

## REMOTE SENSING

### Cooperation

**Agreement Between the  
UNITED STATES OF AMERICA  
and NORWAY**

Signed at Reston and Oslo  
March 12 and 22, 2013

*with*

Annexes



NOTE BY THE DEPARTMENT OF STATE

Pursuant to Public Law 89—497, approved July 8, 1966  
(80 Stat. 271; 1 U.S.C. 113)—

“ . . .the Treaties and Other International Acts Series issued under the authority of the Secretary of State shall be competent evidence . . . of the treaties, international agreements other than treaties, and proclamations by the President of such treaties and international agreements other than treaties, as the case may be, therein contained, in all the courts of law and equity and of maritime jurisdiction, and in all the tribunals and public offices of the United States, and of the several States, without any further proof or authentication thereof.”

**NORWAY**

**Remote Sensing: Cooperation**

*Agreement signed at Reston and Oslo  
March 12 and 22, 2013;  
Entered into force March 22, 2013.  
With annexes.*

**IMPLEMENTING AGREEMENT**

**BETWEEN THE**

**UNITED STATES GEOLOGICAL SURVEY  
OF THE DEPARTMENT OF THE INTERIOR**

**AND THE**

**NORWEGIAN SPACE CENTRE (NSC)**

**FOR COOPERATION IN THE USE OF  
U.S. LAND REMOTE SENSING SATELLITE DATA**

## PREAMBLE

The United States Geological Survey of the United States Department of the Interior and the Norwegian Space Centre (NSC), (hereinafter referred to as "the Parties"),

**RECOGNIZING** their mutual interest in the use of space technology for peaceful purposes;

**NOTING** the value of the United States Landsat satellite missions to cooperation among governments in space-based remote sensing of the Earth's surface;

**DESIRING** to establish an overall legal framework for cooperation in future land remote sensing satellite missions;

**HAVE AGREED** as follows:

## ARTICLE 1 – PURPOSE AND SCOPE OF COOPERATION

This Implementing Agreement (IA) establishes the terms and conditions under which the United States Geological Survey (USGS) will provide United States-owned land remote sensing satellite data and NSC will receive, process, archive, distribute, and exchange such data in cooperation with the USGS. This IA consists of a main text, a definition of terms annex, and mission-specific annexes. The annexes are an integral part of this IA.

## ARTICLE 2 – SPACE FRAMEWORK AGREEMENT

This IA is subject to the *Agreement between the Kingdom of Norway and the United States of America for Cooperation in the Civil Use of Outer Space* which entered into force on November 14, 2001, and was most recently resigned October 23, 2006. The framework agreement provides for important scientific and technical cooperation between the two countries on a range of issues, including research collaboration, remote sensing, and civil space cooperation. Specific activities are undertaken pursuant to separate implementing arrangements or agreements, such as this IA, under this framework document.

## ARTICLE 3 – RESPONSIBILITIES OF THE PARTIES

- A. The USGS shall endeavor to provide operational land remote sensing satellite service under the terms of this IA and shall:
  - 1. Program land remote sensing satellites to collect and provide remote sensing data of areas within the acquisition radius of NSC's ground station(s) and/or globally recorded data to the extent that such requests can be accommodated by the spacecraft. The USGS will endeavor to schedule

satellite downlink resources to meet requests from all participating ICs in an equitable and balanced manner, subject to conflict-resolution guidelines to be provided to all stations. Programming details to meet such requests will be arranged by mutual decision of the Parties' technical representatives.

2. Provide NSC with orbital elements for calculating the antenna pointing angles necessary to acquire the satellite-transmitted signals and with the necessary ancillary and calibration information for processing the data acquired.
3. Reserve the right to curtail or terminate transmission of satellite data to NSC for reasons of (1) spacecraft or USGS ground equipment limitations, or (2) non-payment of annual access fee, if applicable, as agreed in any mission-specific Annex to this IA. In these cases, the USGS will notify NSC and discuss the planned action in the most expeditious manner possible.
4. Provide to NSC, upon request by NSC, reasonable quantities of raw USGS land remote sensing satellite data extracted from the USGS archive in an agreed-upon format and delivered electronically or on media at a price to be negotiated.
5. Provide support for anomaly resolution for USGS land remote sensing satellite missions.
6. Endeavour to ensure that any radio frequency problem occurring in relation to data reception by NSC's ground station(s) is resolved to the satisfaction of the Parties.

**B. NSC shall:**

1. Operate (a) ground station(s) for the reception, processing, archiving, distribution, and exchange of USGS land remote sensing satellite data, including establishing and operating the necessary communication links with the USGS's Mission Operations Center (MOC) and the USGS's data center located at the Earth Resources Observation and Science (EROS) Center as specified in the mission-specific Annex(es).
2. Produce land remote sensing satellite data products in accordance with agreed-upon USGS-sponsored distribution formats.
3. Ensure that all USGS land remote sensing satellite data acquired by NSC are available for sale or distribution on a public, nondiscriminatory basis. This applies to all USGS land remote sensing satellite data acquired under this and previous Landsat MOUs or IAs signed with U.S. Government agencies.

4. Make available to the USGS, upon request, English-language copies of any arrangements signed by NSC concerning the distribution of USGS land remote sensing satellite data from NSC. Such arrangements shall be consistent with this IA.
5. Maintain a current inventory of its USGS land remote sensing satellite data holdings and provide at least monthly updates of its metadata to the USGS in an agreed-upon format, electronically or on agreed-upon media, once the ground station(s) is (are) operational. These metadata may be made available publicly through USGS data facilities.
6. Establish and maintain a computer-accessible electronic system, with external public access, of browse imagery for its USGS land remote sensing satellite data holdings, or provide browse data at least monthly to the USGS in an agreed-upon format and on agreed-upon media, once the ground station(s) is (are) operational. NSC browse imagery may be made available publicly through USGS data facilities.
7. Maintain USGS land remote sensing satellite data that have met NSC quality standards in NSC's archive for at least 10 years following data acquisition, using accepted archive management practices. If NSC plans to discard data, it will issue a purge alert to the USGS, which will be given first right of refusal to acquire the data at a price to be negotiated.
8. Endeavor to ensure that any radio frequency problem occurring in relation to data reception by NSC's ground station(s) is resolved to the satisfaction of the Parties. Questions concerning radio frequency interference by the USGS land remote sensing spacecraft raised by entities in third countries will be referred to the USGS.
9. When requested by the USGS in support of key U. S. Government programs, provide reasonable quantities of NSC-held USGS land remote sensing satellite data, in an agreed-upon format, electronically or on media, and at a price to be negotiated.
10. Repatriate to the USGS, within 30 days of downlink, any USGS land remote sensing satellite data received which is unique to NSC's archive.
11. For purposes of validating data quality, exchange limited amounts of NSC-held USGS land remote sensing satellite data, in an agreed-upon format, electronically or on media, when requested by the USGS. Data for this purpose shall be exchanged annually, at no cost to the USGS.
12. When requested by the USGS in response to a significant loss of spacecraft capability to record data for the USGS archive, routinely provide sufficient quantities of newly acquired USGS land remote sensing satellite data to meet U.S. Government mission requirements, in an agreed-upon format, electronically or on media, at a cost to be negotiated.

For any support necessary to NSC beyond providing USGS land remote sensing satellite data to the USGS as described above, the Parties will negotiate specific financial terms.

13. Communicate with the MOC on spacecraft information, in order to maximize data collection and efficiency of spacecraft operations.
14. Provide support for anomaly resolution of USGS land remote sensing satellite missions.

#### **ARTICLE 4 – INTERNATIONAL MISSION COORDINATION**

- A. Each Party shall designate program representatives to be responsible for the implementation of this IA. Supplemental meetings between the Parties will be held by mutual agreement.
- B. Program management representatives from the Parties will participate in annual meetings of the Landsat Ground Station Operators Working Group (LGSOWG). This group, chaired by the USGS, will serve as a forum for the exchange of policy, programmatic and management information among station operators and the USGS.
- C. Technical representatives from the Parties will participate in annual meetings of the Landsat Technical Working Group (LTWG). This group, also chaired by the USGS, will review and coordinate technical and operational aspects of USGS international mission support.

#### **ARTICLE 5 – SCIENCE AND APPLICATIONS DEVELOPMENT**

1. The Parties will seek to identify opportunities for cooperation in improved land remote sensing satellite data collection, user accessibility, and data distribution.
2. The Parties will seek to identify opportunities to support new research in the use of land remote sensing satellite data, and the development of related applications to enhance land use practices, ecosystems management, climate change research, and other areas of Earth systems science.
3. The Parties will seek to cooperate in the support of global observation and science programs involving the use of land remote sensing satellite data.
4. The Parties will consult with one another on best practices and improved means of cooperation in the long-term archiving and preservation of land remote sensing satellite data.

5. The Parties will share information and consider opportunities for training and capacity building in the use of land remote sensing satellite data.
6. Subject to the provisions of Article 11, the Parties will share information on their respective development and potential for cooperation in their respective land remote sensing satellite missions.

#### **ARTICLE 6 – USER SERVICE ARRANGEMENTS**

The USGS reserves the right to service the land remote sensing satellite data requests of all users affiliated with U.S. Government programs.

#### **ARTICLE 7 – FINANCIAL ARRANGEMENTS AND LEGAL AUTHORIZATION**

1. The Parties shall be responsible for funding their respective activities under this IA, unless otherwise specified in the mission-specific Annex(es).
2. Obligations under this Agreement and any Implementing Annexes shall be subject to the availability of funding obtained through each Party's funding procedures.
3. Should either Party encounter budgetary problems that may affect the activities carried out under this IA that Party shall notify and consult with the other Party in a timely manner in order to minimize the negative impact of such problems on the cooperation.

#### **ARTICLE 8 – DUTIES, FEES, AND TAXES**

In accordance with its national laws and regulations, each Party shall seek to ensure free customs clearance and waiver of all applicable duties, fees, and taxes for the import or export of goods necessary for the implementation of this IA. In the event that any duties, fees, or taxes of any kind are nonetheless levied on such goods, such duties, fees, or taxes shall be borne by the Party of the country levying them.

#### **ARTICLE 9 – ENTRY AND EXIT OF PERSONNEL**

On a reciprocal basis, each Party shall use reasonable efforts to facilitate, in accordance with its laws and regulations, the entry to and exit from its territory of personnel engaged in joint activities pursuant to this IA.

#### **ARTICLE 10 – LAWS, WARRANTIES, RIGHTS, AND LIABILITY**

1. The activities under this IA will be conducted in accordance with the applicable laws and regulations of the Parties' countries, respectively, and shall be subject to the availability of appropriate funds.
2. The USGS does not warrant the suitability of its land remote sensing data for any purpose and shall not be liable for any damage or injury brought about by use of USGS land remote sensing satellite systems and their data.
3. The USGS retains the ownership right to all raw land remote sensing data acquired by its satellites. Beyond the provisions of Article 3.B.3, the USGS places no restrictions on NSC to disclose, use, manipulate, generate products from, distribute, or sell USGS land remote sensing satellite data.

#### **ARTICLE 11 – EXCHANGE OF TECHNICAL INFORMATION**

1. Technical information exchanged between the Parties will be subject to the applicable laws, regulations, and policies of the Parties' countries, respectively. In the event it is necessary to exchange technical information and the furnishing Party considers that such technical information is to be protected for proprietary or export control purposes, such information must be clearly marked with a legend indicating the country of origin, the conditions of release, that the information relates to this IA, and that it is furnished in confidence.
2. The Parties USGS and NSC will take all lawful steps available to prevent disclosure of such protected or proprietary technical information without the consent of the other Party and to ensure that it is used only for the purposes of this IA.
3. The USGS and NSC may release to the public other general, non-technical information regarding each other's programs or operations after ensuring, through consultation with each other when necessary, that this information is fairly and accurately represented.
4. The USGS and NSC may exchange appropriate technical information and documentation for the purposes of downlinking, processing, and archiving USGS land remote sensing satellite data as well as for generating and distributing products from that data.

#### **ARTICLE 12 – CONSULTATIONS AND SETTLEMENT OF DISPUTES**

1. The Parties shall consult, as appropriate, to review the implementation of activities undertaken pursuant to this IA, and to exchange views on potential areas of future cooperation.

2. In the event questions arise regarding the interpretation, application, or implementation of activities under this IA, the Program Managers of the Parties shall endeavor to resolve the questions. If the Program Managers are unable to reach an agreement, then the matter will be referred to a more senior level of the Parties for joint resolution.

#### **ARTICLE 13 – ENTRY INTO FORCE, DURATION, AND TERMINATION**

1. This IA shall enter into force upon signature by both Parties and remain in force through the operational lifetime of the USGS land remote sensing spacecraft(s) from which NSC receives USGS land remote sensing data. This IA may be amended by mutual agreement of the Parties.
2. In the event that either of the Parties is unable to comply with any provision of this IA, either Party, after consultation with the other, shall have the option of terminating this IA, providing at least 30 days' notice of such action, forwarded in writing by one Party to the other.
3. Notwithstanding termination or expiration of this IA, the obligations of the Parties set forth in Article 3.B.3, Article 3.B.7, Article 10.2, Article 10.3, and Article 11 of this IA shall continue to apply.

**ARTICLE 14 – SIGNATURE**

IN WITNESS THEREOF, respective representatives of the Parties have signed this Implementing Agreement.

For the United States Geological Survey  
of the Department of the Interior:

Suzette M. Kimball  
Suzette M. Kimball  
Acting Director  
U.S. Geological Survey  
Reston, Virginia

12 March 2013  
Date

Reston, Virginia, USA  
Place

For the Norwegian Space Centre:

Bo N. Andersen  
Bo N. Andersen  
Director General  
Norwegian Space Centre  
Oslo, Norway

22/3 -2013  
Date

Oslo, Norway  
Place

**ANNEX I**  
**TO THE**  
**IMPLEMENTING AGREEMENT**  
**BETWEEN THE**  
**UNITED STATES GEOLOGICAL SURVEY**  
**OF THE DEPARTMENT OF THE INTERIOR**  
**AND THE**  
**NORWEGIAN SPACE CENTRE (NSC)**  
**FOR COOPERATION IN THE USE OF**  
**U.S. LAND REMOTE SENSING SATELLITE DATA**  
**DEFINITION OF TERMS**

**Acquisition Radius:**

An International Cooperator's (IC's) acquisition radius is that portion of the Earth over which the satellite can communicate with an IC's ground station.

**Browse:**

Browse is a full resolution or sub-sampled Level 0R or Level 1 digital image of the Earth that can be viewed on a scene basis to quickly assess general ground area coverage, data quality, and the spatial relationships between ground area coverage and cloud coverage. A browse is an image with a reduced data volume to facilitate screening of archived Land Remote Sensing Satellite Data. Specifications regarding browse images are documented in the appropriate mission Data Format Control Book (DFCB) and made available by the USGS.

**Data Format:**

The Landsat Technical Working Group (LTWG) recommends the archive data format for exchanging data between an International Cooperator and USGS archives. The archive data exchange format for purposes of quality assessment and key government programs is typically the lowest level of processed data available (i.e. Mission or Raw Computer Compatible [RCC] Data) and is transferred electronically or on media. The archive data exchange format is documented in the appropriate mission Data Validation and Exchange Plan and associated Data Format Control Book (DFCB) and made available by the USGS.

**Data Products Distribution Format:**

The USGS Land Remote Sensing Satellite Data products are Level-0Rp (Level Zero Reformatted Product) in HDF format and Level-1T (terrain corrected) in Geo-TIFF format. International Cooperators may produce data products of their choice. ICs are encouraged, but not required to produce Level 0Rp data products in HDF format, but are required to distribute Level-1T data products in Geo-TIFF format. Specifications regarding Level-0Rp and Level-1T data products are documented in the appropriate mission Data Format Control Book (DFCB) and made available by the USGS.

**International Cooperator (IC):**

An International Cooperator (IC) is any non-U.S. Government agency or commercial organization acting on behalf of or in cooperation with a foreign government or international organization, which enters into an agreement with the USGS for purposes of receiving or exchanging Land Remote Sensing Satellite Data.

**Key U.S. Government Programs:**

Key U.S. Government Programs are any U.S. Government agencies and U.S. Government contractors, other U.S. and foreign researchers and entities involved in the United States Global Change Research Program, and U.S. and foreign researchers and foreign and international entities having signed a cooperative agreement with the United States

Government involving the use of USGS Land Remote Sensing Satellite Data for non-commercial purposes.

The United States Global Change Research Program is the Executive Branch program responding to Public Law 101-606, the Global Change Research Act of 1990, and most recently described in the annual report accompanying the President's budget entitled "Our Changing Planet: The U.S. Climate Change Science Program for Fiscal Year 2012."

International counterpart programs of the U.S. Global Change Research Program are discussed in Section V of "Our Changing Planet." These include the Intergovernmental Panel on Climate Change, the World Climate Research Program, the International Council on Science, and the Group on Earth Observations.

**Mission Operations Center (MOC):**

The Mission Operations Center (MOC) consists of the people, procedures, and hardware/software systems used for the successful execution of real-time spacecraft operations and off-line scheduling and analysis activities. All command and control functions of the spacecraft performed by the Flight Operations Team (FOT) will take place from the MOC.

**Metadata:**

Metadata is descriptive information pertaining to the USGS Land Remote Sensing Satellite Data, including such information as location and acquisition date, compiled for Level 0R and Level-1 data, and made available through the USGS user interface. Specifications regarding the metadata are documented in the Landsat Metadata Description Document (LMDD) and made available by the USGS.

**Raw Data:**

Raw Data is the USGS Land Remote Sensing Satellite Data in the form of wideband telemetry transmitted by the satellite.

**U.S. Government and Affiliated Users:**

U.S. Government and Affiliated Users are any Federal, State or local government agency personnel and personnel from any organization performing cooperative work with or for these government agencies.

**USGS Land Remote Sensing Satellites:**

USGS Land Remote Sensing Satellites are any satellites owned and operated by the USGS for the purposes of this agreement. These satellites may include, but are not limited to, the Landsat missions.

**ANNEX II**

**TO THE**

**IMPLEMENTING AGREEMENT**

**BETWEEN THE**

**UNITED STATES GEOLOGICAL SURVEY**  
**OF THE DEPARTMENT OF THE INTERIOR**

**AND THE**

**NORWEGIAN SPACE CENTRE (NSC)**

**FOR COOPERATION IN THE USE OF**  
**U.S. LAND REMOTE SENSING SATELLITE DATA**

**LANDSAT 8**  
**ANNUAL PAYMENT AGREEMENT**

## **INTRODUCTION**

Pursuant to Article 7 of the Implementing Agreement (IA) between the United States Geological Survey of the Department of the Interior and **Norwegian Space Centre (NSC)** for the Direct Reception, Distribution, and Exchange of Land Remote Sensing Satellite Data; U.S. Presidential Decision Directive/National Science and Technology Council-3, as amended on October 16, 2000; and the Land Remote Sensing Policy Act of 1992, the USGS has established a payment structure to enable it to administer all operations in support of a global network of cooperating ground receiving stations for direct reception of data from the Landsat 8 mission. This Annex sets forth the related financial and administrative terms and conditions for Landsat 8 cooperation between the USGS and NSC.

The NSC established SvalSat, the polar ground station located in Longyearbyen, Spitsbergen, in 1997. Its northern locality provides access to Landsat 8's near-polar satellite orbits daily. The station, which was fully operational in 1999, was operated and maintained by Tromsø Satellite Station. The SvalSat Station is owned and operated by Kongsberg Satellite Services AS (KSAT), a Norwegian company owned 50% by the Norsk Romsenter Eiendom AS a wholly owned subsidiary of NSC and 50% by Kongsberg Defence and Aerospace AS (KDA).

As operator of the SvalSat station, KSAT serves as program liaison for station technical and operational matters. NSC serves as program liaison for matters regarding the IA and related annexes. NSC has overall responsibility for the program on the Norwegian side. KSAT performs the technical activities as defined in this Annex. Activities supporting Landsat 8 operations are developed under the responsibility of the Program Manager at the NSC, who appoints a Svalsat program liaison to serve as the main point of contact for technical, operational, and Svalsat related matters.

## **ARTICLE 1 – OPERATIONAL STATION SERVICES**

Upon direction of the USGS, NSC shall support operation of the Landsat 8 observatory for S- and X-Band station services following declaration of Initial Operating Capability (IOC), nominally scheduled to occur at Launch + 90 days. This is based on the assumption that a 7.3m antenna can be used for the service. The USGS will select the option to be executed based upon Landsat 8 observatory performance as demonstrated during the commissioning and pre-option determination phases. As such, the NSC has provided an option based pricing schedule for post IOC operations in terms of fixed price block allocations covering daily passes. Each option is assumed to be one year in duration with the exception of the Pre-Option Determination option, which is a one-time 90 day performance period.

X-Band services are defined to include both acquisition of data at the station and also transfer of the data via network connection to USGS/EROS. The NSC shall continue to use the equipment provided by the USGS, as well as operational procedures used during

the commissioning phase during operations. Moreover, annual vendor support costs for any Landsat 8-specific COTS hardware or software procured by the NSC is included in the cost structure below.

The NSC shall schedule station assets and coordinate with the Landsat 8 MOC using USGS-approved procedures, including activities such as voice and electronic communication with the MOC, providing schedule of planned outages, provide notification of unplanned outages as soon as possible, post pass reports, and invoices for services used. Planning of station assets is done on a four-week window and a three-day contact schedule provided by the Landsat 8 MOC on a daily basis.

Landsat 8 passes shall have priority over other missions for passes for which they are scheduled. Pass activities will be functionally identical to normal operations that took place during the commissioning phase, with some possible optimization of procedures and processes for long-term operations.

The NSC shall transfer all mission (science) data received on X-Band to the USGS/EROS facility in Sioux Falls, South Dakota, USA via a WAN Link from SvalSat to USGS/EROS. The NSC shall transfer this mission data at a rate consistent with the Landsat 8 mission data latency requirements as defined in the Level 4 Landsat 8 Ground Network Element Requirements Document.

The USGS will fund the IOnet connection to the Landsat 8 MOC, if S-Band services are to be used. The USGS will provide ongoing support for systems and software provided to the NSC for Landsat 8-specific activities (e.g., DCRS software updates and bug fixes). The NSC shall participate in operational Landsat 8 reporting and configuration management activities, as related to Landsat 8 operations.

## **ARTICLE 2 – COST STRUCTURE**

### **Annual Communications Cost**

KSAT will be responsible to provide an Internet communication link to USGS/EROS in Sioux Falls, South Dakota for the duration of the service option from Svalbard. The Annual Communications Cost for the requested service is included in the Annual Operations Cost section below.

If Internet connectivity is insufficient to meet project requirements, the parties shall meet and negotiate in good faith an alternate means of communication for the back haul of Landsat 8 science data. However, the USGS will fund the IOnet connection to the Landsat 8 MOC, if S-Band services are to be used beyond the IOC period.

### **Annual Operations Cost**

Based on the USGS/EROS requirements, the following provides the Annual Operations Cost based on a block allocation.

Principles:

- A small antenna is used (typically 7.3m diameter dish).
- If the USGS is scheduling less passes per day than the amount agreed for that specific period, the cost incurred is equal to the cost for that period.
- If the USGS would like more passes than requested in an option and allocated to the mission, the next level of support can be implemented with 45 days' notice.
- An advance notice (not longer than 28 days per rolling forecast schedule) is anticipated in a dialogue with KSAT and the customer MOC for detail planning.
- It is assumed that there will be a relative constant number of daily passes, consequently 2 -3 passes variation limits on the amount of day-to-day variation in the number of passes per day.

The costs include escalation and General & Administrative (G&A). The communication cost for science data is included in the annual block allocation of passes (options 3-5). A special, dedicated software license is required for the science data transfer and is also included in the options below.

Option	Service Level	FY2013	Option Yr 1	Option Yr 2	Option Yr 3
1	Pre-Option (90 days full support)	\$170,000			
	<b>Option 1 Total</b>	<b>\$170,000</b>			
2	Emergency support 100 passes/yr	\$45,400	\$46,535	\$47,698	\$48,891
	Science data transfer	\$16,000	\$16,400	\$16,810	\$17,230
	<b>Option 2 Total</b>	<b>\$61,400</b>	<b>\$62,935</b>	<b>\$64,508</b>	<b>\$66,121</b>
3	400 passes/yr	\$160,000	\$164,000	\$168,100	\$172,303
	Science data transfer	\$16,000	\$16,400	\$16,810	\$17,230
	<b>Option 3 Total</b>	<b>\$176,000</b>	<b>\$180,400</b>	<b>\$184,910</b>	<b>\$189,533</b>
4	1200 passes/yr	\$366,000	\$375,150	\$384,529	\$394,142
	Science data transfer	\$16,000	\$16,400	\$16,810	\$17,230
	<b>Option 4 Total</b>	<b>\$382,000</b>	<b>\$391,550</b>	<b>\$401,339</b>	<b>\$411,372</b>
5	1600 passes/yr	\$473,600	\$485,440	\$497,576	\$510,015
	Science data transfer	\$16,000	\$16,400	\$16,810	\$17,230
	<b>Option 5 Total</b>	<b>\$489,600</b>	<b>\$501,840</b>	<b>\$514,386</b>	<b>\$527,246</b>
6	<b>Additional 400 passes/yr</b>	<b>\$160,000</b>	<b>\$164,000</b>	<b>\$168,100</b>	<b>\$172,303</b>
7	<b>Additional 800 passes/yr</b>	<b>\$240,000</b>	<b>\$246,000</b>	<b>\$252,150</b>	<b>\$25,454</b>

Note: The cost figures are Firm Fixed Price, including escalation and G&A.

**Changed Requirements, Increase of Antenna Size**

The baseline for the services is the use of an antenna with a 7.3m dish. If a change in the operational requirements or a degradation of the satellite performance results in a need for a larger antenna, the NSC will negotiate in good faith with the USGS a solution that implies the use of an antenna system with a larger dish.

### **ARTICLE 3 – PAYMENT SCHEDULE**

The USGS will provide at least 30 days' notice prior to the date the Pre-Option Determination services are to begin. The Pre-Option Determination activity, if exercised, will be executed upon declaration of IOC and will ensure the USGS has sufficient on-orbit experience with Landsat 8 to determine the correct option number to exercise.

Following this 90 day determination period, options may be selected by the USGS for up to three one year option periods. In so doing, the USGS will specify the option number to exercise. Upon completion of a one year option period of performance, the USGS reserves the right to modify the option service level (option number) as ground system operations are better understood and optimized. The USGS will notify the NSC of any modification to the option service level no later than 60 days prior to the start of a new one year option period of performance.

Additionally, within an option period the NSC shall maintain the capability to take additional S- and X-Band passes upon demand as required by the USGS to support contingency operations. This may result from an on-orbit anomaly or an emergency change to the "nominal" LGN configuration of LGS, GLC, and SvalSat. The per pass price for any contingency or emergency passes will be 550 USD per pass. Emergency passes will be provided based upon availability of assets immediately upon notification from the USGS.

### **ARTICLE 4 – CONTINGENCIES**

The USGS, in consultation with NSC, may curtail or terminate the transmission of data and adjust the cost structure if the USGS is unable to satisfy data requests due to spacecraft system capability limitations or ground receiving stations conflicts.

The USGS reserves the right to terminate transmission of Landsat 8 data to NSC at any time that NSC is delinquent in regularly scheduled delivery of raw telemetry data to the USGS in accordance with IA Article 3.A.3. The USGS will notify NSC 30 days in advance of its intention to terminate transmission for these reasons.

### **ARTICLE 5 – DURATION AND AMENDMENT**

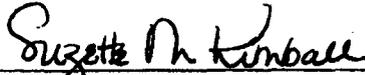
This Annex will remain in effect as long as the IA remains in force, and it may be amended by mutual consent of USGS and NSC through an Exchange of Letters.

At the beginning of each new USG Fiscal Year, the USGS and NSC will review this Annex and revise it if necessary.

**ARTICLE 6 – AUTHORIZING SIGNATURES**

The signatures of the authorized officials below signify the agreement by the Parties to the terms of this annex.

For the United States Geological Survey  
of the Department of the Interior:



Suzette M. Kimball  
Acting Director  
U.S. Geological Survey  
Reston, Virginia

12 March 2013

(date)

For the Norwegian Space Centre:



Bo N. Andersen  
Director General  
Norwegian Space Centre  
Oslo, Norway

22/3-2013

(date)