Working Draft—Not Approved by the CITT

Weather Station Recommendations [Funding Update]

To: Parties to the CSKT-MT Compact;

From: CSKT-MT Compact Implementation Technical Team (CITT)

Date: December 2017

Re: Funding Recommendation for the attached June 21, 2017 CITT recommendation to add 3 AgriMet weather stations to the Flathead Indian Irrigation Project (FIIP) area

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Status

On June 21, 2017, the CITT approved a recommendation to add 3 AgriMet weather stations to the FIIP area (attached). Funding of the initial station equipment and installation will tentatively be provided by the USDI Bureau of Reclamation (BOR), through their Tribal Assistance Program. AgriMet equipment portions amount to approximately $10,000/stations, $30,000 total. Due to uncertainties in Federal budgeting, it is unclear if equipment and installation funds will be available for fiscal year 2018.

The BOR Tribal Assistance funding cannot, however, be used to pay for annual operation and maintenance (O&M) for the three AgriMet stations. BOR has made the CITT aware that station equipment purchases and installation cannot move forward without assurance that the O&M funding for these stations is secured.

Recommendation

The CITT continues to promote an expansion and improvement to the existing FIIP-area AgriMet network, pursuant the original CITT recommendation. The CITT recommends 'Parties to the Compact' fund the AgriMet network expansion project, using State contributions to settlement. This funding recommendation is two-fold and designed to allow for hopeful installations during the spring of 2018:

1. The CITT recommends funding a 10-year O&M package for three AgriMet weather stations. A BOR/CSKT cooperative agreement would be the funding vehicle. Funds would be obligated for the full 10-year period, held by the State, and transferred to the CSKT on an annual basis. The annual amount is $4,800/year ($1600/station/year for three stations); the total 10-year obligation is $48,000.
2. If the BOR funding is not available for station equipment and installations in the amount of $30,000 ($10,000/station for three stations), or some portion thereof, in time for spring 2018 installations, the CITT recommends funding the $30,000, or some portion thereof, equipment purchase and installations. This money would only become obligated after the O&M funding package is arranged with the BOR and is contingent on the BOR being unable to fund previously agreed to equipment purchase and installations for a spring 2018 timeline.

Weather Station Recommendations

To: Parties to the CSKT-MT Compact;
Jama Hamel, AgriMet Program Coordinator, U.S. Bureau of Reclamation; and
Corey Carmack, Tribal Assistance Program, U.S. Bureau of Reclamation

From: CSKT-MT Compact Implementation Technical Team

Date: June, 21, 2017

Re: Recommendation to add 3 AgriMet weather stations to the Flathead Indian Irrigation Project area and move one existing station.

Overview of Compact & Need for Weather Stations

As part of the CSKT-MT Compact (85-20-1901 MCA), the Compact Technical Team (CITT) was formed and charged, among other assignments, to develop and make technical recommendations to improve on-farm efficiency on the Flathead Indian Irrigation Project (FIIP). One area of improvement identified is the installation of additional AgriMet weather stations that can provide localized climate data needed to estimate crop irrigation water requirements that can be used to directly support management decisions of local agricultural producers and irrigation managers.

The CITT plans to recommend the creation and routine publication of weather and crop water requirement reports designed to support FIIP area agricultural and irrigation decisions. The reports would be public information made available through the CITT website. To provide this information, a localized weather station network of sufficient resolution to characterize variable site conditions is essential. Enhanced resolution weather station networks can also support future field-scale evapotranspiration estimates using METRIC[1] or similar techniques that correlate remote sensing with localized weather data.

AgriMet Program Background

AgriMet is a network of automatic agricultural weather stations administered and operated by the U.S. Bureau of Reclamation (USBR) and dedicated to crop water use modeling and other agricultural applications. The Flathead Indian Reservation is part of the USBR's Pacific Northwest Region. Real-time AgriMet data is transmitted from individual stations to USBR's receive- site in Boise, ID through the GOES-8 and DOMSAT satellites. Each Station transmits its data once an hour. Data collection intervals within the hourly transmit period are dependent on the specific sensor equipment at each station. Types of data collected at each station varies. The data is processed at the Boise Regional Office, then made

[1] METRIC (Mapping Evapo Transpiration at high Resolution with Internalized Calibration) is a computer model developed by the University of Idaho that uses Landsat satellite data to computer and map evapotranspiration (ET).

available on the World Wide Web. Data are reviewed daily for quality control purposes, but all numbers should be considered provisional unless officially released by appropriate BOR personnel (US BOR, 2016).

Information collected at individual stations can include:

- Average, Max, and/or Min Air Temp – Shielded and/or Unshielded Ground and/or Crop Canopy Located (F°)
- Barometric Pressure (in. HG)
- Leaf Wetness (resistance values)
- Incremental Precipitation – Heated or Non-heated Tipping Bucket (in.)
- Incremental Global Global Solar Radiation (Langley's)
- Incremental Diffuse Solar Radiation (Langley's)
- Soil Temp at 2, 4, 8, 20, and/or 40 (in.) Depth (F°)
- Average Dew Point Temp (F°)
- Average Actual Vapor Pressure (kPA)
- Relative Humidity (%)
- Average Wind Speed and/or Peak Wind Gust (mph)
- Wind Direction (degrees) and/or Cumulative Run (miles)

Figure 1: AgriMet Weather Station (BOR)

Figure 2: Location of Existing Flathead Area AgriMet Stations (Kjaersgaard & Allen, 2009)

Existing AgriMet Stations on or near the FIIP

Currently there are three AgriMet weather stations within the FIIP area (Figure 2):

1. St. Ignatius (SIGM) installed 4/1/91;
2. Round Butte (RDBM) installed 3/1/89; and
3. Creston (CRSM) installed 4/1/88.

In 2009 the University of Idaho included a review of the three existing AgriMet weather stations as part of their METRIC study conducted for the Mission Valley (Kjaersgaard and Allen 2009). Researchers voiced concerns about the Round Butte station proximity to trees and buildings (Figure 3) and documented lower pyranometer measurements during morning periods due to shading. Ultimately, the shading issue was deemed significant and researchers opted not to use the Round Butte station in their METRIC analysis; they instead relied on St. Ignatius and Creston stations.

Researchers also noted that the St. Ignatius station tended to measure more arid than reference conditions during periods with little or no precipitation in combination with high ET rates. This may be due to its proximity to the airport runway. This issue was not deemed significant enough to avoid using the station.

Figure 3: Round Butte Station and Tree Cover (photo by E. Mace, 2017)

AgriMet Station Cost and Funding

USBR informed us that a single AgriMet station typically costs slightly less than $10,000 for the initial equipment purchase and installation. Annual operating costs are approximately $1,000 per station. The USBR has verbally agreed to pay the initial equipment and installation fees of approximately $30,000 along with the annual operating costs of approximately $3,000 per year through the USBR Tribal Assistance Program.

The CSKT Tribal Council has provided a letter supporting the installations and the USBR's funding of the equipment, initial installation and annual operation (Attachment B). The State of Montana has also provided a letter of support (Attachment C).

Land Ownership and Access

AgriMet stations need to be situated in open fields with relatively easy road access for operation and maintenance. The stations should not be within the immediate influence of direct irrigation. The stations need to be covered under an access agreement between the USBR and the landowner. The CITT suggests situating any new stations on CSKT trust lands as the USBR's access agreements with Tribes are less complicated than access agreements on other lands. The USBR has requested that once sites are determined, the Tribes provide an assessment of cultural and historic impact – a schematic of the station installations will be provided to better inform this effort.

The CITT is in the process of working with the CSKT Lands Department to identify the specific parcels and installation locations to situate the new stations. The general criteria:

1. CSKT trust land ownership
2. No shading or wind obstructions
3. Easily accessed by road
4. CSKT approved as owners and for cultural and social impacts
5. Within proximity to FIIP delivery area

CITT Recommendation #1: Number and Location of AgriMet Stations

AgriMet weather stations need to be situated across the FIIP to best represent most the different crop water irrigation requirement zones and the CITT. Using existing GIS weather data, anecdotal evidence, and comparisons of existing weather station information the CITT has determined an ideal weather station coverage for the area to include six stations in totality, three existing and three new installations:

New Station Recommendations	Existing Stations
Moiese (install in 2017)	St Ignatius (SIGM)
Little Bitterroot (install in 2017)	Round Butte (RDBM)
Jocko (install in 2019 see rec #2 below)	Creston (CRSM)

Station locations are mapped and parcel geocodes, parcel legal land descriptions, and site latitude/ longitude are identified (Attachment A).

CITT Recommendation #2: Round Butte Station Relocation and Correction of Historic Data

The CITT recommends addressing the shading issue identified by Kjaersgaard and Allen in 2009. The CITT recommends moving the existing Round Butte weather station to a better location, but not before attempting to correct historic solar radiation data. The new Round Butte location map and parcel identification is attached to this document. The new location is near the existing site and devoid of the deleterious shading effects of the existing location. The CITT recommends installing one of the three new weather stations at this new location and running the new station concurrently with the existing Round Butte station, thereby allowing for a correlation correction factor to be developed by comparing the simultaneously collected solar radiation information. If successful, the correction factor can be used to improve the quality of the historic data collected at the existing Round Butte site, thereby allowing for improved confidence in its future use. This can likely be achieved in a two-year period at the end of which, the existing Round Butte station can be moved to the Jocko to provide weather measurements for that area. If desired, the CITT offers its assistance with the data correlation and development of a correction factor.

Timeline and Next Steps

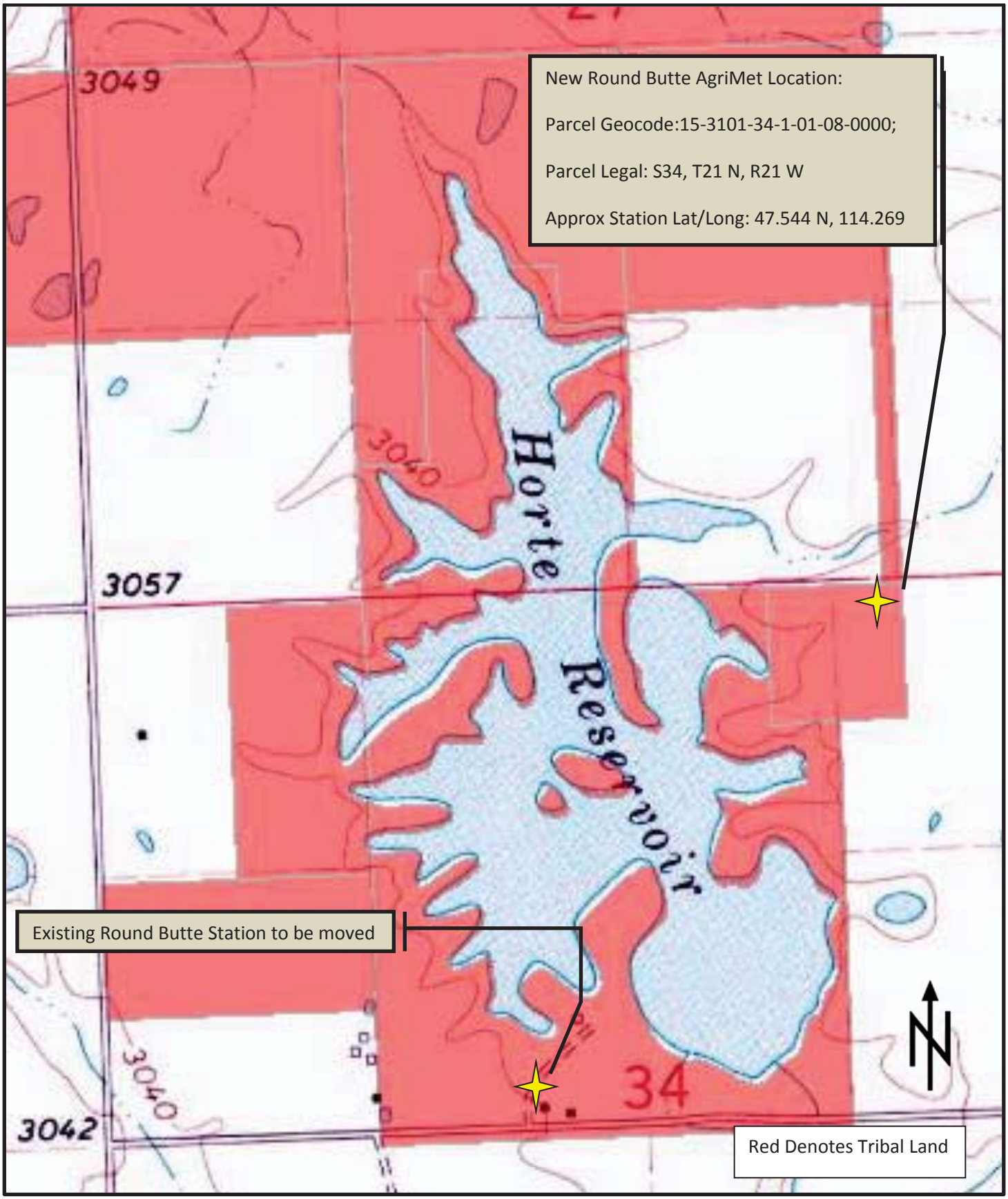
June 21 CITT meeting	Formalize recommendations through CITT vote
June 15	Receive Tribal support letter for AgriMet recommendation
June 15	Formalize access agreements
July-August	Install equipment

References

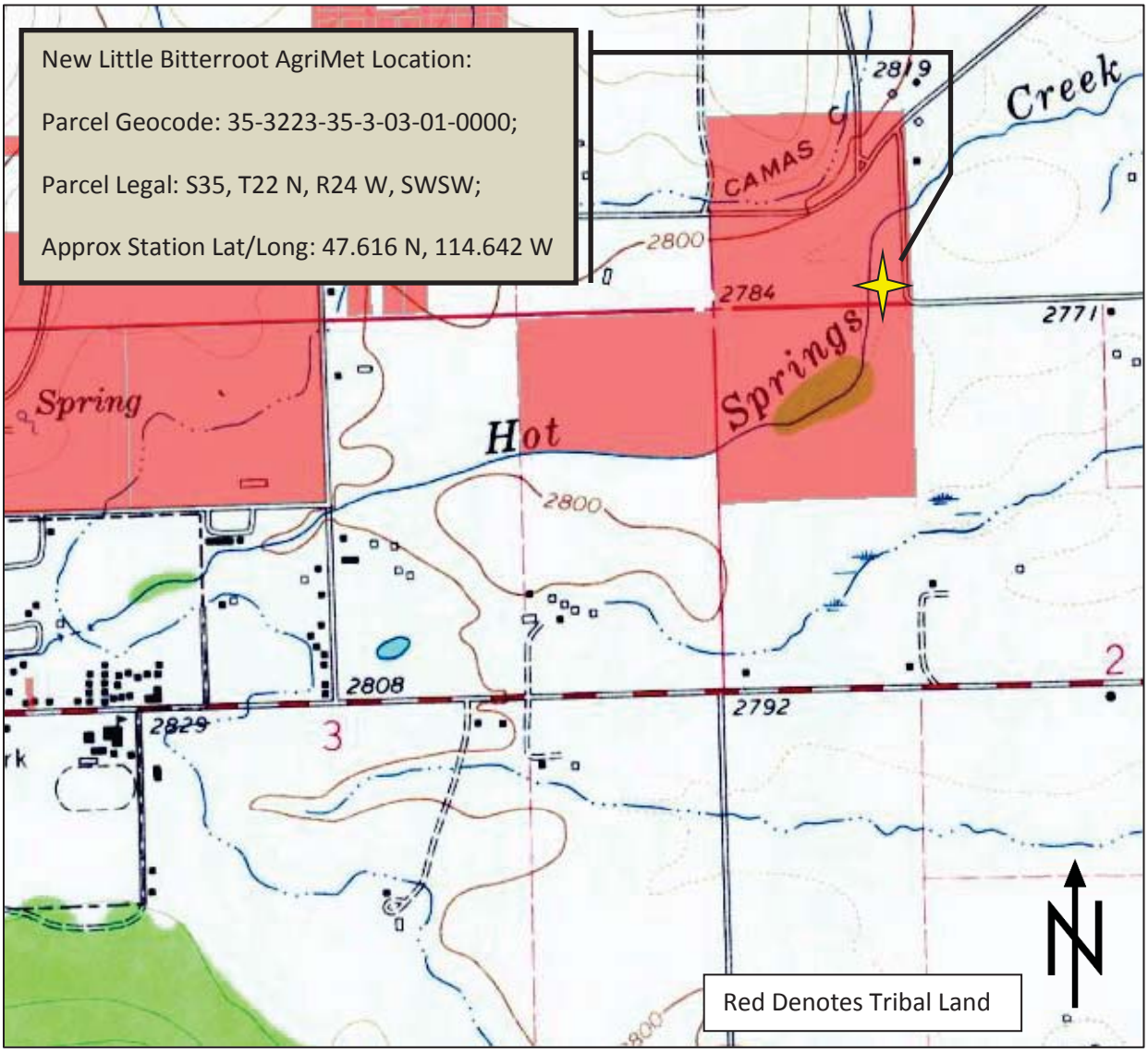
2016. Website Information: Reclamation / Pacific Northwest Region / AgriMet / General Information. https://www.usbr.gov/pn/agrimet/general.html

Kjaersgaard, Jeppe and Allen, Richard. 2009. Field-scale evapotranspiration from the Mission Valley using METRIC; report submitted to the Montana Department of Natural Resources and Conservation. Kimberly R & E Center, University of Idaho.

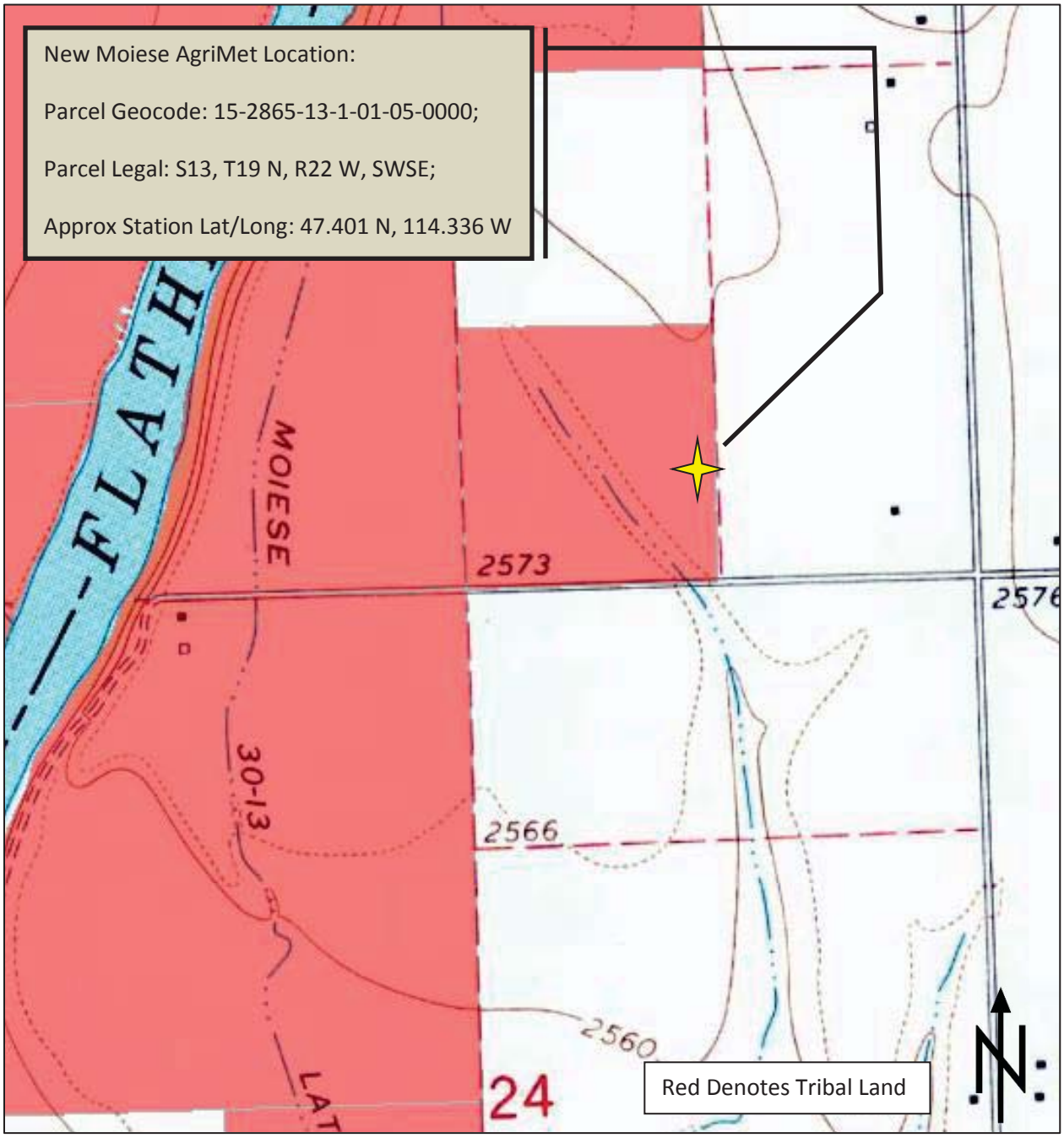
Round Butte AgriMet Station: Relocation of Existing



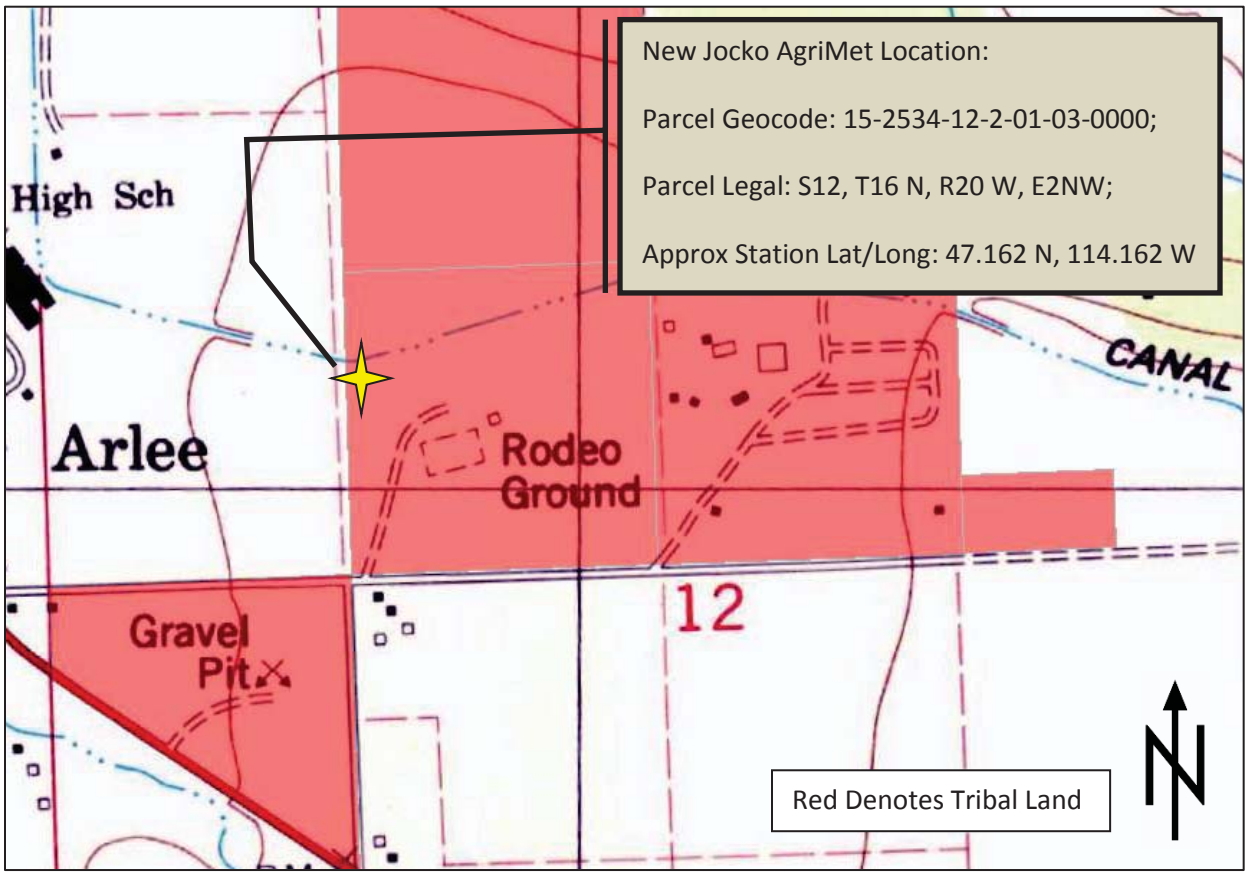
Little Bitteroot AgriMet Station: New Station



Moiese AgriMet Station: New Station



Jocko AgriMet Station: New Station



THE CONFEDERATED SALISH AND KOOTENAI TRIBES
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A Confederation of the Salish,
Pend d' Oreille
and Kootenai Tribes

A People of Vision

June 15, 2017

Jama Hamel,
Agrimet Program Coordinator
U.S. Bureau of Reclamation
1150 N. Curtis Road
Boise, ID 83706

re: AgriMet Station of Flathead Indian Reservation

Dear Ms. Hamel,

The Confederated Salish and Kootenai Tribes understand that through their Tribal Assistance Program the U.S. Bureau of Reclamation Pacific Northwest Region will, at no cost to the Tribes, install and complete operation and maintenance at four (4) Agrimet weather stations at locations specified in an accompanying access agreement. With this understanding, this letter serves to identify the Tribes full support for this activity.

Agrimet weather stations provide climatic and agricultural crop water use data that can form a foundation for greater irrigation water use efficiency. This can bring benefit to both Tribal and non-Tribal agricultural producers on the Reservation, as well as to Tribal water and biological resources. The CSKT-Montana Water Rights Compact Implementation Technical Team (CITT) has, as an objective, to provide tools to maintain and improve onfarm irrigation water use efficiency. Upgrades to the AgriMet network will help to advance this objective.

In closing the CSKT, through this letter, support the Bureau of Reclamation efforts to upgrade the Agrimet network on the Flathead Indian Reservation.

Sincerely,

Vernon S. Finley,

Chairman, Tribal Council

UNITED STATES DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

PERMIT TO ENTER FOR AGRIMET STATION

AgriMet is the Northwest Cooperative Agricultural Weather Station Network. It is operated by the U.S. Bureau of Reclamation, Pacific Northwest Regional Office, 1150 N. Curtis Rd. Suite 100, Boise, ID 83706-1234 Phone (208) 378-5203.

The undersigned, Vernon S. Finley, Chairman, CSKT Tribal Council, hereinafter referred to as Landowner, states as follows:

That the Landowner of the following described properties (maps attached):

1) New Round Butte location S34,T21N,R21W (geocode 15-3101-34-1-01-08-0000) Lake County;
2) Little Bitterroot location S35,T22N,R24W (geocode 35-3223-35-3-03-01-0000 Sanders County;
3) Moiese location S13,T19N,R22W (geocode 15-2865-13-1-01-05-000) Lake County; and
4) Jocko location S12,T16N,R20W (geocode 15-2534-12-2-01-03-0000) Lake County.

will allow the Bureau of Reclamation, its agents and assigns, hereinafter referred to as Reclamation, to place, operate, and maintain AgriMet weather station(s) on said property, and will allow Reclamation ingress and egress over existing access routes and other ways as may be mutually agreed upon, subject to the following terms and conditions:

1. The particular placement of the station(s) will be determined jointly by the Landowner and Reclamation.

2. The station(s) will be serviced and maintained by Reclamation and/or Reclamation appointed personnel.

3. The station(s) may be removed at any time by Reclamation, or within 30 working days if so requested by the Landowner.

4. This Permit shall remain in effect until terminated in writing by either party.

Signed: Leon Finley 6-15-17
Date

Vernon S. Finley,
Chairman, Tribal Council
Confederated Salish and Kootenai Tribes
P.O. Box 278, Pablo Montana 59855

Approved: _____ _____
Bureau of Reclamation Date
AgriMet Representative

DEPARTMENT OF NATURAL RESOURCES
AND CONSERVATION

STEVE BULLOCK, GOVERNOR
1539 ELEVENTH AVENUE

STATE OF MONTANA

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June 30, 2017

Jama Hamel
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Corey Carmack
Tribal Assistance Program
U.S. Bureau of Reclamation
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1917 Marash Road
Yakima, WA 98901-2058

RE: Compact Implementation Technical Team's (CITT) recommendations to add AgriMet weather stations on the Flathead Indian Reservations

Dear Jama Hamel and Corey Carmack:

The State of Montana recognizes the value of localized agricultural weather stations designed to inform irrigation water use and maximize crop production. The State also recognizes that the Compact Implementation Technical Team (CITT) composed of Tribal, State, Federal, and local irrigator representation, has recommended the installation of three (3) new AgriMet sites and the moving of one (1) existing AgriMet site.

Weather information at these recommended locations will benefit irrigators within the approximately 127,000-acre Flathead Indian Irrigation Project and those irrigating adjacent non-Project lands. The added information will also greatly assist with the implementation of the CSKT-MT Water Right Compact, which was ratified by Montana's 2015 Legislature (MCA 85-20-1901) and is the result of more than a decade of negotiations between the Tribes, the State, and the Federal government.

In summary, the State of Montana supports the CITT proposal related to new AgriMet weather stations in the Flathead Indian Irrigation Project area. The State appreciates Reclamation's assistance in developing the CITT AgriMet recommendations and for making the CITT aware that funding is available through the Bureau's Tribal Assistance Program to fund the equipment, installation, and operation and maintenance of the four (4) AgriMet weather stations addressed in the CITT's recommendation.

Sincerely,

John E. Tubbs
Director
MT Department of Natural Resources