6975000 6970000 385000 6965000 6960000

380000

385000

Portage Creek

Susitna River

Cheechako Creek

5

8

11

Glacial striae continue
across lineament group
undeformed

6975000 6970000 6965000 380000 6960000

KJs Qg Tpgr Tvu

E C D

0 1 km
0 1 mi

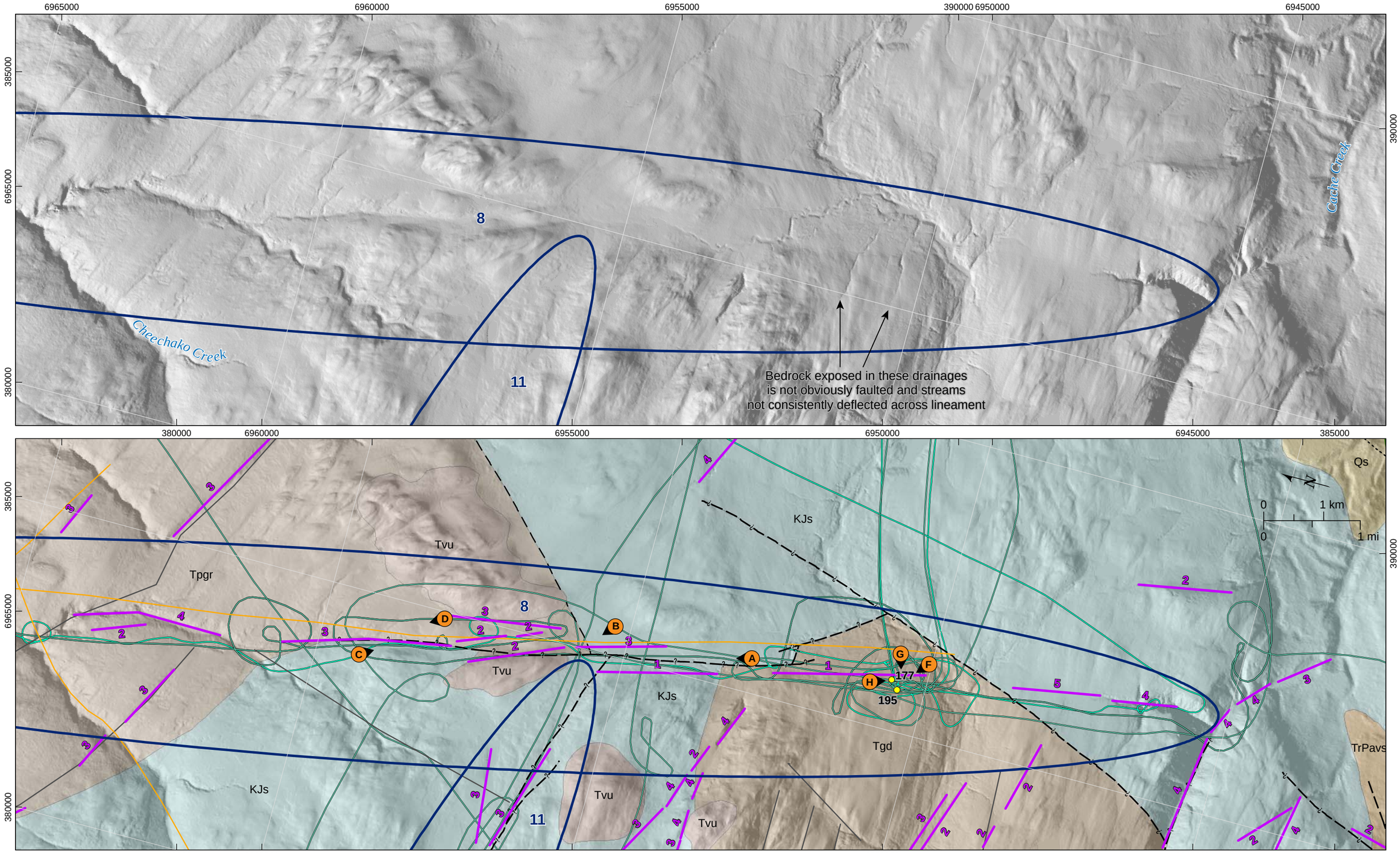
N

Notes: 1. See Figures A0.2, A0.3, A0.4, and A0.5 for explanation.
2. Data frame has been rotated 75° west of north.
3. Geology by Wilson et al., 2009.

DRAFT

FUGRO Date 10/18/13	STATE OF ALASKA ALASKA ENERGY AUTHORITY ALASKA ENERGY AUTHORITY	SUSITNA-WATANA HYDROELECTRIC PROJECT LINEAMENT GROUP 8 MAP DATA	FIGURE A8-1.1

79_218900_Alaska_Railbelt/2189_Lineament Report October 2013, modified 10.18.13



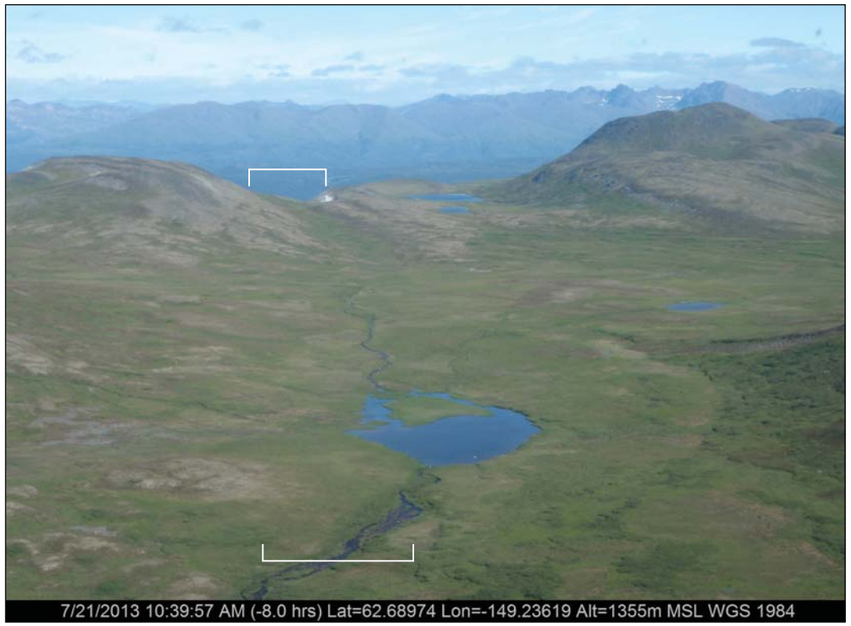
Notes: 1. See Figures A0.2, A0.3, A0.4, and A0.5 for explanation.
2. Data frame has been rotated 75° west of north.
3. Geology by Wilson et al., 2009.

DRAFT

FUGRO Date 10/18/13	STATE OF ALASKA ALASKA ENERGY AUTHORITY ALASKA ENERGY AUTHORITY	SUSITNA-WATANA HYDROELECTRIC PROJECT LINEAMENT GROUP 8 MAP DATA	FIGURE A8-2.1

79_218900_Alaska_RailbeltI2189_Lineament Report October 2013, modified 10.18.13

A)

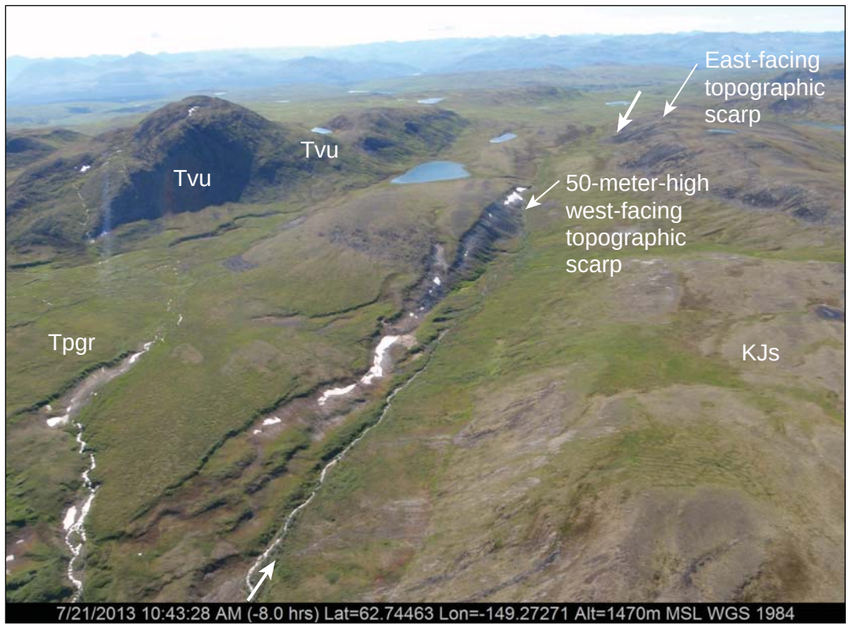


View looking north at middle portion of lineament group 8 along mapped inferred fault. Brackets show position of fault but note that no geomorphic expression of faulting is readily apparent.

B)

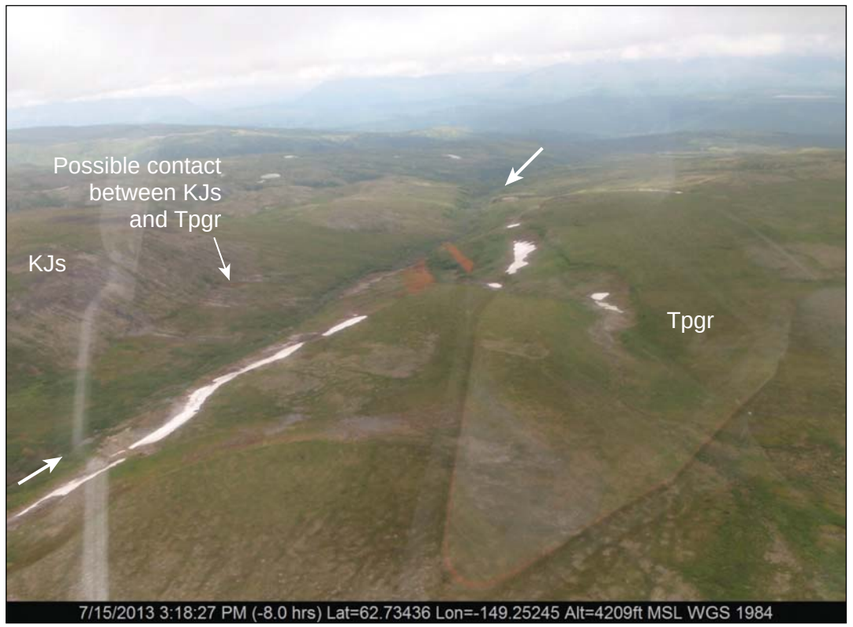
Close up view of saddle area shown in Photograph A. Brackets, again, show position of fault but note that no geomorphic expression of faulting is readily apparent.

C)



View looking south opposite that shown in Photograph B above. Mapped fault runs between large arrows. Note presence of many solifluction scarps in the landscape.

D)



View looking north down the prominent, deeply incised linear drainage. Mapped fault runs between large arrows.

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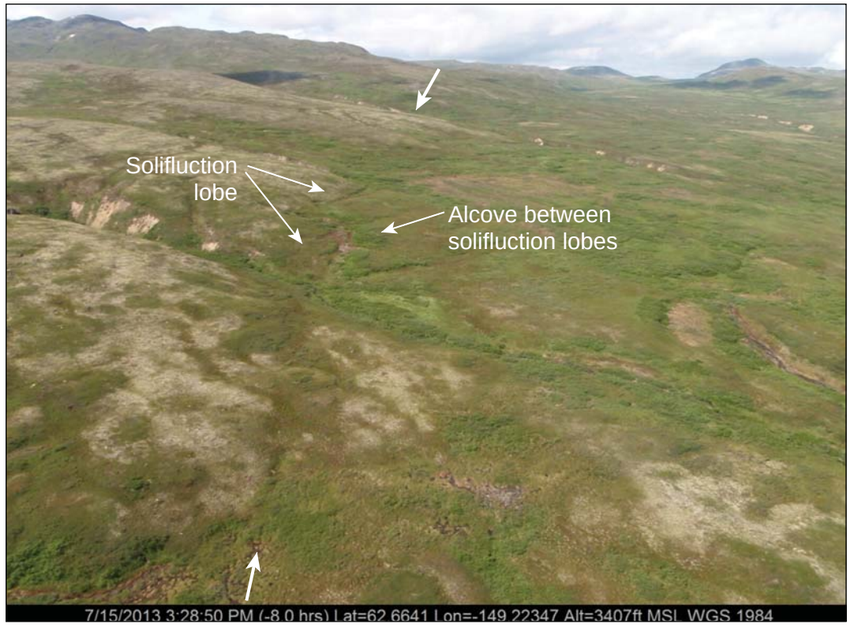
FUGRO Date 10/18/13	STATE OF ALASKA ALASKA ENERGY AUTHORITY ALASKA ENERGY AUTHORITY	SUSITNA-WATANA HYDROELECTRIC PROJECT LINEAMENT GROUP 8 PHOTOGRAPHS	FIGURE A8-2.2

E)

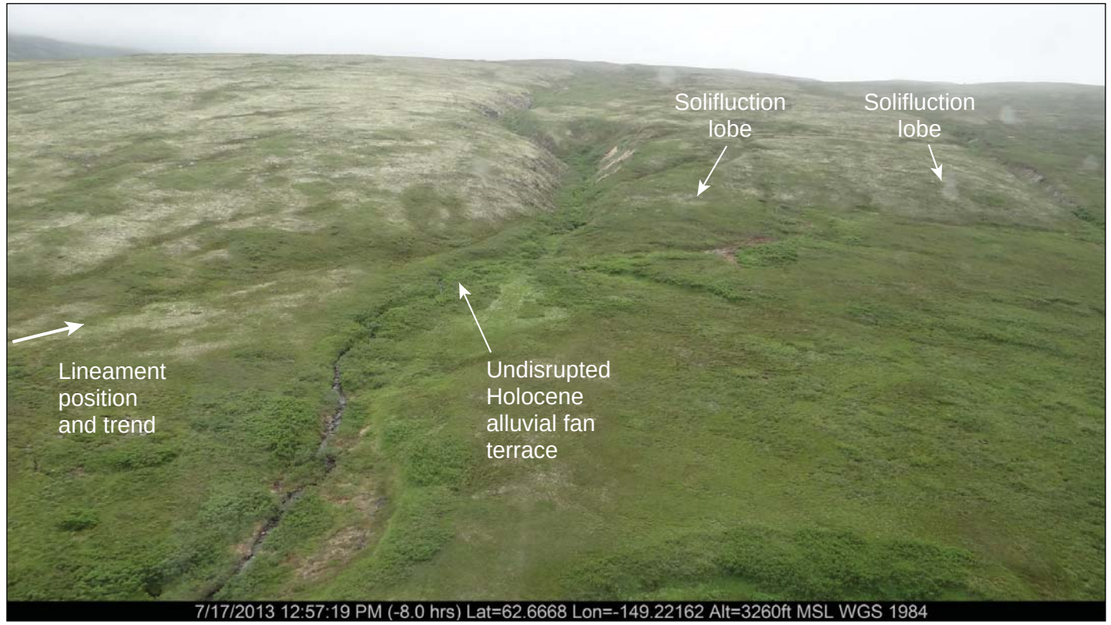
View looking north at north (right) bank of Susitna River showing oxidized mafic dike interpreted by WCC (1982) to not be truncated by the linear drainage.

F)



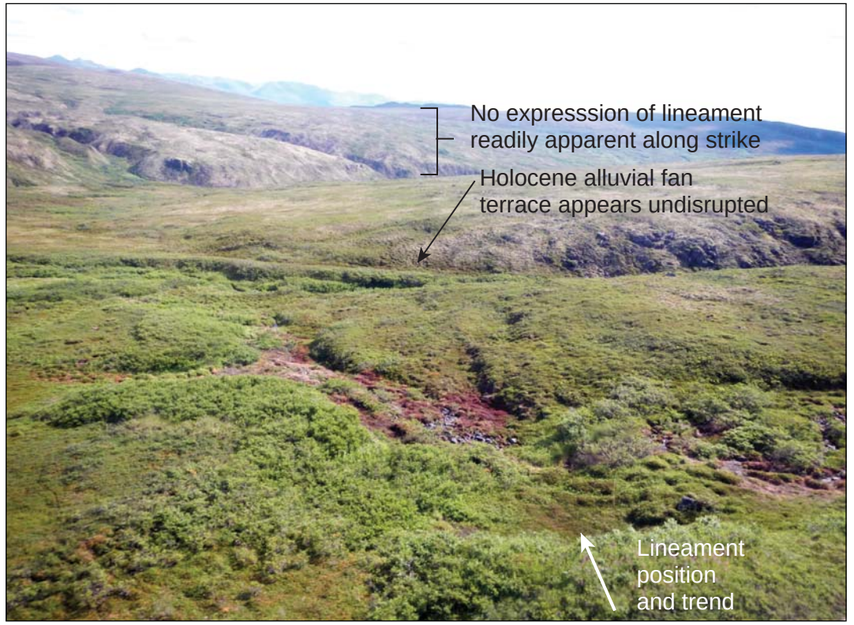
View looking north along 1- to 2-m-high east-facing scarps along southern portion of lineament group 8. Large arrows point along mapped lineament. Note the presence of solifluction lobes with an alcove or recession in between them that create an irregular and curving topographic scarp.

G)



View looking west directly towards 1- to 2-m-high east-facing scarps shown in Photographs F and H. Large arrow points along mapped lineament.

H)

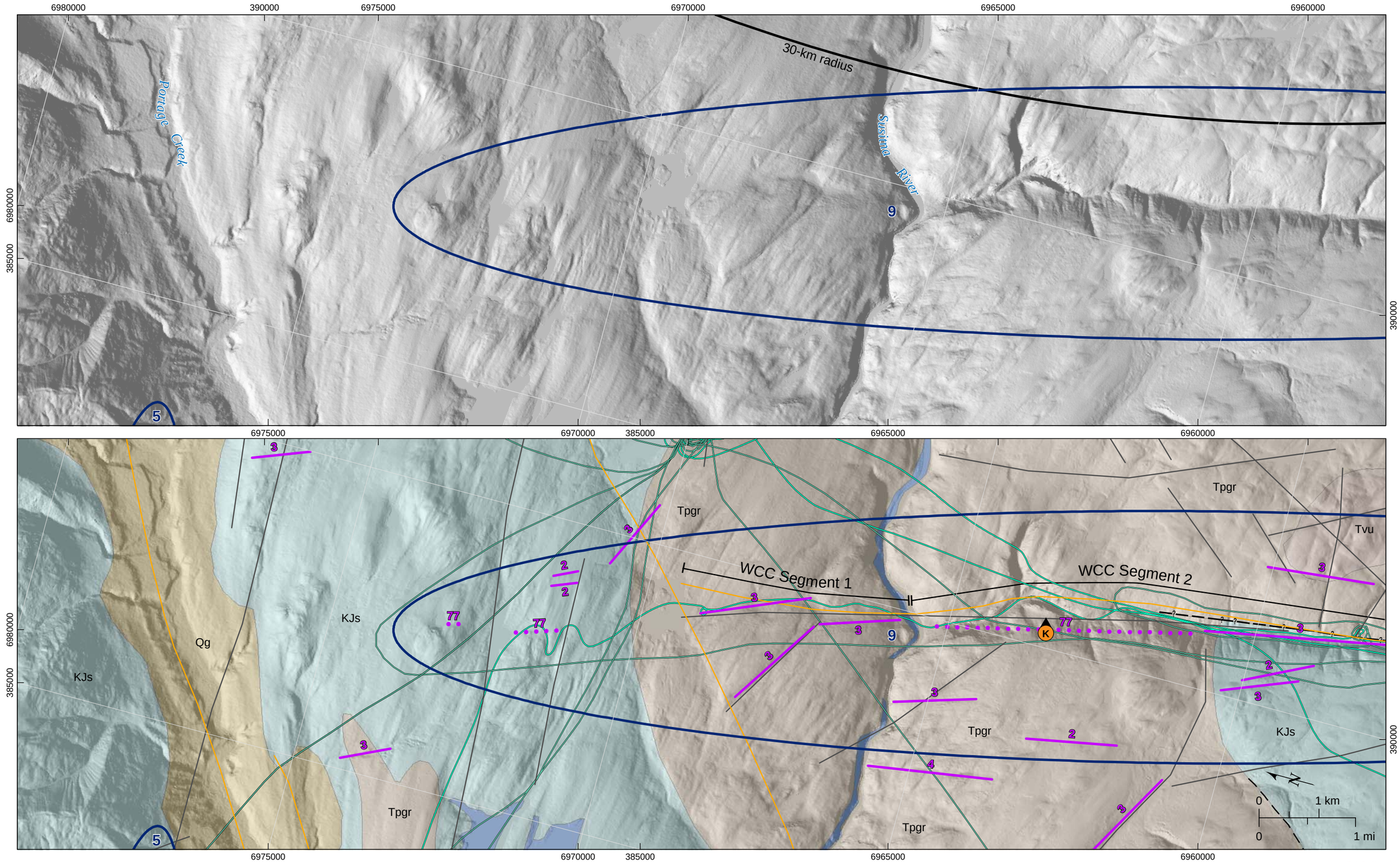


View looking south opposite that shown in Photograph F above. Large arrow points along lineament position and trend.

DRAFT

FUGRO Date 10/18/13	STATE OF ALASKA ALASKA ENERGY AUTHORITY ALASKA ENERGY AUTHORITY	SUSITNA-WATANA HYDROELECTRIC PROJECT LINEAMENT GROUP 8 PHOTOGRAPHS	FIGURE A8-2.3

79_218900_Alaska_Railbelt\2189_Lineament Report October 2013, modified 10.18.13

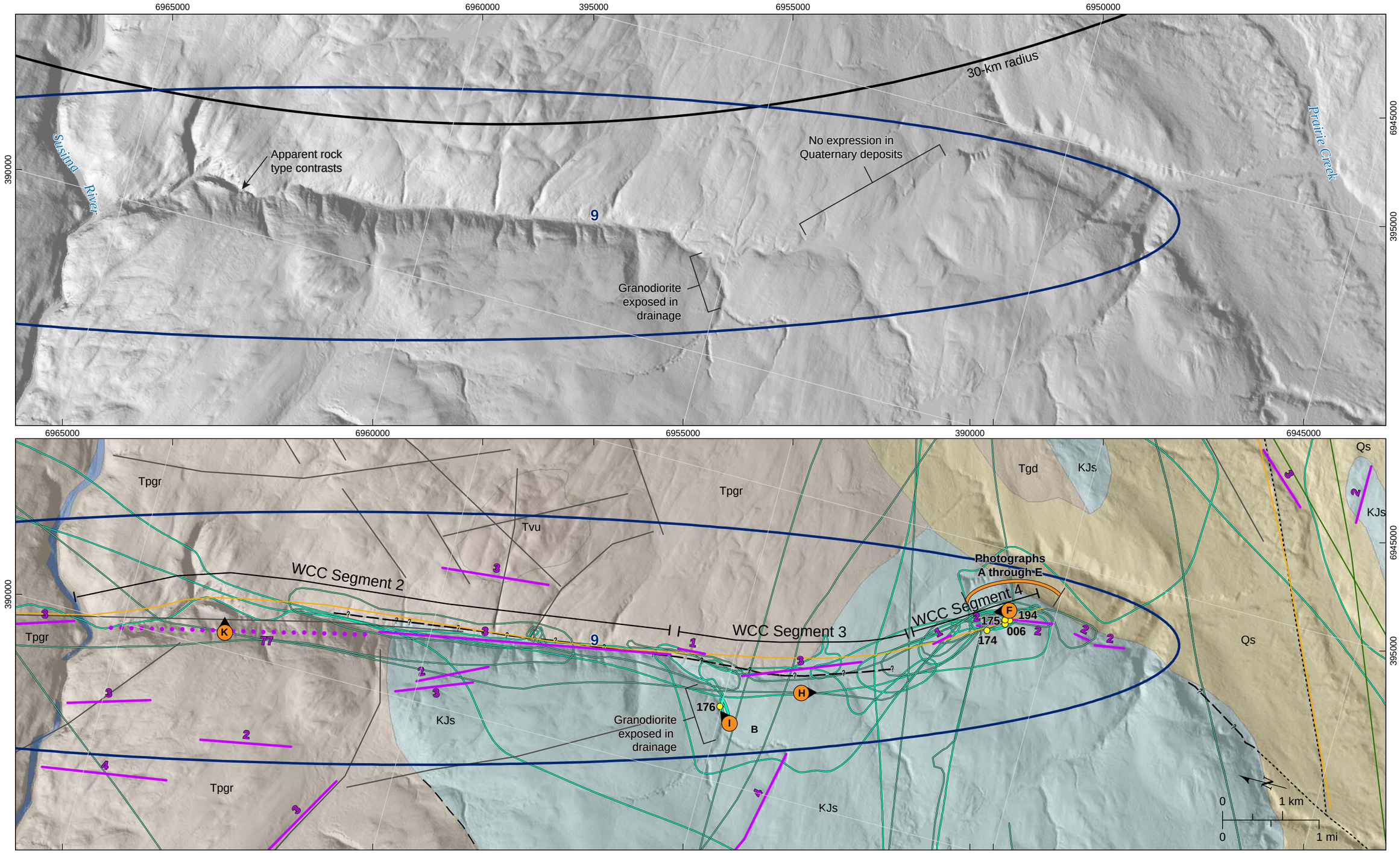


Notes: 1. See Figures A0.2, A0.3, A0.4, and A0.5 for explanation.
2. Data frame has been rotated 75° west of north.
3. Geologic map by Wilson et al., 2009.

DRAFT

FUGRO Date 10/18/13	STATE OF ALASKA ALASKA ENERGY AUTHORITY ALASKA ENERGY AUTHORITY	SUSITNA-WATANA HYDROELECTRIC PROJECT LINEAMENT GROUP 9 MAP DATA	FIGURE A9-1.1

79_218900_Alaska_Railbelt/2189_Lineament Report October 2013, modified 10.18.13

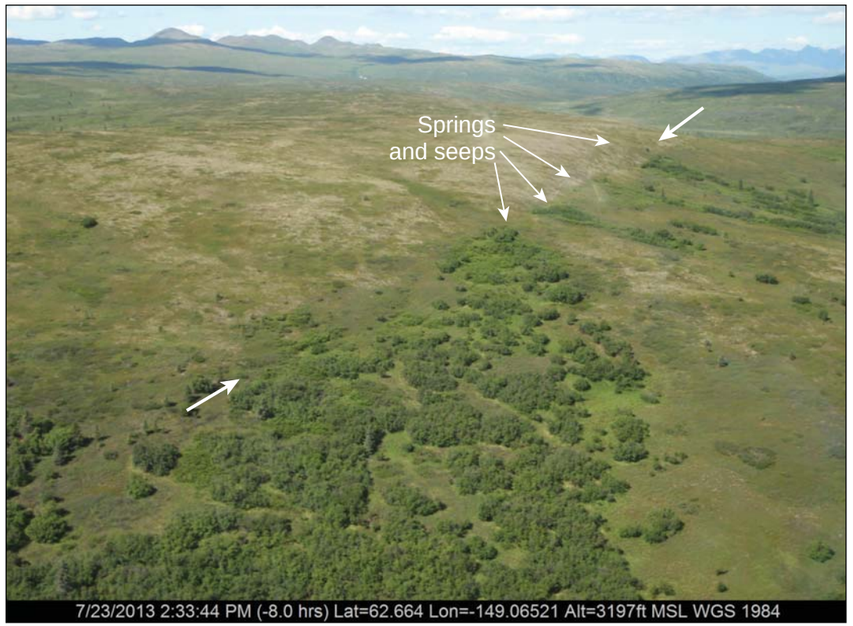


Notes: 1. See Figures A0.2, A0.3, A0.4, and A0.5 for explanation.
2. Data frame has been rotated 75° west of north.
3. Geology by Wilson et al., 2009.

FUGRO Date 10/18/13	STATE OF ALASKA ALASKA ENERGY AUTHORITY	SUSITNA-WATANA HYDROELECTRIC PROJECT LINEAMENT GROUP 9 MAP DATA	FIGURE A9-2.1

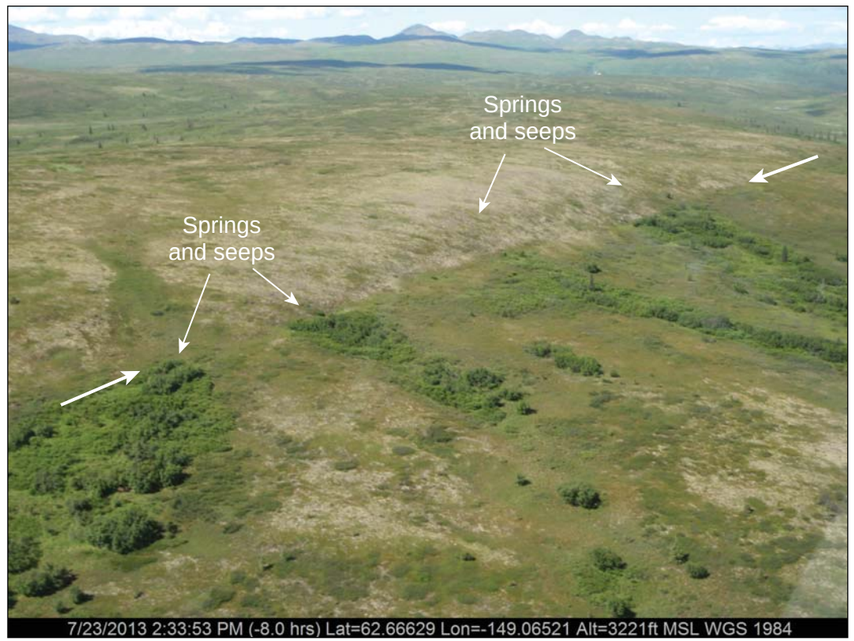
79_218900_Alaska_Railbelt/2189_Lineament Report October 2013, modified 10.18.13

A)



The first in a sequence of 5 photographs looking northwest taken along a series of north-trending, east-facing aligned slope breaks in the southernmost portion of lineament group 8. Large arrows point along lineament.

B)



Photograph 2 of 5 looking northwest. Large arrows point along lineament.

C)

Photograph 3 of 5 looking northwest. Large arrows point along lineament.

DRAFT

FUGRO Date 10/18/13	STATE OF ALASKA ALASKA ENERGY AUTHORITY ALASKA ENERGY AUTHORITY	SUSITNA-WATANA HYDROELECTRIC PROJECT LINEAMENT GROUP 9 PHOTOGRAPHS	FIGURE A9-2.2

D)

Photograph 4 of 5 with view looking northwest. Large arrows point along lineaments.

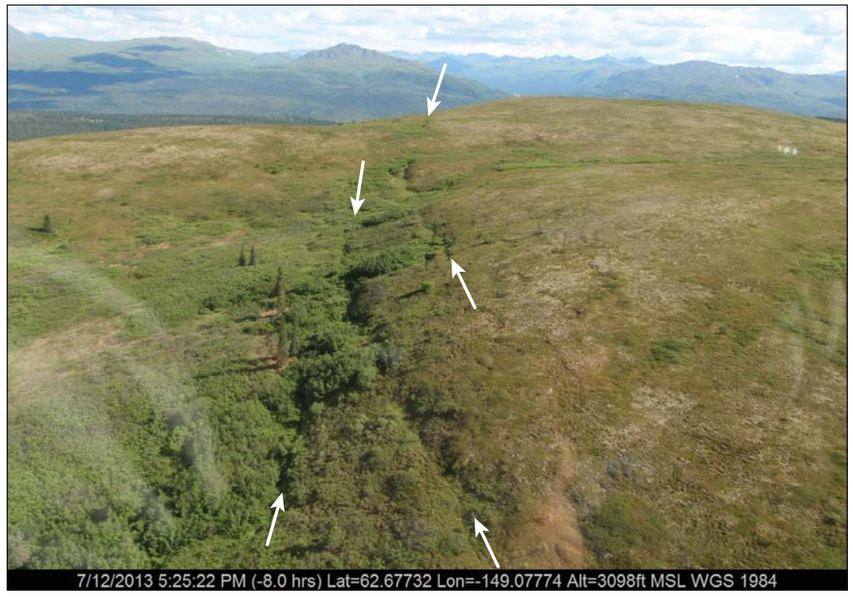
E)

Photograph 5 of 5 with view looking northwest. Note that lineament expression has died out and brackets bound the location of its projection.

F)

View looking north from location F. Geologist at base of east-facing break-in-slope is 170 cm tall.

G)



View looking almost 180 degrees from that shown in Photograph D. Large arrows point along lineaments.

DRAFT

FUGRO Date 10/18/13	STATE OF ALASKA ALASKA ENERGY AUTHORITY ALASKA ENERGY AUTHORITY	SUSITNA-WATANA HYDROELECTRIC PROJECT LINEAMENT GROUP 9 PHOTOGRAPHS	FIGURE A9-2.3

H)

View looking south from location I across area within WCC's segment 3. Note the lack of expression of any lineaments in the broad depression.

I)

Exposures of widespread granodiorite in unnamed creek near GPS waypoint 176 in terrain mapped as flysch (map unit KJs) by Wilson et al. (2009). The geologist is approximately 175 cm tall.

J)

View looking northeast at right wall of linear v-shaped canyon. Large arrows point along apparent bedrock type contrast.

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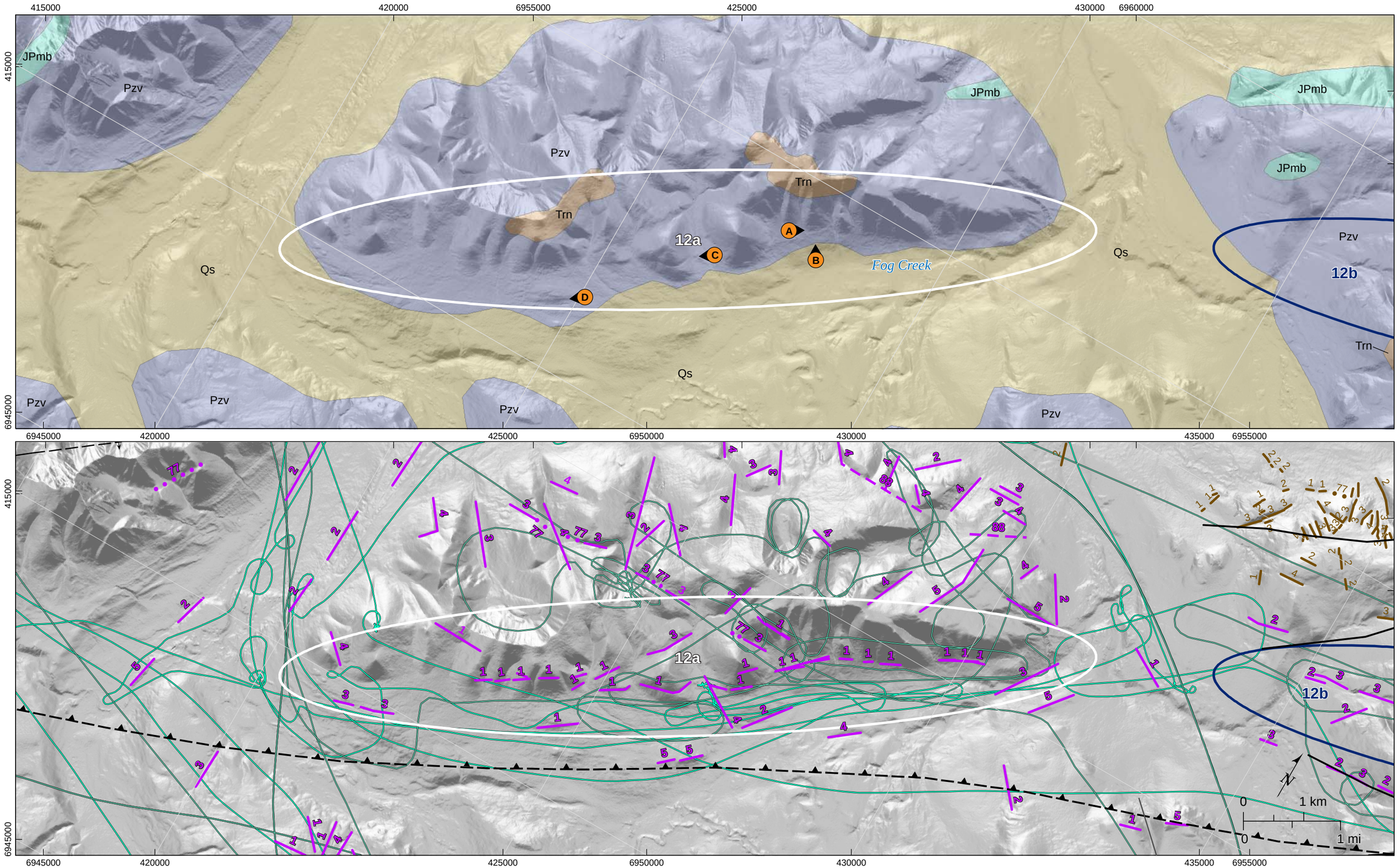
TUGRO Date 10/18/13	STATE OF ALASKA ALASKA ENERGY AUTHORITY ALASKA ENERGY AUTHORITY	SUSITNA-WATANA HYDROELECTRIC PROJECT LINEAMENT GROUP 9 PHOTOGRAPHS	FIGURE A9-2.4



Notes: 1. See Figures A0.2, A0.3, A0.4, and A0.5 for explanation.
2. Data frame has been rotated 30° east of north.
3. Geologic map by Wilson et al., 2009.

DRAFT

FUGRO Date 10/18/13	STATE OF ALASKA ALASKA ENERGY AUTHORITY ALASKA ENERGY AUTHORITY	SUSITNA-WATANA HYDROELECTRIC PROJECT LINEAMENT GROUP 12a MAP DATA	FIGURE A12a.1

79_218900_Alaska_Railbelt/2189_Lineament Report October 2013, modified 10.18.13

A)

View looking northeasterly along lineaments. Arrows point along trend and position of lineaments.

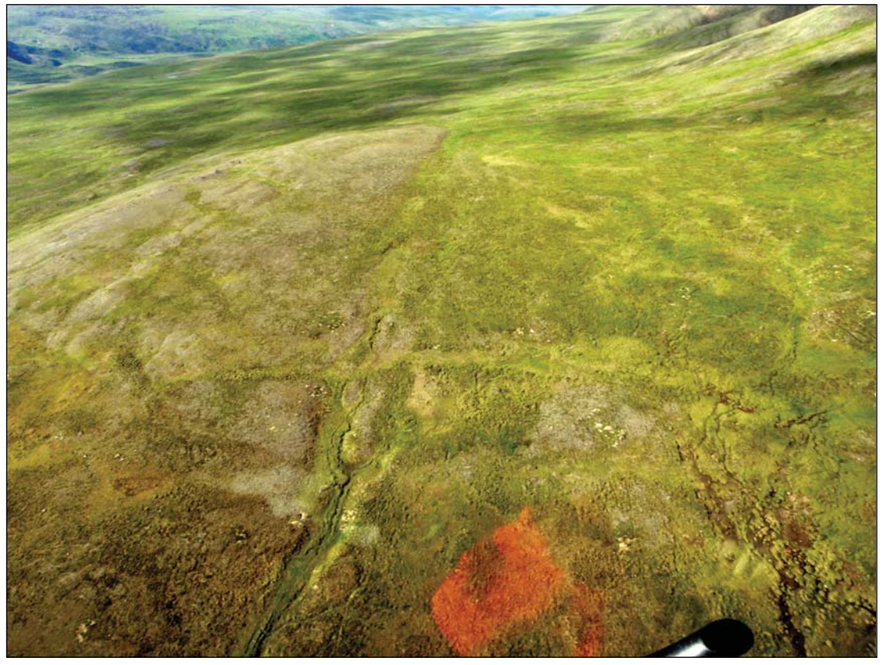
B)

View of lineaments expressed in Quaternary sediment.

C)

View looking at notch in bedrock with expression of apparent northwesterly dip.

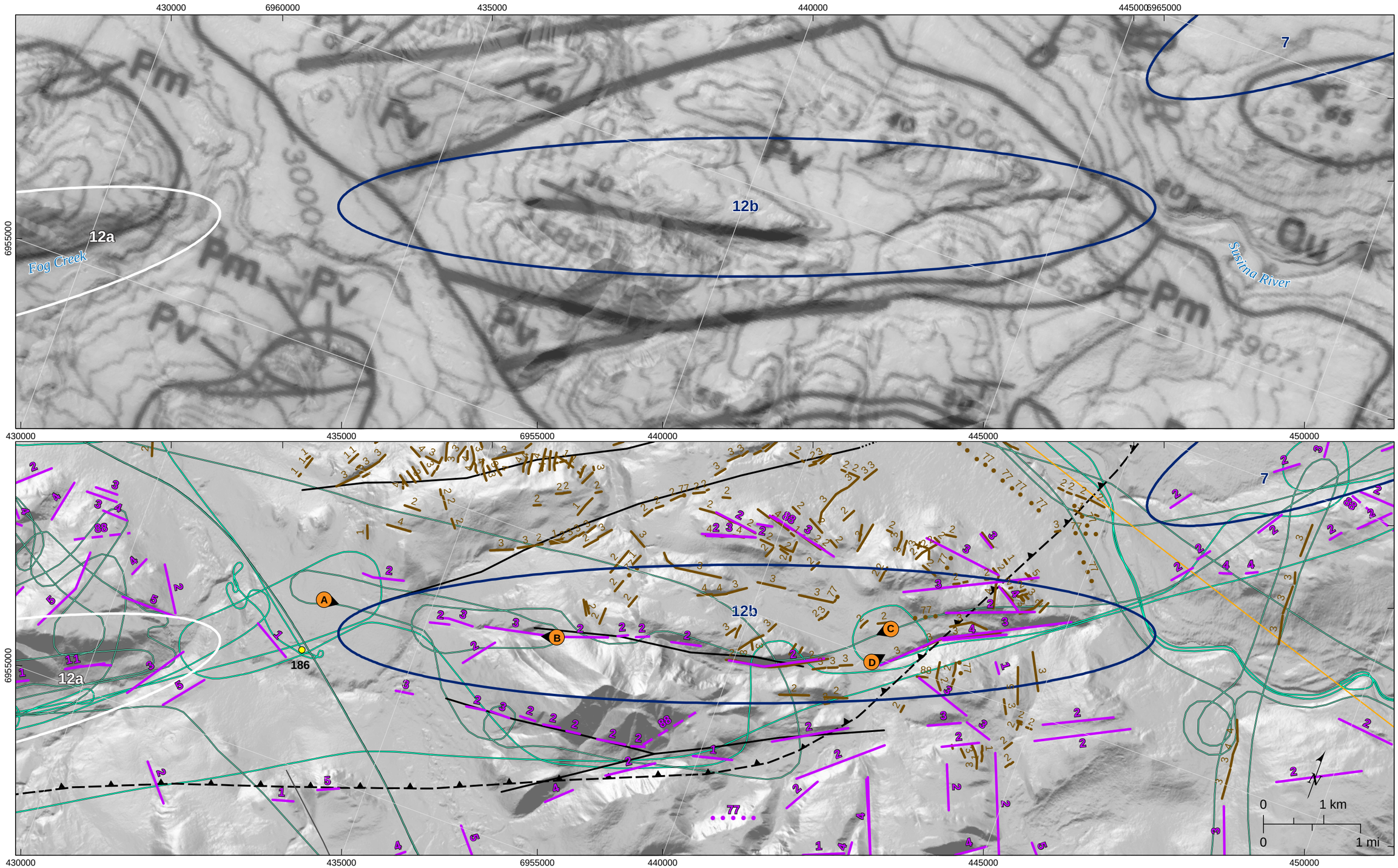
D)



View looking southwesterly along glacially scoured surface.

DRAFT

FUGRO Date 10/18/13	STATE OF ALASKA ALASKA ENERGY AUTHORITY ALASKA ENERGY AUTHORITY	SUSITNA-WATANA HYDROELECTRIC PROJECT LINEAMENT GROUP 12A PHOTOGRAPHS	FIGURE A12a.2



Notes: 1. See Figures A0.2, A0.3, A0.4, and A0.5 for explanation.
2. Data frame has been rotated 20° east of north.
3. Geologic map by Clautice et al., 2009.

DRAFT

FUGRO Date 10/18/13	STATE OF ALASKA ALASKA ENERGY AUTHORITY ALASKA ENERGY AUTHORITY	SUSITNA-WATANA HYDROELECTRIC PROJECT LINEAMENT GROUP 12b MAP DATA	FIGURE A12b.1

79_218900_Alaska_Railbelt/2189_Lineament Report October 2013, modified 10.18.13

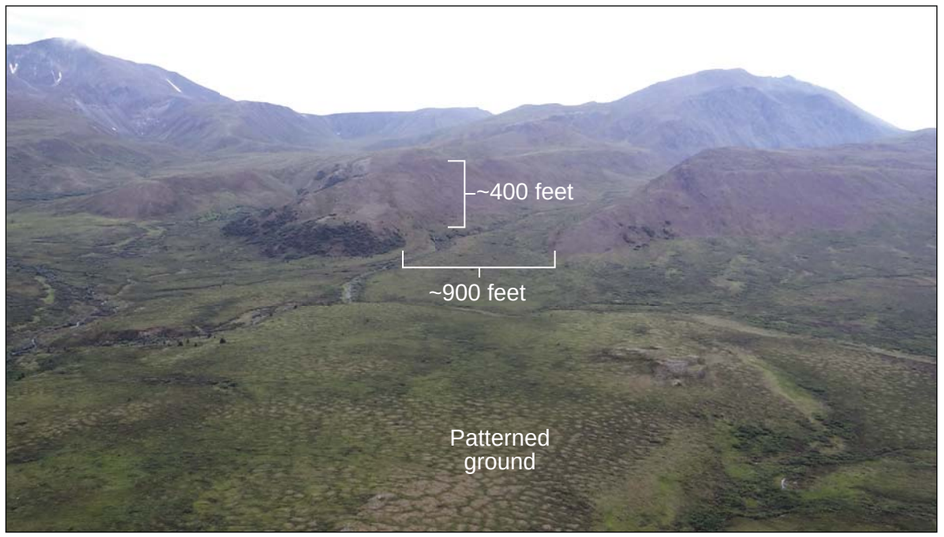
A)

View looking northeast at erosional break-in-slope mapped as an individual lineament. Feature is absent in the background along projection of strike.

B)

View looking southwest down-valley along lineament geomorphically expressed as linear valley. Very little alluvium has accumulated in the drainage, and glacially sculpted bedrock is shallow.

C)



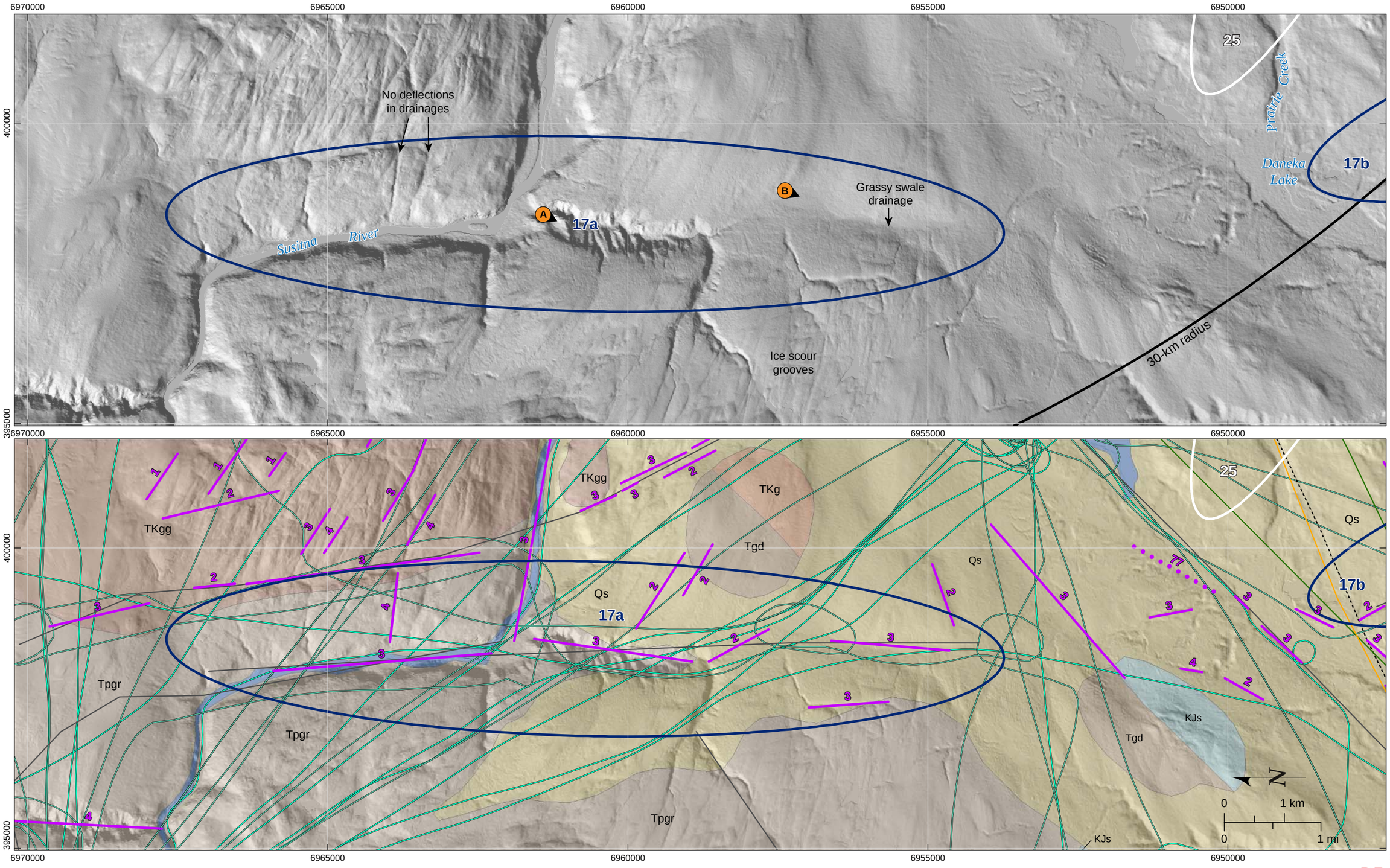
View southerly up-valley into glacial valley along lineaments geomorphically expressed as linear valley and drainage. Underfit creek in deep linear valley suggests landform created by sub-ice channel meltwater.

D)

View northerly down-valley along lineaments geomorphically expressed as linear drainage. Thin cover of unconsolidated surficial sediment mantles the Paleozoic rocks.

DRAFT

FUGRO Date 10/18/13	STATE OF ALASKA ALASKA ENERGY AUTHORITY ALASKA ENERGY AUTHORITY	SUSITNA-WATANA HYDROELECTRIC PROJECT LINEAMENT GROUP 12b PHOTOGRAPHS	FIGURE A12b.2



Notes: 1. See Figures A0.2, A0.3, A0.4, and A0.5 for explanation.
2. Data frame has been rotated 90° west of north.
3. Geology by Wilson et al., 2009.

DRAFT

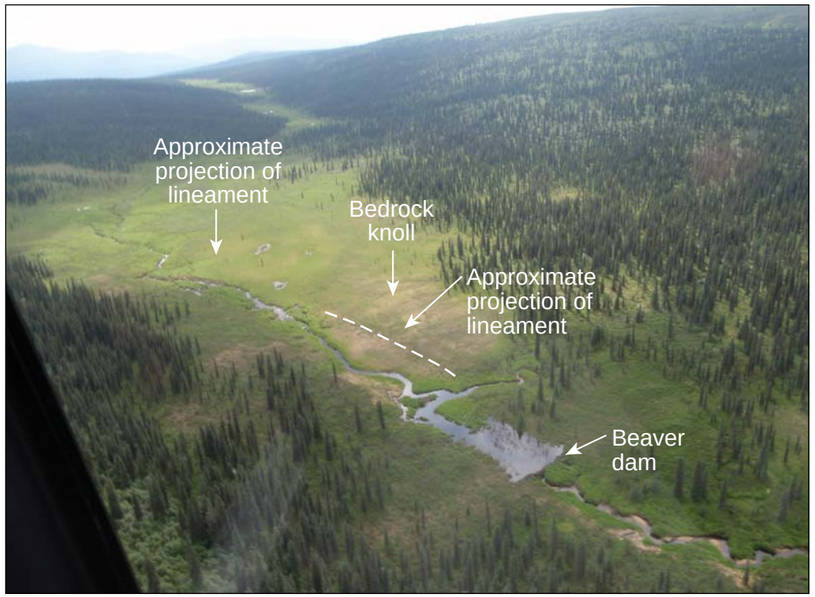
FUGRO Date 10/18/13	STATE OF ALASKA ALASKA ENERGY AUTHORITY ALASKA ENERGY AUTHORITY	SUSITNA-WATANA HYDROELECTRIC PROJECT LINEAMENT GROUP 17a MAP DATA	FIGURE A17a.1

79_218900_Alaska_Railbelt/2189_Lineament Report October 2013, modified 10.18.13

A)

View looking south at linear canyon that is tributary to the Susitna River. Canyon bottom and creek drainage have sinuosity not apparent at smaller scales.

B)



View looking north-northeast at creek in boggy (Holocene) drainage. Lineament is expressed as a depositional contact along the shallow bedrock knoll.

DRAFT

FUGRO Date 10/18/13	STATE OF ALASKA ALASKA ENERGY AUTHORITY ALASKA ENERGY AUTHORITY	SUSITNA-WATANA HYDROELECTRIC PROJECT LINEAMENT GROUP 17a PHOTOGRAPHS	FIGURE A17a.2

6950000 6945000 405000 6940000 6935000 6930000

6950000 6945000 6940000 6935000 400000 6930000

25

30-km radius

Prairie Creek

Daneka Lake

17b

A B C D

Qls

Talkeetna River

3 km

Apparent map drafting error. No evidence was found to support faulting of river alluvium.

Pzv Tvu Qg Ti Tem Tfv Qs JPmb TKgd TrPavs KJs

015

0 1 km

0 1 mi

405000 400000 6950000

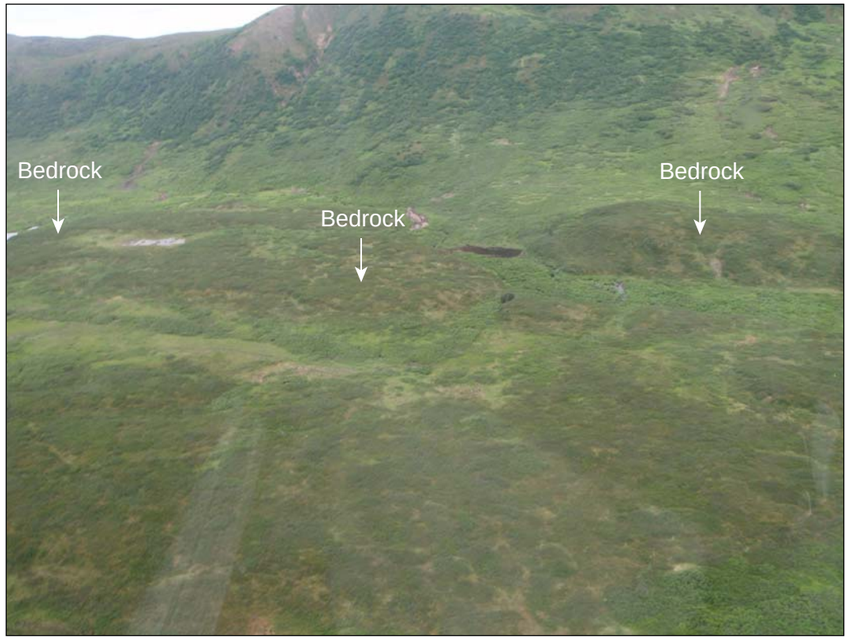
Notes: 1. See Figures A0.2, A0.3, A0.4, and A0.5 for explanation.
2. Data frame has been rotated 75° west of north.
3. Geology by Csejtey (1974), Talkeetna Mountains, Figure 4 (top) and Wilson et al., 2009 (bottom).

DRAFT

FUGRO Date 10/18/13	STATE OF ALASKA ALASKA ENERGY AUTHORITY ALASKA ENERGY AUTHORITY	SUSITNA-WATANA HYDROELECTRIC PROJECT LINEAMENT GROUP 17b MAP DATA	FIGURE A17b.1

79_218900_Alaska_Railbelt\2189_Lineament Report October 2013, modified 10.18.13

A)

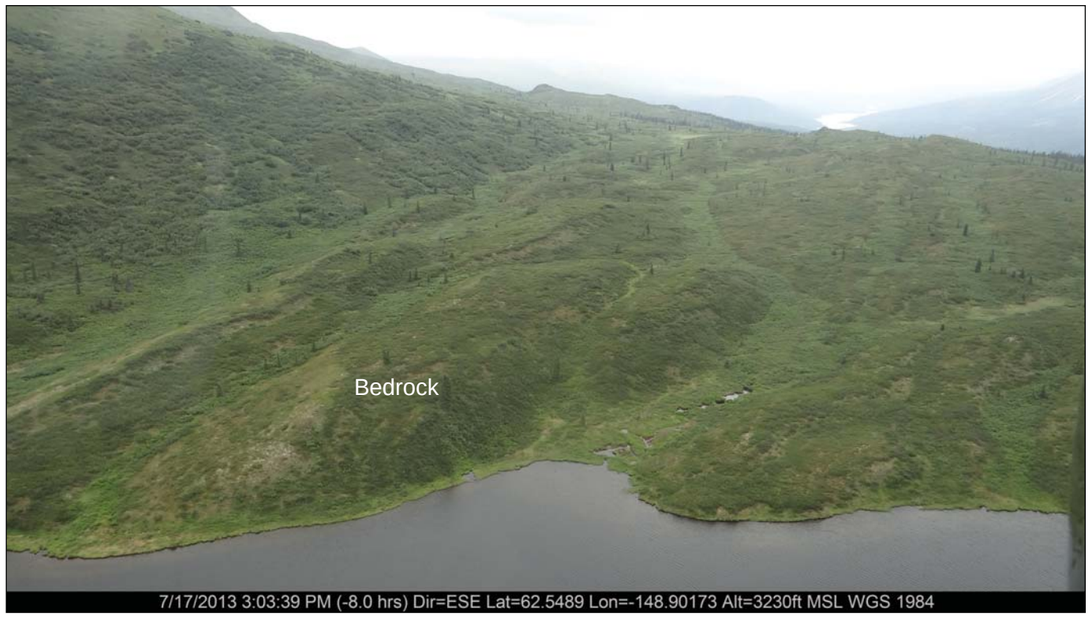


View looking westerly at break-in-slope at base of hillside and undulating glacially-eroded bedrock knobs in foreground.

B)

View looking south southwest at lake margin of glacial valley. Lineament was mapped at base of slope, and is not expressed as a scarp-type feature. Apparent colluvium along projection of lineament does not appear offset.

C)

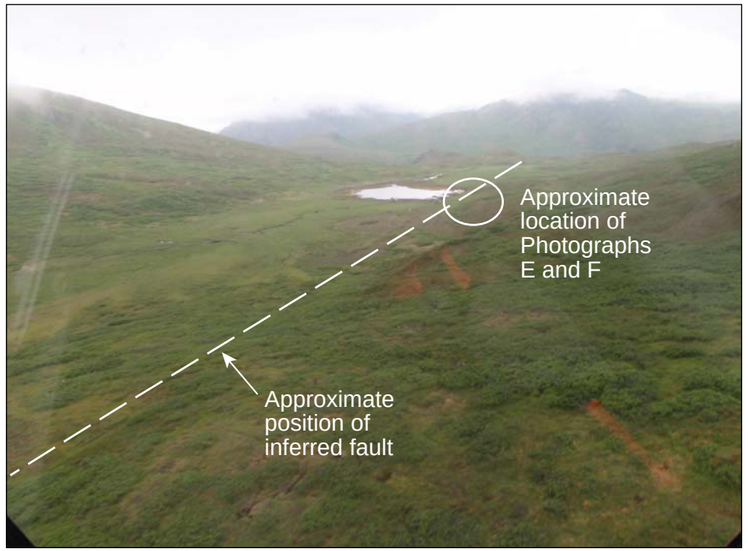


View looking south southeast along glacially-sculpted terrain along which Csejtey (1974) has inferred a fault within the glacial sediment that mantles the bedrock knolls (Figure A17b.1).

DRAFT

FUGRO Date 10/18/13	STATE OF ALASKA ALASKA ENERGY AUTHORITY ALASKA ENERGY AUTHORITY	SUSITNA-WATANA HYDROELECTRIC PROJECT LINEAMENT GROUP 17b PHOTOGRAPHS	FIGURE A17b.2

D)

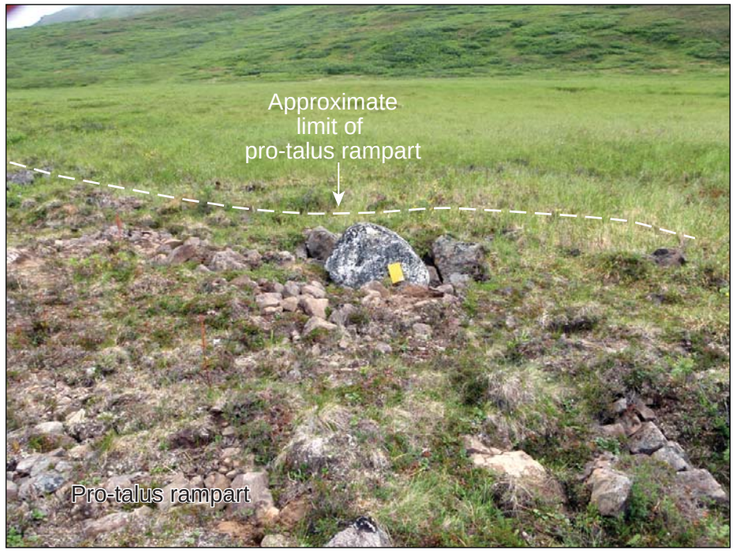


View looking south along southern extent of group 17b, along which an inferred bedrock fault is mapped by Wilson (2009). Photographs B and C are adjacent to lake.

E)

View looking south at pro-talus rampart and GPS waypoint 15. Note lateral distance between base of slope to crest of rampart. Geologist for scale is about 180 cm tall.

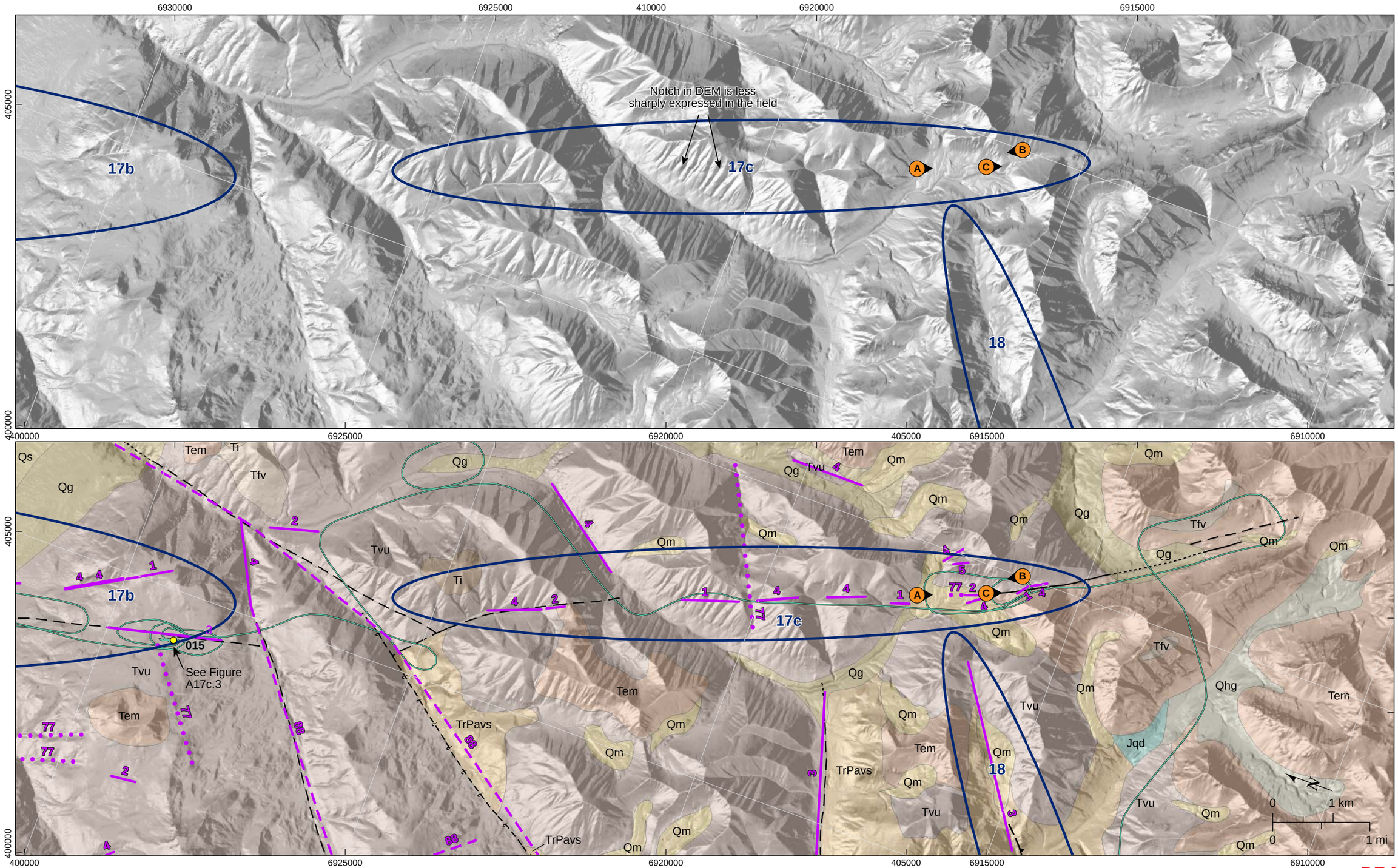
F)



Pro-talus rampart constructed from blocky, frost-shattered volcanic rocks. Photograph is centered on more sub-rounded glacial erratic (granitic) that is not similar to any of the local hillside lithologies. Field notebook is 19 cm tall.

DRAFT

FUGRO Date 10/18/13	STATE OF ALASKA ALASKA ENERGY AUTHORITY ALASKA ENERGY AUTHORITY	SUSITNA-WATANA HYDROELECTRIC PROJECT LINEAMENT GROUP 17b PHOTOGRAPHS	FIGURE A17b.3



Notes: 1. See Figures A0.2, A0.3, A0.4, and A0.5 for explanation.
2. Data frame has been rotated 70° west of north.
3. Geology by Wilson et al., 2009.

DRAFT

TUGRO Date 10/18/13	STATE OF ALASKA ALASKA ENERGY AUTHORITY ALASKA ENERGY AUTHORITY	SUSITNA-WATANA HYDROELECTRIC PROJECT LINEAMENT GROUP 17c MAP DATA	FIGURE A17c.1

79_218900_Alaska_Railbelt/2189_Lineament Report October 2013, modified 10.18.13

A)

View looking southeasterly at lineament expressed at erosional drainage cutting through the likely Holocene rock glacier deposit.

B)

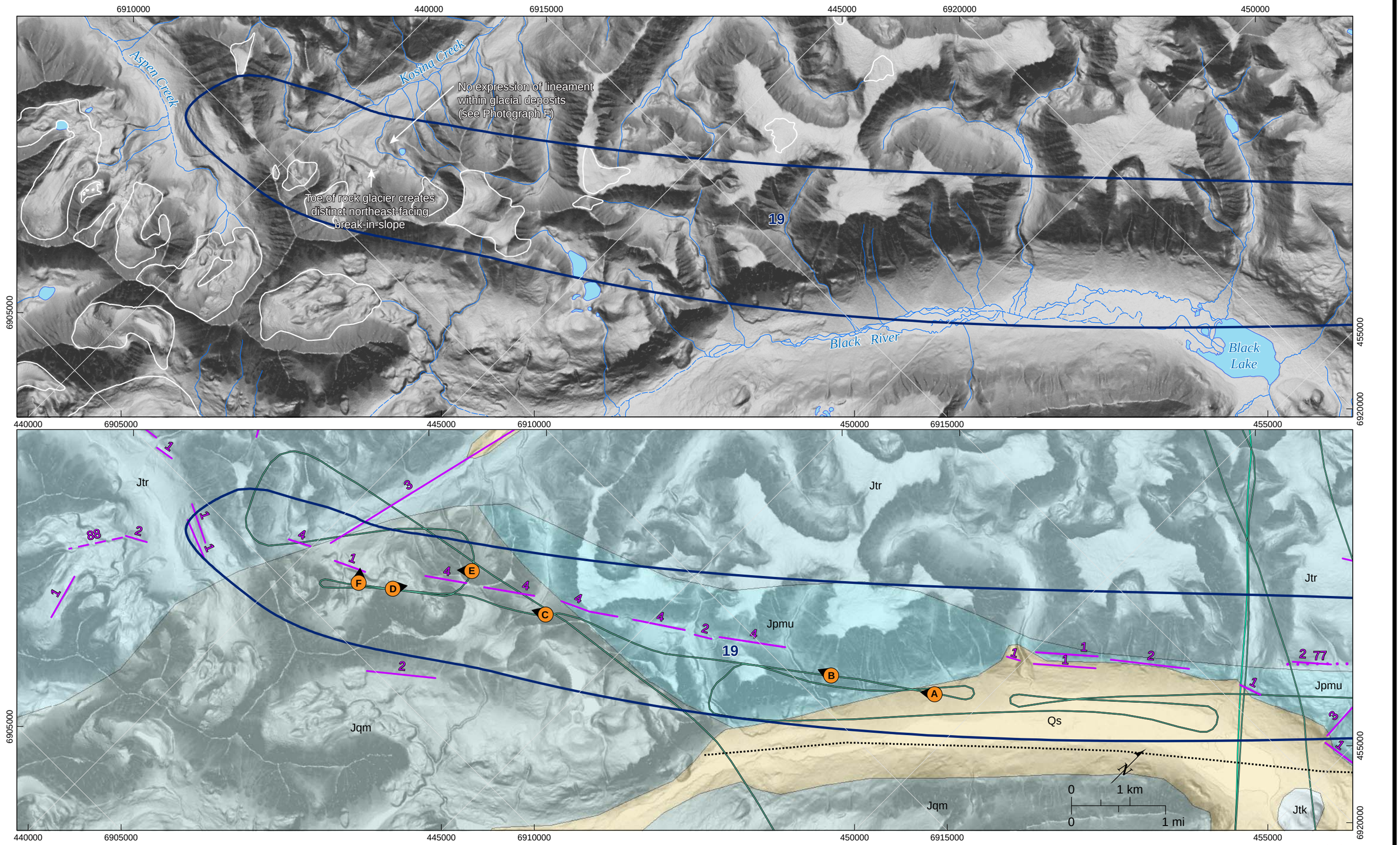
View looking northwesterly (opposite that in Photograph A) at lineament expressed as erosional drainage cutting through the likely Holocene rock glacier deposit.

C)

View looking southeasterly at lineament expressed as likely Holocene rock glacier deposit contacting the valley floor.

DRAFT

FUGRO Date 10/18/13	STATE OF ALASKA ALASKA ENERGY AUTHORITY ALASKA ENERGY AUTHORITY	SUSITNA-WATANA HYDROELECTRIC PROJECT LINEAMENT GROUP 17c PHOTOGRAPHS	FIGURE A17c.2



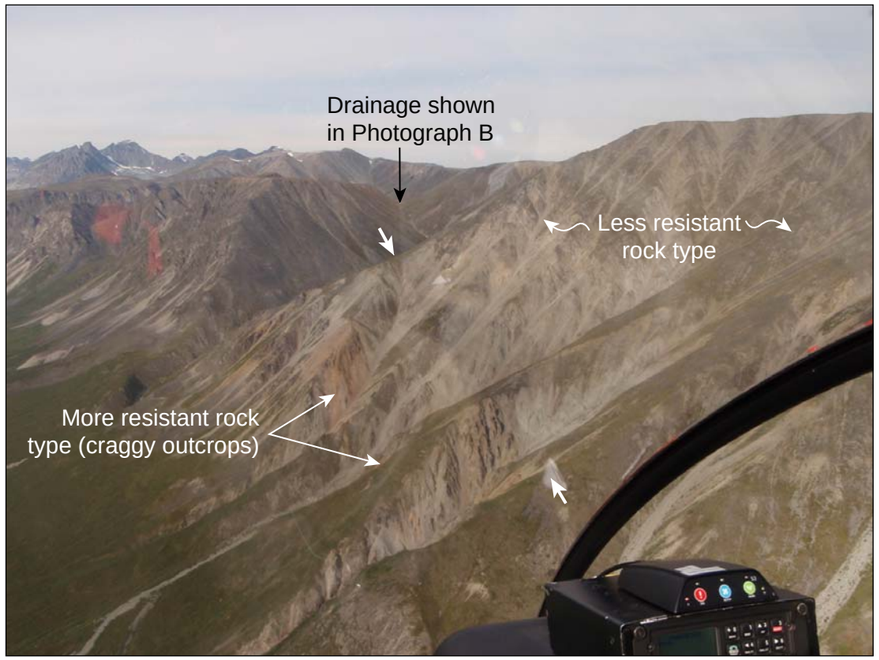
Notes: 1. See Figures A0.2, A0.3, A0.4, and A0.5 for explanation.
2. Data frame has been rotated 45° east of north.
3. Geologic map from Wilson et al., 2009.

DRAFT

FUGRO Date 10/18/13	STATE OF ALASKA ALASKA ENERGY AUTHORITY ALASKA ENERGY AUTHORITY	SUSITNA-WATANA HYDROELECTRIC PROJECT LINEAMENT GROUP 19 MAP DATA	FIGURE A19-1.1

79_218900_Alaska_Railbelt/2189_Lineament Report October 2013, modified 10.18.13

A)



Photograph taken from location A looking southwest along apparent rock type contrast (contact?) and towards mapped lineaments in steep-walled, v-shaped, linear drainage. Arrows point along apparent contact between less-resistant rock on the north and more resistant and craggy outcrops on the south.

B)

Photograph taken from location B looking west along mapped lineaments and apparent rock contact in steep-walled, v-shaped, linear drainages.

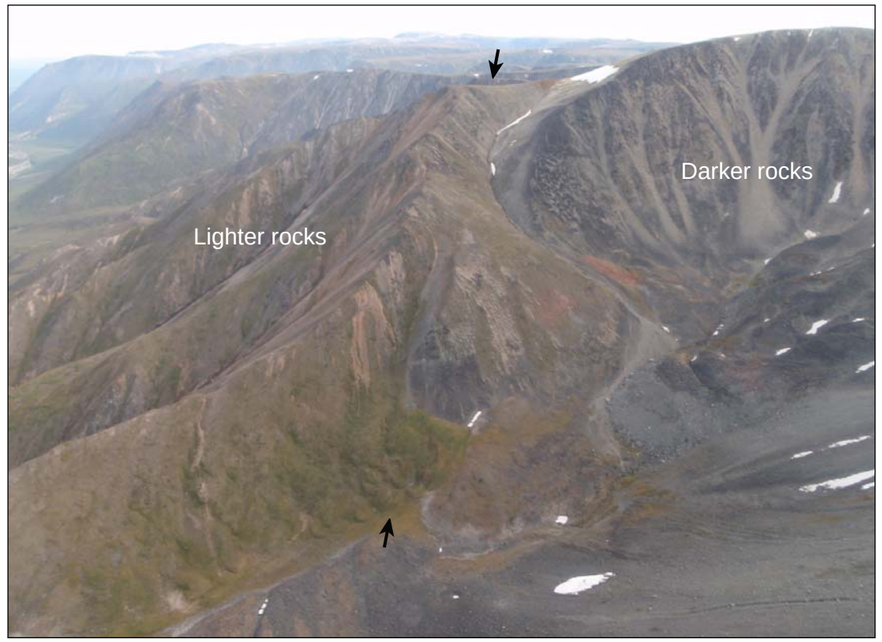
C)

Photograph taken from location C looking west at head of steep-walled, v-shaped, linear drainage where mapped lineaments correspond to apparent rock contact.

DRAFT

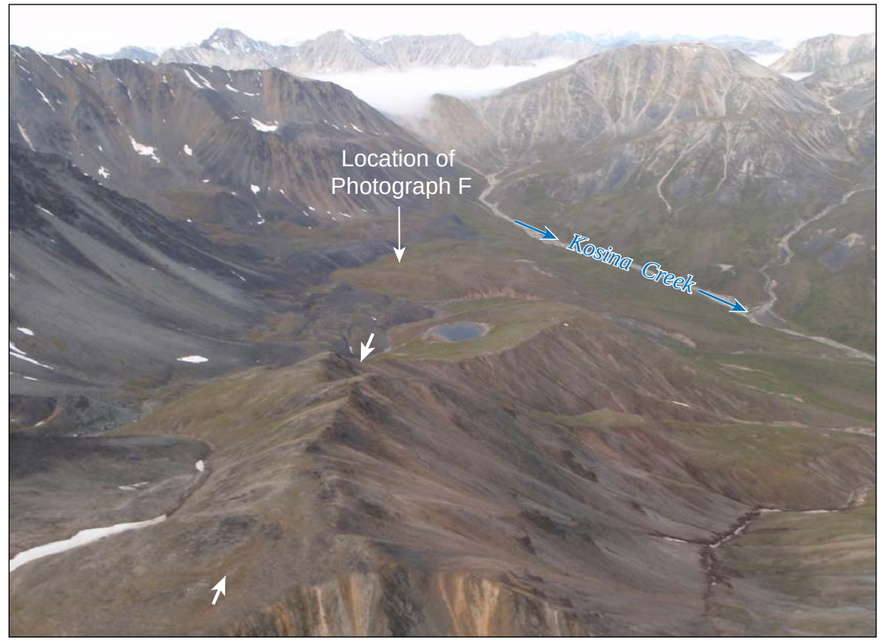
FUGRO Date 10/18/13	STATE OF ALASKA ALASKA ENERGY AUTHORITY ALASKA ENERGY AUTHORITY	SUSITNA-WATANA HYDROELECTRIC PROJECT LINEAMENT GROUP 19 PHOTOGRAPHS	FIGURE A19-1.2

D)



Photograph looking northeast from location D along the western continuation of the apparent rock type contrast shown in Photographs A, B, and C. Arrows point along apparent contact.

E)



Photograph from location E looking southwest down the ridgeline shown in Photograph D. View is 180 degrees from that in Photograph D. Note presence of rock glacier and glacial deposits in valley bottom. Arrows point along apparent contact.

F)

Photograph looking northwest from location F showing apparently undeformed rock glacier and/or glacial deposits along strike of the mapped lineaments and apparent rock contact shown in Photographs A through D.

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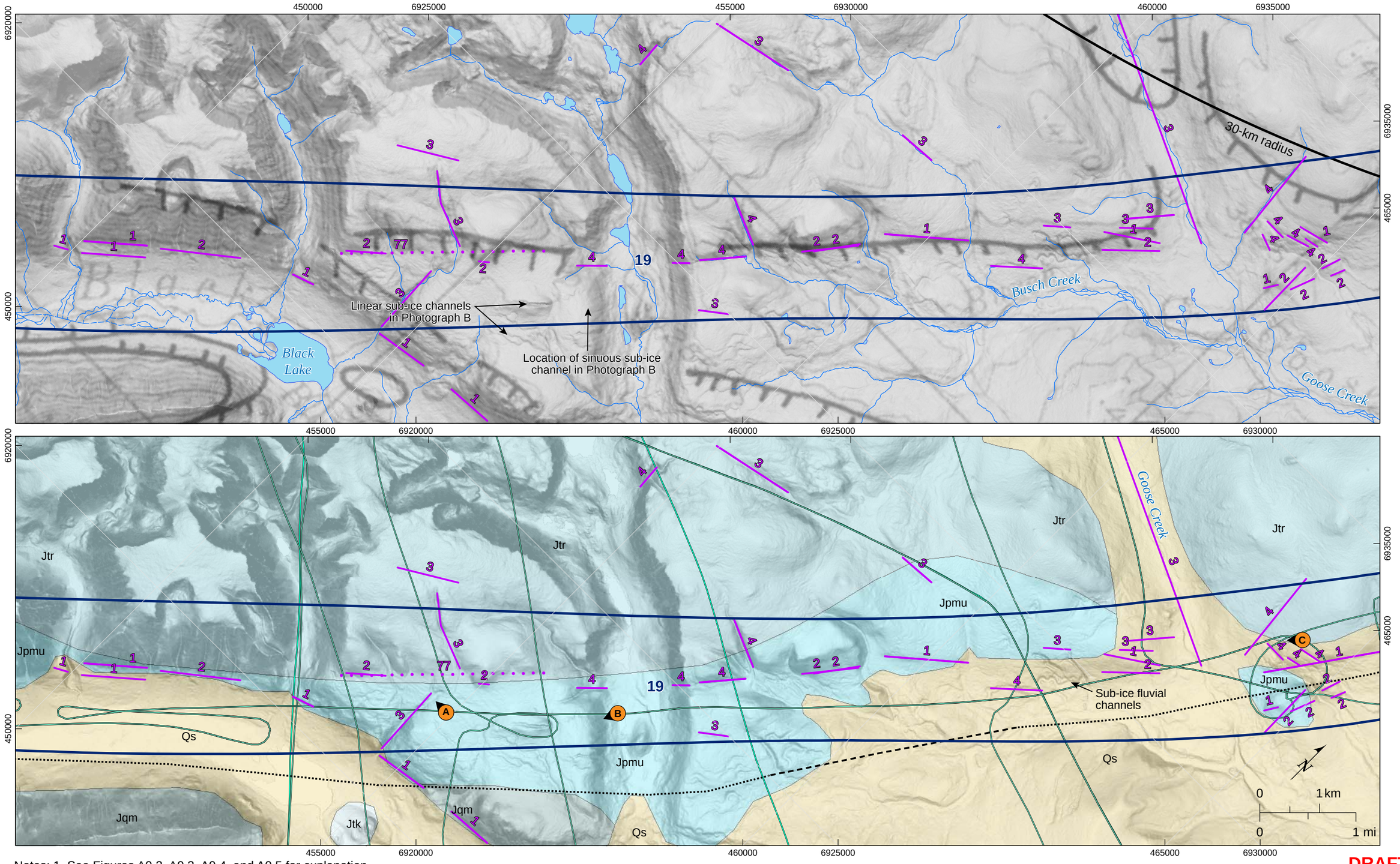
FUGRO Date 10/18/13	STATE OF ALASKA ALASKA ENERGY AUTHORITY ALASKA ENERGY AUTHORITY	SUSITNA-WATANA HYDROELECTRIC PROJECT LINEAMENT GROUP 19 PHOTOGRAPHS	FIGURE A19-1.3



Notes: 1. See Figures A0.2, A0.3, A0.4, and A0.5 for explanation.
2. Data frame has been rotated 45° east of north.
3. Geologic map in top panel by Williams and Galloway, 1986 and bottom panel by Wilson et al., 2009

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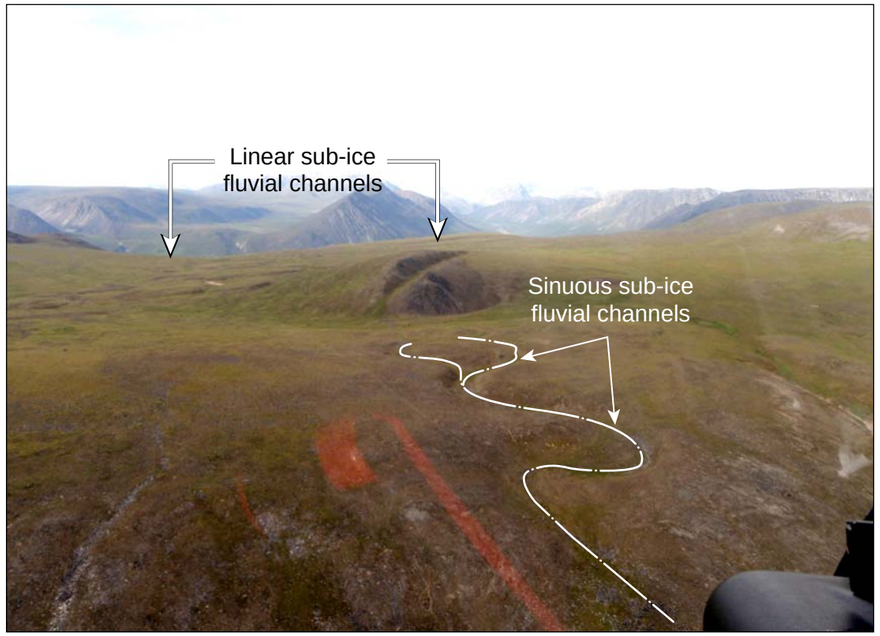
FUGRO Date 10/18/13	STATE OF ALASKA ALASKA ENERGY AUTHORITY ALASKA ENERGY AUTHORITY	SUSITNA-WATANA HYDROELECTRIC PROJECT LINEAMENT GROUP 19 MAP DATA	FIGURE A19-2.1

79_218900_Alaska_Railbelt/2189_Lineament Report October 2013, modified 10.18.13

A)

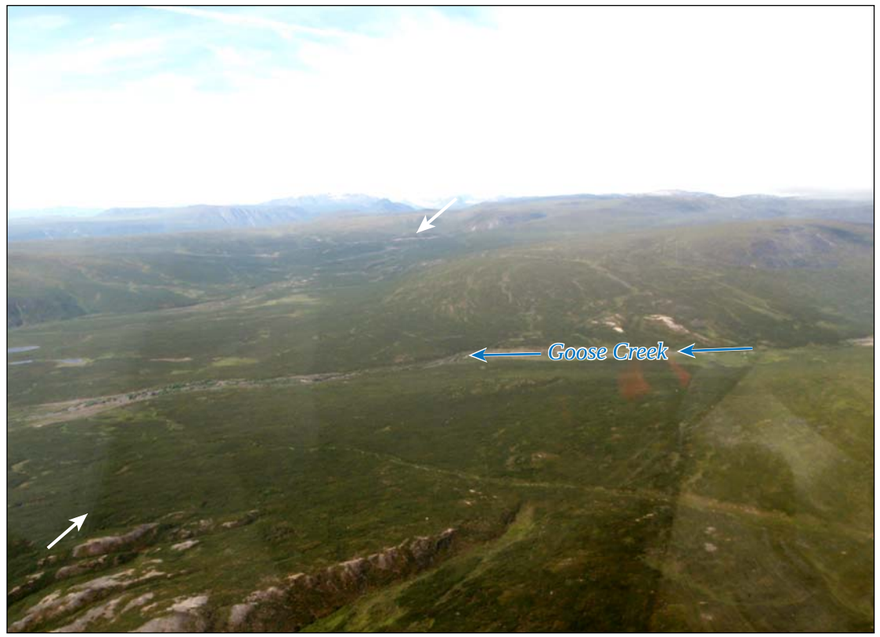
Photograph taken from location A looking west. Arrows point along trend of mapped lineaments along southwest-facing aligned break-in-slope. Note the rounded and subdued nature of break-in-slope. Relief across break-in-slope is ~125 m.

B)



Photograph looking southwest from location B. The sinuous sub-ice channels are not large enough features to be seen on INSAR data.

C)



Overview photograph looking southwest from location C along alignment of mapped lineaments. Arrows point along trend of lineament group 19. Note absence of expression of lineaments within the landscape across the Goose Creek portion of the lineament group.

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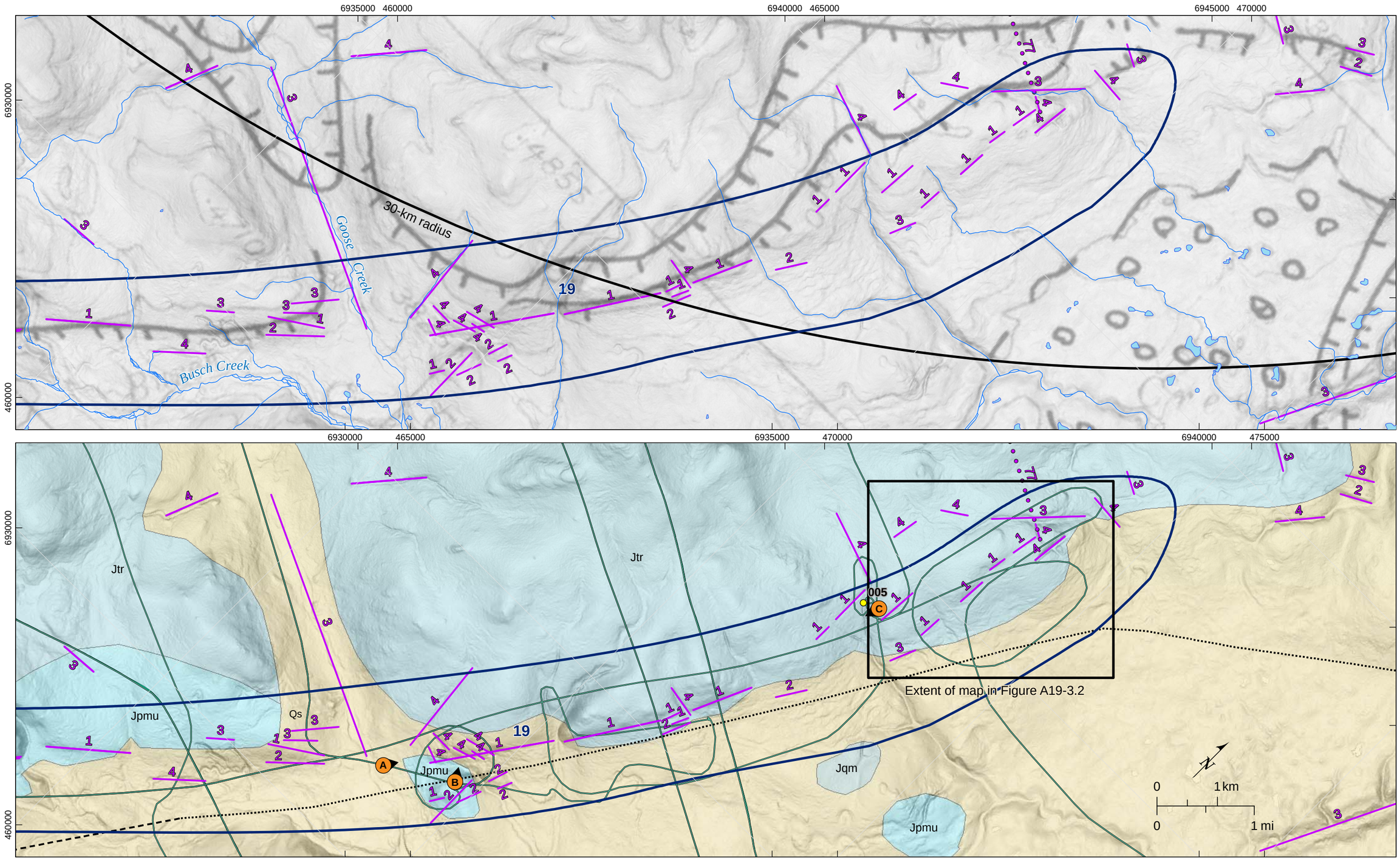
FUGRO Date 10/18/13	STATE OF ALASKA ALASKA ENERGY AUTHORITY ALASKA ENERGY AUTHORITY	SUSITNA-WATANA HYDROELECTRIC PROJECT LINEAMENT GROUP 19 PHOTOGRAPHS	FIGURE A19-2.2



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Notes: 1. See Figures A0.2, A0.3, A0.4, and A0.5 for explanation.
2. Data frame has been rotated 45° east of north.
3. Geologic map in top panel by Williams and Galloway, 1986 and bottom panel by Wilson et al., 2009

FUGRO Date 10/18/13	STATE OF ALASKA ALASKA ENERGY AUTHORITY ALASKA ENERGY AUTHORITY	SUSITNA-WATANA HYDROELECTRIC PROJECT LINEAMENT GROUP 19 MAP DATA	FIGURE A19-3.1

79_218900_Alaska_Railbelt/2189_Lineament Report October 2013, modified 10.18.13

A)

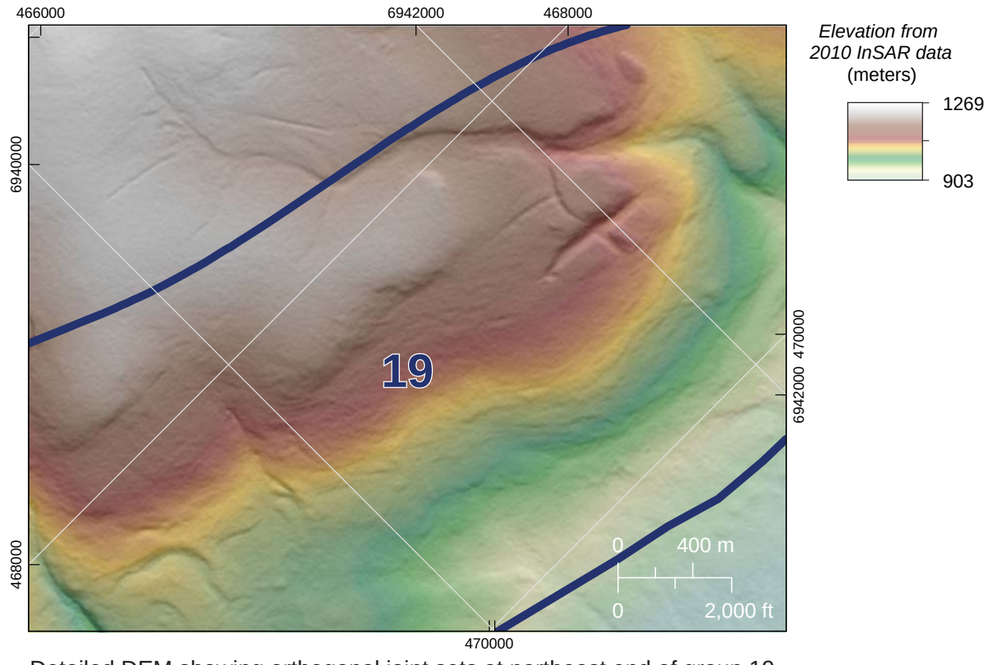
Photograph looking north-northeast from location A along the east-facing break-in-slope that defines the northeast portion of LG 19. Arrows point along alignment of mapped lineaments.

B)

Photograph looking northwest from location B at sub-ice fluvially-eroded channels. Arrows point along the trend of mapped lineaments that make up group 19.

C)

Photograph looking south-southwest from location C at widely spaced, near vertical, well-developed joints in trondhjemite (aka tonalite) bedrock. Joint spacing is 1 to 1.5 meters. Predominant orientations of joints are 042/80SE, 012/85SE, and 082/85SE but other orientations exist. Joint faces have clean surfaces with relief of minerals of 1 to 3 mm. No gouge or mineralization observed on joint surfaces, nor any sense of movement indicators (striae or mullions).



Detailed DEM showing orthogonal joint sets at northeast end of group 19.

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FUGRO Date 10/18/13	STATE OF ALASKA ALASKA ENERGY AUTHORITY ALASKA ENERGY AUTHORITY	SUSITNA-WATANA HYDROELECTRIC PROJECT LINEAMENT GROUP 19 PHOTOGRAPHS	FIGURE A19-3.2

Apparent rock type contrasts

Location of granitic glacial erratic

Glacial lake sediments

Tyone Creek

20

A B C D E F G H I

001 002 018 019 020 021

6895000 480000 6900000 485000 6905000 490000 6910000 495000

6890000 485000 6895000 490000 6900000 495000 6905000

0 1 km

0 1 mi

Notes: 1. See Figures A0.2, A0.3, A0.4, and A0.5 for explanation.
2. Data frame has been rotated 45° east of north.
3. Geologic map from Grantz, 1960.

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FUGRO Date 10/18/13	STATE OF ALASKA ALASKA ENERGY AUTHORITY ALASKA ENERGY AUTHORITY	SUSITNA-WATANA HYDROELECTRIC PROJECT LINEAMENT GROUP 20 MAP DATA	FIGURE A20.1

79_218900_Alaska_Railbelt\2189_Lineament Report October 2013, modified 10.18.13

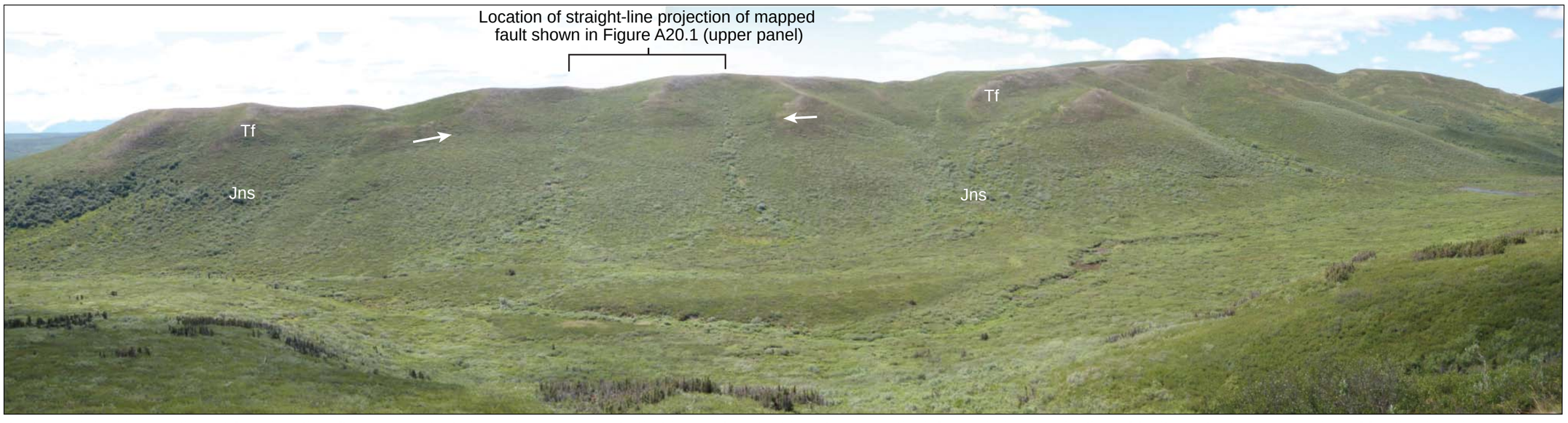
A)

Photograph looking northeast from location A.

B)

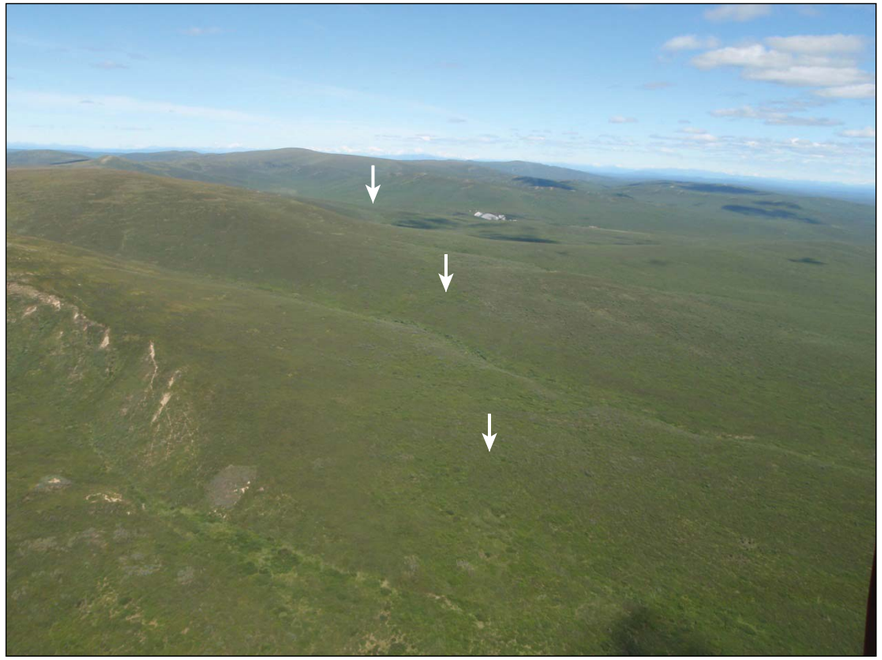
Photograph looking west-southwest from location B. Geologist standing in 3- to 6-m deep- and ~30-m-wide swale. Swale only exists in saddle; it does not continue down either side of saddle.

C)



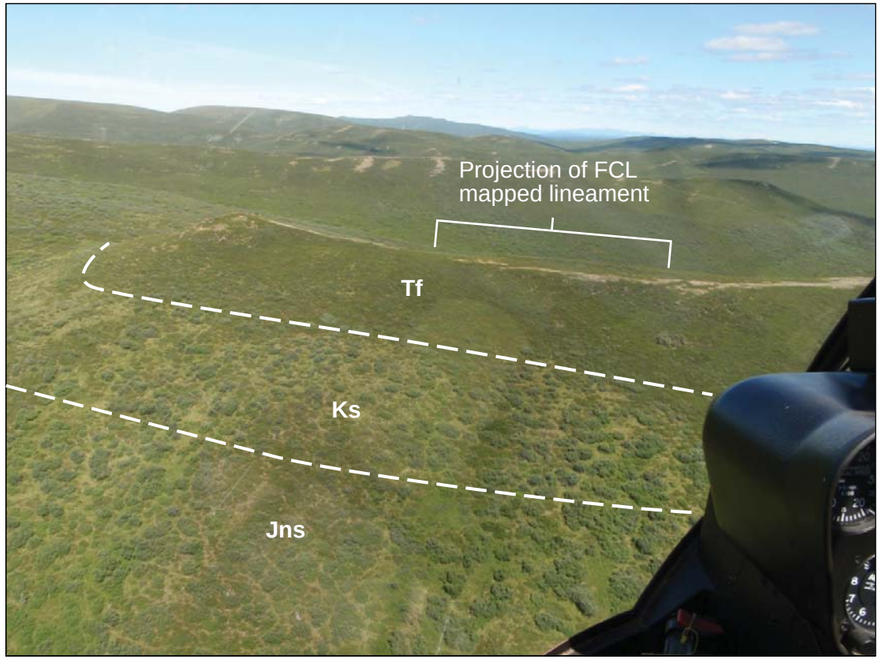
Photograph looking southwest from location C. Basal contact shown by arrows. Note that base of contact is not apparently deformed along projection of fault and that no expression of faulting in valley bottom is apparent.

G)



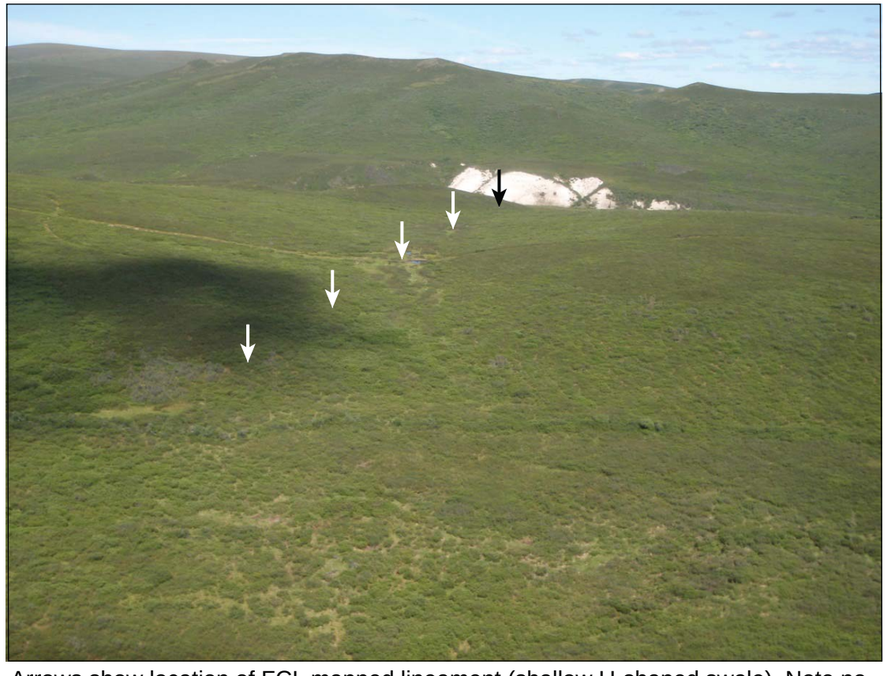
Photograph looking north from location G along mapped fault of Grantz (1960). Arrows point to approximate location of mapped fault. Note absence of apparent geomorphic expression fault.

D)



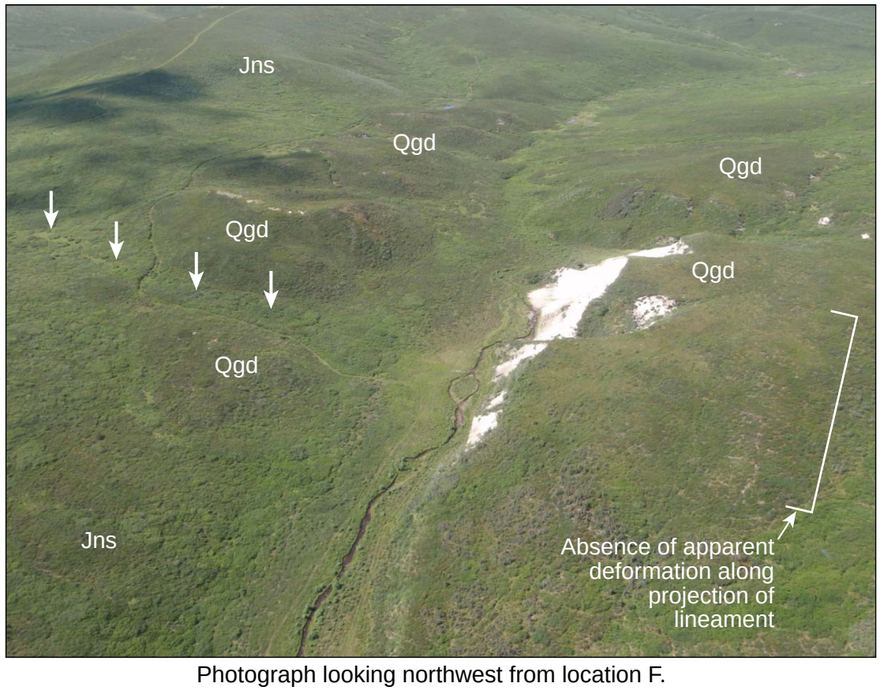
Photograph looking northeast from location D. Note absence of deformation in ridge line of Tf.

E)



Arrows show location of FCL mapped lineament (shallow U-shaped swale). Note no apparent deformation of white-bedded sediments (glacial lake sediments) along projection of lineament.

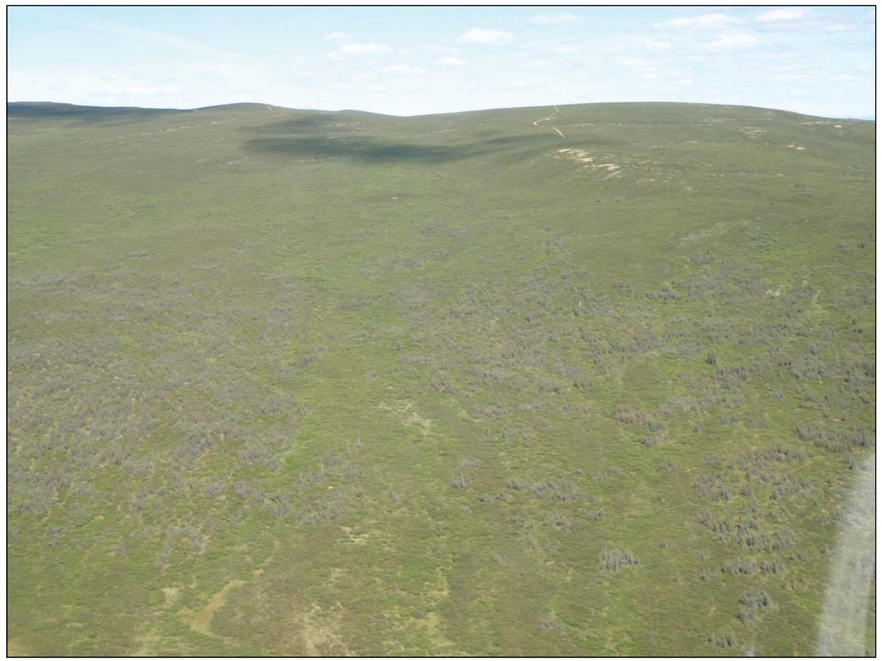
F)



Photograph looking northwest from location F.

FUGRO Date 10/18/13	STATE OF ALASKA ALASKA ENERGY AUTHORITY ALASKA ENERGY AUTHORITY	SUSITNA-WATANA HYDROELECTRIC PROJECT LINEAMENT GROUP 20 PHOTOGRAPHS	FIGURE A20.3

H)



Photograph looking north-northeast from location H along queried mapped fault of Grantz (1960) that lies outside of lineament group. Note absence of fault expression.

I)

Photograph looking north-northeast from location I along queried mapped fault of Grantz (1960) that lies outside of lineament group. Note absence of fault expression.

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FUGRO Date 10/18/13	STATE OF ALASKA ALASKA ENERGY AUTHORITY ALASKA ENERGY AUTHORITY	SUSITNA-WATANA HYDROELECTRIC PROJECT LINEAMENT GROUP 20 PHOTOGRAPHS	FIGURE A20.4

460000 470000 480000 490000 500000 510000

6910000

6900000

6890000

Crater Lake

27

Oshetna River

Big Bones Moraine

Little Oshetna River

Fourth of July Creek

Sellick Cr Spillway

spillway

Drainage divide

Daisy Cr

Yacko Creek

Granitic glacial erratic

Lineament group 20

White Sand Creek

Glacial lake sediments

Tyone Creek

Castle Mtn. extension lineament group

Little Nelchina River

Cadoceras Creek

Creek Moraine

Curtis Lake Moraine

Stagnent Little Nelchina Lobe

Little Nelchina Lobe

Nelchina

Grayling Lake

Marie Lake

Maxon Lake

Explanation

- Glacial drift mantled by glacial lake sediments from 914-975 meter lake
- AA — Location of radiocarbon sample
- Ice boundary (morainal ridge, kame terrace, delta, etc.) marking edge of glacier. Hachures toward glacier
- Linear or drumlinoid feature from ice scour. Direction of ice movement indicated by arrow
- Spillway for glacial meltwater, including that stored in large glacial lakes
- Lineament group

N

0 1km

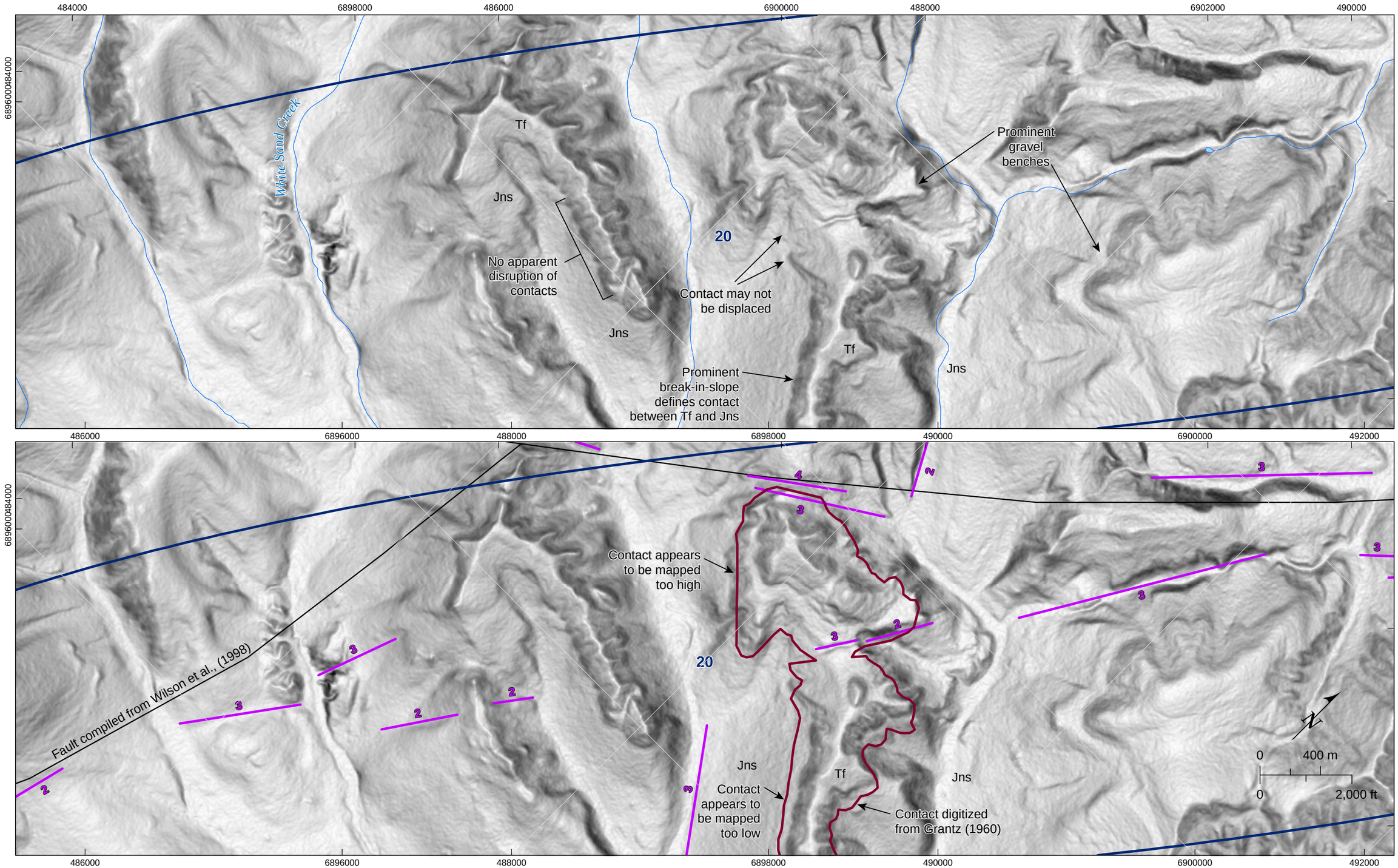
0 1 mi

Notes: 1. See Figures A0.2, A0.3, A0.4, and A0.5 for explanation.
2. Geologic map from Williams and Galloway, 1986.

DRAFT

FUGRO Date 10/18/13	STATE OF ALASKA ALASKA ENERGY AUTHORITY ALASKA ENERGY AUTHORITY	SUSITNA-WATANA HYDROELECTRIC PROJECT LINEAMENT GROUP 20 WILLIAMS AND GALLOWAY MAP (1986)	FIGURE A20.5

79_218900_Alaska_Railbelt/2189_Lineament Report October 2013, modified 10.18.13

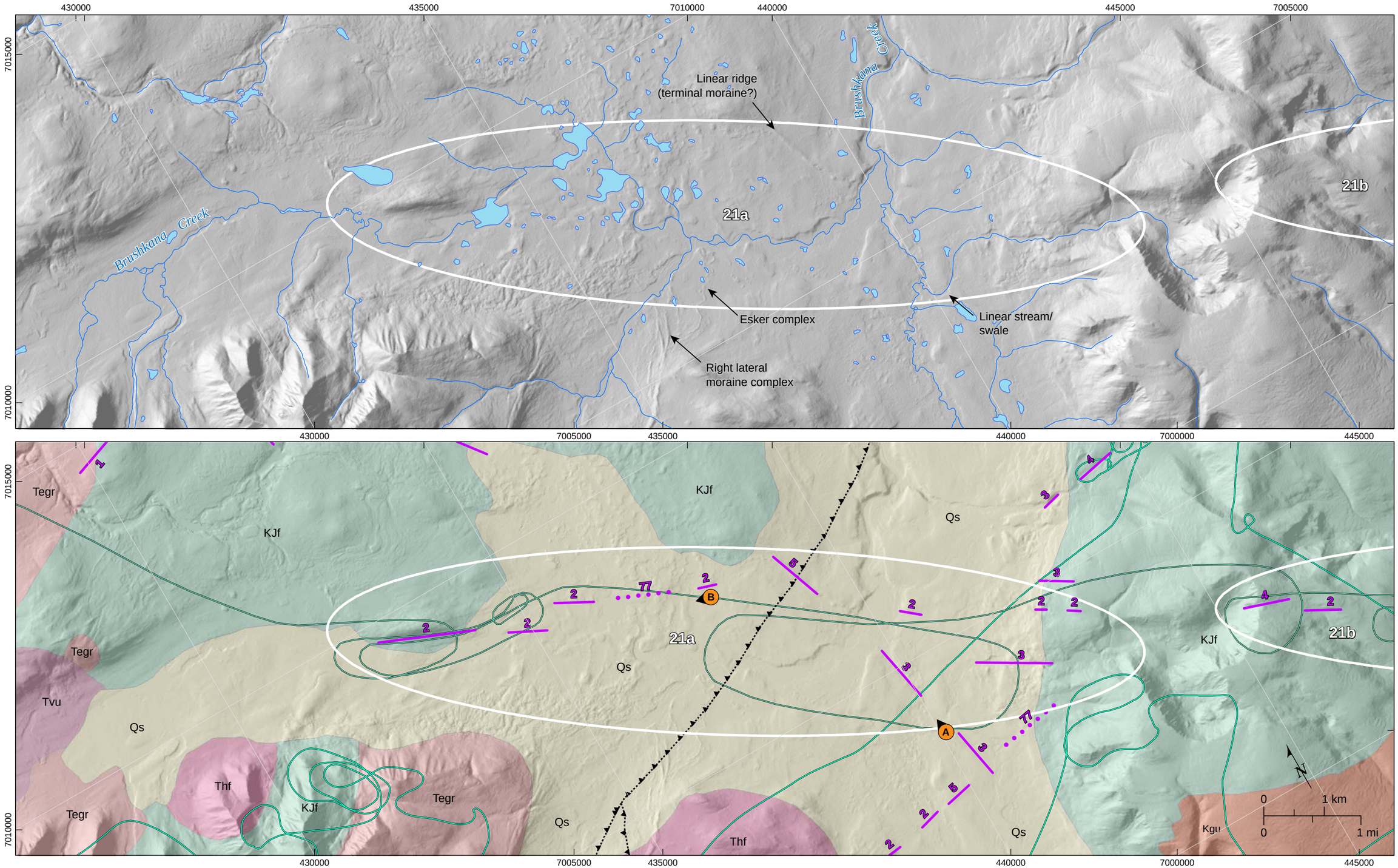


DRAFT

Notes: 1. See Figures A0.2, A0.3, A0.4, and A0.5 for explanation.
2. Data frame has been rotated 45° east of north.
3. Base map is slopeshade derived from INSAR data.

FUGRO Date 10/18/13	STATE OF ALASKA ALASKA ENERGY AUTHORITY ALASKA ENERGY AUTHORITY	SUSITNA-WATANA HYDROELECTRIC PROJECT LINEAMENT GROUP 20 MAP DATA	FIGURE A20.6

79_218900_Alaska_Railbelt/2189_Lineament Report October 2013, modified 10.18.13



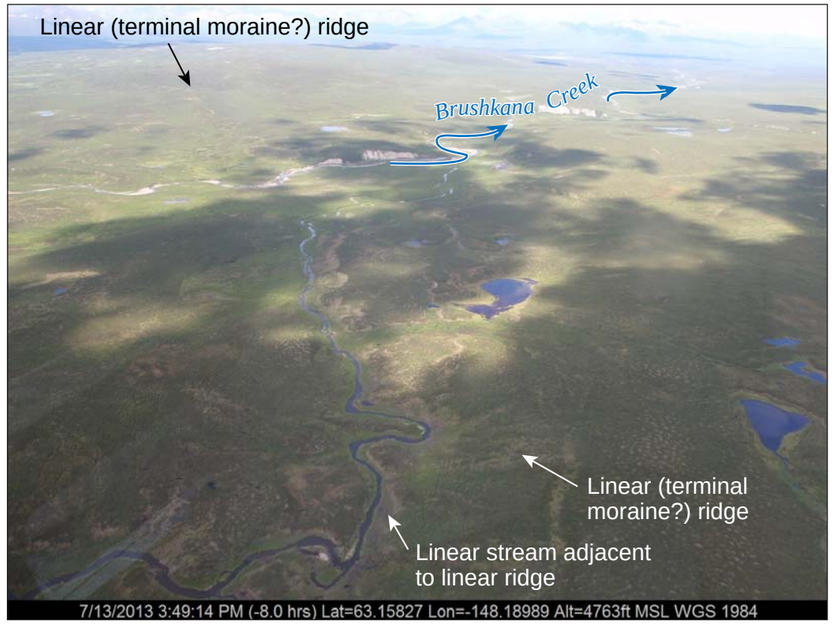
Notes: 1. See Figures A0.2, A0.3, A0.4, and A0.5 for explanation.
2. Data frame has been rotated 30° west of north.
3. Geology by Wilson et al., 1998.

DRAFT

FUGRO Date 10/18/13	STATE OF ALASKA ALASKA ENERGY AUTHORITY ALASKA ENERGY AUTHORITY	SUSITNA-WATANA HYDROELECTRIC PROJECT LINEAMENT GROUP 21a MAP DATA	FIGURE A21a.1

79_218900_Alaska_Railbelt\2189_Lineament Report October 2013, modified 10.18.13

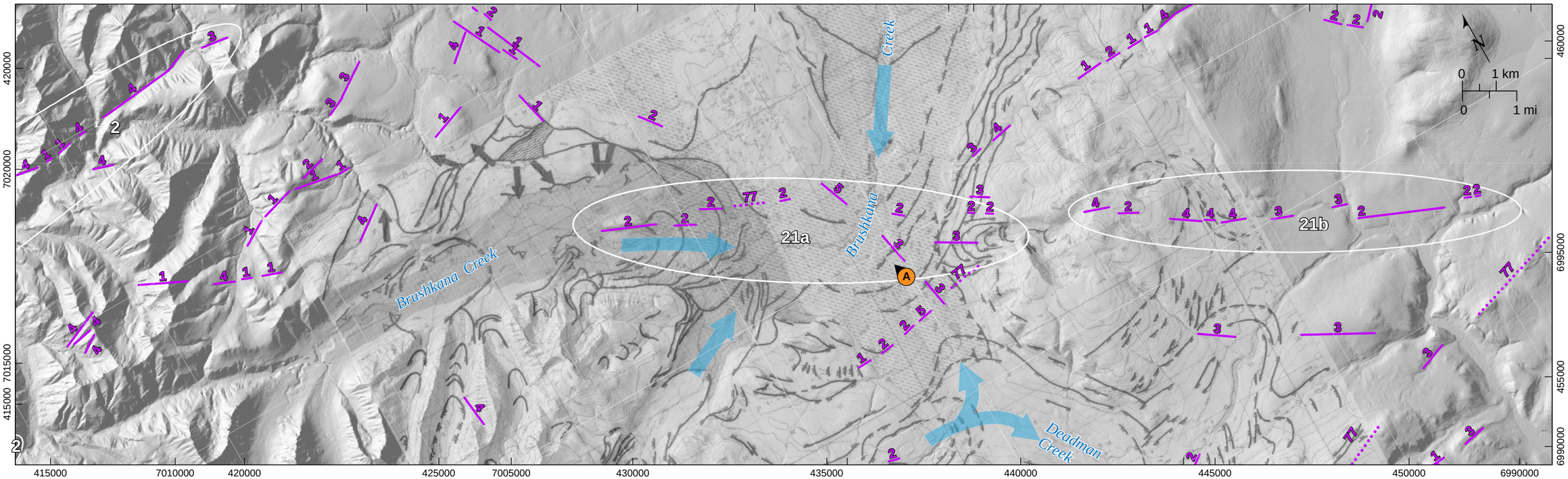
A)



View looking north across Brushkana Creek along north-trending linear ridge and roughly linear stream. Arrows point along alignment of ridges interpreted to be terminal moraine from northeasterly flowing ice.

B)

View looking northwest across western portion of lineament group 21a towards approximately 120-meter-tall rock-cored drumlin. View is looking up the Brushkana Creek valley. Note lack of obvious expression of mapped lineaments in the foreground.



Notes: 1. See Figures A0.2, A0.3, A0.4, and A0.5 for explanation.
2. Data frame has been rotated 30° west of north.
3. Photointerpretive map of glacial extents by Reger, 1990.
4. ➡ indicates ice flow direction.

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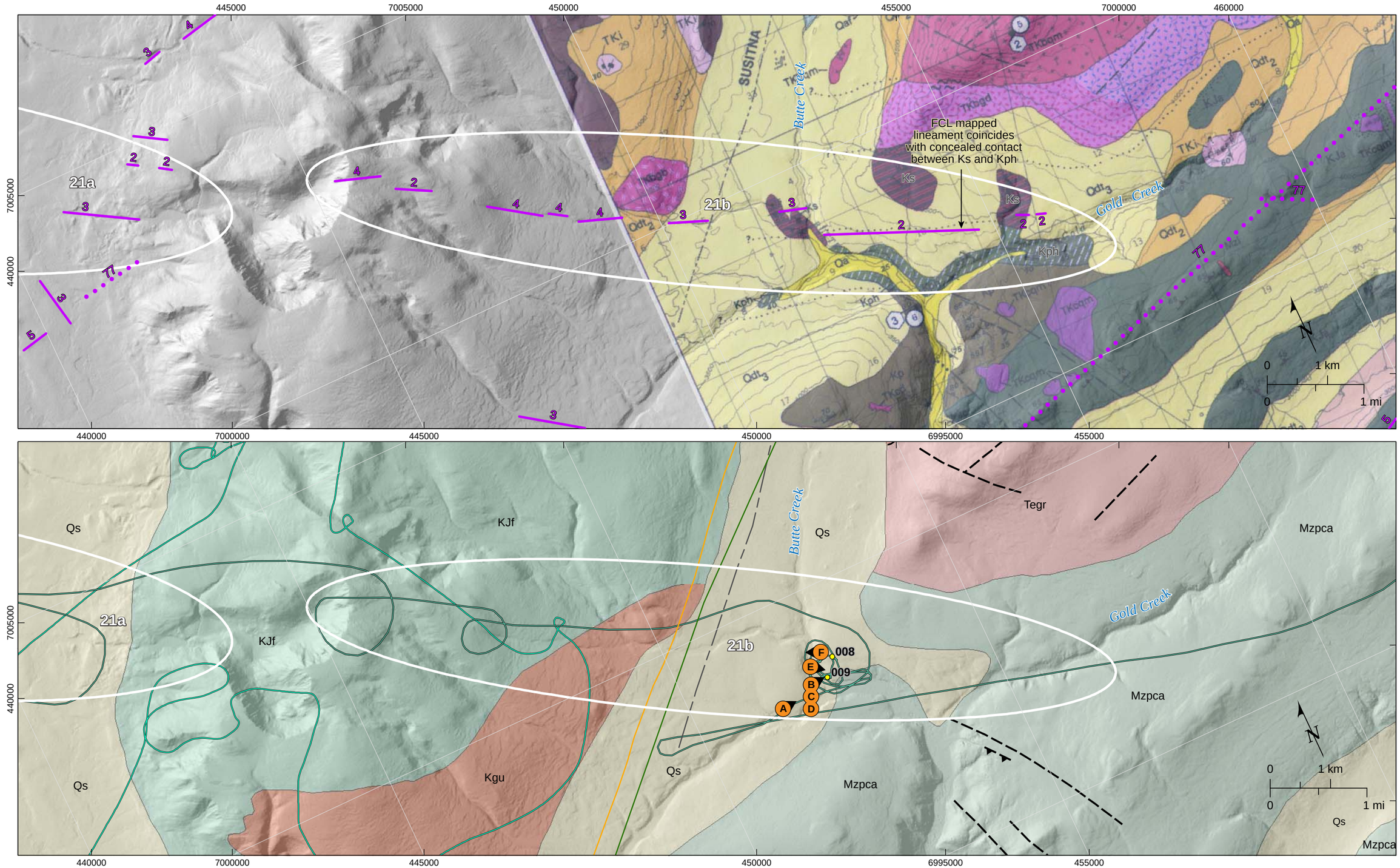
FUGRO Date 10/18/13	STATE OF ALASKA ALASKA ENERGY AUTHORITY ALASKA ENERGY AUTHORITY	SUSITNA-WATANA HYDROELECTRIC PROJECT LINEAMENT GROUP 21a MAP DATA AND PHOTOGRAPHS	FIGURE A21a.2

79_218900_Alaska_Railbelt/2189_Lineament Report October 2013, modified 10.18.13



Notes: 1. See Figures A0.2, A0.3, A0.4, and A0.5 for explanation.
2. Data frame has been rotated 25° west of north.
3. Map in top panel from Smith et al., 1988.
4. Geology in bottom panel from Wilson et al., 1998

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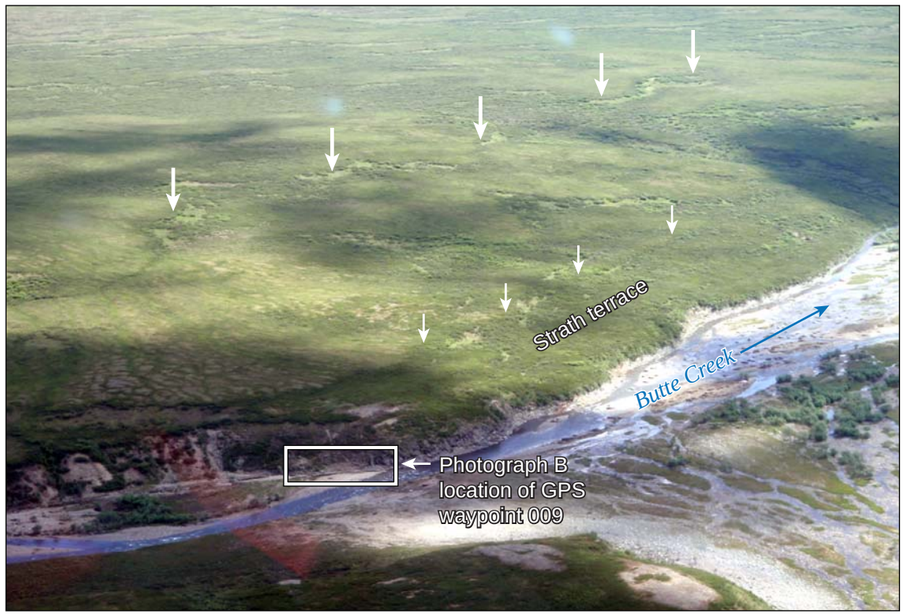
FUGRO Date 10/18/13	STATE OF ALASKA ALASKA ENERGY AUTHORITY	SUSITNA-WATANA HYDROELECTRIC PROJECT LINEAMENT GROUP 21b MAP DATA	FIGURE A21b.1

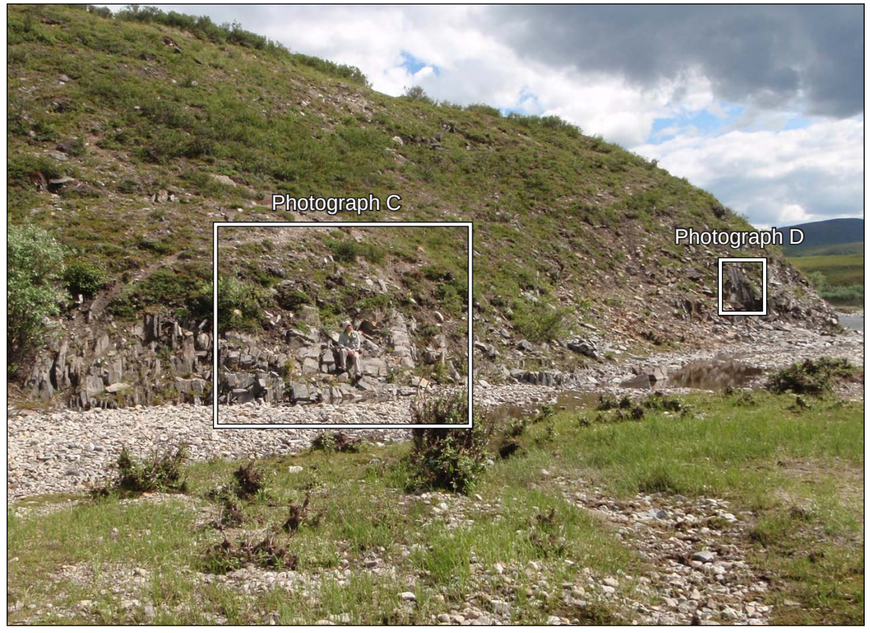
79_218900_Alaska_Railbelt\2189_Lineament Report October 2013, modified 10.18.13

A)



Photograph looking east from location A. Large arrows point to downhill facing slope break visible in INSAR and mapped by Fugro (2013). Field reconaissance revealed smaller lineament (not visible in INSAR data) lies along the small arrows and projects toward the vertically-dipping bedrock exposed in the creek bank shown in Photograph B.

B)



Overview of east-southeast striking, vertically-dipping phyllite exposures located at GPS waypoint 009.

C)

Detail of phyllite exposure showing ~3-meter-wide resistant bed of metamorphosed fine to medium sand. Thick, resistant beds, such as this, are interpreted to create the lineament shown by small arrows in Photograph A above. Geologist for scale.

D)

Detail of vertically-dipping phyllite.

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FUGRO Date 10/18/13	STATE OF ALASKA ALASKA ENERGY AUTHORITY ALASKA ENERGY AUTHORITY	SUSITNA-WATANA HYDROELECTRIC PROJECT LINEAMENT GROUP 21b PHOTOGRAPHS	FIGURE A21b.2

E)

Photograph taken from location E looking east-southeast along trend of FCL mapped lineament (shown by arrows). Note absence of any apparent deformation in surficial deposits or in terrace riser on left bank of Butte Creek.

F)

Photograph taken from location F looking west along trend of FCL mapped lineament to west of Butte Creek. Note no apparent deformation in right bank of stream or any expression of faulting in broad, flat terrace surface mapped as Qdt_3 by Smith et al. (1988).

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FUGRO Date 10/18/13	STATE OF ALASKA ALASKA ENERGY AUTHORITY ALASKA ENERGY AUTHORITY	SUSITNA-WATANA HYDROELECTRIC PROJECT LINEAMENT GROUP 21b PHOTOGRAPHS	FIGURE A21b.3

435000 6995000 440000 445000 6990000 450000

Deadman Mountain

30-km radius

22

Deadman Creek

6

430000 6990000 435000 440000 6985000 445000

Qs Thf Kgu Tegr Mzpca g

WAT5 Seismograph station

Note that left-lateral moraines are not deformed along projection of mapped lineament

A B C D

1:250,000-scale Healy quadrangle

1:250,000-scale Talkeetna Mountains quadrangle

183 77

N

0 1 km

0 1 mi

6985000 450000

Notes: 1. See Figures A0.2, A0.3, A0.4, and A0.5 for explanation.
2. Data frame has been rotated 30° west of north.
3. Geologic map by Reger et al., 1990 (top) and by Wilson et al., 1998 (bottom)

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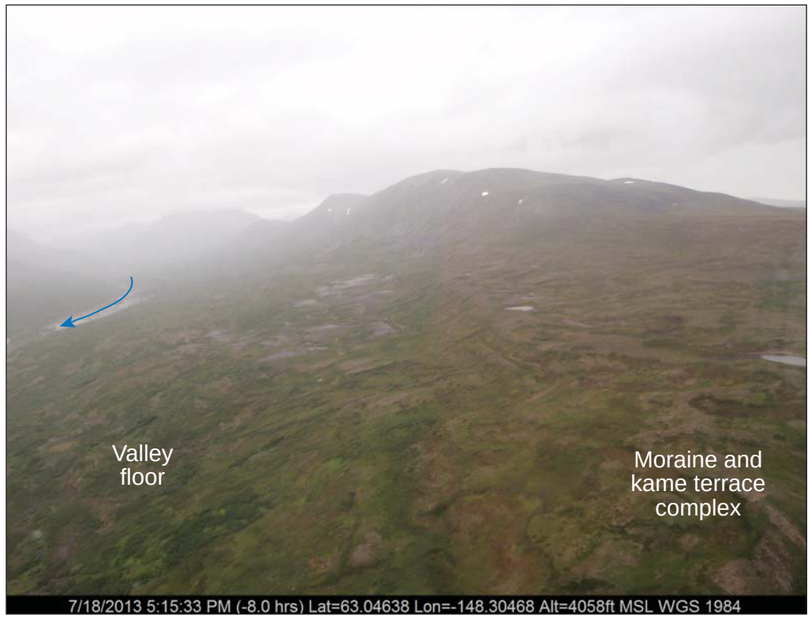
FUGRO Date 10/18/13	STATE OF ALASKA ALASKA ENERGY AUTHORITY ALASKA ENERGY AUTHORITY	SUSITNA-WATANA HYDROELECTRIC PROJECT LINEAMENT GROUP 22 MAP DATA	FIGURE A22.1

79_218900_Alaska_Railbelt/2189_Lineament Report October 2013, modified 10.18.13

A)

View looking north-northeast up the Deadman Creek valley. Note the numerous downhill-facing solifluction scarps. Large arrows point along mapped lineaments.

B)

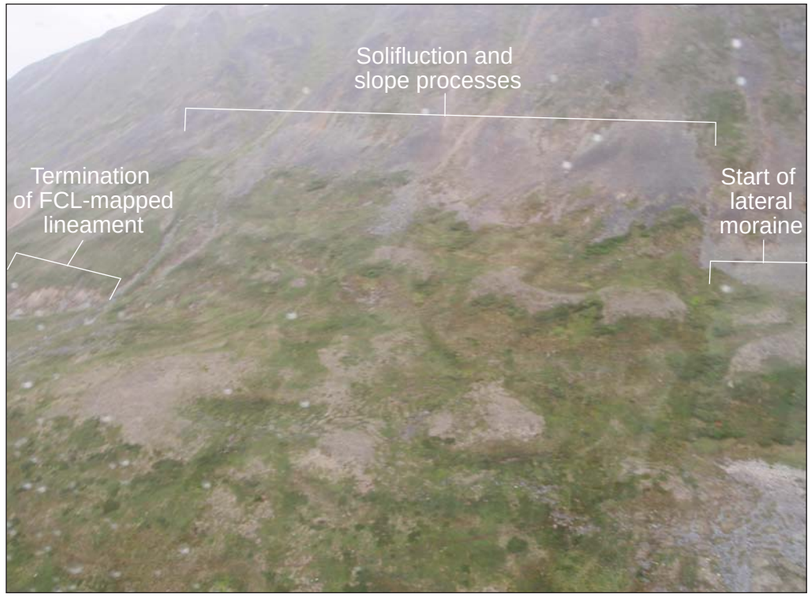


View looking north-northwest up-valley along the margin of the left-lateral moraine and kame terrace complex. No lineaments were observed cutting these deposits.

C)

View looking north at deep drainages whose margins coincide with nivation terraces and hollows. The large size of these drainages is inconsistent with the weakly expressed lineaments located east of Deadman Creek. Such deeply incised drainages are interpreted to be a result of sub-ice erosion.

D)



View looking northeast at area of solifluction and termination of mapped lineament.

DRAFT

FUGRO Date 10/18/13	STATE OF ALASKA ALASKA ENERGY AUTHORITY ALASKA ENERGY AUTHORITY	SUSITNA-WATANA HYDROELECTRIC PROJECT LINEAMENT GROUP 22 PHOTOGRAPHS	FIGURE A22.2

79_218900_Alaska_Railbelt/2189_Lineament Report October 2013, modified 10.18.13