NPS Form 10-900 OMB No. 1024-0018 (Expires 5/31/2020)

United States Department of the Interior
National Park Service

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Nat. Register of Historic Places
National Park Service

1052

National Register of Historic Places Registration Form

This form is for use in nominating or requesting determinations for individual properties and districts. See instructions in National Register Bulletin, *How to Complete the National Register of Historic Places Registration Form.* If any item does not apply to the property being documented, enter "N/A" for "not applicable." For functions, architectural classification, materials, and areas of significance, enter only categories and subcategories from the instructions. **Place additional certification comments, entries, and narrative items on continuation sheets if needed (NPS Form 10-900a).**

1. Name of Property

historic name Pilot Butte Canal Historic District (Cooley Road – Yeoman Road Segment)
other names/site number N/A
multiple property document N/A
(Enter "N/A" if property is not part of a multiple property listing)

2. Location

street & number Roughly bounded by Cooley Rd. to the north, Overtree Rd. to the east, Yeoman Rd. to the south, and Brightwater Dr. to the west ☐ not for publication
city or town Bend and unincorporated Deschutes County ☐ vicinity
state Oregon code OR county Deschutes code 017 zip code 97701

3. State/Federal Agency Certification

As the designated authority under the National Historic Preservation Act, as amended,

I hereby certify that this **X** nomination ___ request for determination of eligibility meets the documentation standards for registering properties in the National Register of Historic Places and meets the procedural and professional requirements set forth in 36 CFR Part 60.

In my opinion, the property **X** meets ___ does not meet the National Register Criteria. I recommend that this property be considered significant at the following level(s) of significance:

___ **national** ___ **statewide** **X** **local**

Christine Curran 12.18.15
Signature of certifying official/Title: Deputy State Historic Preservation Officer Date

Oregon State Historic Preservation Office
State or Federal agency/bureau or Tribal Government

In my opinion, the property ___ meets ___ does not meet the National Register criteria.

Signature of commenting official Date

Title State or Federal agency/bureau or Tribal Government

4. National Park Service Certification

I hereby certify that this property is:

entered in the National Register
determined eligible for the National Register
determined not eligible for the National Register
removed from the National Register
other (explain:)

Beth Savage (Acting Keeper) 2/8/16
Signature of the Keeper Date of Action

Pilot Butte Canal Historic District
(Cooley Road –Yeoman Road Segment) Deschutes Co. OR.
Name of Property County and State

5. Classification

Ownership of Property
(Check as many boxes as apply.)

- [X] private
- [ ] public - Local
- [ ] public - State
- [ ] public - Federal

Category of Property
(Check only **one** box.)

- [ ] building(s)
- [X] district
- [ ] site
- [ ] structure
- [ ] object

Number of Resources within Property
(Do not include previously listed resources in the count.)

Contributing	Non-contributing	
		buildings
		site
1	5	structure
		object
1	5	**Total**

Number of contributing resources previously listed in the National Register

0

6. Function or Use

Historic Functions
(Enter categories from instructions.)

AGRICULTURE/SUBSISTENCE:
Irrigation facility, canal

Current Functions
(Enter categories from instructions.)

AGRICULTURE/SUBSISTENCE:
Irrigation facility, canal

7. Description

Architectural Classification
(Enter categories from instructions.)

NO STYLE

Materials
(Enter categories from instructions.)

foundation: N/A
walls: N/A
roof: N/A
other: EARTH; STONE, basalt

Pilot Butte Canal Historic District
(Cooley Road –Yeoman Road Segment) Deschutes Co. OR.
Name of Property County and State

Narrative Description

(Describe the historic and current physical appearance and condition of the property. Describe contributing and non-contributing resources if applicable .Begin with **a summary paragraph** that briefly describes the general characteristics of the property, such as its location, type, style, method of construction, setting, size, and significant features. Indicate whether the property has historic integrity).

Summary Paragraph

The 1904 Pilot Butte Canal is located in Deschutes County, Oregon in the Upper Deschutes River Basin near the center of the state, east of the Cascade Mountain Range. Here the ponderosa pine forest transitions into the high desert, characterized by arid land, volcanic soils, junipers, sagebrush, and bitterbrush. The irrigation canal begins in Bend, the largest city in the region, population 78,280 today[1]. The canal flows generally north from the intake gate at the 1912 North Dam on the Deschutes River. The elevation at the diversion point is 3,561' and the canal drops about 631' in elevation, allowing the water to flow entirely by gravity.[2][3][4] The canal conveys water through a 225-miles-long distribution system of successively narrower and shallower laterals and ditches on its way to those who hold water rights, serving about 20,711 acres by 1922.[5] The Pilot Butte Canal diverts river water at a rate of 400 cubic feet per second.[6] Excepting the 4.5 miles that are now piped, the roughly trapezoidal-shaped open canal is made of native soil and irregularly shaped and sized rock. A distinctive characteristic of the canal is its wide variability in appearance throughout its 22-mile length. The canal ranges in width from 81' to 4' and in depth from 10' to 6" depending on the amount of water carried, the terrain, amount of basalt rock flows encountered, and slope. As water is delivered, the canal becomes smaller. The canal was built in an area that had a population of 81 people when it was constructed, but now runs through urban, commercial, industrial, and residential subdivisions in Bend and Redmond (population 26,590)[7], as well as some rural areas between the cities and at the end of the system. The nominated segment is nearly unaltered, was the most challenging to construct, and begins 2.4 miles from the river intake. It is mostly outside the Bend city limits in rolling, rocky terrain. The canal crosses from the southwest quarter through the northeast quarter of Township 17 South, Range 12 East, Section 15 W. M. The historic district measures 7,435 feet long and encompasses 50 feet on either side of the canal centerline to create a 100-foot corridor that includes all of the contributing resources. The elevation in the district drops a total of 37 feet. It contains the widest and deepest portions of the entire canal and displays the most variability in dimensions, ranging in width from 20 to 81 feet and in depth from 3 to 10 feet.[8][9] The primary purpose of the canal in the historic district is to convey the canal's full volume of water from the urban area to more arable land. Much of the historic setting, including native ponderosa pine, juniper trees and bitterbrush, remains undisturbed. The district has a character-defining rocky, uneven bed, and highly irregular slopes, angles, cuts, and embankments. The nominated section is interpretable, including its history and the narrative of the people who built it. Tool marks and the construction techniques used are evident. Solid basalt rock flows had to be blasted apart and moved. The water rushes around several rocky 90-degree turns, large rocks, and vegetated islands left in the bed. It looks and sounds like a natural watercourse. The district includes the contributing canal, a non-contributing historic, but altered, bridge; a non-historic flow-measuring weir; and three non-historic gates. Structures and landscaping within the district boundaries that are not related to the operation of the Canal and not noted as contributing features in this document are non-contributing resources. (See Figures 1, 2, 3, 4, 5, 7 and 10.)

[1] Oregon Blue Book, 2015, population of Bend in 2013.
[2] Energy Trust of Oregon, Inc. Open Solicitation, Juniper Ridge 3/27 MW Hydropower, January 23, 2008, page 1.
[3] Ibid.
[4] Google Earth 2014 web site.
[5] Federal Power Commission Report, 1922.
[6] Pat Kliewer, "A Legacy of Water", Redmond Spokesman Newspaper, April 19, 2000, page 13.
[7] Oregon Blue Book, 2015, population of Redmond in 2013.
[8] Kliewer Engineering and Associates, Bend, Oregon, Survey of Pilot Butte Canal in Historic District, October 2014.
[9] 400 cfs equals a flow of 2,992 gallons of water per minute.

The Pilot Butte Canal Historic District (Cooley Road – Yeoman Road Segment) has a distinctive natural appearance that is a direct result of the geology, use of native materials found in place, and time-consuming, difficult construction in challenging conditions.[10] Photographer looking north.[11]

Narrative Description

LOCATION, GEOGRAPHY, AND GEOLOGY OF THE PILOT BUTTE CANAL

General Geographic Location

The Oregon High Desert in Central Oregon slopes easterly from the Cascade Mountain Range which runs south-north from Northern California to British Columbia and through the center of Oregon. The lands irrigated by the Pilot Butte Canal slope to the east and north from the mountain range toward the Deschutes and Columbia Rivers. The water conveyed by the Pilot Butte Canal flows easterly from the south to north flowing Deschutes River and then northerly toward the east-to-west flowing Crooked River, a tributary of the Deschutes River. In addition to the majestic, snowcapped Cascade Mountain Range visible to the west, a 480-foot-tall cinder cone, Pilot Butte, which is a state park and a Bend landmark; and the 1,100-foot-tall Smith Rock in Smith Rock State Park along the Crooked River are each located within a mile of the canal and are visible from it. Three buttes adjacent to the canal include Aubrey Butte in Bend, Long Butte near Deschutes Junction (Deschutes Junction is along Highway 97 about 3.25 miles north of Bend and 6.5 miles south of Redmond.), and Forked Butte in Redmond. Tetherow Butte separates Redmond from the community of Terrebonne where the canal turns east. The canal begins at the Deschutes River along the eastern base of Awbrey Butte and runs closely along the eastern bases of the other buttes. Powell Buttes, elevation of about 5,100 feet, frames the east side of the farming area and other buttes rise to the north. Newberry National Volcanic Monument is located just south of Bend. It was created within the boundaries of the Deschutes National Forest and includes 50,000 acres of lakes, lava flows, and spectacular geologic features in Central Oregon.[12] The three agricultural areas served by the canal and its laterals are relatively flat areas between Deschutes Junction and Redmond, Redmond and Terrebonne, and Redmond and the Crooked River. (See Figure 7.)

[10] Dubuis, John, Dec. 1, 1914, Report to Desert Land Board on Central Oregon Project, State Printing Department, 1915; and Energy Trust of Oregon, Inc. Open Solicitation, Juniper Ridge 3/27 MW Hydropower, January 23, 2008, page 1;Google Earth 2014 web site; Pat Kliewer Interview with COID General Manager Ron Nelson, April 2000; Oregon State Engineer, United States Department of the Interior, Bureau of Reclamation, “Deschutes Project”, December 1914, UC Berkley Library. page 110.

[11] Unless otherwise noted, all photos were taken by Patricia A. Kliewer between February and October 2015.

[12] Wikipedia, .org/wiki/Newberry Volcano.

Geology

The Deschutes Country presented challenging geological conditions for canal construction. The Deschutes Soil and Water Conservation District states *in Deschutes County Rural Living Handbook, a Resource for Country Living and Land Stewardship, "*In Deschutes County, geology includes basalt bedrock, pumice rock, volcanic ash, glacial deposits, and materials deposited by water. The majority of soils occur over basalt bedrock with a mantle of sandy pumice volcanic ash. Due to the volcanic ash, the soils tend to be fragile and are susceptible to wind and water erosion when not adequately protected. Soils are composed of clay, silt, and sand."[13]

Cities and Highways

In addition to the cities of Bend and Redmond, the small unincorporated community of Terrebonne, located about two miles directly north of Redmond, is served with water from the Pilot Butte Canal irrigation system. The north-south US Highway 97 runs through Central Oregon and all three communities. The Pilot Butte Canal crosses under the highway in a pipe in three places, within 100 feet of the North Dam in Bend at Deschutes Junction and the northern end of Redmond.

Source of Water for Irrigation—the Deschutes River

The water for the Pilot Butte Canal is diverted from the Deschutes River at an elevation of 3,561 feet near the center of Bend, within walking distance to City Hall, the historic downtown, modern motels, and a shopping center. The 252-mile-long Deschutes River is a major tributary of the Columbia River. The Deschutes River flows north from Little Lava Lake in southern Deschutes County, about 23 miles southwest of Bend, to the Columbia River, near Biggs Junction. Within the city of Bend, much of the water in the river is diverted for irrigation by several irrigation districts. Swalley Irrigation Canal that serves the area just west of the Pilot Butte Canal, the North Unit Irrigation Canal that serves Jefferson County to the north of the Crooked River, and the Pilot Butte Canal all divert water from the river at the North Dam. Other canals, including the Arnold Canal and the Central Oregon Canal, divert water from the river upstream, at the southern end of Bend. Other important sources of water for irrigation are the Crane Prairie Reservoir (42 miles southwest of Bend) and the Wickiup Reservoir (60 miles southwest of Bend), both located west of La Pine in southern Deschutes County. The source of the Deschutes River is 8.4 miles west of Crane Prairie Reservoir. The river flows in and out of each reservoir. When full, Crane Prairie Reservoir, built in 1922 and rebuilt by the Bureau of Reclamation in 1940, covers an area of seven square miles.[14] Construction began on the Wickiup Reservoir in 1938 as a Civilian Conservation Corp Project, and it was completed in 1949. It is the second largest reservoir in Oregon and it holds 53,300 acre-feet of water and covers 4,940 acres.[15] Water from the reservoir is used to augment flows in the Deschutes River and meet water allocations during irrigation season, including water for the Pilot Butte Canal.

Location of Pilot Butte Canal from the North Dam on the Deschutes to the Crooked River

The Pilot Butte Canal flows 22 miles from the North Dam near downtown Bend to the Crooked River. The North Dam and North Canal were built at the northern edge of Bend in 1912 to replace the original intake of the Pilot Butte Canal south of Bend in order to increase flow in the river through the city of Bend. The short and partially-piped North Canal conveys water from the river for the initial 1.5 easterly-flowing miles where it joins the wider and shallower 1904 Pilot Butte Canal and turns northerly. The canal remains within three miles of the Deschutes River, nearly paralleling it, as the canal heads north through Bend and Redmond. The canal again turns east at the north end of Redmond and ends a half mile south of the Crooked River and about seven miles east of the Deschutes River. (See Figures 1, 2, 3, 10 and 13.) The elevation at the diversion point is 3,561 feet and the canal drops about 631 feet in elevation to its end, allowing the water to flow entirely by gravity.[16][17][18]

[13] Deschutes Soil and Water Conservation District, Deschutes County Rural Living Handbook, 2011, page 16.
[14] Lewis L. McArthur, Oregon Geographic Names, Sixth Edition, 1992, pages 216-7, 905.
[15] Robert Autobee, Deschutes Project, Bureau of Reclamation, 1996, pages 1-12.
[16] Energy Trust of Oregon, Inc. Open Solicitation, Juniper Ridge 3/27 MW Hydropower, January 23, 2008, page 1.
[17] Ibid.
[18] Google Earth 2014 web site.

Purpose of the Water Delivered by the Pilot Butte Canal

For 111 years, under the 1900 water right to the Pilot Butte Development Company, the Pilot Butte Canal has delivered irrigation water from the Deschutes River to reclaim (irrigate) arid land between Bend and Redmond and around the community of Terrebonne in Deschutes County. The canal and its promoters attracted homesteaders, ranchers, farmers, and other settlers to the area. The canal was primarily constructed between 1903 and 1905 by the Deschutes Irrigation and Power Company. Forty acres were irrigated in June 1904 when water reached Levi Wiest's homestead, just east of the townsite of Bend."[19] Today, that homestead is within the urban area of Bend. The Pilot Butte Canal flows continuously for six months during the irrigation season, generally April 15 to October 15, depending on the weather, and for a few days every five to six weeks, called stock runs, during the late fall, winter, and early spring.[20] Typically, flows vary by the amount of irrigation water needed due to the weather, the snowpack on the Cascade Mountains to the west, and the stage of crop development.

Users of the Irrigation Water

Water conveyed by the Pilot Butte Canal has a variety of beneficial uses. It irrigates crops that can grow in the high desert, including potatoes, lavender, peppermint, and horticultural plants, but it is primarily used to irrigate hay and grass pastures on small acreage. "Deschutes County has a wide range of growing seasons because of elevation differences. Frost can happen at any time during the short growing season. Climate definitely limits crop production." Bend and Redmond receive between 8" and 14" of precipitation annually on average.[21] "Hay and pasture have always been the main irrigated crops and are the foundation of the livestock industry, with 35,000 to 40,000 acres grown annually for at least the last 30 years."[22] In addition to agricultural uses, the water is delivered to the city of Redmond to irrigate its parks, schoolyards, and a cemetery.[23] It fills cisterns and stock ponds and irrigates golf courses and residential landscaping.

PILOT BUTTE CANAL HISTORIC DISTRICT (COOLEY ROAD – YEOMAN ROAD SEGMENT)

Nearly unaltered stretch of the Pilot Butte Canal in the distinctive Historic District displaying its historic setting and appearance. Photo taken looking south.[24]

[19] Frank R. Becker, 'A Report on the Central Oregon Irrigation District by Frank R. Becker, Assistant State Engineer, Under the Direction of Rhea Luper, State Engineer, October 19, 1924.
[20] Central Oregon Irrigation District website, www.coid.org.
[21] Deschutes Soil and Water Conservation District, Deschutes County Rural Living Handbook, 2011, pages 3 and 4.
[22] Ibid., page 5.
[23] Interview with Redmond Public Works Department, April 24, 2015.
[24] Photo taken by Aleta Warren in September 2015.

District Boundary

Most of the Pilot Butte Canal Historic District is located immediately outside the northeastern city limits of the city of Bend. The city limit line, for about 3/8 mile, follows the canal in the southwestern quarter of Section 15. In that quadrant, a portion of the western half of the canal is located in the city and the eastern half is located in the rural county. (See Figures 1, 2, 3, and 5.) The nominated segment of the canal is approximately 7,435 feet long and flows diagonally south to north across the length of Section 15 (T17S, R12E, S15 W. M.). The historic district is 100 feet wide, 50 feet from the centerline on each side of the canal. The nominated district includes just over 17 acres. About 1.6 acres are within Bend and the remaining 15.40 acres are in rural Deschutes County. The 100 feet total width of this historic district is adequate to include the main canal and its embankment and all contributing features. The historic district is bounded on the south by the Section Line between Sections 15 and 22 in T17S, R12E, W. M. at the northern right-of-way of Yeoman Road. The district is bounded on the north by the Section Line between Section 15 and Section 10 in T17S, R12E, W. M., at the extension of Cooley Road. The district is bounded on the west by a line paralleling the centerline of the canal, 50’ west of that centerline. The district is bounded on the east by a line paralleling the centerline of the canal, 50’ from that centerline of the canal. A street in the southern half of the district on the west side of the district is Brightwater Drive. Old Deschutes Road in the southern half of Section 15 and Overtree Road in the northern half of Section 15 are east of the district. Only one road crosses the district, the 1902 Old Deschutes Road. It is a two-lane, paved, rural, north-south road near the center of the district. It has crossed the canal since the canal was constructed in 1904. (See Figures 1, 2, 3, 4, and 15.)

Elevation in the Historic District

Because the water in the canal flows by gravity, drops in elevation are important to move the water and were a factor in determining the necessary placement and size of the canal. Slow-moving places are caused by flatter elevations. The canal is generally narrower in fast-moving places that are due to larger drops in elevation. The elevation at the south end of the district is 3,455 feet above sea level. The elevation at the Old Deschutes Road Bridge near the center of the district is 3,429 feet. The elevation at the north end of the district is 3,418 feet.[25] The water in the canal drops 37 feet as it flows through Section 15 and the historic district.[26]

Waves form over large rocks in a stretch of rapid drops in elevation in the Pilot Butte Canal Historic District (Cooley Road – Yeoman Road Segment). The native vegetation along the canal has been relatively undisturbed from the period of significance. Photographer looking west. [27]

[25] Figure 6.
[26] Elevations taken from Google Earth and Figure 6.
[27] Photo taken by Aleta Warren in September 2015.

Historic and Current Setting in the Historic District

The setting of the canal in the district is primarily a rural residential area, a transitional zone between the urban area to the southwest and the publicly-owned scrubland and privately-owned agricultural zones to the north. The Pilot Butte Canal crosses private property in the historic district. Most of the properties extend to the centerline of the canal, with the exception of six rural lots in the southern end which include the entire canal width. The recorded easements in the deeds allow Central Oregon Irrigation District, a quasi-municipal organization of irrigation water users, to operate and maintain the canal.[28] At the southern half of the district, five rural lots ranging from 2.5 to 11 acres in size run completely across and beyond the canal. A 1.6 acre lot on the west side of the canal at the southern boundary is undeveloped. Those and other lots ranging from 2.5 acres to 11 acres in the northern half of the district include irrigated pasture for livestock such as horses or goats[29] The lots accommodate widely-spaced single-family homes and some detached barns, stables, greenhouses, or shops. (See Figure 5 for maps of current lots and Figures 15, 16, 17, and 18 for maps of property development and ownership.)

Generally, being rural, any formal landscaping is confined to the area immediately adjacent to the houses, with historic native vegetation covering the majority of land between the irregularly-spaced houses along the winding streets and the canal. Throughout the nominated area, much of the historic setting remains, with mature native vegetation around basalt rock outcroppings. Generally, Section 15 was an undesirable place for early-twentieth century homesteaders, thereby preserving more of the area's 1904 appearance and setting than along most of the canal. The majority of the land in the district is not farmable due to rolling terrain, poor shallow volcanic soils, and surface rock. Better farmland was available elsewhere and Section 15 was overlooked for all but two homesteads. Most of it was settled for rural residential homesites and hobby farms after 1970. However, in 1913, 120 acres were crossed by the canal at the north end of Section 15 was homesteaded by Earl B. Houston, with 20 acres being cultivated and irrigated and later abandoned. The Houston land has some hobby farms with primarily horses on it today. A 40-acre parcel at the southern end of the district was crossed by the canal and was owned by Edgar and Susan Coleman until 1920. Each of the historic farms has been partitioned into smaller acreages, less than 11 acres in size, many of which retain the irrigation water rights. The Coleman/McLain farm was partitioned into eight properties that now have homes and hobby farms.[30]

A smooth, deep area in the Pilot Butte Canal Historic District (Cooley Road – Yeoman Road Segment). The irrigation pond on the left is the altered historic Houston Pond. The embankment is about two feet tall in this area. There is no ditch rider road on the embankment. Photographer looking south. [31]

[28] Memorandum to Deschutes County, 2014, from Law Office of Bruce W. White, based on Deschutes County deeds for each property in the district at the Deschutes County Clerk's office.

[29] Deschutes County Assessor's tax lot maps.

[30] Real Property Deeds at Deschutes County Clerk's office.

[31] Photo taken in September 2015 by Aleta Warren.

Parcels along a portion of the western side of the canal in the southwest quarter range from 1.6 acres to 0.21 acre. For 3/8 of a mile on the west side of the canal, single-family homes on 1/4 to 1/3 acre lots in the Canal View Subdivision, platted after 1995, within the city are visible. They are opposite larger acreages in the county. The urban lots in the historic district range between 130 to 225 feet deep from the centerline of the canal. The deep lots resulted in houses being set back 75 to 150 feet from the centerline of the canal and all have some strips of natural vegetation bordering the canal. Property owners in the portion of the Canal View Subdivision that are in the historic district have no fences or structures along the canal because they are prohibited by the deed restrictions.[32] Native vegetation in the southwest corner of the district is recovering and is now providing habitat for nesting waterfowl.

Challenging Rock in the Historic District

The canal is made of native earth and rock. The rocks vary greatly in size from pebbles to lava flows and immovable boulders. The irregular rock varies in shape. Some were found as they were dug from the canal bed and others with sharper angles were fractured from larger rock by blasting. The district is an intact stretch of the canal with long portions of its original setting. It has a relatively flat and straight portion of the canal in the north and a gently curving portion in the south. The middle is unique and dramatic, with abrupt turns and drops. The district's nearly solid rock in many places made this segment of the canal the most time-consuming and challenging to construct. Today, the 1904 challenges and methodology are easily observed in the character and appearance of the canal. Drill holes, rock fractured by picks and blasting, and places where soil was scooped out by Fresno scrapers as it was needed to layer with rock to form the embankment along the eastern sides are visible in the district. The demanding work in the hard, uncompromising volcanic lava flows is strikingly evident in the exceedingly rough bottom when the canal is dry. The stretch in the district has a character-defining uneven bed and highly irregular width, depth, slopes, cuts, and embankments. Following the terrain and flowing around rocks and islands left in the channel, when the canal is flowing it looks and sounds like a natural river in the district.

The portion of the canal within the district presented construction challenges. Owners and engineers determined that constructing a uniform, trapezoidal canal in this stretch was impractical. (See Figure 8 for representative plans by Levi Wiest.) The company settled on a practical technique that followed the surveyed route but resulted in a highly irregular canal that generally carried the necessary volume of water. Where solid rock was encountered, the canal is shallower and wider, with more inconsistent side slopes. The unavoidable rough bottom caused a high level of friction that reduced the speed and capacity of the canal.

Photo of sediment and stones deposited in a drilled and blasted rock in the canal bed near the Old Deschutes Road Bridge in the Historic District. Many drilled and fractured rocks in the district represent the 1904 labor.

[32] Deed Restrictions, Deschutes County Clerk, Real Property Records.

In a 1914 report, John Dubuis, Field Inspector for the State of Oregon, under the direction of the state engineer and the Desert Land Board, states, "Canals have been made wider and more shallow than proper, in order to avoid rock excavation."[33] The result is observable. The district includes the most highly variable winding segment that varies back and forth in width from 20 to 81 feet and undulates in depth from 3 to 10feet, with islands and large rocks left in the crude canal bed. (See Figure 6 for photos and a detailed description of the district.) The stretch of the Pilot Butte Canal in the district required the most blasting and moving of materials in the entire canal. (See Section 8 of this nomination for a detailed discussion of the construction challenges in the district.) Some of the removed rock was used to create the embankments on the downhill side. In many locations in the district, the canal was cradled between two higher levels of ground and was not on a diagonal slope. In those places, both sides of the canal were cut into the existing terrain. Most of the canal in the historic district follows a diagonal slope, therefore, the canal was cut into the land on the high side and an embankment was created on the low side.

More extraordinary than seeing its impressive size and tons of haphazardly-placed, angular, rough brown, grey and black rock in its bed and sides when the canal is empty, is the natural appearing flow of water caused by the volcanic rock flows, native materials, rocky bed and sides and its crude workmanship. These remain significant elements giving a unique character to this stretch of the canal. The district has grassy islands in the channel where rock flows were left in place. Water flowing over especially rocky areas creates rapids. Water churns, dives, and splashes over and around large rocks and rock flows. The rough, rocky characteristics of the canal and terrain are conveyed in a strong expression of the aesthetic quality of the canal. The appearance and sounds of the water in the canal during irrigation season indicate what is beneath it. Water is smooth where rock is minimal or rock flows forms the bed, while rapids indicate dense, large rocks below.

Engineers measured the drops in elevation, roughness, and other factors of friction, as well as the size and shape of a channel, all of which were known to contribute to either a faster velocity of water in a canal or a slower one. Known as the value of 'n', Manning's Roughness Coefficient, the 1914 state engineer's report on the Pilot Butte Canal to the Desert Land Board commented on the rocky stretch of the canal in the district: "The values of 'n' on the main canal are found to be much larger than in the original plans, the reason being that the construction left the canal with a very rough rock bottom. On the Pilot Butte Canal the values of 'n' are like that of the natural water channels, especially in the upper portion."[34]

Island in the Pilot Butte Canal Historic District (Cooley Road – Yeoman Road Segment) with two juniper trees and native grasses growing on it. Photographer looking north.

[33] Dubuis, John, Field Inspector, *Report to Desert Land Board On Central Oregon Project*, (Salem: State Printing Department, 1915), page 5.

[34] Ibid., pages 16-19.

OCTOBER 29, 2014 SURVEY of the PILOT BUTTE CANAL HISTORIC DISTRICT (COOLEY ROAD – YEOMAN ROAD SEGMENT)

To determine the character-defining features, including dimensions and materials, and to evaluate the overall condition and integrity of the resource, fieldwork was undertaken to systematically inspect and record it. About 11 days after the 2014 irrigation season ended and the gate at the North Dam was closed, on October 29, 2014, a crew of five volunteers(a historic preservation planner, a civil engineer, an architect, a journalist, and a hydrologist),[35] inspected the Pilot Butte Canal in the historic district. The crew began at the southern boundary of the district at Yeoman Road and walked in the canal bed and on both sides of the canal to the northern boundary at Cooley Road. The crew stopped every 180 feet, took photos looking ahead to the north or east, inspected the canal and noted physical characteristics, engineering challenges, and integrity. The team measured the width of the canal bed at the waterline and between the toes (bottom of the side slopes), measured the deepest and shallowest point in the canal bed and noted their locations, measured the depth and width of the side slopes and recorded the location of the toes. Elevations were recorded at the top of the embankments and in the low points the canal bed and land use observations were made. Five segments of the canal within the district that had features in common were identified. (See Figure 2 for the location of the five distinct segments of the historic district and Figure 6 for a complete summary of the survey and photos of the five sections called “Five Segments of the Historic District.”)

The survey revealed that there were five distinct portions of the canal in the historic district. The portions were of inconsistent lengths. The team called the portions “Five Segments of the Historic District.” While the canal in the historic district has great variability throughout its length, the five segments had common, observable features that were photographed, measured, and described in the survey results. Because of its wide variability in width, depth, and rock encountered, including two areas that have minimal rock, the historic district is a good representation of the entire canal, encompassing all of the purpose, designs, construction methods, and terrain seen throughout the length of the canal

The inspection and the comparison to historic descriptions and aerial photos (see Figure 9:1951, aerial photo of area.) revealed that the canal in the historic district has survived nearly intact since it first held water in 1904.[36] The level of historic integrity is very high. The survey located easily-identifiable evidence of the historic construction methodology and materials used. The canal is located along a surveyed route that follows the terrain, allowing the water to flow by gravity at a brisk rate. The land is sloping from west to east and from south to north. The canal in the district has at-grade cut faces on the western or northern sides for its entire length. Water is contained mostly between one canal wall cut into the canal bed and a built embankment on the opposite, downhill side. The western or northern sides (depending on which direction the canal is winding) were cut to the desired depth. Rock and soil were then removed from the canal bed and pulled to the downhill side. Where nearly solid rock was encountered, the canal was made wide and shallow, excepting the stretch under the Old Deschutes Road Bridge where it is nearly solid rock and yet is narrow. There is evidence of rock blasting and splitting in several locations, and drill holes in rock were also observed. Much of the blasted rock is used as riprap. Rock and soil were removed from the canal bed and piled densely to form the flat-topped embankment. The top of the embankment or berm is smooth and solid, showing the compaction that was done to make the side to the canal strong enough to hold swiftly-flowing water. The inside of the embankments are lined with irregularly shaped rock in a variety of sizes. Generally, in areas of blasting, the riprap on the sides and in the bed are composed of larger rocks than in areas that were dug by hand and scraped aside.

In the District, Segments 1 and 5, groupings of about three feet wide and 1 foot deep depressions are evident outside the taller embankments that resulted from scraping surrounding soils as necessary to layer soil with the rock to form the embankment. More soil was needed than was found in the materials removed from the canal. Soil on the outside edge of the embankment is not covered with rock or riprap. Native plants grow sparsely on

[35] Pat Kliewer, MPA; Tim Casey, AIA; Don Kliewer, PE; Gene Storm; and Jeff Perreault, MS, inspectors, October 29, 2014.
[36] Bend Bulletin, Friday, May 13, 1904, “Water on Desert”, Bend, OR.

the embankment and there is little erosion. Riprap was placed haphazardly on the inside edges of each side of the canal bed and, in some locations, in the bed, to prevent erosion. Although it appears to be crudely constructed, the jagged rocks fit well together and the work has lasted for over a hundred years. Many parts of the canal appear to have excess rock that was not needed for the embankment and the blasted rock was left scattered across the canal bed and some has moved into piles due to the force of the water. The riprap varies in size from 6 inches to over 36 inches in width, and much of it appears to have fractured, unnatural faces showing the extent of the blasting and picks breaking it up. The alternating rock and soil in the embankment is highly compacted and strong. It is lightly used by local property owners on foot or bicycle and occasionally by modern ditch riders who drive pickup trucks to inspect the canal and make necessary repairs such as to repair holes dug by rodents. There are no wheel or wagon ruts, but only surface parallel tire tracks in sparse native vegetation. Four modern metal agricultural gates cross the embankments to discourage unauthorized motor vehicles from driving on the private property on the embankments. There is no embankment and only a deer trail along the canal in District Segment 4 where both sides of the canal are cut faces. The canal is likely to have some minor in-kind repairs to the east embankment where insignificant breaches occurred due to rodent holes over the century of use.

It is important to note that elevations of the segments were recorded at the top of the flat embankments at the beginning of each segment and at low and high points in the bed. The elevations recorded at the beginning of each segment at the top of the embankments may appear to indicate that the canal is flowing uphill. However that assumption is incorrect. The overall fall in elevation from south to north in the nominated area is 37 feet. The embankment is inconsistent in height and width. Stretch 4 has no embankments at all and the elevation measurements were taken on a deer trail along the natural gradient. The seemingly incorrect elevations also are due to the difficult construction in rock and the laborers' ability in that point in time to excavate and move materials from the bed and to smooth the gradient from south to north. The lack of smoothness of both the canal bed and the embankments is further evidenced by the pools that form in the low points and the rocks that are above the water level when the canal is not carrying irrigation water. The water level, the bed and the top of embankments are not parallel.

This photo shows various types of blasted rock and rock flows left in place in the uneven bed within the historic district. The cut face is on the far side and the built embankment is on the right side. Irregularly shaped and sized rock protects the sides from erosion and was placed by hand. Photographer looking northeast.

Description of Characteristics of Segment 1 of the Historic District

The survey of the historic district began at the southern boundary and therefore Segment 1 begins there. The segment is 2,090feet long and the beginning elevation at the southern end is 3,455 feet. It has no alterations to the beds, side slopes, or embankment. The canal was cut into the bed on the west side and has an 18 to 20feet wide, flat-topped embankment on the east side that is currently used for the ditch rider to drive on. This

is the widest and tallest embankment in the district. The embankment drops down 5 feet to the natural grade. The canal has 24-inch wide riprap in places and some one foot deep silt piles in the bed. The canal crosses 2.2 to 11-acre hobby farms that extend under the canal and include both sides and the bed of the canal. A 2.98-acre lot with irrigated horse pasture and a barn is in this segment. None of the urban lots on the west side extend under the canal. Agricultural fencing parallels the canal on east side, although the parcels continue to the west side of the canal. A short stretch of 3-foot tall metal fencing is located about 20 inches outside the canal easements near the west bank. Homes less than 20 years old are constructed on most of the 1.58-acre to 1/3-acre urban lots in the partitioned areas and within the Canal View Subdivision on the west side. The canal begins at the southern boundary of the district as a sharply uneven, undulating, and curving rocky structure with islands of rock. It gradually curves and straightens as it runs north. Four irrigation ponds are east of the canal. The terrain is flat and there is much standing water in the bed. The average width of the canal is 56 feet, with a range of 25.5 to 81 feet. The average depth of the canal is 7.57 feet, with a range of five to 10feet deep. The range of high points in the canal bed is two to 6.5 feet deep. There is no embankment on the west side. The width between the edge of the canal and the base of the sloping sides in the bed is referred to as the "toe." The toe is zero if the wall is vertical. In the district, the toes are highly irregular, adding to the appearance of crudity and exaggerating the irregularities created by the terrain. The width between the toes is narrower than the distance between the outside edges of the canal. In this segment, the west toe ranges in width from 0 to 13 feet and in depth from 1.5 to 7 feet to the water level (daylight). The east toe ranges in width from 1 to 11.5 feet and from 1.5 to 10.5 feet deep.

SEGMENT 2: Water leaves an 81-foot wide, rocky area and rushes under the 20-foot wide Old Deschutes Road Bridge. Photographer looking northeast.[37]

Description of Characteristics of Segment 2 of the Historic District

Where Segment 2 begins, the canal in the district leaves the relatively small rock and gentle curves of Segment 1 and meets the first island and a sharp 90-degree turn to the east. The length of Segment 2 is 1,520 feet. Its beginning elevation is 3,427 feet and the segment drops 8 feet. The terrain drops in elevation from south to north and west to east. The second segment has no alterations to the beds, side slopes or embankment and is characterized by a highly irregular nearly solid rock bed, long stretches of rapids, the largest island and rocks above water level. It has the widest and narrowest points in the district. It begins with a deep, irregular, nearly solid, rock bed with the island that has two juniper trees and grasses growing on it. Canada Geese are nesting there annually. From the island, the bed drops dramatically to form 10-foot deep pools. Silt piles in the deep pools just past the island. The segment has small pools of standing water and large rocks and lava flows. Three areas have significant rapids. Riprap is large and thick. One irrigation slide gate allows water to flow into a new irrigation pond used for residential landscaping and small pastures on the west

[37] Photo taken in September 2015 by Aleta Warren

and north side. The elevation drops rapidly and the canal bed is extremely rocky with no soil. It has a high degree of variability in width, from 20 to 81 feet. Willow trees, yellow iris, wild roses, grasses, and shrubs grow along the banks. The embankment is lower and narrower than in Segment 1. The natural grade is about 2 to 3 feet below the embankment. Segment 2 ends at the eastern edge of the Old Deschutes Road Bridge where the width is 20 feet. Two irrigation ponds built since 1984 are adjacent to the canal, one on each side. One is surrounded by quaking aspen trees. The eight houses in the northern end of Canal View Subdivision are along the west side of the canal in this segment. The city limits end at the northern edge of the subdivision. Two irrigated pastures, one with horses, and two small barns are along this segment. The average depth of the canal is 4.81 feet, with a range of 2.5 to 5.75 feet. The east or south embankment is 1 to 2 feet tall and about 12 feet wide. There is no west or north embankment. The west toe ranges in width from 0 to 10 feet wide. The west toe has a range of depth from 2 to 5.5 feet, which means it slopes irregularly toward the middle of the canal bed and ends 2 to 5.5 feet, below the edge of the canal. The range of widths of the east toe is 3 to 9 feet. The range of depths at the east toe is 2 to 5.5 feet deep. One non-historic gate and headwall are on the west side, and the non-contributing historic Old Deschutes Road Bridge is at the end of this segment. The bridge has alterations of materials and a newer guardrail. Rural residential lots within the County's jurisdiction are on both sides of the canal for the remainder of the length.

Description of Characteristics of Segment 3 of the Historic District

Segment 3 is a straightaway. Segment 3 is 760 feet long and the beginning elevation at the west end is 3,433 feet. It drops 8 feet in elevation. The canal is unaltered and flows to the east and is entirely within rural Deschutes County. It is the shortest, most consistent and straightest segment. A goat farm with an irrigated pasture and a barn is northeast of the Old Deschutes Road Bridge. The remainder of land along the segment is in native vegetation. Houses are widely spaced and set well away from the canal. The south embankment is from 2 to 5 feet tall and about 10 to 12 feet wide. The terrain is regular and flat and slopes gently to the southeast. About 2 to 4 feet of water is sitting in the entire segment when the canal is not running. Search and rescue crews train there for underwater rescues. There is heavy, large riprap on the south side of the canal and medium riprap on the north side. The average width of the canal is 61.5 feet, with a range of 56 to 78 feet wide. The average depth of the canal is 6.63 feet with a range of 6 to 7.5 feet deep. There is no embankment on the north side. The north toe ranges from 5.5 to 11.5 feet wide and 2 to 5.5 feet deep. The south toe ranges from 7 to 11 feet wide and 5 to 5.5 feet deep. There are no structures in this segment.

Description of Characteristics of Segment 4 of the Historic District

This unaltered rocky segment has a distinctively rough, twisting, undulating, irregular canal bed with two cut sides. It begins with a hard left turn and then has "S" curves, followed by another turn to the left. It has sudden drops in elevation with boulders and lava flows in the rocky canal bed. Both sides are cut into the terrain. There is no embankment and only a very short 10-foot-wide ditch rider road on the east side at the southern end, due to rock outcroppings up to the water's edge, thick vegetation, and rough terrain. Ponderosa pine and juniper trees and bitterbrush taller than 6' grow next to the banks. Dense mature native vegetation and widely-spaced residences are in the segment. The segment resembles a river and has many rapids. Segment 4 is 1,330 feet long. It begins at an elevation of 3,425 feet at its southern end and drops 10 feet in elevation as it flows north. The average width of the canal is 51.21 feet, and the width ranges from 39 to 60.5 feet. The average depth of canal is 5.56 feet, with a range of 4.2 to 7.25 feet deep. The highly irregular west toe ranges from 1.5 to 14 feet wide and from 2.5 to 5.25 feet deep. The highly irregular east toe width ranges from 1 to 16 feet wide and 2.5 to 5.25 feet deep. One non-historic water distribution slide gate, headgate, and pipe are at the southern end of the segment.

Description of Characteristics of Segment 5 of the Historic District

The last segment curves and undulates, straightens, and becomes shallower, flatter, and consistent as it flows north to the end of the district. Segment 5 is 1,710 feet long and begins at 3,410 feet in' elevation.. The elevation at the northern boundary of this segment and the nominated district is 3,418 feet. This segment drops 8 feet in elevation. Large, nearly impervious lava flows form the canal bed in many locations and some pools hold water year round. Sand bars are in many portions of the bed. The west side has no berm or embankment

and is cut. The east embankment is about 2 to 4 feet above natural grade. The 10 to 12 feet wide ditch rider road connects to Overtree Road on the south side of Tax Lot 171215AD00111 on the east side of canal. The embankment was recently surfaced with a single layer of scattered, crushed red cinder rock. It runs to the northern end of the historic district. Some areas of the bed have little riprap and some nearly vertical embankments have no riprap. Two lots up to 11 acres in size on the west side have never been cultivated or developed and retain their native vegetation. Remaining lots are large; houses are well spaced and most are set back from the canal with some on knolls; and all display the historic setting. Many rippling rapids and islands with nesting waterfowl are distinctive features of this segment. The terrain flattens and has a downward slope to the north. The average width of the canal is 57.56 feet wide, ranging from 40 to 73.5 feet wide. The average depth of the canal is 3.89 feet with a range from 1.5 to 4.75 feet deep. The west side is a cut, with no embankment. The range of widths of the west toe is from 1 to 16.5 feet wide and it ranges from 1.5 to 4 feet deep. The east toe ranges in widths from 1 to 16 feet wide and in depth from 1 to 4.5 feet deep. Some of the side slopes are nearly vertical. A non-historic 2012 trapezoidal weir flow measuring structure, a non-historic gate to a delivery system pipe to the Houston Irrigation pond, and a series of contemporary metal warning signs for the intake to a recent piping project ahead are at the end of the segment.

Segment 5 in the historic district is distinctively shallower and has less riprap on its sides than the previous segments. The bed has extensive, but flatter, rock flows. Flows and piles of loose rock near the surface cause rapids. Photographer looking north.[38]

Alterations in the Historic District

There are five relatively minor alterations in the district, given its 7,435-foot length and large scale. The only alterations that were recorded are the Old Deschutes Road Bridge, a trapezoidal concrete flow measuring weir, and three water-delivery gates. The summary of the results of the survey are listed in Figure 6 and are described in detail there. (See Figure 6, Pilot Butte Canal Historic District Survey by Segment and Figure 2, showing the location of each structure.)

The survey found that the structure of the canal itself has had only one significant observable alteration to its bed during the past 111 years: the addition of a concrete flow-measuring weir in 2012 at its northern end. The weir was constructed in the existing canal bed, matching the existing canal in dimensions. Although only the top 6 inches of the concrete sides are visible when water is flowing, the flow measuring weir is incompatible with the historic appearance and natural historic construction materials. Some additional riprap was installed in kind on the western slope downstream from the structure to prevent erosion, but is difficult to notice. The poured-in-place concrete trapezoidal weir that measures water flow is two-years-old and is near the north end of the district in Segment 5, on Tax Lot 171215AA00400. The weir is 55 feet wide by 46 feet long and forms

[38] Photo taken in September 2015 by Aleta Warren.

the canal bed and sides. A 10-foot-wide crest, one foot' tall, is centered in the structure. The 90-degree sides are made from poured-in-place concrete and are 39 and 48 inches tall from the foot at the bottom of the canal. The structure is visible when the canal is dry, but only a few inches of the side walls are visible when water is flowing through it. It is the same height as the cut west side and the short eastern embankment. Native vegetation on the west side hides that side of the structure when water is flowing. (See photo below.)

Contributing and Non-contributing Structures in the District

All historically significant resources must retain integrity to be eligible for listing in the National Register. The thorough and systematic survey found that the canal in the historic district has an exceptionally high level of integrity. The primary structure is the canal itself. It is nearly unaltered. The primary resource includes the canal bed, cut faces, riprap and embankments. A secondary structure, the Old Deschutes Road Bridge, built in 1904 at the same time as the canal, exhibits most of its original appearance and would be classified as contributing, except for an upgrade of pressure-treated lumber, paving, and new guardrails in 1969. For that reason, it is non-contributing. Four accessory structures are present. Three are non-historic irrigation pipe-control headgates/hand wheel/slidegates that control water flow from the canal to irrigation water users. They were constructed between 1960 and 1989. The last structure the team observed is a trapezoidal weir flow measuring structure built in 2012 at the northern end of the district to measure the water volume and speed of flow. It is non-historic.

SEGMENT 5: 55' wide by 46' long concrete flow-measuring weir constructed in the canal bed in 2012. Photographer looking northeast.

While the three accessory structures and gates are not likely to be historic and their construction altered about 8 feet of one side of the canal in each case, they are minor alterations and are unobtrusive and compatible. Similar historic gates are found throughout the length of the Pilot Butte Canal and in the laterals. Only the handwheels and rods are visible when water is flowing. They consist of the metal handwheels, metal slide gates, and associated headwalls in District Segments 2, 4, and 5. They allow irrigation water to enter 1 feet in diameter corrugated steel pipes to convey water from the canal to weir boxes that measure the flow of water that passes to the users and to the irrigation ponds. The pipes are set in poured-in-place concrete structures called headwalls that form the side of the canal. The gates are operated by metal handwheel controls on a threaded screw lift rod assembly that lifts the gate to allow water to flow into the pipes, or lowers the gate to close the pipe. (See photo below.)

SEGMENT 2: Non-historic metal wheel control, threaded screw lift rod assembly, metal slide gate, concrete headwall and corrugated steel pipe. Photographer looking southwest.

The Old Deschutes Road Bridge crosses the canal and is the narrowest point in this stretch of the canal. It is a bridge for vehicles and pedestrians with a low, concrete foundation. It is a modest, wooden, single-span bridge built with wood planks laid over wood beams and wood decking. The single-lane dirt road dates at least to 1902, with the Old Deschutes Road being one of the first roads in the area. The bridge had wooden guardrails and a wooden deck prior to 1969.

According to Torina Wilson, EIT, Deschutes County Road Department, the wood-framed Old Deschutes Bridge over the Pilot Butte Canal was built when the canal was constructed in 1904. The concrete abutments are dated 1915 in records that were sent to Deschutes County from Crook County. The bridge is shown on the 1909 irrigation lands map and on the Metsker Maps. (See Figures 14, 16, 17 and 18.) It is also drawn on a 1915 map[39] (See Figure 15.) The wood "stringer deck" was replaced with creosote-treated wood and the metal guardrails replaced the wooden guardrails in the winter of 1969. The bridge has been at this location since 1904, displays many historic components, and is another element of the historic setting. The bridge is historic, but is classified as non-contributing due to alterations, especially the installation of metal guardrails. (See photo below.)

DESCRIPTION OF THE ENTIRE 22-MILE LONG PILOT BUTTE CANAL

Overview

If one were to look at the Pilot Butte Canal system from the air between the Crooked River on the north end and the North Dam on the Deschutes River in Bend on the south end, one would think that they were seeing the a natural drainage system of small creeks leading to larger creeks that join into increasingly larger streams that flow south into the Deschutes River. Of course, that observation would be backwards. The system flows north by gravity from the Deschutes River to the canal which narrows as it conveys water into even narrower delivery laterals and, finally, into ditches. (See Figures 7 and 19.)

The Pilot Butte Development Company and its successor, the Deschutes Irrigation and Power Company, constructed the Pilot Butte Canal with private funding under the Carey Act.[40] Several teams of surveyors followed the terrain and elevations and laid out the canal and the distribution system of laterals and ditches so that water could flow downhill by gravity to serve the future owners of the approximately 25,000 acres it was to

[39] Charles F. Metsker, Civil Engineer, 1935, 1944 and 1972 maps of T 17 S, R 12 E, W.M., page 46.
[40] Michael Hall, Irrigation Development in Oregon's Upper Deschutes River Basin 1871-1957, A Historic Context Statement, 1994, pages 19-30.

irrigate without needing any pumps.[41] (See Figure 7.) The location east of the Deschutes River was ideal for the canal system.[42][43] The resulting main canal continues to flow today without any pumps and displays the methodology and workmanship of the various construction crews and the tools and time they had available.

The canal was entirely located in rural lands when it was constructed, and it was an open canal. It now runs through urban commercial, industrial, and residential subdivisions in Bend for 2.4 miles. In Bend it is piped for 2,204 feet and has many significant alterations. It enters the 1.4 miles of rural area in the Historic District where it retains its historic integrity and winds through rural residential and hobby farms. Next it is piped under 2.6 miles of publicly-owned juniper scrublands for the new Juniper Ridge piping and hydropower project. As it leaves the hydropower plant, it curves through a rural industrial and commercial area for 2.23 miles along US Highway 97. It then winds through 5.8 miles of relatively flat terrain with small irrigated pastures and hay farms. In the agricultural areas, surface rock is reduced and is no longer a significant part of the appearance of the canal. The canal in the agricultural area south of Redmond is smaller, more consistent in shape, smooth in gradient, narrower, and shallower. Riprap is nearly nonexistent. The canal next passes through the constrained urban area of the city of Redmond for 6 miles where 1.5 miles are piped in three areas. It has undergone extensive alterations in the city. It abruptly turns northeast and re-crosses under US Highway 97 at the northern Redmond city limits. The small and shallow canal tapers from 20 to 4 feet wide and 1 foot deep and is now formed of soil and small stones as it finally flows through 5 miles of irrigated agricultural and dry Juniper scrublands and ends a half-mile south of the Crooked River.[44]

Segments and Stretches

For purposed of the National Register Nomination, the canal was divided into ten stretches to facilitate this description, beginning with Stretch 1 at its diversion point in Bend and ending with Stretch 10 at its northern end. The word “stretch” is used instead of “segments” only to avoid confusion as to whether or not an area is within or outside the Historic District. The five divisions in the historic district are called “Segments” while the ten divisions of the entire 22 miles of the Pilot Butte Canal are called “stretches.”

Because of the different dates of construction, the varied terrain and the need for less volume as the canal serves its users, the canal varies in appearance and techniques throughout its length. Based on an inspection of the entire canal for this nomination, the length of the canal can best be described in stretches that display distinct characteristics. Figure 19 shows the location of the ten stretches of the North Canal and the Pilot Butte Canal. (See Figure 19.) Beginning at the diversion point at the North Dam near downtown Bend and ending near the Crooked River, the ten stretches of the canal can be described as follows:

The ten stretches of the canal retain various amounts of integrity of location, design, materials, setting, feeling, association and workmanship. Stretches of high integrity feature characteristics that have very little over the past 111 years. Stretches of low integrity have changed a great deal or only the location remains.

Description of Characteristics of Stretch 1 of the Pilot Butte Canal

Stretch 1 has very low integrity due to its being piped, with the accompanying complete loss of design, materials, setting, feeling association and workmanship. The 1.5 mile long North Canal replaced a previous intake when the new North Dam was constructed. While the original intake point was south of Bend, the current intake is in central Bend. (When it was built in 1912, the North Dam and new North Canal were at the north end of Bend.) The original 1903 intake flume that was shared by both the Central Oregon Canal and the Pilot Butte Canal was upstream of Bend, at the southern edge of the city. The City leaders wanted to retain more flow in the Deschutes River through the city. Therefore, the new North Dam and diversion point and intake facility for the Pilot Butte Canal were constructed downstream of Bend in 1912.This stretch of the North Canal runs northeast from the intake facility in T17S, R12E, Section 29, W. M. to the Burlington Northern

[41] Ibid., page 20.
[42] Energy Trust of Oregon, Inc. Open Solicitation, Juniper Ridge 3/27 MW Hydropower, January 23, 2008, page 1.
[43] Google Earth 2014 web site.
[44] Pat Kliewer, “A Legacy of Water”, Redmond Spokesman Newspaper, April 19, 2000, page 13.

Railroad tracks for a length of about 2,204 feet. The beginning elevation at the intake is 3,561 feet and it drops only 2 feet in this nearly flat stretch. About 20 years ago, the entire stretch was piped underground in a concrete pipe. Due to the piping project, no portion of the historic canal remains in this stretch. The setting is now a constrainetd transportation corridor, a motel and major shopping center.

Stretch 1
Photo of piped stretch is taken looking northeast with the 4-lane Bend Parkway overpass in the background.

Description of Characteristics of Stretch 2 of the Pilot Butte Canal
Stretch 2 has low integrity due to significant changes in design, materials, setting, feeling, association and workmanship. The “U” shaped 1912 North Canal is a unique, open, straight canal that runs through a constrained corridor that includes the North Unit Canal paralleling it on its southern side and a Jeld-Wen Windows and Doors Company millwork manufacturing plant sited closely beside the North Canal for its length on its north side. The south side includes large paved employee parking lots and dirt maintenance roads for the two canals. The stretch runs east from the Burlington Northern Santa Fe Railroad tracks to the Boyd Acres Road Bridge for a length of about 1,613 feet. It begins at the 3,559-foot elevation and ends at 3,558-foot-’ elevation, dropping only one foot.

Stretch 2
North Canal flows under a bridge to the Jeld-Wen Windows and Doors Company. Photo taken looking northeast.

The North Canal is a regular open rectangle with steep sides, 15 feet wide and 9 feet deep. It was designed to be entirely lined with concrete. However, only 100 feet were partially lined before it was first used in 1913 and it was partially rebuilt after 1915 when the velocity of water nearly destroyed it. Today it displays a variety of

major alterations and blown mortar, lumber, and stacked rock lining the nearly vertical sides. Both vehicular and pedestrian non-historic bridges cross the canal in this stretch to provide access from the parking lots and streets. A railroad bridge also crosses this stretch of the canal.

Stretch 2
The photo of the altered, open North Canal with a consistent "U" shape is taken facing west.

Description of Characteristics of Stretch 3 of the Pilot Butte Canal

Stretch 3 has low integrity due to significant changes in materials, workmanship and setting. This narrow, unduating, and gently curving stretch of the North Canal runs east from the Boyd Acres Road Bridge to the Brinson Blvd. Bridge for about 4,017 feet, where it meets the 1904 Pilot Butte Canal. It drops 47 feet to an ending elevation of 3,512 feet. The stretch is less urniform and less vertical than the previous stretch, andwas historically riprapped, although most of the riprap has fallen into the canal bed, due to the steep sides. The uneven velocity of water and turbulence in this stretch due to its characteristically narrow width, sudden drops in elevatin and loose rock in the bed has torn up the canal. Long portions have been altered and lined with air-blown mortar. This stretch is reltively straight with a few bends. It follows the terrrain, and is a relatively regular 10 to 20 feet wide and 6 to 9 feet deep. A distinctive feature of this stretch is Pattie's Drop, a waterfall next to a cave. This stretch ends where the North Canal meets the 1904 Pilot Butte Canal. The stretch runs between a contemporary industrial park with manufacturing plants on the north side and multifamily apartments and urban density single family residences on the south side. The North Unit Canal continues to parallel it on its southern side, with only a dirt maintenance road along the North Unit Canal separating them.

Stretch 3
Photo was taken from Pattie's Drop looking east. The highly alterted North Canal that conveys water to the Pilot Butte Canal **is on the left. Air-blown mortar has been applied to this area. The North Unit Canal that conveys water to Jefferson County is on the right.**

Description of Characteristics of Stretch 4 of the Pilot Butte Canal

Stretch 4 has low integrity due to significant changes in design, materials, setting, feeling, association and workmanship. This wider, shallow, open stretch of the 1904 Pilot Butte Canal runs north from the end of the North Canal at the Brinson Boulevard Bridge to Yeoman Road for about 4,700 feet. At the beginning of this stretch, the North Unit Canal continues east and the Pilot Butte Canal heads north. The Pilot Butte Canal drops 41 feet in elevation. It ranges from 32 to 40 feet wide and from 2 to 5 feet deep. It flows through a developed urban area between residential subdivisions and the new East Empire Business Park. Some portions of the canal bed undulate and some are relatively level. It has an irregular rock and earth bed with some portions paved with blacktop or concrete to reduce erosion. There are some rocky sides and some earthen sides and many have riprap removed for use in private landscaping or fallen in the canal bed. Embankments are inconsistent and not present in most areas that were cut into the terrain on both sides. Water pools in deeper areas. A portion of it has a developed pedestrian trail system between the edge of the canal and backyard fences. Three bridges and a check cross the canal. This stretch has significant alterations that are described more fully in the following section, "Major Alterations Outside the Historic District".

Stretch 4
The photo was taken looking north from the Empire Ave. Bridge. The flat, shallow, wide canal and an urban pedestrian trail on the eastern side, single-family residences on both sides, and private fencing are significant features.

Description of Characteristics of Stretch 5 of the Pilot Butte Canal (The Historic District)

This stretch has the higest rating in all seven aspects of integrity of any stretch of the canal. Its significant natural-appearing stretch of the Pilot Butte Canal is being nominated as a historic district. It has been described in detail earlier in the nomination, retains the most character and is nearly unaltered. It is about 1.4 miles long and drops 35 feet in elevation. (See Figure 6 for more photos of the stretch.) This stretch has the widest variability in appearance and dimensions of the entire canal and was the most time-consuming to construct. This winding stretch varies in width from 20 to 81 feet and undulates in depth from 3 to 10 feet, with islands and large rocks left in the canal bed. Heavy riprap, islands, rapids, lava flows, rock outcroppings, and exposed large rock are found throughout most of the stretch. It conveys the full 400 cfs of water.

Stretch 5
This photo was taken near the northern end of the nominated Historic District, looking southwest in the northeast quarter of T17S, R12E, Section 15 W.M.

Description of Characteristics of Stretch 6 of the Pilot Butte Canal

Stretch 6 has very low integrity due to its being piped with the accompanying complete loss of design, materials, setting, feeling association and workmanship. This stretch of the Pilot Butte Canal begins immediately at the northern boundary of the historic district and crosses undeveloped publicly-owned Juniper scrub lands for about 2.6 miles. It drops 129 feet in elevation. The canal was recently piped underground in a 9-foot' diameter steel pipe for the Juniper Ridge Hydroelectric Power Project. Due to the piping project, no portion of the historic canal remains in this stretch.

Stretch 6
Stretch 6 consists of 2.6 miles of pipe and a hydropower plant. Photo was taken looking north.

Description of Characteristics of Stretch 7 of the Pilot Butte Canal

Stretch 7 has low integrity due to significant alterations of setting, materials, location and workmanship. This 2.23-mile stretch of the Pilot Butte Canal runs north from the Juiper Ridge Hydroelectric Power Plant on the east side of US Highway 97, through the Rural Industrial Zone at Deschutes Junction. The setting has changed dramatically in the past thirty years with industrial uses encroaching nearly to the edges of the canal. The stretch has many major alterations. The canal is now piped under the four-lane US Highway 97 and flows between the commercial development and the highway on the eastern base of Long Butte. The stretch drops 62 feet in elevation. The canal in this location is a relatively consistent, shallow, approximately 20 to 30 feet wide and 1 to 2 feet deep, with small riprap and some lava flows in the bed. Embankents are low, under 2 feet. US Highway 97 parallels the canal. The highway was constructed in 1932 and widened to four lanes in 1991. The canal flows under the 1998 highway overpass at Deschutes Junction. Deschutes Market Road and Deschutes Pleasant Ridge Road cross over the canal with non-historic bridges. The canal is close to the highway right-of-way in several places. A recently constructed concrete flow-measuring wier in the canal bed is visible in the photo taken facing south from the Deschutes Market Road Overpass. There are no ditch rider roads.

Stretch 7
Photo of Stretch 7 shows small rock on bottom and sides of canal and low cut sides covered with grasses. A recently constructed flow measuring device is in the canal bed. An industrial use encroaches on the left.

Description of Characteristics of Stretch 8 of the Pilot Butte Canal

Stretch 8 had a good level of integrity, with some alterations. This winding stretch of the Pilot Butte Canal runs from the north end of the commercial and industrial area of Deschutes Junction on the west side of Highway 97 to the southern city limits of Redmond near Yew Avenue for about 5.8 miles. This area is used for small farms and hobby farms. The terrain is unchallenging, with few rock outcroppings and sandy soil which resulted in a canal with a consistent width and depth. The stretch lacks distinction and becomes narrower, shallower, smoother, and flatter with little or small riprap over its length. It has a smooth gradient and a smooth bed. Many miles were created by cutting to the 1 to 3 feet depth on both sides and removing loose rock and soil from the canal bed. The bed was relatively easily scraped out.Therfore, few embankments are present, although material removed from the canal was piled beside it. The stretch drops 146 feet in elevation over the approximately 6 mile length. The canal is 15 to 32 feet wide and relatively smooth with a sandy or grassy bed and is 1 to 2 feet deep in most areas. The side slopes were easily cut from soil and are covered with grass or light, small rocks that can fit in a hand. A few places have shallow, nearly flat lava flows and short drops in the beds causing ripples and falls of fewer than 4 feet in height. Many non-historic bridges cross the canal.

Stretch 8
Photo was taken in a hay farming area looking northeast from the 46th St. Bridge.

Description of Characteristics of Stretch 9 of the Pilot Butte Canal
Stretch 9 in Redmnd has low integrity with three portions being piped and others beging realligned and rebuilt. This highly altered stretch is entirely within the city limits of Redmond for 6 miles and drops 169 feet in elevation. Urbanization and road construction have resulted in 1.5 miles of the canal being piped in three segments both above ground and under ground. The canal is narrow and shallow in Redmond with a variety of lava flows, large rock, small rubble, or sand and grass in the beds and on the shallow sides. A rocky waterfall drops just feet away from the Comfort Suites Redmond Airport at 2243 SW Yew Avenue. The canal in the city is constrained between streets and urban residential, comercial, and industrial developments.

Stretch 9
The photo of the smooth canal in Redmond was taken looking north with North Canal Blvd. and Home Depot on the left and the intake to a pipe that runs under US Highway 97 at the top. Smith Rock State Park is visible in the background.

Description of Characteristics of Stretch 10 of the Pilot Butte Canal
Stretch 10 has medium integrity, but lacks distinction. The last stretch of the Pilot Butte Canal, after it crosses under US Highway 97 and leaves Redmond, flows east and northeast for about 4.9 miles. It looks like a small, straight stream as it passes through primarily agricultural areas around Terrrebonne and northeast of Redmond. The stretch was the fastest to construct and was unchallenging. Some of the area is unirrigatied juniper scrublands. The canal in this location was the easiest and fastest to construct. The small, shallow canal has a smooth gradient and lacks riprap, although scraped spoils were piled along its grassy edge. The canal drops 53 feet in elevation. The canal narrows in width from about 20’ to 4’ and is about 1’ or less deep for its length. There are a few short areas of small rocks in the bed that form ripples in the shallow water, but most of

the bed is soil with shallow grass-covered cuts and embankments. Many non-historic county bridges cross the canal. The canal ends in T14S, R13E, Section 13, WM.

Stretch10
This photo was taken looking northeast from the 5th Avenue Bridge on the northeastern edge of Redmond in a hay farming area, showing the widest part of Stretch 10. Rock is sparse in the last five miles of the canal and the canal is about 1'deep and tapers to 4' wide, with grassy sides.

Unused water at the end of the Pilot Butte Canal flows through a metal gate and into a culvert one-half mile south of the Crooked River and Smith Rock State Park. The culvert pours leftover water into the 1946 North Unit Irrigation District Canal. A smaller amount of Pilot Butte Canal's "leftover" or tail water, also called "carry water" (water needed to make sure the allocated water gets to the last user on the system with enough pressure to be delivered), flows through a metal flume supported by a wooden bridge over the North Unit Canal and into a pipe to the Lone Pine Canal, which also crosses the Crooked River into Jefferson County[45]

North Unit Canal is on the left. Photographer is looking south a shallow pool behind the two gates at the end of the Pilot Butte Canal. One gate allows water to flow into the North Unity Canal and the other allows water to flow into the Lone Pine Canal.

[45] Deschutes River Conservancy and Deschutes Water Alliance, "Deschutes Water Planning Initiative, Water Supply Goals and Objectives, Final Report", February 26, 2013, page 17.

MAJOR ALTERATIONS TO THE CANAL OUTSIDE THE HISTORIC DISTRICT

Stretches of the canal outside the historic district have been altered. As urban areas have expanded and farms have been partitioned over time, the parcels are much smaller than they were in the significant period of history, and there are more users. Now, in addition to the dwindling number of people who derive their primary incomes from farming, the canal provides irrigation water to an increasing number of rural hobby farms and urban lots.[46] The parcel sizes in the Central Oregon Irrigation District systems, including the Pilot Butte and the Central Oregon Canals, have dropped from the homesteaders' 160 acres in the early twentieth century to about 10 acres today. Agriculture made up 1 percent of the county income in Deschutes County in 2006.[47]

Five parts of the Pilot Butte Canal totaling 4.5 miles are now piped and buried underground due to urbanization, a hydropower project, and highway improvement projects. The northern boundary of the historic district is drawn where 2.6 miles of pipe begins. The canal Stretch 6 was piped with a 9-foot diameter steel pipe within the last five years when the irrigation district constructed a 3.27 megawatt hydroelectric plant called the Juniper Ridge Hydroelectric Plant. Also, the first 2,204 feet of the North Canal from its diversion point at the Deschutes River and around Bend River Mall is now piped. Three other stretches of newer piping are in Redmond. At the south end of Redmond, paralleling Highway 97, 1,100 feet of the canal are piped. Another approximately 6,000 linear feet are piped along Canal Boulevard near Veteran's Way. At the north end of Redmond, about 670 feet are piped under the new overpass of The Dalles-California Highway, US Highway 97. (See photo below.)

Other major alterations outside the district are too numerous to list in detail, but they include many new urban bridges over the canal and culverts under new streets and roads, improvements to historic bridges, relocation and piping of laterals in the urban areas, alterations to embankments, air blown mortar, lumber applied to side slopes and beds, new concrete canal beds, urbanization of formerly rural lands, and relocation of the canal for new streets and buildings. Other major alterations include the addition of several new concrete flow-measuring weirs and several low-head checks (short dam-like structures that create pools where pipes intake water to laterals) across the canal and new gates.

Canal leaves a 1,100' segment of pipe and enters a culvert under Odem Medo Road in Redmond. Highway 97 is in background. Photographer looking south.

In Stretch 4, the stretch immediately south of the district, the canal has lost its integrity. The Pilot Butte Canal is characterized by its passage through dense, non-historic, urban residential and light industrial subdivisions built since 1975, on both sides of the Canal inside the City of Bend. The Canal exhibits significant alterations, including two recently constructed two-lane urban concrete and steel bridges and a steel one-lane pedestrian bridge that connects to a new graveled public hiking trail. The trail is sandwiched between the rocks on the

[46] Aylward, Bruce, PhD, Growth, Urbanization and Land Use Change: Impacts on Agriculture and Irrigation Districts in Central Oregon, DWA Final Report, August 2006,pages 1 and 19.
[47] Central Oregon Irrigation District.

edge of the canal structure and private fences. New urban density housing developments were recently built on the higher side of the canal that altered the canal and the riprap. Large boulders were set on the edge of the canal to form the new rock retaining walls that extend more than 6’ above the canal to prevent erosion of the residential properties.

Photo shows altered riprap and extended embankment above waterline in Stretch 4, immediately south of historic district. Photographer looking southwest,

The alterations prevent understanding the canal’s historic design and construction. Newer homes and solid privacy fences perch above and beside the canal. Part of the canal bed has been paved to prevent erosion and a low-head check crosses it at the point of the newly piped A-4 Lateral. This highly-altered stretch has encroachment onto the edges of the canal by private landscaping paths that run into the edges of the canal, seating areas and rock gardens incorporating the sides of the canal, and solid fences forming a tunnel effect next to the canal. Another part of Stretch 4 has urban density housing on the downhill side and a new light industrial park on the uphill side, with fences on both sides. Riprap in the canal has been removed in many areas. Banks have been altered on both sides. Urban utility pipes and the metal pedestrian bridge cross the canal 50 feet south of the historic district. The canal in this stretch has lost all of its historic setting. The combination of major alterations reduces its integrity.

Photo shows some of the alterations to the canal in Stretch 4, immediately south of historic district: the new gate to a piped A-4 Lateral, a low head check, and a bridge at Empire Avenue. The bed under the bridge has been paved to prevent erosion. Photographer looking northwest.

The piping projects, realignments, and major alterations to the structure have reduced the integrity of the canal overall and have had significant adverse effects on the resource in this stretch.

Photo shows other typical alterations to the canal in Stretch 4, immediately south of historic district. Residential landscaping is connected to the canal. Industrial park is on the right. Looking south.

SUMMARY OFINTEGRITY OF THE NOMINATED STRETCH

The Pilot Butte Canal is a good example of a pioneer era canal in Central Oregon. It continues to display the distinctive characteristics of the period canal construction made with local materials, horse teams and primarily hand tools. It represents the function and appearance of the water conveyance system, as it appeared as an intact system during the historic period. The segment is of sufficient length to portray the purpose, the construction challenges, materials, techniques, and methodology of construction. The area is accessible to the public and interpretation can be achieved in an attractive, well-organized fashion without crowding or overwhelming the resource itself.

The high degree of integrity of location, design, materials, setting, feeling, association and workmanship and appearanceof the 1.4-mile-long Pilot Butte Canal Historic District (Cooley Road – Yeoman Road Segment) differentiate it from the nine other stretches of the 22-mile-long Pilot Butte Canal. The canal in the historic district is unaltered except for the minor addition of three gates and a flow measuring weir. It retains its historic native material and its crude historic appearance.It had the most rock to break up and remove and required the longest time to construct. It is the only unaltered stretch that conveys the full volume of water and displays evidence of all the practical solutions to the unique historic construction challenges in 1904. The canal in the district has a distinctive lack of uniformity, an undulating bed, irregular side slopes, heavily riprapped embankments, cuts, islands, and rapids caused by large rocks left in the bed as it drops 37 feet in elevation. The challenging rock, use of only native materials, and the practical, problem solving methodology resulted in the stretch looking and sounding like a river flowing naturally instead of a twentieth-century man-made canal. It retains the feeling and association with the surveyors who determined its route so it could flow entirely by gravity, the engineers who calculated its volume so that it would carry the water needed to irrigate future farms for the length of the canal, the superintendents and supervisors who adapted plans to meet conditions encountered in the field, specialists who blasted tons of rock, and the hundreds of laborers with horse teams who dug, scraped and moved thousands of loads of rock and soil.

This stretch in the historic district was singled out and described in periodic historic state inspection reports for its unexpectedly large amount of rock and for the dramatic discrepancy between the envisioned regular canal

with a smooth bed, and the resulting highly irregular 3 to 10 feet deep and 20 to 81 feet' wide canal with an undulating rock bottom with the highest value of friction (n) in the system.

The district has the widest variation of terrain and style of canal. The variations demonstrate that a narrow deep canal with fast volume in a sloped area can carry as much water as a wide, shallow canal with a slower flow in flatter terrain. It was the most challenging and labor-intensive stretch of the canal and displays marks and evidence of all of the tools and techniques used in other portions of the canal. It is in the roughest terrain with sudden turns and drops, long portions of a nearly solid volcanic rock flows and boulders in the bed, gentle turns, and "S" curves in quick succession. The islands are evidence of the desire of the company to be done with the challenging stretch and connect the already completed beginning and end of the system. (See Section 8 of this nomination.)

The tremendous variations in the district as seen in the survey data show that the nominated district displays all the designs and methodology found throughout the entire 22 miles of the canal: irregular winding rocky portions with large built-up embankments on the downhill side, portions with vertical sides and others with sloping riprapped sides, smooth and sandy level portions; portions with no embankments; portions with a ditch rider road atop the embankments and portions with no ditch rider road on the embankment; portions with both sides cut into the terrain and others with short embankments used to discard the materials taken from the bed; portions that were blasted and portions that were scraped.

Due to the rocky land in the district being undesirable for homesteading or farming, one homesteader of 160 acres at the north of the district cleared and cultivated only 20 acres along the canal, built a cabin, barn and an irrigation pond. The homestead later failed and was lost to the County for a property tax lien. The buildings burned down and the land reverted back to native vegetation over the last 100 years. Sparse rural development on large lots occurred primarily after 1970, inadvertently protecting most of the historic setting with its rolling hills, rock outcroppings, and native juniper and sagebrush vegetation that was present in 1904 near and alongside the canal. A second homestead with an apple orchard and pasture at the southern end was more successful. That farm, now partitioned into hobby farms under 11 acres with irrigation ponds and irrigated pasture for livestock, and some other irrigated small hobby farms near the middle of the district, continues to represent the purpose of the canal, to attract settlers and farmers to the Deschutes Country by supplying irrigation water to the arid land. Large lots encompassing up to a third of the district's length have never been disturbed or developed and historic vegetation was never cleared. The nominated stretch uniquely displays both the historic setting at the time the canal was constructed and the use of the irrigation water for beneficial uses and agriculture. Because the western half of the canal is within the City of Bend for 3/8 of a mile at the southern end, it also displays the continued urbanization of Bend that was intrinsically linked with the Pilot Butte Canal's development. The historic district's setting in a rural residential area that includes some areas of undeveloped and undisturbed native vegetation on both sides of the canal reminds us of its area's appearance when the canal was constructed. Irrigation sprinklers irrigating small pastures adjacent to the canal and non-historic irrigation ponds in sight of the canal visually remind us of the canals relationship to the land and its history and purpose, to attract settlers and provide irrigation water for arid lands that would otherwise would not be farmable.[48]

[48] Ibid., "Juniper Ridge Phase II, a Project Associated with North Unit District Water and Energy Conservation Initiative, Reclamation WaterSMART Water and Energy Efficiency Grant Proposal", January 2, 2013, Steve Johnson, General Manager pages 30 and 31; Ward Tonsfeldt and Dennis J. Gray, East Slope Cultural Services, Inc. "Cultural Resources Inventory of a Segment of the Pilot Butte Canal, Deschutes County, Oregon", Prepared for David Evans and Associates, Inc., Bend, Oregon, December 2008.

Pilot Butte Canal Historic District
(Cooley Road –Yeoman Road Segment) Deschutes Co. OR
Name of Property County and State

8. Statement of Significance

Applicable National Register Criteria
(Mark "x" in one or more boxes for the criteria qualifying the property for National Register listing.)

- [X] A Property is associated with events that have made a significant contribution to the broad patterns of our history.
- [ ] B Property is associated with the lives of persons significant in our past.
- [ ] C Property embodies the distinctive characteristics of a type, period, or method of construction or represents the work of a master, or possesses high artistic values, or represents a significant and distinguishable entity whose components lack individual distinction.
- [ ] D Property has yielded, or is likely to yield, information important in prehistory or history.

Criteria Considerations
(Mark "x" in all the boxes that apply.)

Property is:

- [ ] A Owned by a religious institution or used for religious purposes.
- [ ] B removed from its original location.
- [ ] C a birthplace or grave.
- [ ] D a cemetery.
- [ ] E a reconstructed building, object, or structure.
- [ ] F a commemorative property.
- [ ] G less than 50 years old or achieving significance within the past 50 years.

Areas of Significance
(Enter categories from instructions.)
EXPLORATION AND SETTLEMENT
AGRICULTURE

Period of Significance
1905 – 1921

Significant Dates
1903, Construction begins
1905, Canal completed, City of Bend incorporated, City of Redmond platted
1921, Settlers become Central Oregon Irrigation District (COID)

Significant Person
(Complete only if Criterion B is marked above.)
N/A

Cultural Affiliation (if applicable)
N/A

Architect/Builder
Wiest, Levi D., Irrigation Engineer

Period of Significance (justification)

The period of significance for the Pilot Butte Canal begins with the completion of the Pilot Butte Canal in 1905. The period of significance ends in 1921 when the irrigation system, including water rights, irrigation canals, and other assets were transferred to the settler-organized Central Oregon Irrigation District (COID), which still operates the Canal to the present. While the main canal was completed in 1905, the construction of laterals and ditches continued throughout the period, providing water to new lands.

Criteria Considerations (explanation, if necessary) N/A

Statement of Significance Summary Paragraph (Provide a summary paragraph that includes level of significance, applicable criteria, justification for the period of significance, and any applicable criteria considerations).

STATEMENT OF SIGNIFICANCE

The Pilot Butte Canal Historic District (Cooley Road –Yeoman Road Segment) is being nominated for listing in the National Register of Historic Places for its local significance under Criterion A in the areas of Exploration and Settlement and Agriculture. It is directly associated with the founding of the largest cites in Central Oregon, Bend and Redmond. It is also directly associated with the settlement of hundreds of farms on over twenty thousand acres in what is now Deschutes County. Constructing the Pilot Butte Canal as a commercial enterprise under the Carey Act brought significant private capital and experience in town building and irrigation development to the high desert. The funds were used to build the irrigation system, stimulate and encourage settlement and develop agriculture. By linking the investment in the irrigation company with corporate goals to attract farmers, sell the irrigated land, expand the agricultural sector, and plat and develop the two cities, one at each end of the canal, the project transformed the high desert. Investment capital flowed from the irrigation company as the canal system was built, bringing value to the lands, and flowed back to the company as settlers purchased lands and bought water. Investment flowed to the settlers in cities as the company invested in businesses, buildings, and infrastructure, and as products and services were bought and sold. The region experienced new economic opportunities, growth, and prosperity. In addition, development of these cities and agricultural lands brought further investment into the area, leading to ongoing economic expansion, which brought the local area into the greater economy of Oregon and the Pacific Northwest.

The nominated section was the critical section of the canal construction on which the future of the irrigation company, the settlement of the region, and the agricultural potential of the area rested. The rock in the nominated district presented a great construction challenge, and uniquely reflects the historic construction techniques used. The accomplishment of removing tons of rock while constructing the nominated section exemplifies private enterprise and laborers overcoming the challenges presented by the region's geology. Because of the toughness of the terrain and the exceeding difficulty in removing the volcanic rocks, unique characteristics were carved into the nominated section, leaving it like that of natural water channels, reflecting the type of terrain and the construction methods which prevailed there. It took an extraordinary amount of capital, exceptional expertise in the utilization of technology, and enormous man and horse-power. Completing the nominated stretch was necessary to meet deadlines set by the State of Oregon under the provisions of the contract with the developers. While in late 1904 the upstream and downstream portions were already completed, water could not flow in the canal until the nominated stretch was completed. The company offered higher wages to attract hundreds of men to work to remove the rock under a tight deadline. The period of significance begins with the completion of the Pilot Butte Canal and the founding of Bend in 1905 and ends in 1921 when the settler-organized Central Oregon Irrigation District (COID) became the operator of the canal following a court decree. The Pilot Butte Canal changed the history of Central Oregon by providing the primary means of watering the arid land and bringing a vast amount of capital, thereby significantly contributing to the economic enhancement of Bend, Redmond and the rural county east of the Deschutes River. Furthermore, the

canal facilitated settlement and significantly shaped the settlement patterns of central Oregon as settlers arrived to establish new homes, ranches, farms, and businesses.

Narrative Statement of Significance (Provide at least **one** paragraph for each area of significance.)

INTRODUCTION

Area Overview

The Cascade Range is a spectacular chain of mountains which present a formidable climactic barrier. Running north-south nearly parallel to the Pacific Ocean, the range creates great precipitation as the marine air rises and cools, condensing and falling as rain or snow. On the west side, it creates lush and diverse vegetation and populous timber lands. On the east side, the rich verdancy quickly changes to an arid plateau.[49] The country east of the Cascades presents a series of broad plains and mesas covered with lava of various ages, from that outpoured recently to the ancient flows whose surface has largely changed into soil. This supports a dense growth of sagebrush, bunchgrasses, and juniper near the mountains, in varying proportions, these being intermingled with forage plants. The vegetation becomes sparse out on the broad valleys, though grasses are found.[50] The Deschutes River drains the eastern slope of the Cascades from a point a few miles north of Crater Lake National Park, northward to the Columbia River. The Deschutes Basin is roughly seventy-five miles long and thirty miles wide with an elevation that ranges from about 3,000' to 5,000'. At the beginning of the twentieth century a vast stretch of desert laying on the east side of the river swept to the east and southeast for many miles, while the largest virgin pine forest in the nation covered the hills on the west side of the river up into the Cascades.[51]

Deschutes River Potential

F.F. Henshaw, John H. Lewis and E.J. McCaustland were three outstanding engineers who served in state and federal roles in which they conducted research on the Deschutes River that aided agencies in managing its waters over the first two decades of the twentieth century. Their research a century ago pointed out the river's irrigation and power potential:

> "In several respects [the] Deschutes River is unique among rivers of the United States. Its natural flow is remarkably constant; its headwaters afford reservoir sites sufficiently large and so distributed that the total flow of the river may be utilized both for irrigation and for power; the irrigable lands in the valley, aggregating 300,000 to 500,000 acres, are so situated on a plateau in the upper part of the basin that the total flow of the upper river and its principal tributaries may be utilized for irrigation; and below the irrigable area the river flows in a deep canyon having a fair slope and affording excellent opportunities for power development, a reliable water supply being assured by the return water from the irrigated areas above and by the lower tributaries of the river. The future of this exceptional combination of abundant water supply, large area of irrigable land, and great water powers will transform the Deschutes Valley into a region whose agricultural importance will be enhanced by the many hydroelectric plants that will furnish power for local use or for transmission to distant power markets."[52]

[49] Natural Resources Conservation Service, *Soil Survey: Deschutes Area,* (Series 1945, No. 2, U.S. Department of Agriculture, Soil Conservation Service in Cooperation with Oregon Agricultural Experiment Station, Washington: Government Printing Office, December 1958), 63. This mix and its density, each species' size and the overall composition of vegetation varies by location.

[50] Newell, Frederick Haynes, *Irrigation In The United States*, (New York: Thomas Y. Crowell, 1902), 350-51. Newell became the first Director in 1907 when the Reclamation Service broke away from the U.S. Geological Survey (USGS) to become a separate agency under the Department of the Interior. Among many activities and accomplishments, he was a hydraulic engineer and an expert on irrigation for the Eleventh and Twelfth United States Census.

[51] Henshaw, F.F., John H. Lewis and E.J. McCaustland, *Deschutes River, Oregon and Its Utilization, Water Supply Paper 344*, Prepared in Cooperation with The State of Oregon, John H. Lewis, State Engineer, (Department of the Interior, U.S. Geological Survey, Washington: Government Printing Office, 1914), 9. 'Introduction' by N.C. Grover; " Geological Survey Report on the Deschutes River," (*The Bend Bulletin*, November 25, 1914), 1.

[52] The authors were District Engineer F.F. Henshaw, State Engineer John H. Lewis and their colleague E.J. McCaustland.

The Last Frontier

At the turn of the twentieth century, Central Oregon, known then as the Deschutes country, was the most remote region in the nation with opportunities to capitalize on the Deschutes River, promising lands for agriculture, and immense pine forests. Americans and new immigrants had been spurred westward by visions of productive farmlands, riches of gold and vast stands of timber. A major factor in westward expansion was the building of transcontinental railroads. By 1900 Portland, Oregon, and Seattle and Tacoma, Washington, were served by the railroads, and trunk and other lines linked smaller communities to the social and economic fabric of the nation.[53] The Deschutes country, however, was not connected by rail to the rest of the nation.

George Palmer Putnam, of New York publishing house G.P. Putnam's Sons, explained *In the Oregon Country*, "The map of Oregon had long shown a huge area without a single railroad crossing it. This railless land was Central Oregon, the largest territory in the United States without transportation."[54] Urling C. Coe, M.D., Bend's first doctor, described the land he first saw in January 1905. "This vast unfenced area…was the largest area in the United States without a railroad, and the last frontier of the thrilling and romantic Old West."[55] In 1900 when the Columbia Southern[56] railroad arrived in the small city of Shaniko, sixty-nine miles from Biggs, Oregon, on the Columbia, it became the connection point between the Deschutes country and the outside world—an eighty-mile, twelve-to-fourteen hour trip by stage from Prineville, which was several more hours from the Bend area.

The Carey Act and the Settlement of the West

"Large-scale settlement of irrigated lands in the twentieth century marked the final phase of a process that began when immigrants first plodded west along the trail to Oregon," according to Carlos Arnaldo Schwantes. In his comprehensive history of the region, *The Pacific Northwest: An Interpretive History*, he writes that "[b]y the turn of the century, people who still dreamed of acquiring a farm from Uncle Sam placed their faith in the power of irrigation to transform the region's countless parched acres into desert gardens."[57]

The new approach to encourage settlement of the West was for the federal government to cede up to a million acres of land to each of the ten arid states if they caused the land to be irrigated, settled, and cultivated. The Carey Desert Land Act of 1894 (Carey Act) was the process by which the federal government, acting through the State, agreed to make available up to 160 acres of arid land to a settler who made application for such a tract, settled upon it, and improved at least one-eighth of it into irrigated acreage. The State was responsible to the Secretary of the Interior to have a map and a plan sufficient thoroughly to irrigate and reclaim the designated land to raise ordinary crops, and to bring about the settlement and cultivation of the lands.[58]Oregon accepted the Carey Act process with enabling legislation on February 28, 1901. The 1901 legislation made it

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Detailed plans were presented for the development of water power at eighteen sites along the river. The question of irrigation was presented.

[53] Culp, Edwin D., *Early Oregon Days*, (Caldwell, Idaho, The Caxton Printers, 1987), 107. Culp writes, "In 1883 the Northern Pacific Railroad reached Portland by using the Oregon Railway and Navigation (OR&N) tracks from Wallula Junction to Portland, a line that followed the south side of the Columbia River. At Portland, the NP had previously built its own right-of-way to Tacoma and Seattle... In 1887 the NP again reached Tacoma and Seattle, this time by continuing its track-laying program entirely in Washington Territory…The OR&N was soon to become property of the Union Pacific (UP), a line that would be competitive with the NP."

[54]Putnam, George Palmer, *In the Oregon Country*, (New York: G.P. Putnam's Son, 1915), 54.

[55]Coe, Urling C., *Frontier Doctor: Observations on Central Oregon and the Changing West*, (Corvallis: Oregon State University Press, 1996), 4. Coe arrived in Bend January 10, 1905. He was the city's first medically trained doctor. His book was copyrighted 1940.

[56]Due, John F. and Giles French, *Rails to the Mid-Columbia Wheatlands: The Columbia Southern and Great Southern Railroads and the Development of Sherman and Wasco Counties, Oregon*, (Washington: University Press of America, 1979), 43-52. The railroad arrived in Shaniko, "an artificial creation of the railway," on March 7, 1990. Elmer Elm (E.E.) Lytle was the person who got the project underway in 1887, and was its president from 1889-1906.

[57] Schwantes, Carlos Arnaldo, *The Pacific Northwest: An Interpretive History*, (Lincoln: University of Nebraska Press, 1996), 295, 297. Carlos Arnaldo Schwantes, Curriculum Vitae. Accessed November 13, 2014.

[58]Winch, Martin T., "Tumalo—Thirsty Land," (*Oregon Historical Quarterly*, vol. 85, no. 4., Winter 1984), 347. Winch is considered Oregon's preeminent expert on Tumalo Irrigation District's history because of his seminal, six-part series on the district, published in the *Oregon Historical Quarterly* (1984-86). He served on the district's board. Winch cites U.S.C.A., Sections 641-48; *Water Rights of Deschutes River and Tributaries*, 134 OR 623, 286 P 563, 578-80 (1930). The Carey Act was modified in 1886 and 1901.

State policy that Oregon's arid land should be reclaimed and settled. The State was to rely completely upon private development corporations to bring about reclamation and settlement of the arid lands.[59] At the end of 1904 twenty-three Carey Act segregations (potential project areas) had been created by the State under the Carey Act, but only four of the twenty-three had been approved by the Secretary of the Interior. Three of these four Oregon irrigation projects were in the Deschutes country.[60]-The three projects were: the Pilot Butte Development Company, the Three Sisters Irrigation Company, and the Deschutes Reclamation & Irrigation Company

Irrigation in the Deschutes country had begun before the turn of the century and ventures were of two types: one was the company established as a cooperative effort to irrigate the farms and ranches of the organizers; the second was the firm organized as a private investment enterprise. Cooperatives included the Squaw Creek Irrigation Company[61] and the Deschutes Reclamation and Irrigation Company. [62] They were formed before Oregon adopted the Carey Act, and were characterized by little or no capital investment and minimal engineering. The Deschutes Reclamation and Irrigation Company was a cooperative formed in 1899. Land was selected under the Desert Land Act. Promoters encouraged settlers to acquire an interest by doing an equal amount of work or by purchasing rights from the company. They had completed a segregation of 1,280 acres by 1913. It was also known as the Swalley canal after two area ranchers who formed it.

The Squaw Creek Irrigation Company was a cooperative venture between neighboring farms formed in 1895 and used/uses water from Squaw Creek (now named Whychus Creek), not the Deschutes River.

Those canal companies formed as commercial investment enterprises were later developments that were formed under the Carey Act and were generally larger in scope than the cooperative ventures. These included a project in the Tumalo Creek[63] area, the Arnold Irrigation Company,[64] and two organizations which came under the management of the Deschutes Irrigation and Power Company: The Pilot Butte Development Company and the Oregon Irrigation Company. In 1902 Congress enacted the Reclamation Act, providing for the construction of irrigation works by the federal government with the proceeds from the sale of public lands.[65] In 1913, the state indefinitely withdrew the Deschutes River from further appropriation until a study could be completed,[66] finally in 1935-37. The water in the river had been over-allocated.

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[59] Ibid. 349. Winch cites Oregon Session Laws for 1901, 378; Seventh Biennial Report of the Desert Land Board (1925), 40-46. In order to administer the act in Oregon, legislation created the State Land Board, which consisted of the Governor, the Secretary of State, and the State Treasurer. In 1909 the State of Oregon created the Desert Land Board to oversee the duties relative to the Carey Act conducted previously by the State Land Board. The State Engineer was appointed secretary to the Board. See also: Teele, Ray Palmer, *The Economics of Land Reclamation in the United States*, (Chicago & New York: A.W. Shaw,1927), 67-69, 152-158.

[60] "State View of Irrigation: What Official Biennial Report to the Legislature Says," (*The Bend Bulletin*, January 27, 1905), 4.. (See following footnotes).

[61] *A History of Deschutes Country in Oregon*, (Deschutes County Historical Society, Bend, OR., 1985), 30-31.. In 1917, the company became the Squaw Creek Irrigation District. No actual irrigated acres for the period were identified.

[62] Shaver, F.A., et al., *An Illustrated History of Central Oregon*, (Spokane: Western History Publishing, 1905), 713-14.

[63] Winch, Martin T., "Tumalo—Thirsty Land," (*Oregon Historical Quarterly*, vol. 86, no. 4, winter, 1985), 388. The Tumalo Creek project did not utilize Deschutes River water until 1923; Ibid., 377. Winch states: "[By 1920], only 4,080 of the irrigated acres were actively farmed, on 102 units, producing, for the most part, grains and hay. An average irrigated acre sold for $75 and yielded a gross return of $29. The district's population was 317"; Winch, Martin T., "Tumalo—Thirsty Land," *Oregon Historical Quarterly*, winter 1984 – spring 1986. The irrigation system suffered engineering, managerial and financial disasters throughout its history; Smith, Dwight A., Cultural Resources Specialist, *Historic Context: The Development of Irrigation in the Bend Area c. 1890 to 1940*, (Oregon Department of Transportation, Salem: Oregon Department of Transportation, June, 1991), n.p., Table 1. The organization has been known and operated under a number of names including the following: Three Sisters Irrigation Ditch Co. (1893); Three Sisters Irrigation Co. (1900); Columbia Southern Irrigation Co. (1905); State "Tumalo Project" (1913); Tumalo Irrigation District (1919); Deschutes County Municipal Improvement District (1922); and Tumalo Irrigation District (1959).

[64] *A History of the Deschutes Country in Oregon*, (Deschutes County Historical Society, Bend, OR., 1985), 17. Water was not delivered by the Arnold Irrigation Company until June, 1911; Federal Power Commission, *Report to the Federal Power Commission on Uses of the Deschutes River, Oregon*, (Washington: Printing Office, 1922), 70. A company reported figure of 3,000 acres 'in crop' was provided in 1920.75.

[65] Teele, Ray Palmer, M.A., *Irrigation in the United States*, (New York: D. Appleton, 1915), 12; The Act was also known as the Newlands Reclamation Act, after Nevada Representative Francis G. Newlands who worked for its congressional support.

[66] State Engineer, [Presumed to be John Lewis], *Deschutes Project*: Oregon Cooperative Work, (Department of the Interior,

Post frontier Period, 1883-1917

Schwantes says that, "During the years bracketed by the completion of the Northern Pacific Railroad in 1883 and U.S. entry in the First World War in 1917, the Pacific Northwest moved inexorably into a post frontier world. …The generation of men and women who came to the West in covered wagons…passed from the scene. They had committed to building a new society in the wilderness; those who followed them were also builders—of cities, transcontinental railroad lines, [and] irrigation works..."[67] These 'builders', Eastern capitalists, had accumulated wealth from investments in railroads, oil and gas, lumber, banking and other enterprises. They sought to further amass capital and, at the turn of the century, the Deschutes country offered the last region in the nation with seemingly unlimited resources for those first to exploit its water, land, and timber. Portland *Oregonian* editor Harvey W. Scott observed similar changes occurring in Oregonians as those described by Schwantes. Scott wrote about changes taking place over the entire Northwest. In 1901, Scott told an audience: "Under operation of forces that press upon us from contact with the world at large, and under the law of our own internal development, we are moving rapidly away from old conditions. Pioneer life is now but a memory; it will soon be but a legend."

A.M. DRAKE AND THE PILOT BUTTE DEVELOPMENT CO.

A.M. Drake Arrives on the Deschutes River, 1900

Alexander McClurg (A.M.) Drake, along with his wife Florence W. and Charles J. Cottor, travelling in their covered wagon, arrived in the area that became Bend, Oregon, in June of 1900. Cotter served as the couple's guide, cook and general handy man. That year, William H. Staats sold the future townsite of Bend to Drake for $4,000. In the fall of that year construction of the couple's rustic log home, built and decorated in the style of a mountain hunting lodge, was started on the east bank of the Deschutes River in what would become the center of Bend.[68]

Alexander M. Drake
President, Pilot Butte Development Company
Photograph: Deschutes County Historical Society

He had been interested for years with his father in railroad and land business, and was "nurtured in the philosophy of development."[69] His father, Elias Franklin Drake, had been engaged in banking and had built

U.S. Reclamation Service, Portland, 1914), 10-12.

[67] Schwantes, *The Pacific Northwest: An Interpretive History*, 287; Dennis, Matthew, "Natives and Pioneers," (*Oregon Historical Quarterly*, vol. 115, no. 3), 288.

[68] *A History of the Deschutes Country in Oregon*, (Deschutes County Historical Society, Bend, OR., 1985), 212-213. Drake was born in Xenia, Ohio, on January 11, 1859. The family moved to St. Paul, Minnesota, following the close of the Civil War. The couple retired to Pasadena, California, in 1911. He died October 10, 1934, following his wife's death on May 15, 1933; Brogan, Phil F., *East of the Cascades*, (Portland: Binford and Mort, 1964), 181-185.

[69] Clark, Keith, *Redmond: Where the Desert Blooms*, (Portland: Western Imprints, 1985), 4; Shaver, F.A., et al., *An Illustrated*

railroads in the mid-to-late 1800s in Ohio, Indiana, Minnesota, and in other areas of the central part of the nation, including the first ten miles of railroad in Minnesota which became a section of the Great Northern Railway. While building railroads, he, through his company, founded several towns, including St. James and Worthington, Minnesota. He served three terms in the Ohio House of Representatives, one term in the Minnesota Senate, and retired as president from the St. Paul & Sioux City Railroad in 1880.[70] He and James J. Hill, who built the Oregon Trunk Railroad to Bend in 1911, had lived very close to one another in St. Paul, Minnesota.[71]

Drake Lodge on Deschutes River, c. 1904
Photograph: Deschutes County Historical Society

L.D. Wiest, Engineer, 1900-07[72]

For thousands of years, one of the greatest engineering challenges has been to bring water to where it is needed, whether to irrigate crops, provide for cities, or to create shipping lanes. Engineer Levi D. Wiest was hired by Drake in 1900 and stayed with the PBD Co. until 1907. He had entered the classical course at Pennsylvania College in 1879 and began to study surveying. From 1881 to 1883 he pursued courses in drafting and civil engineering at the University of Michigan. He surveyed and subdivided his father's land at about that time, and soon after was selected to prepare the plans for the Salina, Kansas, cemetery. By 1884 he was a transit man on a locating party for the Gulf, Colorado and Santa Fe Railroad in Texas.

Wiest then entered employment in the engineering department of the Union Pacific Railway and also the Missouri Pacific Railway, working different instrument positions, typographer and field draughtsman on locating parties, positions on the construction crew, and spent ten months in auditing. In Wyoming in1889 he located approximately 200 miles of canals, laterals, and ditches, which were all built. Arriving in Portland, Oregon in December that year, he made a survey for the Chehalis, Washington water system and afterwards entered the auditing department for the Oregon Washington Railroad and Navigation Company, a system of the Union Pacific. He transferred to a locating party in Idaho for the Oregon Short Line and later to a construction party in

History of Central Oregon, (Spokane: Western History Publishing, 1905), 717.

[70] Minnesota Historical Society, Collections of the Minnesota Historical Society, "Elias Franklin Drake Obituary" (Accessed October 15, 2014); Schmiedeler, Tom, Minnesota Historical Society, "Civic Geometry: Frontier Forms of Minnesota's County Seats" (Accessed October 15, 2014).

[71] Millett, Larry, E-mail to Michael Hall, (April 16, 2014). Miller, an author of several books on the history of architecture in Minnesota, indicated Elias F. Drake's 1866 residence on Lafayette Road was about six blocks from Hill's 1878 home on Canada Street in the Lowertown neighborhood. In 1891 Hill moved to a much larger new residence about a mile-and-a-half from Drake's place. Though, it is not entirely clear how long Drake lived at the Lafayette address, one city directory indicates he was still living there in 1879, so he and Hill were indeed neighbors at one point.

[72] Wiest, Levi D. Biography from *Deschutes Pioneers Gazette*, Deschutes County Historical Society, and Family Sources. (Compiled by Pat Kliewer, Bend, Oregon, 2014).

Oregon and engaged in the reconstruction of the main line of the Union Pacific through the Columbia River Gorge.

Wiest resigned his position with Union Pacific and on October 1, 1900, he began work for Drake, becoming the Chief Engineer of the PBD Co. From the company's early organization, he made all of the surveys of the canal routes and land examinations required under the Carey Act for segregation and for construction purposes. He was the vice-president of the PBD Co. and his duties went beyond canal work to securing land and water rights and similar matters. He surveyed and made the plans for the Bend townsite plat; designed and erected buildings for the company; designed the PBD Co. sawmill; designed Bend's first water system; and designed Bend's power dam.[73]

Levi D. Wiest, Civil Engineer, with wife and daughters
Photograph: Deschutes County Historical Society

The Pilot Butte Development Company, 1902

Drake, his wife, and Cotter incorporated the Pilot Butte Development Company (PBD Co.) on October 29, 1900, to divert the waters of the Deschutes River and to conduct the water through dams, canals, flumes, ditches, pipes, siphons, and other instrumentality to distribute and convey it for irrigation, mining, milling, domestic, manufacturing, navigation, lumbering, power or other purposes, and to supply water to municipal corporations or individuals, for public or private use.[74] Days later, on October 31, he initiated the filing process for water rights.[75] His water rights were under the doctrine of 'appropriation'. Irrigation economist Ray Palmer Teele, M.A., explained the meaning of the term: "Under this doctrine anyone who will put water to a 'beneficial use' may take or 'appropriate' it, and the right to continue to take it exists so long as the use continues, provided such use does not conflict with use by one who made an earlier appropriation from the same source."[76] There was a race to file for water rights on the Deschutes and Drake had posted notices on the river

[73] Family history indicates he saw an advertisement in the Portland *Oregonian* placed by Drake and traveled to Prineville, the Crook County seat, to meet him, then visited what would become Bend, and accepted the position. Beginning about 1907, Wiest was the Arnold Irrigation system engineer for about fifteen years. During 1908-1910 he surveyed a canal for the Suttle Lake Improvement District. From 1923-1927, he surveyed for a railroad between Bend and Sisters for logging purposes. He served as school board director for at least seven years in the school's formative years. He was involved in a number of other enterprises.

[74] Crook County, Oregon, *The Pilot Butte Development Company Articles of Incorporation*, (vol. 1, page 78, Crook County Clerk, Prineville, Oregon, October 29, 1900).

[75] Becker, Frank R., Assistant State Engineer, Under the Direction of Rhea Luper, State Engineer, *A Report on the Central Oregon Irrigation District*, October 19, 1924, (Deschutes County Clerk's Office, Bend, OR.), 138.

[76] Teele, Ray Palmer, M.A., *Irrigation in the United States*, (New York: D. Appleton, 1915), 85. Teele added: "'First in time, first in right', is the classical statement of this doctrine."

and filed documents with the state. His other plans included building a city, a lumbermill, an electrical power-generating plant, a general store, and a school house.[77]

On May 31, 1902, the PBD Co. entered into a contract with the State of Oregon for the reclamation of lands in Segregation List No. 6, comprising 84,707.74 acres under the Carey Act. The company had been engaged with the State to secure the agreement for approximately a year, according to the State Engineer.[78] Wiest was appointed to make the surveys, and J.C.S. Taber was hired as selecting agent. It was the largest contract entered into by the State at the time, to be conducted over a period of ten years. Drake was on the Deschutes River examining it and the lands for a year or more before Oregon adopted the provisions of the Carey Act (1901).[79] The cost of construction and the amount of the lien was fixed at $848,557, the amount estimated by the PBD Co. to build two main canals and a water distribution system, which was about $10 per acre. After an examination made in the field, the State Engineer reported to the State Land Board, "the land is irrigable and the soil is good except for lava dykes 'cutting it up' and there is no alkali; the water supply in the 'Big Des Chutes' is ample for complete reclamation and the dimensions of the proposed canals are sufficient; the general plan of irrigation is feasible and the work proposed, when executed, should reclaim the land; the estimate of cost is not too high, but the estimate for maintenance is too high."[80]

Drake's plans for irrigation development and the incorporation and settlement of Bend, Oregon, were born out of significant eastern wealth and the lure of late nineteenth century capitalism, fueled by the rich promises of the Deschutes River. The U.S. Department of the Interior in 1890 reported the irrigation potential of the DeschutesRiver and the adjacent lands: "It appears not improbable…that a great irrigating system can be profitably constructed along this river. There seems to be no question as to the permanence of the water supply, the fertility of the land when irrigated, and the favorable character of the climate." The report's author, Frederick H. Newell, would become Chief Engineer of the U.S. Reclamation Service upon its creation in 1902, and its first Director in 1907.[81] Drake clearly understood the opportunities before him, including irrigation development, settlement of cities, encouraging his family's railroad partners and associates to extend a railroad to the area and the buying, selling and development of land for business and agricultural purposes.

PBD Co. Plans and Progression of Work, 1903

A headgate(s), or head gate(s), is a structure built for the purpose of forcing water into a canal; it may be a weir or dam. Head-works (headworks) is another term for the structures. The Pilot Butte Canal headgates on the Deschutes River,[82] referenced in a local newspaper in February, 1903, and the 'Becker Report' indicated

[77] Shaver, F.A., et al., *An Illustrated History of Central Oregon*, (Spokane: Western History Publishing, 1905), 717.

[78] Becker, Frank R., Assistant State Engineer, Under the Direction of Rhea Luper, State Engineer, *A Report on the Central Oregon Irrigation District*, October 19, 1924, (Deschutes County Clerk's Office, Bend, OR.), 138, 141. In the spring and summer of 1901 lands were examined and surveyed and a plan of reclamation was prepared for submission to the State Land Board. September 11, 1901, PBD Co. made an application to the State Land Board for a preliminary contract covering the land included in what was later designated as Carey Act Segregation List No. 6. December 2, 1901, a preliminary contract between PBD Co. and State of Oregon was executed. May 31, 1902, a final contract between PBD Co. and State of Oregon, providing for the reclamation of lands in Segregation List No 6, was executed; State of Oregon, *Report of State Land Board Relative to Desert Lands, Granted the State Under the "Carey Act" for the Period Commencing October 1, 1902, and Ending September 30, 1904*, to the Twenty-Third Legislative Assembly [Regular Session], (Salem, Oregon, 1905), 11.

[79] Russell, Israel Cook, *Preliminary Report on the Geology and Water Resources of Central Oregon,* Bulletin No. 252, (U.S. Geological Survey, Department of the Interior, Washington: Government Printing Office, 1905), 94. Russell reported that Drake has had "detailed surveys" made to take water from the Deschutes River at Benham Falls and to conduct it to the "rich lands lying west of Culver… [as] …a part of an extensive and apparently well-matured plan for the irrigation of a vast extent of now unproductive land in the west-central part of Crook County."

[80] State of Oregon, *Report of State Land Board Relative to Desert Lands for the Period Ending September 30, 1902*, (Salem, Oregon, 1902), 26-28.

[81] Newell, F. H., *Report on Agriculture in the United States at the Eleventh Census: 1890*, (Department of the Interior, Census Office, Washington: Government Printing Office, 1894), 207. Newell became the first Director in 1907 when the Reclamation Service broke away from the U.S. Geological Survey (USGS) to become a separate agency under the Department of the Interior.

[82] I.C.S. Staff, *Dams—Irrigation*, (Scranton: International Textbook Company, 1906), 38. This source was a college textbook for engineering students with an emphasis on mathematical equations; it is used here for its definition. For additional information on the subject, see Davis, Arthur Powell, D.Sc. and Herbert M. Wilson, C.E., *Irrigation Engineering*, (New York: John Wiley & Sons, Seventh

engagement of the company with the State Land Board in the period before the contract was signed. The report suggests that the headgate was built by early 1903.[83]The article indicates some excavation, i.e. clearing of rock along the flume right-of-way, had been done "two years before." Though before the contract date, it is possible that Wiest was ready to begin the headgates even before the contract was signed between the PBD Co. and the State, as plans were moving forward in spring and summer of 1901, as suggested by Becker's 1924 report.

The plans of the PBD Co. in July, 1903, were to build the irrigation canal from the headgate at a point on the Deschutes River about three miles upstream from (south of) the future City of Bend, Oregon, out in a northeasterly direction through the dry country. For about a mile-and-a-quarter after the headgates, a flume[84] would carry the water over nearly solid rock. A new lumber mill was to be assembled near the flume to produce the lumber for its construction. That lumber would need to be dried and planned to reduce the chance of warping or other imperfections that could result in the loss of water. Designing the flume was not considered difficult and would be the same as done for other canals in the west and in the region. Preliminary preparations, though, were expected to consume time. No canal work was to be performed until the flume was completed, as plans called for water to be brought along in the canal for the construction camp following its excavation. Work progressed rapidly and economically. At the end of July a half a dozen men were clearing right-of-way for the flume through the river's canyon, trees within reaching distance of the flume were cut away and a space of 25' wide underneath was cleared of all combustible matter. Men would be gradually added as the construction got underway.[85]

The company lumber mill was beginning to operate at intervals as the machinery was tested and adjusted to expeditiously produce lumber in August.[86] The firm began to saw and pile the estimated 700,000 board feet of lumber that would be required for the flume. The flume would follow the general line of the Deschutes canyon wall, cutting across chasms on trestles as high as 25'. At several points along the way where excavation was necessary the work had been done two years before. With the mill at the lower end of the flume, a false flume bottom was to be laid from the mill site to the headgates, which would serve as a roadway for the transportation of materials for the building of the flume. As the flume was completed workmen would move back down the roadway toward the mill, thus preventing the marring or soiling of the finished flume. The work on the flume was expected to be done in November, 1903. At the end of October nearly 1000' of trestle for the flume was completed and the working floor was being laid from the mill up toward the headgates; work was proceeding at 200' to 400' per day.[87] Half the flume was to be completed the first week of December.[88] Thereafter, four wagon loads of scrapers and a breaking plow arrived, but pay, working conditions, and weather precluded canal work, though some blasting was to be completed at the intake.[89] In February, 1904,

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Edition, 1919), 247-262, Chapter XIV, "Canal Structures." Davis was formerly Director and Chief Engineer, U.S. Reclamation Service. Wilson was formerly Chief Engineer and Irrigation Engineer, U.S. Geological Survey.

[83] "Desert Will Be Irrigated," (The DesChutes Echo, February 21, 1903), 1. The article states, "The headgates of the proposed canal are near here"; Working On the Flume Line, The Bend Bulletin August 28, 1903"[83] ('Becker Report'); Becker, *A Report on the Central Oregon Irrigation District*, October 19, 1924, 138, 141. In the spring and summer of 1901 lands were examined and surveyed and a plan of reclamation was prepared for submission to the State Land Board. September 11, 1901, PBD Co. made an application to the State Land Board for a preliminary contract covering the land included in what was later designated as Carey Act Segregation List No. 6.

[84] Etcheverry, B.A., *Irrigation Practice and Engineering: Volume II, Conveyance of Water*, (New York: McGraw Hill, First Edition, 1915), 198. According to Etcheverry, Head of the Department of Irrigation, University of California, in 1915, "A flume may be either a bench flume, supported on a shelf or cut in the side hill, or may be an elevated flume for the conveyance of water over a depression or drainage channel. In steep side-hill work the uphill side of the flume may be supported on a narrow shelf and the downhill side held up by posts or other form of substructure." These support structures were generally referred to as trestles.

[85] "Work On The Ditch: Plans and Progress of Pilot Butte Development Co.," (*The Bend Bulletin*, July 31, 1903), 3.

[86] "Local Events of the Week," (*The Bend Bulletin*, August 21, 1903), 3; "Local Events of the Week," (*The Bend Bulletin*, July 24, 1903), 3. A 45-horse-power engine provided the mill's power. Two loggers had delivered 200,000 board feet of timber, one-third of their contract.

[87] "Progress of Irrigation Flume," (*The Bend Bulletin*, October 23, 1903), 3.

[88] "Work On the Flume," (*The Bend Bulletin*, November 27, 1903), 3.

[89] "Pushing the Ditch Work," (*The Bend Bulletin*, December 14, 1903), 3. Drake offered tents in December weather and sheds for the animals were yet to be erected. Two-thirds of the flume trestle was completed; the flume proper's extent of completion is not

the flume was reported to be 1-1/2 miles in length, with trestle supports 8' apart set on solid rock, and was to be finished by March; however, completion did not occur.[90] No further significant work by Drake's PBD Co. was conducted at that time.Providing an open channel below the flume would be comparatively easy work. For part of the distance, natural channels would be followed and the water would "wash its own way." The remaining canal work, it was said, would "amount to little more than leading the water along the surveyed course."[91] Plans were to deliver water below the Bend townsite before the end of the year.

Guests on the Deschutes, 1903

As early as 1891, A.M. Drake sat on the board of directors of the Chicago, St. Paul & Kansas City Railway Company.[92] Just over a decade later, in November of 1903, Colonel James H. Drake, and James G. and Arthur L. Goodwillie, all of Chicago, spent ten days with Drake and his wife on the banks of the Deschutes. Colonel Drake was a cousin to A.M. Drake. The Colonel was formerly the land commissioner of the St. Paul & Sioux City Railroad (the same railroad as Elias Drake was president) and its assistant manager, but more recently had been a Chicagoan and for twenty-five years had been a member of the Chicago Board of Trade.[93] Elias F. Drake died in 1892, leaving the Colonel as the elder family member and confidant that had been associated with him, and the one with experience in the development of congressional land grants, engineering and construction, finance and other matters.[94] He was not a Board of Trade commission member, nor did he represent a bank, brokerage house or any other type of firm. He was an independent speculator-investor. He held substantial wealth and understood sizeable investments.[95]

James G. Goodwillie, the father, was for thirty years engaged in extensive lumber manufacturing as Goodwillie & Goodwillie at Wausau, Wisconsin, and then was a member of Goodwillie Bros. in Chicago. His firm had built wooden boxes since 1873 and was the oldest manufacturer of boxes, in point of time, in the United States, with

stated. It is not evident if the 'intake' specifically indicates the headgates, or if the blasting is to enlarge the stretch between the headgates and the flume; "P. B. D. Co.'s Work," (*The Bend Bulletin*, December 11, 1903), 3. The cold weather made work slow. The ground was frozen several inches deep. Excavation work was moved north near Long Butte where the soil was not frozen.

[90]"To Open Empire: Big Irrigation Companies in Combine," *(Morning Oregonian*, February 16, 1904), 10. It is possible the extent of the flume's completion was overstated for investors, or what component of the flume was completed was simply misunderstood, i.e. the entire flume was not completed, though the trestle structure may have been.

[91] "Working On the Flume Line," (*The Bend Bulletin*, August 28, 1903), 3. In addition to the excavation indicated to have been done "two years before," it is possible that Wiest began the headgates, referenced in the *DesChutes Echo* of February 21, 1903, and cited in the first sentence of this section, also in 1901; "Clearing Flume Right of Way," (*The DesChutes Echo*, August 8, 1903), 1. A track was to be laid along the flume route for the purpose of conveying material for the structure, as the route was inaccessible to teams.

[92] *Fourteenth Annual Report of the Board of Railroad Commissioners for the Year Ending June 30, 1891, State of Iowa*, "Annual Report of the Chicago, St. Paul & Kansas City Railway Company for the Year Ending June 30, 1891," (Des Moines: State Printer, 1891), 258; "Chicago, St. Paul & Kansas City Railway Company," *Annual Report of the Railroad and Warehouse Commission of Minnesota to the Governor for the Year Ending Nov. 30, 1892*, (Minneapolis: Harrison & Smith Printers, 1893), 235; "Thompson v. Chicago, St. P. & K.C. RY. Co. et al.," (Circuit Court, D. Minnesota, First Division, April 14, 1894), 778. The court document indicates it was organized under the laws of the State of Iowa; Park Genealogical Books. The railroad was started in 1887 and ended in 1983.

[93] "A Revelation to Chicagoans," (*The Bend Bulletin*, November 6, 1903 p. 6.)

[94] *Legislative Documents Submitted to the Twenty-third General Assembly of the State or Iowa, Which Convened at Des Moines, January 13, 1890, vol. vi*, (Des Moines: State Printer, 1890). As an example, in the year reported, the Chicago, Milwaukie & St. Paul Railway Company received congressional grants in Iowa of 372,133.27 acres of land. In that year, the Chicago, St. Paul & Kansas City Railway Company, the railroad on whose board A.M. Drake is known to have sat in 1892, the amount of stock representing railroad in Iowa was $8,538,978.91 (p. 48). The actual cash value of the railroad and equipment was $43,737,728.50 (p. 55).

[95] Stone, George F., The Forty-Second Annual Report of the Trade and Commerce of Chicago for the Year Ending December 31, 1899, *Compiled for the Board of Trade*, (Chicago: The J.M.W. Jones Stationery and Printing Co., 1900), 239; Stone, George F., The Forty-Fourth Annual Report of the Trade and Commerce of Chicago for the Year Ending December 31, 1901, *Compiled for the Board of Trade*, (Chicago: The J.M.W. Jones Stationery and Printing Co., 1902), 231; Keller, Megan, Project Archivist, CME Group Collections, University of Illinois At Chicago, E-mail to Michael Hall, (March 23, 2015). James H. Drake was a member of the Chicago Board of Trade from Nov. 13, 1876 to Jan. 14, 1903.

plants in several cities.[96] His son, Arthur Lawson Goodwillie, had graduated from the prestigious Williams College in 1901 and then worked for a large banking concern in Chicago.[97]

Drake took his guests for a tour of the Deschutes River area, and to view the PBD Co.'s irrigation works and the lands to be irrigated. They drove down the route of the Pilot Butte Canal to Forked Horn Butte near the future city of Redmond to see the broad area to be served by the canal system, and to gain an understanding of the Deschutes country.[98] Before leaving the area, Colonel Drake commented on what they had discovered during their visit:

> "*This country is a revelation to us. Nobody can get an adequate conception of this section by reading about it. It is an empire and I am fairly astonished at the display of native resource and possibilities of development that I observe here. Here I find actually present, and in a form to appeal to any business judgment, such native wealth and much opportunity for using it that I am surprised and gratified beyond expression*."[99]

Drake and his wife accompanied the group to Portland, and was absent from the area for about two months.[100] Returning in January, 1904, he announced "that important plans had been made for the watering of the wilderness, the development of Bend and the colonization of the Deschutes country. He had been as far east as Chicago 'to lay plans for immigration' and to attend to other business connected with his irrigation enterprises."[101]

Contesting Irrigation Companies: PBD Co. and Oregon Irrigation Company, 1900-1903

A.M. Drake and Charles C. Hutchinson, president of the Oregon Irrigation Company (O.I.C.), were early irrigation development competitors in the Deschutes country, which provided the impetus for a contentious relationship. "Inevitably there was competition," wrote historians Keith and Donna Clark in "Pioneers of Deschutes Country," *High & Mighty: Select Sketches about the Deschutes County*.[102] Describing the Drake-Hutchinson contest, they say:

> "*Hutchinson was on the Deschutes with engineers making surveys and water filings two years before Drake appeared in 1900. Since Hutchinson needed capital, in 1899 he wrote to Drake at*

[96] "A Revelation to Chicagoans," (*The Bend Bulletin*, November 6, 1903), 6; Leonard, John William, *The Book of Chicagoans*, (1911, vol. 2), 273. It appears the Wausau firm was called Goodwillie & Goodwillie, 1873-1890, and the Chicago firm, 1890 to at least 1911 (the publication date of this book), called Goodwillie Bros. Another plant was in Manistique, Michigan.

[97] "A. L. Goodwillie Is Dead At 67," *(Lynchburg News,* Lynchburg, Virginia, January 15, 1946), n.p. The obituary says, "He was attracted to the West from his native Chicago by the potentialities of a huge irrigation plan. With a friend, he purchased large tracts of land in the area. When only twenty-three he was named mayor of the town he founded, and received nation-wide recognition as the youngest 'town father' in the country; Family Search, "Arthur Lawson Goodwillie," (Individual Record, Pedigree Resource File); "First Mayor Dies in Virginia," (*The Bend Bulletin*, January 22, 1946), 1.

[98] "A Revelation to Chicagoans," (*The Bend Bulletin*, November 6, 1903), 6; "Why It Is Called Forked Horn Butte," *The Redmond Spokesman*, December 14, 1911), 2. According to the local story, "In the early days a homesteader went hunting on the butte and killed a forked horn deer, and ever since that time in speaking of the locality it has been designated as 'Forked Horn Butte'."

[99] "A Revelation to Chicagoans," (*The Bend Bulletin*, November 6, 1903), 6.

[100] "Local News," (*The Bend Bulletin*, November 13, 1903), 3; Brogan, Phil F., "The Watering of the Wilderness," (*The Bend Bulletin*, January 27, 1931), n.p.

[101] Brogan, Phil F., "The Watering of the Wilderness," (*The Bend Bulletin,* January 27, 1931), n.p. Brogan article, Drake statement.

[102] Vaughan, Thomas, ed., Keith and Donna Clark, "Pioneers of Deschutes Country," *High & Mighty: Select Sketches about the Deschutes Country*, (Portland: Oregon Historical Society, 1981), This text was researched and written by those who lived, or had lived, in Deschutes country or were otherwise particularly familiar with its characteristics and the history surrounding it. Keith Clark's involvement with Oregon Historical Quarterly and the Oregon Historical Society Press spanned many years. Besides contributing to *High and Mighty*, he authored *Redmond: Where the Desert Blooms*, he co-edited with his wife, Donna, *Daring Donald McKay, orThe Last War Trail of the Modocs*, and was a contributor to the *Oregon Historical Quarterly*, and served for many years on the OHQ Editorial Advisory Board. With Lowell Tiller, he co-authored *Terrible Trail: The Meek Cutoff, 1845*. Clark also served as president of the Deschutes County Historical Society and on the Deschutes County Historical Landmarks Commission. He taught history at Central Oregon Community College; "Keith Clark Obituary," Oregon Historical Quarterly, 2002, *HighBeam Research,* (November 15, 2014); Oregon History Project, (November 15, 2014).

Spokane, representing to him the potential profits in irrigation development near Bend. Drake came, assessed the prospect and asked for Hutchinson's proposal. He was offered half of the company stock, with agreement that he be president and manager, conditional on his supplying needed capital. Drake agreed to the terms, and paid for surveys. About two months afterwards, Drake informed Hutchinson that he saw no reason for partnership in the venture, in effect elbowing Hutchinson aside."[103]

The two companies then proceeded to make new water filings, in two instances side by side. Hutchinson protested to the General Land Office, which dismissed it. Thereafter, Secretary of the Interior Hitchcock affirmed the decision, and recognized the legitimacy of the PBD Co.'s claim.[104]
In early December, 1903, Hutchinson returned to revisit the Deschutes country after being gone "for a year or more," with W.E. Guerin and H.D. Turney, of New York, who represented capitalists favorable to investment in irrigation development.[105] A January 20, 1904 letter to the State Land Board from Hutchinson indicated his plans to move forward on a number of matters that conflicted with the PBD Co.'s plans, which Drake had previously protested in a letter to the land board. Hutchinson's plan to build a dam across the Deschutes River was a threat to the PBD Co., as it could divert water away from the planned Pilot Butte Canal. Hutchinson pointed out to the land board the applicable law allowed a dam located on private land to be built.[106] The letter further indicated that his O.I.C. had complied with all of the requisites for a contract for reclamation.[107] The letter refuted Drake's charges, pointing out that the land board's own engineer had made an examination of the feasibility of the plan, and that the O.I.C. would demonstrate to the satisfaction of the land board its financial ability to conduct the project.[108] The plans called for, among other actions, irrigating northward from a diversion point, similar to Drake's plan.[109]

On January 30, 1904, the PBD Co. sawmill that was producing lumber for flumes and other canal building burned. The mill had finished cutting lumber for the flume but the lumber had not been planed. The mill crew saved the planer; however. The sawmill proper was "totally ruined and the engine was subjected to a great heat and many parts were ruined"[110].

[103] Vaughan, ed., "Keith and Donna Clark, "Pioneers of Deschutes Country," *High & Mighty: Select Sketches about the Deschutes Country*. The Clarks cite a letter, "C.C. Hutchinson to Binger Herman," dated October 10, 1901, in author file. Binger Herman, of Oregon, was commissioner of the General Land Office.

[104] Ibid.; Becker, Frank R., *A Report on the Central Oregon Irrigation District*, 1924, "Report: Duty of Water," 1-2. Becker summarized Hutchinson's plans. The Oregon Irrigation Company had been incorporated November 14, 1899, by C.C. Hutchinson and others, and made application to the board in 1901 for a contract to reclaim lands in Central Oregon. The application was protested by A.M. Drake. On January 21, 1902, upon request of the Oregon Irrigation Company, all papers and maps previously filed with the board were withdrawn and returned to the company. On December 22, 1903, the Oregon Irrigation Company made a second application for a contract to reclaim lands in Central Oregon. This application was also protested by Drake. The lands included were designated as Segregation List No. 19, an area of 56,006.90 acres.

[105] "Hutchinson Again Here: Brings New Yorkers to Look Over His Irrigation Project," (*The Bend Bulletin*, December 4, 1903), 3. The report said: "The result of their inspection was not made known before the party left for Portland Wednesday, but there was more or less talk about starting operations on a large scale in the spring [of 1904]."

[106] Oregon State Archives, Letter from A.M. Drake, Pilot Butte Development Company, to State Land Board, January 6, 1904, Desert Land Board Reclamation Records, no. 10-18, box 15, folder 2; Oregon State Archives, Letter from C.C. Hutchinson, Oregon Irrigation Company, to State Land Board, January 20, 1904, Desert Land Board Reclamation Records, no. 10-18, box 15, folder 2.

[107] Ibid. The requisites required having a number of documents filed showing matters including: having an engineer and selecting agent appointed by the land board, a map showing plan of contemplated irrigation and source of water, field notes of survey showing connections of termini with ditch, statement of available water, list of lands selected, contracts with the Secretary of Interior and State, application for contract with an estimate of reclamation costs and annual maintenance charge, and deposit for fees required by the State and the United States land office.

[108] Ibid.

[109] Ibid.

[110] "Two Fires: Sawmill Burns Here, Pilot Butte Development Company's Mill Destroyed Last Saturday Afternoon—Will Not Be Rebuilt," (*The DesChutes Echo*, February 6, 1904), 1. "Lumber to Build: Pilot Butte Mill Is Now In Full Operation," (*The Bend Bulletin*, May 13, 1905), 1. Rebuilding the mill to plane (finish) the flume lumber would take over four months.

That week in January, 1904, Hutchinson, who had "done no actual construction work,"[111] brought eastern capitalists and an engineer into the area for nearly a week.[112] The state engineer also arrived then to inspect the progress made by the PBD Co. and to estimate the value of its work.[113] Drake's contract with the state was for work over ten years, calling for at least ten percent of the project to be done each year, or about $85,000 of construction to be conducted by the end of a year, beginning six months after signing the contract of May 31, 1902. By December, 1903, a year-and-a-half had passed; Drake's time to produce 10% of the project was at an end. If a company with a feasible plan and the financial ability to conduct the project was available, an unfavorable report on the extent of the PBD Co.'s construction by the state engineer to the State Land Board could result in Drake being compelled to sellout. By mid-February, Hutchinson and his capitalists were meeting with the State Land Board.[114]

DESCHUTES IRRIGATION & POWER CO.

Deschutes Irrigation & Power Company Buys Out PBD Co. and O.I.C., 1904

In an action the *Oregonian* called "the most important step which has yet been taken in the work of reclaiming the vast empire of interior Oregon,"[115] the Deschutes Irrigation and Power Company (D. I. & P. Co.) incorporated and representatives went before the State Land Board to announce they had bought out the rights of the PBD Co. and the Oregon Irrigation Company, in mid-February, 1904. The D. I. & P. Co. was capitalized at $2,500,000. The board was informed that the PBD Co.'s rights and contract were bought out at $70,000; the rights of the Oregon Irrigation Company, owned by C.C. Hutchinson, were obtained at about half that amount. Drake's buyout price indicates he did not meet the $85,000 objective set in the contract with the state."We will have water running in our flumes inside of sixty days," said W.E. Guerin, Sr. "Inside of four months, and possibly in three months, we will have water on 25,000 acres of desert land."[116] Guerin had built the Palmer cut-off on the Northern Pacific railroad as president of the Seattle and San Francisco Railroad & Navigation Company, bringing the mainline into Seattle, and sold its rights to the Northern Pacific.[117]

His promises that day stemmed from a career striving to satisfy both railroad investors and government regulators. There was a message to investors in the 25,000-acre figure promised in three or four months: Lands would be irrigated in the time promised; irrigated lands would be selling soon; ten percent of the company's $2,500,000 capitalization (investment), i.e. $250,000, equaling one-third of the contract price with the state, would be returned to the company soon;[118] and the return on their investment was safe and

[111] "To Open Empire: Big Irrigation Companies in Combine," *(Morning Oregonian*, February 16, 1904), 10. Hutchinson had made a number of surveys.

[112] "Work to Begin Soon: The Oregon Irrigation Company Making Its Final Arrangements," (*The DesChutes Echo*, January 30, 1904), 1. Capitalists included Guerin, Turney, and Elliot. The engineer was J.G. Kelley, who would become the D. I. & P. Co.'s chief engineer.

[113] "State Engineer In Town," (*The DesChutes Echo*, January 30, 1904), 1. E.A. Hammond was the new State Engineer.

[114] "Work Will Soon Begin: Oregon Irrigation Company Completing Arrangements With State Land Board," (*The DesChutes Echo*, February 13, 1904), 1. Capitalists included Turney, Guerin, Johnston, and Elliott. One or more provided letters from "Governor Herrick of Ohio and from a number of strong Eastern banks."

[115] "To Open Empire: Big Irrigation Companies in Combine," *(Morning Oregonian*, February 16, 1904), 10.

[116] "Water In Sixty Days: Deschutes Irrigation Company Buys Out Others," (*The Sunday Oregonian*, February 14, 1904), 6; "Articles of Incorporation: Filed in the Office of State at Salem," (*The Sunday Oregonian*, February 14, 1904, Portland, OR.), 1. Deschutes Irrigation & Power Company, Portland, Oregon, was incorporated on February 10, 1904, by W.A. Munly, George H. Hill, and E.B. Holmes, all of Portland; "The Pilot Butte Development Co. to Deschutes Irrigation & Power Co.," [Filed] March 14, 1904, vol. 2, pp. 449-452, (Deschutes County Clerk's Office, Bend, Oregon [Crook County Clerk's Office, vol. 12, p. 189]). Date of March 14, 1904, and sum of $848,557.00 are indicated in document;"Reclaim Desert Lands: Large Company Will Operate in Crook County—Begin at Once," (*Daily Capital Journal*, February 15, 1904), 3; "Deschutes Irrigation & Power Co. Organized: P.B.D. Co. Sells Out," (*The DesChutes Echo*, February 20, 1904), 1.

[117] "Feeling In the East," (*TheDesChutes Echo*, May 14, 1904), 1.

[118] Figures are as follows: 25,000 acres x an average of $10 per acre = $250,000, i.e. 10 percent of the capitalization; $250,000 / $848,557 (contract price) = 33.9 percent, i.e. 1/3 of the contract price would returned to the company immediately; therefore, the remaining irrigation development would occur rapidly, as well, and afterward profit would be realized. See following footnote for further explanation.

forthcoming.[119] The promise was also to potential settlers that the lands would be ready for farming soon. The land board, consisting of the governor and the state's three other top elected officials, would have requested specific goals and a well-defined timeline.[120] It had been understood that negotiations were pending for consolidation of the two enterprises and the land board expressed satisfaction in the news, as it felt a contest between the two companies of certain water rights had resulted in not much progress being made, and that the irrigation work in the Deschutes country should be undertaken under one management.[121] The primary components of the transaction were completed by mid-March.[122]

The principal backers of the new enterprise were "understood to command unlimited means and intend to push the work to completion as rapidly as possible." They were largely interested in railroads and the oil and gas fields of Ohio and Indiana.[123] In addition to W.E. Guerin, Sr., of New York, the capitalists included J.O. Johnston and H.D. Turney, both of Columbus, Ohio. Johnston was general manager of the Columbus Gas Light and Heating Company, Columbus.[124] Turney held investments in oil and gas, and also had operations in New York City.[125] Portland stockholders included Harvey W. Scott, editor of *The Oregonian*, and J. Frank Watson, president of the Merchants Bank. Others were R.H. Eliott, mayor of Birmingham, and chief engineer of the Louisville & Nashville Railroad; Geo. W. Sinks, president, Desher National Bank; and John Desher, both of Columbus. J.O. Johnston, elected vice president, would be the project's general manager. His work in the gas fields of Ohio was highly respected.[126] C.C. Hutchinson was a stockholder, board member, and land commissioner.[127] W.E. (Eugene) Guerin, Jr.,[128] would be a part of the vanguard, involved in establishing and

[119] "Concerning Water Rights," (*The DesChutes Echo*, (June 25, 1904), 1."State View of Irrigation: What Official Biennial Report to the Legislature Says," (*The Bend Bulletin*, January 27, 1905), 4. This article indicates the price fixed ranged from $2.50 per acre for tracts wholly unfit for cultivation to $14.75 per acre for tracts all tillable and irrigable, the average being the amount fixed in the contract between the state and the company of $10 per acre.

[120] Research at the Oregon State Archives did not identify any minutes or other documents associated with the February, 1904, announcement which could illuminate these matters.

[121] "Water In Sixty Days: Deschutes Irrigation Company Buys Out Others," (*The Sunday Oregonian*, February 14, 1904), 6

[122] United States Circuit Court of Appeals for the Ninth Circuit, Frank R. Shinn and Louis G. Addison, and Frank R. Shinn and Louis G. Addison as a Committee for Certain Bondholders, *Complainants Appellees*, vs. The Deschutes Irrigation and Power Company, a corporation, A.F. Biles, Howard Contract Company, a corporation, Merchants Savings and Trust Company, formerly Merchants Investments and Trust Company, an Oregon corporation, *Respondents Appellees* vs. R.S. Howard, Jr., Receiver of the Title Guarantee & Trust Company, *Intervenor Appellant* vs. Alexander M. Drake and Pilot Butte Development Company, *Intervenors Appellees*, No. 1915, 15. The 1915 circuit court decision indicates that on February 12, 1904, a "Contract between A.M. Drake and Turney, Johnston and Guerin for rights of the Pilot Butte Development Co." was executed. The same day, "Assignment of Drake Contract by Turney and others to The Deschutes Irrigation & Power Company" was concluded. Also that same day, "Assignment of rights of Oregon Irrigation Co. to The Deschutes Irrigation & Power Co., viz., its capital stock" was effected. On March 14, 1904, "Conveyance by Pilot Butte Development Co. to The Deschutes Irrigation & Power Co., of rights of way, etc." was finalized. The same day, "Assignment of Contract with State Land Board by Pilot Butte Development Co. to The Deschutes Irrigation & Power Co." was completed.

[123] "To Open Empire: Big Irrigation Companies in Combine," *(Morning Oregonian*, February 16, 1904, Portland, OR.), 10.

[124] *Proceedings of the Ohio Gas Light Association*, (Columbus: Spahr & Glenn, 1904), 661. Proceedings include seventeenth annual meeting of 1901, eighteenth annual meeting of 1902, and nineteenth annual meeting of 1903. Index of association members indicates Johnston, John O., General Manager, The Columbus Gas Light and Heating Company, Columbus, Ohio. Elected to membership March 21, 1900;

[125] Ibid., 667. Proceedings include seventeenth annual meeting of 1901, eighteenth annual meeting of 1902, and nineteenth annual meeting of 1903. Index of association members indicates Turney, Henry D., Director and Member of Association's Executive Committee, Columbus, Ohio. President, Gas Lighting and Heating Company, 80 Broadway, New York, NY. Elected to membership March 21, 1900; *Natural Gas Journal*, (vol. 5, July, 1911), 39. (Google Book). In or about 1911, Henry D. Turney was the president of Columbia Gas & Fuel Company in Columbus, with 29,000 customers.

[126] "The Deschutes Irrigation and Power Company at Bend," (*The Pacific Homestead*, Salem, OR., November 10, 1904), 70; "Local Notes," (*The DesChutes Echo*, February 27, 1904), 3. Named to the board of directors were H.D. Turney, J.O. Johnston, R.F. Guerin (a son of W.E.), Harvey W. Scott, E.E. Lytle, J.F. Watson and C.C. Hutchinson. Officers elected were H.D. Turney, president; J.O. Johnston, vice-president and general manager; and R.F. Guerin, secretary and treasurer.

[127] Ibid.; United States Circuit Court of Appeals for the Ninth Circuit…, 1915, 15. The document indicates "Assignment of rights of Oregon Irrigation Co. to The Deschutes Irrigation & Power Co., viz., its capital stock," made C.C. Hutchinson a stockholder.

[128] Shaver, F.A., et al., *An Illustrated History of Central Oregon*, (Spokane: Western History Publishing, 1905), 804. Shaver indicates W.E. Guerin, Jr. was a prominent banker and leading businessman of Bend, Crook County, matriculated in Cornell University, from which he graduated with honors. Admitted to the Ohio bar in 1893, he was elected to the state legislator of the seventy-fifth assembly of that state.

managing a number of essential settlement businesses, and in promotion of the area and its lands. Drake retained ownership of the townsite and other properties and other rights.[129]

Plans for Settlement and Agricultural Development

At the time of the transaction, the Portland *Oregonian* summarized the benefits of the project and pronounced the significance of settlement and agricultural development in the Deschutes country:

> "*It means that 250,000 acres which are now nonproductive will eventually be made to sustain a population of several thousand persons, and the building of one or more thriving towns. It means a large addition to Oregon's crop production, and the extension of Portland's commercial territory. More than all it means a practical demonstration of what the investment of capital in irrigation projects can do for a large portion of the state which is now practically worthless by reason of its arid character. It is an opening wedge which will be followed by the construction of many other irrigation systems and the reclamation of much of Oregon's domain. A thoroughly organized immigration bureau will be organized and a large amount of money will be spent in advertising the lands throughout the United States and Canada."*

The company's inducements, including price per acre much lower than elsewhere, was expected to result in very heavy immigration, and the company was considering operating its own stage line to and from Shaniko, 82 miles to the north by way of Prineville, on a rough, dirt road.[130]Shaniko was the terminus of the Columbia Southern Railway, which entered Central Oregon from Biggs on the Columbia River in 1900. General Manager Johnston stated, "Our purpose is to employ immigration agents, if necessary, to find settlers for the land thus reclaimed. We will form colonies when we can, and induce individual settlers to come. We will lose no time in putting that arid land into condition to raise alfalfa and other crops."[131]

The Deschutes Irrigation and Power Company followed the Carey Act process relative to the Pilot Butte Development Company's Segregation No. 6 to be served by the Pilot Butte Canal. The DIPC had acquired the Carey Act project at that time. In a May 14, 1904 DesChutes Echo article, the company explained that the segregation had placed a lien upon all lands in it covering the cost of bringing water through its system on each 40-acre tract, amounting to an average of $10 per acre. The State Land Board apportioned the total amount of the lien on each 40-acre tract according to its value from an agricultural standpoint. The cost of bringing water to the land was estimated by both the state engineer and the company engineer. A 40-acre tract with 40 irrigable acres cost the settler/farmer $590.00, the lien the company held on it, or $14.75 per acre. A price existed on each 40-acre tract depending upon the amount of irrigable acres in each, ranging from $2.50 per acre to $14.75 per acre. Not all of the land was farmable or irrigable. When the amount of the lien was paid, the purchaser secured release of the lien and a perpetual water right. When the purchaser presented the release of the lien to the State Land Board, it issued a deed to the land to the purchaser. The new property owner paid $1 per year per acre for the perpetual water right. In the example of 40 irrigable acres, this amounted to $40 per year.[132]

Overview: Pilot Butte and Central Oregon Canals, 1904

Though Drake did not build the canal for much distance before he sold out, his ambitious project to divert water from the Deschutes River in a wooden flume produced an imposing structure in the volcanic lava flow. "Expert engineers have pronounced the headgate of this canal the finest in the United States," said the *Morning*

[129] "Untitled," (*The Bend Bulletin*, April 29, 1904), 4. Indicates Drake was still the owner of the Townsite; "To Open Empire: Big Irrigation Companies in Combine," *(Morning Oregonian*, February 16, 1904), 10; Pilot Butte Development Company, Plat of Bend, Filed June 7, 1904. The townsite plat was not filed until almost four months after this announcement.

[130] "To Open Empire: Big Irrigation Companies in Combine," *(Morning Oregonian*, February 16, 1904), 10. The new company would "offer lands varying from $5 to $15 per acre, guaranteeing water rights," and "irrigated lands elsewhere which offer no greater advantages are selling as high as $300 per acre."

[131] "Water In Sixty Days: Deschutes Irrigation Company Buys Out Others," (*The Sunday Oregonian*, February 14, 1904), 6.

[132] "Feeling In the East," (*TheDesChutes Echo*, May 14, 1904), 1.

Oregonian of February 16, 1904. "The diversion works are in a deep canyon among immense rocks, which afford admirable protection to the permanence of the intake, which leads to a heavy rock cut 20' in depth to the head of the flume, where the surplus water will be turned back into the river."[133]

"Head Gates," Deschutes Irrigation & Power Company
Postcard, c. 1904

"Water was diverted from the east bank of the Deschutes River about three miles above Drake's home in what would become Bend. Plans were to build two canals and use only one diversion structure that would be shared by both canals. About two miles south of Bend the flume divided, forming the Central Oregon Canal on the east and the Pilot Butte Canal on the west."[134] The Central Oregon Canal would run east and irrigate areas in the Powell Butte and Alfalfa areas, east and northeast of Bend. The Pilot Butte Canal would run north toward the Crooked River, northeast of what are now Redmond and Terrebonne. The area irrigated by the two "is in two rather narrow and separate strips with high land between; the Pilot Butte Canal serving the area parallel with the river, and the Central Oregon Canal serving lands east of Bend for a distance and thence turning north."[135]

Logistics, 1904

On April 1st, the D. I. & P. Co. officially took active charge of all irrigation work.[136] The firm needed to assemble resources before excavation for the Pilot Butte main canal could begin on a large scale. Key personnel were hired. Joseph G. Kelley, a hydraulic engineer formerly with the U.S. Army Corps of Engineers, became chief engineer, succeeding L.D. Wiest, who became his assistant,[137] with more engineers joining them.[138] The purchasing agent was to buy more teams of horses and outfits, and to make large purchases of equipment,

[133] "To Open Empire: Big Irrigation Companies in Combine," *(Morning Oregonian*, February 16, 1904, Portland, OR.), 10.

[134] Ross, D.W., J.T. Whistler and T.A. Noble, *Report of the Progress of Stream Measurements for the Calendar Year 1905*, Prepared Under the Direction of F.H. Newell, Part XIV—Columbia River and Puget Sound Drainages, (Department of the Interior, U.S. Geological Survey, Washington: Government Printing Office, 1906), 217.

[135] Cramb, L.K., *The Irrigation Situation In Central Oregon: A Proposal that the Federal Government Provide Storage*, (Bend: Bend Chamber of Commerce, October 15, 1931), II, 4. The Deschutes Irrigation and Power Company: Irrigated Lands, Bend District, Deschutes Valley, Central Oregon, July 7, 1909, (Oregon Historical Society, Collections, Maps, Portland).

[136] "New Company In Charge: Deschutes Irrigation & Power Company Took Formal Control Yesterday," (*The DesChutes Echo*, April 2, 1904), 1. Hutchinson became the selecting agent of lands to be reclaimed for the state relative to the D. I. & P. Co. work.

[137] Ibid.

[138] "Local Notes," (*The DesChutes Echo*, February 27, 1904), 3; "Local Notes," (*The DesChutes Echo*, March 5, 1904), 3; "Local Notes," (*The DesChutes Echo*, May 14, 1904), 3.

supplies, and foodstuffs in Prineville.[139] Great amounts of meat and vegetables were required by the construction crews and were provided by suppliers bringing wagon loads of vegetables from Haystack, forty miles away.[140] A timekeeper was employed, and the firm's entire auditing department was brought from Portland.[141]Hundreds of laborers and teamsters along with their horses and wagons were hired.[142] Boarding for crews was arranged until tents and other camp facilities and supplies arrived.[143]

Teams of horses were in demand to pull scrapers and transport rock and construction materials and for other needs.[144] Wiest went to the Willamette Valley to buy horses.[145] At one point in 1904, before the company was to commence work on the nominated section, seventy-eight wild horses were captured and 'broken' for scraper teams. In half-a-day a range horse was 'broken' for pulling scrapers, and further training came in the regular course of its work. Three men were employed to break horses.[146]

A vast amount of resources were hauled from the railroad at Shaniko to engage in construction. It took at least two days and could take much longer to pull heavy wagons loaded with equipment from Shaniko to the project site. Nielsen, et al., the region's pioneer road historians, describe one leg of the Shaniko-Prineville-Bend route: "Most freight outfits consisted of three wagons pulled by eight-to-twelve horses. At the base of Hunter Grade, the last wagon had to be dropped. After the first two wagons were pulled to the top, the horses had to return to the bottom to pull up the third wagon."[147] Loads coming into the project area aggregated nearly 50,000 pounds (25 tons) each.[148]

There was infrastructure to build including bridges and structures. The Deschutes Lumber Company increased its production to serve the project's timber and lumber needs,[149] while Drake rebuilt his mill.[150] Bridges were built across Bear Creek, on Silver Lake Road, on the Old Deschutes Road in the historic district, and at four other locations where the county roads and canal would intersect.[151] The company built an office, a club house, stables, a blacksmith shop, a granary, a warehouse, a powder house, a cook house, a mess hall, a barn, buildings at its experimental farm, and a residence for management.[152]

Workforce and Teams Buildup, 1904

The southern half of the canal would be wide and deep and would pass through rolling terrain, volcanic lava flows and rock outcroppings. It would be more time consuming to construct and would require blasting as well

[139] "Work on the Canal," (*The Bend Bulletin*, April 15, 1904),1; "Local Notes," (*The DesChutes Echo*, April 9, 1904), 1.

[140] "Local Notes," (*The DesChutes Echo*, May 6, 1904), 3.

[141] "Local Bits," (*The Bend Bulletin*, July 8, 1904), 5; "To Open Empire: Big Irrigation Companies in Combine," *(Morning Oregonian*, February 16, 1904, Portland, OR.), 10.

[142] "Local Notes," (*The DesChutes Echo*, April 9, 1904), 1.

[143] "Irrigation Activities," (*The DesChutes Echo*, March 12, 1904), 1.

[144] "Local Notes," (*The DesChutes Echo,* March 26, 1904), 3. When the Russo-Japanese War broke out in February, 1904, demand for cavalry horses by the Japanese rendered the horse market very costly, making the Pilot Butte Canal construction more expensive. Seventy-five tons of high-grade hay was purchased for the company stables in March; "Local Notes," (*The DesChutes Echo,* May 14, 1904), 3. In May, as hay prices reached exorbitant prices and was almost unobtainable, construction costs grew.

[145] "Wants Valley Horses," (*Oregon Capital Journal*, July 25, 1904), 5.

[146] "Breaking Wild Horses," (*The Bend Bulletin*, October 7, 1904), 1; "More Horses for Ditch Work," (*The Bend Bulletin*, September 30, 1904), 1. Horses were purchased when they were available. During spring, one-hundred tons of hay was stacked at the Forest ranch on the Crooked River, but high water made it impossible to cross the river and bring the fodder to the horses.

[147] Nielsen, Lawrence E., Doug Newman, and George McCart, *Pioneer Roads in Central Oregon*, (Bend: Maverick Publications, 1985), 99-100. A road up Hunter Grade was necessary because Hay Creek runs through a spectacular, impassable gorge; "Local Notes," (*The DesChutes Echo*, March 5, 1904), 3. Any precipitation, from early fall to late spring, resulted in "veritable seas of mud" that presented additional difficulties on the route; "Local Notes," (*The DesChutes Echo*, May 6, 1904), 3.

[148] "To Enlarge Flume," (*The Bend Bulletin*, August 12, 1904), 1. Freighters were bringing in loads from across the state; "Local Notes," (*The DesChutes Echo*, April 9, 1904), 1. J.O. Johnston, vice-president and general manager, purchased the first automobile to make an appearance in Crook County to facilitate his business travel.

[149] "Local Notes," (*The DesChutes Echo*, May 28, 1904), 3. The lumber company purchased a new Samson turbine water wheel; "Local Notes," (*The DesChutes Echo,* March 26, 1904), 3.

[150] "Local Notes," (*The DesChutes Echo*, March 19, 1904), 3; "Local Notes," (*The DesChutes Echo*, April 2, 1904), 3.

[151] "Local Notes," (*The DesChutes Echo*, April 16, 1904), 3; "Work on the Canal," (*The Bend Bulletin*, April 15, 1904),1.

[152] "More Than $100,000," (*The Bend Bulletin*, January 6, 1905), 1.

as digging and scraping. The northern half was anticipated to be relatively unchallenging. It would pass through flatter terrain with less rock, and the canal would become progressively shallower and narrower. A great amount of material was estimated to be excavated from the mile long, nearly solid rock that would be cut and blasted in the stretch in the nominated historic district. It was called the most challenging stretch of the project and the most men per mile were hired to work on it. A sizeable workforce with sufficient teams to operate horse-drawn scrapers as well as laborers was paramount. The first week of March the company posted notices at the camps that after March 15th men who were receiving $2.25 per day and teams that were receiving $2.50 per day would be paid only $2.00 per day, the same rate that was in effect before the company raised rates. Advertisements for men and teams were placed in Oregon newspapers beginning as early as May, 1904, with higher rates of pay offered as the time to execute the excavation through the nominated section approached. A typical advertisement is shown below:

> *WANTED 200 MEN. Wages $2.25 per day. Board $4.50 per week. 50 teams $2.00 per day. Extensive irrigation construction. Permanent employment for good men and teams. Deschutes Irrigation and Power Company. BEND, OREGON.*[153]

The matter of completing the nominated section was so pressing that the need for more teams to operate and pull scrapers boosted the pay rate 25 percent as of September 15, 1904, compared to what it had been. The *Bohemia Nugget* of Cottage Grove advertised a rate of $2.00 per day for teams, as shown above, on May 26 and August 12, along with the *Heppner Times* on August 25 and the *Lincoln County Leader* on September 2 and 9, 1904.[154] However, pay jumped to $2.50 per day for teams in advertisements in the *Madras Pioneer* in the September 15 issue and remained at that rate to the end of the year. Eleven advertisements were identified, placed almost weekly in the *Madras Pioneer* between September 15 and December 29, 1904.[155] According to a later article, the rate for laborers had been raised from $2.00 to $2.25 per day at some point during the summer, apparently before advertising began on May 26. These higher rates of pay stayed until just after the nominated section was completed and then were both lowered.[156]

Progression of Work, 1904

After the D. I. & P. Co. took over the project, the flume was successfully tested in March, 1904, having been upgraded to the satisfaction of the new owners.[157] It was not until early April when the ground had thawed out that canal work began to progress. A crew of fourteen was put in the field in advance of the canal construction; its work was to contour the country so teams would know where to locate laterals and service ditches. “The excavation of the canal “down to Wiest’s homestead is nearly completed,” a later report said.[158] However, water did not arrive through the approximately three miles of canal to Wiest’s property until June 3, 1904. The *Bend Bulletin* recognized “this diversion of water from the Pilot Butte Canal is historic because it mark[ed] the first actual use of it on the soil to produce crops.”[159] Thus, the company had achieved the first part of what it promised to the land board in February. It had water running in its flume from the headgates at the river up to the future townsite of Bend, irrigating Wiest’s. forty acres. But, it did not have water on 25,000 acres, the second promise made in February. That acreage, though overstated, lie north between their position in June, 1904, and the Crooked River Canyon. The nominated section, at mile six, was staggering in size, unyielding in

[153] Advertisement, (*Bohemia Nugget*, May 26, 1904), 7.

[154] Ibid., Ibid., (August 12, 1904), 5; Advertisement, (*Heppner Times*, August 25, 1904), 3; Advertisement, (*Lincoln County Leader*, September 2, 1904), 7; Ibid., (September 9, 1904), 4. Advertisement, (*Madras Pioneer*, September 15, 1904), 4. Madras was a community also in Crook County at the time.

[155] Advertising in the Madras Pioneer was the only Oregon newspaper found after September 9; Ibid., (September 22, 1904), 4; Ibid., (September 29, 1904), 4; Ibid. (October 6, 1904), 4; Ibid. (October 13, 1904), 4; Ibid. (October 27, 1904), 4; Ibid. (November 3, 1904), 4; Ibid., (November 10, 1904), 4; Ibid., (November 24, 1904), 6; Ibid., (December 1, 1904), 4; Ibid., (December 29, 1904), 4.

[156] “Pay Back to Old Figures: Men Don’t Like It and Many of Them Quit,” (*The Bend Bulletin*, March 17, 1905), 1.

[157] “Irrigation Activities,” (*The DesChutes Echo*, March 12, 1904), 1. It is possible that the D. I. & P. Co. decided to make upgrades to the flume they acquired.

[158] “Work on the Canal,” (*The Bend Bulletin*, April 15, 1904),1.

[159] “First Water On Soil,” (*The Bend Bulletin*, June 3, 1904), 1. Chief engineer J.G. Kelly resigned the same week.

stance, and dense in character and had to be completed before water could flow past it into stretches that would be relatively easy to scrape and cut.

During the summer, four crews, with four camps, were worked at different points on the project.[160] In mid-August a report from Eugene, Oregon, indicated that at the completion of sewer contracts, the city would release a number of men for work on the canal. The superintendent went to Eugene to hire.[161] Nearing the end of September the company had about 200 men and 100 teams at work and was trying to double the force as soon as possible. About fifty Italian laborers were brought in for the upper canal and more were expected. Twenty Americans were clearing the right-of-way for the canal. More than 100 men were at the lower construction camp. Two engineering parties were in the field making topographical examinations of the country. The company was getting fifty teams of its own to put on the canal work. A large number of scrapers and a great quantity of general supplies were being received. The company was pushing the freighters to bring in more.[162]

The February 16, 1904 it became apparent that the Oregonian Newspaper's exuberant praise for the engineering on the headgate had been premature and uninformed. The headgate and flume system was not able to carry enough water for the two canals it was to serve. In early October at the headgate "a force of rockmen" were "blasting out a new intake," engineers and surveyors were "taking levels and guiding workmen," and the flume was being enlarged to carry a second channel for tthe Central Oregon Canal, which would irrigate east and northeast of Bend. In all, about 350 men and 100 teams were employed by the company at various places along the canal.[163] Near the end of October the headgates were closed, bringing to a standstill water service to the future Bend townsite, and the work of enlarging the channel through this stretch was expected to take two weeks. The capacity near the headgate was more than tripled.[164]

At this time, late in 1904, winter approached at 3,600' above sea level at the foot of the Cascades. The company feared that snow, ice and freezing temperatures could quickly halt all construction on the canal until spring. The February promises of the D. I. & P. Co. to have water on thousands of acres of desert land, all of which lie north of the nominated section, would soon be a year old. With the company already behind in its schedule, and miles of smaller canal farther north completed, it had to quickly undertake the challenge posed by the geological conditions presented in the nominated stretch, and prove to investors, the State Land Board, and to potential settlers that they were committed to completing the canal in time for spring farming in the Deschutes country.

NOMINATED STRETCH: THE PILOT BUTTE CANAL HISTORIC DISTRICT (COOLEY ROAD - YEOMAN ROAD SEGMENT)

Geological Conditions of Nominated Section Present Challenge

Israel C. Russell of the U.S. Geological Survey and chair of Geology at the University of Michigan wrote the first geological report[165] on the area, publishing the results of his 1903 examination in 1905:

[160] "Local Notes," (*The DesChutes Echo*, March 5, 1904), 3.

[161] "To Enlarge Flume," (*The Bend Bulletin*, August 12, 1904), 1.

[162] "Pushing the Work," (*The Bend Bulletin*, September 23, 1904), 1. C.M. Redfield was the new chief engineer; "C.M. Redfield Dies Suddenly," (*The Bend Bulletin*), March 19, 1924), 1. Article indicates Redfield had come to work for the company in April, 1904, apparently taking over the chief engineer position in early June, 1904, when J.G. Kelly resigned.

[163] "On the New Flume," (*The Bend Bulletin*, October 7, 1904), 1.

[164] "Digs Ditch Bigger," (*The Bend Bulletin*, October 21, 1904), 1. The canal was enlarged to carry 250 cubic feet per second rather than 80 cfs. New calculations had concluded more water was needed than the PBD Co. had initially determined.

[165] Russell, Israel Cook, *Preliminary Report on the Geology and Water Resources of Central Oregon*, Bulletin No. 252, (U.S. Geological Survey, Department of the Interior, Washington: Government Printing Office, 1905), 12. (*The Bend Bulletin*, August 21, 1903), 3. "Examining Our Rocks and Soils: Professor Russell, of the U.S. Geological Survey, in Central Oregon,"1. Russell had been a geologist for twenty-five years, and was among the first scientists "to examine on the ground the work of Mount Pelée" in the Caribbean Sea following its eruption in 1902.

> *"The topography of Central Oregon is characterized by the boldness of its elevations, principally [due] to constructive volcanic activity. The valleys between the mountains, buttes, hills, etc., are, in general, level floored, mainly to the extensive lava flows and the wide distribution of fragmental material blown out of volcanoes in the condition of gravel and dust. Sheets of basalt, which have invaded the valleys and given them level floors, occur widely throughout the central part of the State, and in many localities form the present surface. These lava sheets range in thickness from 80' to 100', as an average minimum, up to several hundred feet."*[166]

Russell also stated:

> *"The portion of Oregon referred to is not only new to geologists, but has not been topographically surveyed. The only map available for use during my reconnaissance was a map of the State of Oregon, drawn to a scale of twelve miles to an inch, published by the General Land Office of the Interior Department. To a large extent this map is devoid of data in reference to even the more conspicuous elements of the relief of the central portion of the State";*

Geologists now know much more about the area than Russell did in 1905. In *Geology of Oregon* Elizabeth and William Orr and Ewart Baldwin explain: "The Deschutes-Columbia River Plateau is predominantly a volcanic province…Geologic events in the Columbia-Deschutes province took place on a grand scale. Immense outpourings of lavas during the Miocene created one of the largest flood basalt provinces in the world, second only to the Deccan Plateau in India."[167] Volcanoes erupted particularly near Bend and southward. From volcanoes near Bend and perhaps from local vents elsewhere, very liquid olivine-basalt lava flowed great distances northward and in places spilled into the valleys of the Crooked and Deschutes River. This basalt covered most of the area in Deschutes County east of the Deschutes River.[168]

Construction of Nominated Section Utilizes Technology, Man-and Horse-Power, 1904-05

Fortunately, the D. I. & P. Co. was able to take advantage of a propitious period in the history of irrigation and land development technology. "Dramatic changes in the methods of farming and land preparation occurred around the turn of the century," explains Robert M. Morgan in *Water and the Land: A History of American Irrigation*. Morgan, who served as chairman of the Northwest Section of the American Society of Agricultural Engineers, and as president of the Irrigation Association, says, "With the ability to reshape the land…farmers began replacing dry land crops, such as grains, with more profitable irrigated crops…Horse-drawn earthmoving and leveling equipment was bulky and imprecise. The 'skip' or 'slip' scraper was popular. Drawn by…horses or mules, the teamster maneuvered the scraper from behind. Considerable brawn was needed to control the scoop… After scraping short distances, the teamster had to dump the full scoop with a mighty heave."[169]

[166] Ibid., 15-16.

[167] Orr, Elizabeth L. and William N., and Ewart M. Baldwin, *Geology of Oregon*, (Dubuque: Kendall/Hunt, Fourth Edition, 1992), 121; William N. Orr, Professor Emeritus of Geology at University of Oregon, director of the Condon Collection, and Elizabeth L. Orr, collections manager of the Condon Collection at the Museum of Natural and Cultural History at the University of Oregon. Both received PhDs in Geology. In Memorial to Ewart M. Baldwin, University of Oregon, Department of Geology. Ewart M. Baldwin received a PhD in Geology and was Professor of the Department of Geological Sciences at the University of Oregon from 1947-1980.

[168] Natural Resources Conservation Service, *Soil Survey: Deschutes Area,* (Series 1945, No. 2, U.S. Department of Agriculture, Soil Conservation Service in Cooperation with Oregon Agricultural Experiment Station, Washington: Government Printing Office, December 1958), 72-73.

[169] Morgan, Robert M., *Water and the Land: A History of American Irrigation*, (Fairfax, Virginia: The Irrigation Association, 1993), 5. An Oregonian, who majored in agricultural engineering at Oregon State, the author has written for *Irrigation News*, *Landscape and Irrigation*, and *Irrigation Journal*, and is a registered author with the Oregon Historical Society.

Using horse-drawn Fresno scrapers
Photograph: DeschutesCounty Historical Society

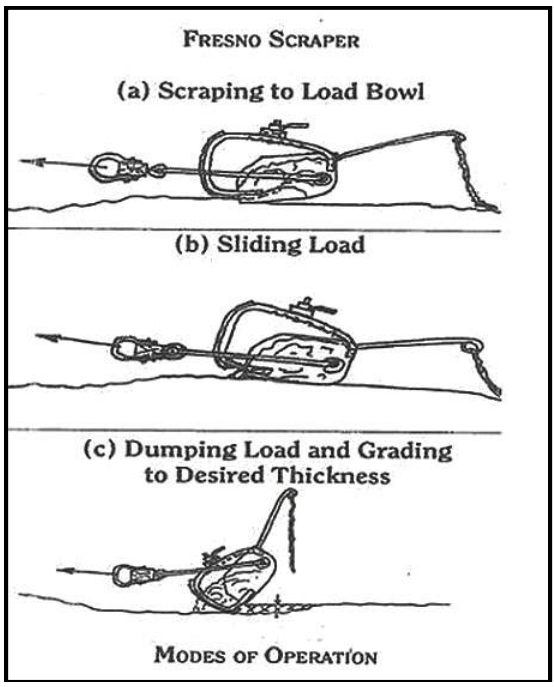
A revolution in horse-drawn earth moving came in 1883. John Porteus, a Fresno Township blacksmith, invented the Fresno scraper. "The device was a metal scoop with unique steel runners, pulled by two to four draft animals. Like the skip scraper, the teamster controlled the depth of cut from behind. However, the Fresno could be skidded along for reasonable distances and dumped on a controlled basis. Porteus' invention was an impressive improvement over the skip."[170]By using these scrapers with the ability to haul material over a short distance and to control the dump, the company was able to not only excavate canal material, but was also able to build canal embankments (banks) where they wanted them, and to the specifications they needed them to be by systematic dumping. In addition, the D. I. & P. Co. invested in the best equipment for the job to be done. J.O. Johnston, vice president and general manager, stated, "We have paid cash and a lot of it, for everything as we went along and we expect to continue this course in the future until every detail of the reclamation work is completed." [171] John H. Lienhard, PhD, Professor Emeritus of Mechanical Engineering and History at the University of Houston explains the operation of the Fresno, a designated Historic Mechanical Engineering Landmark:

> *"Porteus' C-shaped scraper had a blade along the bottom. It scooped as it was pulled along. [Different from all predecessors], this machine rode on runners and could be tilted. An operator walking behind it could change the angle. When it was full, he tilted it back and let it slide on the runners. He could dump as he passed over low spots and smooth out terrain. He could vary the angle of attack to match the [cut required]".*[172]

[170] Ibid. 'Slip' and 'skip' are interchangeable terms, referring to the same type of equipment.

[171]"Cheap Land Gives Start to Redmond," (*The Redmond Spokesman*, August 21, 1952), 2. Article suggests there were some 'slips,' another type of excavation equipment. Indications are this was not the case in the nominated section; Davis, Arthur Powell, D.Sc., and Herbert M. Wilson, C.E., *Irrigation Engineering*, 233. The authors indicate the Fresno scraper is the most satisfactory in handling tough earth too heavy to be handled by other types of scrapers; "D. I. & P. Co. Is Here to Stay," (*Crook County Journal*, April 9, 1905), 1.

[172] University of Houston, "No. 353: The Fresno Scraper," *Engines of Our Ingenuity*, (Accessed March 27, 2015); University of Houston, "Dr. John L. Lienhard," *Engines of Our Ingenuity*, (Accessed March 27, 2015). Lienhard received BS and MS degrees from Oregon State and the University of Washington, his PhD from the University of California at Berkeley, and holds two honorary doctorates; San Joaquin County Historical Society and Museum, "Designating the Fresno Scraper as an Engineering Landmark," (Accessed March 27, 2015). On March 26, 2011, in a ceremony at the Museum the American Society of Mechanical Engineers (ASME) designated the Fresno Scraper as a Historic Mechanical Engineering Landmark. The society noted the Fresno was used throughout the world, including in the construction of the Panama Canal, and was the forerunner of virtually all earthmoving implements.



Fresno Scraper[173]
Modes of Operation

Mechanical engineers Davis and Wilson wrote that the Fresno scraper can be used for hauls of any distance, but it is not very advantageous for long hauls. It is also suitable for making ditches, dikes, and any other scraper work where the haul is not great enough to require wheels.[174]

However, the most significant utilization of technology, steam-powered drilling, was used in the excavation of the nominated section in the ancient basalt (lava) flow, beginning in November, 1904. General Manager Johnston understood the difficulty lava flows would present to construction and had commented on it in February, 1904: "That lava bed is very rough, requiring expensive work in cutting out rock."[175] Typically, steel miners' drills were pounded with sledge hammers to drill holes for blasting charges. After a blast was detonated, teams of men and horses with Fresno scrapers, along with men and shovels, excavated loosened rock to bring the canal to grade.[176]

By the turn of the twentieth century steam power propelled eighty percent of the factories in the nation. It was portable and allowed regulation of the power that was generated.[177] The D. I. & P. Co. purchased two portable steam boilers, "specially made for the work of this company *in the Bend section*"—the nominated section—"and shipped from Columbus, Ohio" to provide power for operating rock drills. One boiler was twenty horsepower and drove four drills. The other was six horsepower and drove one. Together, they could bore 400' per day in the hard, demanding strata of lava, where typically it would take three men to bore eighteen to 20' per day. The drills were "worked by steam direct from the boiler, the steam serving the same purpose as

[173] Boulder Community Network, Boulder County, Colorado, *The Ditch Project: 150 Years of Ditches—Boulder's Constructed Landscape*, (Accessed March 27, 2015). Image, Courtesy of American Society of Mechanical Engineers; Davis, Arthur Powell, D.Sc., and Herbert M. Wilson, C.E., *Irrigation Engineering*, (New York: John Wiley & Sons, Seventh Edition, 1919), 109.

[174] American Society of Mechanical Engineers; Davis, Arthur Powell, D.Sc., and Herbert M. Wilson, C.E., *Irrigation Engineering*, (New York: John Wiley & Sons, Seventh Edition, 1919), 109.

[175] "Water In Sixty Days: Deschutes Irrigation Company Buys Out Others," (*The Sunday Oregonian*, February 14, 1904), 6.

[176] Coe, Urling C., *Frontier Doctor,* 13-14. Coe describes injuries from rock and dynamite and medical attention he provided.

[177] Preston, Daniel, "The Industrial Age: Steam Technology," (*20th Century United States History*, New York: Harper Perennial, 1992), 6.

compressed air in another kind of drilling contrivance" noted the report.[178] "Monster Drills At Work," headlined the *East Oregonian*. "Power will be generated for driving four drills into lava rock. The two boilers with their big steel drills will do more work in a day than 300 men."[179]

Before these machines were brought into the operation, General Manager J.O. Johnston calculated that a "force of 388 rockmen would be required to do the necessary work." The impossibility of getting such a force led "Johnston to devise this method of drilling powder holes in the rock." The machines did not do away with hand drilling. Hand drilling was used where there was little drilling to be done, "but the big ledges" in the nominated section were "bored by the steam-powered drills." The report indicated the shipment filled an entire railroad car, and was hauled by freighters from Shaniko in multiple wagon loads to the work site, taking several days to get all of the equipment delivered.[180]

The amount of basalt excavated from the nominated section was enormous and remarkable with the man- and horse-power of the period. A civil engineer's estimate of the 'in place' material, before it was drilled and blasted, in the nominated stretch, is 55,000 cubic yards.[181] According to a construction contractor experienced in the excavation of lava in the Deschutes country, a cubic yard 'in place' will make about "1.3 truck yards" (1.3 'loose' cubic yards).[182] This 'in place' estimate, therefore, yields 71,500 'loose' cubic yards.[183] Given that a Fresno scraper can carry an average load of 1/3 of a cubic yard[184] it would have taken 214,500[185] scraper loads to remove the material after it was broken into manageable sizes. The contractor indicates that a loose cubic yard of the area's lava weighs about 3,000 pounds (1.5 tons). Therefore, a 1/3 cubic yard load would have weighed 1,000 pounds.

The operation was more than just blasting, scraping and dumping repetitively. Canal banks were built in layers of compacted rock and soil and kept as level as practicable. The travel over the canal banks during construction was performed in a manner to distribute the compacting effect of the horses and scrapers to the best advantage possible.[186] At the apex of the excavation in the nominated stretch, 400-500 men and 215 teams were working on the canal.[187] It is estimated that 215 teams moved 214,500 loads with almost 1000 loads per team over approximately twenty-five straight days of work. This would have amounted to forty loads per day per team/scraper, or five per hour over an eight-hour day.[188] Hundreds of men used shovels and laid riprap by hand.

[178] "To Drill By Steam," (*The Bend Bulletin*, November 18, 1904), 1.

[179] "Monster Drills at Work," (*East Oregonian*, November 28, 1904), 8. Originally in undated *Crook County Journal*.

[180] "To Drill By Steam," (*The Bend Bulletin*, November 18, 1904), 1.

[181] Kliewer Engineering & Associates, (Bend, Oregon, April 6, 2015). Kliewer, Civil Engineer, was member of the survey team who took measurements and observations as described in Section 7, Description; Kliewer Engineering and Associates, Bend, Oregon, Survey of Pilot Butte Canal in Historic District, October 2014.

[182] Hall, Jim, Hall Construction Services, Belgrade, Montana, E-mail to Michael Hall, (April 5, 2015). Hall has been in the heavy construction, rock crushing and road building profession for over forty years, conducting excavation and other projects for local, state, and federal agencies. He is familiar and experienced with the basalt of the Deschutes River area. Regarding exact calculations for yardage and weight, he notes, "It depends on the specific gravity of the rock."

[183] 55,000 x 1.3 = 71,500.

[184] Davis, Arthur Powell, D.Sc. and Herbert M. Wilson, C.E., *Irrigation Engineering*, (New York: John Wiley & Sons, Seventh Edition, 1919), 233. Authors' statement of "an average load of 1/3 of a cubic yard."

[185] 71,500 / .333333 = 214,500 loads.

[186] Davis, Arthur Powell, D.Sc. and Herbert M. Wilson, C.E., *Irrigation Engineering*, 557. Specifications for constructing embankments in this Civil Engineer's book indicates layers were generally not to exceed 12" in thickness.

[187] "Pay Back to Old Figures: Men Don't Like It and Many of Them Quit," (*The Bend Bulletin*, March 17, 1905), 1. Figures are based on numbers from the article indicating that as the result of the reduction in pay about 200 men and 125 teams left the canal work in the first week of March, leaving about 200 men and 90 teams on the work.

[188] Steam drills arrived just after the first week of November. Assuming all team/scraper work began by Friday, November 11, 1904, and concluded on or about December 5, 1904, provides twenty-five days. 214,500 loads / 215 teams/scrapers = 997.67 loads per team. 997.67 loads per team / 25 days = 39.9 loads per day, per team/scraper. Or, 40 loads per day over an 8-hr. day = 5 loads per hour for each team/scraper; Oregon State Archives, Desert Land Board Reclamation Records, Deschutes Irrigation & Power Co., no. 37-43, box 15, folder 10, Letter, J.O. Johnston, vice president and general manager, Deschutes Irrigation & Power Company, Columbus, Ohio, December 5, 1904, to G.G. Brown, Clerk, State Land Board, Salem, Oregon. General Manger Johnston indicates 400-500 men had been at work; Timedate.com. Including December 5 as the end date provides 25 days.

J.O. Johnston, Vice President and General Manager, D. I. & P. Co.

J.O. Johnston drew from his experience in the oil and gas industry in Ohio to develop the specifications for the steam-powered drills and to devise a system to use them effectively. He was not a college trained geologist or engineer. However, his practical geological knowledge, understanding of engineering and, importantly, his acumen out in the field made a significant difference in the outcome of the Pilot Butte Canal project. His background in natural gas field development did not provide experience with lava as it is found in the Deschutes country, but he had a respected, proven record of success working under unique geological conditions.[189] His drilling experience proved itself useful to the project, too, in the difficult, elemental rock of the Deschutes-Columbia plateau, as he determined the use of steam-powered drilling was imperative in the nominated section. According to the 1890 *Geological Survey of Ohio*, J.O. Johnston is credited with the discovery of the most important gas field in Ohio, up to that time. The Thurston field was "by far the largest and most important yet found established on the new gas rock." It comprised parts of four townships. "The discovery of the field is due, more than to any one person, to Mr. J.O. Johnston, Superintendent of the Central Ohio Natural Gas Company, an operator in the eastern field and also practically acquainted with the new oil field of northern Ohio," said the report.[190]

J.O. Johnston
***Progressive Men of Northern Ohio*, 1906[191]**

[189] Orton, Edward, State Geologist, *Geological Survey of Ohio*, (Columbus: The Westrote Co., State Printers, 1890), 241-42. For example, in Ohio, while engaged in the work of exploration, Johnston studied the axes of the anticlines and other factors to determine the points to drill natural gas wells.

[190] Ibid. A company was soon formed in Columbus in which abundant capital, energy, and business sagacity were joined. The well was drilled deep into the Clinton limestone. As a result, a large nearly contiguous territory was held by his company. In 1889, the Columbus city council granted a franchise that brought gas-powered lights and heat, with 45,000 customers, and fuel to numerous large industrial users; Waples, David A., *The Natural Gas Industry in Appalachia: A History of the First Discovery to the Tapping of the Marcellus Shale*, (Jefferson, North Carolina: McFarland & Co., Second Edition, 2012), 110. According to the author: "In 1888, the Thurston gas field was discovered between Lancaster, Fairfield County, and Newark, Licking County. The following year, gas from the Clinton sand wells drilled at Newark was used in the town, and a ten-inch line was laid to the capital at Columbus in Franklin County."

[191] Plain Dealer Press, *Progressive Men of Northern Ohio*, (Cleveland: Plain Dealer Publishing, 1906), 195. According to the Cleveland Plain Dealer, J.O. Johnston, of Columbus, OH., was President, Columbia Gas & Fuel Company. He was born in Allegheny County, NY., May 17, 1853. His education was in the schools of Oswayo, PA. and Wellsville, NY. Financial interests were in gas, oil, marble and manufacturing. (Names of companies changed often as new investors became involved and as circumstances required.)

Challenge and Completion

The strata of lava in the nominated section presented a great construction challenge. It was pivotal to have the steam-powered drills to expedite the excavation. Otherwise, the timely completion of the entire Pilot Butte Canal project would have been jeopardized. The D. I. & P. Co., nor any other company, could have assembled a force of 388 rockmen estimated to be needed to do the necessary work. Additionally, it was crucial to amass a very substantial workforce and several hundred teams. The nominated section was the 'make or break' part of the project on which the future of the D. I. & P. Co., the cities of Bend and Redmond, and the agricultural potential of the Deschutes country rested. Failure in the project management and excavation of this key piece of the grand scheme would have effectively terminated all of the broader, more extensive plans for the settlement and agricultural development of the Deschutes country. A.M. Drake and his PBD Co. did not have the knowledge, resources, or experience to conduct such a large, complex, engaging project as was this one, in this area of the nation, in this period of history. It took an extraordinary amount of capital, exceptional expertise in the utilization of technology, and enormous man- and horse-power.

On February 10, 1905, the work on the nominated stretch was finally done and water could flow in the Pilot Butte Canal to its terminus just south of the Crooked River. The company released men and teams to work on the company's other canal**,** the Central Oregon Canal, where "the ground [was] torn up for a distance of about six miles out" from the river.[192] The water was let into the Pilot Butte Canal on March 5th, 1905.[193]At the end of March the *Bend Bulletin* reported the company's investment in the previous twelve months as $500,000,[194] equivalent to over $12 million in 2015 dollars.[195] The construction of laterals branching off of the Pilot Butte Canal, bringing water to farmers, began in April.[196]

Nominated Section Reflects Geology and Technology

Because of the geologic conditions presented and the technologies employed, *unique characteristics were carved into the nominated section* of the Pilot Butte Canal. The evidence of steam-powered drills, of blasting, and of men with horse-drawn Fresno scrapers in the ancient, hard, uncompromising volcanic surface of the Deschutes country are strikingly present in this section in the canal's exceedingly rugged, irregular bottom. Baseball-size drill holes have been found in the canal bed in the nominated section. Unnatural vertically angled breakage of ancient horizontally laid lava is present in the section. Unknown tons of basalt boulders strewed in the bed remain as remnants of the work. A large island and many small ones sit midstream as artifacts of the labor of hundreds of men pushed to keep an ambitious schedule until they could do no more.

Engineers, as early as 1914, measured the roughness and other factors of friction, as well as the size and shape of a channel, all of which were known to contribute to either a faster velocity of water in a stretch of a canal or a slower one. Known as the value of 'n', the engineer's report on the nominated section of the Pilot Butte Canal to the Desert Land Board[197] stated:

> "The values of 'n' on the main canal are found to be much larger than in the original plans, the reason being that the construction left the canal with a very rough rock bottom…On the Pilot Butte Canal the values of 'n' *are like that of the natural water channels, especially in the upper*

[192] "To Crooked River," (*The Bend Bulletin*, February 3, 1905), 1. Indicates Central Oregon Canal just started at this time, with the breaking up of ground; "Canal Is Finished," (*The Bend Bulletin*, February 17, 1905), 1. This article indicates work completed to the Crooked River on February 10; Brogan, Phil F., "The Watering of the Wilderness," (*The Bend Bulletin*, February 4, 1931), n.p. Brogan states February 9 as the completion date.

[193] "Hundreds At Work," (*The Bend Bulletin*, March 10, 1905), 1. Article indicates water turned into canal on March 5, 1905.

[194] "Still Bend Is Growing," (*The Bend Bulletin*, March 31, 1905), 4.

[195] Federal Reserve Bank of Minneapolis, "CPI Calculator Information," (Accessed March 30, 2015). Using the Consumer Price Index (CPI) for 2015 (239.7) and the CPI for 1913 (9.9; 1913 being the earliest available) the calculation is (239.7/9.9) x $500,000 = $12,106,060.61 in today's dollars.

[196] "Now Building Laterals," (*The Bend Bulletin*, April 14, 1905), 1. The article noted: "Now comes the system of laterals distributing the water for the use of the farmers."

[197] Dubuis, John, Field Inspector, *Report to Desert Land Board On Central Oregon Project*, (Salem: State Printing Department, 1915), 16-19.

portion and truly reflect the type of construction which prevails in that portion" [emphasis added]."[198]

The engineer's report presented a "Table Showing Values of 'N' As Determined on Main Canals." The nominated section, running from the southwest quarter to the northeast quarter of Township 17 South, Range 12 East, Section 15 W.M. at Milepost 8, was the highest value of 'n' presented, calculated by the engineer to be .049. The engineer commented: "Very rough: canal like a stream bed."[199]

Pilot Butte Canal's Design and Construction Techniques

For the entire length of the canal, only native materials found in place were used in its construction.
The canal is irregular in all dimensions, especially in the nominated stretch, and can be described as crude, but functional. The project engineers oversaw survey crews and estimated the amount of water that was necessary to reach the last users at the northernmost stretch. Like other engineers who preceded them in the high desert, Levi Wiest, Joseph G. Kelly and others designed an open canal system with consistent measurements of depth, width and gently angled side slopes to provide carrying capacity to adequately irrigate the land to be sold or homesteaded. (See Figure 8 for a page of Wiest's drawings and Figures 11 and 12 for the area to be sold and irrigated.) They calculated enough water to account for expected losses from seepage into the soil, evaporation, and "carry water" needs.[200] The canal was designed for "safe capacity," which is the maximum amount of water that the canal can carry without causing the velocity of flow to become so great as to cause serious erosion of the bottom and sides.[201] Safe capacity also leaves sufficient clearance between the top of the water surface and the top of the banks to prevent ill effects of wave action, rise and fall of the water surface due to the regulation of the headgates to laterals and the wearing down of the banks by weathering and trampling of cattle and other livestock. The design gave a 1.5 to 2-foot clearance between the top of the water and the top of the banks. Another factor in his design was the expected average roughness of the canal. The greater the roughness, the greater friction it causes and the canal slows down, requiring a larger canal at that location. Areas of higher velocity could be narrower. Slower areas of flatter land would be wider. The calculations for the southern end (including the historic district) were to have it carry the full 400 cfs diverted. An average of 4' deep and about 40' wide canal would carry the necessary amount of water. But, in order to have a minimum of excavation while providing capacity, the canal shows great variability in width, depth and shape. As water is delivered to its users through laterals and ditches, it carries less water and becomes successively smaller.

The route of the Pilot Butte Canal was surveyed and marked, and cleared of trees and bushes. Next, the volcanic topsoil and loose rocks were moved to create the bed and form the embankments.[202] If it was present, rock was blasted into movable sizes. The resulting canal has a soil, bedrock, or lava flow bed, or a combination of them. Soil and rocks dug and blasted out of the canal bed, called "spoils," were used in any embankments that were necessary or placed as riprap on the insides of the banks and in the canal bed to fill in fissures. (See attached photos.) To build embankments, as each half foot of rock and soil was piled in successive layers on the downhill edge of the canal bed, the materials were flattened in layers, called "lifts:" This layering and flattening process continued with progressively narrowing layers until the desired embankment was tall and dense enough to hold the water in the canal. Riprap lines steeper and taller embankments and cut sides so that the desired slopes will hold up to the erosive action of the water. The resulting embankment served two purposes: to hold the water in the canal and to dispose of the soil and rock that had to be removed from the canal bed. Because the compaction made a secure, flat-topped structure, a horseback rider employed by the irrigation company to inspect the canal and check on appropriate water withdrawals, called a ditch rider, could ride on the inconsistent embankments. Embankments are not along all stretches nor are they on both sides of

[198] Ibid., 19.
[199] Ibid., 18.
[200] The Deschutes Irrigation and Power Company, Cross Sections of Pilot Butte Canals and Laterals, Levi Wiest, Oregon State Archives.
[201] Dubuis, John, Report to Desert Land Board on Central Oregon Project, State Printing Department, 1915
[202] Interview with Kenneth Lowe, son of homesteaders, 20220 Sturgeon Road, Bend, February, 2014.

the canal. In many areas, the canal was cut into the terrain and the bed was scooped out, and no embankments were necessary. Along nearly 3/4 of the canal, the embankments are non-existent or are less than 2' tall and were created only to dispose of materials scraped from the excavated bed. Only the nominated stretch in the historic district displays all of the techniques. The majority of the canal was easier and quicker to construct than the stretch in the historic district, although it does have an area in Segment 1 that has little rock and is of consistent width and depth. (See survey of nominated segment in Section 7 of this nomination.)

The location of the Pilot Butte Canal takes full advantage of natural water courses and draws and was described by some of the settlers as "a chain of ponds."[203] While some of the rock flows made the bed impervious and nearly watertight, others spots had cracks that led to caves and underground channels that caused unexpected water losses. The crews added more rock in those locations and in some places plugged holes with concrete that is no longer visible. The canal has silted in and small stones have filled holes making it more impervious to seepage as it has aged.[204] The rockier, less impervious portions of the canal still look like a chain of ponds today where they hold pools of water long after the irrigation season is finished.

THE RELATIONSHIP OF THE PILOT BUTTE CANAL AND THE FOUNDING OF THE CITY OF BEND

Early Bend, 1900-1904

Brogan's *East of the Cascades* describes the area along the Deschutes as the Alexander M. Drakes arrived in early June 1900: "The Cascade peaks to the west were white and beautiful above green skirts of pine, fir, and hemlock. ...There were no signs of life along the sweeping bend of the river…Upstream a short distance, the…W.H. Staats ranch was hidden in timber around a curve in the river. Still farther upstream…was the…Farewell Bend Ranch. To the north, within sight of the stream, were other small ranch houses, little more than cabins, most of them with histories dating to the early eighties (1880s) and most of them abandoned."[205]

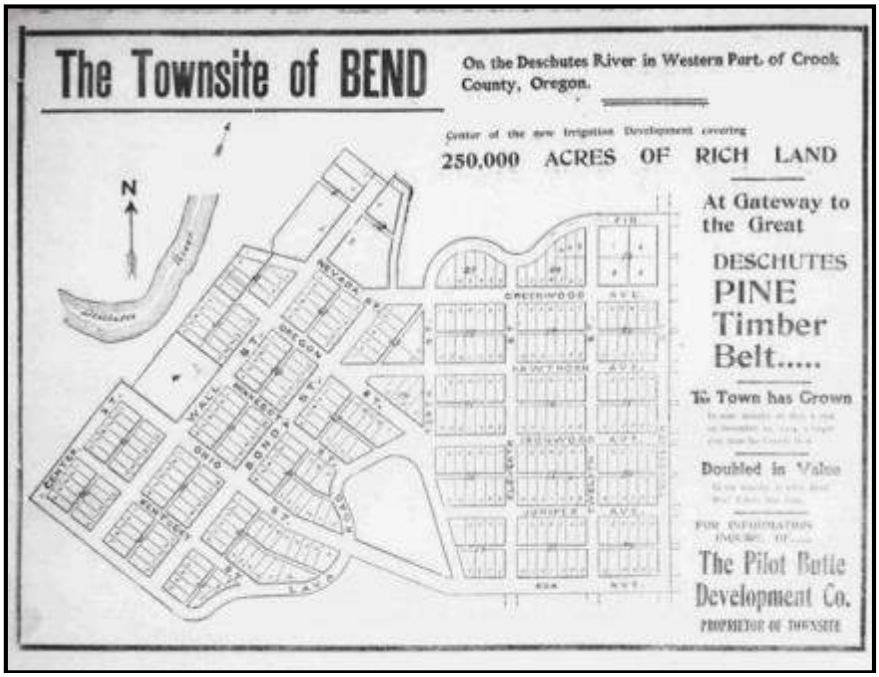
Before the Pilot Butte Canal was built, the area was a small, remote frontier site about twenty-five miles southwest of Prineville, the Crook County seat. It was located in the Deschutes River canyon at one of the few places where in pioneer days it was easy to get a wagon down to the water's edge and ford the stream. Moreover, this site along the Deschutes River was the *most* accessible of these places, and the point where a canyon was not in evidence. It was at a pronounced double bend in the river, which afforded a good place to camp, beginning in the days of the emigrants, but how early is not known. "The place began to be known as Farewell Bend, and the name was appropriate irrespective of the destination of the traveler, north, south, east or west," according to *Oregon Geographic Names*.[206]

John C. Todd said his father, John Y. Todd, "took title to the old Farewell Bend ranch… When the town of Bend first started it extended up the river to Farewell Bend, as well as north on the Staats place, where it really originated."[207] Prince Staats, whose father, William H. Staats, sold all but ten acres of his 'place' to Drake for what became the Bend Townsite, said in a 1953 interview, "Where Bend now stands used to be our cow pasture. The old brush fence that was around the cow pasture would start down by where the power dam is now, run right up through the Pilot Butte Inn and just east of the hospital and on down around close to where

[203] Dubuis Report to Desert Land Board on the Central Oregon Project, page 28.
[204] *Ibid.*
[205] Brogan, Phil F., *East of the Cascades*, (Binford and Mort, Portland, OR., 1964), 181.
[206] McArthur, Lewis A., "Oregon Geographic Names," (*Oregon Historical Quarterly*, vol. 27, 1926), 138-39; McArthur, Lewis A., "Oregon Geographic Names: II; Additions Since 1944," (*Oregon Historical Quarterly*, vol. 47, 1946), 64-65. The various 'Bend' post offices are discussed. The Bend post office was established January 18, 1886, with John Sisemore postmaster. On March 7, 1904, a new Bend post office was established near the site of the Pilot Butte Inn (built in 1917).
[207] McArthur, Lewis A., "Reminiscences of John Y. Todd," (*Oregon Historical Quarterly*, vol. 30, 1929), 70-73. Todd's son, John C. Todd, is quoted. He states, "My father, John Y. Todd, took title to the old Farewell Bend ranch fifty years ago." The exact date is unclear from this statement.

the Brooks-Scanlon mill now stands and from there down to the river. …In those days bunchgrass was plentiful and stock were always fat around this country."[208]

In another 1953 interview, T.W. Vandevert, a pioneer who first saw the Farewell Bend area as an eight-year-old boy, described what Bend looked like in the early days about the time Drake was finishing his homesite along the Deschutes. "Well, it was just like any other timbered country with a crooked wagon road and rocks going through it." In November, 1904, the PBD Co. was clearing the trees out of Minnesota and Bond streets. The *Bend Bulletin* described the work. "A powerful capstan, chains, a team of horses and an axe are the instruments of this work, and they make a clean job of it, pulling over *great pines four feet in diameter* without difficulty, after the surface roots are cut."[209] Vandevert indicated he had seen the area change "from a few little log cabins to the present town of Bend…I've seen the whole country change from what you might say was a wilderness, but a very beautiful wilderness…." [210]



Plat of Bend, PBD Co., Filed June 7, 1904
***Bend Bulletin* Advertisement[211]**

Settlement of Bend, 1904-05

A.L. Goodwillie[212] was the Secretary of the PBD Co., signing the Plat of Bend with Drake on May 31, 1904,[213] two-and-a-half months after Drake's sale of the firm's irrigation contract and rights to the D. I. & P. Co., filed

[208] "Ranch Sale Gives Birth to Town," (*The Central Oregon Answer Book*, Bend: The Bend Bulletin, March 27, 1994), 7. Taken from a transcription of an interview with Prince Staats conducted in 1953 by KBND radio's Kessler Cannon as part of Bend's 50th anniversary celebration. Staats indicated his father homesteaded the property in 1879.

[209] "Local Bits," (*The Bend Bulletin,* November 11, 1904), 5.

[210] "Ranch On the River," (*The Central Oregon Answer Book*, Bend: The Bend Bulletin, March 27, 1994), 17. Taken from a transcription of an interview with W.H. ('Billy') Vandevert conducted in 1953 by KBND radio's Kessler Cannon as part of Bend's 50th anniversary celebration.

[211] Advertisement, (*The Bend Bulletin*, June 14, 1907), 8.

[212] National Register of Historic Places, Goodwillie-Allen-Rademacher House, Bend, Deschutes, Oregon, NRIS 07000493. Arthur Lawson Goodwillie is a Significant Person (Criterion B). Areas of Significance recognized by the National Register in which he contributed include Community Planning and Development, Commerce, Communications, Education, Industry, Politics/Government, and Social History.

[213] Pilot Butte Development Company, Plat of Bend, Filed June 7, 1904. Document signed by Drake and Goodwillie on May 31, 1904.

March 14, 1904. He became a partner with Drake in the PBD Co. sometime just after the two-family get-together in Bend and Portland. In addition to eastern capital, Goodwillie brought leadership as well as organizational and public relations skills.

The D. I. & P. Co. finished the first four miles of the canal and delivered water to the land close to the townsite in June of 1904, so that by December, as the town incorporated, real estate prices were increasing.[214] At this time, the PBD Co.'s business associated with settlement of the townsite went well. Streets, blocks and lots were delineated; townsite land was cleared; lots were sold and the town was developed in various ways.[215]Goodwillie and Drake rebuilt the mill following the January, 1904 fire and it was back into "full operation" in May, with forty employees. [216] The PBD Co. offered an impressive selection of home-building materials.[217] Drake incorporated the Bend Mercantile Company in 1903 to also provide building products and a wide variety of other merchandise needed, and constructed a building in which to retail them in 1904.[218] In 1909 he was treasurer of the newly formed Bend Board of Trade.[219] He built a dam and power plant just north of the townsite, bringing electricity to the city on November 1, 1910.[220]

As the Canal was being completed, the company could focus on bring settlers to the area and buying the land that was for sale. Settlement was encouraged by an aggressive national advertising campaign. The townsite was due to be incorporated, ordinances were written and an infrastructure of dirt streets was in place. Goodwillie was named as the chief petitioner for the incorporation of the City of Bend.[221] On December 19, 1904, an election was held, overwhelmingly deciding in favor of the matter of incorporation, and electing Goodwillie as the city's first mayor.[222] "BEND IS NOW A CITY" announced the *Bend Bulletin* on January 6, 1905.[223]More than $100,000 in building construction had been invested in the city in the previous year. This included $10,025 by the PBD Co. and $11,000 by the D. I. & P. Co.[224]

The first city council meetings were held in the office of the PBD Co., beginning on January 10, 1905.[225]Initial matters concerned making the city respectable and attractive to settlers, potential new business owners and

[214] "Real Estate Is Up: Paid $450 and Sold for $900," (*The Bend Bulletin*, December 8, 1904), 1.

[215] "Week's Sales of Lots," (*The Bend Bulletin*, July 8, 1904), 5. This week the PBD Co. sold seven lots in Bend.

[216] "Lumber to Build," (*The Bend Bulletin*, May 13, 1905), 1; "Notes of the Builders," (*The Bend Bulletin*, April 29, 1904), 2; A "sawmill outfit arriving from the railroad" in April 1904 was machinery to rebuild the mill; "Local Bits," (*The Bend Bulletin*, March 17, 1905), 5.

[217] Advertisement, (*The Bend Bulletin*, May 31, 1907), 1. The PBD Co.'s ad lists the following: "Inch Common, Dimension, Shiplap, Rustic, T. & G. Flooring, Beaded Ceiling, Window Jambs, Window Casing, Head Blocks, O.G. Baseboard, Stair Treads, Water Table, O.G. Battins, Mouldings, P.B.D. Patent Roofing, Fence Pickets, Shingles, Etc., Etc."

[218] "Local Events," (*The Bend Bulletin,* June 5, 1903), 3. Drake's partners were Alexander Thomson, A.H. Grant and T.M. Baldwin; "General Building Note," (*The Bend Bulletin*, May 20, 1904), 1. The company sold lumber, shingles, molding and sash from its two-story building; Advertisement, (*The Bend Bulletin*, October 14, 1904), 1. John Deere agricultural implements, Phoenix Paints, dry goods, groceries and other products were soon added.

[219] "Bend Men Form Board of Trade," (*The Bend Bulletin*, September 8, 1909), 1; *A History of Deschutes Country in Oregon*, 212-13.

[220] "Power Plant for Bend," (*The Bend Bulletin*, January 6, 1909),1; "Try Out Power Plant: Machinery Works Well—Lights May Be Ready in Few Days," (*The Bend Bulletin*, November 2, 1910), 1. John Steidl and others were partners.

[221] "The City of Bend: Petition for Incorporation is Signed," (*The Bend Bulletin*, November 4, 1904), 1. Goodwillie presented the document to the county court on November 26, 1904.

[222] "Goodwillie Winner: To Be Mayor of New City of Bend," (*The Bend Bulletin*, December 23, 1904), 1.

[223] "Bend Is Now A City: Incorporation Approved by County Court," (*The Bend Bulletin*, January 6, 1905), 1. The Crook County Court canvassed the Bend municipal electorate, finding the election legal and officially declared the result; "Elect New Officers," (*The Bend Bulletin*, December 8, 1905), 1. Goodwillie was re-elected to a two-year term on December 5, 1905; Crook County, Oregon, *An Order Granting the Incorporation of a Municipal Corporation of Bend, Oregon*, (Crook County Court, Prineville, Oregon, January 11, 1905); Shaver, F.A., et al., *An Illustrated History of Central Oregon*, (Spokane: Western Historical Publishing Company, 1905), 728-729.

[224] "More Than $100,000," (*The Bend Bulletin*, January 6, 1905), 1. PBD Co. building investments included: sawmill, $4,500; office, $1,450; barn, $800; PBD Co. residence, $375, Drake addition to residence, $1,100; and Goodwillie residence, $1,800. D. I. & P. Co.'s building investments included: office, $2,200; club house, $1,700; stables and shops, $1,200; granary, $700; warehouse, $600; powder house, cook house, etc. at experimental farm, $600, barn, $500, and Guerin residence, $3,500. "Minutes of the Common Council of the City of Bend," December, 1905. In December, 1905, the council learned the total amount of taxable property in the City of Bend to be $50,005 and passed a (retroactive) tax levy for 1905.

[225] "Minutes of the Common Council of the City of Bend," January 5, 1905. Attorney W.E. Guerin, Jr. and his law partner,

professionals. Doctor Urling C. Coe, M.D., observed in his memoirs, *Frontier Doctor*, "The irrigation company had a number of (canal) construction camps within a short distance of town where hundreds of men were employed at high wages…. There were eight saloons with open gambling."[226] The *Bend Bulletin* summarized the first ordinance. "The most important ordinance was that fixing the license of retail liquor saloons at $600 per year, none to be granted for a less period than a year. A bond of $1,000 was required of the licensee."[227] Only five saloons were in operation by March 1905. A contract was also let for the building of a jail.[228]

A group of ordinances were passed in February 1905,[229] as the Pilot Butte Canal project reached its conclusion, beginning with a comprehensive health ordinance. In the preceding year the daughter of an irrigation company employee had been born in a "tent in the middle of Wall Street."[230] In addition to addressing a wide spectrum of diseases and the occurrence of deaths, the ordinance provided for the reporting of all births.[231] The other ordinances included those licensing avocations and amusements; another specified how sidewalks should be built; another was to authorize the working of city prisoners; another to regulate the storage of explosives; another for defining and punishing vagrants; another for disorderly conduct; and one regarding the building of flues and chimneys and the prevention of fire.[232] In May, a full fire-fighting system was purchased. Purchased from the A.G. Long Company of Portland, it consisted of eleven street hydrants; one-thousand feet of the best quality fire hose; two hose carts; one twenty-seven-foot ladder, one sixteen-foot roof ladder and two sixteen-foot ladders; four nozzles each with a one-inch and a three-quarter inch tip; six hydrant wrenches and six hose spanners. The cost was $1,395.50, besides freight. The plant was paid for with six percent warrants on the fire fund, half to be redeemed in 1906, and half in 1907.[233]

To provide for the infrastructural needs of settlers including banking, utilities, and communication, Goodwillie founded and invested in several other firms. W.E. Guerin, Jr., was a partner or officer with him in these. With Guerin he incorporated the Central Oregon Banking & Trust Company.[234] By early February 1905, two franchise ordinances were passed by the city council: one for the water, light and power company and a second for the telephone company.[235] With Guerin and another partner, Goodwillie incorporated the Bend Light, Water and Power Company. The firm purchased the PBC Co.'s rights to construct and maintain electric lines, gas, water, and other public utilities of the city. The city water system was in operation by July 1905.[236]To

George C. Steinemann, provided legal services to the City. The firm charged $150 to incorporate the City of Bend.

[226]Coe, Urling C., *Frontier Doctor: Observations on Central Oregon and the Changing West*, (Corvallis: Oregon State University Press, 1996), 4. Coe arrived in Bend on January 10, 1905.

[227] "Saloon License $600," (*The Bend Bulletin*, December 23, 1904), 1; "Minutes of the Common Council of the City of Bend," December, 1905. The city's chief revenue would come from the liquor license in its first year.

[228] "For A New City Jail," (*The Bend Bulletin*, January 20, 1905. Contract awarded to the Brosterhouses.

[229] "Franchise Ordinances Pass," (*The Bend Bulletin*, February 3, 1905), 1.

[230] Osgood, Judy, ed., *The River Flows As The Mountains Watch: Deschutes Memories*, (Bend: RSVP, 2000), 8-10. As told by Addie Triplett in 1953 to Kessler Cannon, KBND radio. This was near the first Pilot Butte Inn.

[231] "An Ordinance Protecting the Public Health," (*The Bend Bulletin*, February 3), 4. The ordinance said, "It shall be the duty of every physician, midwife, or head of a family, under whose charge any birth occur to report [the] same to the Health Officer before the last of the month in which such birth occurs." A Health Officer and Health Committee were an active, ongoing part of the ordinance.

[232] "Minutes of the Common Council of the City of Bend," January 5, 1905 – December 20, 1905. Standing committees included police, fire and liquor licenses; health; elections; streets, highways, sewers and public lands; rules and order of business; and finance, accounts and current expenses.

[233] Op. cit. Shaver, F.A., et al., *An Illustrated History of Central Oregon*, (Spokane: Western History Publishing, 1905), 729."Finances of Bend," (*The Bend Bulletin*, March 3, 1905), 1. By March 3, 1905, the city projected an income of $3,800 for the year and expenditures of $3,309 for the same period, leaving a balance of $491.

[234] "New Bank for Bend," (*The Bend Bulletin*, July 8, 1904), 1. Firm incorporated July 8, 1904. Goodwillie served as vice-president, Guerin as president, and J.M. Lawrence as secretary. The authorized capital was $25,000; Crook County, Oregon, *Articles of Incorporation of the Central Oregon Banking & Trust Company*, (Crook County Clerk, Prineville, Oregon, July 8, 1904).

[235] "Franchise Ordinances Pass," (*The Bend Bulletin*, February 3, 1905), 1.

[236]Crook County, Oregon, *Articles of Incorporation of The Bend Water Light and Power Company*, (Crook County Clerk, Prineville, Oregon, November 11, 1904); The other partner was George C. Steinemann, an attorney; "Water Franchise," (*The Bend Bulletin*, February 10, 1905), 1; "Water, Light and Power Company," (*The Bend Bulletin*, November 11, 1904), 4; Shaver, F.A., et al., *An Illustrated History of Central Oregon*, (Spokane: Western History Publishing, 1905), 729; "Water Pipes Arriving," (*The Bend Bulletin*, April 14, 1905), 1. A crew of twenty-five workers installed the water system from the river up to Wall Street and along Wall Street to nearly Oregon Avenue.

connect settlers with the greater region Goodwillie and partners incorporated the Deschutes Telephone Company, the city's first telephone company that began by running a line to Prineville. On August 17, 1904, the first voice communication was carried from just outside of Prineville to Bend over the thirty-mile long line that was also used for telegraph messages.[237]

An Illustrated History of Central Oregon captured the period succinctly, stating, "In 1905 the City of Bend marked a new era in the development of Central Oregon, and is a fine example of what can be accomplished when energy and capital unite in the development of vast resources."[238]

Governor Impressed with Settlement, June 1906

The Deschutes' Settlers Association welcomed in June 1906 Oregon Governor Chamberlain, who as head of the State Land Board had visited Bend in 1904, and had returned in that role. With him were the entire land board and some other state officials, including future governor Oswald West, then State Land Agent. Chamberlain was "well pleased with the work of the D. I. & P. Co. He said its canals and entire reclamation works showed the marks of permanency," said the newspaper. He was "impressed...to the greatest degree… [by] the remarkable development of this region during the past two years. At that time he had…found a few scattering cottages along the river and two or three buildings at the townsite. Now he was entertained in a prosperous little city with well laid streets, beautiful lawns, a fine gravity water pressure system and [a] new public school building suitable to a city many times the size and age of Bend. Where before he found barren desert wastes now he could count prosperous ranches by the score."[239]

Bend Area Population Increases After Pilot Butte Canal, 1900-1920

Bend's population showed growth as the Pilot Butte Canal came under construction and in the years after it was built. Approximately 312 people lived in what became Deschutes County in 1900, twenty-one in the Bend Precinct. Canal construction brought the town's population to four or five hundred people. Thereafter, both the city and the adjacent areas grew as settlement occurred and farming developed. See Table 1 below.

[237] "Hello, Prineville," (*The Bend Bulletin*, August 19, 1904), 1. Guerin was president. Goodwillie was vice-president, secretary and treasurer. Gerald Grosbeck was manager; Crook County, Oregon, *Articles of Incorporation of the Deschutes Telephone Company*, (Crook County Clerk, Prineville, Oregon, July 18, 1904). Incorporating with Goodwillie were P. L. Tomkins and George C. Steinemann; "Companies Merged," (*The Bend Bulletin*, May 10, 1907), 1. In May 1907 the telephone company merged with the State Central Telephone Company at Prineville to become The Pioneer Telegraph and Telephone Company.

[238] Shaver, F.A., et al., *An Illustrated History of Central Oregon*, (Spokane: Western History Publishing, 1905), 717.

[239] "Gala Day At Bend: State Land Board Present at Farmer's Institute," (*The Bend Bulletin*, June 22, 1906), 1. The newspaper summarized Chamberlain's remarks. Chamberlain was governor 1903-09, then an Oregon Senator 1909-21. Oswald West served as governor 1911-1915. Approximately 1,500 trout were barbequed for 500-600 attendees. Speakers included A.M. Drake; Jesse Stearns, a prominent stockholder in the D I. & P. Co; H.F. Jones, president of the D. I. & P. Settler's Association at Redmond; Mayor Goodwillie; John Lewis, state engineer; and Dr. U.C. Coe speaking about using pure water and avoiding pollution of the Deschutes.

Year	Population	Sources
1900	21	Bend Precinct, Crook County, U.S. Census.[240]
1903	250	Bend townsite, Sisemore, Deschutes and Lytle.[241]
1904	400-500	Estimate made in 1917.[242]
1910	536	Bend, Crook County, U.S. Census.
1912	1,300	*Bend Bulletin* estimate.[243]
1916	3,205	Count made by high school principal and students.[244]
1917	5,193	Figure filed with City Recorder.[245]
1920	5,415	Bend, Deschutes County, U.S. Census.[246]

Table 1
Bend Population 1900-1920

The U.S. Department of Interior reported on Bend and the adjacent areas in 1913: "The result of this [irrigation] development is reflected in a gradually increasing population, that of the entire [area] being estimated at 4,000, which is distributed among four towns as follows: Terrebonne, 75; Redmond, 800; Deschutes, 50; Bend, 1500."[247] There was plenty of work for engineers and surveyors in the rapidly growing and developing area. They were needed to plat subdivisions, design new utility lines, survey parcels that were sold and lay out streets and roads, among other projects. According to the 1910 Federal Census, hydraulic engineer Joseph G. Kelly had a civil engineering consulting business in Portland, Oregon. Civil engineers living in Bend in 1910 included Robert P. Arnold, Levi D. Wiest, Charles M. Redfield, George Young, Frank H. May, Don E. Rockefeller, Harry M. Esping, Dwight M. Davis, Elmer V. Ward, John S. Ward, Robert B. Gould and William D. James. Also, Leo Pelarski (steam engineer), Robert J. Anderson (surveyor chainman), Carlysle Triplett (steam engineer), Louis H. Radcliff (gasoline engineer) and other surveyors lived in Bend.[248]

Bend Tax Assessment Grows Under Pilot Butte Canal System, 1905-1913

Increasing property tax assessment for the City of Bend is indicated, as the result of irrigation development, settlement, and farming in the region, with data from 1905 to 1913 shown below. From 1905 to the 1910-1911 period, the assessed value of the City of Bend quadrupled as the Pilot Butte Canal begin to provide water for

[240] *A History of the Deschutes Country in Oregon*, (Deschutes County Historical Society, Bend, Oregon, 1985), 11-14. The 1900 U.S. Census found 312 people in what would become Deschutes County. The census included the Bend Precinct, 21; Black Butte Precinct, 210; and Ireland Precinct (south of Bend), 81.

[241] "Population of Bend: Two Hundred and Fifty Persons Resident Here—The Names," (*The Bend Bulletin*, July 31, 1903), 2. This included those at the Bend Townsite, and those at Sisemore, Deschutes and Lytle, the comprehensive community known for years as Bend. Names of residents were listed.

[242] "History of Bend Is Related In Reports By High School Students," (*The Bend Bulletin*, March 15, 1917), 12. This is an estimate.

[243] "Information for the Homeseeker," (The Bend Bulletin, May 15, 1912), 9. This is an estimate.

[244] "Population of Bend is 3200," (*The Bend Bulletin*, April 12, 1916), 1. In April 1916, the census taken by Prof. R. G White, high school principal, and students was considered the most complete and accurate one ever taken; the total population was 3,205. White did not believe there were more than 100 people who may have not been counted. Forty-two high school students covered all that territory embraced in the recently compiled city maps, which included both incorporated and unincorporated districts and additions.

[245] "Bend Residents Now 5,193," (*The Bend Bulletin*, January 18, 1917), 3. The official population of Bend was 5,193, according to the chief enumerator of the census, filed with the City Recorder, in January, 1917. It was believed the figure, taken in regards to the purchase of city bonds, was conservative.

[246] "Population of Bend Exceeds Census Figure," (*The Bend Bulletin*, August 26, 1920), 1. In fall 1920, R.L. Polk directory representatives conducted an enumeration of the population of Bend, finding a total of 6,500 residents, in contrast to 5,415 reported by the U.S. Census earlier that year. Just a few residences beyond the city limits were included, also those in the logging camps of the Shevlin-Hixon Company and Brooks-Scanlon Lumber Company; but, eliminating these, the total was still approximately 6,000.

[247] Oregon Cooperative Work, U.S. Department of the Interior, Reclamation Service, *Deschutes River Projects, Bulletin No. 1*, (Washington: Government Printing Office, 1914), 4. Deschutes refers to a town just outside of Bend, used by the irrigation company, and not the 1902 plat of Deschutes adjacent to the City of Bend.

[248] US Federal Census for Bend, Oregon and Portland, Oregon 1910. Ancestry.com.

settlers who earned income from farm and ranch products and, subsequently, sought products, services and supplies from city manufacturers, service businesses, and merchants. [249]

If the approximately $200,000 assessed against the D. I.& P. Co, and exempted by the supreme courtr, was included in the 1910 figure, it would be nearly an eight-fold (800 percent) increase in assessed value of property in the City of Bend from 1905.[250] See Table 2 below

City of Bend

Year		Assessment
1905		$ 50,005
1906		$ 90,213
1907		$ 72,376
1908		$ 70,882
1909		$ 298,782
1910	*	$ 191,524
1911		$ 215,010
1912		$ 381,685
1913		$ 358,820

Table 2[251]
Bend Tax Assessment, 1905-13
* Approximately $200,000 was assessed against the D.I.& P. Co. which was exempted by the Oregon Supreme Court.

Bend School System Swells Following Pilot Butte Canal, 1904-1913

The school system quickly grew during the construction of the canal and the subsequent settlement of the area. A. L. Goodwillie, L. D. Wiest and James M. Lawrence were the school district's board of directors, beginning in August 1904. There were forty-seven students at the beginning of the 1904-05 school year; in 1905 there were 102. By November 1908 there were over two hundred students.[252] Student enrollment increased from 344 in 1910, to 377 in 1911, to 487 by December 1912.[253] Opening day for school in September, 1919, saw 1,015 students register, an increase of 200 over opening day of 1918.[254] Registered students totaled 1,408 on opening day in 1920.[255] Two years later, the school district population reached 1,965 pupils.[256]

Growth of property values was a positive factor for the school district's expanding student population. In 1910, the taxable property in the school district was $651,733.[257] The property in the school district was assessed at

[249] "County Assessment Is $10,316,157: Some City Figures," (*The Bend Bulletin*, October 22, 1913), 1. Though some increase may be attributed to an expansion of the city limits, it remains an increase in the valuation of the property within the city.

[250] The assessed value of property in the City of Bend in 1910 of $191,524 + $200,000 (D. I .& P. Co. exemption) = $391,524. Just somewhat over that figure ($400,040) would be eight times (800%) more than the City's 1905 assessment of $50,005.

[251] "County Assessment Is $10,316,157: Some City Figures," (*The Bend Bulletin*, October 22, 1913), 1.

[252] "Ready for School," (*The Bend Bulletin*, August 26, 1904), 1; "Local Bits," (*The Bend Bulletin*, December 30, 1908), 5; "School Election," (*The DesChutes Echo*, June 25, 1904), 1; "New Books for School Library," (*The Bend Bulletin*, October 7, 1904), 4.

[253] "487 Pupils In Bend District," (*The Bend Bulletin*," December 25, 1912), 1. The 487 students in 1912 were divided between 251 boys and 236 girls.

[254] "Attendance At Schools Show City's Growth," (*The Bend Bulletin*, September 18, 1919), 1. The number of registered students at the end of the first month, in 1918, was 885. By school, registration was as follows: junior high, 160; senior high, 150; Central 115; Kenwood 215; Reid 325; timber camps 50.

[255] "Schools Show Bend's Growth," (*The Bend Bulletin*, October 28, 1920), 1.

[256] "School Population of Bend Reaches 1965: Gain Indicates Total Inhabitants of City More Than 7000," (*The Bend Bulletin*, November 30, 1922), 1. Includes all children between the ages of four and twenty.

[257] "Recommend 10 Mills," (*The Bend Bulletin*, December 7, 1910), 1.

$1,211,748 in 1913,[258] an increase of 86 percent over the 1910 figure. Three new buildings were completed on the school grounds for the 1912-1913 school year to meet the largest first day enrollment ever recorded.[259]

Subdivisions and Additions Multiply After Pilot Butte Canal was Completed

Bend subdivisions and additions adjacent or otherwise close to the city center were added to the community in the first ten years following the completion of the PilotButteCanal. Second and third additions of the same name, such as BendPark, Kenwood, and Wiestoria, indicate the first ones were very successful for the investors. Others such as North and River Terrace without second and third additions simply indicate there was no more room to expand in the area. See Table 3.

Subdivisions & Additions	Year	Subdivisions & Additions	Year
Awbrey Heights	1910	Lava Road	1910
Bend Park	1911	Lytle	*1903
Bend Park 2nd Add	1913	North Addition	1910
Bend Park 3rd Add	1915	Park	1910
Bend View	1912	Park -- Block 24	1914
Boulevard	1912	Pinelyn	1913
Cascade	1913	Riverside	1910
Center	1910	Riverside 1st Add	1912
Deschutes	*1902	River Terrace	1915
Kenwood	1910	Wiestoria (blocks 1-36)	1910
Kenwood 1st Add	1912	Wiestoria (blocks 37-44)	1913
Kenwood Gardens	1914	Wiestoria (blocks 45-53)	1914

Table 3[260]
Subdivision & Addition Growth, 1902-1915
* Deschutes and Lytle were platted before the canal was built and became a part of the Bend community.

Railroad Officials Visit Bend

In April, 1905, the company had begun work on the Central Oregon Canal "when it came to the conclusion that rail transportation was essential to the settlement of the lands," a report said.[261] Drake used his family connections with owners and developers of railroads and returned to Bend in late May with news the entire region wanted to hear: "From what I am able to learn, east and west, Bend's chances for a railroad are very good."[262] Mayor Goodwillie appointed a committee of Aldermen and citizens, including Drake, to receive a party of railroad officials soon to visit Bend.[263]

The officials arrived shortly thereafter to look over the locality and examine its resources and possibilities of development. The group visited the Pilot Butte Canal and the company's experimental farm just out of Bend.

[258] "County Assessment Is $10,316,157: Some City Figures," (*The Bend Bulletin*, October 22, 1913), 1.

[259] "School Opens Next Tuesday," (*The Bend Bulletin*, August 28, 1912), 1. There were eleven teachers. New buildings were to be used by the fourth, fifth, and six grades. Number of students not given in article.

[260] Deschutes County Clerk, Subdivision Plat Maps (prior to 1960); Deschutes County Clerk, Subdivision Grantor/Grantee Indices (prior to 1960), Deschutes County, Oregon. (Accessed November 30, 2014).

[261] "Drawing to a Head," (*The Bend Bulletin*, April 14, 1905), 1. D. I. & P. Co. officials, President Turney, General Manger Johnston, and stockholder Fred S. Stanley, visited the area to analyze its condition.

[262] "Talk of a Railroad: Plans to Build to Bend Taking Shape," (*The Bend Bulletin*, June 2, 1905), 1. Drake noted: "This matter has been all but clinched two or three times lately. But the railroad world has been struggling with important adjustments and plans have been changed on short notice. Railroad affairs cannot be said to be wholly settled yet, but they are approaching that condition. I believe before a full settlement comes arrangements will be made for putting Bend in railway connection with the commercial world."

[263] "Minutes of the Common Council of the City of Bend," June 20, 1905. Appointed were A.M. Drake, John Steidl, C.A. Chapman, E.F. Batten, Hugh O'Kane, R.B. Mutzig, W.E. Guerin, Jr., F.C. Rowlee and J.M. Lawrence; "Full Fire Protection," (*The Bend Bulletin*, June 23, 1905), 1. Committee of same individuals named by Goodwillie.

They had travelled from Shaniko in the "big automobile of the Central Oregon Transportation Company,"[264] a subsidiary of the D. I. & P. Co., which served as a stage line for the firm in its irrigation development and settlement businesses.[265]

The railroad delegation expressed surprise over the advancement the area had made in the last few years. Industrial agent Judson was enthusiastic: "The country has grown faster than there was reason to expect and there is no room for doubt that it will make a great deal of business for a railroad." Professor French, of the University of Idaho, said, "I know of no better locality for the development of the sugar beet industry." General Manager O'Brien remarked, "I am greatly surprised and gratified at what I have seen. The extent and richness of this region is beyond anything I have been led to believe. Of course you will have a railroad here, you must have it."[266] A week later O'Brien said, "When I see people putting hundreds of thousands of dollars into reclamation work in the Bend section I think they must know what they are doing and that practical results will follow."[267]

Early Farming Success under the Pilot Butte Canal near Bend, 1906

Near Bend, the ranch of Dr. C.E. Coons, in 1906, portended the success other farmers would have under the Pilot Butte Canal system. All over the segregation various crops were "showing a most gratifying growth." Coons' forty-acre tract was "proving a veritable garden spot—an example of where water makes the desert bloom as the rose; a promise of what the future will bring to the upper Deschutes valley," said a report in mid-summer. His tomatoes were 10" high with broad tops and had a healthy appearance. Squash vines showed remarkable growth. Sweet corn planted two months earlier were twelve to 18" tall. String beans showed not a patch of frost and promised a high yield. Four-thousand cabbages were heading and soon to be on their way to market. Lettuce was impressive with leaves 8" to 10" long and from 6" to 8" wide. It was very crisp and tender. Potatoes planted in mid-April were already providing the doctor's family with a plentiful supply. Grains were doing well, too, with rye more than 6' high. Strawberries, gooseberries and raspberries were all growing beyond expectations and already producing fruit. The article noted, "Ranches all through this region are making remarkable showings this year, and the doctor's success is no exception."[268]

THE RELATIONSHIP BETWEEN THE PILOT BUTTE CANAL AND THE CITY OF REDMOND

Settlement of Redmond, 1905-1911

In the Pacific Northwest, Schwantes points out, "when irrigation opened new lands to settlement, cities and towns typically spearheaded agricultural development of the surrounding countryside and formed local markets

[264] "Looking for Traffic: Railroad Men Examining the Bend Country," (*The Bend Bulletin*, June 23, 1905), 1. Officials included W.W. Cotton, former U.S. judge for the judicial district of Oregon, then counsel for the Oregon Railroad and Navigation Company (O. R. & N.); J.P. O'Brien, general manager for the Harriman railway lines in Oregon, Washington and Northern Idaho; R.R. Miller, freight agent of the same; R.C. Judson, industrial agent of the same; G.W. Boschke, chief engineer of the same; E.E. Lytle, president of the Columbia Southern railway (an O. R. & N. branch); H.P French, president of the University of Idaho; and Fred S. Stanley, secretary of the D. I. & P. Co.

[265] "Direct Stageline," (*The Bend Bulletin*, July 8, 1904), 1. By July the firm had two big automobiles running stage between Bend and Shaniko for both passengers and express, with mail to be added by September. The route was to make stops between Bend and Shaniko as well as travel south to Paisley, Silver Lake and Summer Lake; "Biggest Automobile in the United States Was Built in Portland," (*The Sunday Oregonian*, March 12, 1905), pt. III, 22. A.E. Hammond, former chief engineer of the Columbia Southern Railway and former State Engineer, was the president of the transportation company;"Direct to the Railroad: Starting of the Automobile Service," (*The Bend Bulletin*, April 14, 1905), 1.

[266] "Train to Come Soon: That's What Railroad Delegation Says," (*The Bend Bulletin*, June 30, 1905),1. Regarding sugar beets, the professor added, "The soil is right and the climate is favorable. A family can make a good living on a farm raising sugar beets."

[267] "Two Steps To Bend," (*The Bend Bulletin*, July 7, 1905), 1. A week later reports indicated that the Oregon Railroad and Navigation Company was "in the field with the assurance of an extension of the Columbia Southern from Shaniko." O'Brien stated his plans. "I believe that conditions at the present time warrant building to the Agency Plains [near Madras]… And by the time the railroad is completed to Madras I expect conditions to be such that I can recommend an immediate advancement from there to Bend."

[268] "The Soil Is Fertile: Crops of All Kinds Make a Fine Showing," (*The Bend Bulletin*, July 6, 1906), 1.

for farmers."[269] The D. I. & P. Co.'s Supplemental Articles of Incorporation provided: "To establish colonies, cities, villages and towns, including the layout of said towns into lots and blocks and dedicating the streets and alleys of the same to public use."[270] The company developed a plan to establish a town near the north end of the Pilot Butte Canal in the area to be irrigated and then formed the Redmond Townsite Company. Engineers began surveying and staking out the town and clearing streets and lots for the Townsite of Redmond in May, 1905, beginning with twenty acres, with a total of 320 acres set aside. They platted the new town shortly thereafter.[271]

Redmond was located on the Pilot Butte Canal and was named for Frank T. and Josephine Redmond, husband and wife, who had left school teaching jobs in North Dakota, settling in Wasco, Oregon for a short time. Then, at the end of the school year in 1904, they set up their homestead tent amid the sagebrush and junipers on land to be served by the Pilot Butte system. According to Brogan, "The Redmonds, records indicate, were the first purchasers of Carey Act land in Central Oregon."[272] For two years, they hauled water from the Deschutes River several miles away, later building a farmhouse and outbuildings, bordered on one side by the Pilot Butte Canal and, in 1911, on the other side by the railroad. The Redmonds exhibited the greatest number of farm products at the first (1906) and second Potato Show sponsored by the D. I. & P. Co. However, their toughest competition came from the company's experimental farm.[273] The city incorporated on July 6, 1910. The Redmonds are shown in the photograph below.

Frank and Josephine Redmond with daughter
The City of Redmond is named after the couple.
Photograph: Greater Redmond Historical Society

[269] Schwantes, Carlos Arnaldo, *The Pacific Northwest: An Interpretive History*, (Lincoln: University of Nebraska Press, 1996), 295.

[270] Oregon State Archives, Articles of Incorporation # 9549, Deschutes Irrigation & Power Company, February 10, 1904. Clause found in Article III, 13.

[271] "Townsite of Redmond," (*The Bend Bulletin*, May 5, 1905), 1. B.S. Cook & Co. was the realty firm; Cook was an irrigation company engineer. Location was about four miles east of Cline Falls in section sixteen, township fifteen south, range 13 east.

[272] Brogan, Phil F., "The Watering of the Wilderness," (*The Bend Bulletin*, February 12, 1931), n.p.; *A History of the Deschutes Country in Oregon*, (Deschutes County Historical Society, Bend, OR., 1985), 410.

[273] Hole, Leslie Pugmire and Trish Pinkerton, *Images of America, Redmond, (San* Francisco: Arcadia Publishing, 2009), 41. Authors cite a September 21, 1933, *Redmond Spokesman* article; "D. I. & P. Headquarters to be Located at Redmond," (*The Redmond Spokesman*, September 15, 1910), 1. The company announced, at that time, it would move its headquarters from Bend to Redmond; Ward, Elizabeth, *Redmond; Rose of the Desert,* (Redmond: Midstate Printing, June 1975), 2-3. Ward writes that Redmond got its name from a conversation Mr. Redmond had with two D. I. & P. Co engineers, Charles M. Redfield and B. S. Cook. The engineers suggested the named 'Redmond'; "Waterworks Plant: Plans Drawn for System at Redmond," (*The Bend Bulletin*, June 28, 1907), 1. By the summer of 1907, D. I. & P. Co. engineer C.M. Redfield had drawn up plans for a waterworks system for Redmond.

Challenges of Early Settlers near Redmond

Challenges of the early settlers were described by noted local author and historian Keith Clark in *Redmond: Where the Desert Blooms*: "Settlers who came to Redmond came there to farm, to improve the land, to subsist from it, or sell it for a profit. The circumstances of water made land prices higher, but the certainty of some sort of harvest was worth the gamble. When the land was acquired in its pristine state of sagebrush, juniper, and lava rock, it had to be tamed. The sagebrush and the junipers were little hindrance to pioneers whose fathers and grandfathers had cut their way west from the eastern seaboard. The rocks were something else… Farmers built stone boats, heavy sleds upon which the rocks picked painfully from the land could be dragged to a disposal point. Some rocks defied removal, and since there was obviously no soil under them, they were left intact. Sans rocks, the sandy acres must then be leveled and made ready for planting… All [of] this with horse and hand power from dawn to dusk."[274]

Reflecting on Redmond's Settlement

A February 9, 1911, *Redmond Spokesman* article reflected the city's settlement, growth and optimism, counting a variety of business and social opportunities in the city:

> "Redmond has a garage, two banks, two doctors, one bakery, a brickyard, four lawyers, three saloons, two dentists, two railroads, one tailor shop, a skating rink, novelty works, two feed stores, a public library, a reading circle, two newspapers, two drugstores, one harness shop, two barbershops, three restaurants, two transfer lines, one hand laundry, a city water plant, two lumber yards, one jewelry store, a fire department, a basketball team, two photographers, one millinery store, two meat markets, two bowling alleys, one furniture store, a social dancing club, a woodworking plant, two hardware stores, three blacksmith shops, an electric light system, two large general stores, five real estate agencies, four confectionary stores, a central telephone office, five church organizations, two billiard and pool halls, a brass band and orchestra, a passenger and express line, two large sale and feed stables, four fraternal organizations, one cleaning and pressing establishment, ladies auxiliary to the Commercial Club, a public school to the tenth grade, the largest department store in Central Oregon, a Commercial Club with a membership of over 100, [and] two hotels."[275]

In an April, 23, 1921, letter to Fred Henshaw of the Federal Power Commission Board of Engineers, from J.G. McGuffie, Secretary and Counsel for the Central Oregon Irrigation Company, a successor of the D. I. & P. Co., McGuffie observed "the thrifty town of Redmond with its banks and mercantile establishments is *wholly dependent upon the agricultural community surrounding it,which is the result of irrigation*" [emphasis added][276]

FARMING IN THE DESCHUTES COUNTRY

D. I. & P. Co.'s Experimental Farm, June 1905

The D. I. & P. Co. established an "experimental farm" on 100 acres just outside of Bend to demonstrate what its lands could produce, as part of its promotional campaign to attract settlers to visit and buy the segregated lands. It showed positive results after a year of operation. Much was learned about how to farm with irrigated land. The land was cleared and leveled, the soil was prepared and seeded, and then ditches brought water on to it, and cultivation began. Water was introduced at every part of the farm, and was applied in numerous ways

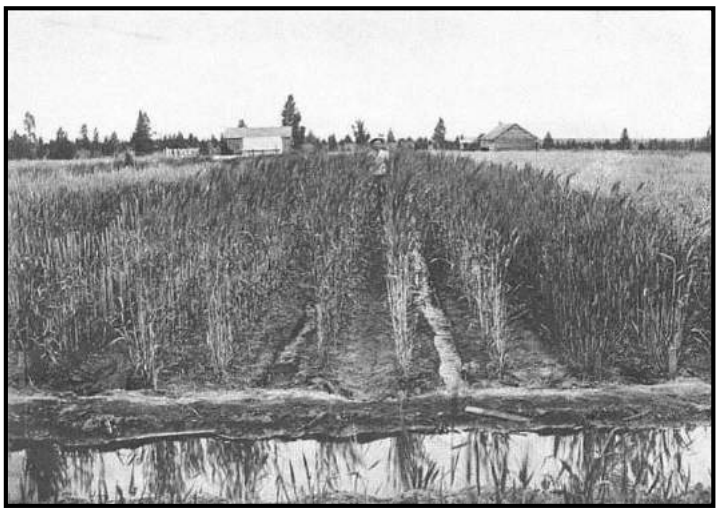
[274] Clark, Keith, *Redmond: Where the Desert Blooms*, (Portland: Western Imprints, 1985), 8-9. Clark's qualifications as historian and author are presented above in earlier material.

[275] "What We Have in the Hub City," (*Redmond Spokesman*, February 9, 1911), sec. 2, 1; Oregon Cooperative Work, U.S. Department of the Interior, Reclamation Service, *Deschutes River Projects, Bulletin No. 1*, (Washington: Government Printing Office, 1914), 4. The federal government reported Redmond with a population of 800 in its 1914 bulletin. Terrebonne, just five miles north, had 75 residents.

[276] McGuffie, J. G., Secretary, Central Oregon Irrigation, Letter to Fred F. Henshaw, Federal Power Commission Board of Engineers, April 23, 1921.

to a variety of crops under various conditions and careful records of the results were kept. Grain was subjected to irrigation by different plans. Beets had the water carefully weighed out to them. Data from various measurements were used as a basis for calculating how much water a farm might need for certain crops under various circumstances and conditions. The products were tried on the market and they were "snapped up in a hurry. No man has ever [eaten] more delicious vegetables than come from the farm," a reporter noted. A wide variety of experiments were conducted with multiple crops grown together. There were fields of oats and vetch, oats and peas, and the three were sown separately. There were dry-land crops and wet-land crops. After one year of development the experimental farm was a success.[277]

The following two photographs shows farming methods being tested at the Deschutes Irrigation & Power Company's Experimental Farm. The first one appears to be in summer, the second one appears to be near harvest time.



Irrigation on Experimental Farm of D. I. & P. Co.
***Redmond Now*,[278] 1910**

Field on D. I. & P. Co.'s Experimental Farm
***Redmond Now*,[279] 1910**

[277] "Change of a Year: Transformation at the Experiment Farm of the D. I. & P. Co.—Crops in Excellent Condition," (*The Bend Bulletin*, June 16, 1905), 1; "Our Land and Water: Experiments to Learn Behavior," (*The Bend Bulletin*, April 7, 1905), 1.

[278] *Redmond Now*, 18.

Farming Success under the Pilot Butte Canal System near Redmond, 1905-1925

Despite the challenges, numerous farming success stories are associated with the Pilot Butte Canal system near Redmond. The *Morning Oregonian* observed, "Upon this land, whose soil is of rich volcanic ash, practically all the products of the temperate zone can be raised advantageously."[280]Rasmus Petersen, a Danish immigrant, came to settle and farm in the Redmond area in 1905, initially earning wages by working on the Pilot Butte Canal. He had read an article written for a Portland newspaper by Governor Chamberlain after his visit to the area, beginning "If I were a young man I would acquire an irrigable tract of land in Central Oregon." Petersen's story of arduous, backbreaking homesteading work in the ubiquitous lava rock, and subsequently developing an extremely successful irrigated farm under the Pilot Butte Canal system is well documented. He acquired 200 acres by homesteading under the Carey Act and successfully grew wheat and oats, alfalfa, potatoes, and other crops, becoming financially successful.[281] A September 30, 1915, article on local farms and ranches in the *Redmond Spokesman* described Petersen's farm as follows: "Rasmus Petersen ranch: Fine corn and oats and 200-ton crop of alfalfa from 85 acres."[282] He also very successfully raised dairy cows and other livestock under the Pilot Butte irrigation system.

Petersen was among farmers in the area in 1925 that cooperated with the county agriculturalist[283] to test different strains of Deschutes Netted Gem, a variety of *Russet Burbank* potato that had been developed in the area.[284] A program overseen by the federal government began as early as 1904 with a letter from the Honorable Elwood Mead, chief of the irrigation and drainage investigation of the U.S. Department of Agriculture, indicating plans to establish an agricultural experiment station relative to the Pilot Butte Canal to "conduct a scientific and practical study of the soil under sound farming operations."[285] The Agricultural College conducted a demonstration farm near Redmond in 1912 with crops used for livestock feed. The average yield of clover and alfalfa was a little over three tons per acre. Corn yielded sixteen tons of fodder, rutabagas twenty-five tons, mangels (a type of beet used for forage for cattle, chickens, swine and sheep) twenty tons, field peas three tons of hay per acre, spring barley sixty to seventy bushels per acre, spring oats fifty bushels per acre, and potatoes yielded ninety to 245 bushels per acre. The report noted, "This shows something of the possibilities of this [area], where the best modern methods are employed."[286]

Frank McCaffery and his wife were settlers, too, initially building a homestead cabin to live in while clearing land to farm under the Pilot Butte Canal system. After working as an employee on the construction of the Pilot Butte Canal, he began selling land to settlers for the D. I. & P. Co. During this time, he became interested in the potatoes settler S.D. Mustard was experimenting with to find the variety most suited to the area's

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[279] *Redmond Now*, 16.

[280] "Railroads Will Open Great Inland Empire: Crook County," (*The Morning Oregonian*, February 4, 1911), 42.

[281]*Deschutes County Yesteryear*, "Came to Bend Using Wagon," (no. 12, fall 1991), 381-83. Reprinted from *The Bend Bulletin*, May 26, 1925; MacHaffie, Ingeborg Nielsen. *Danish in Portland: Past and Present*, (Tigard: Tigard Press, Skribent Press, First Printing, 1982), 9. Petersen's success was shared with other Scandinavian farmers in a 1915 letter in *The Pacific Scandinavien* [sic] from Pastor J.S. Scott of Portland's Bethany Danish Luther Church: "Rasmus Petersen harvested seventy bushels of wheat per acre," it read. Scott quoted in *The Pacific Scandinavien* [sic]; see also National Register of Historic Places, Petersen Rock Garden, Redmond, Deschutes, Oregon, NRIS 13000859.

[282] Hole, Leslie Pugmire and Trish Pinkerton, *Images of America, Redmond(San* Francisco: Arcadia Publishing, 2009), 47.

[283] The program was through the Oregon Agricultural College. It later became Oregon State University's Extension Service.

[284]Mosley, A., O. Gutbrod, S. James, K. Locke, J. McMorran, L. Jensen, and P. Hamm, "Grow Your Own Potatoes," Extension Service, Oregon State University, Corvallis, Oregon, EC 1004, Revised March, 1995), 2.

[285] "Will Try Our Land," (*The Bend Bulletin*, September 30, 1904), 1. Mead indicated work would be conducted under his direction for three years. A federal irrigation expert was to select acreage where conditions are best suited to demonstrating the powers of [the] soil and climate and showing the best method of treatment. This station would conduct a scientific and practical study of the soil under sound farming operations. Director Withycombe of the Oregon Agricultural College was interested and planned to "follow the work with careful attention." Mead was based out of Cheyenne, Wyoming, and was in charge of directing irrigation studies across the West. Withycombe, of the Oregon Agricultural College, now Oregon State University, became Oregon's fifteenth governor, 1915-1919; "Valley Project to Refine Great Basin Resources," (*The Register-Guard*, July 31, 1938), sec. 1, 5. By 1935, Elwood Mead was referred to as the "foremost authority in America on irrigation." Lake Mead behind Hoover Dam was named after him.

[286] State Engineer, [Presumed to be John Lewis], *Deschutes Project*: Oregon Cooperative Work, (Department of the Interior, U.S. Reclamation Service, Portland, 1914), 123-24. These crops were primarily for dairy herd and hog raising feed. Water used was considerably less than that generally assumed to be needed in the area. The experimental station remains in Central Oregon today.

farmlands. While in the state of Washington, he learned of the netted gem variety. He bought two tons of the potatoes and had them shipped to Mustard's ranch to plant. The soil, climate, and irrigation water provided by the Pilot Butte Canal gave the variety, which became known as "Deschutes Netted Gem," all the qualities of firmness, smoothness, uniformity, and a flavor that made it superior to potatoes grown anywhere. They soon sold the best of any potato on the market and at a premium price. The success was beyond all expectations, as they began to be grown across the area and were shipped by rail to California and to points east. The Redmond Potato Show was born out of this success shared by the two settlers.[287] McCaffery and family members are shown in the photograph below in front of their new home in Redmond.

Frank McCaffery
McCaffery at wheel, son Fred on horse, niece, and unknown man.
Photograph: Greater Redmond Historical Society

E.M. Eby was also an accomplished farmer under the Pilot Butte Canal system. He was recognized as one of the most successful diversified farmers in the area, coming to the Deschutes country in 1905 with only $700 in answer to an advertisement telling of 'good land cheap' in the new country east of the Cascades. As a result of his work and the Pilot Butte Canal system his tract of wilderness of brush and junipers was replaced by fertile cultivated fields of potatoes, alfalfa, and grains. His farm (c. 1925) was a typical dairy farm with one of the 'model milk houses' in the county. Its cream was taken by a Redmond creamery and shipped throughout the state.[288]

Most farmers at the time grew a variety of crops, including those grown by Petersen and Eby, as well as a wide variety of vegetables for their own consumption, and to sell to markets. Markets existed in the cities, in the small towns, and within the farming communities. Dairy herds, sheep, and chickens were also found at many farms and ranches.

[287] "Netted Gems An Old Crop Here," (*The Redmond Spokesman*, October 16, 1930), 1. Kenneth C. Miller, agricultural agent for the S. P. & S. railroad said, "Buyers are realizing that these potatoes sell the best of any they put on the market"; Ward, Elizabeth, *Redmond; Rose of the Desert,* (Redmond: Midstate Printing, June 1975), 3-7; "County Spud Showing Good," (*The Bend Bulletin*, November 30, 1922), 1. As late as 1922, Deschutes County Netted Gems took six of the top-ten exhibits, four in commercial class and two in seed class at the Northwest Potato Grower's association show in Spokane, Washington; *Deschutes County Yesteryear*, "Central Oregon As I First Knew It," (no. 1, spring 1986), 12-19. Told by Mrs. Minnie McCaffery, written by Lillian Warmoth; Pinkerton, Trish, ed., *Redmond Local Legacies*, (Redmond: The Redmond Spokesman, 2005), 4-5. "The McCaffery Legacy: Real Estate and Potatoes."

[288] *Deschutes County Yesteryear*, "E.B. Eby Wins By Hard Work," (no. 12, fall 1991), 355-57. Reprinted from *The Bend Bulletin*, March 12, 1925. Eby was a federally-appointed potato inspector for the Deschutes country.

Farming near Redmond
***Redmond Now*,[289] 1910**

Bountiful Crops and Livestock in Deschutes Country, 1913

Harvest levels of all crops in 1913 were extremely high, as was production of livestock across the Deschutes country, in areas adjacent to both Bend and Redmond. Farming was being increasingly diversified. Both clover and alfalfa hay products attained high levels. Big root crops were reported. It was said to be "probably the best all-round year they had." Potatoes yielded as much as 400 bushels per acre. The largest yield of hay was four tons per acre. The variety of vegetables raised in the area had steadily grown in volume not simply with gardens, but in acres of parsnip, carrot, rutabaga, artichoke, cabbage, and pea. In addition to crops, cattle were being raised in increasing numbers as the dairy industry grew. The hog population was growing fast, too. Lesser quality livestock were replaced by the best breeds of beef, dairy and pork. The region was viewed as "on the eve of doing great things in producing butter and allied products and pork."[290]

Deschutes Country Crop Report and Census, 1915

A census of crops, stock and people was made in a report to the Desert Land Board in 1915. It included 645 farms with an average size of 48 acres, and an average size of small farms of 42 acres. The total irrigable acres reported on were 30,692. The types of crops and their acreage were as follows: Alfalfa, 7,351; clover, 2,250; grain, 6,004; potatoes, 757; orchard, 222; garden, 612; miscellaneous, 525; and total acres in crop, 17,719. The stock census found the following: beef cattle, 1,209; dairy cows, 1,004; horses, 1,174; swine, 5,589; and sheep, 443. Total rural population found in the study was 1,398, not including population in towns and cities, or residents on homesteads and desert claims.[291]

Settlers Organize to Market Farm Product, 1919-21

By 1919, the Deschutes County Farm Bureau had organized various settler communities for the buying and selling of hay grown under the Pilot Butte Canal system. Alfalfa hay was one of the most profitable products to grow.[292] The Oregon Cooperative Hay Growers for the Deschutes Valley was organized in Redmond in December, 1921. Forty-one growers represented the farms near Bend and Redmond as well as those in the small communities of Deschutes, Terrebonne, and others. That year, the cooperative farmed over 1,000 acres

[289] *Redmond Now*, 6.
[290] "Crops This Year Are Bountiful," (*The Bend Bulletin*, October 22, 1913), 1.
[291] Dubuis, John, Field Inspector, *Report to Desert Land Board on Central Oregon Project*, (Salem: State Printing Department, 1915), 47.
[292] "Farm Meeting Held At Pleasant Ridge," (*The Bend Bulletin*, February 27, 1919), 6.

of alfalfa, and sold 1,500 tons of hay. A policy of selling only certified product was adopted. All hay shipped out was identified with a tag: "Oregon Cooperative Hay Growers' Deschutes Valley Hay." Primary markets were the Atlantic seaboard and California.[293]

Canal and Farming Acreage Summary

The U.S. Department of Interior reported in 1913 that the irrigation company was "serving water to 25,000 acres of irrigable land, of which 16,800 acres were actually in crop."[294] A 1915 report to the Desert Land Board showed that of the 21,348 irrigable acres of land in 1914, under the Pilot Butte Canal system, 18,913 acres, or eighty-nine percent were sold. By then, the Pilot Butte Canal had 30.1 miles of main canal and 175.08 miles of laterals.[295] The Federal Power Commission's 1922 report stated that 19,169 acres were sold under the Pilot Butte Canal, with 1,542 acres unsold. There were 27,208 acres sold under the Central Oregon Canal system and 9,170 acres unsold. [296]Author and historian Phil Brogan's research a decade later (1931) summarized the work that had been accomplished during the period: "Actual construction started in 1903 and up until 1921 approximately 600 miles of canals and laterals had been built and 45,371 acres of land reclaimed for irrigation."[297]

Polk's Deschutes County Directory for 1924-25 stated, "We have…1,000 farms producing alfalfa, potatoes, grain and other farm crops suitable to our soil and climate."[298] The Bend Chamber of Commerce reported, "The number of farms in Deschutes County increased twenty-three percent from 1925 to 1930, according to United States census figures, exceeded by only three counties in the State of Oregon, and the value of farmlands and buildings increased eighteen-and-a-half percent, exceeded, again, by only three counties in the state. These Deschutes County increases were all in irrigated sections."[299]

FARMING IN THE NOMINATED HISTORIC DISTRICT

Unfortunately, the rock that made the canal in the stretch in the nominated district the most difficult to construct also made it undesirable for farming. As we saw in Section 7, the southernmost portion and the northernmost portion of the canal in the nominated district are the most level and the least rocky. Those portions were homesteaded while the rockiest portion in the middle of T 17S, R12 E, Section 15 was not. In the north and south, the terrain is relatively flat, with rock outcroppings dotting the landscape and making some of the land not farmable. Due to poor shallow soils and the rock, Section 15 was not a desirable area for farms. 120 acres across the north end of Section 15 was homesteaded by Earl B. Houston (Patent awarded on April 1, 1913). His land had a large portion of rock outcroppings, making a challenging farm. He cleared about twenty acres of it, and the old growth juniper tree stumps that remain are a testament to his effort. He cleared out space about twenty feet east of the canal for an irrigation pond that is now lined and altered, but remains in use, serving as a landscape feature and to irrigate landscaping. He built a cabin, cultivated 20 acres of hay and dug a well, but found the farm unprofitable. He sold his homestead to J. D. Rogers in 1911, before Houston received his

[293] "Oregon Co-operative Hay Growers' Ass'n Organized Here," (*The Redmond Spokesman*, December 15, 1921); "Certified Hay Finds Favor With Buyers," (*The Redmond Spokesman, December 8, 1921*), 1; "Hay Grower's Organization Is Effected," (*The Redmond Spokesman*, November 14, 1921), 1.

[294] Oregon Cooperative Work, U.S. Department of the Interior, Reclamation Service, *Deschutes River Projects, Bulletin No. 1*, (Washington: Government Printing Office, 1914), 4. Irrigation information for the two canals is aggregated.

[295] Dubuis, John, Field Inspector, *Report to Desert Land Board on Central Oregon Project*, (Salem: State Printing Department, 1915), 9, 18,. Report submitted for publishing on December 1, 1914. Irrigable acres see p. 9. Of the total irrigable acres in 1914, under the Central Oregon Canal, 25,573 acres were sold, or sixty-nine percent, suggesting the Pilot Butte Canal system was more successful in creating farms. The Central Oregon Canal had 44.15 miles of main canal and 187.51 miles of laterals.

[296] Federal Power Commission, *Report to the Federal Power Commission on Uses of the Deschutes River, Oregon*, (Washington: Printing Office, 1922), 72. There were 27,208 acres sold under the Central Oregon Canal system and 9,170 acres unsold.

[297]Brogan, Phil F., "The Watering of the Wilderness," (*The Bend Bulletin,* March 21, 1931), n.p. These figures include both Pilot Butte and Central Oregon canals.

[298] Polk's Deschutes County Directory 1924-25, 40.

[299] Cramb, L.K., *The Irrigation Situation In Central Oregon: A Proposal that the Federal Government Provide Storage*, (Bend: Bend Chamber of Commerce, October 15, 1931), sec. I,18.

patent or deed. Rogers sold it back to Houston in 1913. Then it was resold to A. Wilcoxen in 1915, who could not make a go of it and lost it in tax foreclosure proceedings. The county owned it for a while then sold it in 1948 to George Carter. It later became the Annie and Robert Eccles McCaw Ranch. In the 1970s and 1980s it was partitioned for rural residential uses.

The only other farmed parcel in the 640-acre Section 15 was 40 acres across the flat south end that was partially farmed by Edgar and Susan Coleman. The Colemans built an irrigation pond, dug a well and built a cabin. They cultivated 20 acres. The Colemans sold their farm to Melvin and Florence McClain in 1920. The McClains built a house, a coop for chickens and an underground rootcellar that remain today. They owned it until 1948, when they sold it to John William Stankamp, a banker, and his wife Flora Lorraine Stenkamp. The Stenkamps and Lorraine Stenkamp's father added a wing onto the house, built a rock and timber barn and other outbuildings. Their adult children, Robert Stenkamp and Patricia Stenkamp Whitehurst, still own and reside there today. They both own land under the canal. Whitehurst grows vegetables for restaurants in her greenhouse. Two members of the Stenkamp family served as mayors of Bend. John Stenkamp owned 1,500 acres in the vicinity at one time, most of them irrigated. The historic irrigation pond is now abandoned and several non-historic ponds are on the old Coleman Ranch.[300]

Of those two original farms, only twenty acres are being farmed today. Native vegetation has returned to the Houston property and there is little sign other than the altered irrigation pond that it was ever farmed. An irrigated pasture for livestock and a small apple orchard that once belonged to the McClains and Stenkamps, remain along the A-4 lateral at the southeast corner of the intersection of Yeoman Road and Old Deschutes Road. Vegetation remains as it has been historically along most of the canal in the district, with the exception of the Canal View subdivision. Old growth juniper trees, Ponderosa pine trees, 6-foot tall bitterbrush, 5-foot tall sagebrush and native bunch and rye grasses provide rich habitat and cover for a surprising number and variety of mammals, birds, reptiles, amphibians, and water fowl.

INVESTORS PROMOTE AND CAPITALIZE ON PILOT BUTTE CANAL SYSTEM

William G. Robbins, PhD, Emeritus Distinguished Professor of History at Oregon State University, in his environmental history of Oregon, *Landscapes of Promise*, described the promoters and investors of the period: "Those who promoted development in the Oregon country were epic poets of sorts, harbingers of change, visionaries whose imaginations knew few restraints other than those dictated by the most obvious limits of technology and natural obstacles."[301] The Deschutes country was quite successful in its marketing efforts. Author and former Tumalo Irrigation District director Martin T. Winch in "Tumalo—Thirsty Land," his seminal, six-part series on the Tumalo Irrigation District, published in the *Oregon Historical Quarterly*, said: "[In 1902] the Deschutes Valley was reported to be 'the best advertised district today in the United States.'"[302]

Successful Promotional Efforts of A.M. Drake

Promotional efforts for settlement were ongoing in the area as Drake used his extensive connections to politicians, government officials, regional and national newspapers, banking and financiers and railroad tycoons and began 'to lay plans for immigration'. His early promotional efforts were primarily through local and state newspapers and in working with others, such as with Goodwillie in incorporating the City of Bend, and subsequently with the Bend Board of Trade. The Board put the Pilot Butte Canal in the headlines and involved

[300] Deschutes County Deeds. Interviews with Patricia Stenkamp Whitehurst and Robert Whitehurst, March 2014.

[301] Robbins, William G., *Landscapes of Promise: The Oregon Story 1800-1940*, (Seattle: University of Washington Press, 1997), 244. In addition, Robbins' books include: *Landscapes of Conflict: The Oregon Story, 1940-2000*; *Hard Times in Paradise: Coos Bay, Oregon, 1850-1896*; *Colony and Empire: The Capitalist Transformation of the American West*; and *The Great Northwest: The Search for Regional Identity*.

[302] Winch, Martin T., "Tumalo—Thirsty Land," (*Oregon Historical Quarterly*, vol. 85, no. 4., Winter, 1984), 351. Winch cites the following sources: " *The DesChutes Echo* (Bend), Dec. 6, 1902, p.1, and Nov. 29, 1902, p. 1. Due and French, *Rails to the Mid-Columbia Wheatlands* (note 8), 44, 52. [title not provided] *Bend Bulletin*, April 3, 1903, p. 2. E.D. Culp, *Stations West*, (Caldwell, Idaho, 1972), 100."

community business members in promotion and development. His work was essentially behind the scenes, seemingly his forte. Sadie Niswonger, who knew Drake well, called him "an organizer" in a 1953 interview.[303]

Shortly after forming the Bend Board of Trade in 1909, he secured space in two publications with large circulations, the Portland *Chamber of Commerce Bulletin* and the *Pacific Homestead*, for an article describing the advantages of the Bend country for the homeseeker, farmer, manufacturer and investor, referring to water power, excellent farm lands, raw materials, business opportunities, and good schools. A small portion read, "Today all eyes are directed toward Central Oregon. The railroads are about to give transportation to the greatest and richest undeveloped area in the West. Now indeed watch Central Oregon grow, for the development of this country in the next three years will surpass anything hitherto seen even in the wonderful Northwest." The article promptly received responses, indicating the growing interest in the prosperity of the Deschutes country following the completion of the Pilot Butte Canal. The Board received forty-five letters in the first week following the article, with fifteen referring specifically to the article in the *Pacific Homestead*.[304]

Drake's selling his irrigation rights and contract to the D. I. & P. Co. indicated experienced investors understood the canal's long-term financial opportunity. In addition, he had played a crucial part in getting the railroad officials to visit the Deschutes country and to make a calculated assessment of its economic potential. At the time of the officials' visit with Mayor Goodwillie's committee in June 1905, which included Drake, Frederick S. Stanley was present and Secretary of the D. I. & P. Co. He would eventually invest several million dollars in the irrigation company. Moreover, he leveraged other investments in lumber, banking, and railroads, and his political connections as former chairman of the committee on railroads and transportation in the Oregon House, to promote and grow his investment in the region.[305] He would remain with the Pilot Butte Canal system until at least 1921. Goodwillie, Drake's PBD Co. partner, disposed of "his holdings in Bend on a rising market" in 1907, including his stock in the PBD Co. to Drake, resigned as mayor and returned to Chicago with his wife who was expecting their first child.[306] He continued to own property and visited Bend many times.

D. I. & P. Co.

The D. I.& P. Co. was a polished public relations organization for its period of history and its area of the nation, with the marketing and publishing experience of eastern businessmen. Moreover, the Pilot Butte Canal was a good irrigation system, embraced by suitable land for farming and ranching, and the ownership knew it. In April, 1904, the company had issued a well written and illustrated booklet describing the Deschutes country and its irrigation work. It described in detail the character of the soil, source of water supply and the prices that products raised on the lands were bringing. Ten thousand copies were printed and distributed to regions from where new settlers were likely to originate.[307] Months before the project was completed, settlers had applied for 1,845 acres, by September 30, 1904.[308] The *Morning Oregonian* said in early 1911, "Central Oregon is well

[303] *Deschutes Country Yesteryear*, "Interview: Sadie Niswonger," (no. 16, summer 1995), 489. Transcription of interview of Mrs. C.P (Sadie) Niswonger by Kesslor Cannon, KBND, 1953. The Niswongers came to Powell Butte in the fall of 1907 and moved to Bend in the fall of 1909. Drake asked the Niswongers to release four lots on the railroad right-of-way, presenting them with a lot at 44 Irving and had the band hall moved to that lot for them to live in until they built a house.

[304] "Board of Trade Work Valuable," (*The Bend Bulletin*, October 27, 1909), 1.

[305] Duniway, David C., State Archivist, Oregon State Library, *Members of the Legislature State of Oregon 1860-1949*, (Oregon State Archives, Bulletin No 2, publication no. 14, 1949), 32. Frederick S. Stanley had served in the Oregon House of Representatives from Union County in 1897, 1898, and 1899. In 1899, he was the chairman of the committee on railroads and transportation; Gaston, Joseph, *Portland, Oregon: Its History and Its Builders*, (Chicago—Portland: S.J. Clarke, 1911, vol. 2), 58-59. Stanley, originally from Wisconsin, organized the Grand Ronde Lumber Company at Perry and the Stanley-Smith Lumber Company at Hood River. In 1904 he organized the First National Bank of Hood River with headquarters in Portland. He was president of the Railway Exchange. Source indicates Stanley's work with the irrigation company would be an investment of four million dollars; "Right of Way Is Now Approved," (*The Bend Bulletin*, July 21, 1909), 1. Stanley had been vice-president of the D. I. & P. Co. as early as July, 1909, and had been doing whatever he could to resolve conflicts with the Harriman railroad operations where there were surveys in areas of the Central Oregon Railroad Company's line, which was being operated under the management of the irrigation company.

[306] "A. L. Goodwillie Is Dead At 67," *(Lynchburg News,* Lynchburg, Virginia, January 15, 1946), n.p.; "Local Bites," (*The Bend Bulletin*, June 21, 1907), 5; "Election Day Soon," (*The Bend Bulletin*, November 12, 1907), 1.

[307] "Advertising the Country," (*The DesChutes Echo*, April 16, 1904), 1.

[308] State of Oregon, *Report of State Land Board Relative to Desert Lands, Granted the State Under the "Carey Act" for the Period Commencing October 1, 1902, and Ending September 30, 1904*, to the Twenty-Third Legislative Assembly [Regular Session],

styled the 'most-talked-of territory in the West' …and the heart in geographical position and economic possibility."[309] Indeed, a newspaper advertisement found even before the canal was completed invited prospective settlers:

> *FREE LAND IN OREGON. In the richest grain, fruit and stock section in the world. Thousands of acres of land at actual cost of irrigation. Deed direct from State of Oregon. WRITE TO-DAY. BOOKLET and MAP FREE. Deschutes Irrigation and Power Company, 610-11-12 McKay Building, Portland, Oregon.*[310]

The D. I. & P. Co. opened real estate offices in Portland and Prineville. Promotional efforts were not historically unique to the D. I. & P. Co. Nor were such efforts unique to irrigation development companies. The railroads were among the first and best to develop the marketing of government lands long before the Carey Act was enacted. Not only were corporations involved in these efforts, many cities and towns, through commercial clubs, had such efforts encouraging settlers to 'buy now', and even individual land owners sought to encourage settlers to purchase from them, as 'the railroad will soon be passing by'.[311] Schwantes observed, "All had a common desire to attract settlers and investors in order to promote economic growth and guarantee a prosperous future."[312]

Promotion was not limited to printed materials. Elaborate displays for fairs and expositions were used to promote the Pilot Butte system. In 1908, a representative of the Oregon Commission of the Alaska-Yukon-Pacific Exposition, to be held in Seattle, visited Bend to prepare an exhibit for the event. He took three photographs of the canal's headgates and photographs of a field of clover and of a large vegetable garden grown on irrigated land. These were made "into stereopticon views 10' or 20' square and were to be used to illustrate lectures given" at the exposition. Commitments from settlers to send a variety of farm products were obtained.[313]

The Promotional Campaign of the Great Northern Railroad

Nothing quite compared, however, to the promotional campaign by the Great Northern railroad once the Deschutes country, under the Pilot Butte Canal system, had developed and 'built-up' the area's population and infrastructure, and had established financial institutions[314] and communication technology of sufficient scale to bring the region into the economic lifeblood of the nation. The Great Northern Railroad's objective was "the thorough advertising and colonization of Central Oregon." The railroad joined efforts with New York publishing house G. P. Putnam's Sons, with its actual son, George Palmer Putnam, whose writings on Central Oregon had already appeared at intervals in the *Oregonian*. Besides a bulletin to be published with Putnam's stories and photographs to advertise Central Oregon, the railroad had collected farm products to be placed on exhibit in St. Paul, Philadelphia, Boston, and other locations.[315] Schwantes noted, "The transcontinental railroads spent fortunes to advertise the [Pacific Northwest] to prospective tourists and settlers."[316]

(Salem, Oregon, 1905), 11.

[309] "Railroads Will Open Great Inland Empire: Crook County," (*The Morning Oregonian*, February 4, 1911)42.

[310] Advertisement, (*Oregon Daily Journal*, July 11, 1904), 16.

[311] Davis, H.L., *Honey in the Horn*, (New York: Avon, 1935, 1962), 330-363. This practice was so ingrained in Central Oregonians and others, it became a part of the narrative of this 1936 Pulitzer Prize-winning novel by a native Oregonian who lived in Wasco County near the Deschutes River during his teenage years. Set in the homesteading years of 1906-08, it follows the characters from the Oregon coast to the Willamette Valley and, finally, to Central Oregon, where many were expecting "old E.H. Harriman" to soon build a railroad. Mr. Pringle, of "Pringleville, the Gateway too [sic] Eastern Oregon, [offered] Home Sites on Easy Terms, Industrial Locations Free. Parties interested were invited to lay their cases before the J.B. Pringle Real Estate Company, whose offices adjoined the hotel dining-room" (p. 346).

[312] Schwantes, *The Pacific Northwest*, 288-89.

[313] "More Advertising," (*The Bend Bulletin*, July 31, 1908), 1.

[314] "A National Bank," (*The Bend Bulletin*, August 7, 1908), 1. The Central Oregon Banking & Trust Company was dissolved and an institution known as the First National Bank of Bend, Oregon took its place.

[315] "Great Northern Begins Extensive Campaign to Advertise Central Oregon," (*The Bend Bulletin*, February 16, 1910), 1. The railroad had already begun advertising in Montana and Washington.

[316] Schwates, *The Pacific Northwest*, 291.

The Bend Company Sells Property in Bend

Nevertheless, a new, robust firm was incorporated in March, 1911, to capitalize on the growth relative to the successful settlement brought about by the Pilot Butte Canal, particularly the establishment of the City of Bend and the increasing farm population with growing families. The *Bend Bulletin* summarized the mega-transaction: "3,000 acres of timber lands, 2,000 acres of agricultural lands, 1,400 acres adjacent to town, 1,300 platted lots, the Pilot Butte Development Company sawmill, the power and lighting plants, city water system, and various water power and irrigation rights."[317] The properties of the PBD Co., the Bend Townsite Co., and the Bend Water, Light & Power Co., as well as valuable water power sites on the Deschutes River, all primarily held by A.M. Drake, had been sold to a syndicate of Eastern lumbermen, and Dayton, Ohio, and Oregon capitalists.[318]

The Bend Company was immediately busy marketing real estate, selling at least thirty-five lots of business and residential properties in the first two weeks after completing the transaction.[319] "The conditions in Bend could not be more favorable for making investments in business property than they are today. There is not a town in the State of Oregon, nor is there one in the entire West where the resources and conditions are such as to make certain a city of the size Bend is sure to be," said a 1913 advertisement.[320] Of those properties purchased, The Bend Company sold 46 percent of the Bend Townsite lots; 41 percent of Park Addition lots; 31 percent of North Addition lots; and 73 percent of Center Addition lots, or an overall average of 59 percent of the lots in these four neighborhoods of Bend by March 31, 1916. The firm controlled all of the actual business lots and nearly all of the intermediate lots that could be developed into business lots.[321]

The Railroad Arrives in Redmond and Bend in 1911

Mayor Goodwillie's committee was successful in showing the railroad officials the richness of the Deschutes country between 1905 and 1907, following the development of the Pilot Butte Canal and the subsequent settlement with its attendant infrastructure and farming capabilities. The economic stimulus and population growth which followed its completion could not be overlooked. "Railroad Day" was celebrated in Bend on October 5, 1911, with a crowd of 1,500 to 2,000 people and distinguished dignitaries. The Oregon Trunk's James J. Hill swept into Bend and drove the golden spike at the Bend depot marking the completion of the route.[322] Hill's speech that day was one of great promotion of the area. He had that day seen "the vegetables and grains and grasses, the products of the soil that reflect the power and the natural wealth of the soil. And, there is no mistake about it," he said, "it can be done because it has been done."[323] The fruit, vegetable and grain exhibit that day in the middle of Oregon Avenue between Wall and Bond streets reportedly "was an eye-opener not only to the visitors but to a majority of the Bend people themselves."[324] His representative, John I. Springer, had been in the region and set in motion a number of matters two years earlier, and had met with Drake and other members of the Bend Board of Trade. Hill's operations had been advertising the lands in the

[317] "New Company Formed," (*The Bend Bulletin*, March 29, 1911), 1. Incorporators were J.M. Lawrence, Franklin T. Griffith, and Clyde M. McKay. The firm was capitalized at $360,000.

[318] "Town of Bend Been Bought," (*The Redmond Spokesman*, March 9, 1911), 1. Drake held the greater part of the interest in these before the transaction, with Frank Robertson of Portland having an interest in the Bend Townsite Co. and the Bend, Water, Light & Power Co.; "Bend Townsite Changes Hands: New Company Takes Over Holdings of Drake and Robertson, Including All the Properties At Bend," (*The Bend Bulletin*, March 8, 1911), 1; "Townsite Deal Goes Through," (*The Bend Bulletin*, March 3, 1911), 1; Various Deeds, see Bibliography.

[319] "Townsite Chiefs Start Work," (*The Bend Bulletin*, April 15, 1911), 1. The spokesman for the firm said "the new company will inaugurate a vigorous publicity campaign. It is the intention to issue much advertising matter and to keep Bend in the public eye"; "Buyers Busy: Local Lots Are Selling Rapidly," (*The Bend Bulletin*, April 26, 1911), 1. A list of buyers and lots is provided.

[320] Advertisement, (*The Bend Bulletin*, July 30, 1913), sec. 3, 6.

[321] "Notes," The Bend Company, Price, Waterhouse & Co., March 31, 1916; "Bend Townsite Changes Hands: New Company Takes Over Holdings of Drake and Robertson, Including All the Properties At Bend," (*The Bend Bulletin*, March 8, 1911), 1. Among the holdings affected by the transfer included portions of the Bend Townsite, and Center, Park, and North Additions. Figures are the percentage that had been sold by March 31, 1916, of the total number of properties transferred from Drake's holdings to The Bend Company.

[322] "Railroad Day Here Is Great Event: James J. Hill Drives Golen [sic] Spike and Bill Hanley Lays Cornerstone—Nearly 2000 People Here for Celebration," (*The Bend Bulletin*, October 11, 1911), 1.

[323] Ibid., 8.

[324] "Exhibits Surpass Expectations," (*The Bend Bulletin*, October 11, 1911), 6.

area for some time by the time the railroad arrived.[325] The railroad provided the avenue for settlers in greater number to arrive and for irrigated farm products, livestock, lumber and other products to travel to market. Importantly, national markets would open for commodities and products of the Deschutes country.[326]

SETTLERS BECOME CENTRAL OREGON IRRIGATION DISTRICT, 1910-9121

The D. I. & P. Co. was reorganized as the Central Oregon Irrigation Company in 1910.[327] In November of that year the *Bend Bulletin* reported that "Oregon's greatest irrigation enterprise [is] actively and firmly on its feet again."[328] In 1912, the North Canal Dam works were completed. From a new diversion point and headgate at the new North Dam, just north of and downstream of the city, a new 1.4 mile long "U" shaped channel, called the North Canal, was constructed in flat terrain to connect the river to the pilot Butte Canal at approximately mile five of the Pilot Butte system.[329] (See the description of Stretch 1 of the canal as described in Section 7 of this nomination.) The new dam, the new diversion point and the new North Canal were built at the prompting of the city council who wanted more flow in the river within the city limits.

The 1912 North Dam on the Deschutes River, photographer looking east.

[325] "Hills Interested In Deschutes Country," (*The Bend Bulletin*, October 6, 1909), 1.

[326] "At Last," (*The Bend Bulletin*, August 28, 1908), 4. The *Bend Bulletin* opined on the matter several years before, saying "There will be a top-notch market for every pound of hay, grain, vegetables, butter and eggs that the country can produce."

[327] McGuffie, J. G., Secretary, Central Oregon Irrigation, Letter to Fred F. Henshaw, Federal Power Commission Board of Engineers, April 23, 1921. McGuffie wrote that during the 1907-1910 period, the D. I. & P. Co. "proceeded actively in the reclamation of lands embraced in Segregation List No. 6, but the bond holders became restive and litigation arose which resulted in the foreclosure by the bond holders [into receivership] and a reorganization of the affairs of the company, and a transfer of all contract rights of the [D. I. & P. Co.] to the Central Oregon Irrigation Company, a corporation, which…continued in the construction and management of the system from November, 1910"; "D. I. & P. Co. To Reorganize: Change in Irrigation Co. Effected This Week," (*The Redmond Spokesman*, November 9, 1910), 1. The Central Oregon Irrigation Company filed its articles of incorporation, October 16, 1910, with a capital stock of $1.5 million. The directorate was Frederick F. Stanley, A.F. Biles, Jesse Stearns, and others representing New York and Columbus interests.

[328] "Troubles Over," (*The Bend Bulletin*, November 2, 1910), 1. Other interests included I.N. Farnum of New York, representing J.G. White & Co.; and L.G. Addision, of Columbus, representing the Ohio bondholders. Roscoe Howard was manager and C.W. Redfield chief engineer. For the new firm, Stanley was president, Biles was vice-president, and Stearns was secretary-treasurer.

[329] Federal Power Commission, *Report to the Federal Power Commission on Uses of the Deschutes River, Oregon*, (Washington, D.C.: Printing Office, 1922), 75. The water for the Pilot Butte Canal system thus remained in the Deschutes River rather than being diverted where it had been since 1904-05, and passed down the river where it was then diverted through the North Canal and into the Pilot Butte Canal, *above the nominated section*. The Pilot Butte Canal system continued to irrigate the same historic lands north of the nominated section; Hadlow, Robert W., Cultural Resources Specialist, *Findings of Effect on Bend's Historic Irrigation Canals, Bend Parkway, The Dalles-California Highway, U.S. 97, Deschutes County*, (Salem: Oregon Department of Transportation, Environmental Section, June 1992), 4. The North Canal became generally known as the North/Pilot Butte Canal. The portion of the Pilot Butte Canal which had come through the Townsite was terminated about 1.5 miles north of the Bend Townsite.

Thereafter, a proposal arose in 1915 that the Central Oregon Irrigation settlers form a district.[330] At that time, irrigation economist Ray Palmer Teele, M.A., wrote in his 1915 book, "Few large Carey Act enterprises have reached the stage of being turned over to the purchasers of water rights."[331] A district, it was proposed, could be perfected by the settlers themselves without any great difficulty. Specifically, it noted: "After the district has been organized, arrangements can be made with the Central Oregon Irrigation Company to acquire all its water rights, construction works, contracts with the State, and all the liens on unsold reclaimed lands within the limits of the Pilot Butte and Central Oregon canals. It is to the best interests of all those who now own land under the system and who have acquired water rights there to formulate some feasible plan of reorganization. It is also evident that the Central Oregon Irrigation Company has certain rights which cannot be eliminated or overlooked. It would seem also that the best interests of the neighboring towns, as well as the settlers on the project would be best protected by the management of all matters pertaining to the project by the settlers and farmers themselves, as would be the case under the district idea."[332]

A date for the vote to form an irrigation district was set by the Desert Land Board. The vote was in favor of forming a district to take over and operate the irrigation system in lieu of a Water Users Association, as had been provided for in the company's contract with the State of June 17, 1907.[333] Following the settlers' formation of the district, various issues ensued with the irrigation company. Ending a long engagement between the settlers and the company, Judge John McCourt, Multnomah County Circuit Court, Portland handed down a decree. The effect of the Final Decree, known as the Dietrich Decree, was to turn over the ownership and operation of the irrigation system as constructed to the settlers organized as the Central Oregon Irrigation District. It transferred water rights, irrigation canals, and other assets roughly valued at $3,000,000[334] to the Central Oregon Irrigation District. The settlers who had water rights had become a district.

[330] Brogan, Phil F., "The Watering of the Wilderness," (*The Bend Bulletin*, March 3, 1931), n.p. On October 27, 1915, Olaf Laurgaard, a well respected irrigation engineer, proposed that the Central Oregon Irrigation settlers form a district. He wrote to Oregon Governor Withycombe (1915-1919) for whom he had consulted on irrigation matters. His suggestion, therefore, was regarded as worthy of consideration. It was Laurgaard's view that all the land in private ownership, Carey Act lands, homesteads, tracts under the Pilot Butte and Central Oregon canals, as well as some other lands should be included within the limits of an irrigation district.

[331] Teele, Ray Palmer, M.A., *Irrigation in the United States*, (New York: D. Appleton, 1915), 200.

[332] Brogan, Phil F., "The Watering of the Wilderness," (*The Bend Bulletin*, March 3, 1931), n.p.;

[333]Brogan, Phil F., "The Watering of the Wilderness," (*The Bend Bulletin,* March 10, 1931), n.p. The vote was on December 17, 1917. The contract with the State stipulated that the system must be turned over to a water users association within five years of completion of construction. Approval of the newly formed Central Oregon Irrigation District was formally given by the Desert Land Board on February 26, 1918; "Change In D. I. & P. Co.," (*The Bend Bulletin*, March 15, 1907), 1. In March, 1907, Ohio owners had disposed of their interests in the D. I. & P. Co. to other owners who then owed all the stock. Soon thereafter a new Agreement was signed between the State and the owners of the irrigation company who were J. Edwin Sawhill and John Steidl of the Deschutes country, and Edward A. Baldwin, Frederick S. Stanley and Jesse Stearns of Portland. Johnston and Turney were among the Ohio sellers; "The Deschutes Irrigation & Power Co. to State Land Board, The Amended and Supplemental Agreement," [Filed] August 7, 1908, vol. 5, 150-67. Under the date of June 7, 1907, a new Agreement (contract) was entered into between the D. I. & P. Co. and the State Land Board embracing the remainder of the land in Segregation List No 6, not under contract with the settlers, and the land in Segregation List No. 19, comprising some 56,000 acres gross, and lying in the bend of the 'horseshoe' formed by the Pilot Butte and Central Oregon canals. (Segregation List No. 19 was the C.C. Hutchinson's Oregon Irrigation Company segregation that the D. I. & P. Co. had acquired in the 1904 buyout.)

[334] Brogan, Phil F., "The Watering of the Wilderness," (*The Bend Bulletin,* March 20, 1931), n.p.Legally, the case was "Dietrich vs. the Central Oregon Irrigation Company"; Brogan, Phil F., "The Watering of the Wilderness," (*The Bend Bulletin,* March 21, 1931), n.p. The statement issued by the district board of directors, who were John A. Riggs, C.H. Hardy and J.G. McGuffie, said, "On July 9, 1921, a decree was entered in the circuit court of Multnomah County, Oregon, in the district's suit against the Central Oregon Irrigation Company, commanding the company to turn the irrigation system over to the settlers on the first day of August 1921. By this decree the district and the holders of contracts upon the segregation receive a prior right for water for the amount provided in the decree over any rights of the company, and the relative rights of the company and the district are very clearly established."Officially transferring to the Central Oregon Irrigation District the title to the water rights and system of the Central Oregon Irrigation Company, the company's deed to the settlers was received in Redmond on the morning of August 1, 1921. The transfer of the management of the company to the district did not involve any difficulties, for at the special meeting of the district directors in Redmond on August 2nd George W. Kanoff, superintendant for the company, was secured as manager of the new district; "C.O.I. President Takes Bride," (*The Redmond Spokesman*, September 23, 1921), 1. Frederick S. Stanley was president of the irrigation company at this time.

COMPARISON OF THE PILOT BUTTE CANAL WITH THREE OTHER IRRIGATION CANALS IN THE UPPER DESCHUTES RIVER BASIN.

According to the USGS, there are 38 canals in the tri-county area of the Upper Deschutes River Basin that generally includes Deschutes County, Jefferson County and Crook County. The USGS defines a canal as a manmade waterway used by watercraft or for drainage, irrigation, mining or water power. Irrigation projects in the Upper Deschutes River Basin include the Tumalo Project west of Bend, the Walker Basin Irrigation Company south of Bend near La Pine, the Arnold Irrigation Company serving areas south and east of Bend, the Three Sisters Irrigation District west of Bend, the Lone Pine District (also known as the Crook County Improvement District No. 1) north of the Crooked River and the Deschutes Reclamation and Irrigation Project, called the Swalley Ditch. The most ambitious and largest project was the North Unit Project, completed in 1946 which irrigates more than 50,000 acres north of the Crooked River. The Pilot Butte Canal that serves the area north and northeast of Bend and Redmond and the Central Oregon Canal that serves users east of Bend and in Alfalfa and Powell Butte are managed by the Central Oregon Irrigation District. There are eight irrigation districts in the Upper Deschutes River Basin. The districts are indicated in the maps in Figures 20 and 21.[335]

The Deschutes Basin Board of Control

The Deschutes Basin Board of Control (DBBC) has a website,[336], which describes the eight irrigation districts that belong to the organization. In October 2015, the website defines DBBC as follows.

> *"For over a century irrigation districts in Central Oregon have played a pivotal role in the Deschutes Basin's development and growth. Collectively they convey water to over 150,000 acres of productive farms and ranches as well as local cities, parks, and schools. The Districts have also undertaken unprecedented steps in collaboration with local, state and federal agencies, conservation groups and others to conserve water, and improve fish and wildlife habitat in the Deschutes River and its tributaries."*
>
> *"The Deschutes Basin Board of Control (DBBC) is comprised of eight Irrigation Districts including Arnold, Central Oregon, Lone Pine, North Unit, Ochoco, Swalley, Three Sisters and Tumalo Irrigation Districts."*
>
> *"Through the DBBC, formed in 2002, the Districts coordinate and share their respective resources and management assets to conserve water, improve their services for farm and ranch families, and enhance river conditions for wildlife species and recreational opportunities."*

The following descriptions are illustrative of three historic irrigation canals in the Bend area.

Arnold Irrigation District

The Arnold Irrigation District serves users in Bend and others south and east of Bend in Deschutes County. The District includes 600 acres that are within Bend's Urban Growth Boundary or Urban Reserve Areas. It was organized on December 27, 1904, just as the Pilot Butte Canal was nearly completed. On January 9, 1905 Oregon's Secretary of State certified its Articles of Incorporation. Like the Pilot Butte Canal, it was a commercial enterprise under the Carey Act. The purpose was to acquire, buy, own, sell or improve any real estate or water rights, construct flumes and canals for irrigation purposes, and to conduct general irrigation business. Its capital stock was $5,000. It filed for water rights on February 1, April 15 and April 25, 1905. Construction began in April 1905. Arnold Irrigation District's founders were W. Arnold, T.O. Harshman and J. J. Reed. The project engineer was Levi David Wiest, the same man who was the first engineer for the Pilot Butte Canal.

The DBBC states that as one of Oregon's oldest irrigation districts, the district has long embraced water conservation, has repaired leaks in a historic metal flume, lined 1.5 miles of its main canal and laterals, piped

[335] USGS website, Oregon.
[336] <dbbcirrigation.com/about/>

5.5 miles of laterals, and even eliminated 4.5 miles of old laterals. Diligent water monitoring at turnouts has provided the largest contribution to conservation. It plans to replace aging wooden flumes soon. Some historic segments now have concrete lining.

The source of the district's water is the Deschutes River at a diversion point south of Bend and stored water in Crane Prairie Reservoir. The canal was 17 miles long and was shortened to 14 miles due to deficient volume. (Wiest also underestimated the size of the flume near the diversion point of the Pilot Butte Canal.) It diverts an average of approximately 25 cfs since 1997.The Arnold Irrigation District serves 647 patrons on an average of 6.78 acres per account. The acres covered today are 4,384. The district absorbed the Pine Forest Ditch Company, the Bend Company and North Irrigation Company. [337] (See Figure 22, photos of this district.)

Tumalo Irrigation District

Tumalo – Thirsty Land, by Martin Winch, published in six successive issues of the Oregon Historical Quarterly (vol. 84 no. 4 through vol. 87 no. 1) details the saga of the Tumalo Irrigation District. Tumalo Irrigation District was Oregon State's third contract under the Carey Act and the first "failed" Carey Act project. The project to build the canal was a commercial enterprise under the Carey Act, but was taken over by the State of Oregon. [338] Michael Hall states in his history of the irrigation districts in the Upper Deschutes Basin, "The Carey Act lands which became known as the 'Tumalo Project' hold a distinction in history as the most seriously vexed Carey Act project in Oregon, and possibly the Nation, suffering nearly simultaneous engineering, managerial, and financial disasters"[339]. In 1900 the Three Sisters Irrigation Company took over from the Three Sisters Ditch Company that had been incorporated in 1893. The founders were the settlers on Wilmer Flat, the location of the failed Tumalo Reservoir. The plans were to water the area with water from Tumalo Creek, just west of Bend. Other key dates for this district are as follows:

- Nov. 1, 1905. Project sold to the Columbia Southern Irrigation Company.
- 1911. Project deeded to the Oregon, Washington & Idaho Finance Company that was hired by the state to prepare a financial and engineering report on the project.
- 1913. Oregon Legislature passed the Columbia Southern Act authorizing $450,000 of public funding to reorganize and construct the project. State of Oregon took control of the project as Tumalo Irrigation Project through 1919. The primary project engineer was Olaf Laurfaard for the state in 1913.
- 1920. Turned over to Tumalo Irrigation District until 1922.
- 1922, to 1924. Deschutes County Improvement District.
- Development on the system continued through the1950's.
- Present: Tumalo Irrigation District.

In 1902, Columbia Southern (affiliated with the Columbia Southern Railroad) acquired the right to Tumalo Creek's flow and sold $100,000 shares of capital stock. The canal was partially constructed in 1903-1904 and primarily during 1913-1924. The Columbia Southern Company founded the unincorporated town of Laidlaw (now called Tumalo) and promoted the area to attract settlers. Tumalo Irrigation District absorbed the Columbia Southern Canal, Bend Feed Canal, Tumalo Feed Canal, and the Cloverdale Irrigation Company.

[337] Arnold Irrigation District web site, www.arnoldirrigationdistrict.com
Deschutes River Conservancy and Deschutes Water Alliance, *Deschutes Water Planning Initiative, Water Supply Goals and Objectives Final Report,* February 26, 2013. Pages 11-16.
Deschutes Basin Board of Control Website, www.dbbcirrigation .com.
Bureau of Reclamation web site, www.usbr.gov.

[338] Hetzel, Christopher, *Draft National Register of Historic Places Multiple Property Documentation Form, Irrigation Projects in Oregon, 1850 – 1964*. *January 12, 2015,* ICF International, Seattle, WA.

[339] Michael Hall, Irrigation Development in Oregon's Upper Deschutes River Basin 1871-1957, A Historic Context Statement, 1994, p 16-18.

Today, the Deschutes Basin Board of Control states,

> *"TID has improved its system's efficiency, conserved water, and improved habitat. The District recently closed the Columbia Southern Diversion and Feed Canal, restoring instream flows to 8.5 miles of Tumalo Creek. Working to reduce diversion losses, the District has piped over 60% of the 11 miles of its main canals. TID has committed to return all future water savings on the Tumalo Feed Main Canal to instream uses. TID has protected over 10 cfs of senior water rights on Tumalo Creek below its diversion and another 6 cfs on Crescent Creek. Upon the completion of the Tumalo Feed Canal piping project, with leasing, over 22 cfs will be permanently protected below TID diversions. TID is replacing another 3,000 linear feet of open canal with pipe in 2015-2016".*

Most of the two main canals are piped. The sources of the irrigation water for the district are the Deschutes River in central Bend, Crescent Creek and Tumalo Creek and its upper tributaries and stored water from Crescent Lake. The District has 11 miles of main canal and 69 miles of laterals and ditches. It diverts 45,725 acre feet to serve 635 patrons on 60 square miles or 8,093 acres. The average account size is 13 acres. The district serves 690 acres inside the city of Bend.[340](See Figure 24, photos of this district.)

Swalley Irrigation District

Two area ranchers, George W. Swalley and C. R. Swalley filed in 1892 for some water from the Deschutes River to apply to their farms. They lived about halfway between the future cities of Redmond and Bend. On September 1, 1899, the Swalleys and six other land holders, including James R. Benham, filed for water rights under the Swalley's prior claim. In October 1899, they formed the Deschutes Reclamation and Irrigation Company as a cooperative venture. Each man was to contract for or personally work to build the system of ditches, flumes, and roads to deliver water to their ranches. They also worked at the O. B. Riley Lumber Mill to produce the lumber that was necessary to build the flumes. Irrigation began in 1902 and in 1904 the corporation issued 4,800 shares of stock to settlers as they settled and could use the water. The settlers were generally responsible for cooperatively digging ditches to connect their land to the laterals. In 1912, the company acquired a right to divert water from the Deschutes River at the new North Dam in Bend. By 1931, the canal was 13 miles long. It served the area north of Bend between the Deschutes River and the Pilot Butte Canal. The original filing was to irrigate 6,638 acres, but the segregation approved by the State of Oregon under the provisions of the Carey Act was for 1,280 acres. Michael Hall states that, of seven Carey Act projects approved by the State of Oregon between 1901 and 1906, the Deschutes Reclamation and Irrigation Company project for 1,280 acres was only one completed by 1913.[341] Later segregations and projects increased the acreage to 4,331 today.

Swalley Irrigation District has 28 miles of canals and laterals providing water delivery to the 662 district water users. The main canal is 13 miles. As urbanization occurs, some of the structures developed have been piped, especially through the Mt. View Mall and the Bend River Mall, both within the Swalley boundaries. The district piped the approximately 3 miles between the northern city limits of Bend and the hydroelectric plant at Deschutes Junction. [342] The Deschutes Basin Board of Control web site states,

> *"Despite being one of Oregon's smaller irrigation districts, SID has returned the largest amount of water to the Deschutes River through its conservation projects. In 2009, the district completed the piping of 5.1 miles of its main canal along with several smaller laterals. Altogether, the district has returned 38 cfs of water, with an 1899 water right (the most senior on the river), to the Deschutes River. A year*

[340]Michael Hall, Irrigation Development in Oregon's Upper Deschutes River Basin 1871-1957, A Historic Context Statement, 1994.

[341]*Ibid.* page 15.

[342]COID web site, www.coid.org
Deschutes River Conservancy and Deschutes Water Alliance, *Deschutes Water Planning Initiative, Water Supply Goals and Objectives Final Report,* February 26, 2013. Pages 17-24; Deschutes Basin Board of Control Website, www.dbbcirrigation .com; Bureau of Reclamation web site, www.usbr.gov.

later, SID completed the first small in-conduit hydroelectric plant in the state of Oregon in 20 years. This new 0.75mw facility is capable of producing enough clean, renewable electricity for up to 350 homes.

(See Figure 23, photos of this district.)

SIGNIFICANCE OF THE NOMINATED STRETCH OF THE PILOT BUTE CANAL

Further Significance of the Nominated Stretch

Today, the 1904 work on the Pilot Butte Canal is easily recognized and observed in the nominated stretch. Displaying the 1904 construction techniques, materials and challenges met by the company is the Pilot Butte Canal's most significant character-defining feature. The immense accomplishment of constructing this section, more than any other, exemplifies the overcoming of the challenge presented by the region's geology. It required great ingenuity, technology and labor. Its completion exalted it above all other sections of lesser challenge and travail. Because of the toughness of the terrain, and the exceeding difficulty in removing the rock, the resulting design was much wider and shallower than proposed. This physical feature further magnifies the feeling of a natural stream. Compared to the flow in the non-historic pipes and open stretches between the intake and the southern boundary of the district, the volume of water through this section is perceived as significantly greater; the full force of the water is seen and heard. The innumerable boulders strewn down its bed and the riprap along its banks further intensify the turbulence, fluctuations and wavering. It appears very much as a wild stream, rapidly moving downstream, undulating with a natural rhythm, its form with whitecaps contrasts distinctly with its banks. The qualities of design, materials, and workmanship reflected by the flowing water are extraordinary. They remain expressive, indicative factors of the character of the canal, man working with and against nature, and are conveyed in its rapids and ripples. These aesthetic qualities of the canal, like that of a natural stream, impart the resource's historic narrative and declare its physical attributes. It is these characteristics and qualities that make the nominated section the most significant section of the entire Pilot Butte Canal system.

CONCLUSION

The canal's completion in early 1905 spearheaded the settlement of Bend and Redmond, and initiated the development of agriculture on a large scheme in the Deschutes Country in the period to follow.

HAER OR-62 for the Pilot Butte Canal prepared for Oregon Department of Transportation on May 26, 1998 states on the title page under significance, "Construction and completion of the Pilot Butte Canal in 1904 introduced irrigation to Central Oregon and contributed to the settlement, growth and creation of the city of Bend. Although several other private irrigation companies had incorporated and were planning irrigation canals, Drake's Pilot Butte Development Company and its successor, the Deschutes Irrigation and Power Company, were the first to complete a major irrigation canal in Central Oregon."

In May 1998, HAER OR-63,stated on page 6, "The Pilot Butte Canal is labeled on current maps as the O.P.B.C (Old Pilot Butte Canal) Lateral, a name not readily identifying it as the most historically significant canal connected with the founding of Bend." It continues to say that this initial canal system was instrumental in the establishment of the city of Bend, Oregon and its surrounding communities. It further states that the well-funded company that developed the Pilot Butte Canal was responsible for the founding of the city of Redmond, Oregon and for attracting settlers to the area though a well-orchestrated national advertising campaign.

As discussed and documented in this nomination, the Pilot Butte Canal was the second canal in Oregon under the Carey Act. It is the only canal associated with the founding of the cities of Bend and Redmond, the two most populous cities in Central and Eastern Oregon. The development of Bend, Redmond, and the surrounding region would certainly have been different but for the ambitious funding, planning and construction

of the Pilot Butte Canal. The canal's impact on early settlers, the patterns of development, and the economy are significant. This history is meticulously documented in the materials submitted with the nomination of the Pilot Butte Canal Historic District (Cooley Road – Yeoman Road Segment).

The rough, rocky bottom and sides, which make the canal in this section run like that of a "natural water channel" (i.e., streams and rivers) reflect the early methods and type of construction which prevailed and which were reported by engineers in 1915 reports to the state.[343] The demanding work of hammers and drills, men with shovels and horse-drawn Fresno scrapers in the hard, uncompromising volcanic lava of the high desert are strikingly evident when the canal is dry. Widely varying widths and depths and earthen banks reinforced with irregular riprap reflect the solutions found for the difficulties encountered in the canal construction. Small rubble helped fill in rock fissures underlying the volcanic rock on the canal floor. Native vegetation lines the canal. It retains much of the undeveloped native setting that was present during its construction. The sagebrush, juniper, wild grasses, and lava outcroppings along the banks are the same features and characteristics that challenged the irrigation company and homesteaders more than 100 years ago. The pioneer spirit can be felt. The canal and its surrounding natural environment communicate a sense of what it was like in the historic period. The feeling, the canal's expression of the aesthetic and historic sense of this particular place at a particular period of time, is evident and strong. The Pilot Butte Canal at this location is an assemblage of man-made and natural features joined together by a "thread" of space and time that recreate a 1904 experience. The essence of this linear corridor, however, is more than an experience of a "sense of place." It presents a multitude of sights, sounds, motions, and emotions.

Robert Morgan, revered irrigation engineering historian, said: "The destiny of the human race has been influenced by irrigation water ever since man's first attempts at agriculture in the dawn of civilization."[344] Alexander M. Drake stood at the forefront of a vast wilderness and had the vision to build the Pilot Butte Canal for the settlement and farming of the Deschutes country. The Pilot Butte Canal brought historic changes to the region from that day forward. The phenomenal growth of Bend began in 1904 with the initiation of the large irrigation project, followed by substantial settlement and significant agricultural growth, succeeded by great investment by corporations who saw the promise of the region now known as Central Oregon.

The D. I. & P. Co., with J.O. Johnston and others, who came after A.M. Drake and his PBD Co., accepted the geological challenge presented in the nominated section. As observed one-hundred years ago, the nominated section, the Historic District, is like of a natural water channel. The nominated section truly displays the type of construction which prevailed there. The beginning and the end of the canal were much less challenging and were completed before the nominated stretch. The company offered increased wages and brought in specialized equipment in order to complete the nominated section on time to complete the canal and meet the project deadlines set by the state. The spirit and energy of the pioneer builders are still realized in the inspiring vibrancy of the section's waters. The Pilot Butte Canal Historic District exists as true living history, as alive today as it was in 1905, renewing itself each winter in the Cascade Mountains of the Deschutes country. Its future will ensure an authentic, livable community which understands and appreciates its heritage.

[343] Dubuis, John, Field Inspector, *Report to Desert Land Board On Central Oregon Project*, (State Printing Department, Salem, OR), 1915, 16-19.

[344] Morgan, Robert M., *Water and the Land: A History of American Irrigation*, (Fairfax, Virginia: The Irrigation Association, 1993), 3.

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Pilot Butte Canal Historic District
(Cooley Road –Yeoman Road Segment) Deschutes Co. OR
Name of Property County and State

Previous documentation on file (NPS):

___ preliminary determination of individual listing (36 CFR 67 has been requested)
___ previously listed in the National Register
___ previously determined eligible by the National Register
___ designated a National Historic Landmark
___ recorded by Historic American Buildings Survey #_____
__X__ recorded by Historic American Engineering Record # ORE, 9-BEND, 3 and 2D

Primary location of additional data:

__X__ State Historic Preservation Office
__X__ Other State agency
__X__ Federal agency
__X__ Local government
__X__ University
___ Other

Name of repository(ies): _____

Historic Resources Survey Number (if assigned): N/A

10. Geographical Data

Acreage of Property 17.07 acres
(Do not include previously listed resource acreage; enter "Less than one" if the acreage is .99 or less)

Latitude/Longitude Coordinates
Datum if other than WGS84: N/A
(enter coordinates to 6 decimal places)

1	44.109268	-121.270736		3	44.094680	-121.272176	
	Latitude	Longitude			Latitude	Longitude	
2	44.109254	-121.263878		4	44.094737	-121.281587	
	Latitude	Longitude			Latitude	Longitude	

NEW Verbal Boundary Description (Describe the boundaries of the property.)

The nominated area includes the entire length of the Pilot Butte Canal within Township 17 South, Range 12 East, Section 15, W. M., bounded at its southern edge by Yeoman Road and by the Section 15 boundary at the north, measuring about 7,435' long and extending 50'on either side of the centerline of the Pilot Butte Canal, establishing a 100' wide corridor. The district includes the Canal and its immediate historic setting, a non-contributing altered bridge, a non-historic flow-measuring weir, and three non-historic head gates, while excluding non-historic residences and outbuildings. Non-historic small-scale site features such as ornamental sculpture, planters, etc., and decorative landscaping within the nominated corridor not related to the operation of the Canal and not noted in this document are non-contributing resources. See Figures 1 through 5.

NEW Boundary Justification (Explain why the boundaries were selected.)

The boundary of the Pilot Butte Canal Historic District includes the entirety of the Canal itself and associated gates, embankments, and the intact immediate historic setting within the 100' corridor as described above. The wide variation in the Canal's width in this stretch precludes a tighter boundary; however, the selected 100' corridor excludes residences and outbuildings, as well as landscaping related to residential development. The northern boundary of the district is the section line between Sections 15 and 10 near Cooley Road where the Canal drops 25' into a non-contributing non-historic concrete block forebay constructed in 2009 that funnels water into a 9' diameter underground steel pipe. The pipe continues north for 2.25 miles, representing a substantial break in the continuity of the historic canal. The southern boundary of the district is the section line between Sections 15 and 22 at Yeoman Road. Immediately south of that line, the canal has a marked diminishment of integrity of structure, setting and feeling. The section line generally is the boundary between

rural Deschutes County and the City of Bend. South of its boundary line, the Canal in Section 22 is characterized by its passage through dense, non-historic, urban residential and light industrial subdivisions built since 1975, on both sides of the Canal inside the City of Bend. The Canal in Section 22 exhibits significant alterations, including two recently constructed two-lane urban bridges; a steel one-lane pedestrian bridge that connects to a new public, graveled, pedestrian trail along the eastern edge of the canal; new tall rock retaining walls replace the historic lower canal walls; extensively altered riprap; many utility pipes spanning the Canal; landscaping for buildings encroaching on and incorporating the canal structure; densely aligned buildings and solid fences forming a tunnel effect next to the Canal; stretches of non-historic concrete pavement and blacktop in the canal bed to prevent erosion; a new low-head check (short dam-like structures that create pools where pipes intake water to laterals) spanning the Canal at the newly piped A-4 Lateral; new gates; and realignments for new streets and buildings, along with dozens of minor alterations. The canal in Section 22 exhibits major alterations that detract from its ability to interpret the historic structure or its purpose accurately.

11. Form Prepared By

name/title Michael A. Hall, MBA, Historic Preservation Planner date Oct 30, 2014
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P. Kliewer: 60465 Sunridge Drive, Bend, OR 97702 P. Kliewer: pkliewer@hotmail.com
city or town See above state OR zip code See above

Additional Documentation

Submit the following items with the completed form:

- **Regional Location Map**
- **Local Location Map**
- **Tax Lot Map**
- **Site Plan**
- **Floor Plans (As Applicable)**
- **Photo Location Map**(Include for historic districts and properties having large acreage or numerous resources. Key all photographs to this map and insert immediately after the photo log and before the list of figures).

Photographs:

Submit clear and descriptive photographs. The size of each image must be 3000x2000 pixels, at 300 ppi (pixels per inch) or larger. Key all photographs to the sketch map. Each photograph must be numbered and that number must correspond to the photograph number on the photo log. For simplicity, the name of the photographer, photo date, etc. may be listed once on the photograph log and doesn't need to be labeled on every photograph.

Photo Log

Name of Property: Pilot Butte Canal Historic District

City or Vicinity: Bend

County: Deschutes **State:** OR

Photographer: Patricia A. Kliewer

Date Photographed: October 29, 2014

Description of Photograph(s) and number, include description of view indicating direction of camera:

Photo 1 of 19: (OR_DeschutesCounty_PilotButteCanalHistoricDistrict_0001)
Segment 1, Fence is at the southern boundary of the historic district. Camera facing north.

Photo 2 of 19: (OR_DeschutesCounty_PilotButteCanalHistoricDistrict_0002)
Segment 1, Canal bed. Camera facing north.

Photo 3 of 19: (OR_DeschutesCounty_PilotButteCanalHistoricDistrict_0003)
Segment 1, Canal bed. Ditch Rider Road on right. Camera facing north.

Photo 4 of 19: (OR_DeschutesCounty_PilotButteCanalHistoricDistrict_0004)
Segment 1, Canal bed. Ditch Rider Road on right. Camera facing north.

Photo 5 of 19: (OR_DeschutesCounty_PilotButteCanalHistoricDistrict_0005)
Segment 2, Canal bed. Island on left foreground. Camera facing north.

Photo 6 of 19: (OR_DeschutesCounty_PilotButteCanalHistoricDistrict_0006)
Segment 2, Canal bed. Irrigation pipe gate. Camera facing northwest.

Photo 7 of 19: (OR_DeschutesCounty_PilotButteCanalHistoricDistrict_0007)
Segment 2, Canal bed. Camera facing east.

Photo 8 of 19: (OR_DeschutesCounty_PilotButteCanalHistoricDistrict_0008)
Segment 2, Canal bed and Old Deschutes Road Bridge. Camera facing east.

Photo 9 of 19: (OR_DeschutesCounty_PilotButteCanalHistoricDistrict_0009)
Segment 3, Canal bed. Ditch Rider Road on right side. Camera facing east.

Photo 10 of 19: (OR_DeschutesCounty_PilotButteCanalHistoricDistrict_0010)
Segment 3, Canal bed. Camera facing east.

Photo 11of 19: (OR_DeschutesCounty_PilotButteCanalHistoricDistrict_0011)
Segment 3, Canal bed. Camera facing northeast.

Photos Continued

Photo 12 of 19: (OR_DeschutesCounty_PilotButteCanalHistoricDistrict_0012)
Segment 4, Canal bed where it turns to the left. Camera facing northeast.

Photo 13 of 19: (OR_DeschutesCounty_PilotButteCanalHistoricDistrict_0013)
Segment 4, Canal bed where it turns to the right. Camera facing north.

Photo 14 of 19: (OR_DeschutesCounty_PilotButteCanalHistoricDistrict_0014)
Segment 4, Canal bed. Standing water. Camera facing north.

Photo 15 of 19: (OR_DeschutesCounty_PilotButteCanalHistoricDistrict_0015)
Segment 5, Canal bed. Standing water. Lava flow above water. Camera facing north.

Photo 16 of 19: (OR_DeschutesCounty_PilotButteCanalHistoricDistrict_0016)
Segment 5, Canal bed. Ditch Rider Road on right. Camera facing north.

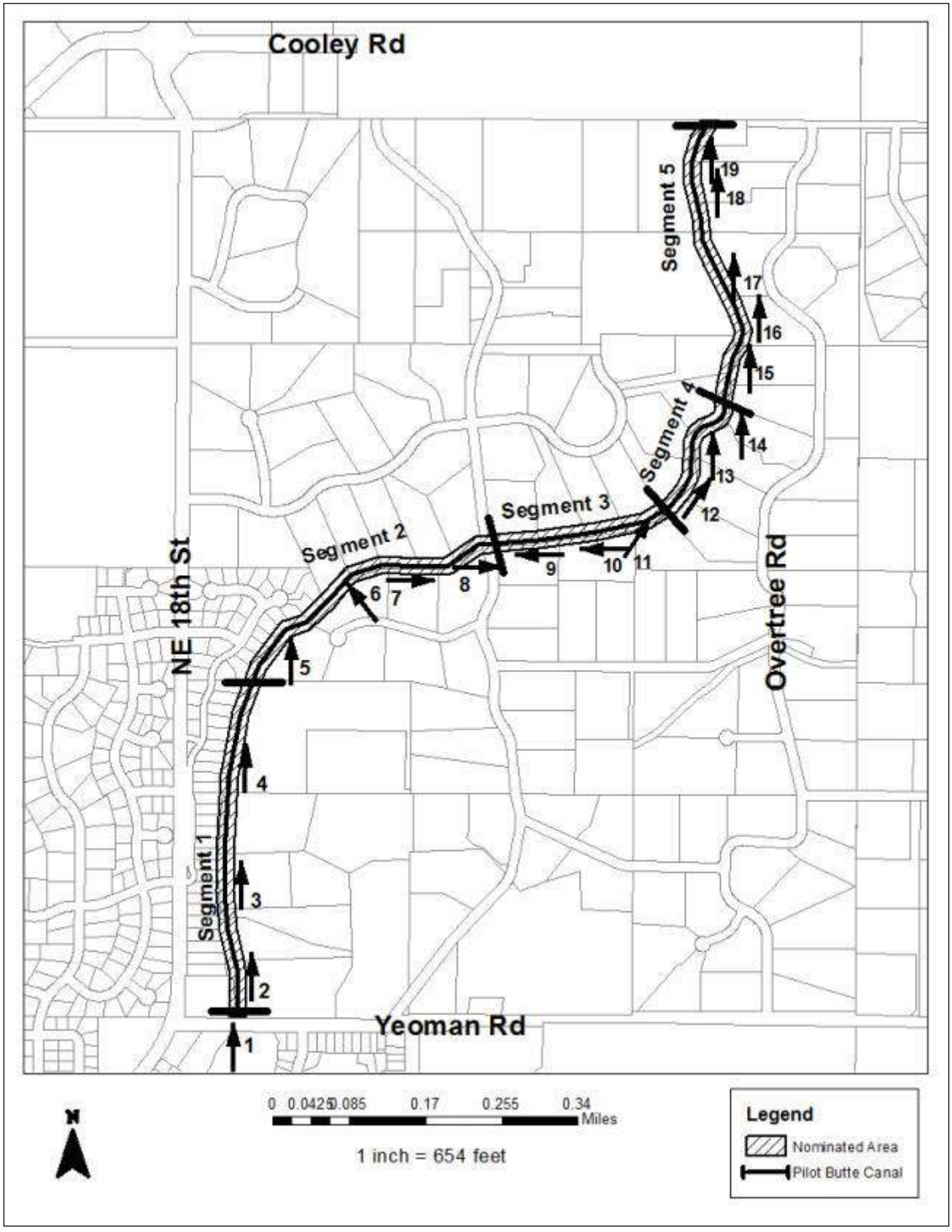
Photo 17 of 19: (OR_DeschutesCounty_PilotButteCanalHistoricDistrict_0017)
Segment 5, Canal bed. Ponderosa pine tree on left Concrete flow measuring structure in canal bed between signs. Warning signs for intake facility for Juniper Ridge Phase I Hydroelectric Project. Ponderosa pine tree on left. Camera facing north.

Photo 18 of 19: (OR_DeschutesCounty_PilotButteCanalHistoricDistrict_0018)
Segment 5, Approaching northern boundary of historic district. Canal bed. Irrigation water delivery system gate on right. Camera facing north.

Photo 19 of 19: (OR_DeschutesCounty_PilotButteCanalHistoricDistrict_0019)
Segment 5, Sign is hanging on a wire that marks the northern line for Section 15. It is also the northern boundary line for the historic district. Canal bed is composed of a heavy lava flow. Site of historic waterfall on Pilot Butte Canal. Intake structure for piping project in Section 10 is NOT in the historic district. Camera facing north.

Pilot Butte Canal Historic District
(Cooley Road –Yeoman Road Segment) Deschutes Co. OR
Name of Property County and State

Photo Location Map



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Pilot Butte Canal Historic District (Cooley Road-Yeoman Road Segment)
Name of Property
Deschutes Co., OR
County and State
N/A
Name of multiple listing (if applicable)

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List of Figures
(Resize, compact, and paste images of maps and historic documents in this section. Place captions, with figure numbers above each image. Orient maps so that north is at the top of the page, all document should be inserted with the top toward the top of the page.

Figure 1: General Location Map

Figure 2: Local Location Map

Figure 3: Tax Lots with Boundary of Pilot Butte Canal Historic District

Figure 4: Map of Tax Lots superimposed on current aerial photos

Figure 5a-h: Tax Lot Maps with Boundary of Historic District Indicated with Heavy Black Lines

Figure 6: Pilot Butte Canal Historic District Survey by Segment, 17 pages.

Figure 7: Central Oregon Irrigation District Service Area Map.

Figure 8: Engineering Drawings for the Pilot Butte Canal and Laterals.

Figure 9: 1951 Aerial photo of area, Deschutes County Surveyor's office.

Figure 10: Map, 1924, by Frank Becker, Oregon State Engineer, depicting Central Oregon from the Columbia River to Crater Lake and showing rivers and canals.

Figure 11: Map of Arid Lands Selected for Irrigation in Crook County Oregon by the State of Oregon, Segregation List # 6. Signed by Levi D. Wiest, JM Lawrence, and CC Hutchinson. (Oregon State Archives)

Figure 12: Map of T 17 S, R 12 E, showing Carey Act List # 6, Carey Act List # 19 and Central Oregon Irrigation District, Deschutes County Clerk's Deed Index.

Figure 13: Map of Oregon, printed in 1902, stamped Deschutes Irrigation and Power Company, Portland, OR, McKay Building and showing proposed location of the Col. So. Railway Extension to future Bend area. (Oregon State Archives)

Figure14: Map of Irrigated Lands for Sale under Contracts with the United States and the State of Oregon in the Bend District, Deschutes Valley, Central Oregon, July 7, 1909.

Figure15: A portion of a 1915 Map by civil engineer Robert Gould of T 17 S, R 12 E, showing location of Pilot Butte Canal in the historic district in Section 15.

Figure16: Map dated 1935, Metsker's Atlas of Deschutes County, page 46, T 17 S, R 12 E, showing Section 15.

Figure17: Map dated 1944, Metsker's Atlas of Deschutes County, page 46, T 17 S, R 12 E, showing Section 15.

Figure18: Map dated 1972, Metsker's Atlas of Deschutes County, page 46, T 17 S, R 12 E, showing Section 15.

Figure 19: Map Showing the Ten Stretches of the 22 Miles of the North Canal and Pilot Butte Canal, 2015.

Figure 20: Topographic Map of Eight Irrigation Districts in Upper Deschutes River Basin: Arnold, Central Oregon, Lone Pine, North Unit, Ochoco, Swalley, Three Sisters, and Tumalo Irrigation Districts.

Figures Continued

Figure 21: Map of Eight Irrigation Districts in the Upper Deschutes River Basin shown with county lines, cities, rivers and creeks that are the source of the irrigation water, as well as Arnold, Central Oregon, North Unit, Ochoco, Swalley, Three Sisters, and Tumalo Irrigation Districts.

Figure 22: Photos of Arnold Irrigation District, Arnold Canal.

Figure 23: Photos of Swalley Irrigation District, Swalley Canal.

Figure 24: Photos of Tumalo Irrigation District.

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N/A
Name of multiple listing (if applicable)

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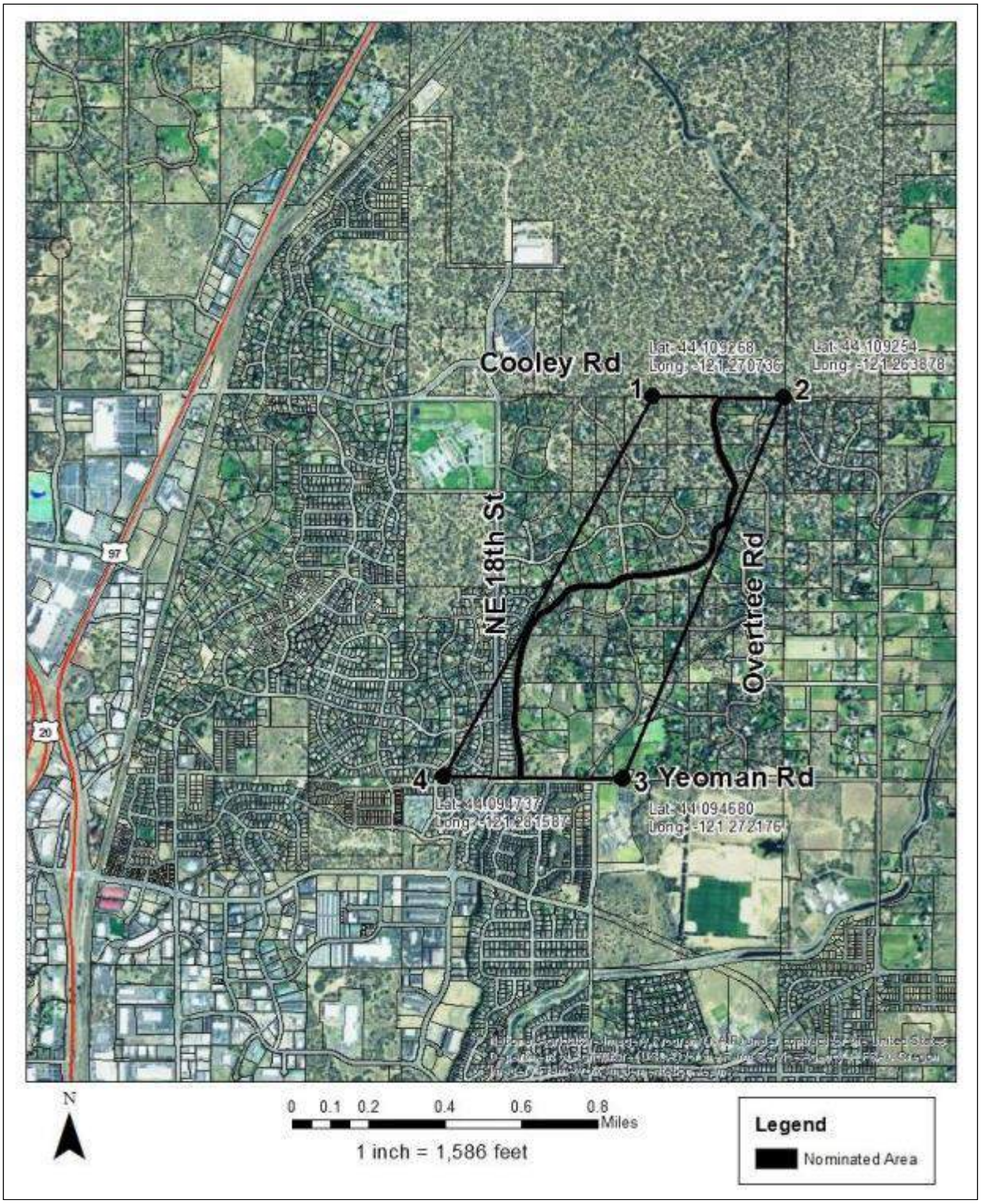
Figure 1: General Location Map, 2011 Aerial photograph and tax lots. Lat/Long coordinates on map.



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Pilot Butte Canal Historic District (Cooley Road-Yeoman Road Segment)
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N/A
Name of multiple listing (if applicable)

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Figure 2: Local Location Map, 2011 Aerial photograph and tax lots. Lat/Long coordinates on map.

Figure 3: Tax Lots in T 17 S, R 12, E, Section 15, boundaries of historic district, prepared by Deschutes County Community Development Department, October 2014.

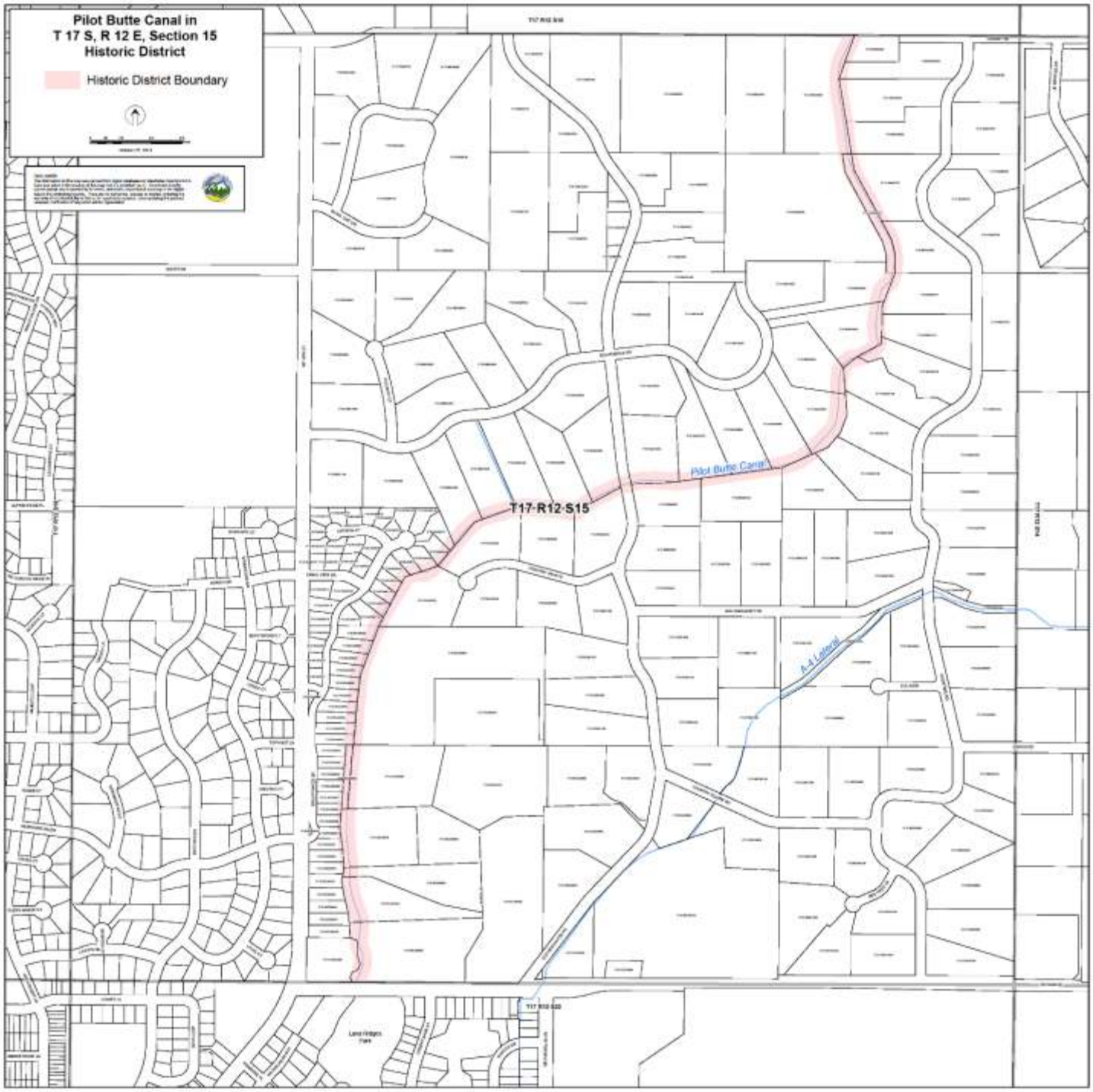

Figure 4: Map of Tax Lots superimposed on current aerial photos in T 17 S, R 12, E, Section 15, and showing boundaries of historic district, prepared by Deschutes County Community Development Department, October 2014.

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Pilot Butte Canal Historic District (Cooley Road-Yeoman Road Segment)	Name of Property
Deschutes Co., OR	County and State
N/A	Name of multiple listing (if applicable)

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Figure 5a: Tax Lot Map, 171215 Index.

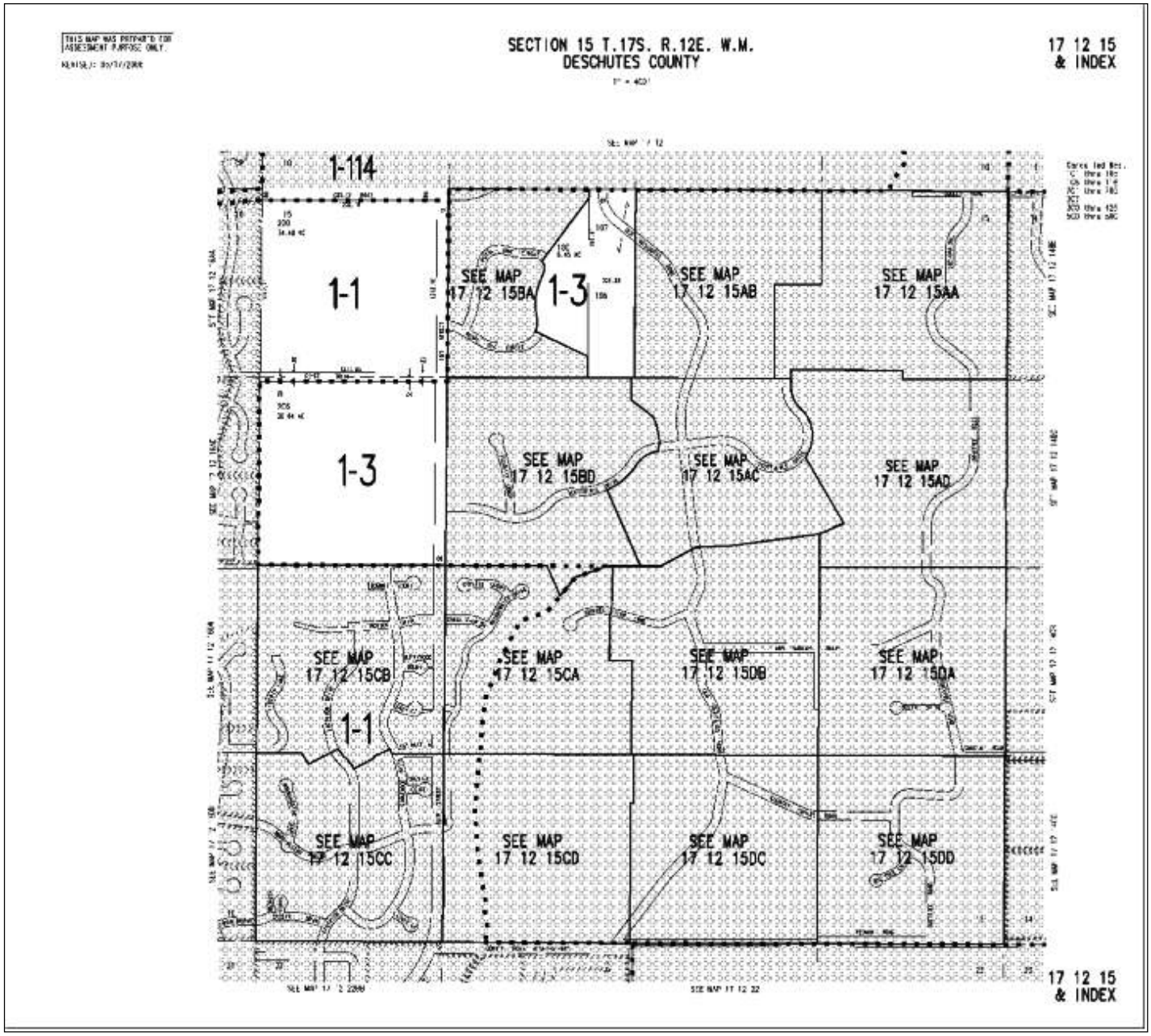

Figure 5b: Tax Lot Map,171215AA. The boundary is drawn for representational purposes. Not to scale.

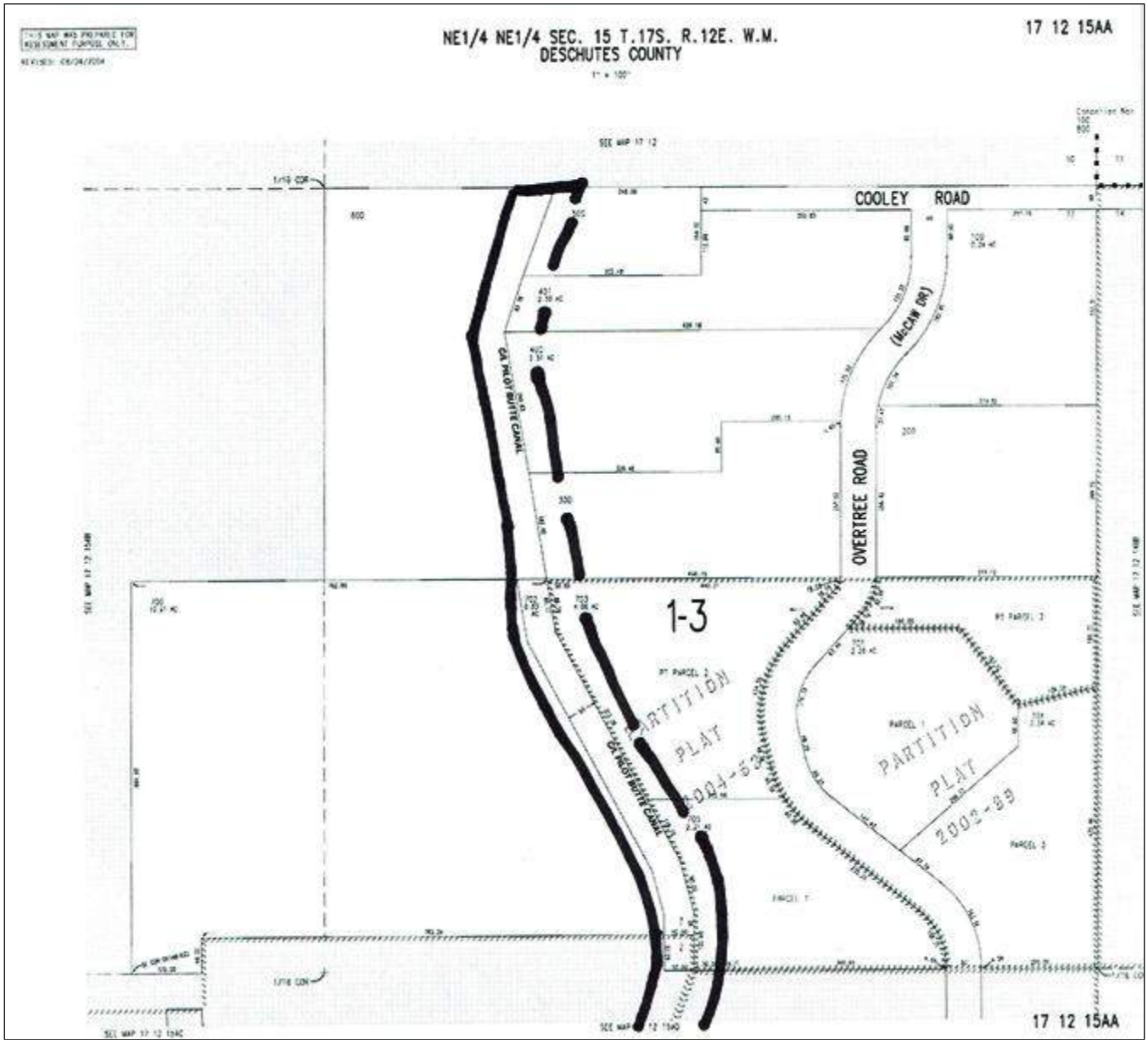

Figure 5c: Tax Lot Map,171215AC. The boundary is drawn for representational purposes. Not to scale.

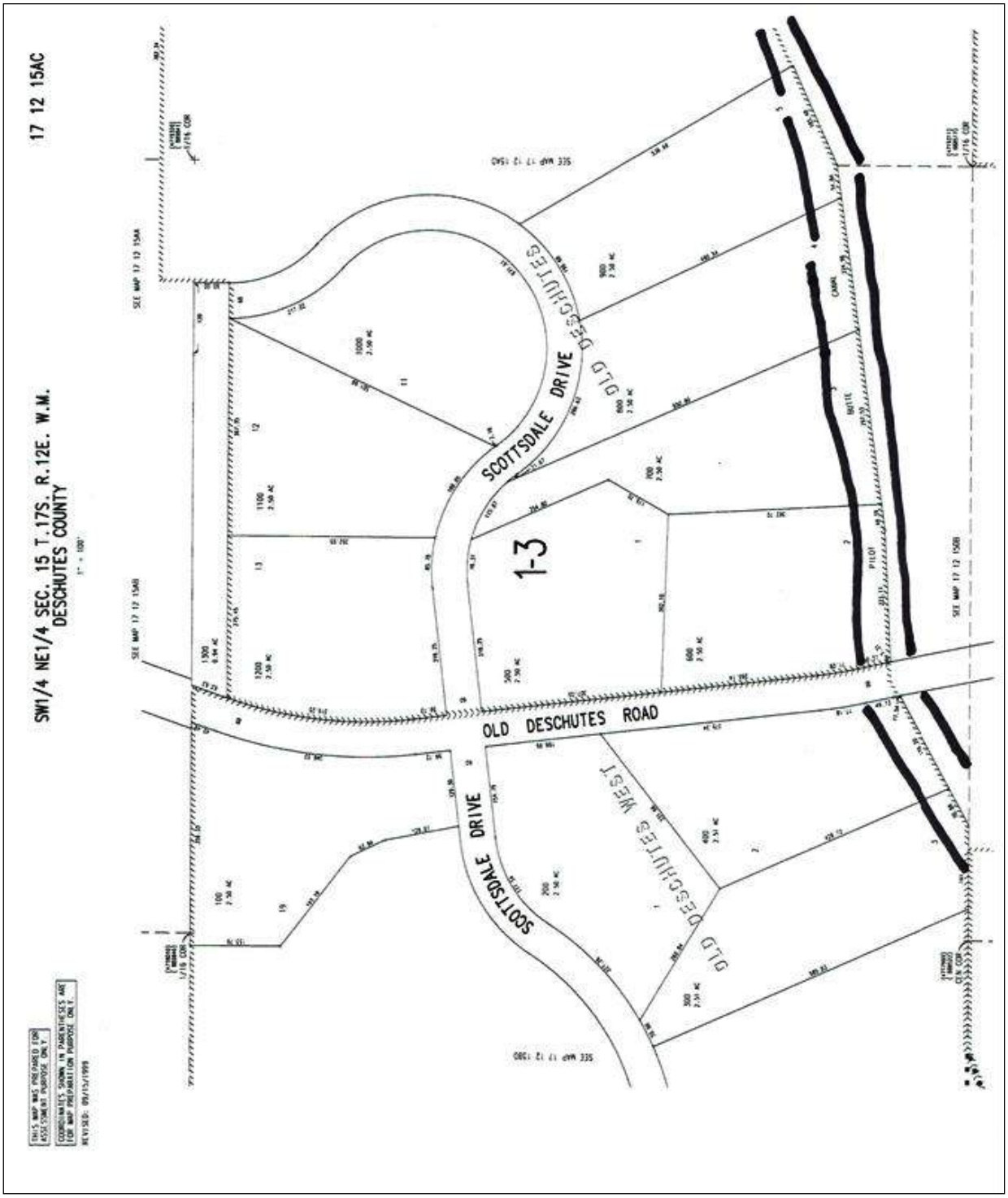

Figure 5d: Tax Lot Map, 171215AD. The boundary is drawn for representational purposes. Not to scale.

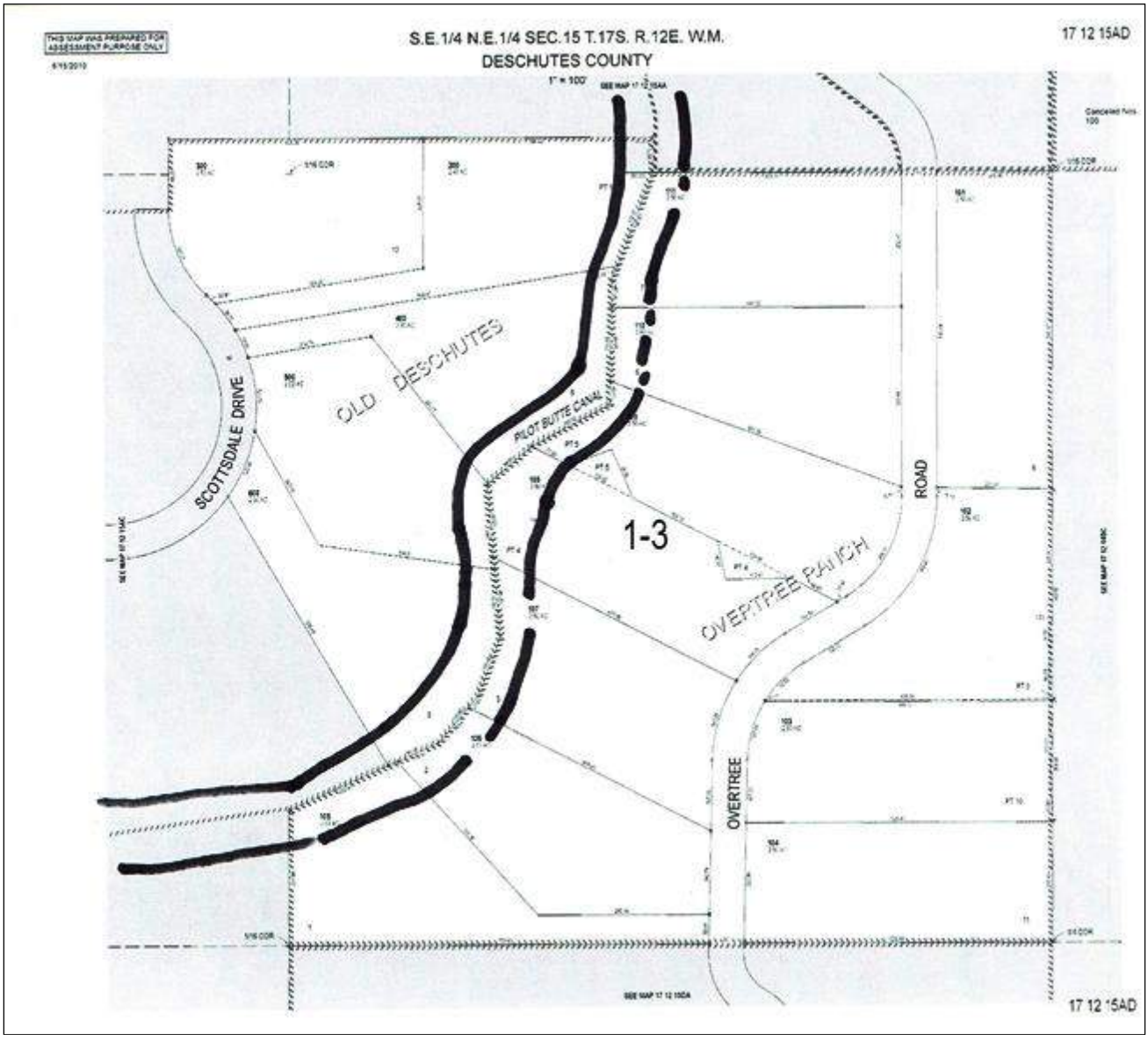

Figure 5e: Tax Lot Map,171215BD. The boundary is drawn for representational purposes. Not to scale.

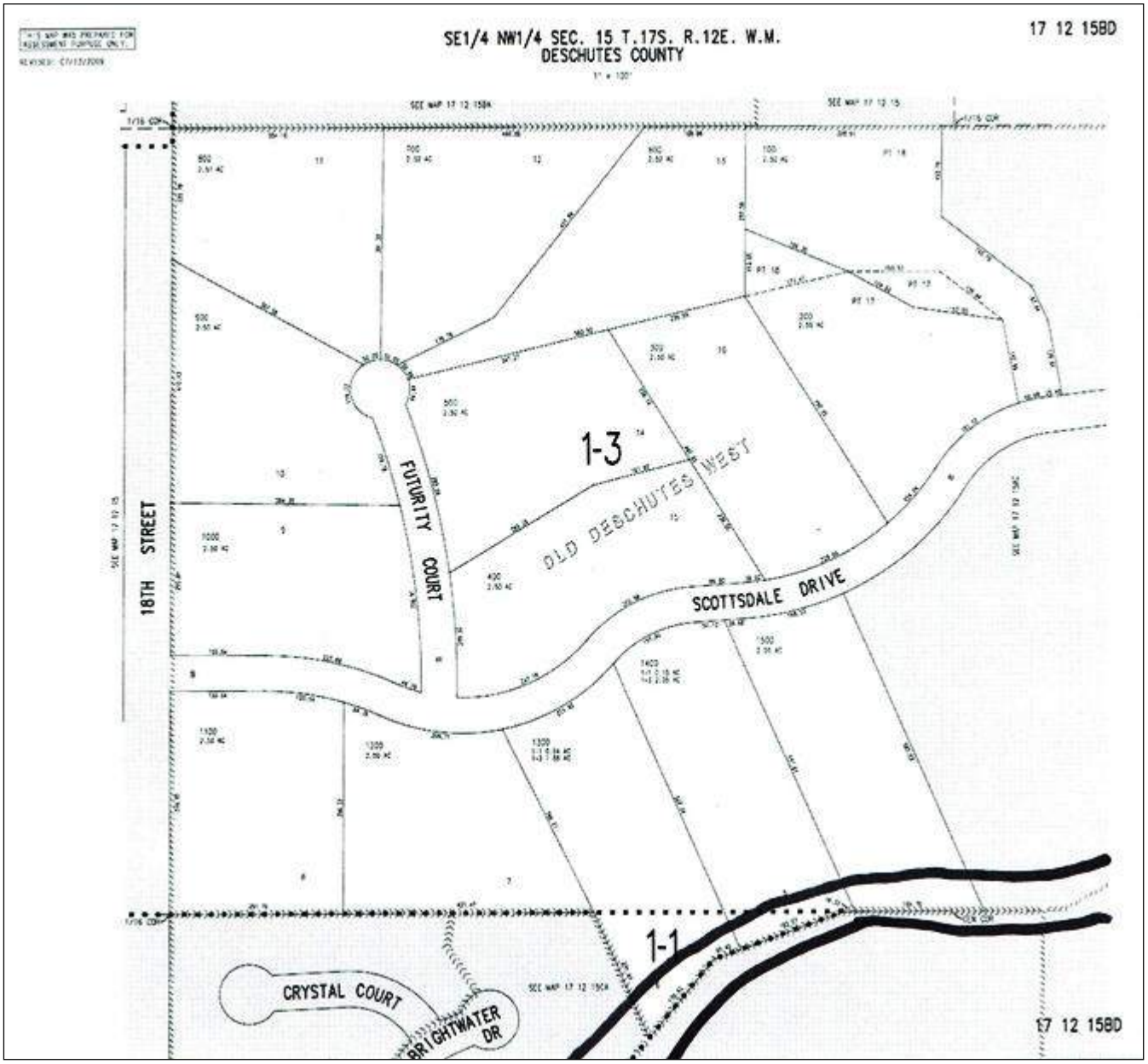

Figure 5f: Tax Lot Map,171215 CA. The boundary is drawn for representational purposes. Not to scale.

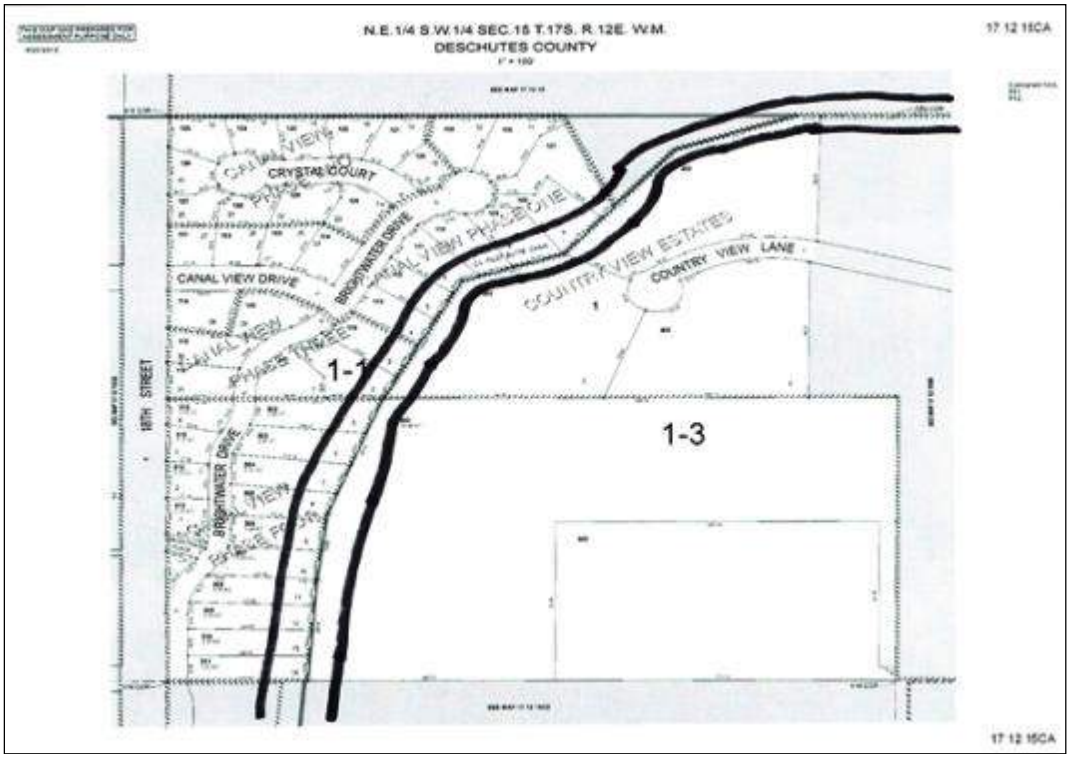

Figure 5g: Tax Lot Map,171215CD. The boundary is drawn for representational purposes. Not to scale.

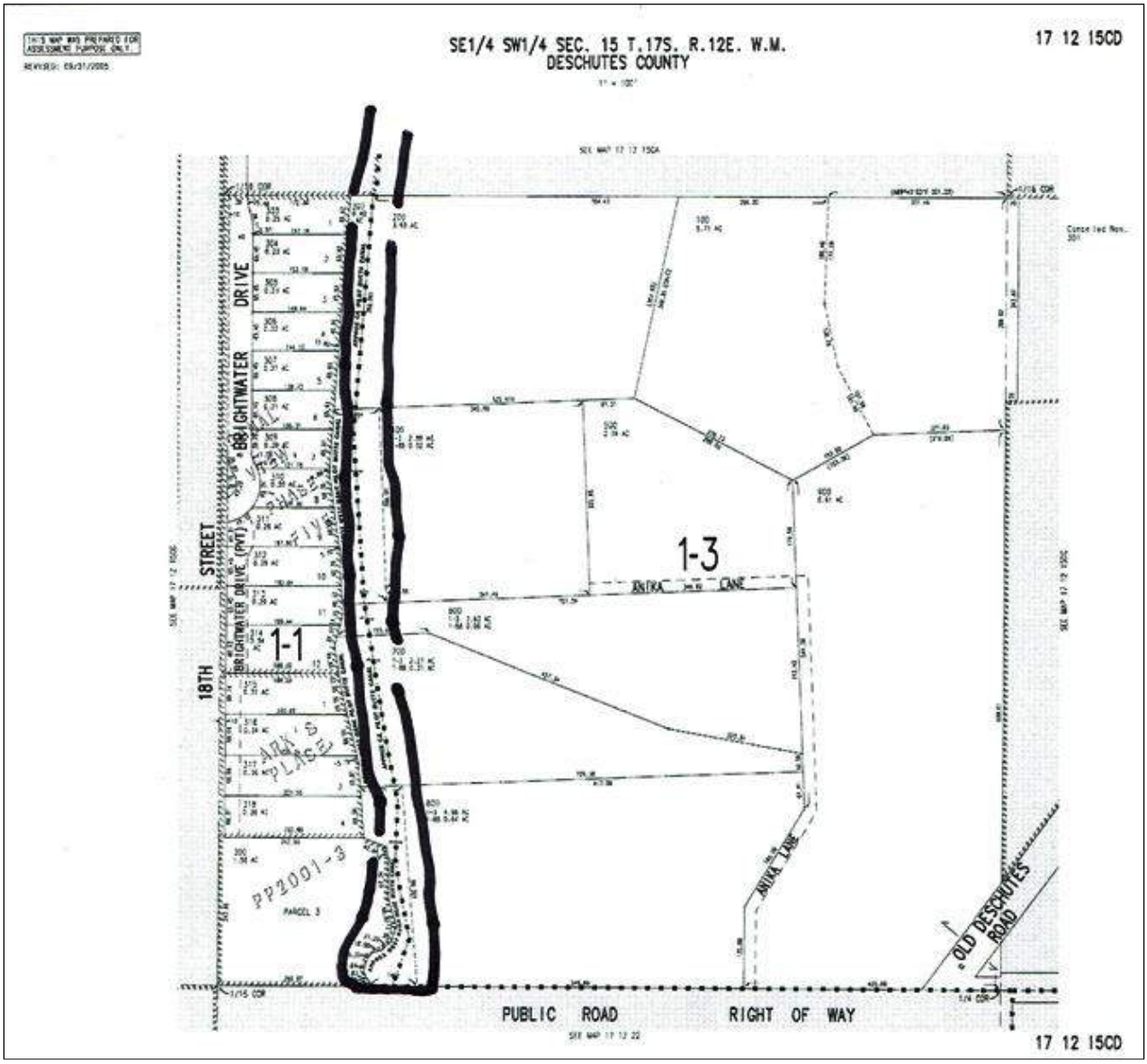

Figure 5h: Tax Lot Map, 171215DB. The boundary is drawn for representational purposes. Not to scale.

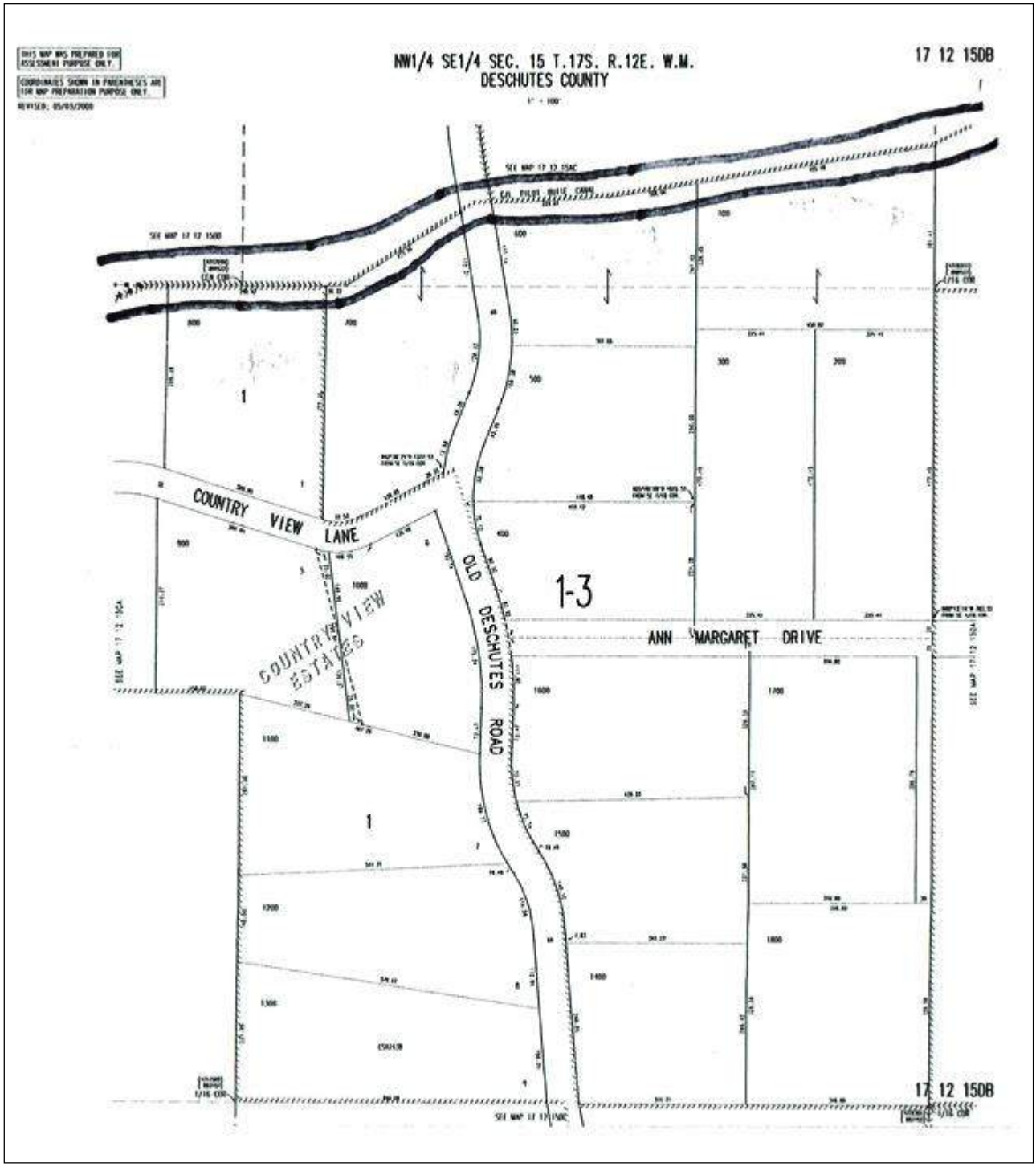

Figure 6: Pilot Butte Canal Historic District Survey by Segment.

SUMMARY OF SURVEY

1. Primary Structure Present: Pilot Butte Canal
Total Primary Structures Present: 1
2. Secondary Structures Present: Old Deschutes Bridge
Total Secondary Structures**:** 1
3. Accessory Structures Present: 3 Irrigation pipe control headgates/ha**nd wheel/slidegates.**
1 Flow trapezoidal metering structure in canal bed
Total Accessory Structures: 4

1. Primary Structure and Primary Resource: 1
Historic Name: Pilot Butte Canal.
Date of Construction: 1903-1905
Date of Construction of this stretch of the Pilot Butte Canal: 1904
The primary resource includes the canal bed, cut faces, embankments and berms where present.
Function: Irrigation Canal under Carey Act.
Historic Contributing Segments: 5/5
Non-Historic Non-Contributing Segments: None
Rank: Historic Contributing.

2. Secondary Structure and Secondary Resource: 1
Historic Name: Old Deschutes Road Bridge.
Function: Bridge for vehicles and pedestrians over Pilot Butte Canal.
Built Date: 1904, major alterations 1969.
Rank: Historic Non-Contributing.

3. Accessory Structures:

Historic Name: Three Slide Gates.
Function: Control water flow from canal to irrigation water users.
Built Dates: ca 1960-ca 1989
Rank: Non-Historic Non-Contributing

Historic Name: Trapezoidal Weir flow measuring structure
Function: Measures water volume and speed of flow
Built Dates: 2012
Rank: Non-Historic Non-Contributing

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Name of Property
Deschutes Co., OR
County and State
N/A
Name of multiple listing (if applicable)

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Data Table for Pilot Butte Canal Historic District

Survey completed on October 29, 2014 by Pat Kliewer, MPA; Don Kliewer, PE, civil engineer; Jeff Perreault, MS, hydrologist; Tim Casey, architect; and Gene Storm, journalist.

	PILOTBUTTECANAL IN T17S R12E SECTION 15 WM														
	DATE:	October 29, 2014	START	9:30AM	END	1:25PM		RECORDER	D. KLIEWER		GARMIN GPS				
	SOUTH TO NORTH, YEOMAN ROAD TO COOLEY ROAD								P. KLIEWER		CANON CAMERA				
								E. TOP BANK	G. STORM		100' CLOTH TAPE				
								W. TOP BANK	J PERREAULT		100' CLOTH TAPE				
DATUM	WAS 84							E TOE	P. KLIEWER		MEASURING POLES				
								W TOE	T. CASEY		MEASURING POLES				
				EAST	**CANAL**										
	SECT	**NORTH**	**WEST**	**TOP BANK**	**TOP**	**LOW POINT**		**HIGH POINT**		**EAST TOE**		**WEST TOE**		**REMARKS**	
SEGMENT	**ID**	**DECIMAL**	**DECIMAL**	**ELEVATION**	**WIDTH**	**DIST**	**DEPTH**	**DIST**	**DEPTH**	**DIST**	**DEPTH**	**DIST**	**DEPTH**		
1	STA 0	44.094694	121.277444		81	41	7.25	44	4.5	5	6	79	3	Metal Agricultural Gate to Ditch Rider Road	
1	STA2	44.095194	121.277556	3455	25.5	17	10	22.5	6.5	7	VERTICAL	25.5	VERTICAL	NO ALTERATIONS	
1	STA 4	44.095778	121.277556	3445	63	36	9	52	2	6	10.5	62	1.5	HEAVY RIPRAP ON SS	
1	STA 6	44.096278	121.277694	3451	63.8	33.5	6.5	17	5.25	8	4.5	55.5	5		
1	STA 8	44.096806	121.277722		52.3	26	7.5	NONE		9.5	5.5	44	5.5		
1	STA 10	44.097306	121.277806	3442	49.5	25	9.5	NONE		8	6.5	42	6.5	RIPRAP 24" DIA	
1	STA 12	44.097861	121.277750		46.6	27	7	10	4	4	3.5	36.8	6.25		
1	STA 14	44.098389	121.277667	3443	63.8	31.5	10	NONE		10	7.5	53	7		
1	STA 16	44.098972	121.277611	3439	58.2	37.5	8.5	NONE		11.5	5.25	45.5	7	Berm 18'-20' WIDE	
1	STA 18	44.099389	121.277583	3437	49.5	32	5	30	4	1	1.5	44	5		
1	STA 20	44.099889	121.277278		50.5	41	7.5	NONE		8	5.5	43	6.75		
2	STA 22	44.100472	121.276917	3427	49.5	27	4.5	42	1.5	6.5	2.5	48	2	72' SO. TOM'S FENCE	
2	STA 24	44.100944	121.276528		64.5	54.25	5	26.5	1.5	7	4.5	57.8	4.5		
2	STA 26	44.101111	121.275889		44.5	30.25	5.75	25	5	9	5.25	37	5.5		
2	STA 28	44.101528	121.275417		46	16.75	5.5	40	2.5	7	4.25	42.75	3.75	SLIDE GATE W/ HEADWALL	
2	STA 30	44.101778	121.274806	3425	81	16.5	5.75	43	2.75	6	5	76.5	2		
2	STA 32	44.101972	121.274139	3426	49.5	27.5	5.5	NONE		9	4.75	39	5		
2	STA 34	44.101944	121.273361	3423	58	NONE		NONE		4.5	3.5	53.25	3		
2	STA 36	44.102000	121.272806		63.5	32	4	NONE		3	2	58.5	2.75		
2	STA 38	44.102278	121.272194	3429	42	27.5	2.5	37	1.5	3.5	2.5	42	2	ROADBRIDGE	

Data Table for PilotButteCanal Historic District

SEG-MENT	SECT ID	NORTH DECIMAL	WEST DECIMAL	EAST TOP BANK ELEVA-TION	CANAL TOP WIDTH	LOW POINT DIST	LOW POINT DEPTH	HIGH POINT DIST	HIGH POINT DEPTH	EAST TOE DIST	EAST TOE DEPTH	WEST TOE DIST	WEST TOE DEPTH	REMARKS
3	STA 40	44.102333	121.271528	3433	78	40.5	6.5	NONE		10	5.5	71	4	
3	STA 42	44.102361	121.270750	3435	56	27	7.5	NONE		11	5.5	44.5	4	
3	STA 44	44.102444	121.270056	3433	56	29.5	6.5	NONE		8.5	5.25	49	4.5	
3	STA 46	44.102528	121.269333		56	28.5	6	NONE		7	5	50.5	5.25	
4	STA 48	44.102583	121.268639	3425	54	26.5	5.25	NONE		9	4.5	52.5	2.5	ROAD GATE;
4	STA 50	44.102806	121.268028	3421	60.5	31.5	5	6	3	6	3	57.25	3	SLIDE GATE PBC31 @
4	STA 52	44.103194	121.267556	3417	46	23	5.5	NONE		9	5.25	37	5.25	N44-06-11.1 W121-16-04.0
4	STA 54	44.103667	121.267417	3415	50	25	7.25	NONE		9	6	41.5	5.25	
4	STA 56	44.104139	121.267472	3414	39	22.5	5.5	1	1.17	1	1.14	35.5	5	
4	STA 58	44.104444	121.266833	3419	51	27	6.25	5	2.5	5	2.5	46	3.25	
4	STA 60	44.104722	121.266750	3415	58	26	4.2	NONE		12	4	36	4	HEAVY & DEEP RIPRAP
5	STA 62	44.105222	121.266611	3410	71	NONE		NONE		3	1	70	1.5	Ditch Rider Road Sparse Red Cinder
5	STA 64	44.105778	121.266417		52	34.5	4.25	NONE		6	3	43	4	
5	STA 66	44.106222	121.266389	3410	52	9	4.5	NONE		9	4.5	44.75	2.5	Opposite AW Lvingroom
5	STA 68	44.106694	121.266694	3407	73.5	27	4	40.5	1	1	1	70.5	2.25	SIGN " FALLS AHEAD"
5	STA 70	44.107083	121.267028	3402	60	48.75	4	11	0.34	1.5	1	52.5	3.5	
5	STA 72	44.107611	121.267250	3415	53	34	3.5	1	0.17	1	0.17	46	3.5	NO RIPRAP
5	STA 74	44.108056	121.267389		55		1.5	NONE						MEASURING WIER
5	STA 76	44.108611	121.267500	3416	61.5	29	4.75	16	2	16	2.5	45	3	
5		44.108861	121.267444	3415										SLIDE GATE PBC 311
5	STA 78	44.109083	121.267306	3417	40	21.5	4.75	NONE		5	2.5	27.5	4	
5		44.109222	121.267167	3418										ENTRANCE TO INTAKE

THIS DATA DOES NOT REPRESENT A TOPOGRAPHIC SURVEY. THE DATA WAS COLLECTED FOR DESCRIPTIVE PURPOSES ONLY

SEGMENT 1

Tax Lots and Addresses Located In Segment 1:

171215CD00200	63299 Anika Lane, Bend, OR97701
171215CD00300	63208 Brightwater Drive, Bend, OR97701
171215CD00400	63265 Anika Lane, Bend, OR97701
171215CD00600	63235 Anika Lane, Bend, OR97701
171215CD00700	63225 Anika Lane, Bend, OR97701
171215CD00800	63205 Anika Lane, Bend, OR97701
171215CA00500	20971 Country View Lane, Bend, OR97701
171215CA00502	63346 Brightwater Drive, Bend, OR97701
171215CA00503	63342 Brightwater Drive, Bend, OR97701
171215CA00504	63338 Brightwater Drive, Bend, OR97701
171215CA00505	63334 Brightwater Drive, Bend, OR97701
171215CA00506	63330 Brightwater Drive, Bend, OR97701
171215CA00507	63326 Brightwater Drive, Bend, OR97701
171215CA00508	63322 Brightwater Drive, Bend, OR97701
171215CA00509	63318 Brightwater Drive, Bend, OR97701
171215CA00510	63314 Brightwater Drive, Bend, OR97701
171215CA00511	63310 Brightwater Drive, Bend, OR97701

Description of Characteristics of Segment 1:
Segment 1 has a cut at-grade west side and an 18’ to 20’wide, flat-topped berm or embankment on the east side that is used for the ditch rider to drive on. The embankment drops down 5’ to the natural grade. The canal has 24” wide riprap in places and some 1’ deep silt piles. The canal crosses large acreages, including a two-acre irrigated horse pasture. Agricultural fencing parallels the canal on east side, although the parcels continue to the west side of the canal. Some 3’ tall metal residential fencing outside the COID easements parallels the west bank. Homes in Canal View Subdivision are on most of the west side. The canal begins at the southern boundary of the district as a sharply undulating and curving structure and gradually gently curves and straightens as it runs north. Deer hoof prints and raccoon prints are in the mud. Dozens of mallard ducks are swimming in the pools of water. Four irrigation ponds are east of the canal.

Latitude and Longitude at Southern Edge of Segment:
North decimal: 44.094694.
West decimal 121.277444
Length: 2,090’ long
Elevation at south end: 3455’
Terrain: Flat
Presence of Standing Water: Yes
Average Width of Canal: 56’
Range of Canal Widths: 25.5’ to 81’
Average Depth of Canal: 7.57’
Range of Canal Depths: 5’ to 10’ deep in deepest part of canal
Range of High Points in Canal Bottom: 2’ to 6.5’ deep
Width of top of east berm and Ditch Rider Road: 18’-20’ wide
Range of Widths of West Embankment: 0, cut, no embankment

Range of widths of west toe: 0 to 13' wide
Range of depths of west toe: 1.5' to 7' deep
Range of Widths of east toe: 1' to 11.5' wide
Range of Depths at east toe: 1.5' to 10.5' deep
Structures: none
Alterations: none

Segment 1: Canal bed with standing water, wide embankment on right. Photographer looking north.

Segment 1: Small farms with wooden horse fencing, pasture and irrigation pond on east side of canal. Photo taken from top of embankment looking east.

Segment 1: City of Bend on left of canal centerline. At-grade cut on left (west) side of canal; embankment on right (east). Rural county livestock farms on right. Photographer looking north.

SEGMENT 2

Tax Lots and Addresses Located In Segment 2:

171215CA00200	20980 Country View Lane, Bend, OR97701
171215CA00300	20965 Country View Lane, Bend, OR97701
171215BD01300	20935 Scottsdale Road, Bend, OR97701
171215BD01400	20955 Scottsdale Drive, Bend, OR97701
171215BD01500	20975 Scottsdale Drive, Bend, OR97701
171215CA00107	63400 Brightwater Drive, Bend, OR97701
171215CA00108	63396 Brightwater Drive, Bend, OR 9770
171215CA00109	63390 Brightwater Drive, Bend, OR 9770
171215CA00110	63384 Brightwater Drive, Bend, OR97701
171215CA00111	63380 Brightwater Drive, Bend, OR 9770
171215CA00112	63376 Brightwater Drive, Bend, OR 9770
171215CA00113	63370 Brightwater Drive, Bend, OR97701
171215CA00118	63358 Brightwater Drive, Bend, OR97701
171215CA00119	63364 Brightwater Drive, Bend, OR97701
171215DB00700	63385 Old Deschutes Road, Bend, OR97701
171215DB00800	21000 Country View Lane, Bend, OR97701
171215AC00300	20985 Scottsdale Dr., Bend, OR97701
171215AC00400	63425 Old Deschutes Road, Bend, OR97701

Description of Characteristics of Segment 2:
Canal has an island with two juniper trees and grasses growing on it. Silt piles in deep spots and near standing water in southern part of segment. Canal turns from north to east. One irrigation slide gate on west side. Elevation drops rapidly and canal bed is extremely rocky. High degree of variability in width. Willow trees and shrubs are along banks. South side embankments are shorter than in Segment 1. Natural grade is about 2 to 3’ below ditch rider road. Segment ends at eastern edge of bridge. Two irrigation ponds next to canal, one on each side.

Latitude and Longitude at Southern Edge of Segment 2:
North decimal: 44.100472
West decimal: 121.276917
Length of Segment: 1,520’
Elevation at south end: 3427’
Drop in elevation this segment: 8’
Terrain: dropping in elevation from south to north and west to east.
Presence of Standing Water: Yes
Average Width of Canal: 50.50’
Range of Canal Widths: 20’ to 81’
Average Depth of Canal: 4.81’
Range of Canal Depths: 2.5’ to 5.75’
Width of Ditch Rider Road: 12’
Range of Widths of East Embankment: 12’
Range of Widths of West Embankment: 0’
Range of widths of west toe: 0’ to 10’ wide

Range of depths of west toe: 2’ to 5.5’ wide
Range of widths of east toe: 3’ to 9’ wide
Range of depths at east toe: 2’ to 5.5’ deep
Structures: One non-historic gate and headwall, west side, and historic Old Deschutes Road Bridge.
Alterations to canal: None
Other Alterations: Bridge has alterations of materials and newer guardrail.

Segment 2: Water flows around island. With two juniper trees and other native plants. Smooth water flows over deep places and becomes rapids over rocks near the surface. Canal View Subdivision and Awbrey Butte in the City of Bend at top of photo. Property lines go to center of canal in this location.
Photographer looking southwest.

Segment 2: Stock Run. Horse pasture fencing on right.
Photographer looking northwest

Segment 2: Old Deschutes Road Bridge. Jeff Perreault M.S. stands on lava flow.
Photographer looking northeast to goat farm at red house and barn (right).

Segment 2: Rapids during stock run. Photographer looking north

SEGMENT 3

Tax Lots and Addresses Located In Segment 3:

171215DB00100	21086 Ann Margaret Drive, Bend, OR97701
171215DB00600	63390 Old Deschutes Road, Bend, OR97701
171215AC00600	63440 Old Deschutes Road, Bend, OR 9770
171215AC00700	21035 Scottsdale Road, Bend, OR97701
171215AC00800	21055 Scottsdale Road, Bend, OR97001
171215AC00900	21075 Scottsdale Drive, Bend, OR97701
171215AD00105	63405 Overtree Road, Bend, OR97701

Description of Characteristics of Segment 3:
Goat farm with irrigated pasture at lot northeast of bridge. Regular, flat terrain sloping to south. Relatively straight canal. Much water. Heavy large riprap on south embankment and smaller riprap on north embankment. Relatively consistent segment. Flows east.

Latitude and Longitude at Southern Edge of Segment 3:
North Decimal: 44.102333
West Decimal: 121.271528
Length of Segment: 760’
Elevation at south end: 3433’
Drop in elevation this segment: 8’
Terrain: Flat
Presence of Standing Water: Yes, Water across most of segment
Average Width of Canal: 61.50’
Range of Canal Widths: 56’ to 78’ wide
Average Depth of Canal: 6.63’ deep
Range of Canal Depths: 6’ to 7.5’ deep
Width of Ditch Rider Road: 10’
Range of Widths of South Embankment: 12
Range of Widths of North Embankment: 0
Range of widths of north toe: 5.5’ to 11.5’ wide
Range of depths of north toe: 2’ to 5.5’ deep
Range of Widths of south toe: 7’ to 11’ wide
Range of Depths at south toe: 5’ to 5.5’ deep
Structures: None
Alterations: None

Segment 3: Segment is straight and deep with thick riprap on both sides. At-grade cut side on north side of canal. Sloping embankment and agricultural fencing on south side. Tax lots run to center of canal. Photographer looking east.

SEGMENT 4

Tax Lots and Addresses Located In Segment 4:

171215AD00106	63415 Overtree Road, Bend, OR97001
171215AD00107	63435 Overtree Road, Bend, OR97001
171215AD00108	63445 Overtree Road, Bend, OR97001
171215AD00109	63455 Overtree Road, Bend, OR97001
171215AD00110	63475 Overtree Road, Bend, OR97001
171215AD00400	21115 Scottsdale Drive, Bend, OR97701
171215AD00500	21105 Scottsdale Drive, Bend, OR97701
171215AD00600	21095 Scottsdale Drive, Bend, OR97701

Description of Characteristics of Segment 4:
Rough irregular canal bed makes turns to east and north. Sudden drops in elevation. Boulders and lava flows in canal bed. Ditch rider road ceases due to rough terrain. Ponderosa pine trees, mature native vegetation, rock outcroppings into banks.

Latitude and Longitude at Southern Edge of Segment 4:
North Decimal: 44.102583
West Decimal: 121.268639
Length of Segment: 1330’
Elevation at southern end: 3425’
Drop in elevation this segment: 10’
Terrain: sudden drops, many turns, undulating terrain
Presence of Standing Water: No
Average Width of Canal: 51.21’ wide
Range of Canal Widths: 39’ to 60.5’
Average Depth of Canal: 5.56’ deep
Range of Canal Depths: 4.2’ to 7.25’ deep
Width of Ditch Rider Road: 10’, partial at south end
Range of Widths of East Embankment: none
Range of Widths of West Embankment: none
Range of widths of west toe: 1.5’ to 14’ wide
Range of depths of west toe: 2.5’ to 5.25’ deep
Range of Widths of east toe: 1’ to 16’ wide
Range of Depths at east toe: 2.5’ to 5.25’ deep
Structures: Water distribution slide gate, metal agricultural gate at end of ditch rider road.
Alterations: none

SEGMENT 4: At this location, the canal has two cut sides and a shallow, rocky bed. The loose rock was likely blasted. Because there is no embankment here in which to make use of it, the rock was left in the canal bed. Photographer looking north.

SEGMENT 4: Undulating bed, lava flows and loose rock, no berms. Photographer looking north.

SEGMENT 5

Tax Lots and Addresses Located In Segment 5:

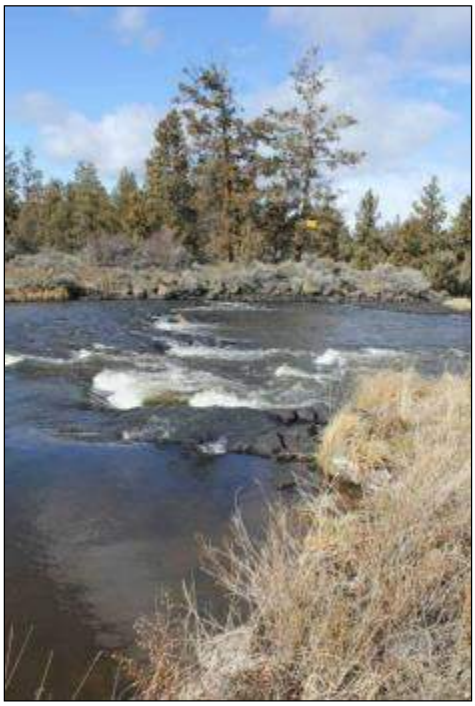
171215 AA00300	63557 Overtree Road, Bend, OR97701
171215 AA00400	63575 Overtree Road, Bend, OR97701
171215 AA00401	63597 Overtree Road, Bend, OR97701
171215 AA00500	63595 Overtree Road, Bend, OR97701
171215 AA00600	No situs address
171215 AA00702	No situs address
171215 AA00703	63545 Overtree Road, Bend, OR97701
171215 AA00705	63535 Overtree Road, Bend, OR97701
171215AD00111	63495 Overtree Road, Bend, OR97001
171215AD00200	21125 Scottsdale Drive, Bend, OR97701

Description of Characteristics of Segment 5:
Canal straightens as it flows north and becomes more consistent and flatter. Large lava flows in canal bed and some stretches hold water. Ditch rider road connects to Overtree Road on the south side of Tax Lot 171215AD00111 on the east side of canal and is sparsely surfaced with a single layer of scattered crushed red cinder rock. East embankment is about 4' above natural grade. West side has no berm or embankment and is a cut. Some areas have little riprap and some embankments have no riprap where sides are nearly vertical.

Latitude and Longitude at Southern Edge of Segment 5:
North Decimal: 44.105222
West Decimal: 121.266611
Latitude and Longitude at Northern Boundary of Historic District:
North Decimal: 44.109222
West Decimal: 121.267167
Length of Segment: 1710'
Elevation at south end of segment: 3410'
Elevation at northern boundary of historic district: 3418'
Drop in elevation this segment: 8'
Presence of Standing Water: Yes, pools
Terrain: Flattens out, slight slope to north.
Average Width of Canal: 57.56' wide
Range of Canal Widths: 40' to 73.5' wide
Average Depth of Canal: 3.89' deep
Range of Canal Depths: 1.5' to 4.75' deep
Width of Ditch Rider Road: 12'
Range of Widths of East Embankment: 10-12'
Range of Widths of West Embankment: 0'
Range of widths of west toe: 1' to 16.5' wide
Range of depths of west toe: 1.5' to 4' deep
Range of Widths of east toe: 1' to 16' wide
Range of Depths at east toe: 1' to 4.5' deep
Structures: Trapezoidal Weir flow measuring structure, slide irrigation gate on east side, series of warning signs for intake to piping project ahead. Alterations: flow measuring weir**.**

Segment 5: Red cinder covers part of the top of the embankment. This is a gently curving stretch of canal with smaller-diameter loose rock and lava flows in the canal bed. It has riprap on side slopes and standing water with silt piles. Photographer looking northeast.

SEGMENT 5: The canal bed at its northern end is nearly flat and is wide and shallow. The surveyors are standing beside and in the 2012 concrete trapezoidal flow-measuring weir structure that was constructed in the existing canal bed. Photo looking north.



Segment 5: Rapids. Photographer looking west.

Segment 5: Men are standing on lava flow in the canal bed at the northern Historic District boundary line. The red sign is hanging on a wire at the Section line between Sections 10 and 15. The structure is outside the historic district in Section 10 and is the intake for the 2.25-mile piping project for the Juniper Ridge Hydropower project. Photographer looking north.

Figure 7: Central Oregon Irrigation District Service Area Map

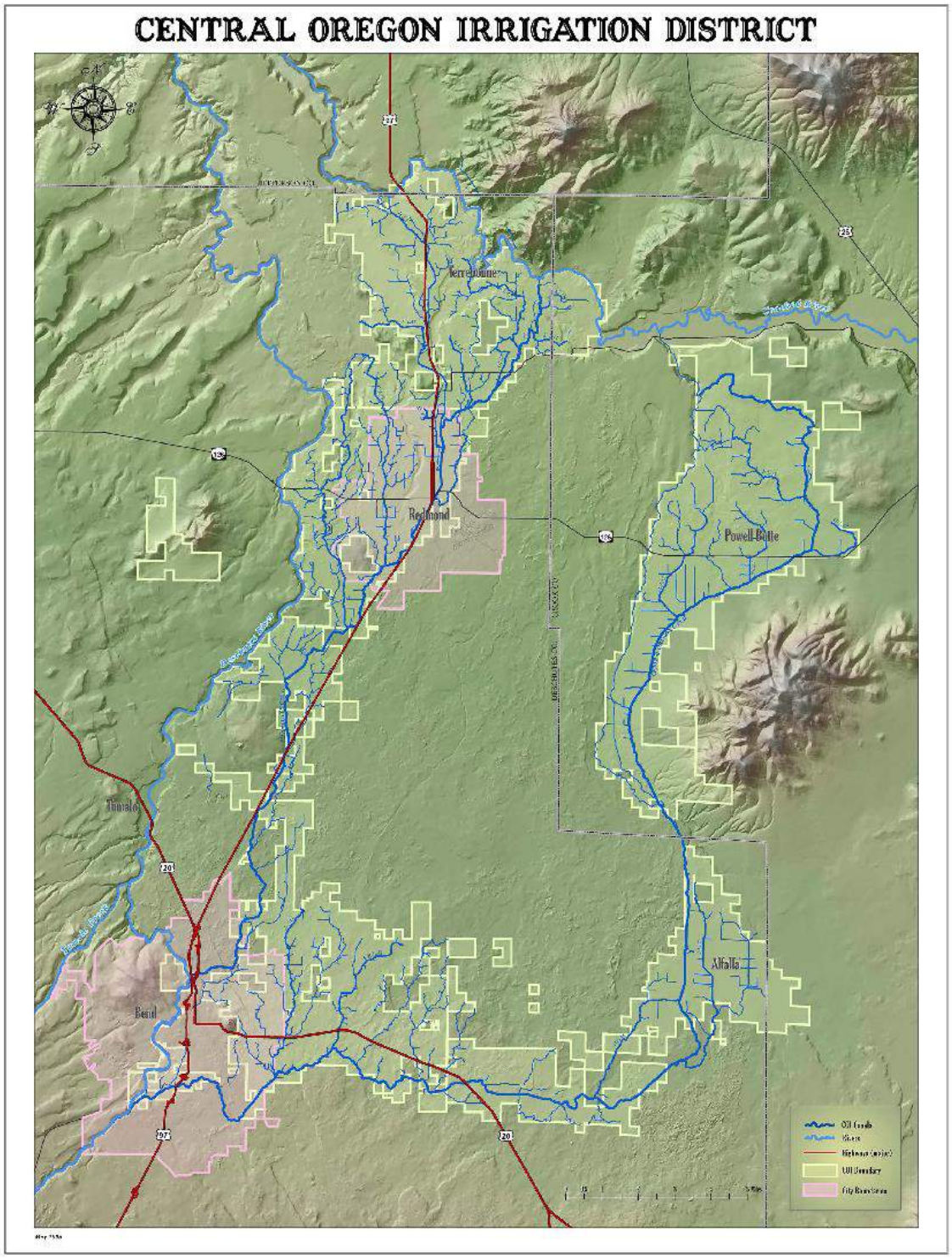


Figure 8: Engineering drawings for cross sections of the Pilot Butte Canal and Laterals, Drawn by civil engineer Levi David Wiest, dated January 22, 1908. (Oregon State Archives)

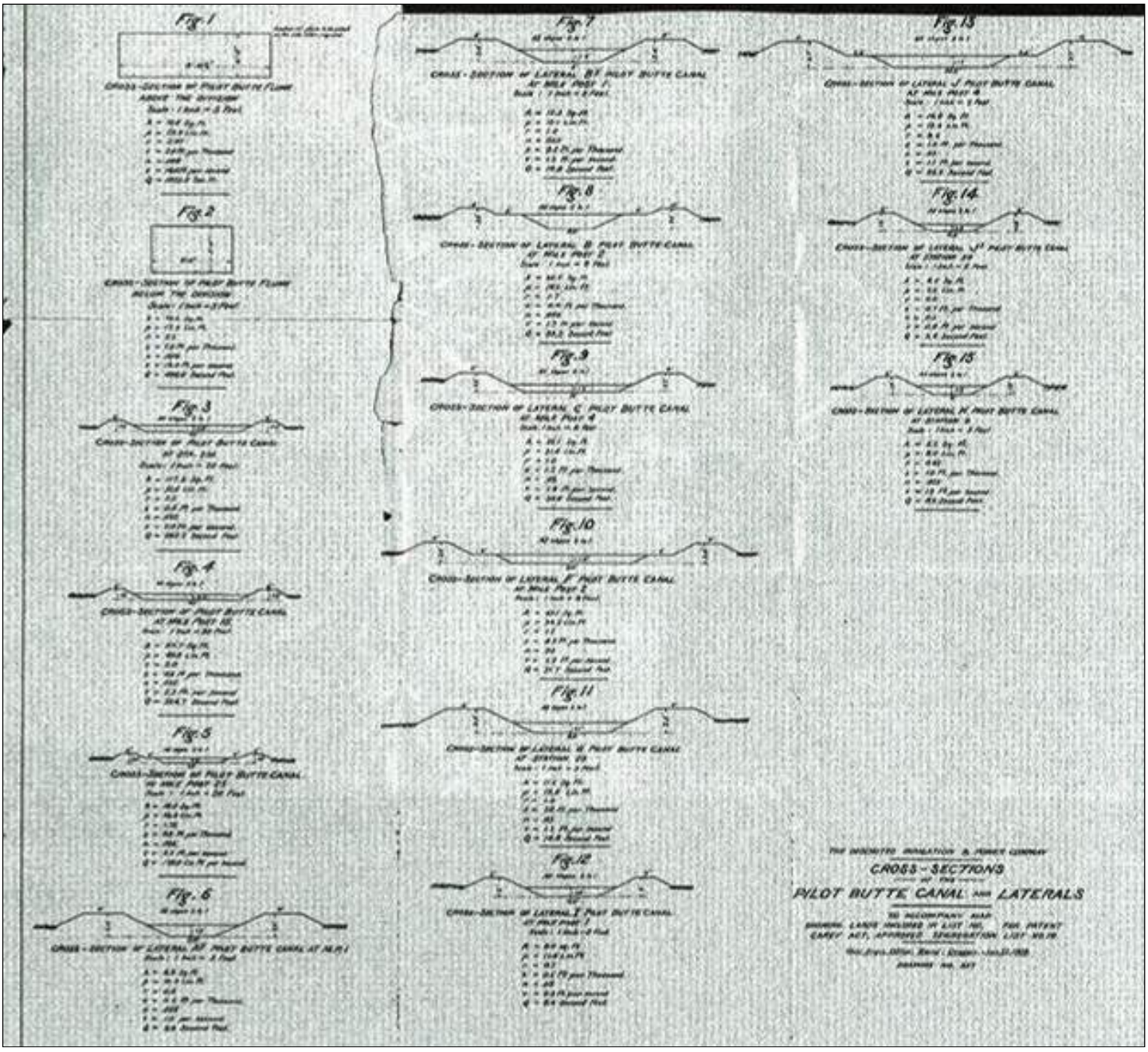


Figure 9: 1951 Aerial photo of area, Deschutes County Surveyor's office.

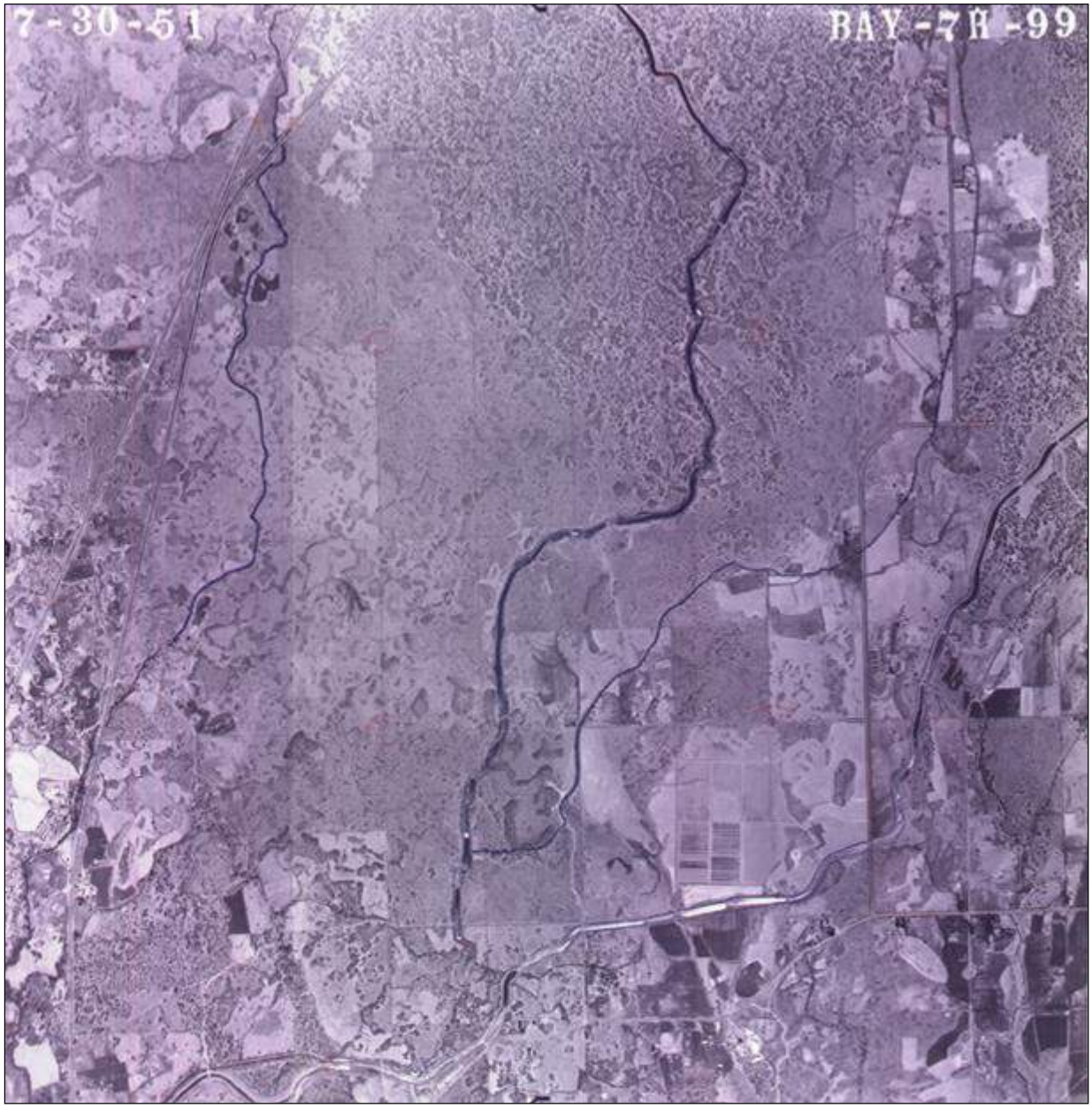
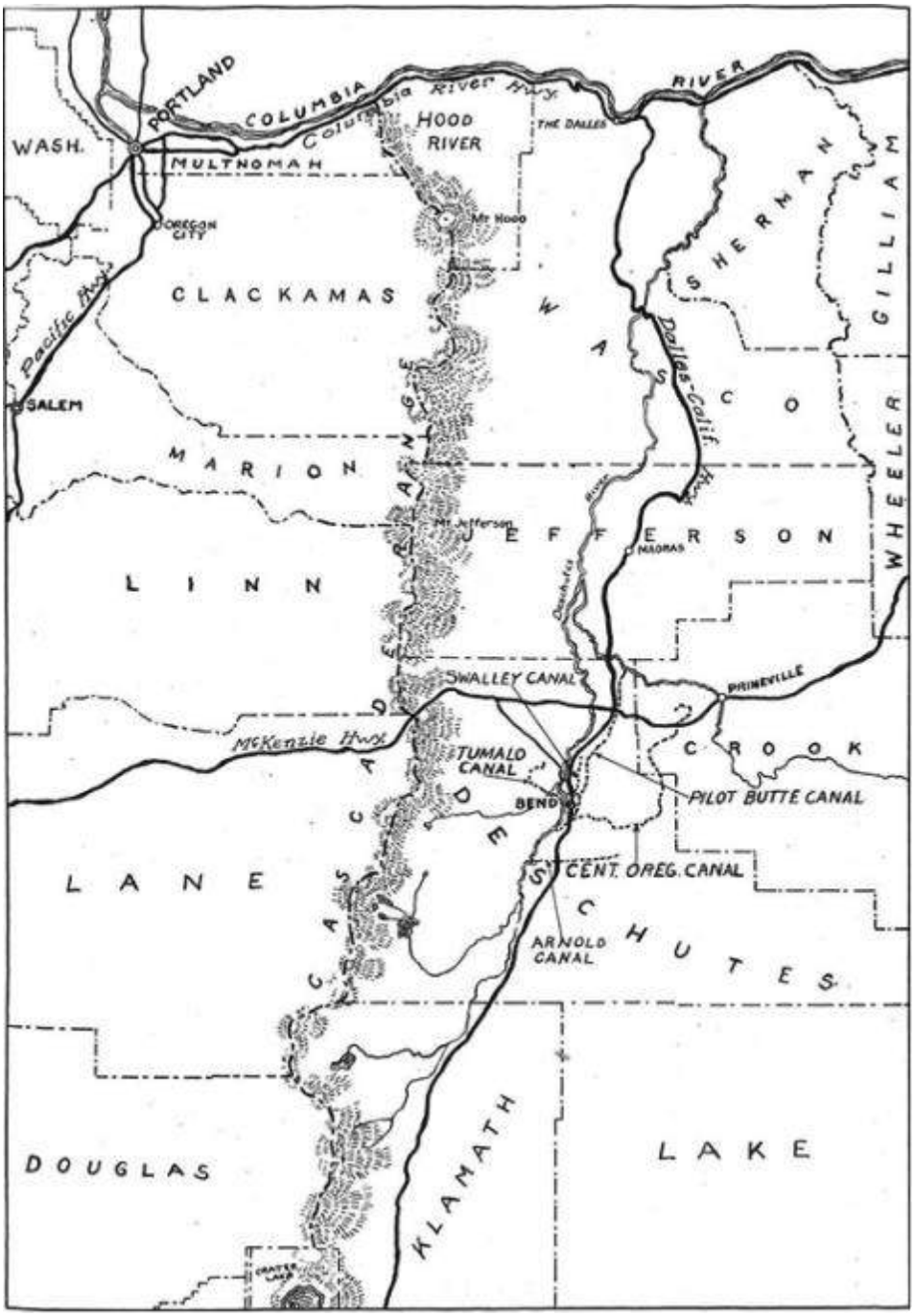


Figure 10: 1924 Map by Frank Becker, Oregon State Engineer, depicting Central Oregon from the Columbia River to Crater Lake and showing rivers and the Pilot Butte Canal and others in the area as of 1924.[345]



[345] Becker, Frank R., Assistant State Engineer, Under the Direction of Rhea Luper, State Engineer, *A Report on the Central Oregon Irrigation District*, October 19, 1924, (Deschutes County Clerk's Office, Bend, OR.), "Duty of Water."

Figure 11: Map of Arid Lands Selected for Irrigation in Crook County Oregon by the State of Oregon, Segregation List # 6. Signed by Levi D. Wiest, JM Lawrence, and CC Hutchinson. (Oregon State Archives)

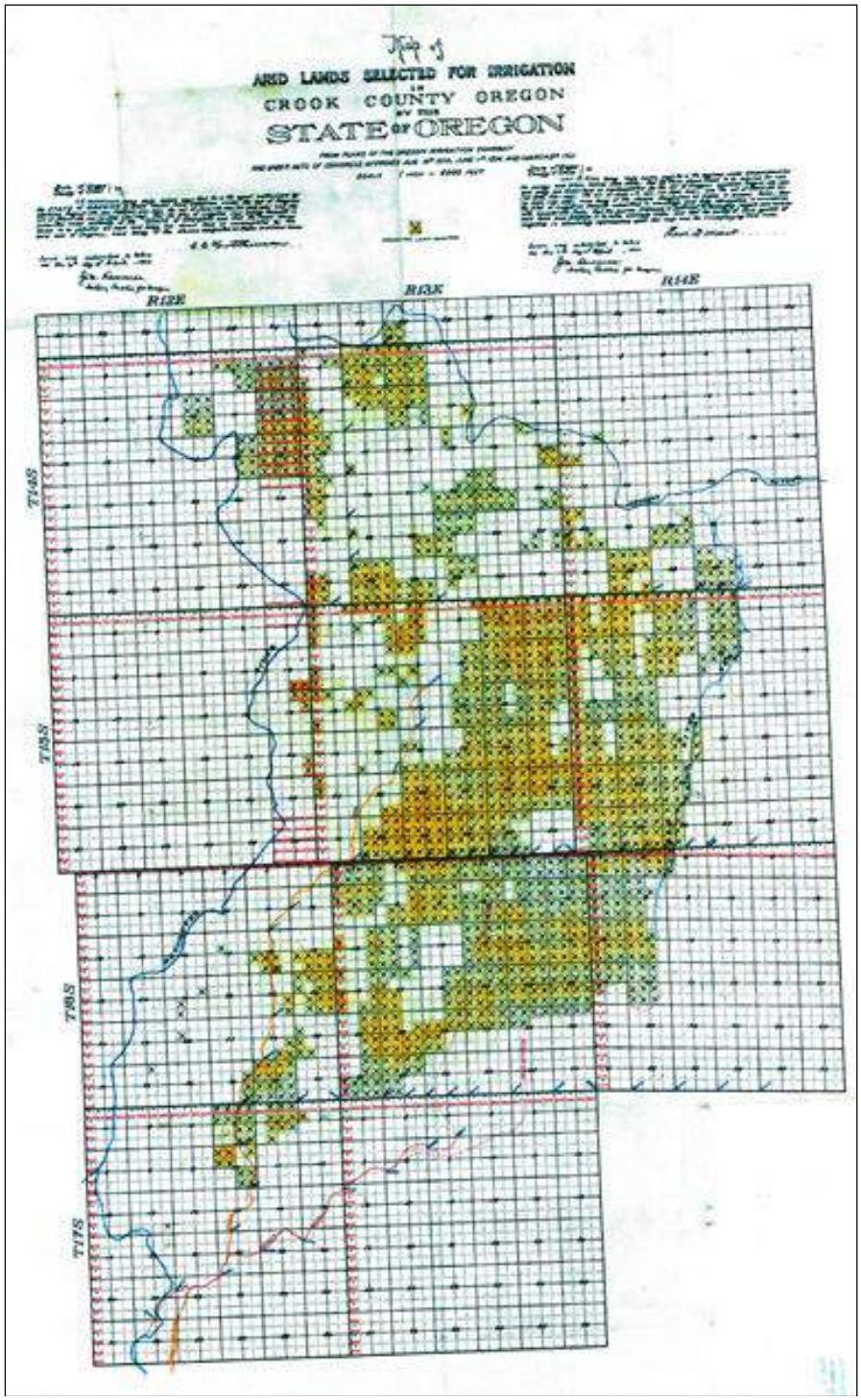


Figure 12: Map of T 17 S, R 12 E, showing Carey Act List # 6, Carey Act List # 19 and Central Oregon Irrigation District, Deschutes County Clerk's Deed Index.

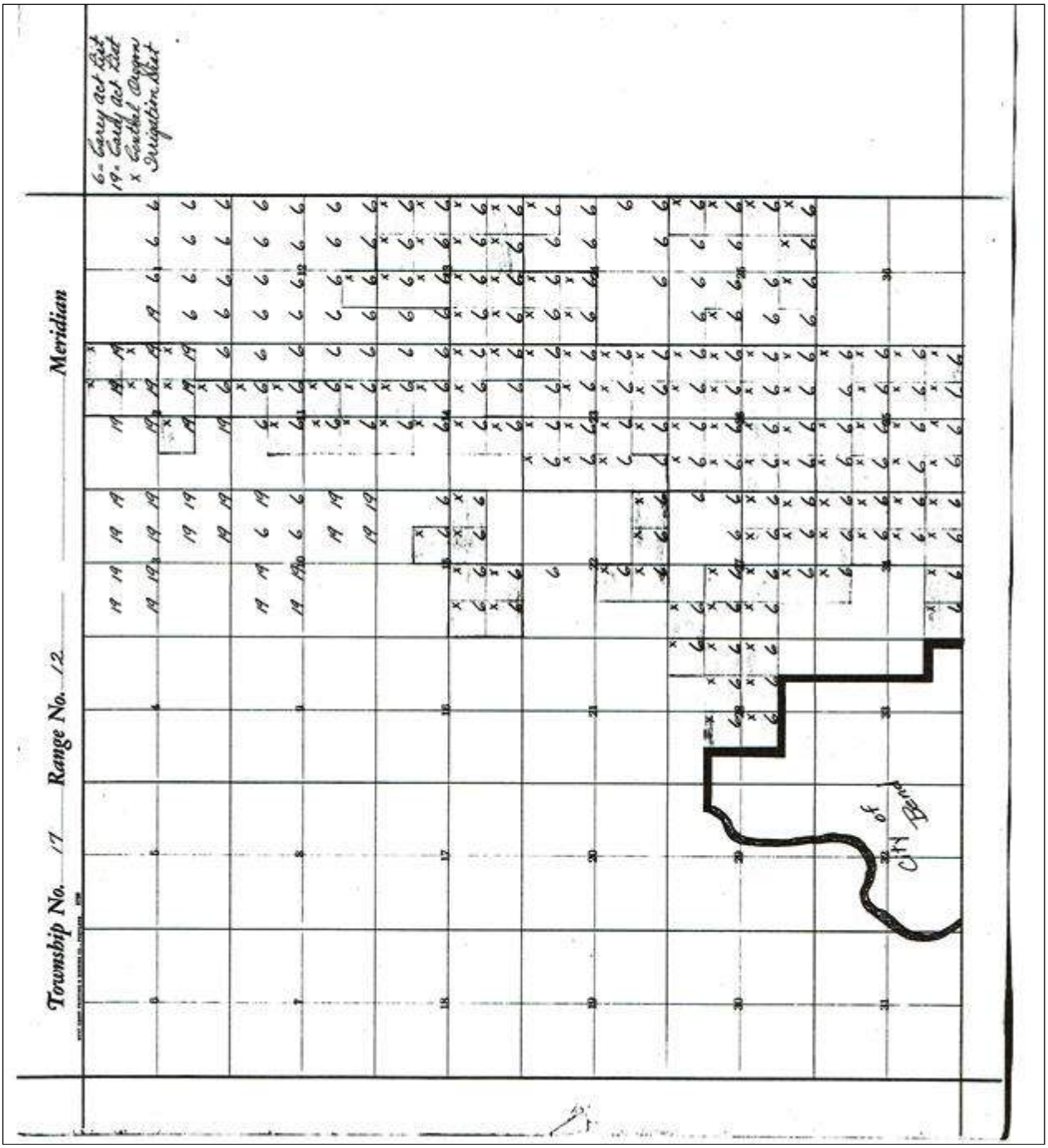


Figure 13: Map of Oregon, printed in 1902, stamped Deschutes Irrigation and Power Company, Portland, OR, McKay Building and showing proposed location of the Col. So. Railway Extension to future Bend area. (Oregon State Archives)

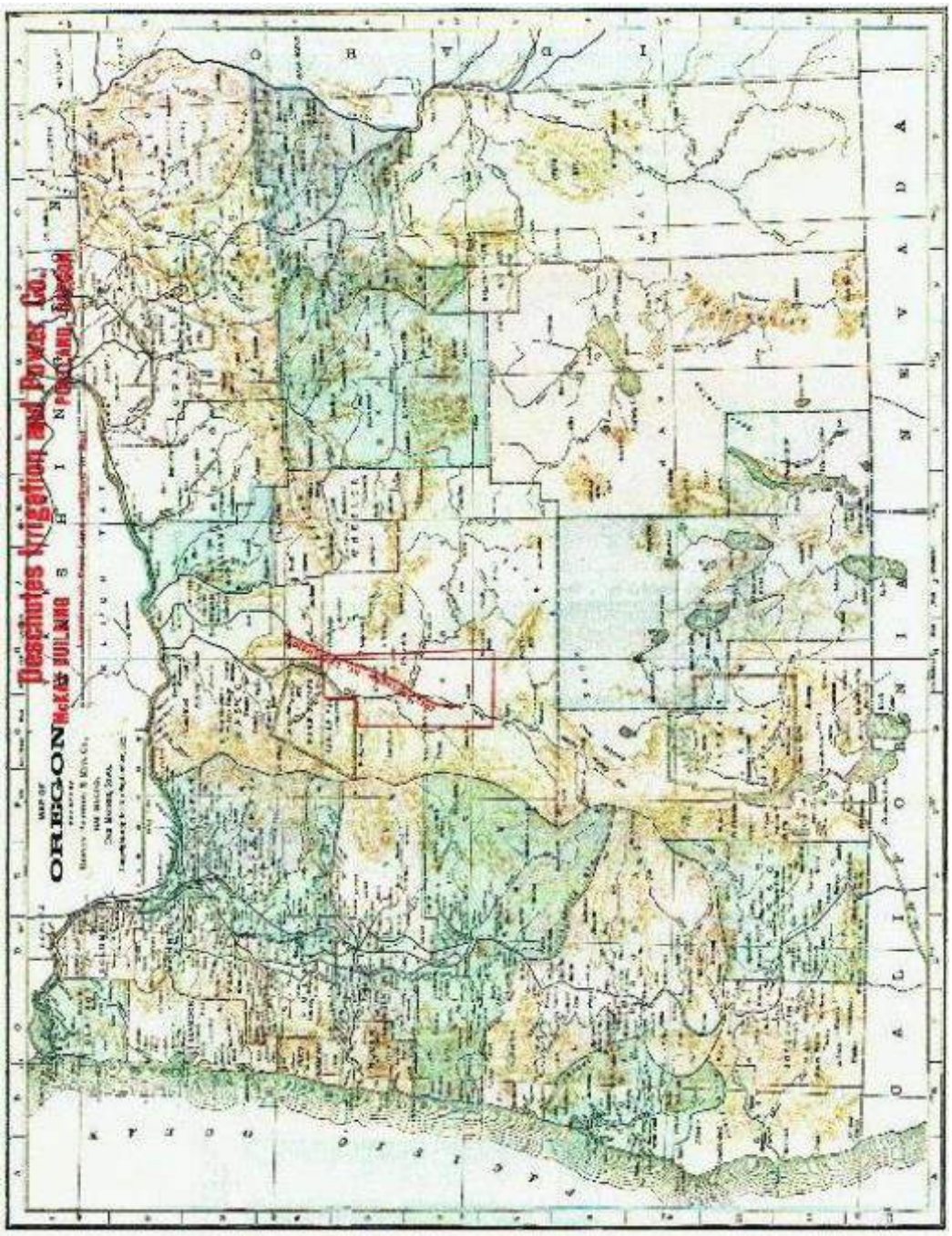


Figure 14: Map of Irrigated Lands for Sale under Contracts with the United States and the State of Oregon in the Bend District, Deschutes Valley, Central Oregon, July 7, 1909.

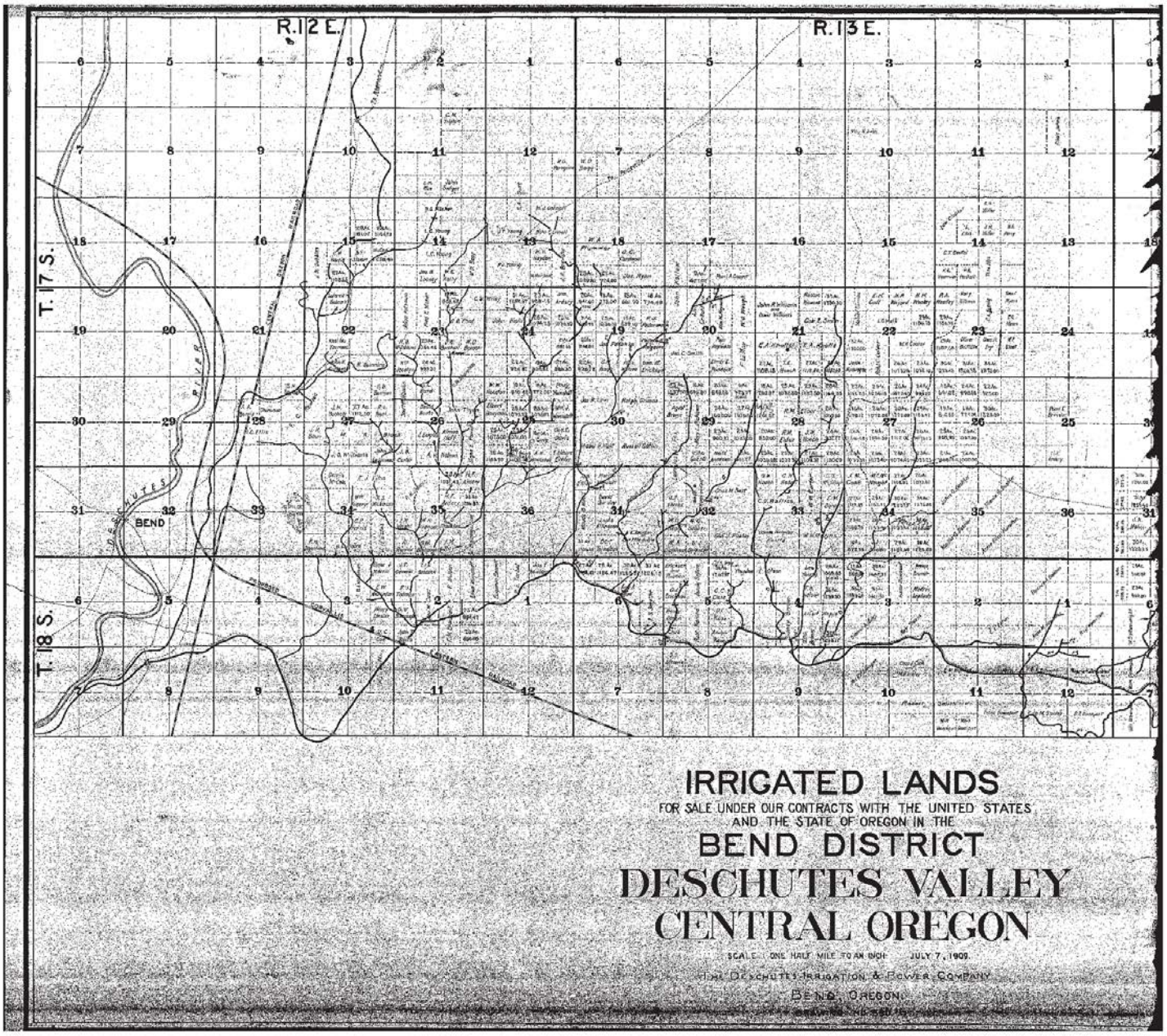


Figure 15: A portion of a 1915 Map by civil engineer Robert Gould of T 17 S, R 12 E, showing location of Pilot Butte Canal in the historic district in Section 15.

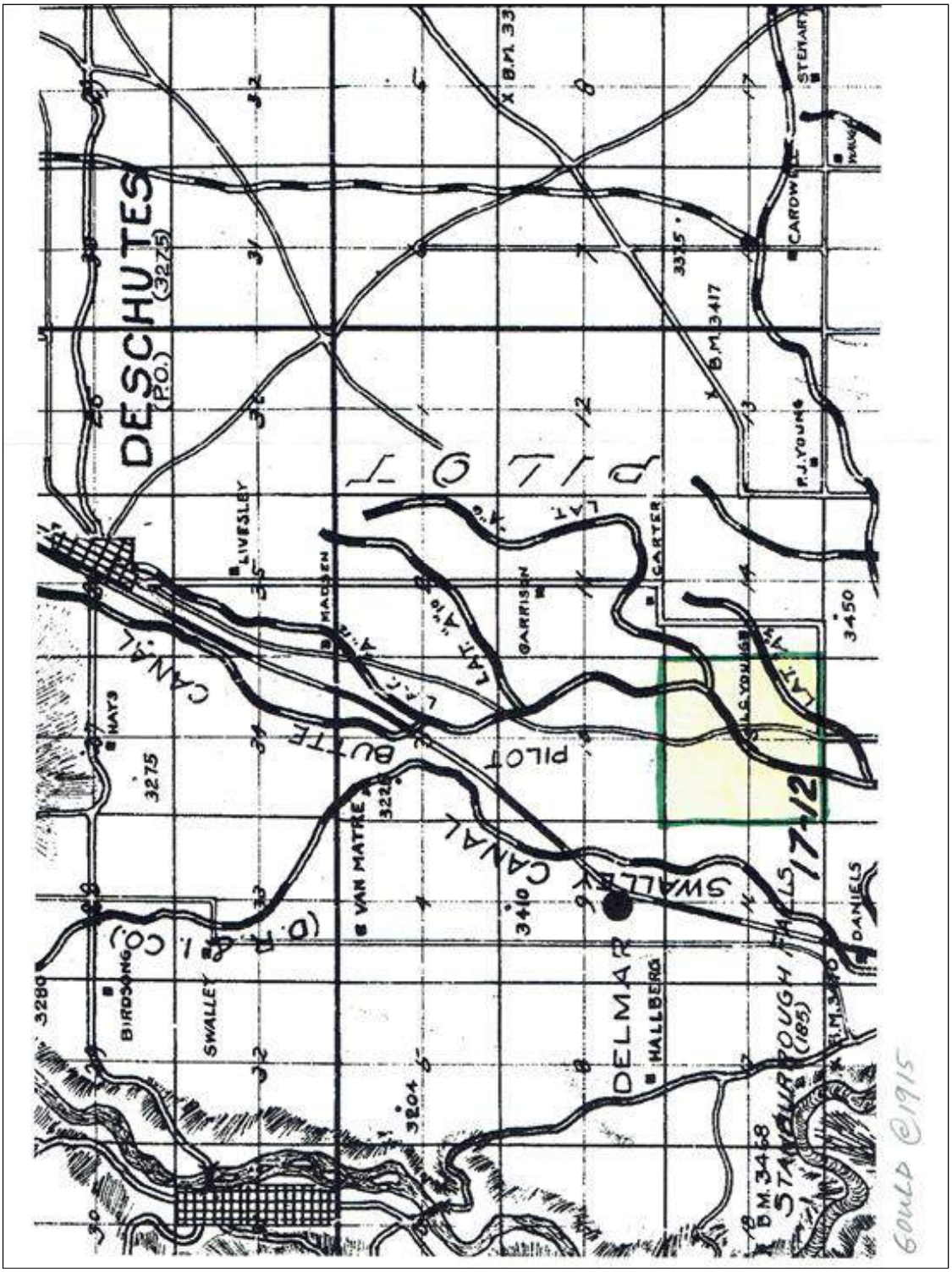


Figure 16: Map dated 1935, Metsker's Atlas of Deschutes County, page 46, T 17 S, R 12 E, showing Section 15.

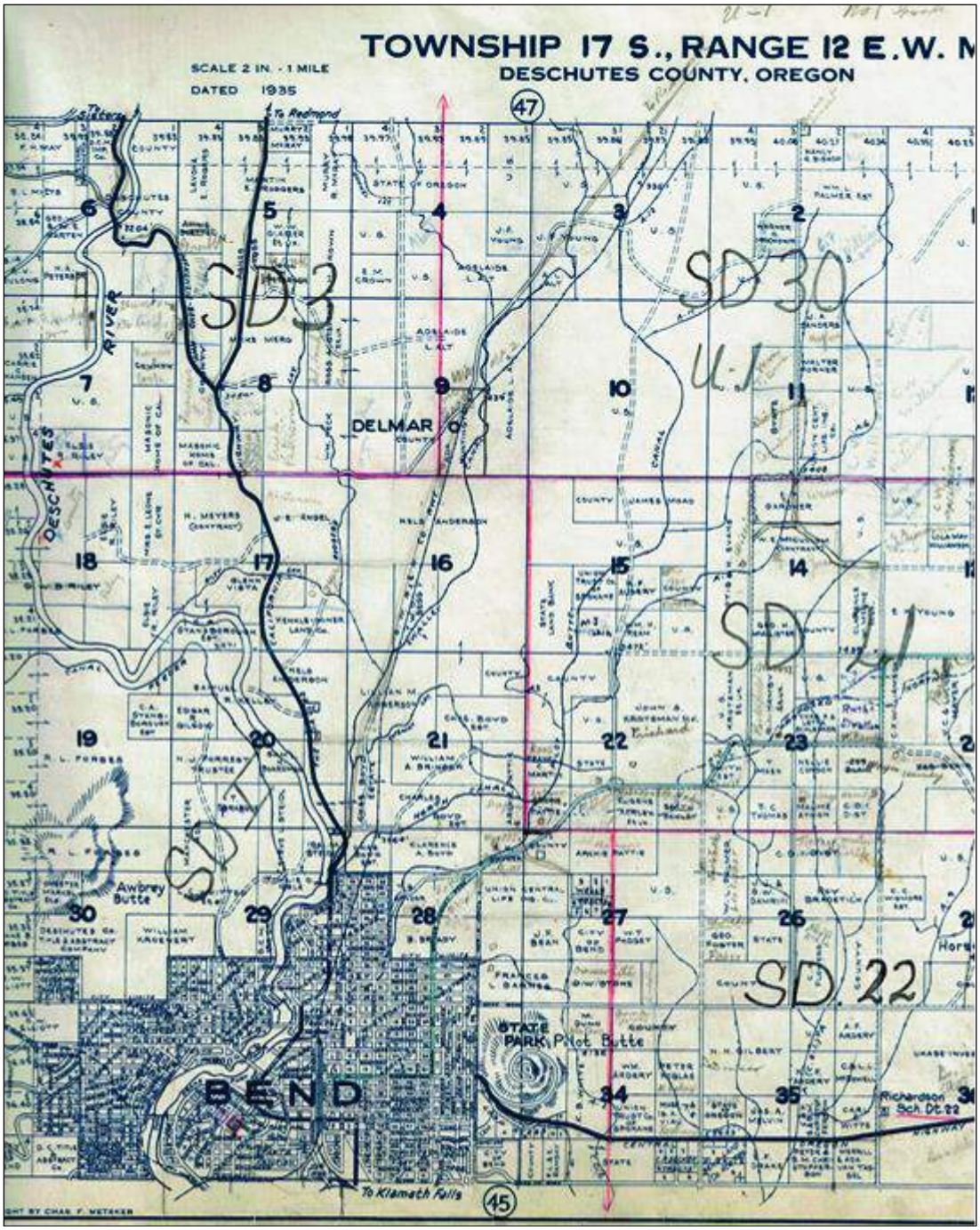


Figure 17: Map dated 1944, Metsker's Atlas of Deschutes County, page 46, T 17 S, R 12 E, showing Section 15.

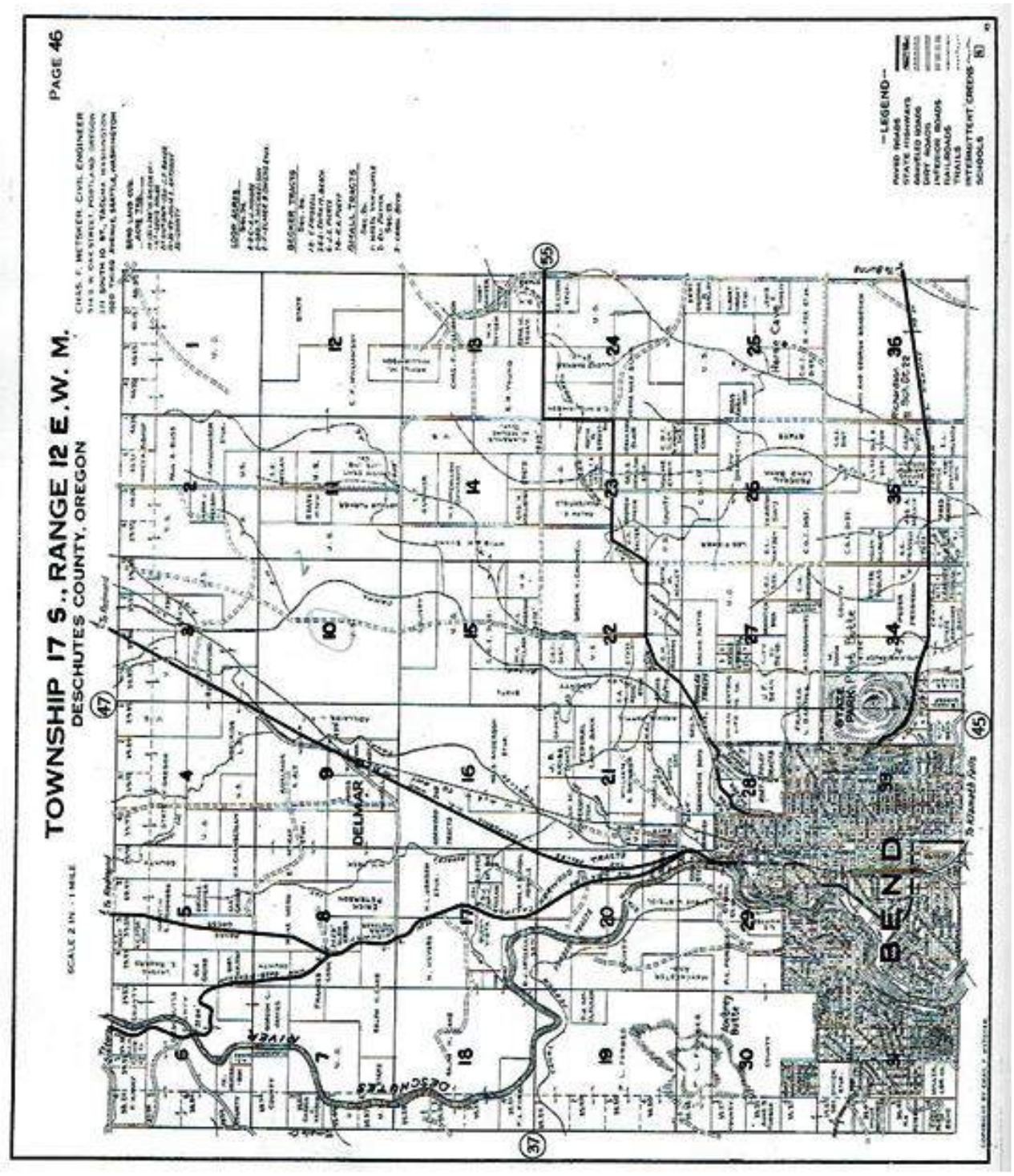


Figure 18: Map dated 1972, Metsker's Atlas of Deschutes County, page 46, T 17 S, R 12 E, showing Section 15.

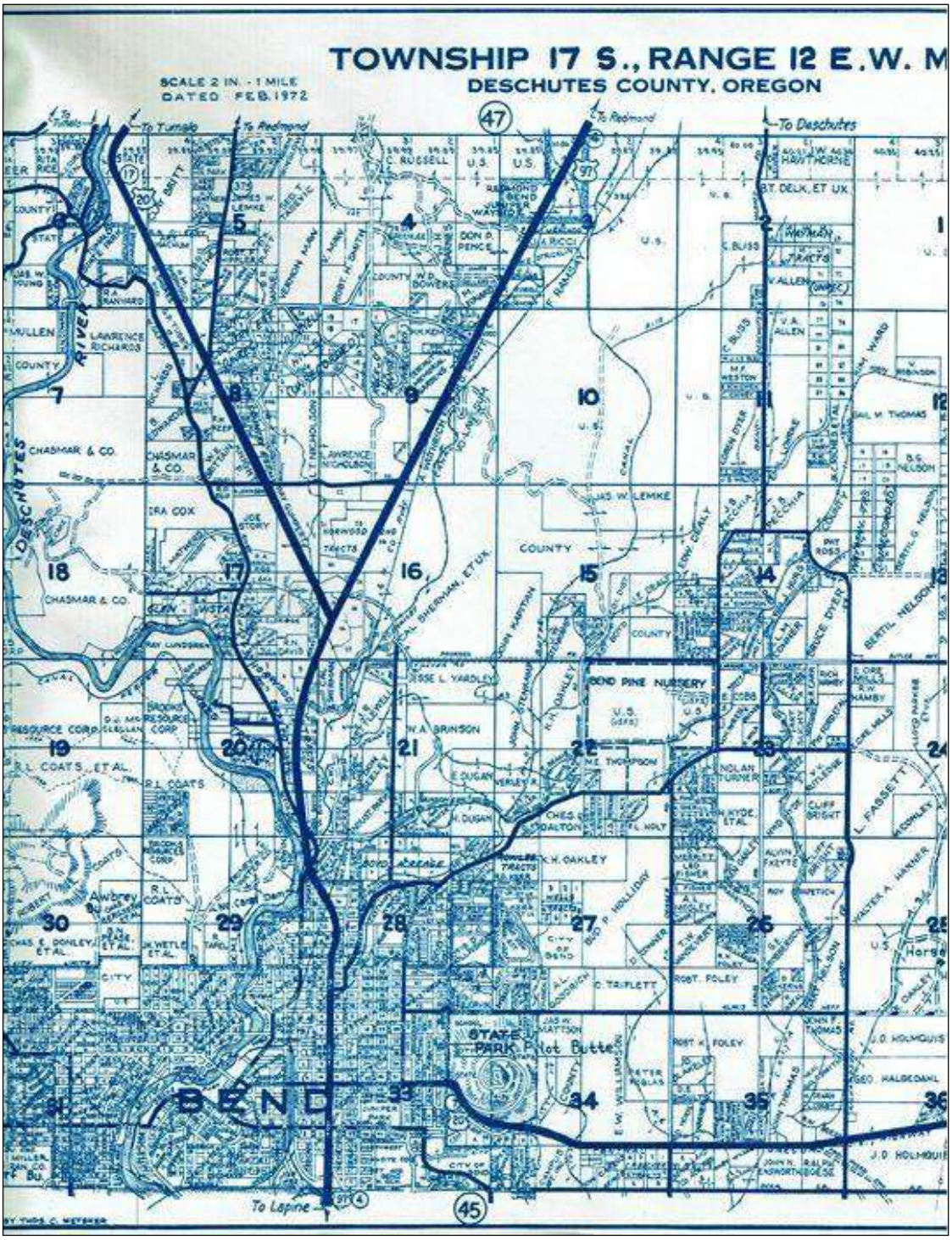
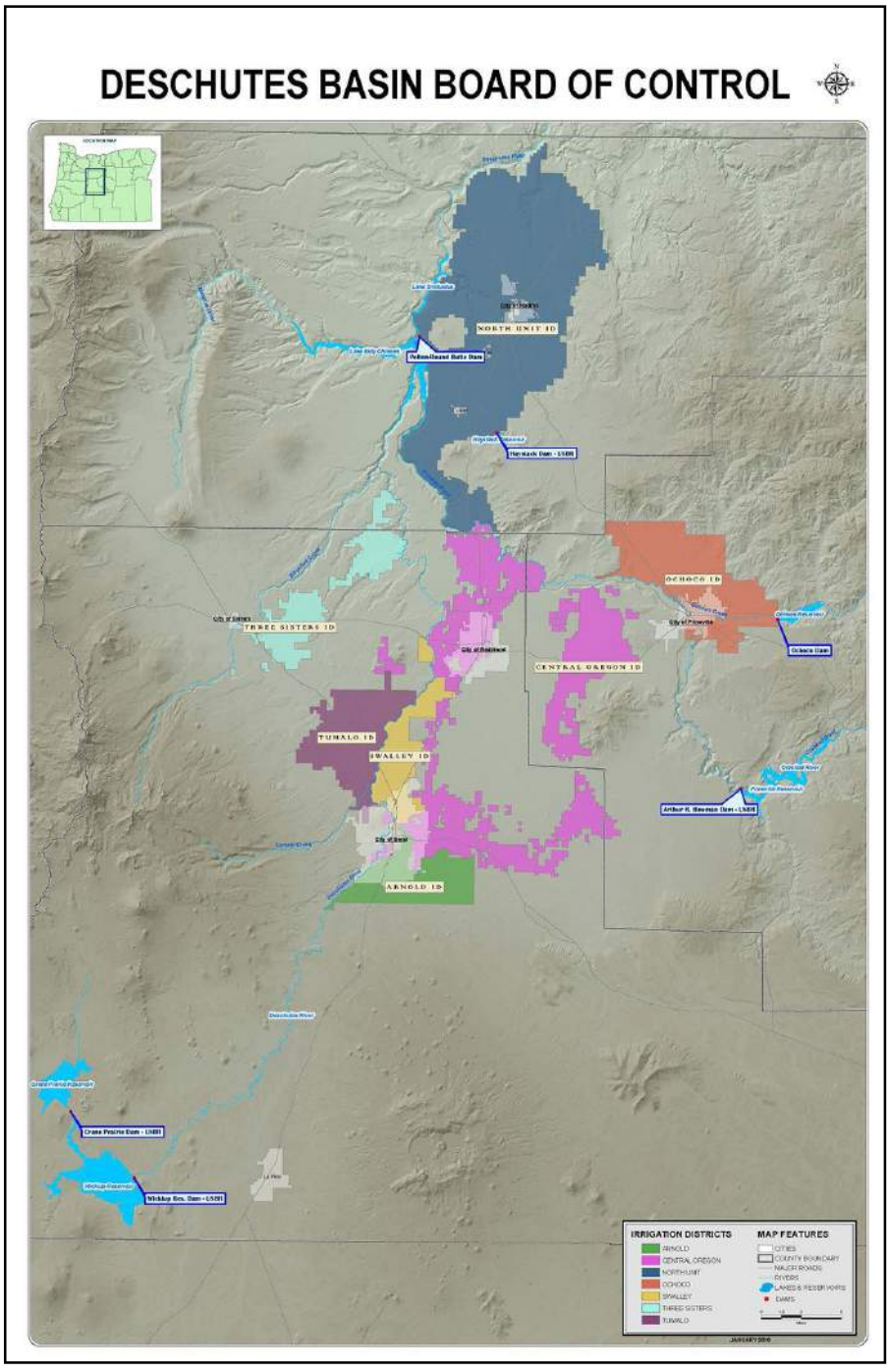


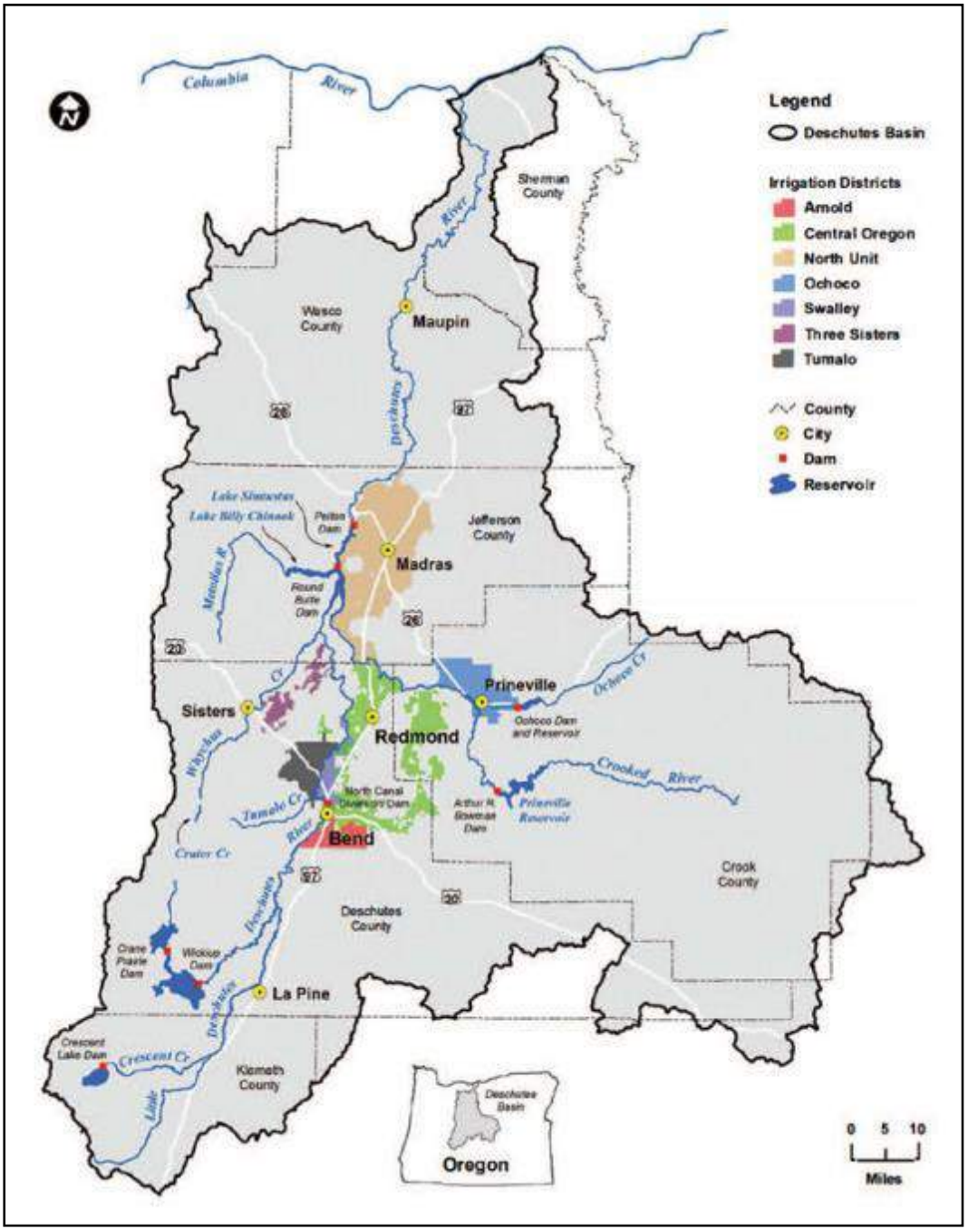
Figure 19: Map Showing the Ten Stretches of the 22 Miles of the North Canal and Pilot Butte Canal, 2015. North arrow is at the top of the page. White indicates the historic district.

Figure 20: Topographic Map of Eight Irrigation Districts in Upper Deschutes River Basin: Arnold, Central Oregon, Lone Pine, North Unit, Ochoco, Swalley, Three Sisters, and Tumalo Irrigation Districts.



Source of Topographic Map: Deschutes Basin Board of Control (DBBC), 2010.

Figure 21: Map of Eight Irrigation Districts in the Upper Deschutes River Basin shown with county lines, cities, rivers and creeks that are the source of the irrigation water, as well as Arnold, Central Oregon, North Unit, Ochoco, Swalley, Three Sisters, and Tumalo Irrigation Districts.



Source of Map: Deschutes Basin Board of Control (DBBC), October 2015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