WETLANDS DELINEATION REPORT

for

Roberts Property

Prepared for:

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Job. No.: 12001.01

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TABLE OF CONTENTS

I. INTRODUCTION: Site Location and Project Purpose

This report describes the character and extent of federally regulated wetlands on a 20 acre (+/-) site in Teton County, Idaho. The site is located approximately 1 mile south of the town of Tetonia in the northern portion of Teton County, Idaho (Sections 34, Township 6N, Range 45E). Highway 33 borders the property along its north boundary line, but access to the parcel is via a gravel county road that turns south off Highway 33 at the site's northwest corner. Approximately 300 feet from the Highway, there is a new gravel subdivision road into the site.

The site is now owned by Reg Roberts who proposes to develop it for low-density residential housing. Since two creeks, Spring Creek and a high flow channel of South Leigh Creek flow through the site, Mr. Roberts is aware that his property contains wetlands regulated by the Corps of Engineers, and the Corps has, in fact, already granted him a permit for his subdivision road, which crosses two wetland drainages. Before proceeding with site development and planning board approval for his subdivision, Mr. Roberts deemed it prudent to commission a wetlands delineation for the entire site. In April 2004, he hired Lone Goose Environmental, LLC, (LGE) to complete this task. This report contains the site observations, field data, and results of that delineation.

II. SITE DESCRIPTION

The site appears to be rectangular parcel with a piece missing in it northeast quadrant. It is a relatively young alluvial terrace cut by the above-mentioned creeks. Spring Creek enters the site near the northeast corner along Highway 33. It curves to the south in a roughly semicircular fashion and then flows back out of the site near its northwest corner. South Leigh Creek side channel enters the site near its southeast corner, and this creek's braided channel transects the site along and generally parallel to the south boundary line. Portions of the braided channel may actually cross the south boundary, but that is difficult to discern in the thicket of riparian woodland bordering this creek.

The first impression of the site upon entering along the new subdivision road is that this is generally level terrace encased by woods along the two creeks. Upon exploring the site, it becomes evident that its topography is quite uneven. The high flow branch of South Leigh Creek, in particular, has cut such a maze of old channels that it is difficult to differentiate side channels from the main channel. This web of channels is hidden in the thicket of woods along the south boundary. Spring Creek, which currently has a more defined meandering pattern than South Leigh Creek, has also historically created some distinct topographic changes. The creek has moved over time leaving a high cut bank that separates a low wetland terrace from a higher upland terrace. This change in elevation is, as in the case of South Leigh Creek's channels, screened by a stand of mixed aspen, cottonwoods and willows. Such distinct topographic changes created by both creeks define the wetland/upland boundary on the Roberts site.

This site, like most undeveloped sites in Teton County, was formerly in agricultural use. It was probably previously used to pasture cattle, but it was certainly not rich pasture. The gravelly, well-drained soils would not have produced abundant forage with significant irrigation.

III. METHOD

The methodology used for identifying and delineating wetlands on the subject site was the three parameter approach approved by the U.S. Army Corps of Engineers and described in their 1987 Corps of Engineers Wetlands Delineation Manual (Corps Manual). To meet the Corps' definition of a wetland, under normal conditions all three of the following criteria must be satisfied:

1. Vegetation--more than fifty percent (50%) of the dominant vegetation must have a wetland indicator status of facultative (FAC), facultative-wet (FACW), or obligate (OBL).

2. Soils--soils that are either included on the national list of hydric soils or evince distinct hydric properties approximately 10-inches below the surface. Such properties include soils with a matrix chroma of one or less in the absence of redoximorphic features (mottling) or a chroma of two or less in the presence of these features (re: Munsell).

3. Hydrology--positive evidence of hydrology during the growing season. Such evidence is typically indicated by one or more of the following: surface inundations, soil saturation in the major portion of the the upper root zone (w/in 12-inches of the soil surface), water marks, surface drainage patterns, driftlines, sediment deposits, surface scouring, and/or specialized plant morphological adaptations.

For a routine delineation a sufficient number of borings are dug throughout the study site to reveal the nature of that site. At each boring location dominant plants are identified, soils are examined for hydric indicators, and the presence or absence of hydrology indicators are noted. These data enable the delineator to locate and flag a wetland/upland boundary. The boundary flags are then surveyed by a state licensed surveyor and plotted on a survey plan.

On the Roberts site the work of delineation was done in four days during mid-April 2004 (April 10, 13, 15, and 16). During that period, thirteen soil borings were dug throughout the site, and based on the findings from those thirteen data points, the wetland/upland line was located. The task to setting the wetland/upland boundary was facilitated by the creek-carved topography of the site. The wetland/upland line was surveyed by AW Engineering of Victor, Idaho, and the survey plan is attached in the back pocket of this report.

IV. VEGETATION

There are two major plant communities on the site: Thickets of riparian scrub-shrub woodlands surrounding the two creeks and near level, largely upland pastures between the stream corridors and bordering Highway 33.

The woodland overstory is composed of aspen (Populus tremuloides--FAC+) and narrowleaf cottonwood (Populus angustifolia--FACW). The shrub layer is a tangle of willows (Salix sp.--FACW-OBL), hawthorne (Craetegus douglasii--FAC), golden current (Ribes aureum--FAC+), and serviceberry (Amelanchier alnifolia--FACU). Wild rose (Rosa woodsii--FACU) was also present indicating a level of disturbance on the site. It was

evidence of surface hydrology during significant high flows. The creek follows a web of braided channels that torrents of water have carved across the alluvial terrace on which the site is situated. These channels probably contain water only during spring runoff, when snow is rapidly melting in the mountains. The creek might contain water well into the summer but for upstream irrigation diversions. Old wood headgates indicate that this portion of the creek was used to transport irrigation flows, but the headgates do not appear to be maintained.

Despite the brief seasonal flows in South Leigh Creek, the channel and its adjacent wetlands are still regulated waters of the United States. It was possible to determine from site observations of soils, plants, and indications of surface ponding, that there are sufficient flows in the creek to support wetlands along the creek corridor.

VII. CONCLUSION

The gravelly, well drained soils underlying the site would not sustain wetlands but for the creeks. Regulated wetlands and waters are confined to creek corridors, to low areas (old flood terraces) near the creeks, to old highflow channels and to the main creek channels. Due to the fact that this delineation was completed during the early portion of the growing season prior to the peak of the hydrologic cycle, soil saturation in wetlands was sometimes observed below 12 inches in depth. On wetland sites it was typically found at about 17 to 18 inches in depth, but the presence of distinct hydric soils indicators, critical diagnostic hydrophytic plant species, and specific landscape features formed by the creeks (channels, flood terraces) revealed jurisdictional wetlands and waters. Coincidence of these factors plus "best professional judgment" given the season of the year determined the location of the wetland/upland boundary line.

As noted previously, the wetland/upland line frequently followed distinct landscape features formed over time by the two creeks. In one instance the wetland/ upland boundary was set at the top of a high (near vertical) old cut bank. While the actual boundary was somewhat lower on the bank, it was most practical (i.e., reasonable) to set the line at the top edge of this steep slope (see Photograph #9).

Another factor to be considered in locating the wetland boundary (i.e., extending the typical 12-inch depth rule for soil saturation) is the prolonged drought conditions in Teton County. It remains to be seen whether this drought is an anomaly or an indication of a changing climate, but wetlands throughout the county appear to be drying out. The Roberts site did not evince some of the dramatic changes in plant community that have been observed in other locations. The delineated wetlands still contain a distinct hydrophytic plant community, but it was assumed that the level of saturation in the soil profile is lower this season than in previous years due to the lengthy drought. Exceptionally dry conditions were considered in addition to the fact that hydrologic site data were sampled about a month before peak levels of hydrology in Teton County.

occasionally observed in the delineated wetlands, but it was more commonly found on uplands. In the absence of cattle grazing,wild rose and buckbrush (Symphoricarpos albus--FACU) are early successional woody plants on the upland pastures.

Pasture grasses are the dominant herbaceous plants in both the woodland and on the old upland pastures. Naturalized species; bluegrass (Poa pratensis--FAC), timothy (Phleum pratense--FAC-), and brome (Bromus inermis--FAC); appear in both uplands and wetlands. Redtop (Agrostis stolonifera--FACW) typically becomes, however, the most important of the dominant grasses on the wetlands. Conversely, the increased presence of wheatgrass (Pascopyrum smithii--FACU), dandelion (Taraxacum officinale--FACU) and yarrow (Achillea millefolium--FACU) is indicative of uplands. Scattered nebraska sedge (Carex nebrascensis--OBL) is found in wetland swales, but sedges are most dominant in a broad area of shrubby wetlands at the eastern end of the site below the high bank carved and abandoned by Spring Creek. Dense stands of wire rush (Juncus balticus--FACW) are also found among the sedges.

V. SOILS

The Soils Survey, Teton Area, Idaho-Wyoming, depicts essentially one soil series underlying the Roberts site. There is a sliverof Foxcreek loam (Fs) along Highway 33, but this small mapped area probably does not extend beyond the road right-of way into the site. The primarly soil underlying the site is Badgerton gravelly loam (BgA). it is described as being well drained, permeable, and tending to be either gravelly or underlain by gravel and/or cobbles. It is a cryoboroll derived from alluvium with a tendency to be xeric, and given its classification, Badgerton gravelly loam is not a listed hydric soil.

All upland borings exhibited in the upper soil profile (0 to 12 inches in depth) either a chroma of 3 or a chroma of 2 without redoximorphic features (mottles). Wetland borings typically revealed a chroma of 2 with mottles and occasionally a chroma of 1. There was a distinct relationship between soil chroma and boring location on the landscape. Wetland borings having low chromas and mottling were at low elevations in swales, drainages, and along creek channels. Upland borings, immediately upslope at somewhat higher elevations, had chromas of 2 and 3 without mottles.

VI. HYDROLOGY

The most significant hydrologic features of the site are the two creeks. These creeks created the site's topography and sustain its woodlands and wetlands. Each creek, however, is quite different in character. The two creeks transect the site separated by a low, barely perceptible ridge on which the new subdivision road is located. This ridge was formerly a wide corridor of open pasture; it currently provides access into the site.

Spring Creek contains perennial water and follows a meandering pattern through the northern half of the property. As its name suggests, it is fed by springs, and consequently it has a reasonably consistent flow. It may rise a few inches (less than a foot) in the late spring during the peak of the hydrologic cycle in the Teton Valley, but it does not appear to be subject to cyclical flooding.

The South Leigh Creek highflow branch was dry during mid-April, but there was clear

– NATURAL RESOURCES ANALYSIS –

HERITAGE PEAKS LLC PROPERTY

TETON COUNTY, IDAHO

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CONTENTS

– NATURAL RESOURCES ANALYSIS –

HERITAGE PEAKS PROPERTY, TETON COUNTY, IDAHO

INTRODUCTION

A natural resources analysis (NRA) of the 20-acre Heritage Peaks property was performed by Biota Research and Consulting, Inc. during August 2010. This study was prepared at the request of Sean Moulton of Moulton Law Office, representative of the property owners. This NRA includes both an inventory of natural resources on the property and an assessment of impacts associated with proposed development on the property. The first portion is the natural resources inventory and provides documentation of existing natural resources on the property. The second portion consists of the impact assessment and management recommendations.

Field reconnaissance, personal interviews, and aerial-photo interpretation were the primary methods employed in conducting this study. Use of the property by various wildlife species, as evidenced through direct and indirect observations (e.g., pellet groups, tracks, browse, burrows, nests) was recorded. Documents and reports pertaining to the property and its vicinity were also examined and reviewed.

LOCATION OF PROPERTY

The property is located approximately 1 mile southeast of Tetonia in Teton County, Idaho (T6N, R45E, Section 34; Appendix 1-Attachment 1 and 2). Access to the property is gained by traveling north from Driggs on Idaho State Highway 33 for approximately 7 miles and then south 0.1 miles on N 2000 W to the property access road.

LAND USES

The project area has been and continues to be used for pasturing livestock; several horses were present during site evaluations in August 2010. Historic and current land uses have, in places, altered the vegetation and topography of the project area, creating areas of disturbed land and converted native plant communities.

PROJECT AREA VICINITY

The property is bordered by agricultural land and rural residential development on parcels ranging in size from 15 to 120 acres. The Teton Regional Land Trust holds conservation easements on 14 properties, encompassing 2,176 acres, within a 5-mile radius of the project area. Residential development in the vicinity occurs at a relatively low density.

The project area encompasses portions of the Spring Creek riparian corridor and is adjacent to the South Leigh Creek riparian corridor. Riparian plant communities, such as the hawthorn, aspen, and cottonwood forests found in these corridors, have many ecologically important attributes. These riparian associations typically take on a linear form as a result of their proximity to and dependence on rivers and streams and often form continuous strips along watercourses. This pattern of occurrence creates a high edge-to-area ratio and results in numerous ecotones with multiple aquatic and terrestrial plant communities and diverse habitats for animals. Mesic environments associated with riparian zones also

support lush, multi-layer vegetative communities, a scarcity in many parts of the arid West. Over one-half of all wildlife species in the western United States require riparian areas for at least some portion of their lifecycle, and riparian areas provide daily, seasonal, and dispersal-related movement corridors for many wildlife species. Riparian areas also buffer watercourses from pollution, sedimentation, and high temperatures (i.e., by providing shade) that can be harmful for aquatic life and human health.

PHYSIOGRAPHY AND SOILS

The project area is relatively flat at elevations between 6,090 and 6,110 feet, and drainage patterns are generally east to west. Spring Creek and its associated riparian zone bisect the property, and this watercourse and the adjacent South Leigh Creek have exerted considerable influence on local topography.

Soil types within the project area include Badgerton gravelly loam and Fox Creek loam (Noe 1969; Appendix 1-Attachment 3). These soils formed in a mixed alluvium and generally occur on 0-4% slopes at elevations of 5,900 to 6,000 feet. Foxcreek loam is the only soil found within the project area that is listed as hydric on the hydric soils list for the Teton area, Idaho-Wyoming (USDA 1991, 2007).

Badgerton gravelly loam – These well drained to moderately well drained soils were formed from medium textured alluvium and derived from granite, gneiss, quartzite, sandstone, limestone, and loess. Permeability is moderate in the upper part and very rapid in the sand and gravel. The available water capacity is moderate, and the soil is often subject to flooding for short periods in the spring. Under natural vegetation, the erosion hazard is slight, but when vegetation is removed, the erosion hazard is severe because of the susceptibility to flooding.

Fox Creek loam – These poorly drained, medium-textured soils formed in alluvium derived from gneiss, sandstone, quartzite, and limestone. These soils occur along stream channels on the upper edge of wet bottomland at elevations between 5,800 to 6,500 feet. These soils are typically used for meadow hay and range, but natural vegetation consists mostly of hydrophytic grasses and sedges.

SURFACE HYDROLOGY AND WETLANDS

SURFACE HYDROLOGY

Surface hydrologic features present within the project area include Spring Creek, a small unnamed spring-fed creek, and an irrigation ditch.

Spring Creek – Spring Creek is a natural watercourse that originates along the west slope of the Teton Mountain Range and culminates at its confluence with the Teton River. Spring Creek generally flows from east to west, and it enters the property in the northeastern corner after flowing under Idaho Highway 33 east of Tetonia (Appendix 1-Attachment 4).

The hydrologic regime of Spring Creek is complex due to ground and surface water interactions within the drainage. Spring Creek proper begins mid-way between the Teton River and the Teton foothills, where a change in geologic and topographic conditions results in the discharge of groundwater in an array of natural springs. Presently, the project area reach of Spring Creek is a perennial watercourse that is connected to the Teton River by continuous surface water flows during most years. Using the U.S. Geological Survey's StreamStats hydrologic modeling program, annual peak flows through the project area reach are estimated at 195 cubic feet per second (cfs); base flows are estimated at about 5-10 cfs during the fall and winter

Other Watercourses – Two channels of a small, unnamed, spring-fed watercourse parallel Spring Creek and meander through the property from east to west. It is unclear whether this watercourse is perennial or intermittent, but it conveyed less than 1 cfs during the August site assessment. This watercourse appears to originate at groundwater springs located north and east of the property, but some flood flows from Spring Creek may occasionally escape into the channel, flow across the floodplain, and enter this unnamed spring-fed creek.

Irrigation Ditch – An old irrigation ditch is present on the property, extending from the unnamed watercourse in a northwesterly direction to County Road 2000 East. It is unclear how this ditch is operated, or whether it currently functions to supply a downstream water user. However, flows through the ditch are likely seasonal in conjunction with spring runoff and increased discharge through the unnamed watercourse at the irrigation ditch origination.

WETLANDS

A wetland delineation was performed by Lone Goose Environmental in May 2004 within the project area, and about 10 acres were mapped as wetlands (Appendix 1-Attachment 5). These are primarily palustrine forested and scrub-shrub wetlands supported by surface water and near-surface groundwater associated with the creeks in the project area.

VEGETATIVE COVERTYPES (ASSOCIATIONS)

Vegetative covertypes within the project area include agricultural meadow (*Poa pratensis/Bromus inermis*), mesic cottonwood forest (*Populus angustifolia/Rosa woodsii*), mesic aspen forest (*Populus tremuloides/tall shrub/forb*), and tall shrub (*Crataegus douglasii/Salix/Symphoricarpos*). The general covertypes have been further classified into associations based on Merigliano (2009), as adopted by Teton County in May 2010. Covertypes presented below are presented irrespective of whether or not they classified as or included wetlands.

Table 1. Areal tabulation of vegetative covertypes on the Heritage Peaks project area, Teton County, Idaho.

Vegetative Covertype	Acreage	% Tract
Mesic Deciduous Forest - Cottonwood (*Populus angustifolia/Rosa woodsii*)	8.4	42.0
Agricultural Meadow (*Poa pratensis/Bromus inermis*)	6.4	32.0
Mesic Deciduous Forest - Aspen (*Populus tremuloides/tall shrub/forb*)	1.1	5.5
Tall Shrub (*Crataegus douglasii/Salix/Symphoricarpos*)	3.1	15.5
Disturbed Area	1.0	5.0
Total	20.0	100.0

MESIC DECIDUOUS FOREST – COTTONWOOD

The cottonwood covertype found within the project area is best characterized as the *Populus angustifolia/Rosa woodsii* association, which has a canopy dominated by *Populus angustifolia*, *Populus balsamifera ssp. trichocarpa*, and/or *Populus acuminata*, which is a hybrid of the first 2 species (Merigliano 2009). Woods rose (*Rosa woodsii*) and several other shrub species (e.g., black hawthorn-*Crataegus douglasii*, coyote willow-*Salix exigua*, Geyer's willow-*S. geyeriana*, Bebb's willow-*S. bebbii*, and prickly currant-*Ribes lacustre*) comprise the shrub layer. The understory also contains a substantial amount of immature cottonwood saplings due to seed germination and vegetative suckering. Due to the dense tree and shrub canopy, very few herbaceous species are present in the understory.

Black cottonwood (*Populus balsamifera ssp. trichocarpa*) is a large, broad-leaved tree that is typically found along major watercourses. Small stands of black cottonwood trees are known to occur in Teton

County intermixed with narrowleaf cottonwoods. These species also regularly hybridize when they occur in the same community (*Populus acuminata*). This community is considered to be of global rarity and importance (IDFG 2007) and represents important habitat for many bird species (TRLT 2006).

MESIC DECIDUOUS FOREST – ASPEN

Several aspen groves are found within the tall shrub and mature cottonwood stands. These stands are dominated by both mature and immature quaking aspen. The specific Merigliano (2009) association for these aspen stands is the *Populus tremuloides/tall shrub/forb*. The overstory is comprised entirely of mature aspen, and the shrub layer is comprised of black hawthorn (*C. douglasii*), chokecherry (*Prunus virginiana*), serviceberry (*Amelanchier alnifolia*), snowberry (*Symphoricarpos albus*), and immature aspen. The herbaceous layer is comprised of a variety of forbs and graminoids. Some portions have such robust aspen regeneration that the herbaceous community is essentially nonexistent.

TALL SHRUB

The particular association for the tall shrub covertype found within the project area was not identified in Merigliano (2009); however, its abundance suggests that the inclusion of it is warranted. The tall shrub layer is dominated by black hawthorn (*C. douglasii*), with some intermixed willows (*Salix* sp.). The understory is dominated by snowberry (*S. albus*) and Woods rose (*R. woodsii*).

DISTURBED

Although not technically a vegetative covertype, disturbed areas include land altered by human use, development, or natural disturbances. Disturbed areas on the project area are primarily associated with the gravel driveway.

RARE PLANTS

No rare plants are expected to be present within the project area to the due lack of habitat and/or current land use practices.

INVASIVE PLANTS

Several species of invasive weeds are present within the project area, some of which have been listed as noxious by the State of Idaho. Although a comprehensive inventory has not been performed, site investigations revealed the presence of musk thistle (*Carduus nutans*), Canada thistle (*Cirsium arvense*), bull thistle (*Cirsium vulgare*), houndstongue (*Cynoglossum officinale*), oxeye daisy (*Leucanthemum vulgare*), and herb sophia (*Descurainia sophia*). All of the species listed above are on the state's noxious weed list except for sophia and bull thistle. Several patches of musk thistle were especially dense.

THREATENED AND ENDANGERED SPECIES

Although not likely, there is a possibility that two threatened and one candidate species may occasionally travel through the project area. These species are listed below in Table 2.

Table 2. Wildlife species listed as threatened, endangered, or candidate which may occur within or near the Heritage Peaks project area, Teton County, Idaho (Miller 2008).

Species Name	Federal Classification/Status	Expected Occurrence
Gray Wolf (*Canis lupus*)	Threatened/Experimental	Rare accidental
Canada Lynx (*Lynx canadensis*)	Threatened	Rare accidental
Yellow-billed cuckoo (*Coccyzus americanus*)	Candidate	Very rare migrant

GRAY WOLVES

The current estimate of wolf numbers in the Greater Yellowstone Experimental Population Area, including Wyoming and adjacent parts of Idaho and Montana, is 455 wolves (USFWS et al. 2010). This population is classified as nonessential experimental, which incorporates more flexible management options than if the population were threatened or endangered. Population goals for the wolf recovery program in Wyoming, Montana, and Idaho were met in 2002, and all 3 states support viable recovered wolf populations. However, litigation in recent years has resulted in these populations being delisted, and then most recently relisted under the Endangered Species Act in August 2010.

In 2009, the Upper Snake Region was home to 2 documented resident packs of wolves and 3 documented border packs (Mack et al. 2010). The 3 border packs, 2 of which are from Montana and 1 from Wyoming, are known to occasionally venture into Idaho, and wolves have been observed in Teton Valley in recent years.

Wolf activity is intricately tied to prey availability, and the emerging pattern is for the Yellowstone area wolves to establish territories near ungulate winter ranges. Because the project area supports year-round use by wild ungulates, it is possible that wolves travel in the vicinity of and through the project area.

CANADA LYNX

The Canada lynx was first proposed for listing as a threatened species under the ESA in July of 1998 and was formally listed in April 2000. The final rule to list lynx in the lower 48 states emphasized the need for management and protection of lynx habitat on public lands (primarily public lands administered by the US Forest Service and the Bureau of Land Management) to ensure the continued survival of the species in the "contiguous US distinct population segment". In response to the uncertain status of lynx in the conterminous United States and to Endangered Species Act listing, an interagency lynx coordination effort between the US Fish and Wildlife Service, US Forest Service, Bureau of Land Management, and National Park Service was initiated in March 1998. A revised federal proposal to protect Canada lynx critical habitat does not include any areas in Teton County, ID or the Teton Mountains Range.

Lynx are solitary carnivores generally occurring at low densities in boreal forests. Distribution and abundance of this species is closely tied to that of the snowshoe hare, their primary prey. Vegetative communities present on the property are not considered suitable for lynx foraging or denning, and lynx presence is not expected.

YELLOW-BILLED CUCKOO

The yellow-billed cuckoo is a candidate for listing as threatened and was identified by the USFWS as possibly present in the vicinity of the project area. However, this species is not expected to occur within the project area, except as an extremely rare migrant, and was dismissed from further consideration.

SPECIES OF SPECIAL CONCERN

As part of the environmental review process, potential presence of special concern species not otherwise protected by federal law was analyzed. Known occurrences of "species of greatest conservation need," including those previously listed as threatened or endangered, within the project area and neighboring townships were provided by the Idaho Conservation Data Center (Table 3; ICDC 2008).

Table 3. Wildlife species of greatest conservation need which may occur in the vicinity of the Heritage Peaks project area, Teton County, Idaho (ICDC 2008).

Listed Species	Status	Expected Occurrence
Bald eagle (*Haliaeetus leucocephalus*)	Delisted	Resident
Harlequin duck (*Histrionicus histrionicus*)	Sensitive	Breeding
Grizzly Bear (*Ursus arctos*)	Delisted	Rare/Accidental
Yellowstone Cutthroat Trout *(Oncorhynchus clarki bouvieri)*	Sensitive	Seasonal

BALD EAGLE

The bald eagle was removed from the federal list of threatened and endangered species on August 8, 2007 (72 FR 37346). Following the delisting of the bald eagle, the US Fish and Wildlife Service published the National Bald Eagle Management Guidelines following guidance from the Bald Eagle and Golden Eagle Protection Act (BGEPA), 16 U.S.C. 668 and Migratory Bird Treaty Act (MBTA), 16 U.S.C. 703.

Bald eagles in Teton Basin primarily breed and winter along the Teton River and the lower reaches of river tributaries. Teton River tributaries such as South Leigh and Teton Creek are known to provide important roosting habitat for wintering bald eagles (TRLT 2006). Active bald eagle territories in Teton Basin are monitored annually (BLM et al. 2009). In 2009, 8 bald eagle breeding areas were active in the Teton Basin. The project area is more than 3 miles from the closest known historic bald eagle nesting territory and more than 3 miles from the Teton River, where eagle breeding and wintering are known to occur. Due to the proximity to these breeding areas, Bald eagles likely occasionally use large cottonwood trees within the project area for perching and/or roosting.

HARLEQUIN DUCKS

Harlequin ducks are currently listed by the Idaho Conservation Data Center as a breeding species of special status with a state rank of 1, meaning that the population is critically imperiled in Idaho. There are presently fewer than 100 breeding pairs of harlequin duck throughout all of Idaho, and Teton County comprises the southern extent of the species range in the state. Certain reaches of Teton Creek and Darby Creek in Wyoming have been identified as harlequin duck breeding habitat, but these are located upstream of the project area.

The characteristics of Spring Creek on and in the vicinity of the project area lack several important components common to documented harlequin duck breeding habitat including: a montane riparian setting; fast moving, low gradient mountain stream channel with good water quality; and a conifer-dominated forested riparian landscape free of human disturbance. The lack of isolated, montane riparian nesting habitat in a conifer-dominated woodland setting precludes the project area from potential nesting by harlequin ducks. Hens tend to escort broods downstream from high-quality nesting sites during brood rearing, and this behavior may result in very rare occurrences of this species within the project area.

GRIZZLY BEAR

On March 22, 2007, the USFWS announced that the Yellowstone population of grizzly bears no longer meets the Endangered Species Act's definition of threatened or endangered. Since listed in 1975, the grizzly bear population has been steadily increasing at a rate between 4 and 7 percent. The current grizzly bear population is more than 500 animals, which is significantly higher than the population of 136 animals estimated in 1975 (USFWS 2008). Grizzly bear habitat has also expanded to areas where grizzly bears have been absent for decades. Monitoring of grizzly bear population will continue in order to insure the future existence of this species.

Grizzly bears currently inhabit much of the Greater Yellowstone Area, including portions of Yellowstone National Park, Grand Teton National Park, and Bridger-Teton, Shoshone, Caribou-Targhee, Gallatin, and Custer National Forests, but at a relatively low density. Grizzly bears are not expected to be present within the project area with any regularity. The project area and its vicinity are unattractive to bears due to land use activities, such as farming and residential development, and the lack of suitable habitat components.

YELLOWSTONE CUTTHROAT TROUT

Yellowstone cutthroat trout is considered a "species of special concern" or a "sensitive species" within its historical range by a number of state and federal natural resource agencies and organizations. A petition for listing under the Endangered Species Act was rejected in February 2001 when the US Fish and Wildlife Service (USFWS) published a finding of not warranted (USFWS 2001). A 12-month review of the status of Yellowstone cutthroat trout performed by the US Fish and Wildlife Service concluded that the species did not warrant listing as threatened or endangered under the ESA (Federal Register Doc. 06-1539, files 2-17-06).

Although other native species (e.g., sculpin, longnose dace, speckled dace, Utah sucker, Utah chub, and red-sided shiner) are likely present in the project area, Yellowstone cutthroat trout are generally thought of as the species of highest conservation need. They have been documented throughout the Teton Basin, including in the project area catchment upstream of the Heritage Peaks property in upper North Leigh Creek on the Targhee National Forest (Colyer 2006). That headwaters population has been invaded by non-native brook trout, reflecting the connectivity of surface water flows during the late summer and fall in the drainage. The hydrologic connectivity, perennial flows, and presence of Yellowstone cutthroat trout in the vicinity of the project area indicate that YCT have access to, and likely utilize, the project area reach of Spring Creek for seasonal holding and feeding, migration, rearing, and potentially spawning. The population of YCT in the Spring Creek catchment is sympatric (residing with non-native salmonid species), which suggests that the population may be subjected to introgression by rainbow trout and/or competition and displacement by brook trout.

WILDLIFE

The project area contains year-round representatives of 5 vertebrate animal classes including birds, mammals, amphibians, reptiles, and fish (see above). Vertebrates were not systematically surveyed but species observed during site visits were recorded. The presence of other species was assumed when appropriate habitats were present, based upon the general distribution of these species.

NEOTROPICAL MIGRATORY BIRDS

Neotropical migratory birds include raptors, passerines, and shorebirds that breed in North America but migrate to Mexico, Central, and South America for the winter. In the United States, the Migratory Bird Treaty Act of 1918 establishes a federal prohibition, unless otherwise permitted by regulations, to "pursue, hunt, take, capture, kill, attempt to take, possess, offer for sale, sell, offer to purchase, purchase, export, at any time, or in any manner, any migratory bird, including any part, nest, or egg of any such bird" (16 U.S.C. 703). Of the 243 bird species that breed in Idaho, 119 are considered neotropical migrants (Ritter 2000). IDFG reports that 99 species of birds could utilize the cottonwood bottom habitat (Wright 1993).

All of the project area but a small portion in the northwest corner has been mapped within the landbird wildlife overlay prepared jointly by the TRLT and the IDFG (Appendix 1-Attachment 7). Specifically, the overlay identifies this area as songbird and raptor breeding and wintering habitat. This is undoubtedly due to the presence of mature cottonwoods, tall shrubs, and associated riparian vegetation. Riparian and wetland habitats generally contain the highest density of neotropical migrants, and cottonwood and tall shrub covertypes found within the project areas represent high quality foraging habitat to many bird species, such as various warblers, flycatchers, and vireos; cedar waxwings and black-headed grosbeaks. In contrast, agricultural landscapes are often characterized by low habitat connectivity and decreased habitat patch size and tend to lack structural complexity found in undisturbed but otherwise similar landscapes (Saab 1999). Species richness and abundance of individual species often decline as a result of such fragmentation. Although studies were not conducted to inventory neotropical migrant species presence and possible nesting within the project area, the mixture of riparian and upland habitats found within the project area ensure that a variety of neotropical migrant species are present and breed here between May and mid-July.

UPLAND GAME BIRDS

Upland game birds are primarily ground-dwelling birds that forage on plants and insects. Roughed and sharp-tailed grouse, gray partridge, and possibly ring-necked pheasants may use the project area. Ruffed grouse are year-round inhabitants of the structurally diverse plant community associated with the aspen stands and streamside thickets of the project area. Roughed grouse were observed within the riparian forest during August 2010 site evaluations. Both ring-necked pheasants and gray partridge are generally found in open agricultural areas, wet meadows, and along riparian ecotones. Anecdotal evidence suggests that numbers of pheasants are very low in the Teton Basin, with artificial stocking maintaining the population.

WATERFOWL/WATERBIRDS

A variety of waterfowl species likely use Spring Creek for nesting and brood rearing, including Canada geese, mallards, cinnamon teal, green-winged teal, and American widgeon. Brood cover is generally good due to the dense riparian vegetation. Various shorebirds may also be present. Great blue herons are commonly found in wetland open-water communities, particularly in cottonwood riparian forests, lakes, and rivers. The long-billed curlew is classified as a Level 3 special status bird, meaning it is rare or uncommon (IDFG 2007). This species is considered a locally common resident in Teton Valley and uses agricultural areas and short-grass wetlands for reproduction and during migration. Although long-billed curlews prefer to nest in large expanses of grassland, adults often move the young to dense cover for brooding (TRLT 2006). Curlew nesting habitat is not present within the project area, but a few curlew use may occur irregularly within the project area. Sandhill cranes are relatively common in Teton Valley, but a map of greater sandhill crane habitat utilization in Teton County does not identify the

project area as pre-migration habitat (TRLT 2006). Any use of the project area by cranes is expected to be peripheral.

RAPTORS

Shrub-grassland, forest, and water-dependant raptor species are expected to be present in the project area. Raptor nesting is expected within the cottonwood-dominated riparian zone along Spring Creek. As mentioned previously, all but a small portion of the project area has been mapped within the Teton County landbird wildlife overlay for songbird and raptor breeding and wintering habitat (Appendix 1-Attachment 7).

Shrub-grassland Raptors	Water-associated Raptors	Forest Raptors
Northern harrier	Osprey	Northern goshawk
American kestrel	Bald eagle	Cooper's hawk
Red-tailed hawk	Peregrine falcon	Sharp-shinned hawk
Swainson's hawk		Great gray owl
Great horned owl		Northern saw-whet owl
Prairie falcon		Merlin
Rough-legged hawk		
Short-eared owl		

The great gray owl is a forest dwelling raptor that is listed as a sensitive species by Region 4 of the USFS and is expected to use the project area in all seasons. Eastern Idaho hosts a large population of great gray owls (Franklin 1987, 1988; Whitfield 1997) and represents the southern edge of the breeding range.

MAMMALS

The covertypes present within the project area support a diverse array of native mammals. Terrestrial, small- and medium-sized mammals expected to use the project area include coyotes, red squirrels, ground squirrels, pocket gophers, weasels, badgers, chipmunks, mice, voles, and shrews. The reliable, consistent flows in Spring Creek may also provide habitat for aquatic and semi-aquatic animals such as beaver, muskrat, and mink. Two river otters were observed within the project area during a 2010 site evaluation. Large ungulates are known to use the riparian areas in the vicinity of the project area for movement corridors. Although the habitat is not ideal for large carnivores due to a limited prey base and avoidance of human development, mountain lions and wolves may move through the area.

Elk

The forested vegetative covertypes and the riparian area along Spring Creek could provide suitable cover for elk within the project area, and the agricultural meadow could provide a food source. However, the proximity to a major highway and surrounding human activity probably limits elk use of the project area. No evidence of elk use was observed during site evaluations and elk use of the project area is believed to be peripheral at best.

Deer

Mule Deer –It is likely that snow depth and the lack of accessible forage suggests the project area has little or no value as mule deer winter range; however, these animals likely use the project area on an occasional basis.

White-tailed Deer –The Spring Creek riparian corridor is expected to provide winter range to white-tails during some winters, and yearlong range during all years. The riparian habitat also provides a movement corridor for deer moving between bottomlands along the Teton River and summer range along the foothills of the Teton Mountain Range (Wright 1993).

Moose
Winter moose use is likely quite common within the project area and its vicinity due to the presence of a perennial watercourse, wetlands, thick cover, and substantial foraging opportunities. Single animals and cow/calf groups likely use the mature cottonwood and tall shrub covertypes along Spring Creek with regularity. In addition to winter habitat, Spring Creek and South Leigh Creek and their riparian zones provide important corridors for moose moving from the valley bottom to area highlands (Wright 1993).

Amphibians and Reptiles
Flowing and standing water, wetlands, and coarse woody debris (fallen logs left on the ground) represent excellent amphibian habitat, and it is likely that tiger salamanders, boreal chorus frogs, and Columbia spotted frogs are present within the project area.

The western terrestrial garter snake is expected to be the most common reptile found within the project area. These snakes are generalists and can be found in virtually any wetland or terrestrial habitat below 11,000 feet. Rubber boas, which inhabit moist or dry forests, may also be found in the project area.

DEVELOPMENT IMPACT ASSESSMENT

PROPOSED DEVELOPMENT

Proposed development within the project area consists of 2 building envelopes for residential structures, 2 septic leachfields, and a vehicle turn-around (Appendix 1-Attachment 8). The western building envelope is 0.39 acres in size and the eastern envelope is 0.56 acres. The impact analysis is based on an assumption that all areas within the proposed building envelopes would be disturbed by future development; however, this assumption may actually over-estimate vegetative impacts associated with future development. All planned development was designed to avoid impacts to wetlands and watercourses on the project area. Impacts to vegetation were unavoidable, but these impacts are concentrated in the agricultural meadow, which provides the lowest quality wildlife habitat on the project area.

AESTHETIC IMPACTS

Proposed development is expected to have minimal impacts to aesthetics, as seen from Idaho Highway 33 or the surrounding properties. The presence of relatively dense stands of cottonwood and aspen trees and tall shrubs will provide substantial vegetative screening of development areas.

WATER QUALITY IMPACTS

Proposed development will be located on an elevated alluvial terrace approximately 8 to 10 feet higher than the creeks and riparian area, and at least 175 feet from Spring Creek and 15 feet from the small, spring-fed stream. The thick, forested, riparian area is expected to mitigate any adverse impacts to water quality in the project area watercourses. Efforts should be taken to use approved stormwater BMPs to prevent any erosion/sedimentation during construction.

WATERCOURSE AND WETLAND IMPACTS

Watercourses
There will be no impacts to watercourses within the project area.

Wetlands
There will be no impacts to wetlands within the project area.

IMPACTS TO VEGETATION AND RIPARIAN CORRIDORS

A total of 1.32 acres of vegetative covertypes will be impacted by the proposed development, including 0.11 acre of mesic cottonwood forest, 0.62 acres of agricultural meadow, 0.26 acres of mesic aspen forest, and 0.28 acres of tall shrub. In addition, 0.05 acres of previously disturbed land will be impacted. Vegetative impacts for proposed development within the project area are summarized in Table 4.

The Idaho Fish and Game Department considers the loss of and impacts to riparian corridors resulting from residential development a major concern and actively discourages habitat fragmentation or development within the riparian areas (IDFG 2007). The proposed development will impact 0.65 acres of high-value riparian covertypes and will likely result in a small amount of habitat fragmentation.

Table 4. Vegetative impacts (acres) for the proposed development associated with the Heritage Peaks project area, Teton County, Idaho.

Vegetative Covertype	Building Envelopes		Septic Leachfields		Vehicle Turn Around		Total Impact
	West Lot	East Lot	West Lot	East Lot	West Lot	East Lot	
Mesic Deciduous Forest - Cottonwood (*Populus angustifolia/Rosa woodsii*)	0	0.04	0	0.07	0	na	0.11
Agricultural Meadow (*Poa pratensis/Bromus inermis*)	0	0.39	0.15	0.08	0	na	0.62
Mesic Deciduous Forest - Aspen (*Populus tremuloides/tall shrub/forb*)	0.18	0.08	0	0	0	na	0.26
Tall Shrub (*Crataegus douglasii/Salix/Symphoricarpos*)	0.21	0	0	0	0.07	na	0.28
Disturbed Area	0	0.05	0	0	0	na	0.05
Total	0.39	0.56	0.15	0.15	0.07	na	1.32

WILDLIFE IMPACTS

Impact Definitions

Future development occurring on the property may have adverse effects on certain species and natural resources. The following assessment of environmental consequences of the proposed development on wildlife and fish species used the following impact measure, duration, and intensity definitions.

Impact Measures - Four impact measures are examined for wildlife. These include habitat loss, mortality, habitat fragmentation, and human-caused disturbance.

- Habitat Loss - Implementation and perpetuation of all or part of the project would result in a direct loss of habitat.
- Mortality - Implementation and perpetuation of all or part of the project would result in the death(s) of individuals.
- Habitat Fragmentation - Implementation and perpetuation of all or part of the project would result in the fragmentation of habitat.
- Human-caused Disturbance - Implementation and perpetuation of all or part of the project would result in the displacement of individual animals.

Duration of Impact - A short-term impact would have a duration less than or equal to 3 years and a long-term impact would have a duration greater than 3 years following implementation.

Intensity of Impact - Impact thresholds are defined in Table 5.

Table 5. Wildlife impact threshold definitions.

Measures	Negligible	Minor	Moderate	Major
Habitat Loss **Mortality** **Habitat Fragmentation** **Human-caused Disturbance**	A small number of individual animals and/or a small amount of their respective habitat may be adversely affected via direct or indirect impacts associated with a given alternative. Populations would not be affected or the effects would be below a measurable level of detection. Mitigation measures are not warranted.	Adverse impacts to individual animals and/or their respective habitats would be more numerous and detectable. Populations would not be affected or the effects would be below a measurable level of detection. Mitigation measures may be needed and would be successful in reducing adverse effects.	Effects to individual animals and their habitat would be readily detectable, with consequences occurring at a local population level. Mitigation measures would likely be needed to reduce adverse effects and would likely be successful.	Effects to individual animals and their habitat would be obvious and would have substantive consequences on a regional population level. Extensive mitigation measures would be needed to reduce any adverse effects and their success would not be guaranteed.

Threatened and Endangered Species
Proposed development is not expected to impact any threatened, endangered, or candidate species

Bald Eagles
Proposed development is not expected to impact bald eagles.

Harlequin Ducks
Proposed development is not expected to impact harlequin ducks.

Grizzly Bear
Proposed development is not expected to impact grizzly bears.

Yellowstone Cutthroat Trout
Proposed development is not expected to impact Yellowstone cutthroat trout.

Neo-tropical Migratory Birds
Proposed development is expected to directly impact 0.65 acres of migratory bird habitat, and this impact is expected to be adverse, negligible, and long-term. A recent study found that bird abundance and species diversity tends to decline as residential development increases and the decrease is proportional to the development density (Smith and Wachob 2003). In this case, development density for the foreseeable future is relatively low, thus impact to migratory birds should be minimal. Depending on construction timing, ground-nesting and tree-nesting birds could be disturbed and productivity of individual pairs reduced. Impacts from the proposed development will result in a small degree of fragmentation of neo-migratory bird habitat. Nonetheless, by preserving standing dead trees (snags), protecting wetlands and watercourses, and conserving the undeveloped area as open space, the loss of habitat for migratory birds will be minimal.

Upland Game Birds
Proposed development is not expected to adversely impact upland game birds. Dispersed human uses within the Spring Creek riparian zone may result in flushing individuals or small coveys of birds.

Waterfowl/Waterbirds
Proposed development is not expected to adversely impact waterfowl/waterbird habitat. However, dispersed human uses occurring within the Spring Creek riparian zone may result in individuals or small groups of birds being flushed.

Raptors
Impacts to raptors resulting from the proposed development are expected to be adverse, negligible, and long-term. Raptor foraging habitat (e.g., agricultural meadows) will be impacted by the proposed development, but similar foraging habitat for raptors is abundant in the vicinity.

Small Mammals
Impacts to small mammals are expected to be adverse, negligible, and short-term during the construction periods. After construction has ceased, small mammal populations are expected to return to near pre-development numbers.

Elk
The project area is mapped within the big game overlay for migration corridors and seasonal range. The relatively small amount of disturbance associated with the proposed development is not likely to adversely impact elk. Any impacts would be adverse, negligible, and short-term.

Deer
Impacts to mule and white-tailed deer resulting from the proposed development are expected to be adverse, negligible, and short-term. Some individuals may be displaced by construction activities, but this impact is expected to be temporary. Deer are expected to adapt to the future development proposed on the project area.

Moose
Crucial moose habitat is not present within the project area, but moose may occasionally be found within the project area. Impacts to moose are expected to be adverse, negligible and short-term.

Amphibians and Reptiles
The impacts of proposed development on reptiles and amphibians are expected to be adverse, negligible, and short-term. Most herptile habitat is located within the Spring Creek riparian zone and wetlands, and these areas will not be impacted by proposed development.

IMPACT CONCLUSION

The Heritage Peaks property provides habitat for a variety of wildlife species, primarily linked to the Spring Creek riparian forest and tall shrub habitat. Impacts associated with proposed development are associated with residential building envelopes, septic leach fields, and a vehicle turn-around. The development will directly impact about 1.27 acres of vegetated covertypes. No wetlands or watercourses will be impacted by the proposed development.

Development-related impacts to wildlife are expected to be adverse, negligible and short-term or long-term for neotropical migratory birds, raptors, small mammals, elk, deer, moose, and herptiles (Table 6). No development related impacts are associated with threatened or endangered species, bald eagles, harlequin ducks, Yellowstone cutthroat trout, upland game birds, or waterfowl.

FUTURE DEVELOPMENT AND MANAGEMENT RECOMMENDATIONS

The project area represents habitat to variety of wildlife species, including songbirds, raptors, waterfowl/waterbirds, small to medium-sized mammals, ungulates, amphibians, and fish. Habitats within the project area are associated with the Spring Creek riparian corridor where forested and scrub-shrub wetlands, upland stands of deciduous forests and tall shrubs, and several agricultural meadows. Bird life within the riparian community is abundant and diverse with resident and migratory songbirds, waterbirds, gamebirds, and raptors using the property. Small mammal use is extensive and habitat is present to support medium-sized and large mammals on a seasonal and year-round basis. Livestock

operations and farming of large, privately owned agricultural tracts is the primary land use occurring in the vicinity of the project area.

Table 6. Summary of impact types, thresholds, and duration conclusions associated with proposed development on the Heritage Peaks project area, Teton County, Idaho.

	Impact Threshold		
Species	Adverse	Beneficial	Duration
Gray Wolves	None	None	None
Canada Lynx	None	None	None
Grizzly Bear	None	None	None
Yellow Billed Cuckoo	None	None	None
Bald Eagle	None	None	None
Great Gray Owl	None	None	None
Harlequin Ducks	None	None	None
Yellowstone Cutthroat Trout	None	None	None
Neotropical Migratory birds	Negligible	None	Long
Upland Game Birds	None	None	None
Waterfowl/Waterbirds	None	None	None
Raptors	Negligible	None	Long
Small Mammals	Negligible	None	Short
Elk	Negligible	None	Short
Deer	Negligible	None	Short
Moose	Negligible	None	Short
Amphibian and Reptiles	Negligible	None	Short

RESIDENTIAL DEVELOPMENT

Certain measures have been taken to minimize impacts to important wildlife habitats resulting from any future residential development occurring on the project area. The relatively limited wildlife values associated with the agricultural fields make them preferred areas for development and this is where the majority of impacts associated with proposed development will occur.

STREAM CORRIDOR PROTECTION

Riparian areas are the single most productive wildlife habitat in North America (Thomas et al. 1980). The cottonwood-dominated forested wetlands and riparian zone found along Spring Creek support a wide variety of wildlife, including ungulates, mammalian predators, small- and medium-sized mammals, and many species of songbirds, waterfowl, shorebirds, raptors, amphibians, and reptiles. The importance of riparian and wetland habitats to avifauna in particular is well documented. Over half of all wildlife species in the western United States require riparian areas for at least some portion of their lifecycle. In relative terms, riparia support a greater avian diversity than any other habitat in the Intermountain West. Functioning as an ecotone between aquatic and terrestrial habitat, riparian ecosystems support a diversity of wildlife communities that are influenced by and respond to various vegetation characteristics (i.e., structural diversity, plant diversity and successional stage).

Portions of the project area provide considerable ecotone (edge) communities (e.g., along stream channels, between the cottonwood forest and tall shrub habitats, and between the tall shrub and

agricultural meadow covertypes). Due to the variability in the herbaceous layers of vegetation, the vertical and horizontal diversity is high, and this overall vegetative and structural diversity translates directly into a complex assemblage of wildlife species using these habitats (Brinson et al. 1981). Riparian obligate species benefit from increased habitat connectivity and distribution, larger patch sizes, and increased structural complexity (Saab 1999). The proposed project has minimized impacts to the Spring Creek riparian corridor.

FOREST MANAGEMENT

Snags and fallen trees in various stages of decay contribute much needed diversity of ecological structure to terrestrial environs and are abundant on the parcels. Providing and maintaining a supply of coarse woody debris is a major challenge in effective wildlife and land management. A continuous source and production of trees, snags, and deadfall are needed to support the complex interactions among animals, plants, and dead organic material. The practice of removing all or large quantities of standing dead or dead-fallen woody material is ecologically undesirable, and dead trees and snags greater than 15-inch diameter at breast height should be retained whenever possible. Taller trees provide greater security to nesting birds against ground predators. In general, it is best to leave taller snags because, in time, tall snags become shorter and taller trees may reduce interspecific conflicts by allowing vertical segregation of species and activities. To provide a diversity of nesting and feeding habitat, snags of all tree species and in all states of decay should be left standing. Snags should be left in dispersed clumps rather than as single trees uniformly scattered over an area. The desirable density of snags depends upon habitat type, but 300-400 per 100 acres is recommended for many western forests.

Conserving snag-dependent wildlife requires planning for replacement of snags as they fall. Some live trees can be retained as sources of future snags. Saving trees with crown and upper stem defects, such as top rot, broken top, or fork, is desirable because they provide certain species of raptors (e.g., great gray owls) with nest sites and are likely to contain some decay that produces desirable snags for cavity dwellers. Live trees may also be converted to snags through anthropogenic actions. One strategy may be to kill trees at intervals to provide a continuing source of snags through forest rotation. Thus, desirability of snags generally increases with diameter, proportion of stem covered by bark, height, and broken top. It is recommended that at least some snags located within the project area be left in place as real or potential nesting and foraging habitat to raptor species so long as they do not represent a threat to humans or residential structures.

TOPOGRAPHIC ALTERATIONS

The filling, excavating, dredging, mining, drilling, or removing of topsoil, sand, gravel, rock, minerals, or other materials, or other changes of the topography of the project area is discouraged, except where absolutely necessary or associated with approved development and enhancement plans.

AGRICULTURE

Intensive grazing of livestock within the project area, as historically practiced, is discouraged. If livestock pasturing occurs on the project area, it should only be at levels that would not cause overgrazing, soil compaction, and/or erosion. A general rule of thumb is available forage should not be reduced below 50 percent by pastured livestock. Wintering livestock on the project area is not recommended; to do so would require the storage of hay or other alfalfa or grass product on-site. Careless hay storage or feeding livestock will likely attract deer, elk, and/or moose and increase the likelihood of problems resulting from this attraction.

RAPTOR HABITAT PROTECTION AND RESTORATION

The mature cottonwood covertype within the Spring Creek riparian zone represents important raptor habitat and should be left as intact and undisturbed as practicable. Maintaining hunting perches will also enhance raptor use on the project area. Low stumps, downed trees, leaning trees, and trees with low branches are essential to juvenile success and should be left on the parcels. Leaning trees are critical in the pre-flight period of development for young birds. Specific plans for nest platform construction can be found in a report published by Bull, Henjum, and Anderson (1987).

FENCES

An assessment of site-specific fencing needs should be made for the project area. Fences frequently disrupt or discourage normal movement and use patterns of wildlife or actually present hazards to wildlife and their use should be avoided or minimized. In situations where fences are necessary, they should be constructed in such a way so as to reduce their potential negative impacts to wildlife. Fence construction should adhere to the recommendations provided below for wildlife-compatible fences. If the control of livestock is not necessary, perimeter fences around the parcel should be removed.

Perimeter boundary fences should be constructed of wood posts and a mix of barbed wire, rails, or sheep fence. Recommended materials, dimensions, and techniques for erecting any new fences on the project area are provided below:

1) The preferred fence design is a combination of posts, wire strands, and a top pole. This design effectively controls livestock while promoting wildlife movements.
2) The spacing of fence posts should be 13-16 ft.
3) The overall height of the fence should not exceed 42 in; the preferred height is 38 inches in most situations and 40 in if problems develop.
4) Installed fence posts should have sufficient extra height to allow raising or lowering the top pole between 38 and 42 in above the ground.
5) The bottom wire should be smooth twisted wire and located 16-18 in above the ground. This will allow immature ungulates (elk calves and deer fawns), and smaller animals to crawl under the fence.
6) The second and third wire strands can be barbed wire and spaced evenly over the distance between the bottom strand and the top of fence (e.g., the second strand is at 25 in and the third strand is at 34 in). It may be that only one strand of wire is actually needed and could be placed at about 29 in.
7) The top pole nailed to the side of the fence posts will facilitate animals attempting to jump the fence and protect them from injuries resulting from rubbing or becoming entangled in a top strand of wire. The top pole should be set at a maximum height of 42 in above the ground; the preferred height is 38 in.
8) Gates will allow wildlife access to the project area during periods when livestock control is unnecessary. At these times the gates should be opened and left opened until livestock control is again necessary.
9) Gates should be constructed of wire (both barbed and smooth-twisted wire) with a optimal height of 38 in. The gates should be installed at least every 450 ft of continuous fence. The spacing of the wires should be the same as that on the fence (i.e., bottom at 16-18 in above ground, top at no more than 42 in, and either one or two strands spaced evenly between). The top and bottom strands should be of smooth-twisted wire and the middle strand(s) of barbed wire.

INVASIVE AND NON-NATIVE PLANTS

Once development plans are finalized, it is recommended that native vegetation be restored in areas not occupied by buildings, landscaped, or in cultivation. This will likely require both active seeding and planting as well as invasive plant control. The best long-term control technique for reducing exotic plant invasions is to establish diverse and continuous native vegetative cover; however, spot herbicide spraying of weeds will likely be necessary for several years prior to establishment of native plant communities.

Additionally, the introduction of any non-native plants that might compete with or harm native species and result in their decline is discouraged. An exception to this would be the introduction of non-native species within the immediate confines of the building envelopes. However, planting certain ornamental (non-native) woody or shrubby vegetation for landscaping purposes is discouraged in order to reduce the likelihood of human-wildlife encounters. Wildlife damage to landscaping efforts may occur and should be accepted when the project area is located within an area used by moose, mule deer, and elk. A list of native plant species recommended for screening and revegetation efforts, based on palatability to wildlife, should be generated once goals and objectives have been identified.

NON-NATIVE FAUNA

The introduction into the wild of any non-native or domesticated animal species that might compete with or harm native species and result in a decline in their use is strongly discouraged.

DOMESTIC PETS

Free-roaming, unrestrained domestic pets should be prohibited. Unrestrained pets can easily disrupt wildlife use on the parcel and should be actively controlled. Dogs will readily chase, harass, and even kill both small and large mammals, as well as birds. Although less conspicuous than dogs, free-roaming cats can be as damaging to wildlife as dogs. Cats are effective predators of small birds, and mammals and free-roaming cats have a high potential (both short- and long-term) for disturbing many wildlife species. Domestic pets, exotic predators, and native predators often expand near human settlements and may have negative effects on some native migratory bird species (Odell and Knight 2001).

INTENTIONAL FEEDING OF UNGULATES

Artificial feeding of deer and elk on the project area is strongly discouraged because it "short-stops" ungulates in route to natural winter ranges and frequently precipitates many unforeseen and potentially devastating problems. By attracting animals close to roads and human habitations, the number of vehicle-caused deaths and the likelihood of human disturbance and harassment by domestic dogs are greatly increased. Supplemental feeding may also lead to both localized depletion and over-utilization of vegetation in the area surrounding the feedground. Concentrating animals in small, localized areas can increase the chance of disease and parasite transmission, which could result in an outbreak of an epizootic that under normal circumstances would be confined to a few individuals. Artificial feeding can also cause animals to abandon traditional migration routes and ranges and become less wary of humans.

WILDLIFE HARASSMENT

A variety of big game mammals may be present on the project area at various times of the year. The presence of these and other wildlife species should be expected and tolerated. People residing on or owning project area should be both respectful of and sensitive to wintering wildlife and not purposefully harass these animals as they struggle to survive harsh winters. Deer can be expected to browse on landscaped vegetation, and this activity can sometimes cause significant damage to vegetation. Owners and residents should make a concerted effort to educate themselves on how to minimize wildlife harassment. A variety of local and regional non-profits can help the owners achieve a compatible and responsible co-existence with native wildlife species.

MINIMIZE WILDLIFE ATTRACTION AND BEAR-HUMAN ENCOUNTERS

Although grizzly and black bears are not common on the project area, human-bear conflicts could be deterred by vigilant adherence to and enforcement of food storage and sanitation recommendations.

1. Livestock and pets: No animals or fowl, other than household pets, should be kept on the premises. Indoor feeding of pets is encouraged. Salt blocks should be prohibited.
2. Food storage: Food items, whether for humans or pets, should be kept in bear-resistant food and garbage storage containers or made unavailable to bears. Refrigerators used for food storage should be inside a closed building.
3. Food preparation and clean-up: When preparing food out-of-doors, such as for barbecues, it is important to clean up immediately afterwards to keep the area as free from food odors as possible. Ice chests and food containers use out-of-doors must be stored so they are unavailable to bears.
4. Garbage and refuse disposal: All garbage should be kept in bear-resistant containers, stored inside, and transported to an approved garbage transfer site regularly. Bear resistant containers are securable containers, constructed of solid non-pliable material capable of withstanding 200 pounds of energy. When secured and under stress, the container will not have any cracks, openings, or hinges that would allow a bear to gain entry by biting or pulling with its claws. Wood containers are not considered bear resistant unless they are reinforced with metal.
5. Human safety: Feeding bears and other wildlife for any purpose should not prohibited.
6. Reporting: Grizzly bear sightings and/or incidents should be reported within 24 hours to the District Ranger's Office in Ashton at (208) 652-7442.
7. Bird feeding, including seed, suet, and sugar water, should be discontinued when bears are active (typically March through November).

ROADS

The construction of roads should be minimized. Roads of varying sizes are often associated with habitat loss and fragmentation, increases in weedy species along roadsides, increases in noise and visual disturbance, and direct mortality.

OFF-ROAD VEHICLE USE

Control the use of any off-road vehicles such as all-wheel drives, motorcycles, all-terrain vehicles, and snowmobiles, except when necessary for specified activities on existing roads. This is very important so wildlife can adapt to *predictable* patterns of human use.

HERBICIDES

The use of chemical herbicides and pesticides are discouraged except for controlling noxious terrestrial weeds. Application of state-approved herbicides should be done responsibly by licensed and trained people. All label directions should be strictly adhered to.

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APPENDIX 1 – ATTACHMENTS

1) Location and topography of the Heritage Peaks property, Teton County, Idaho.

2) Aerial photograph depicting the location and site characteristics of the Heritage Peaks property, Teton County, Idaho.

3) Aerial photograph depicting USDA mapped soil types on the Heritage Peaks property, Teton County, Idaho.

4) Aerial photograph depicting surface hydrologic features on the Heritage Peaks property, Teton County, Idaho.

5) Aerial photograph depicting delineated wetlands on the Heritage Peaks property, Teton County, Idaho.

6) Aerial photograph depicting vegetative covertypes (associations) on the Heritage Peaks property, Teton County, Idaho.

7) Aerial photograph depicting the Teton County wildlife overlays on the Heritage Peaks property, Teton County, Idaho.

8) Aerial photograph depicting proposed development on the Heritage Peaks property, Teton County, Idaho.

LEVEL I NUTRIENT/PATHOGEN EVALUATION ADDENDUM FOR HERITAGE PEAKS SUBDIVISION

Prepared for:

D&R Roberts Family Limited Partnership

PO Box 417, Driggs, ID 83422

t: 307-690-1638

Project #10012-133-1

HARMONY
DESIGN & ENGINEERING

110 E. Little Avenue, PO Box 369

Driggs, ID 83422

T: 208-354-1331 F: 208-354-1332

July 5, 2010

TABLE OF CONTENTS

Full report is available upon request to Planning Dept.

1. INTRODUCTION

1.1. BACKGROUND

A Nutrient Pathogen (NP) Evaluation for the Heritage Peaks Planned Unit Development was prepared by Rocky Mountain Environmental (RME) dated March 4, 2009 and submitted to the Department of Environmental Quality (DEQ) for review. This Level I Nutrient Pathogen (NP) evaluation was conducted for a proposed subdivision that included 4 single family lots which were 1.00 to 1.62 acres in size and 12.33 acres of open space.

In response to the NP Evaluation by RME, comments were provided by DEQ in a letter dated March 25, 2009. Specifically the comments were:

1. The NP Evaluation does not discuss or address the fate transport of pathogens or their effects on ground water.
2. The NP Evaluation does not discuss or address the fate transport of phosphorous to the groundwater or adjacent Spring Creek. It is uncertain whether there exists a connection of ground water (either the shallow perched water (wetlands) or the upper unconfined aquifer) to the surface water of Spring Creek. Spring Creek is not a 303d listed stream and currently has no TMDL and has not been listed as water quality limited, however the USEPA Gold Book (USEPA, 1986) water quality guidelines values for total phosphorous should guide the evaluation if there exists a connectivity of either the shallow perch water or the upper unconfined aquifer to Spring Creek. The US EPA water quality value for phosphorous for streams is 0.100 mg/l.
3. The location and placement of the drain fields will be critical in meeting all of the Technical Guidance Manual (TGM) criteria. The Health District should be consulted for proper location of the drain fields per the TGM for Subsurface Disposal Systems.
4. The individual drain fields should also be modeled to assure compliance to any individual drinking water wells that may be located down gradient of the proposed drain field locations. The wells for lots 3, 4, and 5 are down gradient of the drain fields for lots 4 and 5.
5. The conclusions for the NP report should be more specific in what will actually be proposed as far as the number and size of lots and the level of treatment in order to meet the required limits at the compliance points. The plat should be updated to match the accepted or selected alternative from the NP evaluation.

In February 2010, the subdivision layout was modified and the current layout includes only two lots, 6.05 and 6.01 acres in size, and 6.63 acres of open space. This report has been prepared to respond to the comments made by the DEQ and to update the Level 1 NP Evaluation based on the revised subdivision plan.

Teton Basin 2001 to 2009 water quality monitoring program. FTR took samples three to four times each year from eleven monitoring locations in three hydrologic categories which included the main stem of the Teton River, valley-floor tributaries or "spring creeks", and headwater tributary background sites. Spring Creek at the project site would be expected to have similar characteristics to the five sampled valley-floor tributaries which include Woods Creek, Six Springs, Fish Creek, lower Fox Creek, and Warm Creek. Total nitrate plus nitrite (expressed as nitrogen) values for these five sites showed that measurements taken in June were not consistently lower than measurements taken throughout the rest of the year. Graphs of the FTR data are included in Appendix A.

The standard deviation of the FTR data taken from the valley-floor tributaries was 0.30 to 0.87 mg/L with an average standard deviation of 0.51 mg/L. Although we only have one recent measurement from Spring Creek, we can use the average standard deviation from the valley-floor tributaries to conclude that 68% of the nitrate concentration will range from 0 to 0.86 mg/L assuming that 0.35 mg/L is the average. Using the mass balance approach, the two proposed septic systems would increase the nitrate concentration by 0.006 mg/L to 0.866 mg/L in Spring Creek. The impact to the Teton River was evaluated using the same mass balance approach and using data collected by FTR in August 2003 which had one of the highest background concentrations and lowest stream flow rates. The result is an increase of 0.000 mg/L due to the large dilution effect of the Teton River.

To Groundwater:

The nitrogen mass balance spreadsheet provided by DEQ was used to evaluate the impact of nitrate contamination to the deeper water bearing aquifer. A maximum 1 mg/L increase in nitrate concentration at the point of compliance boundary (the western property line) was considered to be a negligible effect. In order to meet this requirement, both of the proposed home sites will need to use advanced treatment systems which reduce the nitrate concentration in the effluent to 27 mg/L.

Two recommended site layouts were analyzed. The first is similar to the proposed layout shown in Figure 6 with Lot 1 building and drainfield on the western portion of the property (Figure 11). The drawback to this layout is that wetlands will be disturbed in order to install the sewer line from the house to the drain fields. The second alternative is to locate both homes and drain fields on the eastern portion of the site (Figure 12). Both of these alternatives will result in 3.0 mg/L nitrate concentration at the downstream boundary which is meets the 1 mg/L increase.

4. CONCLUSIONS

Phosphorous, nitrate, and pathogen contamination to groundwater and surface water is unlikely if the two proposed septic tanks and drain fields for the Heritage Peaks Subdivision are properly designed, constructed, and maintained. Even if no attenuation or degradation of phosphates and nitrates occurs through the vadose zone, concentrations will not exceed 0.1 mg/L total

phosphate in Spring Creek and will result in less than 1.0 mg/L increase in nitrate concentration in the groundwater at the western property boundary.

Unfortunately, the surface water target total nitrogen concentration of 0.6 mg/L is exceeded in many locations throughout the upper Teton River basin (FTR, 2009). This includes Spring Creek with an estimated total nitrogen concentration of 0 to 0.86 mg/L. Several studies have concluded that the majority of the nitrate pollution in surface waters is due to agriculture impacts. In Teton County approximately 58% of residual nitrogen originates from fertilizers, 19% from cattle manure, 19% from legume crops, less than 5% from precipitation, and less than 1% from domestic septic systems (Rupert, 1996). The impact of the two proposed septic systems on nitrate concentration in both Spring Creek and the Teton River was analyzed using a mass balance approach and the results showed a 0.006 and 0.000 mg/L increase respectively. This increase can be considered negligible compared to the impact of agricultural runoff.

5. RECOMMENDATIONS

Given the presence of wetlands, irrigation canals, intermittent streams, perennial streams, and high groundwater on the project site, it is very important that the septic systems include advanced treatment and are professionally engineered, installed, and properly maintained. Having an adequate unsaturated zone below the septic drain field is critical to ensure that good aeration and slow travel of effluent is achieved through the soil. This is important to achieve adequate decomposition and die-off of pathogens, promote soil based removal of bacteria, and for adequate adsorption of phosphorous. Therefore, we recommend mounded drain field systems, either capping fill trench or sand mounds, and low hydraulic loading rates be used to create an adequate unsaturated zone.

Adequate separation distances and proper well construction is also recommended. For design soil group B-2 the required minimum separation distance from the bottom of the drain field to normal high groundwater is 4 feet and to seasonal high groundwater the minimum distance is 1 foot (DEQ, 2009). Horizontal separation of 200 feet is required between drain fields and permanent or intermittent surface water and a distance of 50 feet is required between drain fields and irrigation canals. Wells must be a minimum of 50 feet from the drain fields and should be constructed with adequate casing and sealing to prevent cross contamination between higher groundwater layers and the water bearing formation.

We recommend the preliminary plat shown in Figure 6 be modified to include drain field and culinary well placements for the two proposed lots as shown in either Figure 11 or Figure 12. The benefit of proposed layout alternative 2 shown in Figure 12 is that no wetlands will need to be disturbed for the installation of the sanitary sewer lines. The drain fields shown in Figures 11 and 12 are preliminary and based on size standards included in the TGM for a 4 bedroom home using 2.5 foot wide trenches.

The septic systems for the two proposed lots must include extended treatment system that achieve a nitrate concentration in the effluent of 27 mg/L in order for the two proposed to have a negligible effect on downstream nitrate concentration in groundwater. These systems along with the mounded drain fields should be designed by a professional engineer. A representative from the Eastern Idaho Public health department visited the site in 2003 and also recommended extended treatment and engineered sand mound systems.

At this time, we do not feel that further on-site investigation or reporting is necessary.

FLOOD PLAIN REPORT

Heritage Peaks Subdivision

D&R Roberts Family Limited Partnership

South half Nothwest quarter of
Section 34, Township 6 North, Range 45 East, B.M.,
Teton County, Idaho

Prepared By:

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Victor, ID 83455
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AW Engineering
Box 139, Victor, Idaho 83455
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Feb 16, 2011

Mr Reg Roberts
P.O. Box 417
Riggs, Idaho, 83422

Re; **Heritage Peaks Subdivision**
FEMA Flood Plain Report

Dear Reg:

We have revised the report and ran the HEC RAS program to support or conclusions as required by Williams Engineering. We have attempted to answer the Williams Eng's 10 issues shown in the 2/2/2011 review letter from them. We have resubmitted the report to Williams and to the Teton County. The County has informed us that we are on their agenda for March 9 at 5:00 pm.

We found from this further study that the 100 year flood plain included more area but did not affect the two building sites. Although Site 1 is not a foot above the determined BFE. To get a small or no flood insurance it will need to be filled to be over one foot above the BFE elevation.

We did do some additional cross sections in order to have the bridge data entered correctly. The topo map is close to what is on the property but is not real accurate because of the undulating ground especially in the creek bottom areas.

Site two on Lot 2 is over 4 feet above the shown BFE and does not appear to have any flood plain issues, as we had expected.

I hope this letter and report help us to proceed and get the 2 Lot subdivision completed. Please call if you have any questions.

Sincerely;

Arnold W Woolstenhulme

FLOOD PLAIN REPORT

Heritage Peaks Subdivision

S ½ NW 1/4 Sec 34, Twp 6 N, Rng 45 E, B.M.
Teton County, Idaho

prepared for

D & R Roberts Limited Partnership
P.O. Box 417
Driggs, ID 83422

Revised Feb 16, 2011

AW ENGINEERING
BOX 139
VICTOR, IDAHO 83455
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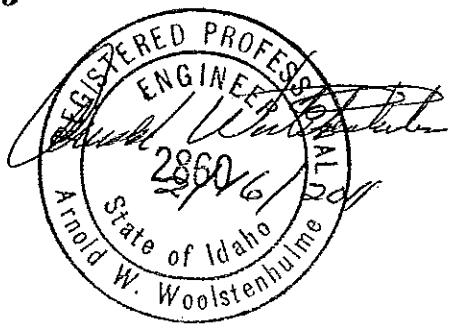


INDEX PAGE

HYDROLOGY REPORT

ENCLOSURES APPENDIX

1. SITE DESCRIPTION

The study was conducted on the 18 acres of land on which the proposed Heritage Peaks Subdivision is located, being in the S 1/2, of the NW 1/4 of Section 34, Top 6 N, Rng 45 E, B.M., Teton County, Idaho. This study was required because of FEM. and Teton County requiring any proposed subdivision of lands having 50 lots or over 5 acres and with flood plain issues will have to have a study done to determine, as a minimum, the Base Flood Elevation
(BFE) for each proposed house site. The study and surveying was done by AW Engineering for the Heritage Peaks subdivision on this land in November through January of 2010.

Spring Creek is a creek that is fed by springs, but has the North Fork and Middle Fork of Leigh Creek as a tributary that joins Spring Creek about one mile north of said property. The old historic creek channel appears to have meandered across the said property. The present channel in this property is stable with good vegetation along the banks.

Natural spring runoff for this creek is usually in June of each year.
Limited peak flow records exist on this particular stream.
From Williams Engineering recommendation the regression method available online USGS StreamStats program was run for this property with the stream junction at Highway 33 being the point of flow analysis. This report showed an area of 36.2 Sq miles, and a 100 year flow of 1580 cfs. AW from local sources and available local data had used 1550 cfs on the previous calculations.

The comparison of two steams in Teton County (Trail Creek and Teton Creek) showed the FEM. detailed study and the USGSStats
Regression program available on line that the online method over estimates the flow from 12 to 18 percent compared to the Detailed Study done by FEM. in 1988. AW used 1550 cfs to run the HEC RAS program evaluation, so it compared with the prior report and study.

The stream channel upstream is well defined and is channeled into the property by a bridge under State Highway 33. This bridge is 42 feet wide and 6 feet high. With a velocity of 6.2 ft / sec, the bridge could pass 1550 cfs of water. The bridge across the county road (30 ft wide x 6 ft high) is more restrictive. With a velocity of 7 ft / sec, this bridge could carry 1260 cfs.

The area has natural grasses and willows, shrubs, aspens and cottonwood trees growing along the creek channel. This natural vegetation can be a hindrance to stream flow during flooding conditions, because it can block the stream channels. Some of the higher ground has grasses with some sage brush growing on it.

The HEC RAS program shows the calculated velocity and cross sections as it calculated the BFE water surface and shows the water level of overtopping the County road and causing back water upstream about 120 feet onto the property. This does not affect either building site.

2. Flood Channel

AW Engineering has calculated the flow that may occur during a typical spring flooding scenario. The information and calculations follow:

Ran NRCS STREAMSTATS PROGRAM
Showed Q = 1580 cfs
Area of runoff 36.15 sq miles

AW Prior calculations and local experience the 1550 cfs of flow was used to run the HEC RAS program, to be able to compare it with the previous report.

100 YEAR FLOOD FLOW
Q = (c) (i) (a) = 100 Year flood flow
C = 0.0326 coefficient for flow across area
i = 2.60 rainfall for 100 yr 24 hr storm
A = 28.4 Sq Mi Area, or 18,176 acres of runoff, Taken from USGS top map for the runoff area.

Q = (0.0326 (2.60) (18,176) = 1,540 ac in per hr = 1,550 cfs
1 Ac in / hr = 1.008 cfs

EXISTING Bridge Across Hwy 33
Bridge 42' x 6 high x 6 ft / sec flow
Capacity is 1,510 cfs flowing full

CHANNEL FLOW
The channel averages 30' wide and about 3.0 feet deep and would carry 810 cfs at 8 ft / sec flowing full.

The amount of water overflowing the channel would be
1550 - 810 cfs = 740 cfs.
See Appendix Sheets for Cross Section Flow.

A NRCS Regression evaluation was done on South Leigh Creek at the County road 2000 West and it did not show any influence upon Spring Creek or on the said project property. Therefore no study was done evaluating any junction with South Leigh Creek for this project.

This confirms the field study and knowledge of the local conditions at this property and Leigh Creek Drainage.

CONCLUSIONS

1. The Project map showing the 100 yr flood plain and the BFE's for the two building sites is in Appendix " A". Calculated flood plain cross sections and data is shown in Appendix D - F after imputting the cross sections and running the FEMA He-Ras program to calculate the flow area. *See sheet in Appendix E*

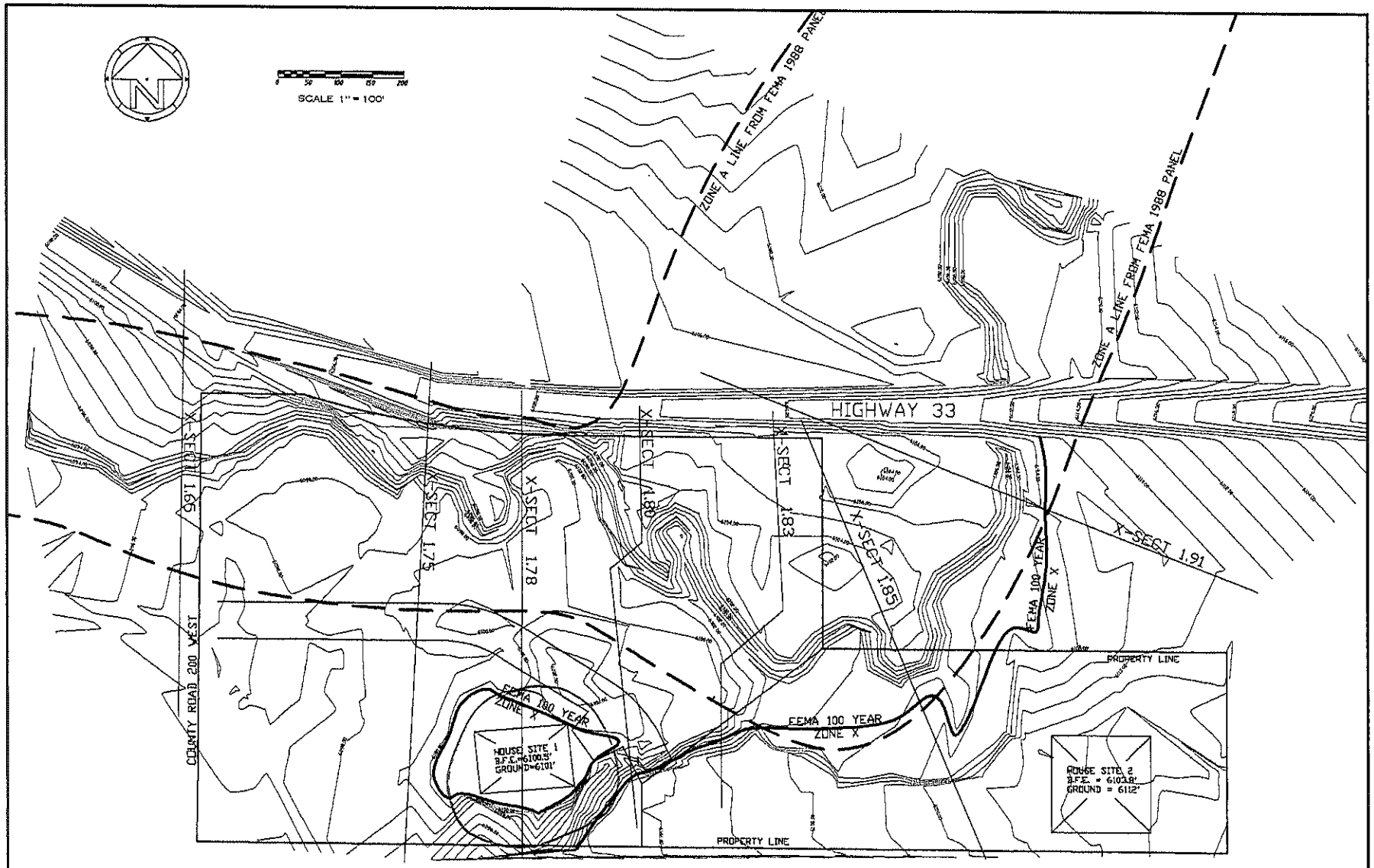
   The FEMA map panel was made without the aid of on ground or surveyed cross sectional data. Therefore there is some difference in the FEMA 1988 lines and the AW 2010 computed 100 year flood plain lines.

2. There is about ½ of this 18 acres parcel of land that would be in the defined flood plain. Neither of the building sites lie in the AW Computed 100 year flood plain. The detail topo map of the site along with the pertinent data is shown in the Appendix " B- G".

3. Calculations show the 100 year flood to be 1,550 cfs. This was used to calculated the BFE elevations at the two building sites. *Shown on Appendix B Map*

4. The existing bridge at the property inlet across State Highway 33 is 42 feet span could carry 1550 cfs of water with out over topping the highway.

5. The existing bridge at the property outlet across the County road is 26 feet span and it was included in running the HEC RAS program. The county road and bridge act as a dam across the channel. The cross section along County road 2000 West shows the road is 2.5 feet lower at 1000 feet to the south, which would allow the flood flow would run across the county road.



PART OF THE S 1/2 NW1/4 SECTION 34
T.6N. R.45E. TETON COUNTY IDAHO

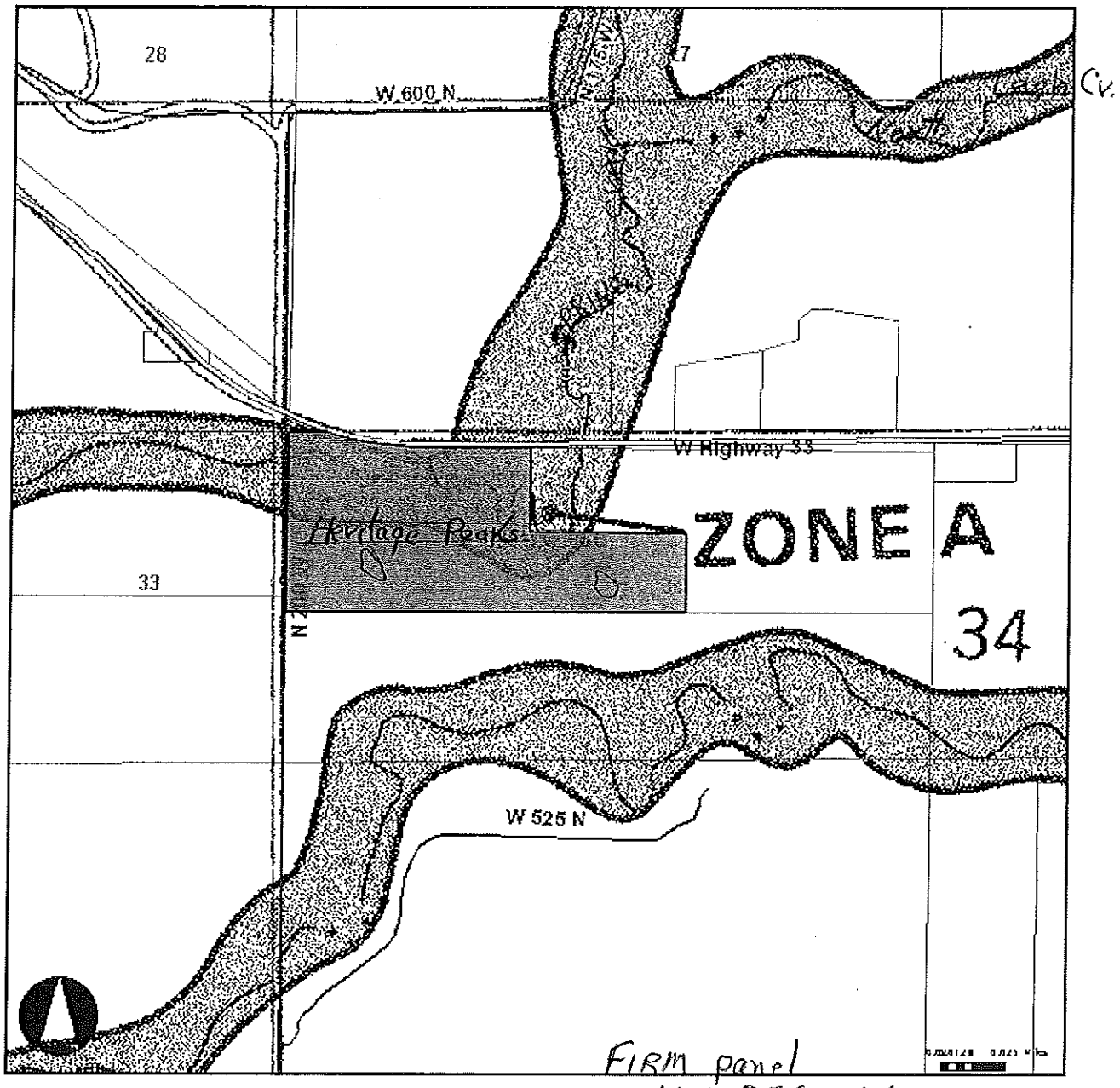
FLOOD PLAIN STUDY
HERITAGE PEAKS SUBDIVISION

REGINALD ROBERTS
P.O. BOX 417
DRIGGS, IDAHO 83422

AW ENGINEERING

SHEET 1 OF 1

FLOOD PLAIN



Parcels

Parcels

Preliminary Subdivisions

Roads

Forest Service

Forest Service

BLM

B.L.M.

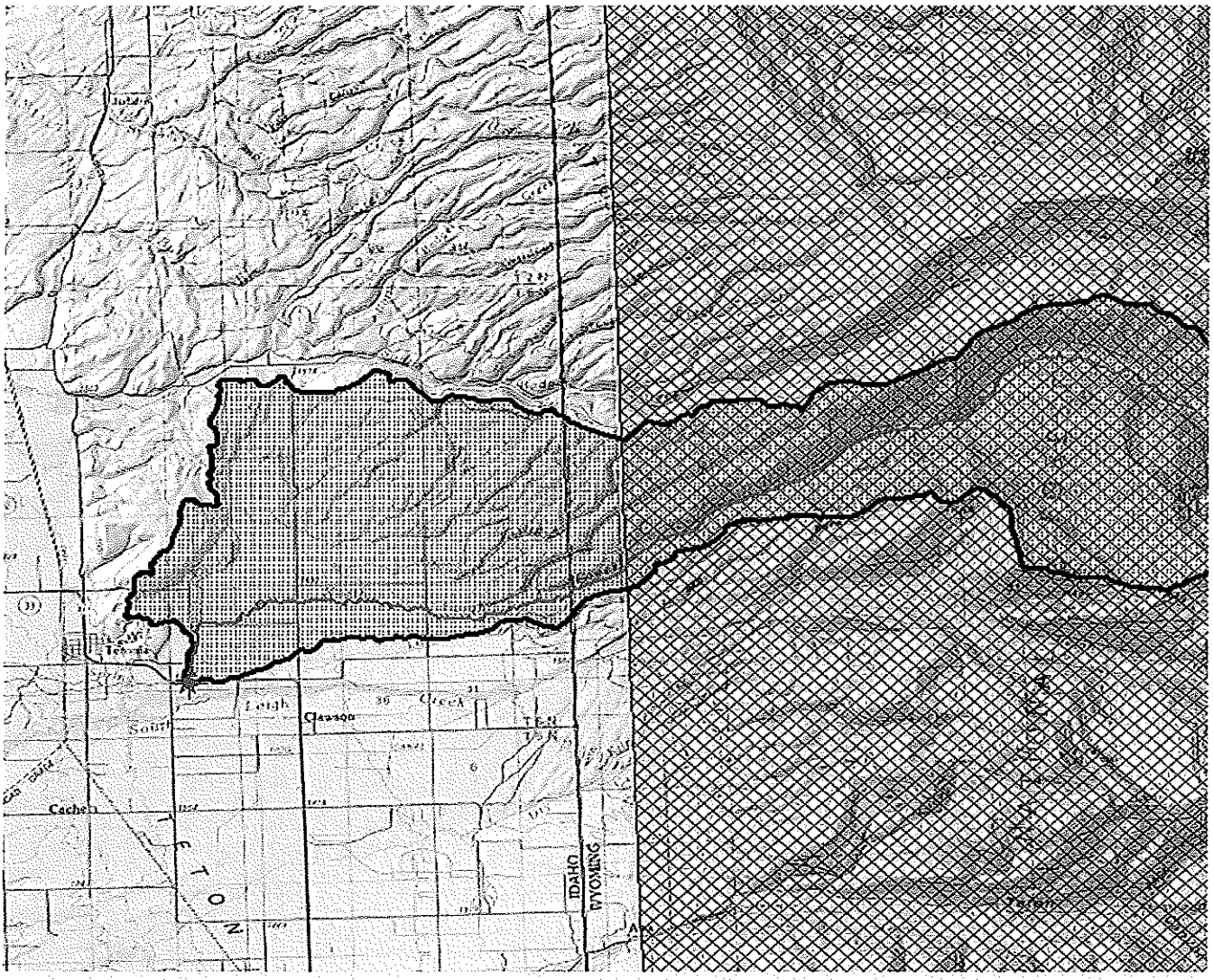
State Land

State of Idaho

B–1

USGS
Idaho StreamStats

StreamStats Print Page



2/15/2011 3:28:04 PM 36.2 Sq mi

1550-1580 cfs

C-1

USGS

Streamstats Ungaged Site Report

Date: Fri Feb 4 2011 09:03:45 Mountain Standard Time
Site Location: Idaho
NAD27 Latitude: 43.8066 (43 48 24)
NAD27 Longitude: -111.1353 (-111 08 07)
NAD83 Latitude: 43.8065 (43 48 23)
NAD83 Longitude: -111.1360 (-111 08 10)
Drainage Area: 36.15 mi2
Percent Urban: 0.6 %
Percent Impervious: 0.0602 %

Spring Cr / No Leigh Cr at Hwy 33 / Spring Cr Jct.

Teton Area

Teton Co, Id

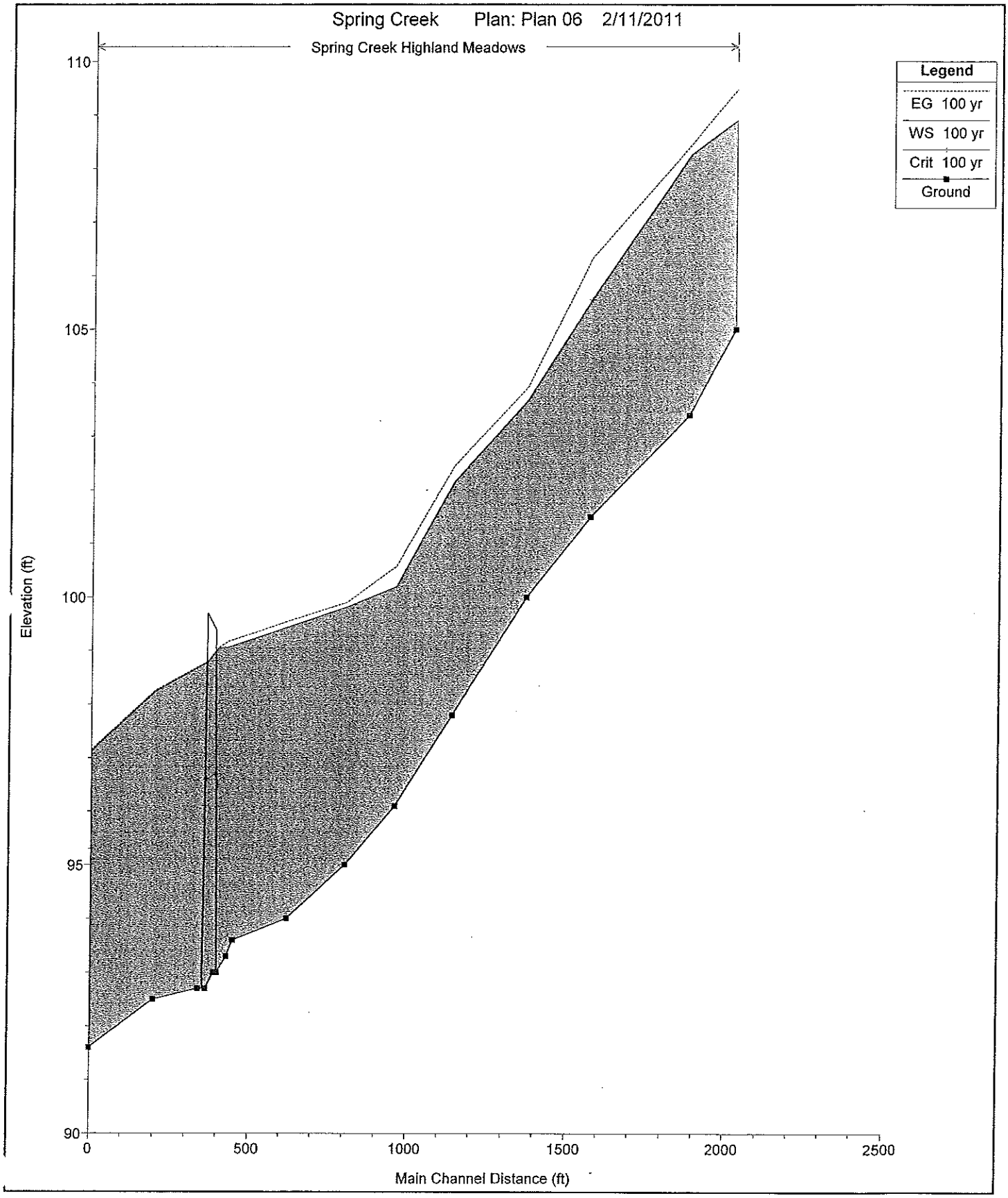
100% Peak Flow Region 8 (36.2 mi2)			
Parameter	Value	Regression Equation Valid Range	
		Min	Max
Drainage Area (square miles)	36.2	2.5	874.8
Mean Basin Slope from 30m DEM (percent)	20.1	5.1	53.6
Slopes gt 30pct from 30m DEM (percent)	22.3	1.2	88.7

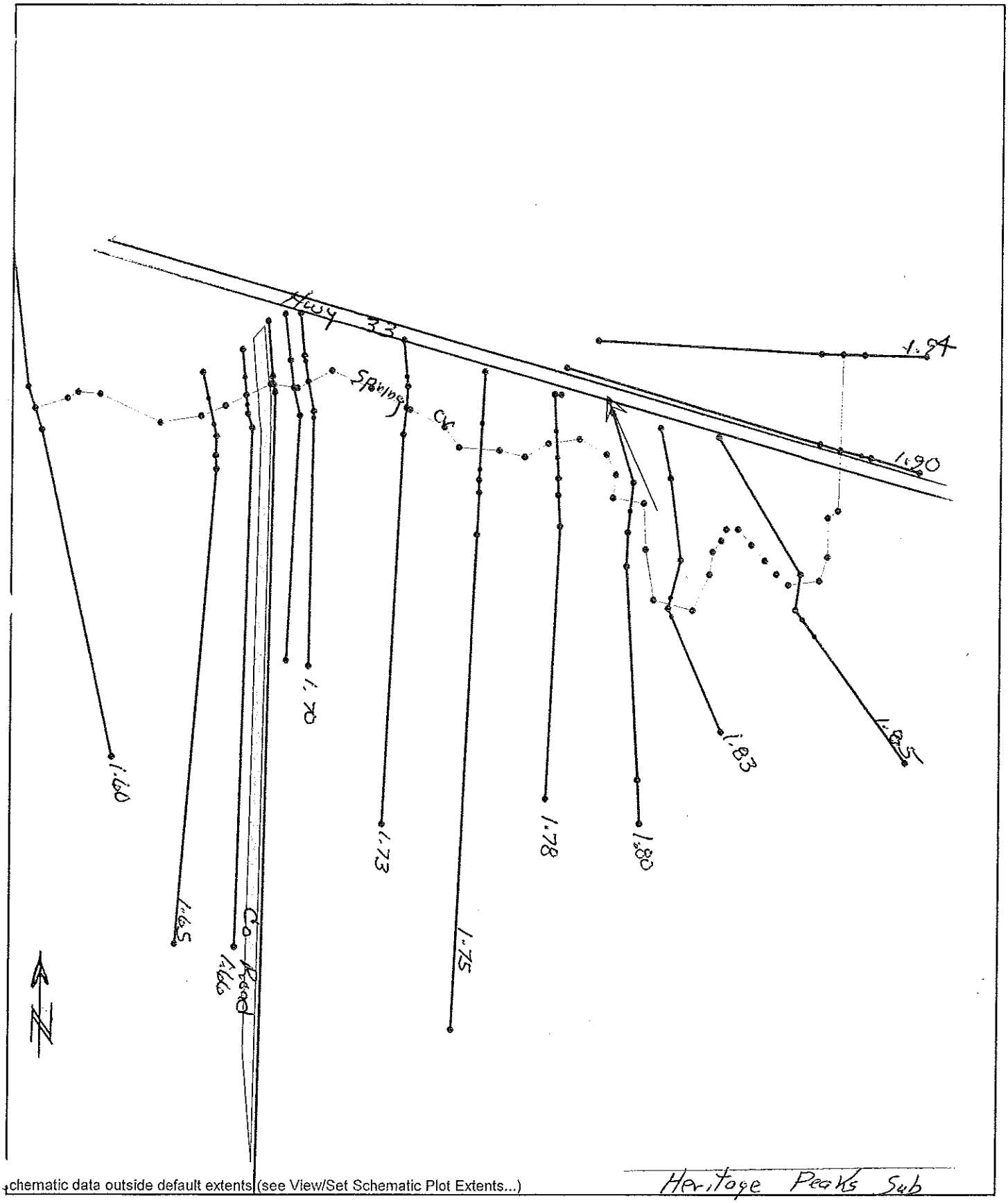
100% Low Flow Region 8 (36.2 mi2)			
Parameter	Value	Regression Equation Valid Range	
		Min	Max
Drainage Area (square miles)	36.2	6.6	874.8
Percent Forest (percent)	37	2.3	93.9
Mean Annual Precipitation (inches)	32.7	14.2	56
Mean Basin Elevation (feet)	7290	5691.9	8951
Mean Basin Slope from 30m DEM (percent)	20.1	6.15	53.2
Slopes gt 30pct from 30m DEM (percent)	22.3	1.2	86.6

100% Undefined Region (36.15 mi2)

The selected watershed is entirely in an area for which flow equations were not defined.

C-2


Spring Creek Plan: Plan 06 2/11/2011
Spring Creek Highland Meadows
Legend
EG 100 yr
WS 100 yr
Crit 100 yr
Ground
Elevation (ft)
110
105
100
95
90
0
500
1000
1500
2000
2500
Main Channel Distance (ft)



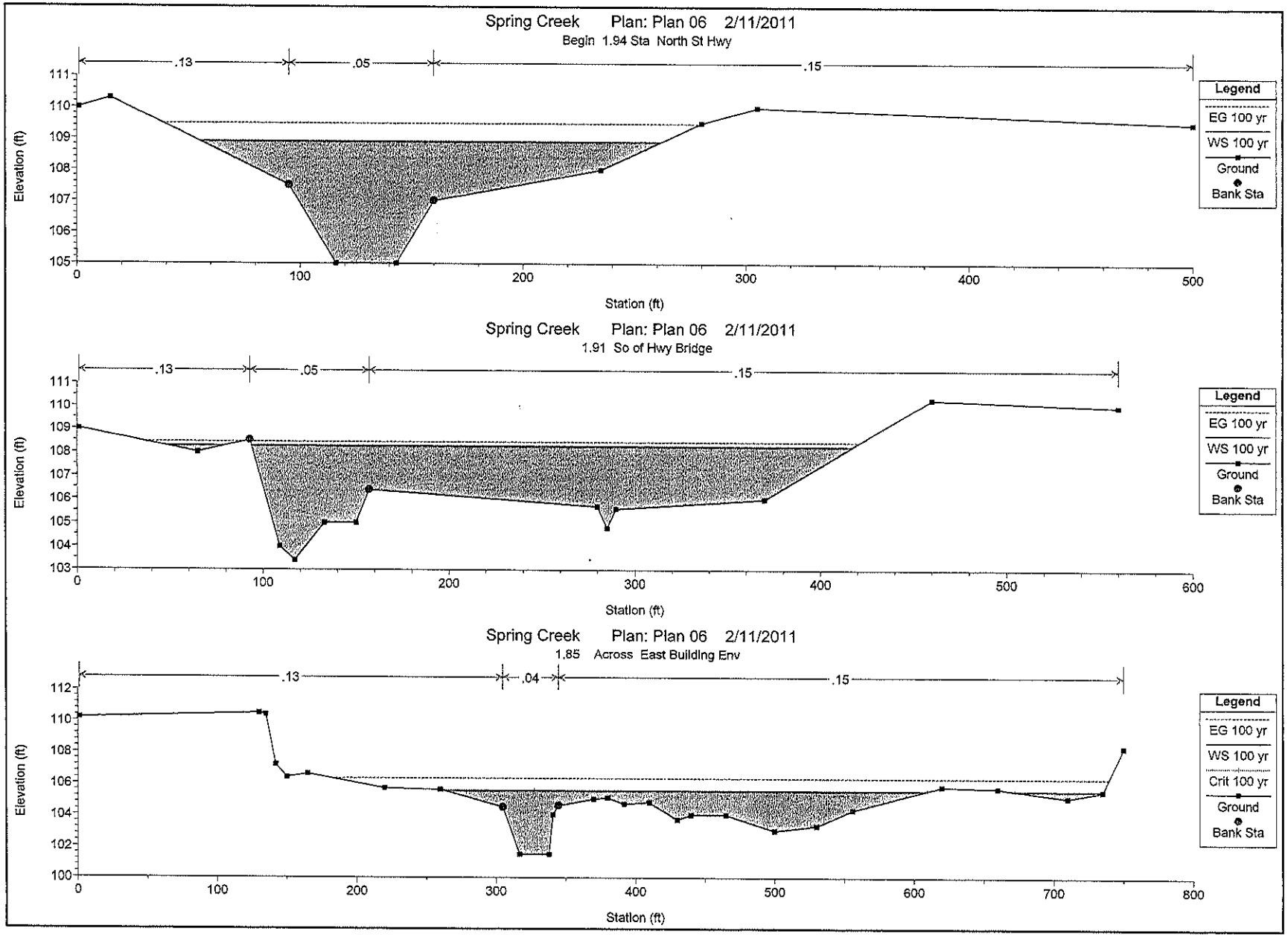
Soi. chematic data outside default extents (see View/Set Schematic Plot Extents...)

Heritage Peaks Sub

E-O

HEC-RAS Plan: Plan 06 River: Spring Creek Reach: Highland Meadows Profile: 100 yr

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Highland Meadows	1.94	100 yr	1500.00	105.00	108.90		109.47	0.009845	6.43	354.58	206.77	0.63
Highland Meadows	1.91	100 yr	1500.00	103.40	108.26		108.44	0.004436	4.33	763.90	354.80	0.42
Highland Meadows	1.85	100 yr	1550.00	101.50	105.55	105.55	106.32	0.011149	8.39	517.63	410.50	0.82
Highland Meadows	1.83	100 yr	1550.00	100.00	103.68		103.92	0.005004	5.54	664.28	343.20	0.55
Highland Meadows	1.80	100 yr	1550.00	97.80	102.15		102.44	0.008962	6.05	662.94	469.52	0.59
Highland Meadows	1.78	100 yr	1550.00	96.10	100.20		100.58	0.012581	6.18	515.73	458.20	0.59
Highland Meadows	1.75	100 yr	1550.00	95.00	99.82		99.91	0.001761	3.15	1401.13	826.92	0.27
Highland Meadows	1.73	100 yr	1550.00	94.00	99.45		99.55	0.002128	3.68	1274.26	679.48	0.30
Highland Meadows	1.70	100 yr	1550.00	93.60	99.11		99.21	0.001864	3.16	1039.33	498.43	0.28
Highland Meadows	1.69	100 yr	1550.00	93.30	99.07		99.18	0.001805	3.16	1031.71	497.59	0.28
Highland Meadows	1.68	100 yr	1550.00	93.00	99.06	96.49	99.06	0.004657	0.58	2664.81	1145.72	0.04
Highland Meadows	1.675		Bridge									
Highland Meadows	1.66	100 yr	1550.00	92.70	98.71		98.72	0.002280	0.47	1860.54	837.77	0.04
Highland Meadows	1.65	100 yr	1550.00	92.50	98.24		98.26	0.005087	0.67	1473.89	834.19	0.05
Highland Meadows	1.60	100 yr	1550.00	91.60	97.13	95.31	97.15	0.006105	0.73	1462.33	799.00	0.06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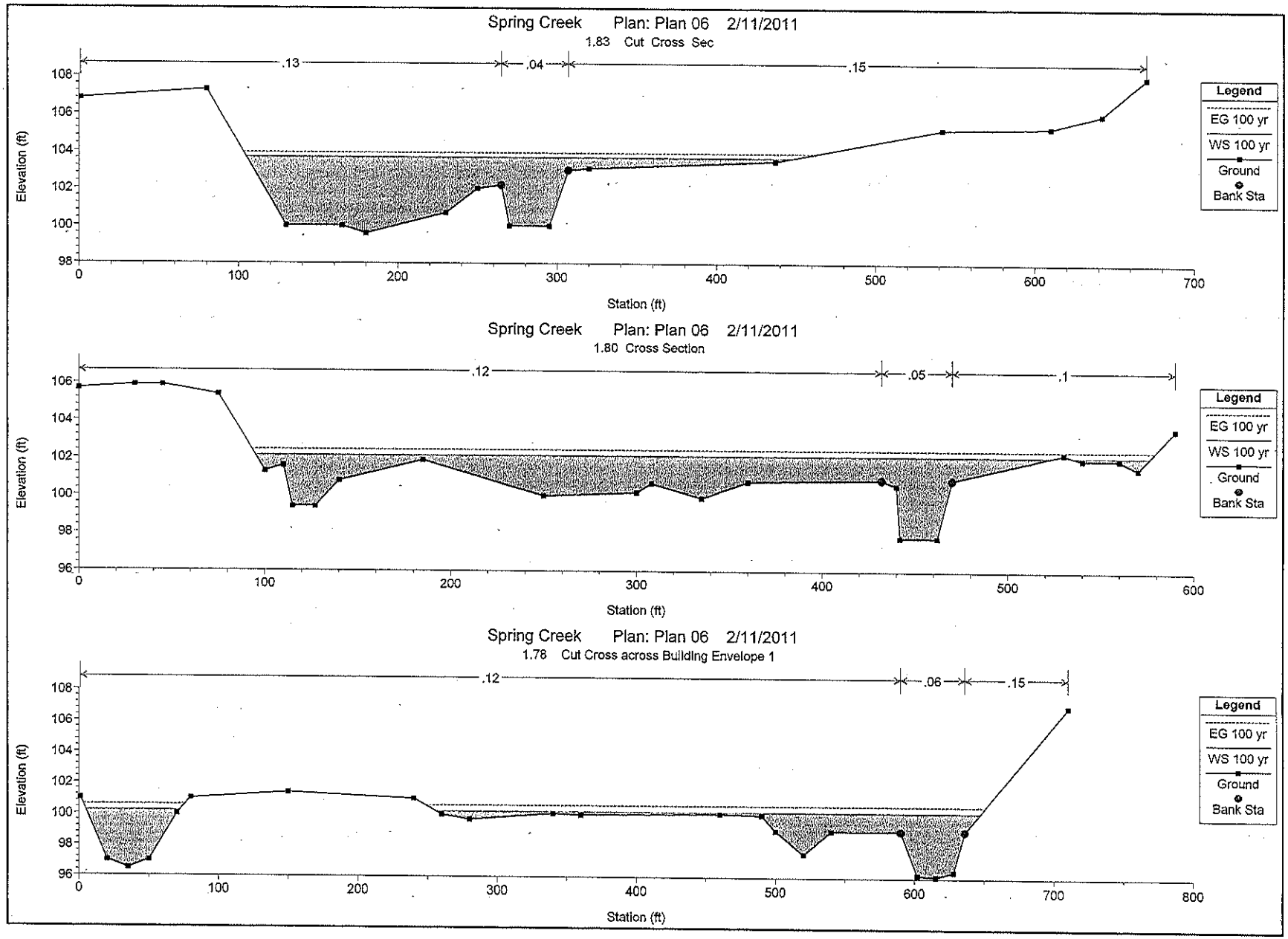
Begin 1.94 Sta North St Hwy
.13
.05
.15
Elevation (ft)
Station (ft)
Legend
EG 100 yr
WS 100 yr
Ground
Bank Sta
Spring Creek Plan: Plan 06 2/11/2011
1.91 So of Hwy Bridge
.13
.05
.15
Elevation (ft)
Station (ft)
Legend
EG 100 yr
WS 100 yr
Ground
Bank Sta
Spring Creek Plan: Plan 06 2/11/2011
1.85 Across East Building Env
.13
.04
.15
Elevation (ft)
Station (ft)
Legend
EG 100 yr
WS 100 yr
Crit 100 yr
Ground
Bank Sta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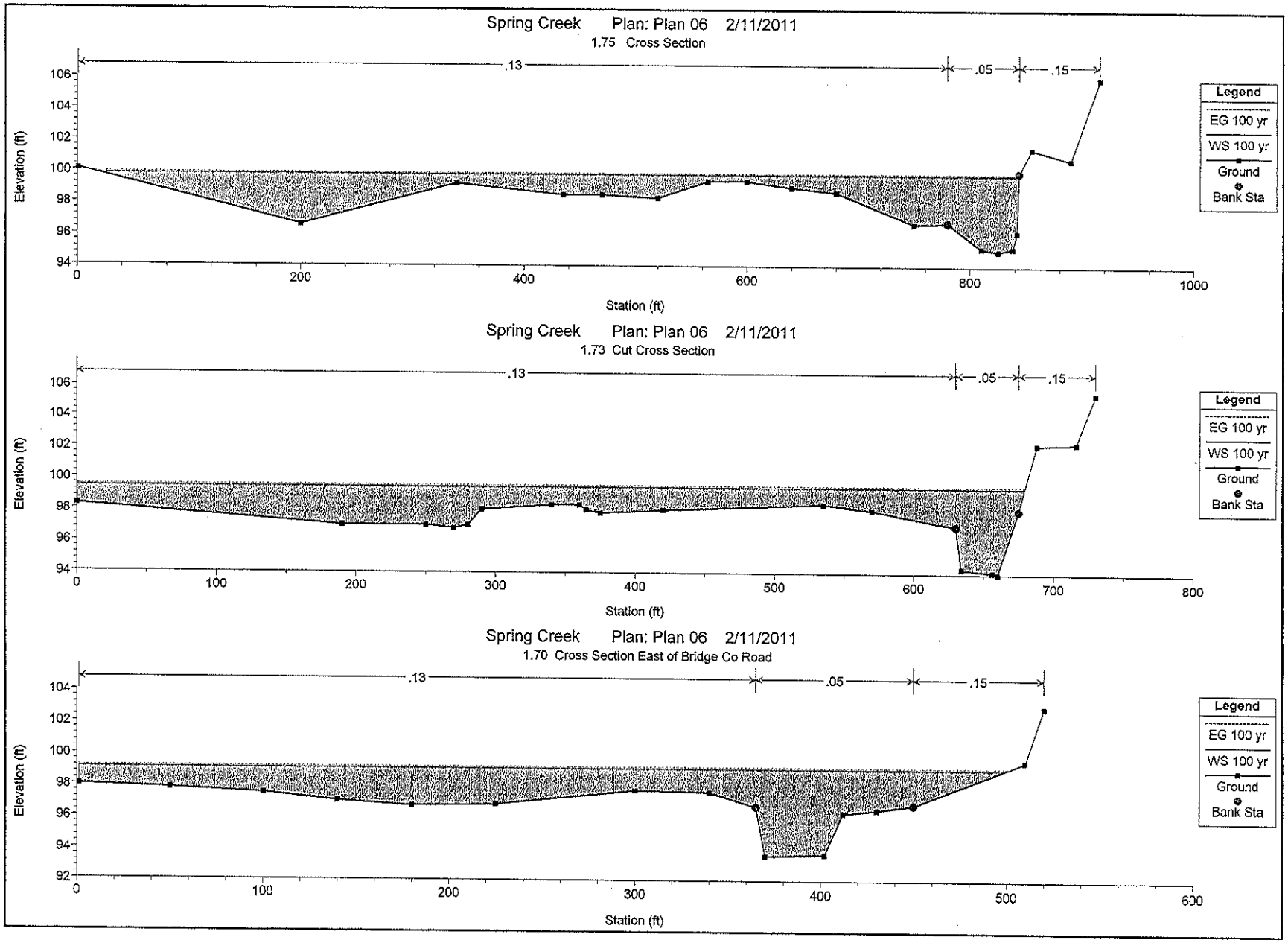
1.83 Cut Cross Sec
.13
.04
.15
Elevation (ft)
Station (ft)
Legend
EG 100 yr
WS 100 yr
Ground
Bank Sta
Spring Creek Plan: Plan 06 2/11/2011
1.80 Cross Section
.12
.05
.1
Elevation (ft)
Station (ft)
Legend
EG 100 yr
WS 100 yr
Ground
Bank Sta
Spring Creek Plan: Plan 06 2/11/2011
1.78 Cut Cross across Building Envelope 1
.12
.06
.15
Elevation (ft)
Station (ft)
Legend
EG 100 yr
WS 100 yr
Ground
Bank Sta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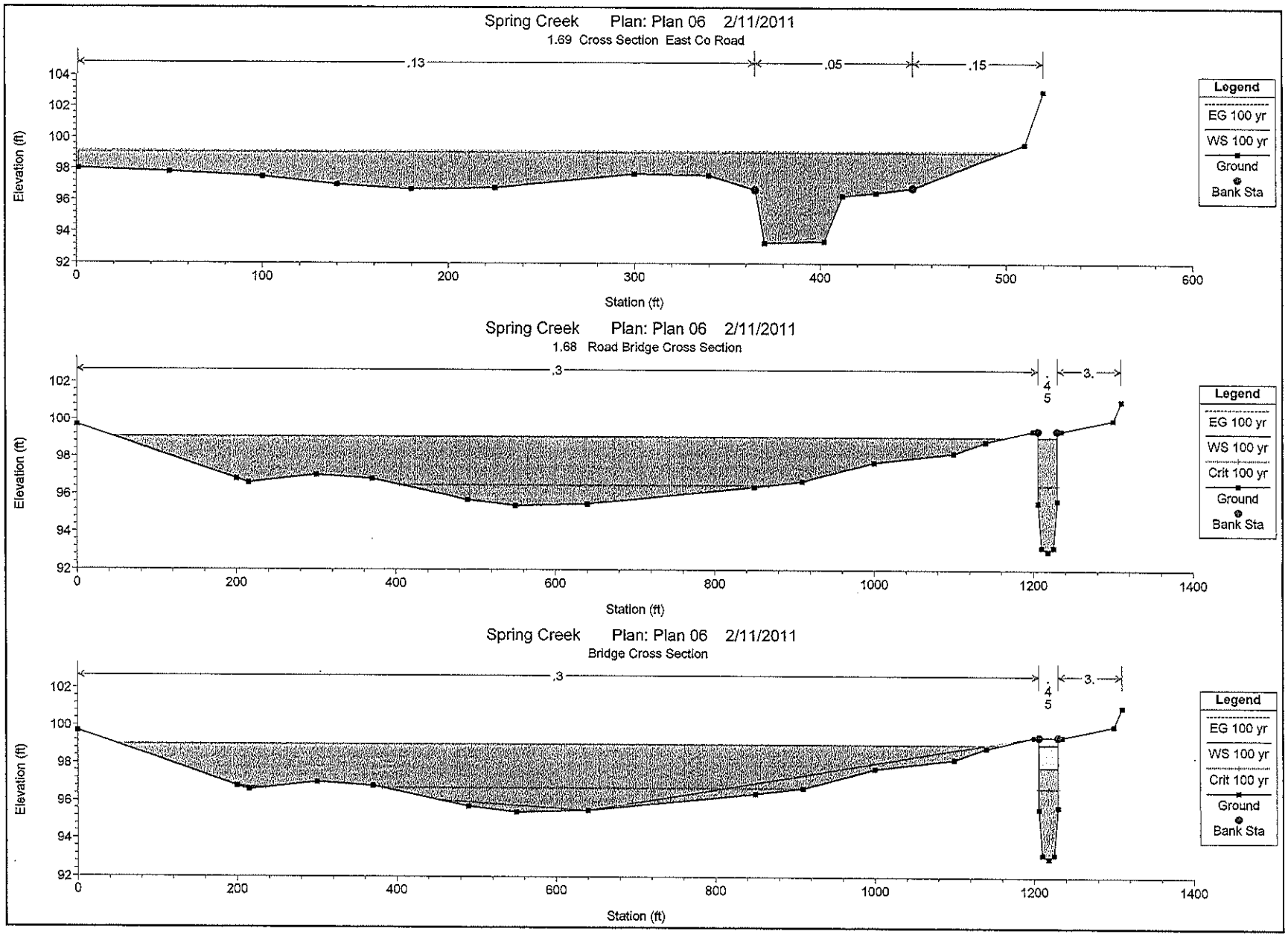
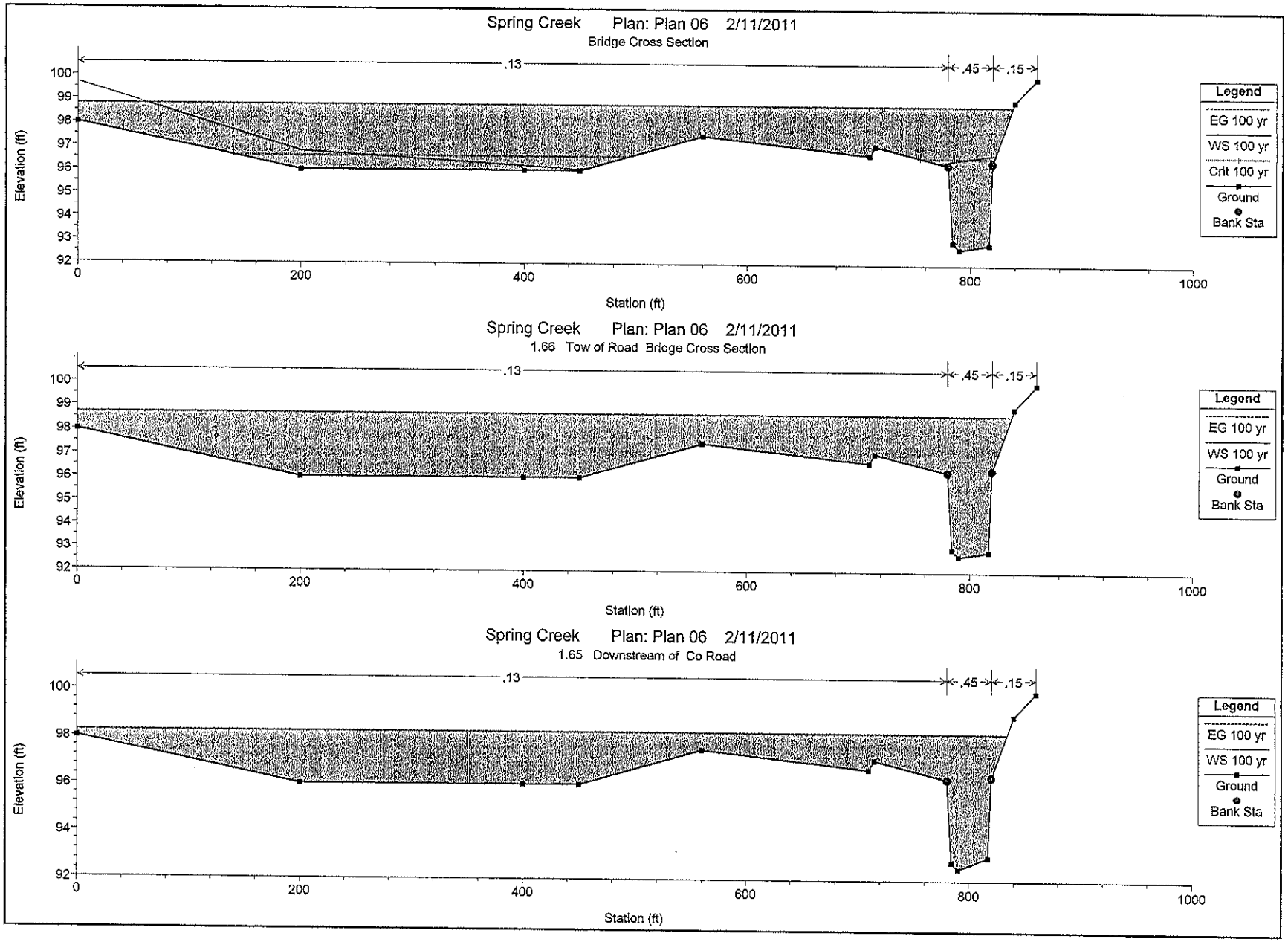
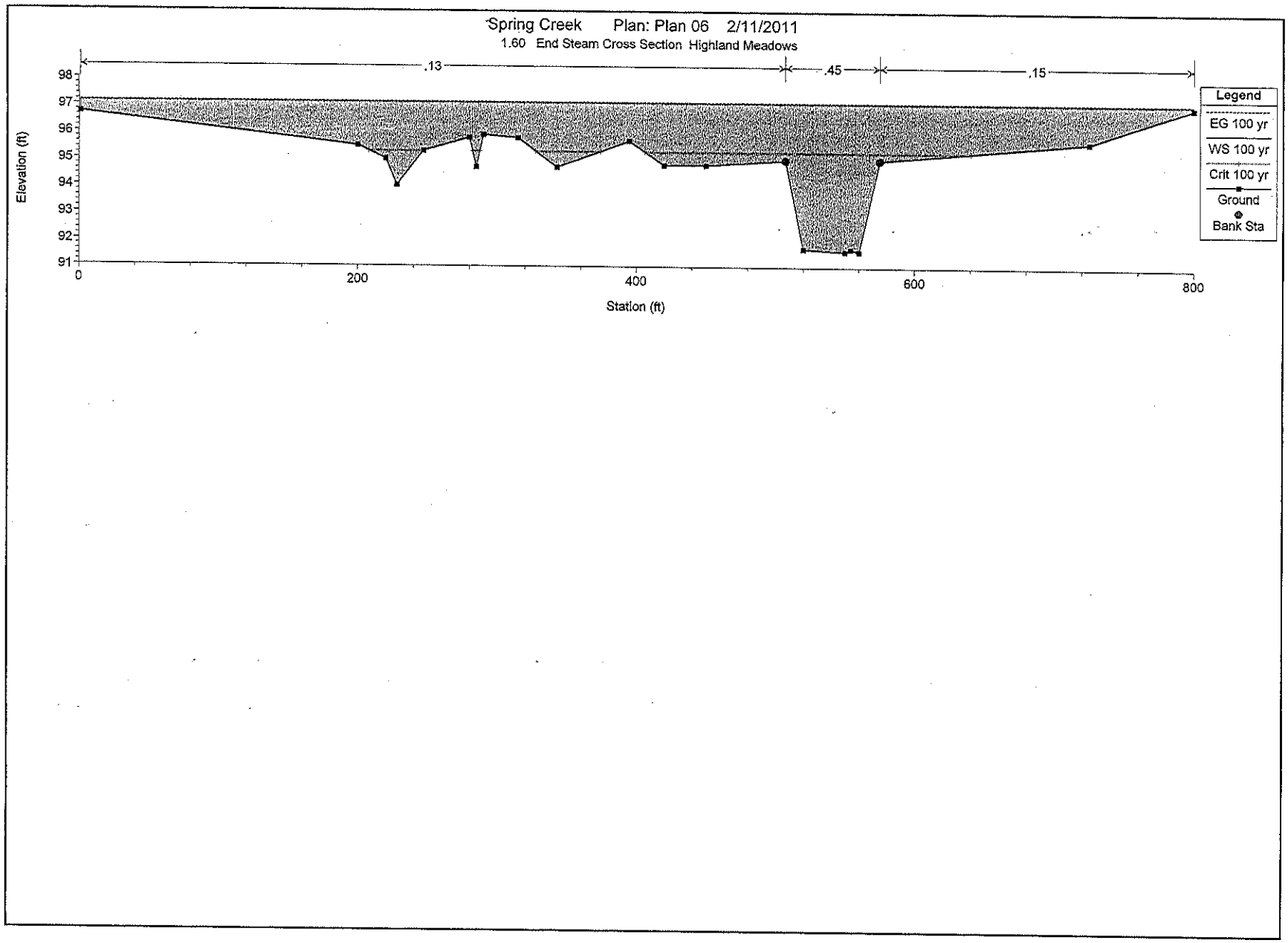
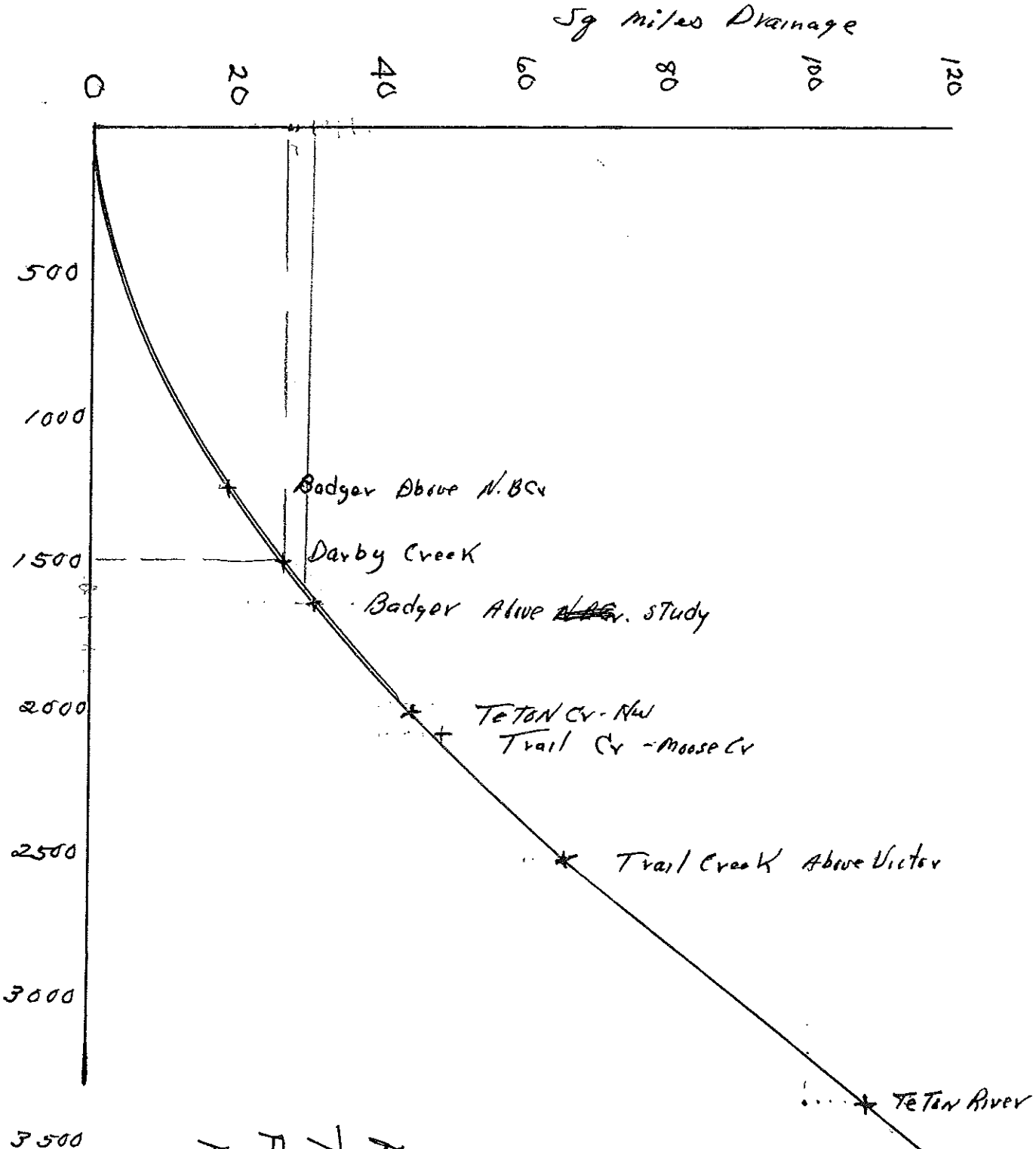
1.75 Cross Section
.13
.05
.15
Elevation (ft)
106
104
102
100
98
96
94
0
200
400
600
800
1000
Station (ft)
Legend
EG 100 yr
WS 100 yr
Ground
Bank Sta
Spring Creek Plan: Plan 06 2/11/2011
1.73 Cut Cross Section
.13
.05
.15
Elevation (ft)
106
104
102
100
98
96
94
0
100
200
300
400
500
600
700
800
Station (ft)
Legend
EG 100 yr
WS 100 yr
Ground
Bank Sta
Spring Creek Plan: Plan 06 2/11/2011
1.70 Cross Section East of Bridge Co Road
.13
.05
.15
Elevation (ft)
104
102
100
98
96
94
92
0
100
200
300
400
500
600
Station (ft)
Legend
EG 100 yr
WS 100 yr
Ground
Bank Sta


Spring Creek Plan: Plan 06 2/11/2011
1.69 Cross Section East Co Road
.13
.05
.15
Elevation (ft)
Station (ft)
Legend
EG 100 yr
WS 100 yr
Ground
Bank Sta
Spring Creek Plan: Plan 06 2/11/2011
1.68 Road Bridge Cross Section
.3
.4
.5
3.
Elevation (ft)
Station (ft)
Legend
EG 100 yr
WS 100 yr
Crit 100 yr
Ground
Bank Sta
Spring Creek Plan: Plan 06 2/11/2011
Bridge Cross Section
.3
.4
.5
3.
Elevation (ft)
Station (ft)
Legend
EG 100 yr
WS 100 yr
Crit 100 yr
Ground
Bank Sta


Spring Creek Plan: Plan 06 2/11/2011
Bridge Cross Section
.13
.45
.15
Elevation (ft)
Station (ft)
Legend
EG 100 yr
WS 100 yr
Crit 100 yr
Ground
Bank Sta
Spring Creek Plan: Plan 06 2/11/2011
1.66 Tow of Road Bridge Cross Section
Spring Creek Plan: Plan 06 2/11/2011
1.65 Downstream of Co Road


Spring Creek Plan: Plan 06 2/11/2011
1.60 End Steam Cross Section Highland Meadows
.13
.45
.15
Elevation (ft)
98
97
96
95
94
93
92
91
0
200
400
600
800
Station (ft)
Legend
EG 100 yr
WS 100 yr
Crit 100 yr
Ground
Bank Sta



Runoff
Teton Co
From Peak Discharge
FEMA 1989

F-1

G–1

G-2

Spring Creek
County Bridge Looking East

Spring Creek

State Hwy 33 n Looking South

G. 2of2

NOTE: THIS IS A REPRODUCTION OF TABLE I, APPENDIX A,
"DESIGN CHARTS FOR OPEN CHANNEL FLOW", (HDS #3)

	Manning's n range [1]
I. Closed conduits:	
A. Concrete pipe	0.011–0.013
B. Corrugated-metal pipe or pipe-arch:	
1. 2⅔ by ½-in. corrugation (riveted pipe): [3]	
a. Plain or fully coated	0.024
b. Paved invert (range values are for 25 and 50 percent of circumference paved):	
(1) Flow full depth	0.021–0.018
(2) Flow 0.8 depth	0.021–0.016
(3) Flow 0.6 depth	0.019–0.013
2. 6 by 2-in. corrugation (field bolted)	0.03
C. Vitrified clay pipe	0.012–0.014
D. Cast-iron pipe, uncoated	0.013
E. Steel pipe	0.009–0.011
F. Brick	0.014–0.017
G. Monolithic concrete:	
1. Wood forms, rough	0.015–0.017
2. Wood forms, smooth	0.012–0.014
3. Steel forms	0.012–0.013
H. Cemented rubble masonry walls:	
1. Concrete floor and top	0.017–0.022
2. Natural floor	0.019–0.025
I. Laminated treated wood	0.015–0.017
J. Vitrified clay liner plates	0.015
II. Open channels, lined [4] (straight alinement): [5]	
A. Concrete, with surfaces as indicated:	
1. Formed, no finish	0.013–0.017
2. Trowel finish	0.012–0.014
3. Float finish	0.013–0.015
4. Float finish, some gravel on bottom	0.015–0.017
5. Gunite, good section	0.016–0.019
6. Gunite, wavy section	0.018–0.022
B. Concrete, bottom float finished, sides as indicated:	
1. Dressed stone in mortar	0.015–0.017
2. Random stone in mortar	0.017–0.020
3. Cement rubble masonry	0.020–0.025
4. Cement rubble masonry, plastered	0.016–0.020
5. Dry rubble (riprap)	0.020–0.030
C. Gravel bottom, sides as indicated:	
1. Formed concrete	0.017–0.020
2. Random stone in mortar	0.020–0.023
3. Dry rubble (riprap)	0.023–0.033
D. Brick	0.014–0.017
E. Asphalt:	
1. Smooth	0.013
2. Rough	0.016
F. Wood, planed, clean	0.011–0.013
G. Concrete-lined excavated rock:	
1. Good section	0.017–0.020
2. Irregular section	0.022–0.027
III. Open channels, excavated [4] (straight alinement, [5] natural lining):	
A. Earth, uniform section:	
1. Clean, recently completed	0.016–0.018
2. Clean, after weathering	0.018–0.020
3. With short grass, few weeds	0.022–0.027
4. In gravelly soil, uniform section, clean	0.022–0.025
B. Earth, fairly uniform section:	
1. No vegetation	0.022–0.025
2. Grass, some weeds	0.025–0.030
3. Dense weeds or aquatic plants in deep channels	0.030–0.035
4. Sides clean, gravel bottom	0.025–0.030
5. Sides clean, cobble bottom	0.030–0.040
C. Dragline excavated or dredged:	
1. No vegetation	0.028–0.033
2. Light brush on banks	0.035–0.050
D. Rock:	
1. Based on design section	0.035
2. Based on actual mean section:	
a. Smooth and uniform	0.035–0.040
b. Jagged and irregular	0.040–0.045
E. Channels not maintained, weeds and brush uncut:	
1. Dense weeds, high as flow depth	0.08–0.12
2. Clean bottom, brush on sides	0.05–0.08
3. Clean bottom, brush on sides, highest stage of flow	0.07–0.11
4. Dense brush, high stage	0.10–0.14
IV. Highway channels and swales with maintained vegetation [6] (values shown are for velocities of 2 and 6 f.p.s.):	
A. Depth of flow up to 0.7 foot:	
1. Bermudagrass, Kentucky bluegrass, buffalograss:	
a. Mowed to 2 inches	0.07–0.045
b. Length 4–6 inches	0.09–0.05
2. Good stand, any grass;	
a. Length about 12 inches	0.18–0.09
b. Length about 24 inches	0.30–0.15
3. Fair stand, any grass:	
a. Length about 12 inches	0.14–0.08
b. Length about 24 inches	0.25–0.13
B. Depth of flow 0.7–1.5 feet:	
1. Bermudagrass, Kentucky bluegrass, buffalograss:	
a. Mowed to 2 inches	0.05–0.035
b. Length 4 to 6 inches	0.06–0.04
2. Good stand, any grass:	
a. Length about 12 inches	0.12–0.07
b. Length about 24 inches	0.20–0.10
3. Fair stand, any grass;	
a. Length about 12 inches	0.10–0.06
b. Length about 24 inches	0.17–0.09
V. Street and expressway gutters:	
A. Concrete gutter, troweled finish	0.012
B. Asphalt pavement:	
1. Smooth texture	0.013
2. Rough texture	0.016
C. Concrete gutter with asphalt pavement:	
1. Smooth	0.013
2. Rough	0.015
D. Concrete pavement:	
1. Float finish	0.014
2. Broom finish	0.016
E. For gutters with small slope, where sediment may accumulate, increase above values of *n* by	*0.002*
VI. Natural stream channels: [7]	
A. Minor streams [8] (surface width at flood stage less than 100 ft.):	
1. Fairly regular section:	
a. Some grass and weeds, little or no brush	0.030–0.035
b. Dense growth of weeds, depth of flow materially greater than weed height	0.035–0.05
c. Some weeds, light brush on banks	0.035–0.05
d. Some weeds, heavy brush on banks	0.05–0.07
e. Some weeds, dense willows on banks	0.06–0.08
f. For trees within channel, with branches submerged at high stage, increase all above values by	*0.01–0.02*
2. Irregular sections, with pools, slight channel meander; increase values given in 1a–e about	*0.01–0.02*
3. Mountain streams, no vegetation in channel, banks usually steep, trees and brush along banks submerged at high stage:	
a. Bottom of gravel, cobbles, and few boulders	0.04–0.05
b. Bottom of cobbles, with large boulders	0.05–0.07
B. Flood plains (adjacent to natural streams):	
1. Pasture, no brush:	
a. Short grass	0.030–0.035
b. High grass	0.035–0.05
2. Cultivated areas:	
a. No crop	0.03–0.04
b. Mature row crops	0.035–0.045
c. Mature field crops	0.04–0.05
3. Heavy weeds, scattered brush	0.05–0.07
4. Light brush and trees: [10]	
a. Winter	0.05–0.06
b. Summer	0.06–0.08
5. Medium to dense brush: [10]	
a. Winter	0.07–0.11
b. Summer	0.10–0.16
6. Dense willows, summer, not bent over by current	0.15–0.20
7. Cleared land with tree stumps, 100–150 per acre:	
a. No sprouts	0.04–0.05
b. With heavy growth of sprouts	0.06–0.08
8. Heavy stand of timber, a few down trees, little undergrowth:	
a. Flood depth below branches	0.10–0.12
b. Flood depth reaches branches	0.12–0.16
C. Major streams (surface width at flood stage more than 100 ft.): Roughness coefficient is usually less than for minor streams of similar description on account of less effective resistance offered by irregular banks or vegetation on banks. Values of *n* may be somewhat reduced. Follow recommendation in publication cited [8] if possible. The value of *n* for larger streams of most regular section, with no boulders or brush, may be in the range of	0.028–0.033

TYPICAL MANNING BASE "n" VALUES | TABLE "F-1a"

USGS

Streamstats Ungaged Site Report

Date: Fri Feb 4 2011 10:42:42 Mountain Standard Time
Site Location: Idaho
NAD27 Latitude: 43.8037 (43 48 13)
NAD27 Longitude: -111.1355 (-111 08 08)
NAD83 Latitude: 43.8036 (43 48 13)
NAD83 Longitude: -111.1363 (-111 08 11)
Drainage Area: 23.76 mi2
Percent Urban: 1.11 %
Percent Impervious: 0.0817 %

South Leigh Creek

100% Peak Flow Region 8 (23.8 mi2)

Parameter	Value	Regression Equation Valid Range	
		Min	Max
Drainage Area (square miles)	23.8	2.5	874.8
Mean Basin Slope from 30m DEM (percent)	27.5	5.1	53.6
Slopes gt 30pct from 30m DEM (percent)	35.8	1.2	88.7

100% Low Flow Region 8 (23.8 mi2)

Parameter	Value	Regression Equation Valid Range	
		Min	Max
Drainage Area (square miles)	23.8	6.6	874.8
Percent Forest (percent)	37	2.3	93.9
Mean Annual Precipitation (inches)	41.7	14.2	56
Mean Basin Elevation (feet)	7920	5691.9	8951
Mean Basin Slope from 30m DEM (percent)	27.5	6.15	53.2
Slopes gt 30pct from 30m DEM (percent)	35.8	1.2	86.6

100% Undefined Region (23.76 mi2)

The selected watershed is entirely in an area for which flow equations were not defined.

I-1

100% Low Flow Region 8 (23.8 mi2)			
Parameter	Value	Regression Equation Valid Range	
		Min	Max
Drainage Area (square miles)	23.8	6.6	874.8
Percent Forest (percent)	37	2.3	93.9
Mean Annual Precipitation (inches)	41.7	14.2	56
Mean Basin Elevation (feet)	7920	5691.9	8951
Mean Basin Slope from 30m DEM (percent)	27.5	6.15	53.2
Slopes gt 30pct from 30m DEM (percent)	35.8	1.2	86.6

Statistic	Flow (ft^3/s)	Prediction Error (percent)	Equivalent years of record	90-Percent Prediction Interval	
				Minimum	Maximum
PK1_5	146	74		48.8	438
PK2	175	69		61.6	497
PK2_33	192	68		69	536
PK5	249	64		93.6	664
PK10	296	63		112	777
PK25	349	63		133	918
PK50	385	63		145	1020
PK100	436	64		163	1160
PK200	473	65		175	1280
PK500	507	67		184	1400

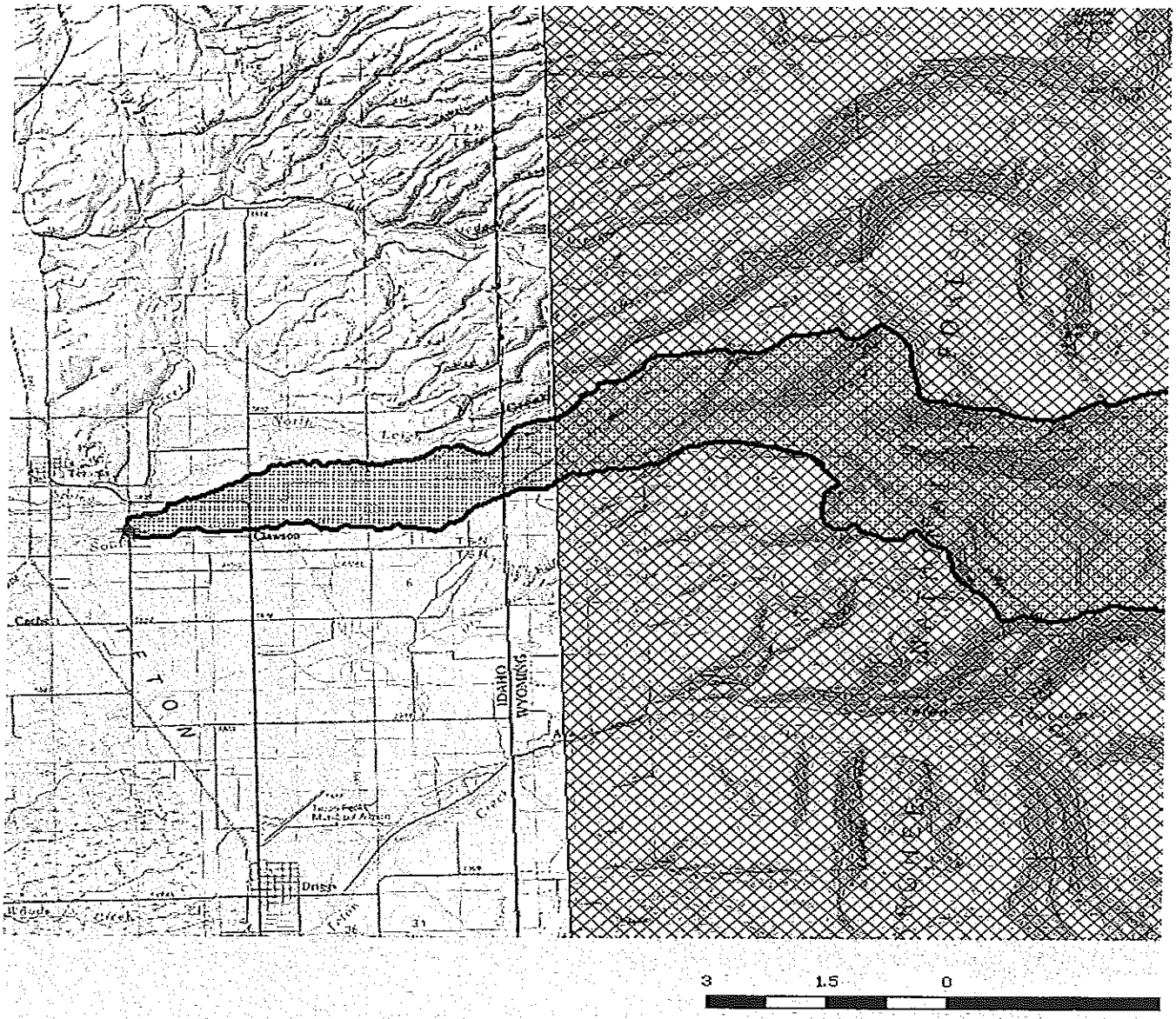
Statistic	Flow (ft^3/s)	Estimation Error (percent)	Equivalent years of record	90-Percent Prediction Interval	
				Minimum	Maximum
M1D10Y	5.87	49			
M7D10Y	6.52	29			
M7D2Y	8.58	32			
M30D5Y	7.39	28			

Statistic	Flow (ft^3/s)	Estimation Error (percent)	Equivalent years of record	90-Percent Prediction Interval	
				Minimum	Maximum

USGS Idaho StreamStats

StreamStats Print Page

South Leigh Creek



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I-3