND HUMAN ENVIRONMENT

The impacts analysis identifies and evaluates direct, secondary, and cumulative impacts.

• Direct impacts: impacts that occur at the same time and place as the action that causes the impact

• Secondary impacts: further impacts to the human environment that may be stimulated, or induced by, or otherwise result from a direct impact of the action.

• Cumulative impacts: collective impacts on the human environment of the proposed action when considered in conjunction with other past and present actions related to the proposed action by location or generic type. Related future actions must also be considered when these actions are under concurrent consideration by any state agency through pre-impact statement studies, separate impact study evaluation, or permit processing procedures.

Where impacts are expected to occur, the impacts analysis estimates the duration and severity of the impact.

The duration of an impact is quantified as follows:
• **Short-term**: impacts that would not last longer than the proposed operation of the site, including reclamation of the site.
• **Long-term**: impacts that would remain or occur following reclamation of the proposed site.

The severity of an impact is measured using the following:
• **No impact**: There would be no change from current conditions.
• **Negligible**: An adverse or beneficial effect would occur but would be at the lowest levels of detection.
• **Minor**: The effect would be noticeable but would be relatively small and would not affect the function or integrity of the resource.
• **Moderate**: The effect would be easily identifiable and would change the function or integrity of the resource.
• **Major**: The effect would alter the resource

III. IMPACTS ON THE PHYSICAL ENVIRONMENT

- *RESOURCES potentially impacted are listed on the form, followed by common issues that would be considered.*
- *Explain POTENTIAL IMPACTS AND MITIGATIONS following each resource heading.*
- *Enter "NONE" If no impacts are identified or the resource is not present.*

4. GEOLOGY AND SOIL QUALITY, STABILITY AND MOISTURE:

Consider the presence of fragile, compactable or unstable soils. Identify unusual geologic features. Specify any special reclamation considerations. Identify any cumulative impacts to soils.

Current conditions

Geology: The Geology of the site consists of alluvial deposits of sand and gravel overlaying Marias River shale and sandstone formations.

Soils: According to the USDA's Web Soil Survey, the project area consists of seven soil types, see Attachment E, soil report.

1. Crago gravelly loam, 0 to 4 percent slopes
2. Niart-Crago-Arrod gravelly loams, 0 to 4 percent slopes
3. Rothiemay-Niart clay loams, 0 to 4 percent slopes
4. Niart-Crago gravelly loams, 0 to 4 percent slopes
5. Niart gravelly loam, 0 to 4 percent slopes
6. Delpoint-Cabbart-Crago complex, 15 to 60 percent slopes
7. Megonot-Yawdim-Rock outcrop complex, 25 to 60 percent slopes

The primary soil factors to consider for gravel mining activities are soil erodibility and soil restoration potential. Soil erodibility is a factor that determines the soils risk to erode from stresses such as weather and machinery travel. Soil restoration is the potential for restoration to the original state. This is a good metric of how the soil will react upon reclamation.

- *K factor* –These soils exhibit ratings from .10 - .28 correlating a low to moderate rating for soil-to-sheet and rill erosion from water based on numerical ranges from 0.02 to 0.69.
- *Soil compactibilty risk* – 5.7% of the acreage exhibits a high compactibility risk while the remaining acreage has a medium compactibility risk.
- *Wind erodibility group* – These soils exhibit a moderate rating to wind erosion.
- *Soil restoration potential* – These soils exhibit a high potential for soil restoration.
- *Soil rutting hazard* – These soils exhibit severe potential to soil rutting.
- *Suitability for Roads* – These soils are rated from moderately suited to poorly suited for using the natural surface of the soil for roads.

Alternatives

No Action Alternative:

The selection of the no action alternative would not be expected to have any impact to the geology and soil quality, stability, and moisture.

Action Alternative:

- Direct Impacts: Gravel would be excavated and utilized for surrounding infrastructure projects, the removal and utilization of the gravel is irreversible. All soil present on the site would either remain in place or be stripped, stockpiled, seeded, and saved for reclamation. Stockpiled soil would be planted with a seed mix to mitigate erosion. Upon reclamation, the soil would be replaced upon the disturbed areas and would be planted with a native seed mix approved by the Department. The stripping and moving of soil could result in minor losses of total volume, but it would not impair the reclamation efforts of the site. There are no unusual or fragile soils, or geologic features within the project area. Impacts to soil are expected to be negligible and long-term from the selection of the action alternative. Impacts to topography are expected to be minor and long-term from the selection of the action alternative. Operations would begin with stripping and stockpiling approximately 6 inches of topsoil and overburden from across the project area, removing aggregate resources would follow. These

activities would not inhibit the success of reclamation. The mining and removal of sand and gravel would be irreversible and irretrievable, as this material would be utilized for construction. Negligible, short-term impacts to geology and soil quality, stability and moisture would be expected.

- Secondary Impacts: No impacts expected.
- Cumulative Impacts: There are no cumulative impacts expected to geology and soil quality, stability and moisture from the selection of the action alternative.
- Duration: Direct impacts of the selection of the action alternative would be expected to be long-term.

Mitigations

The potential selection of action alternative would include the following stipulation in the aggregate permit:

- Berms that are constructed by topsoil and overburden, will be planted with a native seed mix, that does not contain crested wheatgrass, to mitigate erosion from moisture events and wind.

5. WATER QUALITY, QUANTITY AND DISTRIBUTION:

Identify important surface or groundwater resources. Consider the potential for violation of ambient water quality standards, drinking water maximum contaminant levels, or degradation of water quality. Identify cumulative effects to water resources.

Current Conditions

Surface Water: Sections 26 of T22N – R1W, contains one perennial stream, Tank Coulee, that flows west to east through the S2 of the N2 approximately 700' to the south of the proposed project area. Tank Coulee enters the west boundary of section 26 at an elevation 3629' ASL and exits the east boundary of section 26 at an elevation of 3554' ASL. The proposed project area sits approximately 150 feet or greater above the existing surface water features.
The U.S. Fish and Wildlife Service's National Wetlands Inventory map identifies a PEM1B class wetland feature 332.20 feet south of the project area, sitting at an approximate elevation of 3600' ASL, see Attachment D of wetlands map of project area.

Ground Water: A search of the Montana Ground Water Information Center website found there are eight water wells within a one-mile radius of the project vicinity. Each well is summarized below in Table 1 and a map of the reported surface location of each well is located on page 17 as Attachment C of this document. Inaccurate reporting, less refined legal descriptions and poor mapping accuracy may lead to inconsistencies between the reported and physical locations of groundwater wells.
The proponent has not applied for a water right and does not currently anticipate using onsite groundwater for mining operations.

GWIC ID	Latitude	Longitude	Surface Elevation	Total Depth	Static Water Level	Depth Water Enters	Calculated Water Table Elevation
76515	47.651258	-111.711619	3710	35	10	<null>	3700
76535	47.648046	-111.708379	3713	40	8	40	3705
76536	47.629151	-111.683195	3774	61	30	33	3744
76537	47.635452	-111.718958	3675	16	<null>	9	Unknown
76547	47.624611	-111.690005	3782	35	20	35	3762
76549	47.62142	-111.69949	3765	35	7	13	3758
140804	47.65308	-111.710284	3701	25	<null>	<null>	Unknown
140805	47.638	-111.6698	3505	98.2	38.56	98.2	3466.44
196703	47.62142	-111.69949	3770	40	23	25	3747
206326	47.623706	-111.702214	3795	80	15	60	3780
208321	47.638	-111.6698	3505	78	15	20	3490
209742	47.623706	-111.691362	3785	60	13	25	3772
231730	47.63639	-111.71638	3785	12	<null>	<null>	Unknown

Alternatives

No Action Alternative:

The no action alternative is not expected to have any impacts to water quality, quantity and distribution.

Action Alternative:

- Direct Impacts: The average calculated groundwater elevation from nearby Ground Water Information Center (GWIC) data is 3692' ASL. The proposed project area elevation is between 3719' and 3791' ASL. The proponent may truck water onto the site to control dust. Due to the nature of the Dryland Opencut application and approval it is expected that berms and mine topography would retain stormwater within the project area, and the site would not intersect groundwater. Precipitation would be expected to infiltrate into the subsurface. There are no impacts expected to water quality, quantity or distribution from the selection of the action alternative.
- Secondary Impacts: No impacts expected.
- Cumulative Impacts: No cumulative impacts to water quality, quantity and distribution would be expected.
- Duration: Any impacts would be expected to last duration of the permit, until final reclamation.

Mitigations

The potential selection of action alternative would include the following stipulation in the aggregate permit:

- If gasoline, oil or other forms of hazardous liquids are stored on site, they must be contained within primary and secondary impermeable containment, in which the secondary containment is able to contain the entire volume of the hazardous liquid. For example, a 55-gallon drum of gasoline must also be stored in an HDPE container or similar methods.
- All equipment utilized in mining must be regularly maintained and inspected to ensure it is not leaking fluids, spreading noxious weeds, or creating an undue fire hazard.

6. AIR QUALITY:
What pollutants or particulate would be produced? Identify air quality regulations or zones (e.g. Class I air shed) the project would influence. Identify cumulative effects to air quality.

Issues and Concerns

- An increase in dust in the immediate area.

Current Conditions

Currently the significant emission sources in the project area are from agricultural activities or vehicles travelling on adjacent roads. Although intermittent and irregular, fire activity can have a significant effect on air quality in the project area.

Alternatives

No Action Alternative:

The no action alternative would not be expected to have impacts on air quality.

Action Alternative:

- Direct Impacts: An increase in airborne pollutants and particulates may occur during mining operations from vehicles, and other associated heavy equipment used during operations. An increase in dust particulates may occur from mining operations and truck traffic. Increases in exhaust from machinery in the immediate area would also be expected. During times when an asphalt plant is present on site, and is being utilized, it is expected that emissions from the plant will also have minor impacts to air quality in the area. Overall, short-term, minor impacts to air quality are expected. No long-term impacts to air quality are expected. The proponent would be responsible for maintaining any necessary air quality permits required for processing equipment including generators, crushers, and asphalt plants for allowable emissions.

- Secondary Impacts: Fugitive dust and emissions may travel offsite to the surrounding area. Any particulate or pollutant would dissipate over distance. Secondary impacts are expected to be short-term and negligible.
- Cumulative Impacts: Minor amounts of additional dust would be expected from the project area.
- Duration: Any Impacts would be expected to last duration of the permit, until final reclamation.

Mitigations

The potential selection of action alternative would include the following stipulation in the aggregate permit:

- A water truck shall be used to minimize fugitive dust blowing from the site and along the haul route.

7. VEGETATION COVER, QUANTITY AND QUALITY:

What changes would the action cause to vegetative communities? Consider rare plants or cover types that would be affected. Identify cumulative effects to vegetation.

Current Conditions

The project area within section 26 is predominately covered by tame (non-native) and native grazing land. The vegetation of the non-native grazing land consists of Crested Wheatgrass (*Agropyron cristatum)* and the vegetation of the native grazing land consists of Western Wheatgrass (*Pascopyrum smithii*), Bluebunch Wheatgrass (*Pseudoroegneria spicata*), (Green Needlegrass (*Nassella viridula*), Prairie Sandreed (*Calamovilfa longifolia*), Blue Grama (*Bouteloua gracilis*), Sandberg Bluegrass (*Poa secunda sandbergii*), Prairie Junegrass (*Koeleria macrantha*), Threadleaf Sedge (*Carex filifolia*), Needle and Thread (*Hesperostipa comata*), Fringed Sagewort (*Artemisia frigida*), Silver Sagebrush (*Artemisia cana*), and various forbs. Noxious weeds were identified throughout the entire tract during a 2016 field evaluation, noxious weeds identified consists of Spotted Knapweed (*Centaurea maculosa),* Leafy Spurge (*Euphorbia esula),* Canada Thistle (*Cirsium arvense*), and Houndstongue (*Cynoglossum officinale*). The Natural Heritage Program database identified no vegetative species of concern within Sec. 26 of T22N, R1W.

Alternatives

No Action Alternative:

The no action alternative would be expected to have no impact to vegetation cover, quantity and quality in the project area.

Action Alternative:

- Direct Impacts: Vegetation would be impacted in the project area. Excavation equipment would strip the vegetation and topsoil within the project area, and vegetation would die as a result. Any agricultural activities may continue outside of opencut activities. Upon reclamation, the proponent will be responsible for replacing topsoil and overburden in the mined area, along with the revegetation of the site. Impacts to vegetation cover, quantity and quality are expected to be short-term and minor.
- Secondary Impacts: With the removal of vegetative communities, disturbances may result in the propagation of noxious and invasive weeds. Per the stipulations of the permit the proponent would be responsible for the management and mitigation of invasive weeds within the project area.
- Cumulative Impacts: Negligible impacts, if any, would be expected.
- Duration: Any impacts would be expected to last the duration of the permit, until full reclamation.

Mitigations

The potential selection of action alternative would include the following stipulation in the aggregate permit:

- An invasive weed management plan will be constructed by the Department and Proponent. It will include proof of mitigation on an annual basis.
- Upon reclamation, no slopes greater than 3:1 shall exist. This will ensure the future viability of the area for grazing production.
- Upon reclamation, the proponent will plant an approved seed mix from the Conrad Unit Office.
- Fire extinguishers shall be kept on site during mining activities. Damages from a fire started by the proponent are the sole responsibility of the proponent.

8. TERRESTRIAL, AVIAN AND AQUATIC LIFE AND HABITATS:

Consider substantial habitat values and use of the area by wildlife, birds or fish. Identify cumulative effects to fish and wildlife.

Current Conditions

The project area is open rangeland consisting of grasses and shrubs providing habitat and forage for a variety of wildlife species including deer and antelope throughout the year. Species present within the project vicinity may also include raptors and other birds, various rodents, rabbits, foxes, coyotes, and reptiles.

Alternatives

No Action Alternative:

The no action alternative would not be expected to have impacts to terrestrial, avian and aquatic life and habitats.

Action Alternative:

- Direct Impacts: The selection of the action alternative would create temporary disruptions to general wildlife throughout the duration of the permit. Similar habitat and forage are adjacent to the project area and could sustain the wildlife displaced during project activities. Short-term, minor impacts are expected to wildlife habitat from the action alternative.
- Secondary Impacts: Negligible impacts would be expected, animals displaced from the project area would need to utilize surrounding lands while mine activities occur. Surrounding lands are expected to have the vitality to sustain displaced individuals from the project area.
- Cumulative Impacts: The acreage from the proposed project area is not substantive enough to create significant cumulative impacts to wildlife. Short-term, minor impacts are expected.
- Duration: Any impacts would be expected to last the duration of the permit, until final reclamation.

9. UNIQUE, ENDANGERED, FRAGILE OR LIMITED ENVIRONMENTAL RESOURCES:

Consider any federally listed threatened or endangered species or habitat identified in the project area. Determine effects to wetlands. Consider Sensitive Species or Species of special concern. Identify cumulative effects to these species and their habitat.

Current Conditions

A search of the Montana Natural Heritage Program database identified one species of concern, Grizzly Bear, in the section of proposed activities.

Alternatives

No Action Alternative:

The no action alternative is not expected to have impacts to unique endangered, fragile or limited environmental resources.

Action Alternative:

- Direct Impacts: As Grizzly Bear populations increase; individuals are forced out of recovery zones identified by the USFWS in search of habitat and sustained forage. The proposed project area lies within the estimated current distribution as stated by the USFWS. However, it is outside the designated recovery zones. The proposed project would disturb minor amounts of rangeland. Considerable forage and habitat similar to the composition of the project area would remain in adjacent areas. The adjacent lands have the capacity and suitability to support any Grizzly Bears impacted by the project during the term of the action alternative. Collectively, short-term negligible effects to the above listed species of concerns would be anticipated.

- Secondary Impacts: Negligible impacts would be expected, animals displaced from the project area would need to utilize surrounding lands while mine activities occur.
- Cumulative Impacts: Human disturbances such as houses, roads, vehicles and farming equipment have long been present in the area. Any Grizzly Bears present in the project area would be conditioned to human presence. The introduction of the proposed action would not be expected to significantly alter the already pre-disturbed area. Negligible cumulative impacts would be expected.
- Duration: Any impacts would be expected to last the duration of the permit, until final reclamation.

10. HISTORICAL AND ARCHAEOLOGICAL SITES:

Identify and determine effects to historical, archaeological or paleontological resources.

Current Conditions

A Class III cultural and paleontological resources inventory was conducted of the area of potential effect on state land. Despite a detailed examination, no cultural or fossil resources were identified. No additional archaeological or paleontological investigative work is recommended. The proposed project will have *No Effec*t to *Antiquities* as defined under the Montana State Antiquities Act. A formal report of findings is on file with the DNRC and the Montana State Historic Preservation Officer.

Alternatives

No Action Alternative:
The no action alternative is not expected to have impacts to historical and archaeological sites.

Action Alternative:
- Direct Impacts: Because no cultural or paleontological resources were identified, proposed aggregate quarrying activities will have *No Effec*t to *Antiquities* as defined under the Montana State Antiquities Act. A formal report of findings has been prepared and is on file with the DNRC and the Montana State Historic Preservation Officer.
- Secondary Impacts: No impacts expected.
- Cumulative impacts: No impacts expected.
- Duration: Any impacts would be expected to last the duration of the permit, until final reclamation.

Mitigations

The potential selection of action alternative would include the following stipulation in the aggregate permit:
- If any cultural or paleontological resources are encountered during mining, all operations must stop and the permittee must contact DNRC.

11. AESTHETICS:

Determine if the project is located on a prominent topographic feature, or may be visible from populated or scenic areas. What level of noise, light or visual change would be produced? Identify cumulative effects to aesthetics.

Issues and Concerns
- Location to residence(s)

Current Conditions

The proposed project area is located adjacent to 2nd Rd NE to the north and 13th Ln NE to the west. The proposed location is in a rural part of Teton County, in which the closest town is approximately 10 miles away.

Alternatives

No Action Alternative:
The no action alternative is not expected to impact aesthetics.

Action Alternative:

- Direct Impacts: An increase in noise from trucks and heavy equipment may be heard adjacent to the project area. The site may be visible from adjacent roads, public spaces, and neighboring land. The operator's boundary coordinate table submitted as part of the Montana DEQ opencut mining permit has a 75' buffer from the adjacent landowner to the east, and a 55' buffer to the 2nd RD NE road. The construction of berms and highwalls around the pit can help reduce audible and visual impacts to the surrounding environment. The natural topography of the site should also help mitigate these impacts. During the operation of an asphalt plant, a distinct smell may radiate from the site. Asphalt plants typically only operate for short periods of time based upon need and impacts are expected to be short-term. Upon reclamation, the site will be returned to an acceptable landscape by blending topography and revegetation. Impacts to aesthetics are expected to be short-term and moderate.
- Secondary Impacts: No impacts expected.
- Cumulative Impacts: No impacts expected.
- Duration: Any impacts would be expected to last the duration of the permit, until final reclamation.

Mitigations

The potential selection of action alternative would include the following stipulation in the aggregate permit:

- Mining is to commence in the eastern part of the pit and move west to eliminate a longer exposure to the western adjacent landowner.
- All mining and crushing activities will only occur during daylight hours.

12. DEMANDS ON ENVIRONMENTAL RESOURCES OF LAND, WATER, AIR OR ENERGY:

Determine the amount of limited resources the project would require. Identify other activities nearby that the project would affect. Identify cumulative effects to environmental resources.

Current Conditions

The composition of land, water and air is described within other sections of this document. Energy sources that would be required by the project area are abundant in the area.

Alternatives

No Action Alternative:
The no action alternative is not expected to have impacts to the demands of environmental resources of land, water, air or energy.

Action Alternative:

- Direct Impacts: The selection of the action alternative would not impact limited resources of land, water, air or energy. The proposed project would utilize approximately 130.0 acres of Trust Land that has been historically utilized as pasture/rangeland. Water and air have been properly analyzed in the corresponding section of this document. Energy in the form of diesel fuel and labor is readily available in the area and is not a limiting factor. Land and open spaces are abundant in the area and the project would not be expected to impact the demands of environmental resources of land.
- Secondary Impacts: No impacts expected.
- Cumulative Impacts: No impacts expected.
- Duration: Any impacts would be expected to last the duration of the permit, until final reclamation.

13. OTHER ENVIRONMENTAL DOCUMENTS PERTINENT TO THE AREA:

List other studies, plans or projects on this tract. Determine cumulative impacts likely to occur as a result of current private, state or federal actions in the analysis area, and from future proposed state actions in the analysis area that are under MEPA review (scoped) or permitting review by any state agency.

Current Conditions

State Trust Lands owns 480 surface acres within section 26. The site is currently pasture/rangeland that is being managed under a State of Montana grazing lease. The proposed action would eliminate some of the grazing area utilized by the surface lessee.

DEQ has analyzed and granted a dryland opencut mining permit for the project area.

Alternatives

No Action Alternative:

The no action alternative is not expected to have impacts to other environmental documents or projects pertinent to the area.

Action Alternative:

- Direct Impacts: The grazing lessee would realize a net loss in available acreage held under their lease. The proponent must negotiate a surface damage agreement and coordinate a one-time fee paid to the grazing lessee in accordance with Montana Law. In subsequent years, the Department will subtract non-usable acreage from the grazing lease. Upon reclamation the site would return to rangeland. The revegetation grass mix will be based on the vegetative community that has been disturbed, native or non-native. The project would have a temporary, moderate impact to the surface lease agreement.
- Secondary Impacts: No impacts expected.
- Cumulative Impacts: No impacts expected.
- Duration: Any impacts would be expected to last the duration of the permit, until final reclamation.

Mitigations

The potential selection of action alternative would include the following stipulation in the aggregate permit:

- Surface damages must be evaluated and paid prior to any stripping of soil, as well as the active mining area must be fenced in to allow for grazing to continue.

IV. IMPACTS ON THE HUMAN POPULATION

- *RESOURCES potentially impacted are listed on the form, followed by common issues that would be considered.*
- *Explain POTENTIAL IMPACTS AND MITIGATIONS following each resource heading.*
- *Enter "NONE" If no impacts are identified or the resource is not present.*

14. HUMAN HEALTH AND SAFETY:

Identify any health and safety risks posed by the project.

Issues and Concerns

- Road Safety

Current Conditions

The current conditions of the site pose no risk to human health or safety.

Alternatives

No Action Alternative:
The no action alternative is not expected to have any impact to human health or safety.

Action Alternative:

- Direct Impacts: The proposed action is expected to have no impact to human health or safety, other than those typically associated with gravel mining employees. The site is in a rural area, bordering one residence to the west of section 26. An increase in traffic on county road 2nd Rd NE would occur. Most traffic, but not all, would travel east out of the pit area depending on where aggregate resources are needed. Traffic impacts are evaluated further in section 18 of this document.

- Secondary Impacts: No impacts expected.
- Cumulative Impacts: No impacts would be expected.
- Duration: Any impacts would be expected to last the duration of the permit, until final reclamation.

15. INDUSTRIAL, COMMERCIAL AND AGRICULTURE ACTIVITIES AND PRODUCTION:

Identify how the project would add to or alter these activities.

Current Conditions

The project area is currently utilized as rangeland.

Alternatives

No Action Alternative:
The no action alternative would not be expected to have any impact to industrial, commercial, and agriculture activities and production.

Action Alternative:

- Direct Impacts: This project would establish a reliable aggregate resource that would benefit construction projects in the greater Great Falls area. The acreage contained within a potential gravel permit would be removed from rangeland use as described in section 13 of this document. Restoring the use of the rangeland would occur upon reclamation of the site. Impacts to rangeland would be minor and short-term. Potential beneficial impacts to commercial and industrial activities would be moderate and long-term.
- Secondary Impacts: The selection of the action alternative is expected to have no secondary impacts to industrial, commercial, and agricultural activities in the area.
- Cumulative Impacts: There are no cumulative impacts expected to industrial, commercial, and agricultural activities from the selection of the action alternative.
- Duration: Any impacts would be expected to last the duration of the permit, until final reclamation.

16. QUANTITY AND DISTRIBUTION OF EMPLOYMENT:

Estimate the number of jobs the project would create, move or eliminate. Identify cumulative effects to the employment market.

Current Conditions

The closest town and employment center is Power, Montana, located approximately 10 miles away.

Alternatives

No Action Alternative:

The no action alternative is not expected to impact the quantity and distribution of employment.

Action Alternative:

- Direct Impacts: No impacts are expected to quantity and distribution of employment.
- Secondary Impacts: No impacts expected.
- Cumulative Impacts: No cumulative impacts expected.
- Duration: Any impacts would be expected to last the duration of the permit, until final reclamation.

17. LOCAL AND STATE TAX BASE AND TAX REVENUES:

Estimate tax revenue the project would create or eliminate. Identify cumulative effects to taxes and revenue.

Current Conditions

Trust land is exempt from local property tax. Operators and lessees conducting business on Trust Lands must pay business taxes.

Alternatives

No Action Alternative:
The no action alternative is not expected to have any impact on local and state tax bases or tax revenues.

Action Alternative:
- Direct Impacts: Short-term, negligible, impacts to tax revenue would be expected from the action alternative.
- Secondary Impacts: No impacts expected.
- Cumulative Impacts: No cumulative impacts are expected.
- Duration: Any impacts would be expected to last the duration of the permit, until final reclamation.

18. DEMAND FOR GOVERNMENT SERVICES:

Estimate increases in traffic and changes to traffic patterns. What changes would be needed to fire protection, police, schools, etc.? Identify cumulative effects of this and other projects on government services.

Issues and Concerns
- Increase in traffic impacting 2nd RD NE.

Current Conditions

The closest road to the site is county road 2nd RD NE and any emergency services would come from Power, MT.

Alternatives

No Action Alternative:
The no action alternative is not expected to have any impact on the demand for government services.

Action Alternative:
- Direct Impacts: During construction activities and through the life of the pit, an increase in construction related traffic may occur, there will be proper signage notifying travelers of trucks entering. Truck traffic would be dependent on market conditions and where projects are located, any improvement on local roads would be at Teton County's discretion. The action alternative would have short-term and minor impacts to traffic patterns.
- Secondary Impacts: No impacts expected.
- Cumulative Impacts: Minor impacts, of an increase in truck traffic, could be expected.
- Duration: Any impacts would be expected to last the duration of the permit, until full reclamation.

Mitigations
The potential selection of action alternative would include the following stipulation in the aggregate permit:
- Proper "Trucks Entering" signage must be constructed on both sides of the pit along 2nd RD NE.

19. LOCALLY ADOPTED ENVIRONMENTAL PLANS AND GOALS:

List State, County, City, USFS, BLM, Tribal, and other zoning or management plans, and identify how they would affect this project.

Current Conditions

There are no known environmental plans or goals for this tract or in the project vicinity.

Alternatives

No Action Alternative:
The no action alternative is not expected to have any impact on locally adopted environmental plans or goals.

Action Alternative:

- Direct Impacts: County zoning clearance has been obtained from Teton County. No impacts are expected, there are no known zoning or management plans for this tract.
- Secondary Impacts: No impacts expected.
- Cumulative Impacts: No Cumulative impacts expected.
- Duration: Any impacts would be expected to last the duration of the permit, until final reclamation.

20. ACCESS TO AND QUALITY OF RECREATIONAL AND WILDERNESS ACTIVITIES:

Identify any wilderness or recreational areas nearby or access routes through this tract. Determine the effects of the project on recreational potential within the tract. Identify cumulative effects to recreational and wilderness activities.

Current Conditions

This site is not designated as wilderness, nor does it provide access to wilderness. Montana State Trust Lands are accessible for public use by purchasing the necessary permits through the Montana Fish Wildlife and Parks.

Alternatives

No Action Alternative:
The no action alternative is not expected to have any impact on the access to and quality of recreational and wilderness activities.

Action Alternative:

- Direct Impacts: Short-term, minor impacts are expected as mining occurs. State Trust Land surrounding the permitted area would remain open for recreational activities.
- Secondary Impacts: No impacts expected.
- Cumulative Impacts: No cumulative impacts expected.
- Duration: Any impacts would be expected to last the duration of the permit, until final reclamation.

21. DENSITY AND DISTRIBUTION OF POPULATION AND HOUSING:

Estimate population changes and additional housing the project would require. Identify cumulative effects to population and housing.

Current conditions

The closest population center to the project is Power, MT.

Alternatives

No Action Alternative:
The no action alternative is not expected to impact the density and distribution of population and housing.

Action Alternative:

- Direct Impacts: No impacts expected.
- Secondary Impacts: No impacts expected.
- Cumulative Impacts: No additional impacts expected.
- Duration: Any impacts would be expected to last the duration of the permit, until full reclamation.

22. SOCIAL STRUCTURES AND MORES:

Identify potential disruption of native or traditional lifestyles or communities.

Current conditions

There are no known native or traditional lifestyles in the area.

Alternatives

No Action Alternative:
The no action alternative is not expected to impact social structures and mores.

Action Alternative:
- Direct Impacts: No impacts are expected to native or traditional lifestyles.
- Secondary Impacts: No impacts expected.
- Cumulative Impacts: No additional impacts expected.
- Duration: Any impacts would be expected to last the duration of the permit, until final reclamation.

23. CULTURAL UNIQUENESS AND DIVERSITY:
How would the action affect any unique quality of the area?

Current Conditions

There are no known unique qualities of the area. Much like the surrounding landscape, the site is comprised of native range.

Alternatives

No Action Alternative:
The no action alternative is not expected to impact cultural uniqueness or diversity.

Action Alternative:
- Direct Impacts: No impacts are expected to unique qualities of the area.
- Secondary Impacts: No impacts expected.
- Cumulative Impacts: No additional impacts expected.
- Duration: Any impacts would be expected to last the duration of the permit, until final reclamation.

24. OTHER APPROPRIATE SOCIAL AND ECONOMIC CIRCUMSTANCES:
Estimate the return to the trust. Include appropriate economic analysis. Identify potential future uses for the analysis area other than existing management. Identify cumulative economic and social effects likely to occur as a result of the proposed action.

The return to the trust would be $1.50/cubic yard of material removed, with periodic adjustments to reflect market conditions. The expected potential return to the trust could be $3,000,000 based off the indicated gravel resources from testing. Increases in price per yard would lead to a higher total compensation to the trust. This would be realized over the pit life utilized for future projects until final reclamation.

Upon reclamation, vegetation will be reestablished, and the area returned to grazing ground.

EA Checklist Prepared By:	**Name:**	Thomas Palin / Michaela Hanson	**Date:**	10/3/23
	Title:	Mineral Resource Specialist / Land Use Specialist		

V. FINDING

25. ALTERNATIVE SELECTED:

Action Alternative: The aggregate take and remove amendment would be approved and the proponent would be authorized to mine, crush, and remove sand & gravel from the proposed location on Montana State Trust Lands. The proponent would also be allowed to operate an asphalt plant within the permitted area.

26. SIGNIFICANCE OF POTENTIAL IMPACTS:

I conclude that no significant impacts will occur as a result of the proposed gravel permit on state lands. All identified potential impacts under the "action alternative" will be mitigated by incorporating the below stipulations into the final permit.

1. All topsoil will be retained and left on-site for reclamation.
2. Seed mixtures for reclamation will be determined by the Conrad Unit office.
3. The site will be kept free of debris and garbage. Only equipment that is actively being used is permitted on the site.
4. Berms that are constructed by topsoil and overburden, will be planted with a grass mix based on the vegetative community that has been disturbed, native or non-native, that does not contain crested wheatgrass, to mitigate erosion from moisture events and wind.
5. If gasoline, oil or other forms of hazardous liquids are stored on site, they must be contained within primary and secondary impermeable containment, in which the secondary containment is able to contain the entire volume of the hazardous liquid. For example, a 55-gallon drum of gasoline must also be stored in an HDPE container or similar methods.
6. All equipment utilized in mining must be regularly maintained and inspected to ensure it is not leaking fluids, spreading noxious weeds, or creating an undue fire hazard.
7. The permittee will be required to use dust control practices on the mine site and the access road.
8. An invasive weed management plan will be submitted to the Conrad Unit office and the proponent will provide proof of mitigation activities annually.
9. If any cultural or paleontologic resources are encountered operations must stop and contact the DNRC Conrad Unit office.
10. Proper "Trucks Entering" signage must be constructed on both sides of the pit along 2nd RD NE.
11. All mining and crushing activities will be limited to daylight hours.
12. The total amount of disturbed, unreclaimed land shall not exceed 40 acres at any time.
13. Permittee shall work with the Department to develop and implement a weed management plan to implement during the life of the pit and into reclamation.
14. Mining should commence in the eastern part of the pit and move west to eliminate longer-term exposure to the western adjacent landowner.
15. Surface damages must be evaluated and paid prior to any stripping of soil, as well as the active mining area must be fenced in to allow for grazing to continue.

27. NEED FOR FURTHER ENVIRONMENTAL ANALYSIS:

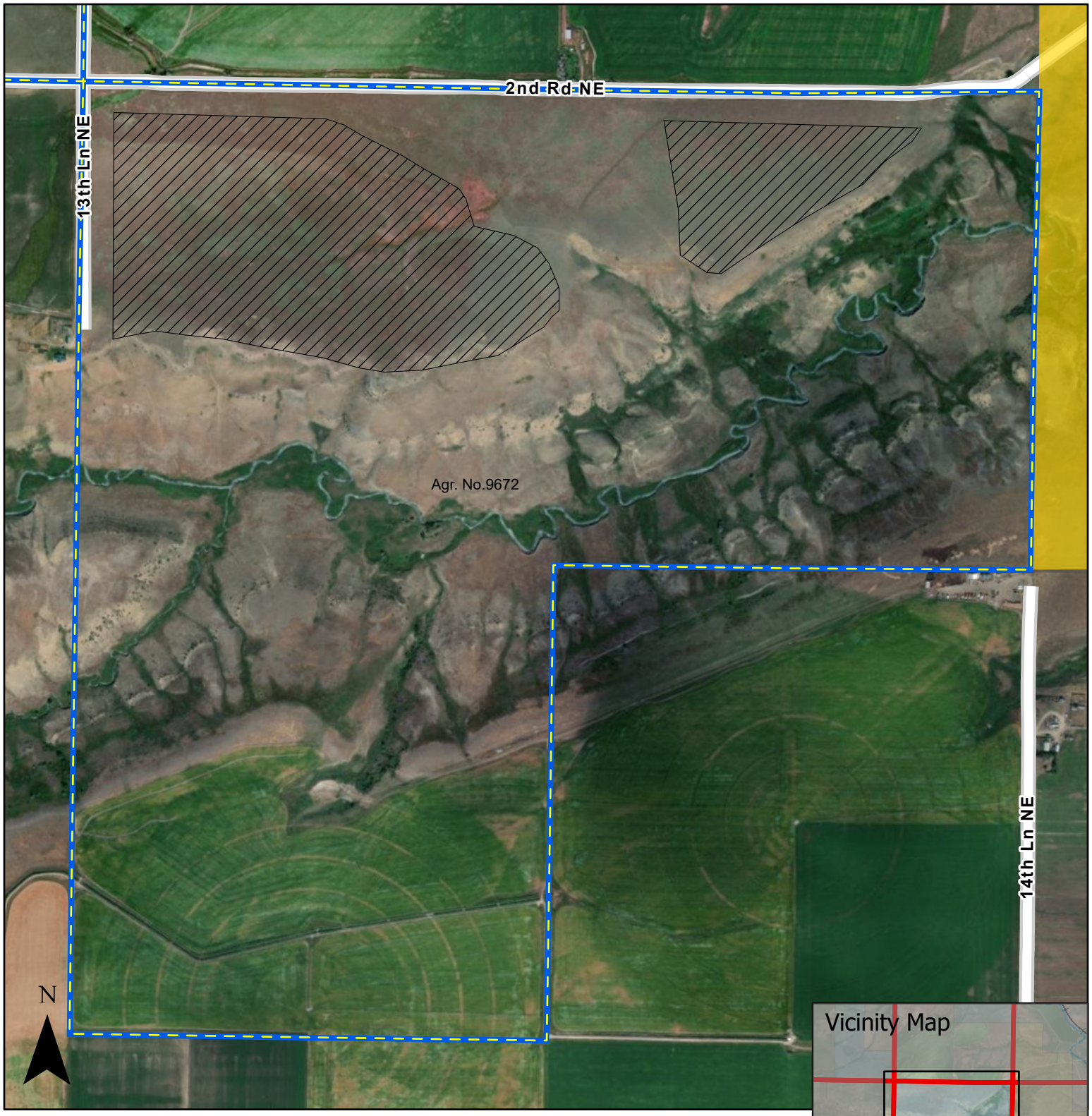
[ ]	EIS	[ ]	More Detailed EA	[XX]	No Further Analysis

EA Checklist Approved By:	Name: Erik Eneboe Title: Conrad Unit Manager		
Signature:		**Date**:	11/28/2023

Attachment A – Project Location Maps

The Montana Department of Natural Resources & Conservation

Knife River Tank Coulee Gravel Pit
Attachment A - Project Location



Proposed Gravel Pit Boundary

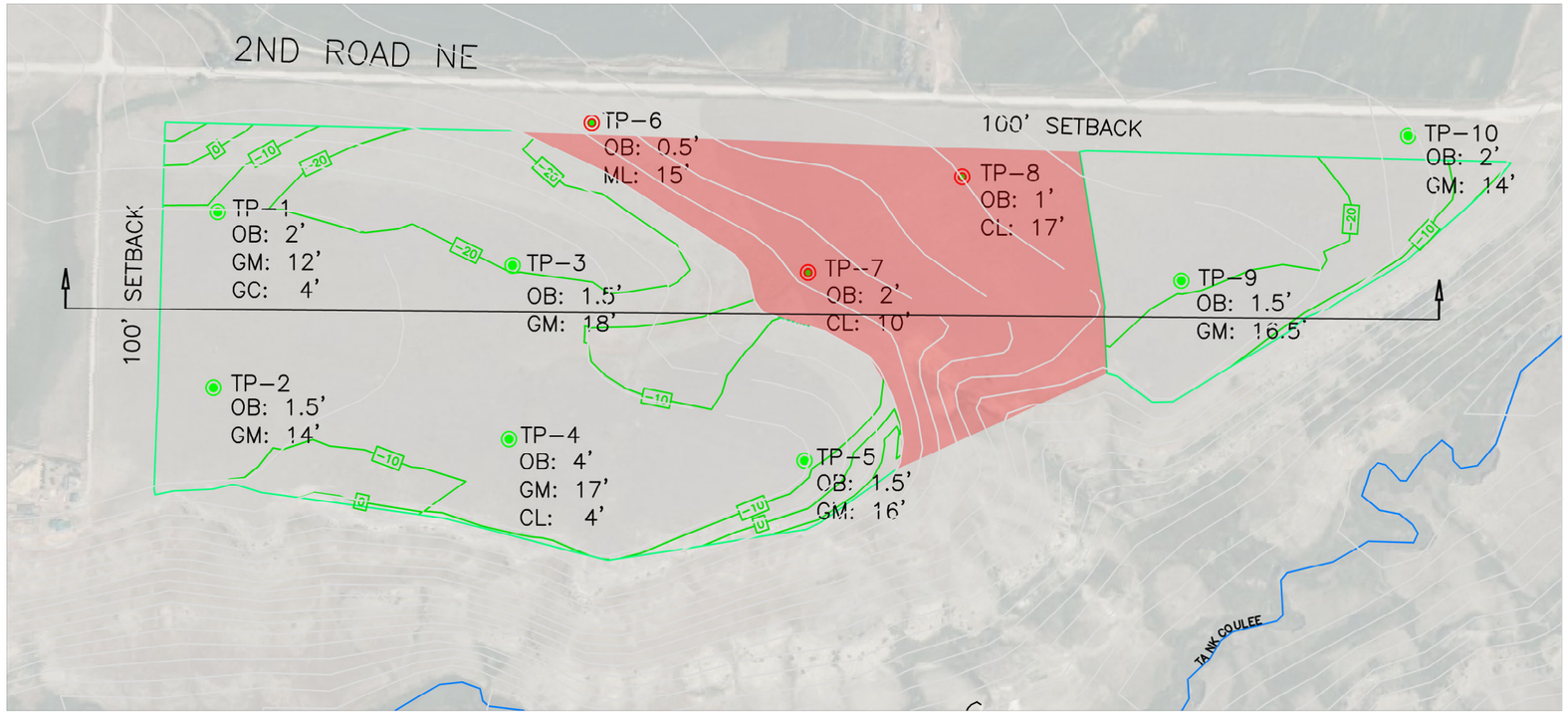
DNRC Agreement Tracts

DNRC Surface Tracts

US Bureau of Reclamation

Location: 47.632734°N , -111.699073°W

0 0.1 0.2 0.4 Miles



-10 DEPTH OF GRAVEL

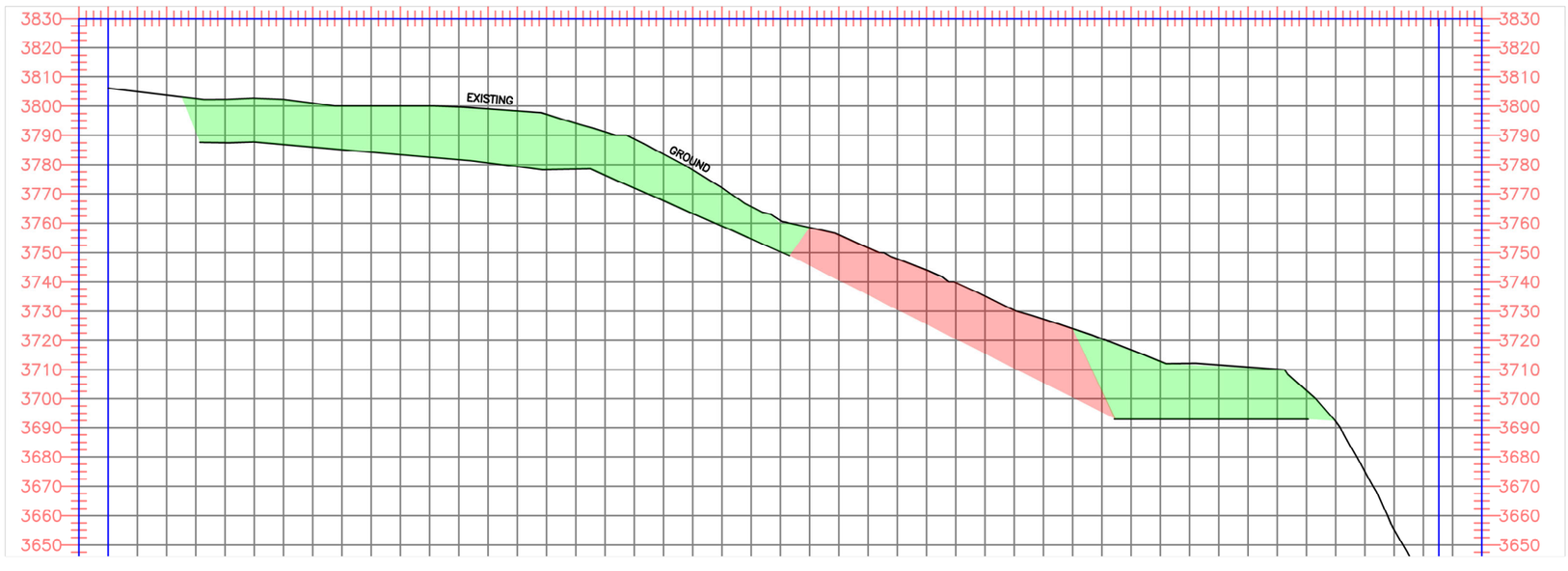
3000 EXISTING GROUND ELEVATION

NONMINING AREA (NO ROCK)

N

SOIL CLASSIFICATIONS

OB	OVERBURDEN
CL	CLAY
ML	SILTS
GC	GRAVEL W/CLAY
GM	SILTY GRAVELS



RESOURCE CALCULATION

	WEST PIT 64 AC	EAST PIT 18 AC	TOTAL 82 AC 24 AC
AREA: NONMINEABLE			
OVERBURDEN: AVERAGE DEPTH:	214,000 CY 2.0'	37,000 CY 1.3'	251,000 CY 1.5'
TEST PIT DEPTH: IN-SITU VOLUME: 1.5 TONS/CY	18' 1,391,000 CY 2,086,500 TN	18' 508,800 CY 762,000 TN	18' 1,899,800 CY 2,848,500 TN
ROCK % ROCK YIELD	60% 1,251,900 TN	50% 391,000 TN	1,642,900 TN
ROCK:OB RATIO	6.5:1	13.75:1	7.5:1

RESOURCE CLASSIFICATION: MEASURED RESOURCE

Scale in Feet
100 0 100 200

KNIFE RIVER
AN MDU RESOURCES COMPANY

KNIFE RIVER CORPORATION
ENGINEERING DEPARTMENT
1150 WEST CENTURY AVENUE
BISMARCK, ND 58503
(701) 530-1417

RESOURCE CALCULATION
TANK COULEE PIT
IMR-GTF

REVISION SCHEDULE	DATE

	DATE	NAME
DRAWN BY:	4/10/23	RINGSTAD
SURVEYED BY:	4/5/23	RINGSTAD
DATUM/SPC:	2500	MT-2500
FILENAME:		IMR-GTF Tank Coulee Pit Reserves 230407.dwg

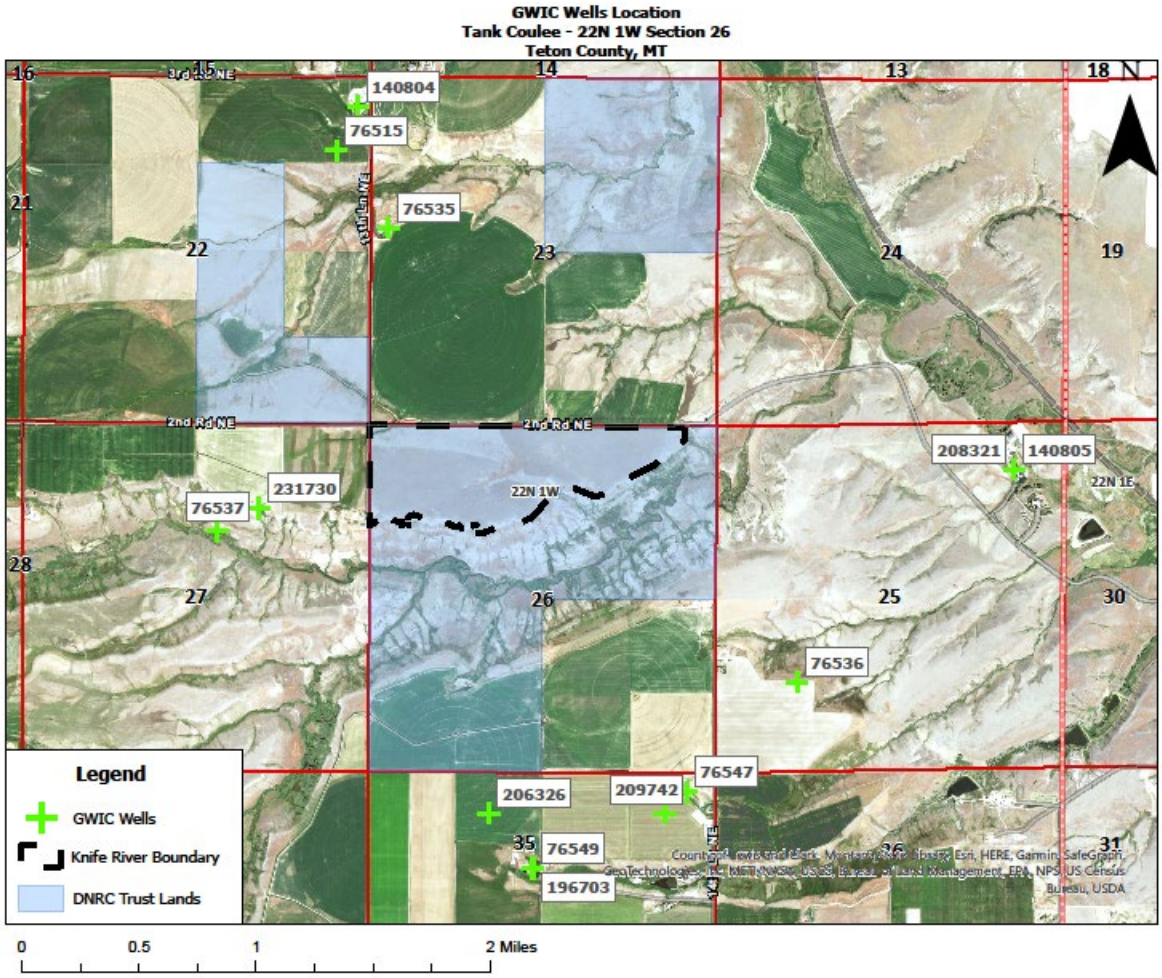
Attachment B – Scoping comments

Regarding the Knife River, gravel permit application.
I am concerned about the opening of a gravel pit adjacent to my property for several reasons. The first is - the project is located within 100 feet of my house. The second– is it will bring a ton of traffic, especially truck traffic to the area with all the dust that would go along with it. I would rather not have the traffic and the dust that close to my home and my family. The third - is safety. I am concerned that the road (2nd Rd., Northeast) would be overwhelmed with the traffic. It is already in very poor condition, and there are several blind corners and hills where I have already almost been hit head-on by other traffic. On the other hand, I do not wish to stand in the way of progress, but perhaps it would be an option to explore for gravel in other areas?
Thank you so much for your consideration,
[redacted]

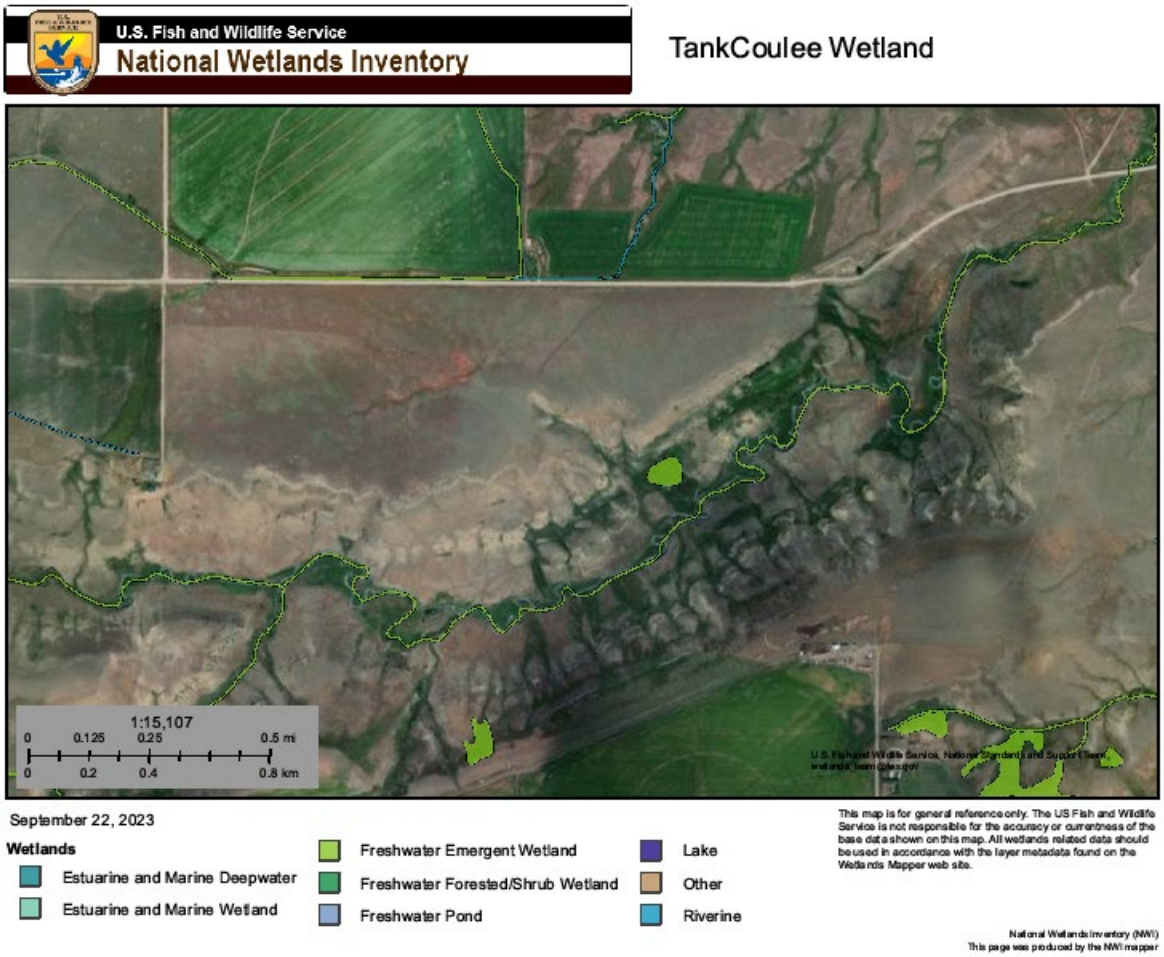
DNRC Response to Public Comment

Many of the concerns communicated in through scoping have been included and evaluated within the corresponding sections of this document. Mitigations have been identified by the DNRC staff to combat concerns related to aesthetics, dust control, traffic, and safety. These mitigations can be read in section 26 of this document and will be included in the aggregate take and remove permit.

Attachment C – GWIC Wells Location Map



Attachment D – Wetlands Map



United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Choteau-Conrad Area; Parts of Teton and Pondera Counties, Montana

October 4, 2023

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require

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Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

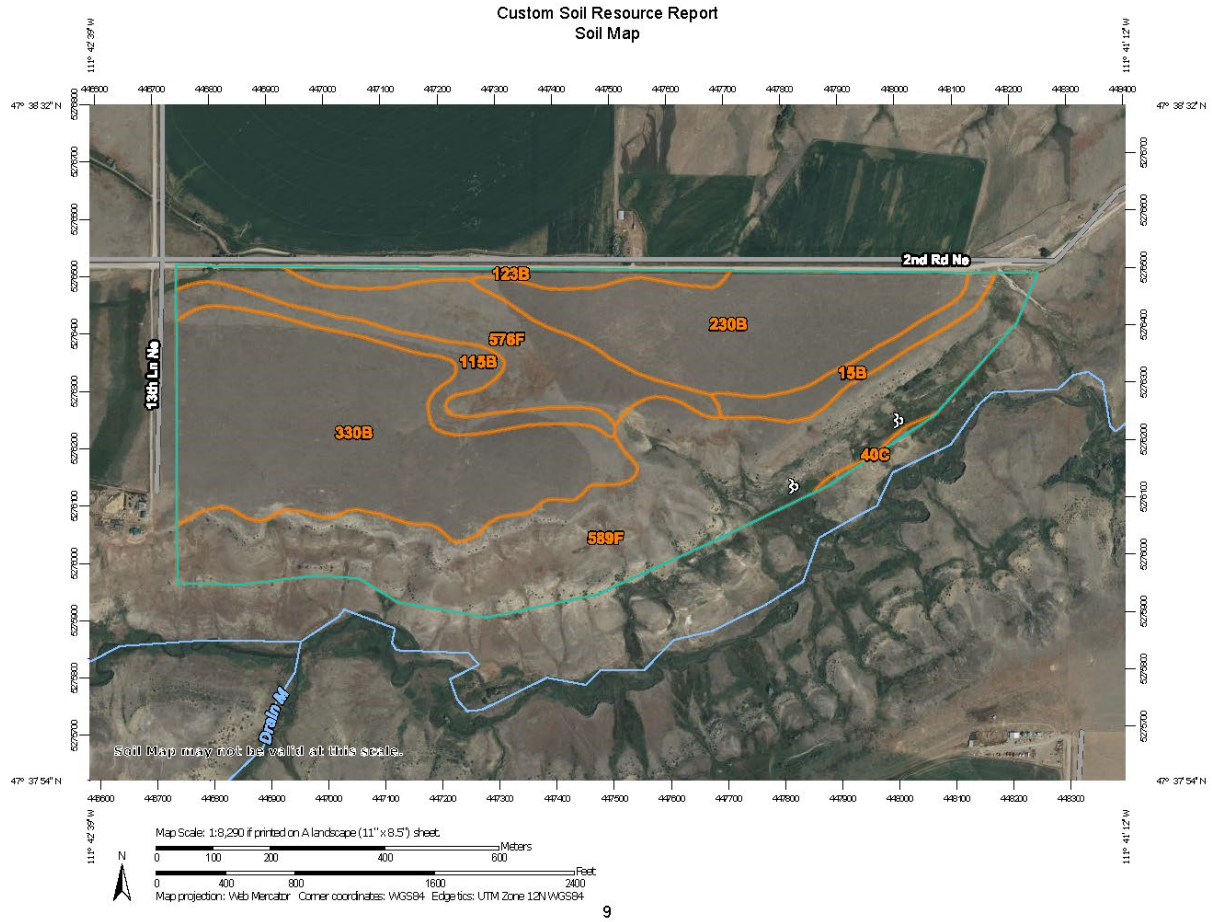
Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.


Custom Soil Resource Report
Soil Map
2nd Rd Ne
134th Ln Ne
123B
230B
576F
115B
15B
330B
40C
589F
Drain M
Soil Map may not be valid at this scale.
Map Scale: 1:8,290 if printed on A landscape (11" x 8.5") sheet.
Meters
0 100 200 400 600
Feet
0 400 800 1600 2400
Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 12N WGS84
N
9

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Choteau-Conrad Area; Parts of Teton and Pondera Counties, Montana
Survey Area Data: Version 21, Aug 30, 2023

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jul 6, 2021—Sep 30, 2021

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background

MAP LEGEND	MAP INFORMATION
	imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
15B	Crago gravelly loam, 0 to 4 percent slopes	5.1	3.0%
40C	Kobase silty clay loam, 4 to 8 percent slopes	0.4	0.3%
115B	Niart-Crago-Arrod gravelly loams, 0 to 4 percent slopes	8.2	4.7%
123B	Rothiemay-Niart clay loams, 0 to 4 percent slopes	5.0	2.9%
230B	Niart-Crago gravelly loams, 0 to 4 percent slopes	28.5	16.5%
330B	Niart gravelly loam, 0 to 4 percent slopes	49.1	28.5%
576F	Delpoint-Cabbart-Crago complex, 15 to 60 percent slopes	19.0	11.0%
589F	Megonot-Yawdim-Rock outcrop complex, 25 to 60 percent slopes	57.2	33.1%
Totals for Area of Interest		**172.5**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the

scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Choteau-Conrad Area; Parts of Teton and Pondera Counties, Montana

15B—Crago gravelly loam, 0 to 4 percent slopes

Map Unit Setting

National map unit symbol: cphp
Elevation: 3,200 to 4,200 feet
Mean annual precipitation: 12 to 14 inches
Mean annual air temperature: 39 to 45 degrees F
Frost-free period: 105 to 125 days
Farmland classification: Not prime farmland

Map Unit Composition

Crago and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Crago

Setting

Landform: Stream terraces
Down-slope shape: Linear
Across-slope shape: Linear

Typical profile

A - 0 to 6 inches: gravelly loam
Bk1 - 6 to 10 inches: gravelly loam
Bk2 - 10 to 22 inches: extremely gravelly loam
Bk3 - 22 to 60 inches: extremely gravelly sandy loam

Properties and qualities

Slope: 0 to 4 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 70 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Very low (about 3.0 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: B
Ecological site: R046XN254MT - Limy (Ly) RRU 46-N 13-17 PZ
Hydric soil rating: No

Minor Components

Arrod

Percent of map unit: 4 percent
Landform: Stream terraces
Down-slope shape: Linear

Across-slope shape: Linear
Ecological site: R052XN178MT - Shallow (Sw) 10-14" p.z.
Hydric soil rating: No

Rothiemay

Percent of map unit: 3 percent
Landform: Stream terraces
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R046XN252MT - Silty (Si) RRU 46-N 13-19 PZ
Hydric soil rating: No

Niart

Percent of map unit: 3 percent
Landform: Stream terraces
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R046XN254MT - Limy (Ly) RRU 46-N 13-17 PZ
Hydric soil rating: No

40C—Kobase silty clay loam, 4 to 8 percent slopes

Map Unit Setting

National map unit symbol: cpsb
Elevation: 3,200 to 4,000 feet
Mean annual precipitation: 11 to 14 inches
Mean annual air temperature: 39 to 45 degrees F
Frost-free period: 105 to 125 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Kobase and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Kobase

Setting

Landform: Alluvial fans
Down-slope shape: Linear
Across-slope shape: Linear

Typical profile

A - 0 to 6 inches: silty clay loam
Bw - 6 to 24 inches: silty clay
Bk - 24 to 28 inches: clay
Bky - 28 to 36 inches: clay
By - 36 to 60 inches: clay

Properties and qualities

Slope: 4 to 8 percent

Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Gypsum, maximum content: 5 percent
Maximum salinity: Nonsaline to slightly saline (0.0 to 4.0 mmhos/cm)
Sodium adsorption ratio, maximum: 10.0
Available water supply, 0 to 60 inches: High (about 9.7 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Ecological site: R052XN162MT - Clayey (Cy) 10-14" p.z.
Hydric soil rating: No

Minor Components

Ethridge

Percent of map unit: 5 percent
Landform: Alluvial fans
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R052XN162MT - Clayey (Cy) 10-14" p.z.
Hydric soil rating: No

Marias

Percent of map unit: 3 percent
Landform: Alluvial fans
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R052XN162MT - Clayey (Cy) 10-14" p.z.
Hydric soil rating: No

Abor

Percent of map unit: 2 percent
Landform: Plains
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R052XN162MT - Clayey (Cy) 10-14" p.z.
Hydric soil rating: No

115B—Niart-Crago-Arrod gravelly loams, 0 to 4 percent slopes

Map Unit Setting

National map unit symbol: cpfm
Elevation: 3,200 to 4,200 feet

Mean annual precipitation: 12 to 14 inches
Mean annual air temperature: 39 to 45 degrees F
Frost-free period: 105 to 125 days
Farmland classification: Not prime farmland

Map Unit Composition

Niart and similar soils: 35 percent
Arrod and similar soils: 30 percent
Crago and similar soils: 30 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Niart

Setting

Landform: Stream terraces
Down-slope shape: Linear
Across-slope shape: Linear

Typical profile

A - 0 to 5 inches: gravelly loam
Bw - 5 to 10 inches: clay loam
Bk - 10 to 21 inches: clay loam
2C - 21 to 60 inches: very gravelly loam

Properties and qualities

Slope: 0 to 4 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 55 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 6.1 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Ecological site: R046XN254MT - Limy (Ly) RRU 46-N 13-17 PZ
Hydric soil rating: No

Description of Arrod

Setting

Landform: Stream terraces
Down-slope shape: Linear
Across-slope shape: Linear

Typical profile

A - 0 to 7 inches: gravelly loam
Bk - 7 to 15 inches: very gravelly loam
2Bkm - 15 to 25 inches: indurated
3Bk - 25 to 60 inches: extremely gravelly loamy sand

Properties and qualities

Slope: 0 to 4 percent
Depth to restrictive feature: 12 to 20 inches to undefined
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 60 percent
Available water supply, 0 to 60 inches: Very low (about 1.8 inches)

Interpretive groups

Land capability classification (irrigated): 7e
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Ecological site: R052XN178MT - Shallow (Sw) 10-14" p.z.
Hydric soil rating: No

Description of Crago

Setting

Landform: Stream terraces
Down-slope shape: Linear
Across-slope shape: Linear

Typical profile

A - 0 to 6 inches: gravelly loam
Bk1 - 6 to 10 inches: gravelly loam
Bk2 - 10 to 22 inches: extremely gravelly loam
Bk3 - 22 to 60 inches: extremely gravelly sandy loam

Properties and qualities

Slope: 0 to 4 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 70 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Very low (about 3.0 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: B
Ecological site: R046XN254MT - Limy (Ly) RRU 46-N 13-17 PZ
Hydric soil rating: No

Minor Components

Rothiemay

Percent of map unit: 4 percent
Landform: Stream terraces
Down-slope shape: Linear

Across-slope shape: Linear
Ecological site: R046XN252MT - Silty (Si) RRU 46-N 13-19 PZ
Hydric soil rating: No

Varney

Percent of map unit: 1 percent
Landform: Stream terraces
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R046XN252MT - Silty (Si) RRU 46-N 13-19 PZ
Hydric soil rating: No

123B—Rothiemay-Niart clay loams, 0 to 4 percent slopes

Map Unit Setting

National map unit symbol: cpg3
Elevation: 3,200 to 4,000 feet
Mean annual precipitation: 11 to 14 inches
Mean annual air temperature: 39 to 45 degrees F
Frost-free period: 105 to 125 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Rothiemay and similar soils: 50 percent
Niart and similar soils: 35 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Rothiemay

Setting

Landform: Stream terraces
Down-slope shape: Linear
Across-slope shape: Linear

Typical profile

A - 0 to 5 inches: clay loam
Bw - 5 to 16 inches: clay loam
Bk - 16 to 50 inches: clay loam
BC - 50 to 60 inches: gravelly clay loam

Properties and qualities

Slope: 0 to 4 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches

Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 60 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: High (about 9.2 inches)

Interpretive groups
Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Ecological site: R046XN252MT - Silty (Si) RRU 46-N 13-19 PZ
Hydric soil rating: No

Description of Niart

Setting
Landform: Stream terraces
Down-slope shape: Linear
Across-slope shape: Linear

Typical profile
Ap - 0 to 6 inches: clay loam
Bw - 6 to 10 inches: clay loam
Bk - 10 to 30 inches: clay loam
2C - 30 to 60 inches: very gravelly loam

Properties and qualities
Slope: 0 to 4 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 55 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 7.3 inches)

Interpretive groups
Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Ecological site: R046XN254MT - Limy (Ly) RRU 46-N 13-17 PZ
Hydric soil rating: No

Minor Components

Crago
Percent of map unit: 6 percent
Landform: Stream terraces
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R046XN254MT - Limy (Ly) RRU 46-N 13-17 PZ
Hydric soil rating: No

Varney
Percent of map unit: 5 percent

Landform: Stream terraces
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R046XN252MT - Silty (Si) RRU 46-N 13-19 PZ
Hydric soil rating: No

Arrod

Percent of map unit: 4 percent
Landform: Stream terraces
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R052XN178MT - Shallow (Sw) 10-14" p.z.
Hydric soil rating: No

230B—Niart-Crago gravelly loams, 0 to 4 percent slopes

Map Unit Setting

National map unit symbol: cpm2
Elevation: 3,200 to 4,000 feet
Mean annual precipitation: 12 to 14 inches
Mean annual air temperature: 39 to 45 degrees F
Frost-free period: 105 to 125 days
Farmland classification: Not prime farmland

Map Unit Composition

Niart and similar soils: 55 percent
Crago and similar soils: 30 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Niart

Setting

Landform: Stream terraces
Down-slope shape: Linear
Across-slope shape: Linear

Typical profile

A - 0 to 5 inches: gravelly loam
Bw - 5 to 10 inches: clay loam
Bk - 10 to 21 inches: clay loam
2C - 21 to 60 inches: very gravelly loam

Properties and qualities

Slope: 0 to 4 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches

Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 55 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 6.1 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Ecological site: R046XN254MT - Limy (Ly) RRU 46-N 13-17 PZ
Hydric soil rating: No

Description of Crago

Setting

Landform: Stream terraces
Down-slope shape: Linear
Across-slope shape: Linear

Typical profile

A - 0 to 6 inches: gravelly loam
Bk1 - 6 to 10 inches: gravelly loam
Bk2 - 10 to 22 inches: extremely gravelly loam
Bk3 - 22 to 60 inches: extremely gravelly sandy loam

Properties and qualities

Slope: 0 to 4 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 70 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Very low (about 3.0 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: B
Ecological site: R046XN254MT - Limy (Ly) RRU 46-N 13-17 PZ
Hydric soil rating: No

Minor Components

Arrod

Percent of map unit: 6 percent
Landform: Stream terraces
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R052XN178MT - Shallow (Sw) 10-14" p.z.
Hydric soil rating: No

Rothiemay

Percent of map unit: 5 percent

Landform: Stream terraces
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R046XN252MT - Silty (Si) RRU 46-N 13-19 PZ
Hydric soil rating: No

Varney

Percent of map unit: 4 percent
Landform: Stream terraces
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R046XN252MT - Silty (Si) RRU 46-N 13-19 PZ
Hydric soil rating: No

330B—Niart gravelly loam, 0 to 4 percent slopes

Map Unit Setting

National map unit symbol: cpqc
Elevation: 3,200 to 4,000 feet
Mean annual precipitation: 11 to 14 inches
Mean annual air temperature: 39 to 45 degrees F
Frost-free period: 105 to 125 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Niart and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Niart

Setting

Landform: Stream terraces
Down-slope shape: Linear
Across-slope shape: Linear

Typical profile

A - 0 to 5 inches: gravelly loam
Bw - 5 to 10 inches: clay loam
Bk - 10 to 21 inches: clay loam
2C - 21 to 60 inches: very gravelly loam

Properties and qualities

Slope: 0 to 4 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None

Frequency of ponding: None
Calcium carbonate, maximum content: 55 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 6.1 inches)

Interpretive groups
Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Ecological site: R046XN254MT - Limy (Ly) RRU 46-N 13-17 PZ
Hydric soil rating: No

Minor Components

Crago
Percent of map unit: 7 percent
Landform: Stream terraces
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R046XN254MT - Limy (Ly) RRU 46-N 13-17 PZ
Hydric soil rating: No

Rothiemay
Percent of map unit: 4 percent
Landform: Stream terraces
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R046XN252MT - Silty (Si) RRU 46-N 13-19 PZ
Hydric soil rating: No

Arrod
Percent of map unit: 3 percent
Landform: Stream terraces
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R052XN178MT - Shallow (Sw) 10-14" p.z.
Hydric soil rating: No

Varney
Percent of map unit: 1 percent
Landform: Stream terraces
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R046XN252MT - Silty (Si) RRU 46-N 13-19 PZ
Hydric soil rating: No

576F—Delpoint-Cabbart-Crago complex, 15 to 60 percent slopes

Map Unit Setting
National map unit symbol: cpw9
Elevation: 3,200 to 4,200 feet

Mean annual precipitation: 11 to 14 inches
Mean annual air temperature: 39 to 45 degrees F
Frost-free period: 105 to 125 days
Farmland classification: Not prime farmland

Map Unit Composition

Delpoint and similar soils: 40 percent
Cabbart and similar soils: 25 percent
Crago and similar soils: 20 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Delpoint

Setting

Landform: Hills
Down-slope shape: Linear
Across-slope shape: Linear

Typical profile

A - 0 to 6 inches: loam
Bw - 6 to 15 inches: loam
Bk - 15 to 30 inches: loam
Cr - 30 to 60 inches: unweathered bedrock

Properties and qualities

Slope: 15 to 35 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Available water supply, 0 to 60 inches: Low (about 4.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: C
Ecological site: R052XN168MT - Silty-Steep (SiStp) 10-14" p.z.
Hydric soil rating: No

Description of Cabbart

Setting

Landform: Hills
Down-slope shape: Linear
Across-slope shape: Linear

Typical profile

A - 0 to 3 inches: loam
Bk - 3 to 14 inches: loam
Cr - 14 to 60 inches: unweathered bedrock

Properties and qualities

Slope: 35 to 60 percent

Depth to restrictive feature: 10 to 20 inches to paralithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 25 percent
Gypsum, maximum content: 5 percent
Maximum salinity: Nonsaline to moderately saline (0.0 to 8.0 mmhos/cm)
Sodium adsorption ratio, maximum: 5.0
Available water supply, 0 to 60 inches: Very low (about 2.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: D
Ecological site: R052XN178MT - Shallow (Sw) 10-14" p.z.
Hydric soil rating: No

Description of Crago

Setting

Landform: Hills
Down-slope shape: Linear
Across-slope shape: Linear

Typical profile

A - 0 to 6 inches: gravelly loam
Bk1 - 6 to 10 inches: gravelly loam
Bk2 - 10 to 22 inches: extremely gravelly loam
Bk3 - 22 to 60 inches: extremely gravelly sandy loam

Properties and qualities

Slope: 35 to 60 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 70 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Very low (about 3.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: B
Ecological site: R046XN254MT - Limy (Ly) RRU 46-N 13-17 PZ
Hydric soil rating: No

Minor Components

Yamacall

Percent of map unit: 8 percent

Landform: Alluvial fans
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R052XN161MT - Silty (Si) 10-14" p.z.
Hydric soil rating: No

Rothiemay

Percent of map unit: 5 percent
Landform: Alluvial fans
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R046XN252MT - Silty (Si) RRU 46-N 13-19 PZ
Hydric soil rating: No

Kremlin

Percent of map unit: 2 percent
Landform: Hills
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R052XN161MT - Silty (Si) 10-14" p.z.
Hydric soil rating: No

589F—Megonot-Yawdim-Rock outcrop complex, 25 to 60 percent slopes

Map Unit Setting

National map unit symbol: cpwg
Elevation: 3,200 to 4,200 feet
Mean annual precipitation: 11 to 14 inches
Mean annual air temperature: 39 to 45 degrees F
Frost-free period: 105 to 125 days
Farmland classification: Not prime farmland

Map Unit Composition

Megonot and similar soils: 35 percent
Yawdim and similar soils: 30 percent
Rock outcrop: 20 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Megonot

Setting

Landform: Hills
Down-slope shape: Linear
Across-slope shape: Linear

Typical profile

A - 0 to 5 inches: silty clay loam

Bw - 5 to 12 inches: silty clay loam
Bk - 12 to 21 inches: silty clay
By - 21 to 32 inches: channery silty clay
Cr - 32 to 60 inches: weathered bedrock

Properties and qualities

Slope: 25 to 60 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Gypsum, maximum content: 5 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Very low (about 2.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: D
Ecological site: R052XN164MT - Clayey-Steep (CyStp) 10-14" p.z.
Hydric soil rating: No

Description of Yawdim

Setting

Landform: Hills
Down-slope shape: Linear
Across-slope shape: Linear

Typical profile

A - 0 to 5 inches: silty clay loam
C - 5 to 16 inches: silty clay loam
Cr - 16 to 60 inches: weathered bedrock

Properties and qualities

Slope: 25 to 60 percent
Depth to restrictive feature: 10 to 20 inches to paralithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Available water supply, 0 to 60 inches: Very low (about 2.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: D
Ecological site: R052XN179MT - Shallow Clay (SwC) 10-14" p.z.
Hydric soil rating: No

Minor Components

Cabbart

Percent of map unit: 7 percent
Landform: Hills
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R052XN178MT - Shallow (Sw) 10-14" p.z.
Hydric soil rating: No

Abor

Percent of map unit: 5 percent
Landform: Hills
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R052XN164MT - Clayey-Steep (CyStp) 10-14" p.z.
Hydric soil rating: No

Kobase

Percent of map unit: 3 percent
Landform: Hills
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R052XN162MT - Clayey (Cy) 10-14" p.z.
Hydric soil rating: No

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