WINCE – CORTHELL – BRYSON
Consulting Engineers
Box 1041 Kenai, Alaska 99611
Phone 907-283-4672 Fax 907-283-4676
email: mblanning@wcbalaska.com

December 17, 2021

Kenai Peninsula Borough
Land Management Division
144 N. Binkley Street
Soldotna, Alaska 99669

Attention: Marcus Mueller

Subject: Slope Instability Investigation in Cooper Landing

Mr. Mueller,

As requested, Wince-Corthell-Bryson (WCB) has performed a preliminary slope instability investigation in Cooper Landing. The purpose of the investigation was to determine the nature, severity, and subsequent steps appropriate to address the slope instability. The scope of work did not include subsurface exposure, precision measurement, or design.

The slope in question is located in Cooper Landing, Alaska on Tract A, ASLS 2003-2, SW2005-10 within Section 27, T5N, R3W, Seward Meridian, see attached Figures 1 and 2. The property is owned by the Kenai Peninsula Borough (KPB).

According to the KPB, a report of a slope washout was made to the KPB on November 8, 2021. The report indicated that silt laden water was running from the slope and impacting a structure on the adjacent property to the south. The adjacent property, described as that portion of USS 2522-HS 35 lying north of the Sterling Highway, is owned by Bunkhouse Properties LLC, who was the party that reported the slope instability. WCB spoke with Bruce Neeno on December 3, 2021. Mr. Neeno, manager of the Bunkhouse Properties LLC, confirmed the timing of the slope failure and indicated that water and mud from the washout had flowed into the building and water was still flowing under the ice that had built up.

WCB reviewed existing documents on file at the KPB associated with the Russian Gap subdivision road project. Documents reviewed included the following:

- An agreement between the KPB and Sherman and Pixie Smith, dated July 25, 2001. The Smiths were the prior owners of USS 2522-HS 35. The agreement allowed the KPB to excavate usable gravel from the face of an embankment along the KPB and Smith common property boundary for use in construction of the Russian Gap subdivision road. Upon completion of the excavation, the slope was to be left at a 2:1 (horizontal to vertical) grade.
- A November 14, 2002 letter from Mr. Smith to the KPB. Mr. Smith noted that there was a drainage problem and that water was flowing from the KPB property onto his property. Mr. Smith also noted that a portion of the newly constructed slope had sloughed down onto his property.

- Correspondence in May of 2003 between the KPB and a contractor describing a plan to install 340 linear feet of french drain along the toe of the slope and tie it into an existing drain at the west end of the slope. Also, three vertical french drains were to be installed to correct areas of instability along the slope. One of the vertical french drains was to be installed at the east end of the slope.

On December 7, 2021, representatives from WCB made a visit to the site. At the time of the site visit, the temperature was 28ºF with overcast skies. There was approximately 12" of snow on the ground. The following was noted:

- Although there was a considerable amount of snow cover, the area of the slope failure was visible, see photographs #1, 2, 3 & 4. The eroded area was approximately 50 feet long and 10 feet wide at the widest location. At the upper end of the erosion, the depth was approximately seven feet. The exposed walls of the eroded area showed 2" to 4" of topsoil over gravel. The bottom of the eroded area appears to end approximately fifteen feet from the toe of the slope. Small brush and trees exist along the toe of the slope. No water was observed in or around the eroded area. There is ice build up between the toe of the slope and the structure on the Bunkhouse property (formally Smith property).

- Up gradient of the slope failure, in the natural vegetation, a drainage way exists, see photograph #5. The drainage way is fairly well defined near the east side of the slope. As you proceed farther up the hillside, the drainage way becomes less defined. Approximately 700 feet up the hillside, several small depressions were observed with open water, see photograph #6.

- The centerline of the proposed new route of the Sterling Highway is approximately 1000 feet north of the slope failure. It has been cleared. Although there was 12" to 24" of snow on the ground, it does not appear that any earthwork has been started in this area, see photograph #7.

- A catch basin inlet was found within the existing Sterling Highway right-of-way near the west driveway entrance onto the Bunkhouse property, see photograph #8. The inlet had a 24" diameter corrugated metal pipe (cmp) extending towards the northwest corner of the Bunkhouse property and a 24" cmp extending south, under the Highway. The outlet of the 24" cmp, where it discharges to Kenai Lake, was found on the south side of the Kingfisher Roadhouse, see photograph #9. Water was observed flowing through the drainpipe from north to south and discharging to the lake. Two 36" diameter cmp culverts that cross the Highway were also found near the east boundary of the Bunkhouse property. No water was observed flowing through the culverts.

Although no precipitation records were found specifically for the Cooper Landing area, records were reviewed for the Seward area. In late October and early November of this year, Seward had several days of heavy rainfall. This would correspond to the time period of the slope failure. In addition, a landslide that occurred approximately three miles to the west that closed the Sterling Highway occurred during this time period and was described as a result of heavy rainfall.

It is our opinion that the rainfall that occurred in late October and early November led to the slope failure. Based on our on-site observations and review of KPB records, it appears that the failure is caused by subsurface water migrating down-slope. This subsurface water saturates the soil, causing the slope to fail. As was noted during our site visit, there is subsurface water

flowing through the drainage pipe and discharging to the lake. This subsurface water appears to be coming from the french drain at the toe of the slope.

It would be extremely difficult to make permanent repairs at this time of the year due to the snow cover, frozen ground, and freezing temperatures. We do, however, recommend the following:

- It is likely that during spring break-up, additional erosion of the slope will take place. To help protect the structure on the Bunkhouse property, we recommend placing a temporary barrier between the structure and the toe of the slope to divert silt laden water around the structure. The barrier could be constructed using jersey barriers or drain rock placed in a berm with an impermeable membrane placed on the slope side of the barrier. If drain rock were used to construct the temporary barrier, it could then likely be reused in the permanent repairs to the slope.
- Next summer, once the snow has melted, arrange for an engineer to reinspect the slope and surrounding area. At a minimum, excavate a test hole near the bottom of the slope failure to verify the existing conditions. Also determine the location of the east end of the existing french drain at the toe of the slope, what condition it is in, and also how the drain is connected to the 24" cmp at the west end.
- Next summer make permanent repairs to the slope. The repairs would depend on the conditions found during the engineer's reinspection next summer, however, it is likely that the repairs would include installing vertical french drains, similar to those previously installed on other areas of the slope. Expansion of the french drain to the east, at the toe of the slope, would also likely be included in the repairs.

If you have any questions regarding this report, please do not hesitate to contact me at our office.

Sincerely,

Mark Blanning, P.E.
Wince-Corthell-Bryson

Attachments: Figures 1-2
Photographs 1-9

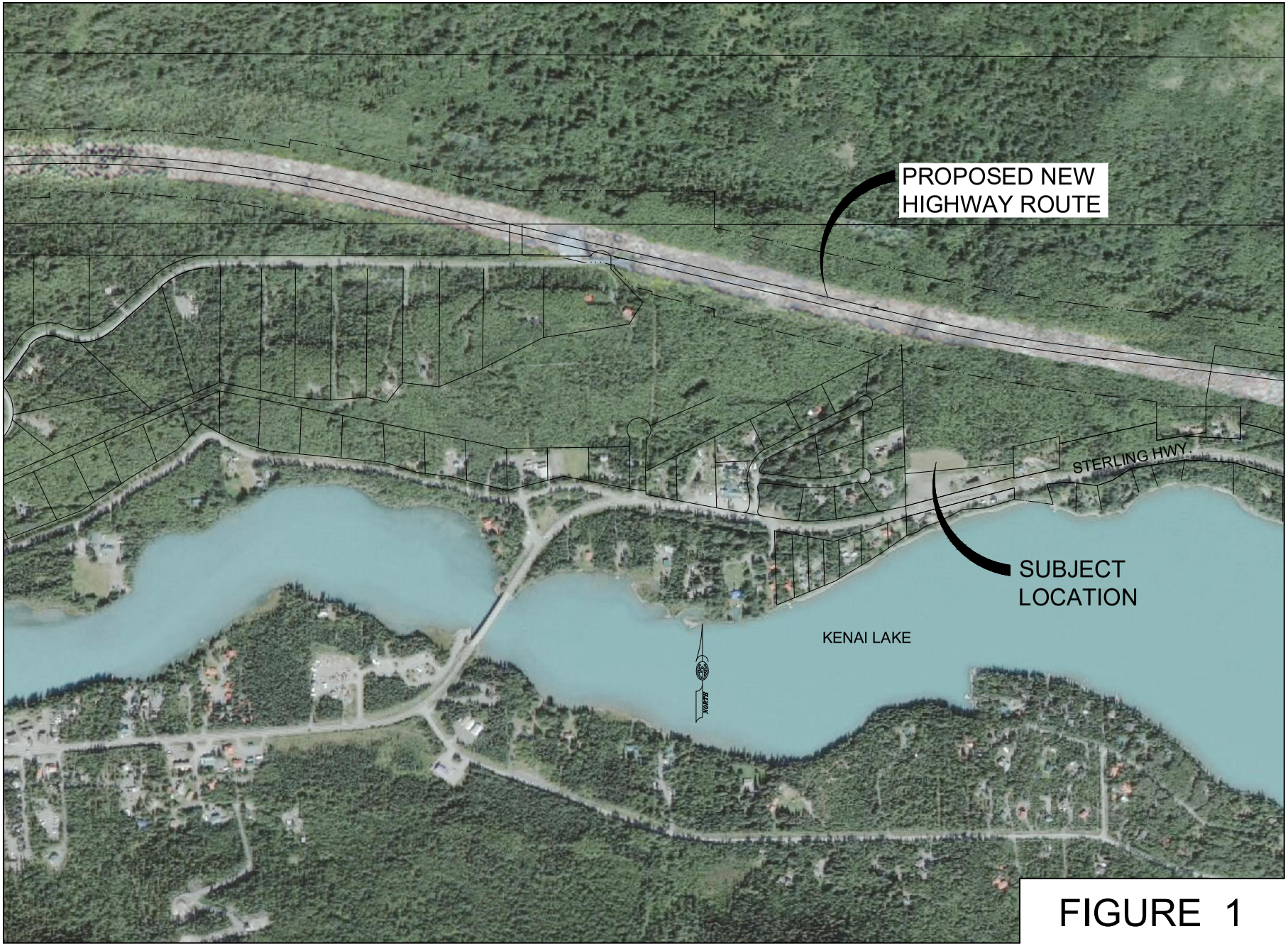
PROPOSED NEW
HIGHWAY ROUTE
STERLING HWY
SUBJECT
LOCATION
KENAI LAKE
HERON

FIGURE 1

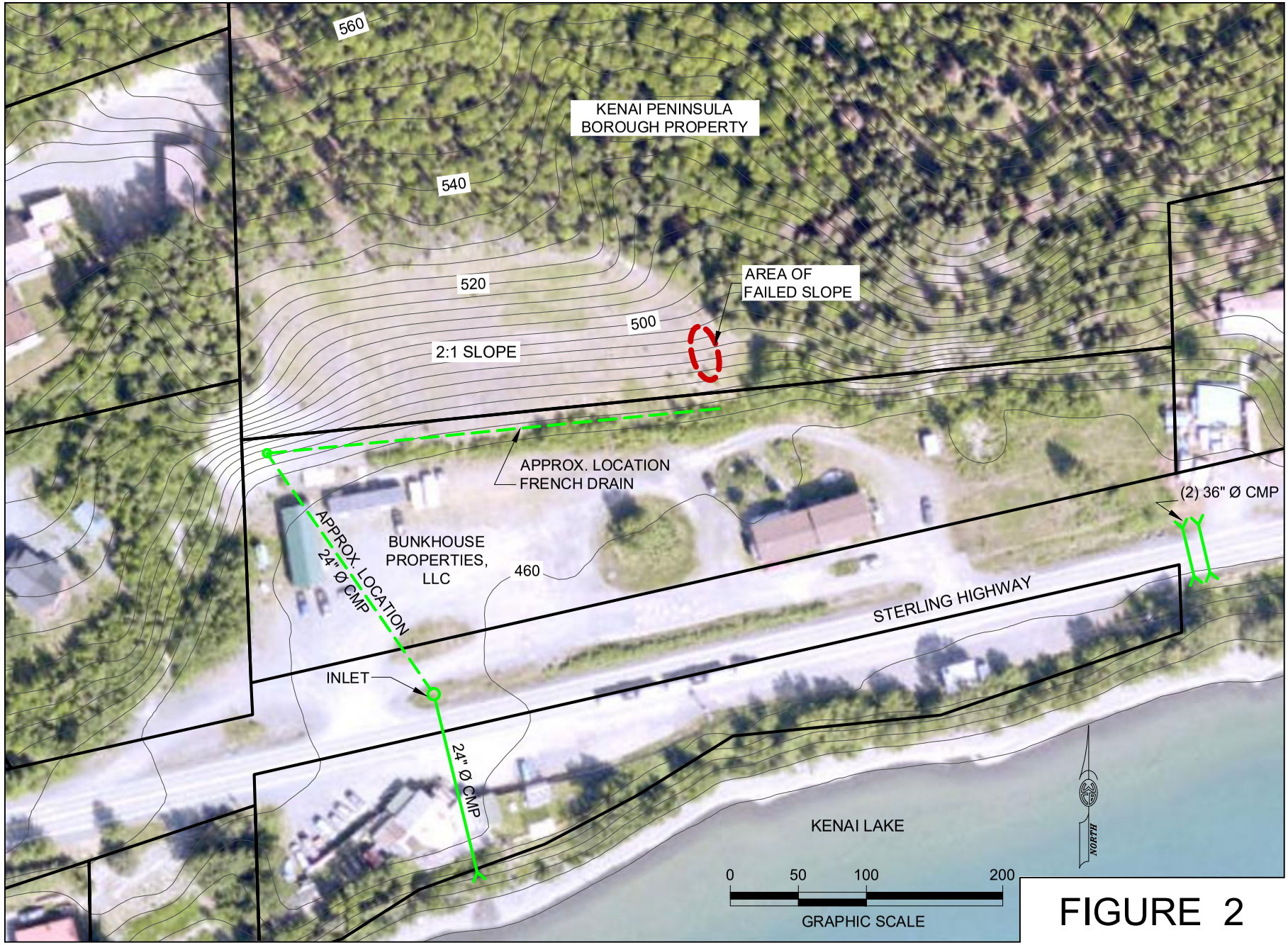
560
KENAI PENINSULA
BOROUGH PROPERTY
540
520
AREA OF
FAILED SLOPE
500
2:1 SLOPE
APPROX. LOCATION
FRENCH DRAIN
(2) 36" Ø CMP
APPROX. LOCATION
24" Ø CMP
BUNKHOUSE
PROPERTIES,
LLC
460
STERLING HIGHWAY
INLET
24" Ø CMP
KENAI LAKE
NORTH
0
50
100
200
GRAPHIC SCALE

FIGURE 2

Photograph #1: View of failed slope from the Sterling Highway. Affected structure on the right.

Photograph #2: Area of failed slope.

Photograph #3: Failed slope from below.

Photograph #4: Failed slope from above.

Photograph #5: Drainage way above failed slope.

Photograph #6: Depression with open water upgradient from failed slope.

Photograph #7: Cleared route of proposed new Sterling Highway alignment.

Photograph #8: Catch basin inlet in Sterling Highway right-of-way.

Photograph #9: Outlet of drainage pipe south of Kingfisher Roadhouse.