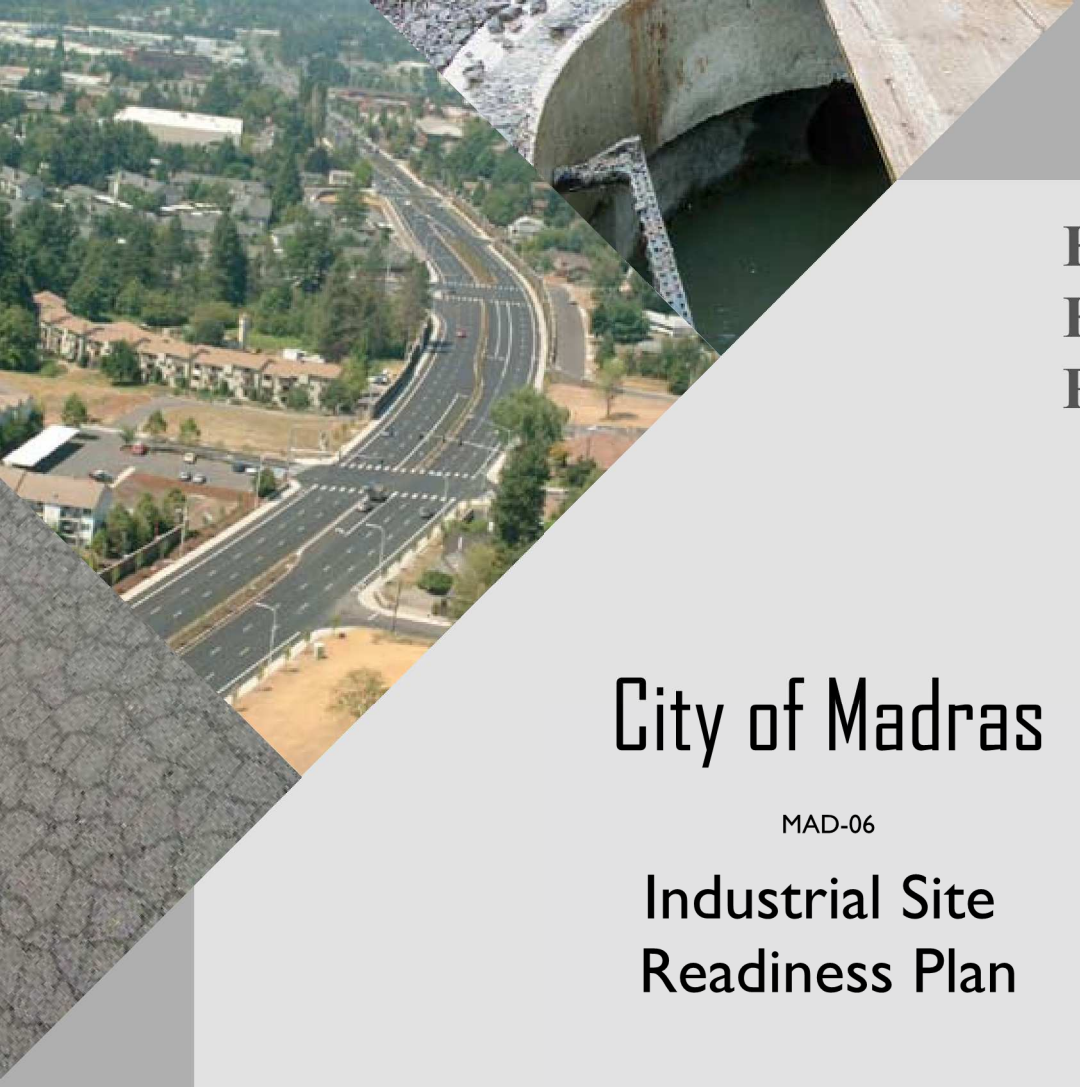

Harper
Houf Peterson
Righellis Inc.

# City of Madras

MAD-06

# Industrial Site Readiness Plan

November 2017

## Prepared For:

City of Madras
Public Works Department
125 SW "E" Street
Madras, OR 97741
P: 541-475-2344

## Prepared By:

Harper Houf Peterson Righellis Inc.
205 SE Spokane St., Suite 200
Portland, OR 97202
P: 503-221-1131 F: 503-221-1171

Wen H. Jou, P.E.
Ken Condit, P.E.

HHPR

ENGINEERS ◆ PLANNERS
LANDSCAPE ARCHITECTS ◆ SURVEYORS

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## APPENDIX NO. AND TITLE

# EXECUTIVE SUMMARY

## S.1 INTRODUCTION

**General.** The Industrial Park that lies within the City of Madras Airport and Industrial Center is a critical part of the City's economy and continued development of the Park is a priority for the community. This area is partially developed and those portions of the Park with developments are currently served by a multi-modal transportation system, as well as infrastructure for potable water, sewer and dry utilities services. The purpose of this Industrial Site Readiness Plan (ISRP) is to address the infrastructure improvements needed to support the further development of the Industrial Park.

**Probable Costs.** We have developed preliminary estimates of probable costs for this ISRP from information available at the time the study was prepared. These probable costs are planning-level estimates and their accuracy is anticipated to be within +35% to –20% of the actual cost. Allowances for contractor overhead and profit, mobilization/demobilization, and construction contingencies are included to provide conservative estimates. Actual costs will depend on the scope identified during project development and conditions at the time bids are solicited for each project.

## S.2 RAIL SERVICE, ROADWAYS, AND STORMWATER MANAGEMENT

### *S.2.1 Rail Service*

**Feasibility Study.** A Rail Feasibility Study was conducted as part of this ISRP to evaluate way to improve local rail service (see Appendix A). That study reviewed existing service, evaluated potential improvements, and presented a concept plan for implementing proposed improvements.

**Existing Service.** The Industrial Park includes a rail spur system that connects directly to the main rail line running through Madras. A rail siding also extends along the main rail line within the Park to serve the site occupied by Cenex grain. The Burlington Northern Santa Fe Railroad (BNSF) operates over the main line and provides service to the spur system.

Key limitations to the existing spur system with regard to rail service are summarized below.

- Portions of the rail spur system are in deteriorated condition and in need of remedial work.
- The spur system does not provide the pull-through service preferred by railroads, but instead requires forward-and-back service that is more time consuming and less efficient.
- The connection of the spur system to the main line is not a full wye and only provides access from the south.
- BNSF reports that main-line rail service combined with local service creates congestion.

**BNSF Plan for Local Rail Improvements.** BNSF is planning to perform work on trackage in the Industrial-Park area. Improvements BNSF is considering are summarized below.

- Full Wye – BNSF plans to install an additional connecting track between the main line and lead spur to provide spur access from the north.
- Double Track Main Line – BNSF is considering the addition of a second track from the north side of the Willow Creek trestle to NE Cherry Lane, east of the Industrial Park. This new BNSF siding would be divided into two segments with a universal crossover.

**Potential Long-Term Improvements for Service Expansions.** Potential expansions to rail service would be focused on supporting bulk freight service through a reload facility for larger scale users than current spur customers. Such improvements to expand service would generally entail either a dedicated, Industrial-Park siding along the main line or a new, looped spur system. Both options would support pull-through service.

The siding would require less space and be less complex to implement. But each option has potential benefits and either option is technically feasible. To be conservative, the Feasibility Study identified the costs of a looped spur system for expanded service.

**Improvements to Existing Spur System.** The Rail Feasibility Study proposed two upgrades to the existing spur system in addition to the full-wye improvement being planned by BNSF. The first upgrade would be to rehabilitate the existing spur tracks according to the recommendations of the 2011 report prepared by West Rail Construction Company.

The second upgrade would be to extend the two existing tracks at the north end of the spur system to extend service to future industrial developments on currently vacant land. An alternate concept for extending rail spurs has also been developed by the Harris Group as part of a siting study for a potential user.

**Summary of Proposed Rail Service Improvements.** Table ES-1 lists the rail system improvements identified to support industrial site readiness and lists the concept-level estimates of probable costs.

**Table ES-1**
**Proposed Rail Improvements**
**(Costs in December 2016 Dollars)**

| Project Description | Probable Project Cost |
|---|---|
| **Phase 1 Improvements** | **$15,800,000** |
| BNSF Siding South Segment | |
| Madras Spur System Wye | |
| Spur Extensions/Exist Rail Rehabilitation | |
| **Phase 2 Improvements** | **$21,600,000** |
| BNSF Siding North Segment | |
| Loop Track C | |
| BNSF Universal Crossover | |

The projects listed under Phase 1 would more directly impact the current Industrial Park rail service and are considered a higher priority for planning purposes. Actual project priorities need to be coordinated with BNSF. Also, projects will need to be reevaluated when the City receives development proposals and an Industrial Park expansion is planned. Projects that improve rail service could be eligible for funding under the *Connect*Oregon program.

*S.2.2 Roadways*

Improved street access and connectivity will be necessary to support industrial site readiness and maintain a safe transportation network as development occurs. Table ES-2 (following page) summarizes the proposed roadway improvements according to priority and lists the concept-level estimates of probable costs.

**Table ES-2**
**Proposed Roadway Improvements**
**(Costs in December 2016 Dollars)**

| Project Description | Probable Project Cost |
|---|---|
| **Category 1 Improvements – Higher Priority** | **$1,250,000** |
| U.S. 26/Cherry Lane Intersection Realignment | |
| U.S. 26/Earl Street Intersection Realignment | |
| **Category 2 Improvements – Medium Priority** | **$10,720,000** |
| U.S. 26/Depot Road Intersection Realignment | |
| U.S. 26/Future Industrial Connector Intersection | |
| Demers Drive & Paul Jasa Way Extensions | |
| Jersey Lane & Other North Area Extensions | |
| East-West Industrial Connector – Berg Drive to U.S. 26 | |
| **Category 3 Improvements – Lower Priority** | **$17,430,000** |
| U.S. 26/Dogwood Lane Intersection Realignment | |
| Earl Street, Frontage Road and Other Connectors | |
| Northward Extensions of Berg and Andrews Drives | |
| Daimler Road Extension to Dogwood Lane | |

Actual project priorities will depend on growth rate and patterns of development. The estimates of probable costs have been obtained from the draft update to the City's Transportation Service Plan being prepared by Kittleson and Associates.

*S.2.3 Stormwater Management*

There is a limited system of existing storm drains and retention ponds serving developed portions of the Industrial Park. An expansion of the existing piping network to serve future developments is not recommended due to geographical and regulatory constraints.

The Industrial Park is relatively flat and no receiving stream or drainage channel is available for a discharge. Therefore, future developments will need to install on-site stormwater control systems according to current regulations and City Standards.

Projects for stormwater facilities will be part of each development project. The scope and schedule of the stormwater project will need to be developed based on actual development plans. Costs for on-site stormwater improvements and any offsite conveyance systems that may be required will be borne by the industrial site developer(s) and/or user(s).

## S.3 DRY UTILITIES AND WATER SERVICES

*S.3.1 Electrical and Natural Gas Services*

Pacific Power provides electrical service and Cascade Natural Gas Corporation (CNGC) provides natural gas service to Industrial Park users. These utilities generally must offer service to new customers, unless the proposed demand by a prospective user exceeds available and planned capacity.

The existing electrical distribution grid and gas piping network will need to be extended to serve undeveloped areas of the Industrial Park. Prospective industries would need to provide service demand information to the utilities and request their services. The utilities would then work out service plans and associated charges for delivering electricity and natural gas to the proposed development.

The Industrial Park is on the boundary of the Pacific Power service area and the Central Electric Cooperative, Inc. (CEC) provides power service to the City's North Wastewater Treatment Plant. There is the potential that either Pacific Power or CEC could extend electrical service to land located to the northwest and northeast of the airport when developments occur in those areas.

### *S.3.2 Telecommunications*

The Oregon Broadband Mapping Project (Broadband Mapping) documents that developed parts of the Industrial Park contain telecommunications infrastructure supporting fiber optic, DSL, and fixed wireless services. The following companies provide dedicated voice and/or broadband services to the area.

- BendBroadband
- CenturyLink
- Quantum Communications

The costs of telecommunications services are user specific.

### *S.3.3 Water Service*

**General.** Deschutes Valley Water District (DVWD) provides potable water service to Industrial Park users through a network of water transmission and distribution piping. Existing DVWD supply, storage and transmission facilities provide surplus capacity for industrial growth. The district periodically updates its system Master Plan to identify projected needs and has an ongoing capital improvements program.

**Potential Water Line Improvements**. Based on input from DVWD, we have identified three potential waterline projects to expand and enhance the existing Industrial Park distribution system. These potential improvements and the planning-level estimates of probable project costs are listed below.

- An 8-inch waterline extension along the Demers Drive right of way ($675,000).
- A 12-inch waterline loop along Berg Drive, the west side of Highway 26, and a proposed east-west roadway near the northern Urban Growth Boundary ($3,545,000).
- An 8-inch waterline loop around the airport, along Dogwood Lane, and on the west side of Highway 26 ($6,075,000).

## S.4 WASTEWATER FACILITIES

### *S.4.1 General*

The 2017 Wastewater Master Plan Update (WWMP) evaluated the City's wastewater (WW) facilities under existing and projected conditions, including those facilities serving the Industrial Park. Chapter 4 of this ISRP presents the results of those evaluations and the proposed improvements identified in the 2017 WWMP as they pertain to the Industrial Park.

*S.4.2 Existing Facilities*

The City provides sewer service to most of the developed areas in the Industrial Park, as well as the airport and a nearby residential area along the north side of Birch Lane. The existing WW facilities needed to provide this service are listed below.

- An Industrial Park Collection System that consists of gravity sewers, manholes, two pump stations and pressure sewers (force mains).
- The North Wastewater Treatment Plant, which includes a lagoon system, clarifier, disinfection system, pumping equipment, sludge drying beds, and associated components.
- A lined, effluent storage pond located at the treatment plant site.
- Effluent distribution pump and piping for conveyance to irrigation sites.
- Irrigation components for effluent recycling on the municipal golf course and nearby farm fields owned by the City.

A small portion of the developed land in the Industrial Park does not receive sewer service and these users must rely on septic tanks with onsite disposal wells and/or drainfields.

*S.4.3 Collection System Evaluation*

**Existing Conditions.** Current flows into the gravity sewers are quite low and most of the sewer capacity remains available for developments. The main pump station (PS) serving the collection system, the Demers PS, will also have surplus capacity, even after full development of the planned Willowbrook subdivision, between Birch and Adler Street.

**Future Conditions.** Projections for future industrial developments are not available and the City has not received proposals for developments that would contribute large WW flows to the Industrial Park sewers. The Industrial Park sewers would have enough capacity to handle an increase in WW flows that is proportional to projected City-wide increases in residential flows.

**Sewer Extensions.** Two extensions of existing gravity sewers along Mill Street and Hess Street are proposed to serve potential in-fill developments near these existing roadways. These two sewer extensions are recommended as mid-term projects to support industrial site readiness.

**Potential Major WW Flow Contributors.** Large-scale industrial developments may contribute high-enough flows to require larger sewer lines and a higher capacity at the Demers PS. To support industrial site readiness, an analysis was conducted to identify the potential improvements needed to serve major developments in either of 3 large undeveloped areas (a North, South and East Area). The analysis assumed an average WW flow of 1.0 MGD would be added with a peaking factor.

A new parallel sewer and a major expansion of the Demers PS would be needed to serve a major WW contributor in each alternative area. Either the North Area, east of Berg Drive, or the South Area, east of Demers Dive, would be preferred sites for major users based on our estimates of probable costs for collection system improvements. The East Area across Highway 26 would cost more to serve.

**Demers PS.** Given the age and condition of the Demers PS, the City should plan to renovate the facility over the next 3 to 5 years as part of an ongoing major maintenance and repair program. The City should also plan to replace the PS either in 16-20 years or when additional capacity is needed to serve industrial development, whichever occurs first.

The replacement facility should be designed to accommodate phased expansions. This design approach would support industrial site readiness for developments with differing WW flow contributions. Future expansions of the Demers PS will also necessitate an increase in the size of the PS force main to accommodate the higher pumping rate.

**Golf Course PS.** This second PS serves a residential area outside the Industrial Park. However, the facility pumps flows into the sewer system that serves the Industrial Park and is tributary to the Demers PS. A replacement Golf Course PS with increased capacity is planned to handle flows from the future Willowbrook residential development. The sewers in the Industrial Park and the Demers PS have sufficient capacity to handle flows from the replacement Golf Course PS. Therefore, the PS replacement is not projected to significantly impact industrial site readiness.

**Sewer Service to Undeveloped Airport Area.** Due to local topography, a separate collection system with a new PS and force main would be required to serve land to the northwest of the airport. It may also be feasible to extend gravity sewer service from this separate northwest collection system to the land immediately northeast of the airport. Alternatively, the land northeast of the airport may require another new PS and force main for WW service.

*S.4.4 North Wastewater Treatment Plant (NWWTP)*

The NWWTP treats all WW flows from the Industrial Park Collection System and currently treats a portion of the flows from the City's Main Collection System. The rest of the Main Collection System flows are treated at the City's South WWTP. The 2017 WWMP recommends the City maintain both the North and South plants in service, partly because they are both strategically located to serve proposed and potential developments.

To address deficiencies and maintain industrial site readiness, the 2017 WWMP recommends phased improvements to the NWWTP. The proposed improvements would provide reliable service at the plant's current capacity for another 20 years and accommodate potential expansions to serve future industrial growth.

The recommended plan for the NWWTP would consist of the following proposed/potential phases:

- **Phase 1a Retrofit (Complete within 3 to 5 years, maintain existing capacity):**

  Replace the clarifier, disinfection system, pumps, and related components.

  ***Alternate Phase 1a:*** *The City may implement a scaled-back upgrade intended solely to provide weather protection for the clarifier and pumps and thereby allow their operation throughout the entire year.*

- **Phase 1b Retrofit** (**Complete in 11-15 years, maintain existing capacity):**

  Construct headworks for preliminary treatment; convert half of the existing lagoons into a higher-rate, lagoon system; and add an aerobic digester tank for biosolids treatment.

  Purchase additional farmland and expand irrigation capabilities to offset the loss of farmland in the airport area due to development.

- **Phase 2 Retrofit/Expansion (Timing and scope dependent on development):**

  Convert the other half of the existing lagoons to a parallel, higher-rate lagoon system and expand other treatment processes to provide a total 1.0-MGD capacity.

  Double the effluent storage volume, purchase additional farmland, and install additional irrigation systems to expand effluent recycling capacity.

- **Phase 3 Expansion (Timing and scope dependent on development):**

  Construct a separate 0.5-MGD lagoon system and other treatment processes on adjacent land to expand total treatment capacity to 1.5 MGD.

  Add effluent storage volume, purchase additional farmland, and install additional irrigation systems to expand effluent recycling capacity.

*S.4.5 Summary of Proposed/Potential WW Improvements*

Table ES-3 summarizes the WW facilities improvements proposed to support industrial site readiness for potential developments and lists planning-level estimates of probable project costs.

**Table ES-3**
**Proposed WW Facilities Improvements**
**(Costs in December 2016 Dollars)**

| Project Description | Probable Project Cost |
|---|---|
| **Industrial Park Sewer Extensions (6-10 years)**<br>8" Sewers in Hess and Mill Streets | **$629,000** |
| **Potential Sewer for Major Users – North Area Alternative** (1)<br>18" Berg Drive Parallel Sewer (development dependent) | **$907,000** |
| **Industrial Park PS and Force Main Improvements**<br>Demers PS Renovation – No Expansion (within 5 years)<br>Demers PS Replacement – Expanded Capacity (2) (16-20 years)<br>Demers Force Main Replacement – 8" Pressure Pipe | **$3,470,000** |
| **Northwest Area PS and Force Main** (3)<br>New separate PS with force main extending to NWWTP<br>Timing, scope and locations are development dependent<br>Assume same capacity as replacement Demers PS for planning purposes | **$2,270,000** |
| **North WWTP Renovation & Effluent Recycling Improvements**<br>Phase 1a – Replace clarifier, disinfection system, pumps, etc.<br>Phase 1b – Retrofit to Maintain 0.5 MGD Capacity<br>Farmland Acquisition, Effluent Transmission Line & Irrigation System | **$11,810,000** |
| **North WWTP & Effluent Recycling Expansions**<br>Phase 2 – Retrofit and Expansion to 1.0 MGD (4)<br>Phase 3 – Construct 0.5-MGD Module; Expand Capacity to 1.5 MGD (4) | **$56,485,000** |

**Notes:**

(1) Potential North Area alternative shown for industrial site readiness planning; project timing and alignment would depend on when and where developments for major users occur.

(2) Demers PS expansion and actual capacity would be development dependent.

(3) Actual project scope and capacity would depend on development patterns and growth rates in area northwest of airport.

(3) Alternate Phase 1a with reduced scope may be implemented instead of full Phase 1a.

(4) Probable costs include treatment capacity, storage ponds, additional farmland, irrigation systems, and effluent transmission line to farmland.

# CHAPTER 1
# INTRODUCTION

## 1.1 BACKGROUND

The City of Madras Airport and Industrial Center is located at the north end of the City and contains 780 acres of land zoned for airport and industrial uses. The industrial lands within the Center, referred to in this study as the Industrial Park, are a critical part of the City's economy and the ongoing development of the Park is a priority for the community.

The Industrial Park is partially developed and those portions of the Park with developments are currently served by a multi-modal transportation system that provides direct highway, rail and airport access. These developed areas also include centralized infrastructure for potable water, sewer and dry utilities services.

## 1.2 REPORT PURPOSE AND SCOPE

The Infrastructure Finance Authority (IFA) awarded a grant to the City that requires the preparation of an Industrial Site Readiness Report, or Plan (ISRP). The purpose of the ISRP is to address the infrastructure improvements needed to support the further development of the Industrial Park.

The scope of this ISRP generally consists of the following main tasks.

1. Prepare a rail feasibility study to develop service concept alternatives including spur extensions and other track options to route rail cars through an expanded industrial park. Evaluate phased implementation of rail improvements.
2. Develop a concept plan for roadway service and access requirements in coordination with City's Transportation System Plan Update.
3. Address requirements for stormwater management planning.
4. Contact dry utilities and water supplier to identify their current Industrial Park infrastructure and their requirements for serving future site developments and expansions.
5. Address sewer, pump station, and wastewater (WW) treatment requirements for potential industrial site developments and identify the recommended WW improvements according to the recent master planning effort.
6. Prepare ISRP to address the requirements for infrastructure improvements with opinions of probable project costs.

The preparation of this ISRP was approved and authorized by the Madras City Council on December 9, 2014.

## 1.3 PROBABLE PROJECT COSTS

We have developed preliminary estimates of probable costs for this ISRP from information available at the time the study was prepared. The cost information used to generate the estimates has been updated to December 2016 using the Engineering News-Record Construction Cost Index of 10,530.

The probable construction costs developed for this study are planning-level estimates and their level of detail falls within Estimate Class 4 as defined by the Association for the Advancement of Cost Engineering International (Recommended Practice #18R-97, Rev. March 2016). Consistent with this estimate class, the accuracy is anticipated to be within +35% to –20% of the actual cost.

Allowances for contractor overhead and profit, mobilization/demobilization, and construction contingencies are included to provide conservative estimates. A nonconstruction cost factor was also applied to each project to include an allowance for planning, engineering, and administrative costs. Because the estimates are planning level, we used a 25% factor for construction contingences and a 35% factor for nonconstruction costs.

Actual project costs will depend on the scope identified during project development. Actual construction costs will also be affected by labor and material costs and competitive market conditions at the time bids are solicited, as well as by specific site conditions and other factors. Consequently, the final construction costs will vary from our estimates.

# CHAPTER 2
# RAILROAD, ROADWAY AND STORMWATER SERVICES

## 2.1 RAILROAD SERVICE

### *2.1.1 Rail Feasibility Study*

A Rail Feasibility Study was conducted as part of this ISRP to evaluate methods for improving access to rail service in the Industrial Park. The study reviewed existing rail service, evaluated potential improvements, and presented an implementation plan for the proposed improvements. This section summarizes the conclusions of the Rail Feasibility Study and Appendix A presents the full report that resulted from the study.

An evaluation of the existing rail spurs was not in the scope of either the ISRP or the Rail Feasibility Study. West Rail Construction (WRC) Company previously inspected the lead rail spurs in October 2011 and proposed upgrades to rehabilitate the existing trackage. These previous proposals and the associated estimates of probable construction costs were assumed to be reliable and therefore, were incorporated into the feasibility study. A copy of the study by WRC Company is included as an appendix to the Rail Feasibility Study described above.

### *2.1.2 Existing Railroad Service*

The Industrial Park includes a rail spur that branches into a series of tracks serving multiple sites that connects directly to the main rail line running through Madras. This spur system consists of approximately 3.2 miles of track. A 0.4-mile, rail siding also extends along the east side of the main rail line within the Industrial Park to serve the site occupied by the Cenex grain facility. The main line is single track through Madras except for a 0.5-mile siding within the Industrial Park that does not directly serve any local site(s). Figure 2-1 presents a map showing the Industrial Park rail lines, as well as the main line.

The Burlington Northern Santa Fe Railroad (BNSF) provides freight service on the main line, spur system and Cenex siding. However, rail customers (users) in the Park also have access to the Union Pacific Railroad (UP) network through trackage rights.

The right of way (R-O-W) for the main line through Madras, commonly referred to as the Oregon Trunk Line, is actually owned by the UP. However, the line is operated by the BNSF as a result of a 1910 agreement between the predecessor railroad companies. The primary spur through the industrial park is owned by UP and the short spurs off that main track are owned by individual industries, except that the spur to Wilbur-Ellis is owned by the City of Madras.

### *2.1.3 Existing System Limitations*

Key limitations to the existing spur system with regard to local and through rail service are summarized below.

- Portions of the rail spur system are in deteriorated condition and in need of remedial work.
- The spur system does not provide the pull-through service preferred by railroads, but instead requires forward-and-back service that is more time consuming and less efficient.
- The connection of the spur system to the main line is not a full wye and only provides access from the south.
- BNSF reports that main-line rail service combined with local service creates congestion through Madras.

The limitations of the existing spur system are important factors in addressing industrial site readiness and were the main consideration in conducting the Rail Feasibility Study.

### *2.1.4 BNSF Plans for Local Rail Improvements*

As part of the feasibility study, input was obtained from BNSF regarding rail service in Madras. BNSF reported that the company has plans to perform work on trackage in the Industrial-Park area. The improvements BNSF is considering are described below and shown in Figure 2-2A. BNSF had not established a schedule for the improvements at the time the feasibility study was prepared.

**Spur Wye Connection**. BNSF would like to produce a full wye junction between the spur and the main line by installing a connecting track to provide spur access from the north. The curvature of the wye concept shown in Figure 2-2A has a tighter radius than is allowed under current railroad standards. Therefore, it is very likely BNSF and UP would require a longer radius (wider curve) that would involve a different wye-track layout than shown.

**Double Track Main Line.** BNSF's regional and national planning departments are considering the construction of a section of double track about 3.1 miles long in the area of the Industrial Park. This new track would extend from the north side of the Willow Creek trestle to NE Cherry Lane, east of the Industrial Park, and would generally serve as a passing track for through trains. This siding could also expedite through-traffic while BNSF provides local freight-car delivery and pickup service.

The double-track improvement under consideration by BNSF would be divided into a North Siding and South Siding. A universal crossover would be installed where these two segments would meet (approximately 1,000 feet north of the overpass for U.S. Highway 26 – see Figure 2-2A). Due to space constraints in the main-line R-O-W, the south double-track siding may impact both the existing spur connection to the main line and the nearby rail bridge over the canal. A respacing of the main line tracks and the existing Cenex siding appears feasible as a way to reduce or avoid impacts on the spur connection.

### *2.1.5 Industrial Park Rail Service Improvements*

**General.** The Rail Feasibility Study identified and evaluated the following two main approaches to improving and expanding rail service in the Industrial Park.

- Construct a dedicated, Industrial-Park siding along the main line.
- Construct a looped spur system.

The intent of each approach would be to develop a system that would conform to current railroad standards and attract rail-served distribution centers and/or bulk commodity customers. To support this goal, the preferred system layout would accommodate a reload facility in which freight could be transferred from truck to rail service and vice versa.

The following subsections describe each of these options, plus a third potential approach involving extensions of the existing spur tracks.

**Industrial-Park Siding.** A siding that parallels the main line would be less difficult to implement for direct service and/or a reload facility than a dead-end spur or a looped spur. This would be particularly true if BNSF constructs the planned double-track upgrade described above.

It might also be feasible to reconnect the existing spur to an Industrial-Park siding and allow local train service to spot cars without entering the main line. This could ease congestion on the main line and make providing local service more attractive to BNSF.

The main portion of a siding for local service would likely be located outside the UP/BNSF main line R-O-W. However, the existing R-O-W in the Madras area is adequate for both the double-track main line BNSF is contemplating and a separate Industrial-Park siding.

A limitation to a parallel siding is direct service would only be available to parcels adjacent to the main line. Therefore, the development of a reload facility along the siding would be crucial to the expansion of rail service to other parcels in the Industrial Park that are remote from the main line.

**Looped Spur System.** A looped spur system would provide pull-through service to improve efficiency and could extend direct rail service to parcels of land not located adjacent to the main line. This configuration would allow high-volume users to engage the railroad for the transport of commodities from origin to destination.

Key constraints in the development of a loop configuration are listed below:

- The need to enough space to meet railroad standards for a minimum radius of curvature (764 feet);
- The need for sufficiently mild slopes over the site to support local rail service; and
- The need to coordinate the spur layout with the layout of collector streets and potential development parcels.

The feasibility study evaluated the potential for constructing a looped spur entirely within the current UGB as a northern extension of the existing spur system. This rail loop does not appear to be feasible and is not a recommended option due to the following disadvantages.

- Overall space constraints between the airport and U.S. Highway 26 would limit the length of the loop. This means that any spur tracks within the main loop could not meet the minimum curvature standard. The limitation of loop length would also restrict the length of any unit train that a bulk shipper could use making it less attractive to potential users.
- The spur loop would be about a mile from the main line, at the end of the existing spur system. As a result, improvements to the existing spur trackage would be required and, even with such improvements, service to the loop would be time consuming for BNSF.
- It would be difficult to coordinate the loop layout with the layout of collector streets and potential development parcels. The current plan for collector streets at the north end of the Industrial Park would need to be substantially revised to accommodate the spur loop.

The feasibility study identified other potential locations for a spur loop east of Highway 26 and north of the main rail line. Figure 2-2A shows the preferred, conceptual loop layout identified in the feasibility study for this east area (Alternative Loop Track C). The main advantages to this layout relative to other alternatives identified in the study is the loop track would be relatively close to the main line and the lengthwise orientation of the loop generally follows existing topography.

A potential spur loop system east of Highway 26 would be almost entirely outside the existing Urban Growth Boundary (UGB) on County land that is zoned for Exclusive Farm Use (EFU). A rail loop would probably be extended into this area only after it has been brought within the UGB and rezoned as Industrial land.

Rail track and appurtenant facilities proposed for EFU land would require an Administrative Review permit. The proposal would also need to comply with the State Transportation Planning Rule as it pertains to rural-zoned lands.

**Spur Extensions and System Rehabilitation.** Figure 2-2A shows two potential rail spur extensions (in solid red) that can be installed in conjunction with the spur system upgrades identified in the 2011 WRC Study. These extensions would begin at the northern ends of the existing primary Industrial Park spur and the Wilbur Ellis spur. Such northerly spur extensions would be a viable approach to serving future north-end industrial development and would cost less than the looped spur concept presented above.

**Alternate Spur-Extension Concept.** Harris Group Inc. has also developed a concept for track extensions at the north end of the spur system on behalf of a potential industrial park user. This alternative spur concept from Harris Group was developed separately from the Rail Feasibility Study and is reproduced in Figure 2-2B.

In addition to potential spur extensions, the Harris Group concept also shows a potential future looped spur that would extend beyond the current UGB at the north end of the Industrial Park. Although the loop shown in Figure 2-2B would meet the minimum curvature standard, the other disadvantages previously described for a north end loop would apply to this concept (distance from the main line and development/infrastructure siting constraints).

### *2.1.6 Summary of Proposed Rail Service Improvements*

Table 2-1 (following page) summarizes the rail system improvements identified to support industrial site readiness and lists the planning-level estimates of probable costs. The general basis for the development of the estimates is described in Chapter One of this report and breakdowns of the estimates are presented in the Rail Feasibility Study (Appendix A).

The estimate of probable cost for Project 3 under Phase 1 is based on the spur-extension concept shown in Figure 2-2A and costs would differ for the alternative concept shown in Figure 2-2B. Phase 1, Project 3, also includes the estimated probable costs for rehabilitating the existing spur tracks identified in the 2011 WRC Study.

The Phase 1 projects listed in Table 2-1 would more directly impact current Industrial Park rail service and are considered a higher priority for planning purposes. The actual priorities assigned to the proposed work are subject to future discussions between BNSF and the City.

The identified rail projects will also need to be reevaluated when actual proposals for developments are submitted to the City and when an Industrial Park expansion is planned. Projects that improve rail service could be eligible for funding under the *Connect*Oregon program.

The two phases of the BNSF double-track siding are listed in Table 2-1 as recommended improvements because they would potentially benefit rail service to the Industrial Park, including future expansions of the Park to the east-northeast. The BNSF siding would benefit Industrial Park service by allowing BNSF to route through trains around any local train service that must switch to and from the main track. This would improve operating efficiencies.

**Table 2-1**
**Summary of Proposed Rail Improvements**
**for Industrial Park (Costs in December 2016 Dollars)**

**Phase 1 Improvements**

| | Project Description | Probable Project Cost (1) |
|---|---|---|
| 1. | BNSF Siding South Segment (2) | $10,000,000 |
| 2. | Madras Spur System Wye | $1,700,000 |
| 3. | Spur Extensions/Exist Rail Rehabilitation | $4,100,000 |
| **Total – Phase 1 Probable Project Costs** | | **$15,800,000** |

**Phase 2 Improvements**

| | Project Description | Probable Project Cost (1) |
|---|---|---|
| 1. | BNSF Siding North Segment (2) | $13,400,000 |
| 2. | Loop Track C (3) | $6,100,000 |
| 3. | BNSF Universal Crossover (2) | $2,100,000 |
| **Total – Phase 2 Probable Project Costs** | | **$21,600,000** |

(1) Project cost includes a 25% construction contingency and a 35% allowance for nonconstruction costs (engineering and administrative).

(2) BNSF project that supports more efficient Industrial Park rail service. BNSF to determine schedule and scope.

(3) Potential improvements shown for planning bulk rail service to support industrial site readiness.

(4) Timing would depend on when developments for major users occur.

## 2.2 ROADWAY ACCESS AND CONNECTIVITY

### *2.2.1 Existing Roadways*

The partially-developed areas in the Industrial Park are served by a limited network of minor collector streets and local industrial roadways. U.S. Highway 26 bisects the Industrial Park and provides direct access to and from this network. Figure 2-3 shows the existing roadway network, with the exception of Depot Road, which is a short connector located immediately to the south of the area shown and to the east of the BNSF main line railroad.

The existing roads lie almost entirely on the west side of Highway 26, with only Cherry Lane extending to the east. Direct Highway 26 access is currently provided by four intersections (Cherry Lane, Hess Street, Earl Street, and Depot Road).

The existing road network generally provides adequate connectivity to serve current developments within the Industrial Park. However, many of the roads and intersections do not meet current City or ODOT standards. The City plans to require improvements to existing roadways that do not meet City standards as part of in-fill developments that occur along these rights of way. These improvements to existing industrial roadways that are driven by City development standards are not covered in this report.

*2.2.2 Descriptions of Proposed Roadway Improvements*

**General.** Improved street access and connectivity will be necessary to support industrial site readiness and maintain a safe transportation network as development occurs. Intersection improvements along Highway 26 and new connectors will be needed in the Park to provide suitable user access for both shippers and employees. Roadway extensions and additions will also be necessary to serve Industrial Park developments beyond the current roadway network.

**Estimates of Probable Costs.** Table 2-2 (following page) lists the proposed roadway improvements and summarizes the planning-level estimates of probable project costs. We generated this list of improvements in coordination with the City and Kittleson & Associates, the consultant currently preparing an update to the Madras Transportation System Plan (TSP). The cost estimates were obtained from a draft of the TSP update provided by Kittleson & Associates. The general basis for the development of the estimates is described in Chapter One of this report.

The proposed improvements fall into three categories as described below.

1. Category 1 includes projects of higher priority that will enhance accessibility and safety under both current and future conditions. These proposed projects should be implemented as funding becomes available independent of development proposals.
2. Category 2 involves projects intended to support improved connectivity as future development occurs within the current Industrial Park. These projects are dependent on future development proposals and are considered medium priority.
3. Category 3 consists of projects identified to improve access and connectivity for the following areas:

   - the segment of the Industrial Park east of Highway 26, and
   - land adjacent to the airport, north and west of the UGB.

   These projects are also dependent on future development proposals and are likely to be of lower priority than projects in Categories 1 and 2. The projects north and west of the UGB would only be City projects once an UGB expansion occurred.

The following paragraphs briefly describe the intersection and roadway projects. Figure 2-3 identifies their currently proposed/planned locations.

**U.S. Highway 26 Intersections.**

- **Project 1 (Category 1) – U.S. 26/Cherry Lane Realignment**. This project will eliminate the intersection skew by adjusting the alignment of Cherry Lane on the east side of Highway 26. The result will be a straight-through orientation for Cherry Lane, perpendicular to Highway 26 on both sides.

  The City limits and UGB currently extend along the south side of Cherry Lane, east of Highway 26. Therefore, an adjustment of these boundaries would be necessary for this improvement to be a City project.

- **Project 2 (Category 1) – U.S. 26/Earl Street Realignment**. This project will shift the alignment of Earl Street on the west side of Highway 26 to provide a "T" intersection with Earl Street perpendicular to Highway 26 according to ODOT standards. An east leg would be added to this intersection as part of the easterly Earl Street extension (Project 11).

- **Project 3 (Category 2) – U.S. 26/Depot Road Realignment.** This project will upgrade the existing intersection and the adjacent frontage roads. The improvement will likely be driven by adjacent, future industrial development on the east side of Highway or redevelopment of land to the west, between Depot Road and the railroad main line.

**Table 2-2**
**Summary of Proposed Roadway Improvements**
**for Industrial Park (Costs in December 2016 Dollars)**

**Category 1 Improvements** (2)

| Project No. | Project Description | Probable Project Cost (1) |
|---|---|---|
| 1. | U.S. 26/Cherry Lane Intersection Realignment | $500,000 |
| 2. | U.S. 26/Earl Street Intersection Realignment | $750,000 |
| **Total – Category 1 Probable Project Costs** | | **$1,250,000** |

**Category 2 Improvements** (2)

| Project No. | Project Description | Probable Project Cost (1) |
|---|---|---|
| 3. | U.S. 26/Depot Road Intersection Realignment | $500,000 |
| 4. | U.S. 26/Future Industrial Connector Intersection | $750,000 |
| 6. | Demers Drive Extension | $2,090,000 |
| 7. | Paul Jasa Way Extension | $1,060,000 |
| 8. | Jersey Lane Extension | $1,240,000 |
| 9. | Other North Area Extensions | $3,570,000 |
| 10. | Berg Drive/U.S. 26 Industrial Connector | $1,510,000 |
| **Total – Category 2 Probable Project Costs** | | **$10,720,000** |

**Category 3 Improvements** (2)

| Project No. | Project Description | Probable Project Cost (1) |
|---|---|---|
| 5. | U.S. 26/Dogwood Lane Intersection Realignment | $1,000,000 |
| 11. | Earl Street Eastside Extension | $2,240,000 |
| 12. | Eastside Frontage Road | $1,580,000 |
| 13. | Other Eastside Connector(s) | $730,000 |
| 14. | Extensions of Berg and Andrews Drives | $3,880,000 |
| 15. | Daimler Road Extension to Dogwood | $8,000,000 |
| **Total – Category 3 Probable Project Costs** | | **$17,430,000** |

(1) Project cost includes a 25% construction contingency and a 35% allowance for nonconstruction costs (engineering and administrative).

(2) Categories 1, 2, and 3 generally represent higher, medium and lower project priorities, respectively. Project timing depends on growth rate and patterns of development. Therefore, priorities may shift.

- **Project 4 (Category 2) – U.S. 26/Future Industrial Connector**. This improvement would be constructed in conjunction with the connector proposed between Berg Drive and Highway 26 (Project 10). The intersection work is identified as a separate project because it is located in the ODOT right of way.

  Construction of the connector and Highway 26 intersection will be driven by future industrial development in the north area of the Park. The proposed roadway alignment is immediately inside the north UGB boundary, since this offers the greatest flexibility in land development within the UGB, between the airport and Highway 26.

- **Project 5 (Category 3) – U.S. 26/Dogwood Lane Realignment**. This project will adjust the alignment of Dogwood Lane on both sides of Highway 26 to eliminate the intersection skew. The result will be a perpendicular orientation for Dogwood Lane at Highway 26.

**Local Streets (Industrial Roadways, Collectors and other streets).**

- **Project 6 (Category 2) – Demers Drive Extension (2,720 LF).** This project will construct a new industrial connector in the existing right of way from Cherry Lane south to Adler Street. The existing Demers wastewater pump station (PS) is apparently located near the middle of the existing right of way. Therefore, either the road right of way would need to be adjusted in the area of the PS or the existing PS would need to be replaced with an adjacent facility. A PS replacement is proposed in 16-20 years (see Chapter 4).

- **Project 7 (Category 2) – Paul Jasa Way Extension (1,380 LF).** This project will construct an industrial connector west from Mill Street to the future Demers Drive (Project 6). A portion of the right-of-way exists for this extension adjacent to Mill Street. However, a new right of way would need to be dedicated for most of the extension. Paul Jasa Way currently extends for a short distance east from Mill Street, but that street is not aligned with the right of way on the west side of Mill Street.

- **Project 8 (Category 2) – Jersey Lane Extension (1,610 LF).** This project will construct a new industrial connector in a new right of way between Mill Street and Berg Drive.

- **Project 9 (Category 2) – Other North Area Extensions (4,650 LF).** This project would involve northward extensions of both Mill Street and Andrews Drive, plus another connector from Andrews to Berg Drive. Mill Street would terminate at Andrews Drive and Andrews would extend to the future connector included as Project 10.

  Dedicated rights of way have been established for most of these roadway extensions; however the actual locations of these roads would depend on development patterns and may differ substantially from what is shown in Figure 2-3. The estimated probable project cost for the extensions are based on the current right-of-way alignments.

- **Project 10 (Category 2) – Berg Drive/U.S. 26 Industrial Connector (1,960 LF).** This project would extend an east-west roadway in a new right of way from Berg Drive to Highway 26 to improve connectivity at the north end of the Industrial Park. The project includes a short extension of Berg Drive to the north to reach the assumed east-west alignment.

  The proposed roadway alignment is immediately south of the UGB to offer the greatest flexibility in developing land inside the UGB, between the airport and Highway 26. This project is proposed in conjunction with Project 4 described above.

- **Projects 11, 12 & 13 (Category 3) – Earl Street, Frontage Road and Other Eastside Connectors (5,270 LF).** These projects would involve the construction of new industrial roadways in new rights of way east of Highway 26 and within the current UGB. The alignments shown in Figure 2-3 were developed for the purposes of initial planning and cost estimating. Actual locations of these roads would depend on development patterns and may differ substantially from what is shown.

  Currently, the UGB along Cherry Lane, east of Highway 26, is to the south of the right of way and Cherry Lane is a county road. Therefore, intersections with Cherry Lane would be in the county right of way unless the UGB were adjusted.

- **Project 14 (Category 3) – Extensions of Berg and Andrews Drives (4,500 LF).** These northerly extensions would improve connectivity to existing Dogwood Lane. This project would improve access for both the Industrial Park and future airport developments.

- **Project 15 (Category 3) – Daimler Road Extension (9,300 LF).** This project would extend a new street in a new right of way from the end of the existing Daimler access road to Dogwood Lane. The intent of this project is to provide connectivity for developments on the northwest side of the airport. The actual road alignment would depend on future development patterns and may differ significantly from what is shown in Figure 2-3.

## 2.3 STORMWATER MANAGEMENT

### *2.3.1 General*

Existing storm drains in the Industrial Park range from 12 inches to 24 inches in diameter and are shown in Figure 2-4. An outfall is located at the northeast corner of Desert Peaks Golf Course where stormwater discharges to an open field and infiltrates into the ground or evaporates.

The Industrial Park is relatively flat and no receiving stream or drainage channel is available for a discharge. Therefore, future developments will need to install on-site stormwater control systems according to Best Management Practices (BMPs), current City Standards, and the City's current Storm Water Pollution Control Plan for the airport.

### *2.3.2 On-Site Stormwater Control/Treatment Systems*

BMPs must be designed to provide stormwater flow controls and either pollution source reduction or treatment of polluted stormwater. BMPs include constructed facilities, maintenance procedures, activity schedules, prohibitions on certain practices, and administrative practices that prevent adverse impacts to the environment.

Flow controls are generally implemented using constructed infiltration, detention or evaporation facilities designed to limit discharge rates and volumes or to eliminate discharge to receiving streams. Since land development and redevelopment tend to increase stormwater runoff, flow control BMPs are usually necessary to comply with design criteria regarding stormwater discharges. Flow control BMPs may also function as treatment facilities.

Source reduction BMPs are aimed to reduce the amount of pollution exposed or introduced to stormwater at sites where potential pollutants are present in significant amounts. In developing BMPs, regulators have recognized the importance of source control as a means for protecting water quality. Thus, an emphasis has been placed on preventing pollutants from getting into stormwater and limiting the amount of runoff that is discharged from sites that handle or store potential contaminants.

Separate stormwater treatment facilities should be provided to augment flow control and source reduction BMPs that are not adequate to maintain compliance with applicable water quality standards. At this time separate treatment facilities will generally only be applicable at a construction or industrial site that must comply with an NPDES permit issued by the Oregon Department of Environmental Quality.

### *2.3.3 Stormwater Control Project Costs*

Projects for stormwater facilities will be a segment of each development project. The scope and schedule of the stormwater project will need to be developed based on actual development plans. Each site specific stormwater improvement will include a stormwater management plan, design development of the proposed BMPs, installation, continuing facility maintenance and stormwater control practices, and associated project administration.

Costs will be borne by the industrial site developer(s) and/or user(s) for on-site stormwater improvements and any offsite conveyance systems that may be required.

NOV 2017


## LEGEND

- UGB
- CITY LIMITS
- MAIN LINE RAILROAD
- RAIL SPUR SYSTEM
- CENEX RAIL SIDING
- RAIL SPUR BRIDGE

P:\MAD (City of Madras)\MAD-06 (ISRP)\MAD06 - DWGS\SHEETS\ MAD06-Figure 2-1 Existing Railroad.dwg


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EXISTING INDUSTRIAL PARK RAILROAD

# INDUSTRIAL SITE READINESS PLAN

CITY OF MADRAS, OR

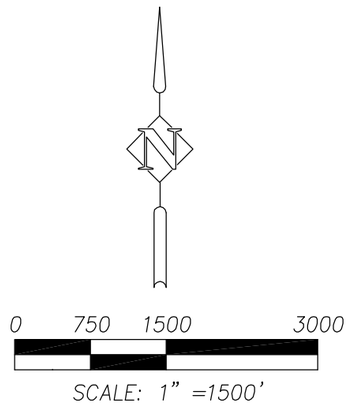
SHEET NO. FIG 2-1

JOB NO. MAD-06

NOV 2017

## LEGEND

- UGB
- CITY LIMITS
- EXISTING BNSF MAINLINE RAILROAD
- INDUSTRIAL PARK SPUR SYSTEM (EXISTING & PROPOSED)
- POTENTIAL FUTURE LOOPED SPUR SYSTEM
- POTENTIAL BNSF SIDING (DOUBLE TRACK FOR PASSING)

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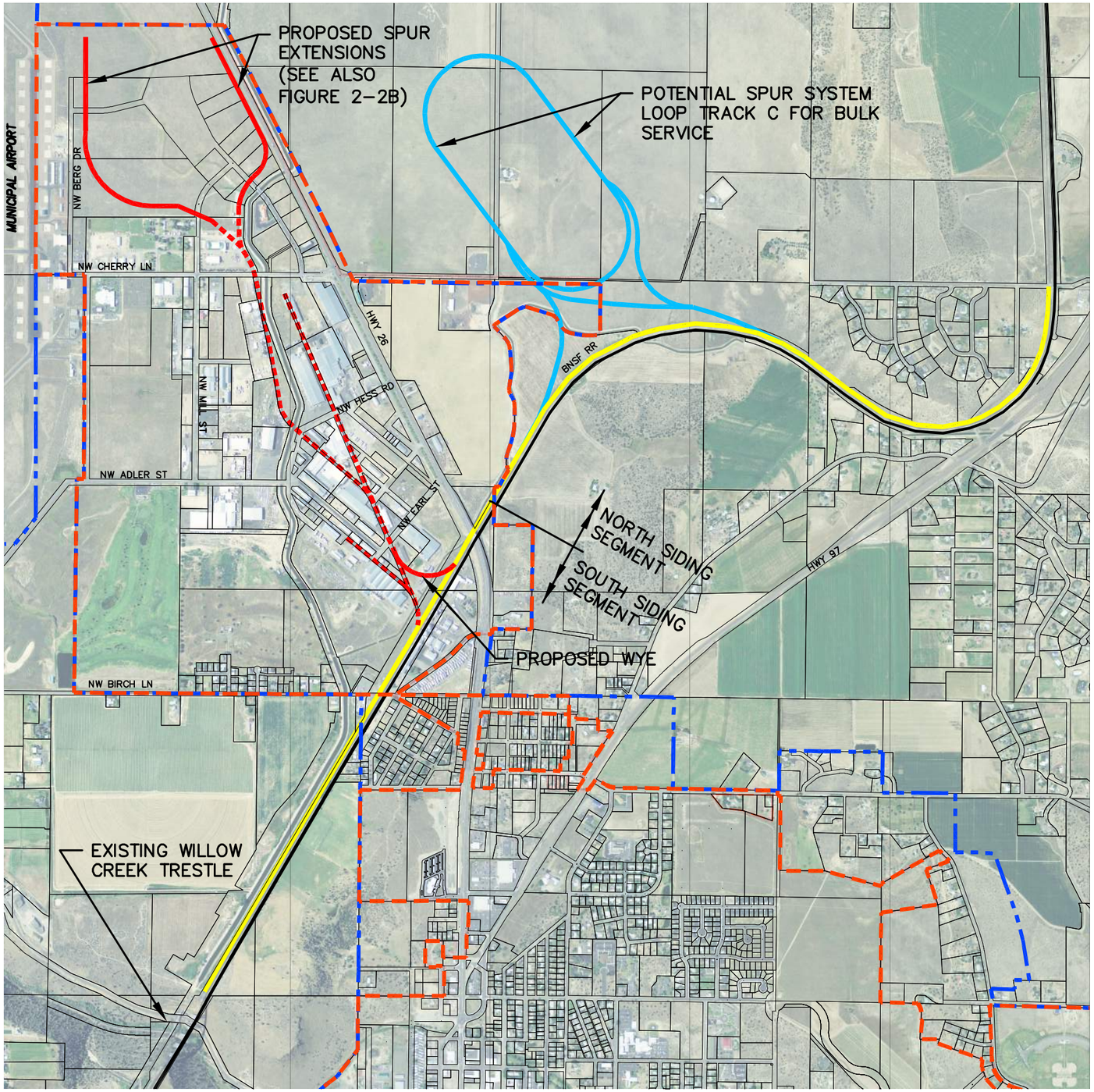



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PROPOSED/POTENTIAL RAILROAD IMPROVEMENTS

# INDUSTRIAL SITE READINESS PLAN

CITY OF MADRAS, OR

SHEET NO. FIG 2-2A

JOB NO. MAD-06

P:\MAD (City of Madras)\MAD-06 (ISRP)\MAD06 - DWGS\SHEETS\ MAD06-Figure 2-2 Proposed Railroad Improvements.dwg

NOV 2017

0 200 400 800

SCALE: 1" = 400'

PH 1A

PH 1B

PH 2

PH 3

HWY 26

R765.00'

200' STORAGE TRACK

750' CONTINUING TRACK

750' STORAGE TRACK

#9 RHTO

#9 LHTO

9° 30" CURVE
603.8' RADIUS

STREET A

STREET B

STREET C

STREET D

#11 LHTO

7275 LF LOOP

DIVERT IRRIGATION LATERAL DITCH

500' SETBACK FROM BERG ROAD

NW DOGWOOD LANE

NW CHERRY LANE

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 34 35 36 37 38 39 40 41

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ALTERNATE SPUR CONCEPT FROM HARRIS GROUP

# INDUSTRIAL SITE READINESS PLAN

CITY OF MADRAS, OR

SHEET NO.

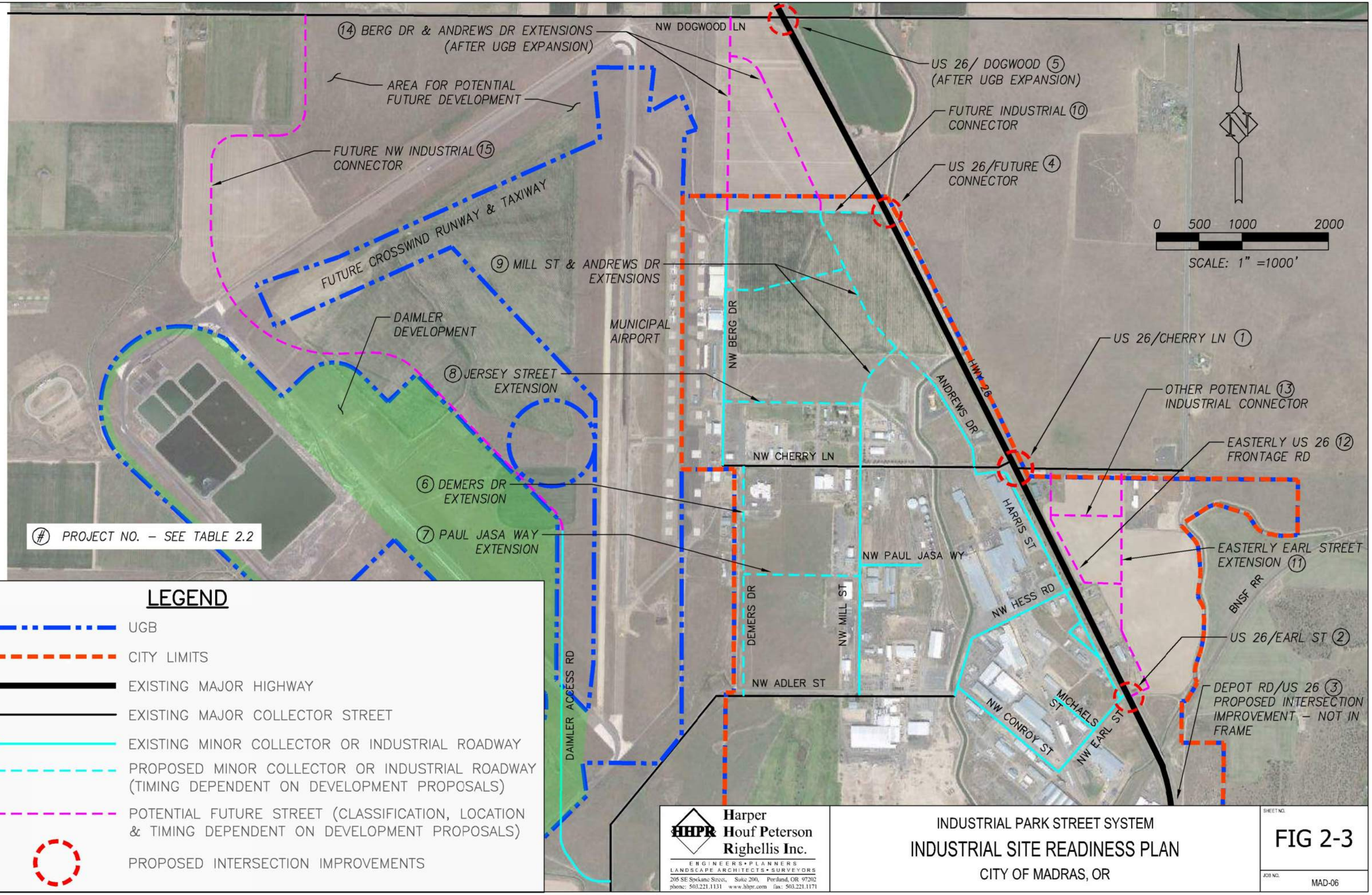
FIG 2-2B

JOB NO.

MAD-06

P:\MAD (City of Madras)\MAD-06 (ISRP)\MAD06 - DWGS\SHEETS\ MAD06-Figure 2-2 Proposed Railroad Improvements.dwg

NOV 2017





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INDUSTRIAL PARK STREET SYSTEM

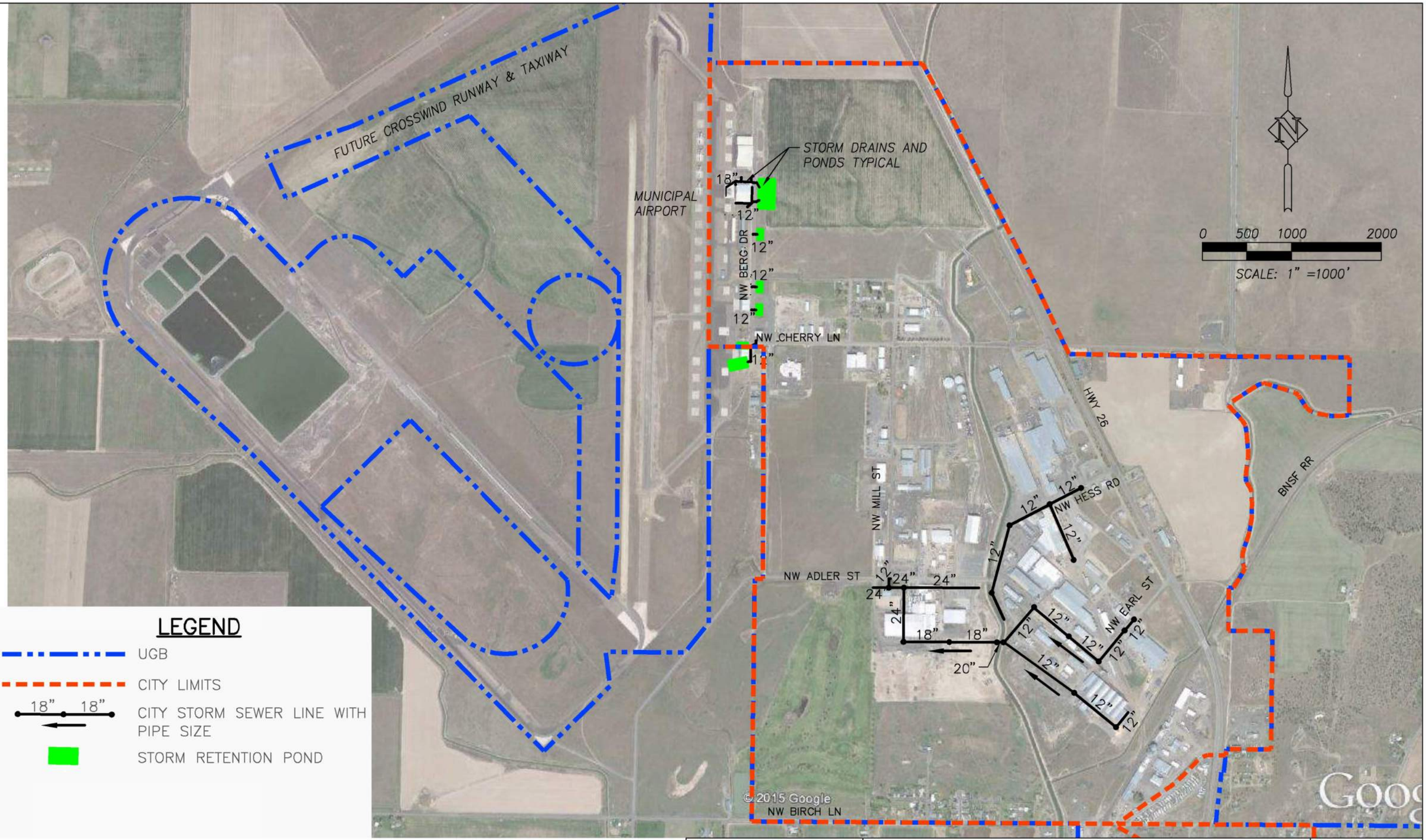
# INDUSTRIAL SITE READINESS PLAN

CITY OF MADRAS, OR

SHEET NO. FIG 2-3

JOB NO. MAD-06

NOV 2017




## LEGEND

- UGB
- CITY LIMITS
- 18" 18" — CITY STORM SEWER LINE WITH PIPE SIZE
- STORM RETENTION POND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INDUSTRIAL PARK EXISTING STORM DRAINS

# INDUSTRIAL SITE READINESS PLAN

CITY OF MADRAS, OR

SHEET NO. FIG 2-4

JOB NO. MAD-06

P:\MAD (City of Madras)\MAD-06 (ISRP)\MAD06 - DWGS\SHEETS\ MAD06-Figure 2-4 Existing Storm Drains & Ponds.dwg

# CHAPTER 3
# DRY UTILITIES AND WATER SERVICE PLANS

## 3.1 DRY UTILITIES SERVICES

### *3.1.1 Natural Gas*

Cascade Natural Gas Corporation (CNGC) provides natural gas service to Industrial Park users through the buried distribution network shown in Figure 3-1. Currently this piping network is adequate to serve the partially-developed areas of the Park. Pipeline extensions will be required to provide service to undeveloped area. Prospective commercial/industrial users would need to submit a request for gas service along with any available demand information and CNGC would then work out a service plan.

Industrial service is available to customers engaged in a process, which creates or changes raw or unfinished materials into another form or product. CNGC offers natural gas service to industrial users in either of the following two customer categories.

- Core Market Customers who purchase bundled gas services from Cascade under one tariff that includes gas supply, distribution services, and pipeline transportation services.
- Non-Core Market Customers who purchase unbundled gas services that involve the separate purchase of distribution services and gas supply/pipeline transportation services.

CNGC offers "bundled" services to most customers that combine the cost of transportation, distribution, and the natural gas itself into one price. Prospective industries will need to provide their projected demands to CNGC with a request for services. Then CNGC will work out a plan to extend and/or upgrade the existing natural gas distribution system to meet the prospective customer demands. Charges and fees to industries will be based on their usage and capacity demands.

### *3.1.2 Electrical*

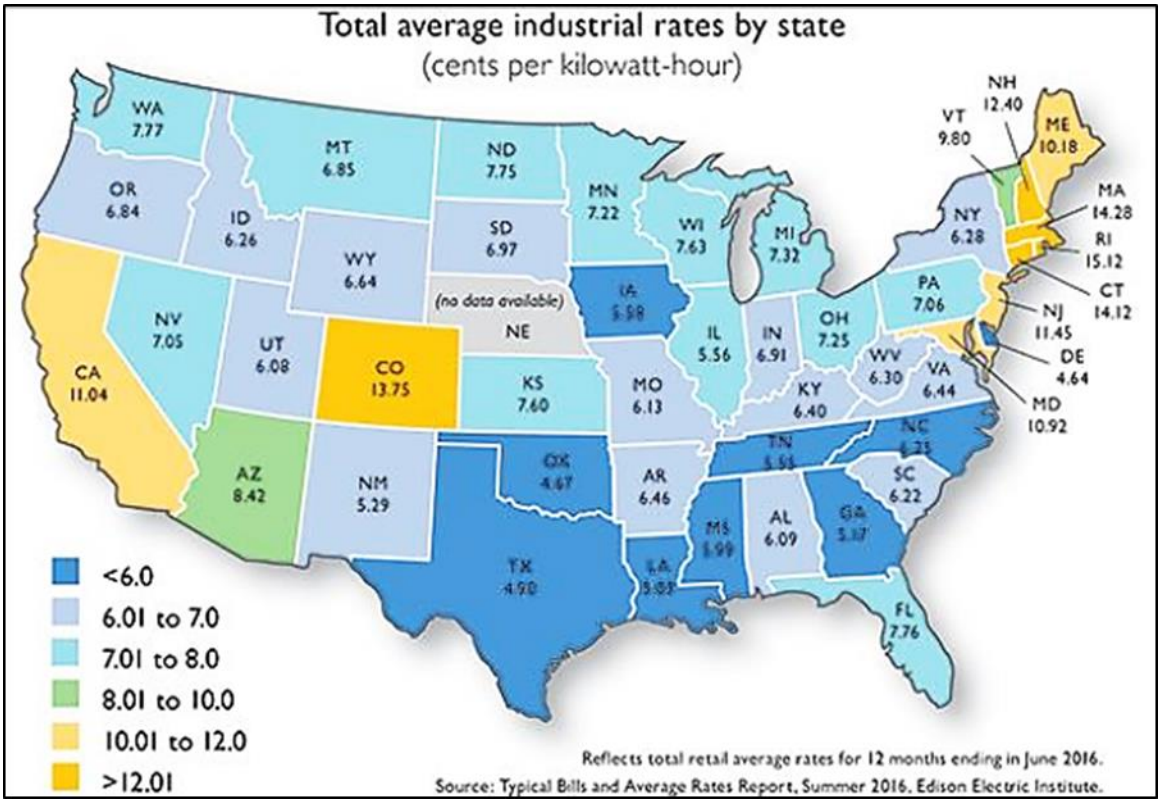
Pacific Power provides electrical service to Industrial Park users through the power distribution system shown in Figure 3-2. Currently all users within the Park are adequately served and the existing power grid could serve additional in-fill developments. However, power lines will need to be extended to serve undeveloped land in the Industrial Park and surrounding the airport.

Power utilities generally must extend service to new customers, unless the magnitude of the demand by a prospective user exceeds available or planned capacity. Service would be provided either from the existing distribution system in developed areas or by extending power lines to undeveloped areas. Pacific Power recently extended new service to the Daimler Proving Grounds on airport land west of the Industrial Park.

The Industrial Park is currently located on the westerly boundary of the Pacific Power service area in the Madras vicinity. The Central Electric Cooperative, Inc. (CEC) provides service to the City's North Wastewater Treatment Plant and surrounding rural areas from overhead power lines. As a result, either Pacific Power or CEC could potentially extend electrical service to developments that occur to the northwest and northeast of the airport (see Figure 3-1).

Prospective commercial/industrial users would need to submit a request for electrical service along with demand information to Pacific Power or, if appropriate, CEC. The utility would then work out a service plan and establish the charges for delivering electricity to the development.

In general, electrical rates are competitive in Central Oregon and could be low enough to be a potential factor in encouraging prospective industries to locate in Madras. The map below shows average 2016 industrial rates charged by investor-owned utilities for each state. The data was collected from an industrial-rate survey conducted by the Edison Electric Institute. The survey results showed that Oregon rates for the 12 months ending June 30, 2016 were significantly lower than the average rates in Washington and California, and also lower than the national average.




### *3.1.3 Telecommunications*

The Oregon Broadband Mapping Project (Broadband Mapping) documents that developed parts of the Industrial Park contain telecommunications infrastructure supporting fiber optic, DSL, and fixed wireless services. The following companies provide dedicated voice and/or broadband services to the area.

- BendBroadband
- CenturyLink
- Quantum Communications

BendBroadband is part of TDS Broadband Service, which is a subsidiary of Telephone and Data Systems headquartered in Madison, Wisconsin. BendBroadband offers broadband and telephone services for businesses through fiber connectivity and reports the availability high-capacity Ethernet services, at speeds up to 10 gigabit per second (Gbps), throughout their footprint.

CenturyLink is headquartered in Monroe, Louisiana and offers telecommunications packages suitable for large and small businesses. According to Broadband Mapping, CenturyLink provides DSL asymmetric service to the Industrial Park. CenturyLink also reports that it has obtained Federal funding to expand and support broadband services for rural customers.

Quantum is a local exchange carrier based in Redmond, Oregon and is owned by LS Networks of Portland, Oregon. Quantum provides a range of voice and high-speed data services to large-scale enterprises and other businesses, including services via fiber optic networks. LS Networks has reported that it will deploy a high-density, fiber-optic broadband network and will offer broadband plans at speeds of 1 Gbps in selected rural Oregon communities. However, currently Broadband Mapping does not show LS Networks service extending to the entire Industrial Park.

The costs of telecommunications services would depend on the types of services the user obtains and on the service provider the user selects.

## 3.2 WATER SERVICE

### *3.2.1 Existing Water System*

Deschutes Valley Water District (DVWD) provides potable water service to Industrial Park users through a network of water transmission and distribution piping. DVWD is a regional water supplier with a service area that extends along the east side of the Deschutes River Valley. The water supply, Opal Springs, is near the Crooked River and a system of water transmission mains bring the water to the Industrial Park and airport.

Figure 3-3 shows the existing water transmission and distribution lines in the Industrial Park. A 20-inch transmission main conveys water into the Industrial from the south. Distribution pipe sizes range from 6 inches to 14 inches in diameter. The Metolius Storage Tanks maintain water pressure in the Industrial Park at approximately 130 pounds per square inch (psi). Due to the magnitude of this supply pressure, water services typically include pressure reducing devices.

Existing DVWD supply, storage and transmission facilities provide surplus capacity for industrial growth. The district periodically updates its system Master Plan to identify projected needs and has an ongoing capital improvements program. Over the last 20 years, DVWD has expanded its supply and transmission capacities to meet projected demands.

### *3.2.2 Potential Water Line Extensions and Looping*

Based on input from DVWD, we have identified three potential waterline projects that would improve and expand the Industrial Park distribution system to serve prospective customers. These new lines are shown in Figure 3-3 and described below.

- **Demers Drive Extension.** A water main loop can be provided by installing approximately 2,000 feet of pipe in the Demers Drive right of way. The new pipe would extend north from the existing 10-inch main along Adler Street to the stub end of an existing 8-inch main about 500 feet south of Cherry Lane. For planning purposes, we have assumed this waterline extension would be 8 inches due to the sizes of the existing pipes at each end.
- **Berg Drive/Highway 26 Extension.** A new waterline loop could be extended along Berg Drive, Highway 26 and a planned east-west roadway to serve future developments in the north area of the Park. The new mains would connect to an existing 10-inch pipe in Berg Drive and an existing 20-inch stub along the west side of Highway 26. For planning purposes, we have assumed this waterline would be 12 inches, which is the minimum pipe size required by the City for areas zoned for commercial/industrial development.

- **Northwest/Dogwood Lane/Highway 26 Extensions.** New waterlines could be extended along Highway 26, Dogwood Lane, and a planned extension of Daimler Road to serve future developments northwest and northeast of the airport. The northwest extension around the airport would connect to an existing 8-inch pipe at the end of Daimler Road. The Highway 26 extension would connect to the proposed 12-inch loop described above. For planning purposes, we have assumed this waterline would be 8 inches based on the size of the existing main in Daimler Road.

Additional water main extensions will need to be constructed as growth occurs in undeveloped areas on the east side at Highway 26. More water lines will also be needed in the areas to the northwest and northeast of the airport as development occurs. The proposed pipe sizes, locations and lengths in these future areas will depend on specific development proposals.

### *3.2.3 Probable Project Costs for Water Line Extensions/Looping*

Table 3-1 on the following page summarizes our planning-level estimates of probable project costs for the potential waterline projects identified above. The general basis for the development of the estimates is described in Chapter One of this report. The timing of these improvements will depend on when and where industrial developments are proposed and the required water demand.

**Table 3-1**
**Potential Waterline Improvements for**
**Industrial Park and Airport Area (Costs in December 2016 Dollars) (1)**

| Project Description | Pipe Size (inches) | Estimated Length (ft.) | Estimated Base Unit Cost (ft.) | Probable Construction Cost (2) | Probable Project Cost (3) |
|---|---|---|---|---|---|
| 1. Demers Drive Extension | 8 | 2,000 | $200 | $500,000 | $675,000 |
| 2. Berg Dr./East-West Connector/Highway 26 Loop | 12 | 7,000 | $300 | $2,625,000 | $3,545,000 |
| 3. NW Area/Dogwood Lane/Highway 26 Loop | 8 | 18,000 | $200 | $4,500,000 | $6,075,000 |
| **Total – Industrial Park/Airport Waterline Projects** | | | | | **$10,295,000** |

**Notes:**

(1) Potential improvements are shown for planning industrial site readiness. Timing dependent on developments for major users. Required waterline projects must be reevaluated based on actual development proposals.

(2) Construction cost includes a 25% construction contingency.

(3) Project cost includes a 35% allowance for nonconstruction costs (engineering and administrative).

NOV 2017

NW DOGWOOD LN

AREA FOR POTENTIAL FUTURE DEVELOPMENT

SIZE & LOCATION OF FUTURE GAS LINE EXTENSIONS TO BE DETERMINED

SIZE & LOCATION OF FUTURE GAS LINE EXTENSIONS TO BE DETERMINED

FUTURE CROSSWIND RUNWAY & TAXIWAY

MUNICIPAL AIRPORT

NW BERG DR

NW CHERRY LN

HWY 26

SIZE & LOCATION OF FUTURE GAS LINE EXTENSIONS TO BE DETERMINED

BNSF RR

EXISTING 2" GAS TO DAIMLER

NW MILL ST

NW HESS RD

NW ADLER ST

NW EARL ST

0 500 1000 2000

SCALE: 1" =1000'

## LEGEND

- UGB
- CITY LIMITS
- EXISTING CASCADE GAS LINE
- POTENTIAL CASCADE GAS LINE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205 SE Spokane Street, Suite 200, Portland, OR 97202
phone: 503.221.1131 www.hhpr.com fax: 503.221.1171


INDUSTRIAL PARK NATURAL GAS LINES

# INDUSTRIAL SITE READINESS PLAN

CITY OF MADRAS, OR

SHEET NO. FIG 3-1

JOB NO. MAD-06

P:\MAD (City of Madras)\MAD-06 (ISRP)\MAD06 - DWGS\SHEETS\ MAD06-Figure 3-2 Natural Gas Lines.dwg

NOV 2017

NW DOGWOOD LN

AREA FOR POTENTIAL FUTURE DEVELOPMENT

POWER MAY BE SUPPLIED BY EXTENSION OF EITHER CEC OR PACIFIC POWER LINES

POWER MAY BE SUPPLIED BY EXTENSION OF EITHER CEC OR PACIFIC POWER LINES

FUTURE CROSSWIND RUNWAY & TAXIWAY

MUNICIPAL AIRPORT

NW BERG DR

NW CHERRY LN

HWY 26

NW MILL ST

NW HESS RD

NW ADLER ST

NW EARL ST

BNSF RR

EXISTING POWER TO DAILMER

0 500 1000 2000

SCALE: 1" =1000'

## LEGEND

- UGB
- CITY LIMITS
- EXISTING PACIFIC POWER BURIED POWER LINE
- EXISTING PACIFIC POWER OH POWER LINE


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INDUSTRIAL PARK POWER DISTRIBUTION SYSTEM

# INDUSTRIAL SITE READINESS PLAN

CITY OF MADRAS, OR

SHEET NO. FIG 3-2

JOB NO. MAD-06

P:\MAD (City of Madras)\MAD-06 (ISRP)\MAD06 - DWGS\SHEETS\ MAD06-Figure 3-1 Pac Power Elec Distr Sys.dwg

NOV 2017

NW DOGWOOD LN

AREA FOR POTENTIAL FUTURE DEVELOPMENT

8" NW WATER MAIN EXTENSION**

8" US 26/DOGWOOD WATER MAIN LOOP**

FUTURE CROSSWIND RUNWAY & TAXIWAY

12" BERG DRIVE/US 26 WATER MAIN LOOP**

MUNICIPAL AIRPORT

NW BERG DR

8" STUB

20" STUB

10" STUBS

NW CHERRY LN

HWY 26

6" STUB

NW MILL ST

NW HESS RD

8" PLUG

4" DRAIN

6" PLUG

8" PLUG

BNSF RR

8" DEMERS WATER MAIN EXTENSION**

NW ADLER ST

NW EARL ST

8" DRAIN

0 500 1000 2000

SCALE: 1" =1000'

## LEGEND

- UGB
- CITY LIMITS
- 14" EXISTING WATER LINE WITH PIPE SIZE (6" & LARGER)
- BUTTERFLY VALVE
- GATE VALVE
- FIRE HYDRANT ASSY W/ VALVE
- PROPOSED WATER MAIN

** PIPE SIZE MAY DIFFER BASED ON ACTUAL DEVELOPMENT PROPOSALS

P:\MAD (City of Madras)\MAD-06 (ISRP)\MAD06 - DWGS\SHEETS\ MAD06-Figure 3-3 Water System.dwg

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205 SE Spokane Street, Suite 200, Portland, OR 97202
phone: 503.221.1131 www.hhpr.com fax: 503.221.1171

INUSTRIAL PARK WATER SYSTEM

# INDUSTRIAL SITE READINESS PLAN

CITY OF MADRAS, OR

SHEET NO. FIG 3-3

JOB NO. MAD-06

# CHAPTER 4
# WASTEWATER SERVICE

## 4.1 EXISTING WASTEWATER FACILITIES

### *4.1.1 General*

The City of Madras currently provides sanitary sewer service to most of the developed areas in the Industrial Park. The existing wastewater (WW) facilities needed to provide this service generally consist of the following components:

- a collection system with gravity sewers, manholes, two pump stations and force mains;
- a Wastewater Treatment Plant (WWTP) with an effluent storage pond;
- effluent distribution piping; and
- irrigation components for effluent recycling.

The following subsections provide descriptions and Figure 4-1 presents a map of these facilities. Chapter Two of the 2017 Wastewater Master Plan Update (WWMP) presents additional information on the existing wastewater facilities serving the Industrial Park.

### *4.1.2 Collection System*

The Industrial Park Collection System is separate from the City's Main Collection System and serves only the north end of the City. This collection system provides service to the Industrial Park, Municipal Airport, Desert Peaks Golf Course, and a nearby residential area.

The gravity sewer network for the Industrial Park includes 24,330 linear feet of 8-inch, 10-inch and 12-inch pipes. These sewers are divided into two drainage basins, a larger network serving the Industrial Park, airport and golf course, as well as a smaller sub-basin serving a residential area along the north side of Birch Lane.

The larger sewer basin has three central interceptor sewers that extend along Demers Drive, Cherry Lane and Berg Drive. These sewers convey Industrial-Park WW flows to the Demers Pump Station (PS) located in the Demers Drive right of way, on the south side of Cherry Lane. From there, the WW is pumped to the North WWTP (NWWTP) for treatment, storage and recycling.

These pumped flows are conveyed through dual 4-inch force mains to a 10-inch force main that extends to the NWWTP. The 10-inch force also conveys WW to the NWWTP from the "B" Street North PS located within the City's Main Collection System.

A second PS, the Golf Course PS, serves the smaller sewer sub-basin along Birch Lane and pumps residential flows north, through a 4-inch force main, to a manhole (MH) south of Adler St. The sewers downstream of this MH are tributary to the Demers Drive interceptor.

### *4.1.3 Wastewater Treatment*

The City's NWWTP treats all flows from the Industrial Park Collection System and part of the flows from the Main Collection System. The plant is located along the southwest side of the Municipal Airport. It was originally constructed in 1973 and remained the City's sole treatment plant until 2001 when the City's South WWTP was constructed. Upgrades to the NWWTP were implemented in 1993 and 1998.

The average design capacity of the NWWTP is 0.5 million gallons per day (MGD), although current flows to the plant are about half that amount. The NWWTP includes the following treatment processes:

- a five-cell lagoon system,
- mechanical clarification equipment with chemical addition,
- disinfection equipment that adds sodium hypochlorite and a chlorine contact basin,
- an effluent storage pond,
- in-plant liquid-stream and sludge pumps,
- PLC-based controls for the process equipment,
- a sludge pond to store solids generated by the clarification equipment, and
- sludge drying beds.

The influent WW flows by gravity through the lagoon system for biological treatment and is then pumped either to the clarifier and disinfection process or to the effluent storage pond. The clarifier operates during the growing season and produces Class B effluent suitable for recycling.

The effluent storage pond receives partially-treated WW from the lagoons during cold weather. The stored lagoon effluent is sent through the clarifier and disinfection process for further treatment during warmer weather and recycled.

The 2017 WWMP reports overall condition of the NWWTP is adequate, but there are significant deficiencies. Some equipment is in good condition due to recent replacements or repairs; but other equipment is either close to 20 years old or older. The original components still remaining at the plant are close to 40 years old.

### *4.1.4 Effluent Recycling*

The NWWTP is a zero-discharge facility and all Class B effluent is used for irrigation on nearby farmland and the Desert Peaks Municipal Golf Course. The City can only irrigate during the growing season, which is typically between April 1 and October 31.

Irrigation practices follow an approved Effluent Reuse (Recycled Water Use) Plan. The City currently owns the lands that receive recycled water and follows the access, exposure, and notification requirements established by the State for Class B treated effluent. The farmland is leased to growers with the understanding the crops will be irrigated with recycled water and the objective is to use all effluent by the end of each growing season.

### *4.1.5 Biosolids Handling*

The sludge-drying beds receive both the sludge that is removed from the sludge pond and biosolids trucked from the City's South WWTP. The solids are left on the drying beds until they are adequately dewatered for land application as Class B biosolids on nearby City-owned farmland.

### *4.1.6 Onsite Sewage Disposal*

A small proportion of the developed land in the Industrial Park does not receive sewer service. These developments must rely on septic tanks with onsite disposal wells and/or drainfields for the WW they generate.

## 4.2 COLLECTION SYSTEM SEWER EVALUATIONS

### *4.2.1 General*

Analyses of the Industrial Park Collection System were completed under both existing and future conditions as part of the 2017 WWMP. The analysis of existing flow conditions found no capacity deficiencies in either the sewers or the pump stations.

Currently there are no formal proposals for major Industrial Park developments and no separate industrial growth forecasts to use as a basis for estimating future WW contributions. As a result, flow projections for the Industrial Park over the next 20 years are based on industrial growth being proportional to population growth.

Using this approach, the existing system was modeled under a future condition assuming full development of the Industrial Park with users who would contribute flows at the same per-acre rate as existing users. This analysis showed the existing sewers are adequate to handle this level of development.

In addition to the above analyses, the WWMP further evaluated industrial site readiness through the completion of the following steps.

- The existing collection system was analyzed to identify the available capacities in the main interceptor sewers under estimated, current-flow conditions.
- The impacts of major industrial developments were then evaluated by applying an assumed peak flow rate from a hypothetical large-scale user (or users) at potential upstream development sites. This evaluation identified the potential, alternative system improvement that would be needed to serve such major developments at each site.

The following subsections describe the results of the above-described analyses.

### *4.2.2 Analysis of Existing Collection System*

**Existing Interceptor Capacities.** We established the limiting hydraulic capacity of each existing interceptor by identifying the segment(s) with the mildest slope and calculating the capacity of these sewer reaches. An estimate of the available capacity was then identified by subtracting the estimated, existing peak flow from the calculated capacity. Table 4-1 presents the results of this capacity analysis.

**Table 4-1**
**Existing and Available Sewer Capacities at Segments With Minimum Slopes**

| Existing Interceptor | Pipe Size (inches) | Min. Slope (%) | Design Depth (d/D) (1) | Pipe Capacity (MGD) | Available Peak Flow Capacity (MGD) (2) |
|---|---|---|---|---|---|
| Berg Drive | 10 | 0.25 | 0.90 | 0.75 | 0.73 |
| Cherry Lane | 8 | 0.40 | 0.90 | 0.79 | 0.77 |
| Demers Drive | 10 | 0.29 | 0.90 | 0.80 | 0.74 |

(1) d/D = allowed ratio of flow depth (d) to pipe diameter (D) per City Standards.
(2) Available capacity = calculated capacity minus estimated existing peak flow.

Since flows in the Industrial Park are currently quite low, most of the interceptor capacity remains available for developments. Each of the three interceptors can accept additional peak flows of about 0.70 to 0.75 MGD at their upstream end without surcharging. This translates to average design flows of 0.23 to 0.25 MGD, if a design peaking factor of 3.0 is used.

### *4.2.3 Evaluation of Major Flow Contributions*

**Major Industrial Flow Contributions.** An additional analysis was performed to address the impacts of major industrial developments on the collection system. This analysis applied a conservative flow at upstream manholes in the system to model flows from large-scale contributors and adjacent developments. For planning purposes, we applied a 1.0 MGD average flow with a peaking factor of 3.5 to model these combined future flows from major users and adjacent developments.

The locations chosen for applying the WW flow were selected where adjacent areas have large parcels of land available that could support major developments. These sites, labeled as the North, South and East Industrial Areas, are shown in Figure 4-2.

The North Area would be tributary to the Berg Drive sewer and the South Area would be tributary to the Demers Drive sewer, or directly to the Demers PS. We investigated alternatives alignments for serving the East Area as described below.

As Table 4-1 indicates, the existing sewers do not have available capacities sufficient to convey the future peak industrial flow we applied to model the impacts of major users. Therefore, the modeling effort evaluated alternative sizes of parallel sewers that would serve the potential development areas. The analysis did not model replacement sewers for the existing interceptors since the existing pipes are less than 30 years old and should continue to provide reliable service for over 20 years.

**North and South Industrial Areas.** Modeling results show an 18-inch parallel sewer would be needed to supplement the existing capacity of either the Berg Drive or Demers Drive interceptors to handle an average-flow increase of 1.0 MGD. To be conservative, our analysis assumed the Demers Drive parallel sewer would extend south to Adler Street. However, the proximity of the Demers PS to the South Area might allow the Demers parallel sewer to be shorter than we assumed.

**East Industrial Area.** Two alternative alignments were evaluated for serving major developments in the East Area, a parallel sewer along Cherry Lane and a south route along Hess St., Adler St. and Demers Dr. The route along Cherry Lane is recommended because it would be shorter than the south route and a 15-inch pipe would be adequate to handle an average-flow increase of 1.0 MGD. The south route would require an 18-inch pipe.

Another consideration for the East Area is the topography. This area generally slopes down to the east. Therefore, developments on the east side of this area, closer to the railroad, would probably require a PS to lift the wastewater up to the Industrial Park Collection System. This requirement could potentially increase the cost of wastewater service for most of the East Area.

### *4.2.4 Sewer Extensions*

Two 8-inch sewer extensions are planned in the Industrial Park Collection System. One line would extend along Mill Street, north of Adler, and the other would extend along Hesse Street and across U.S. Highway 26 (see Figure 4-2). These extensions would provide service to a small number of developments that currently use onsite disposal systems and would also support infill development within these parts of the Industrial Park.

### *4.2.5 Undeveloped Airport Property*

Land along the northwest side of the airport is identified in the 2010 Airport Master Plan Update as a future redevelopment area. Similarly, plans call for future commercial/industrial development of the land immediately to the northeast of the airport and south of Dogwood Lane. Because the airport property generally slopes toward the northwest, potential developments in these areas could not be served by gravity sewers tributary to the Industrial Park Collection System. Therefore, at least one new PS would be required.

Figure 4-2 illustrates a general layout for a potential WW collection system that would serve the northwest airport property. Since the PS force main shown in Figure 4-2 would extend directly to the NWWTP, development of this area would not impact the existing gravity sewers. The layout and sizing of the gravity sewers serving the area would depend on the actual patterns and service needs of the developments that occur.

It may be feasible to serve the land immediately northeast of the airport with a gravity sewer extending west and southwest to the potential PS the site shown in Figure 4-2. If gravity service to a PS on the northwest side is not feasible, another PS would be needed for the northeast area. Regardless, it would be more costly to serve this northeast parcel than the northwest property.

## 4.3 COLLECTION SYSTEM PUMP STATIONS

### *4.3.1 Demers Pump Station*

The existing capacity of the Demers PS is 0.42 MGD and the net available capacity for future developments is estimated to be 0.14 MGD after full development of the Willowbrook Subdivision. The collection system analysis shows the Demers PS is adequate for the development of the Industrial Park with future users that contribute similar WW flows as the existing users.

Recommended improvements to support industrial site readiness are described below.

- Given the age and condition of the PS, the City should plan to renovate the facility in 3 to 5 years with new pumps, valves and electrical components. The wet well lid and pump retrieval assemblies also need to be replaced due to damage from corrosion.
- The City should plan to replace the PS either in 16-20 years or when additional capacity is needed to serve industrial development, whichever occurs first. The replacement facility should be designed with space for an additional pump, as well as for larger pumps, to accommodate phased expansions. This design approach would support industrial site preparedness for developments of different sizes with differing wastewater flow contributions.

Future expansions of the Demers PS will necessitate an increase in the size of the PS force main to accommodate the higher pumping rate. We have included a future replacement of the Demers force-main with an 8-inch pipe as a recommended PS improvement project. A second 8-inch pipe could be installed parallel to this replacement pipe when a further PS expansion is required.

The timing of the future PS expansions, force main replacement and second, parallel force main would depend on the pace of industrial development and their actual WW contributions.

### *4.3.2 Golf Course Pump Station*

The Golf Course PS will need to be replaced and expanded when the Willowbrook residential development proceeds. Because the replacement PS will not serve Industrial Park users, the project is not part of the planning effort for industrial site readiness.

The existing capacities of the downstream Industrial Park sewers and Demers PS are adequate for the planned PS capacity. Although the expanded PS will slightly reduce available system capacity for industrial developments, the project should not significantly impact industrial site readiness.

### *4.3.3 Northwest Area Pump Station*

As described in Section 4.2.5 and illustrated in Figure 4-2, a separate PS and force main would be needed to extend service to land along the northwest side of the airport. The actual sizing and location of the PS would depend on the service needs of the future users who locate to the area. Another key consideration in siting the PS is the shallow depth to rock in the airport area. A more detailed study into the most cost effective way to extend sewer service to undeveloped airport property will be required during the early stages of site development.

## 4.4 NORTH WASTEWATER TREATMENT PLANT

### *4.4.1 Recommended Treatment Scenario*

The 2017 WWMP recommends the City maintain both the NWWTP and SWWTP in service, in part because both WWTPs are strategically located to serve proposed and potential developments. The NWWTP's proximity to the Industrial Park and the importance of maintaining industrial site readiness make the plant site an important asset.

Since industrial WW service needs can vary widely, planning efforts for site readiness need to incorporate flexibility. The existing NWWTP location supports the development and implementation of a cost effective and suitably flexible plan for phased expansions to serve industrial developments.

### *4.4.2 Recommended NWWTP Improvements*

The 2017 WWMP recommends phased improvements and expansions to the NWWTP to address existing deficiencies and maintain industrial site readiness. The phased expansions would also require expansions of effluent storage capacity and effluent recycling/irrigation systems. Additional farmland must by procured to provide the required irrigation system expansions.

Table 4-2 (following page) summarizes the recommended plan for the NWWTP and Figure 4-3 illustrates the plan. The proposal would provide reliable service at the current capacity for another 20 years and also accommodate potential expansions to serve future industrial growth. The phasing, sizing of incremental expansions, or other aspects of the recommended plan could differ depending on the timing and service needs of proposed developments. The recommended plan would be implemented in coordination with phased expansions of the SWWTP to also meet service needs for the Main Collection System.

## 4.5 SUMMARY OF RECOMMENDED IMPROVEMENTS

Tables 4-3, 4-4 and 4-5 (Pages 4-8 thru 4-10) summarize the recommended WW projects and list the planning-level estimates of probable project costs. The general basis for the development of the estimates is described in Chapter One of this report.

The probable project cost for installing a separate PS and force main to serve the area on the northwest side of the airport are based on providing a future PS capacity similar to the potential replacement project for the Demers PS.

**Table 4-2**
**Summary of Recommended NWWTP Improvements**

**Phase 1a Retrofit – Maintain 0.5-MGD Capacity (Complete within 5 years) (1)**

- Replace clarifier, disinfection system, pumps, and related components.
- Maintain existing lagoon system and associated piping in service.
- Maintain existing effluent storage pond and associated piping in service.
- Maintain existing sludge drying beds in service (2)

**Phase 1b Retrofit – Maintain 0.5-MGD Capacity (Complete in 11-15 years) (1)**

- Construct headworks with mechanical screen and low-energy, vortex grit chamber.
- Retrofit half of the existing lagoons to convert to an aerated lagoon system as the new secondary treatment process. Abandon remaining portion of existing lagoons.
- Construct an aerobic digester/holding tank for biosolids.
- Maintain existing effluent storage pond and associated piping in service.
- Maintain existing sludge drying beds in service (2)
- Identify/procure additional farmlands for effluent recycling and land application of sludge.

**Phase 2 Retrofit – Expand NWWTP to 1.0-MGD Capacity to Serve Industrial Growth (3)**

- Convert abandoned existing lagoons to a 0.5-MGD, parallel, aerated lagoon system.
- Expand influent screening and grit removal processes at headworks.
- Construct additional clarification and disinfection process capacity.
- Expand pumping capacity and other plant components.
- Expand effluent storage capacity by constructing nearby ponds.
- Construct additional sludge drying beds.
- Identify/procure additional farmlands for effluent recycling and land application of sludge.

**Phase 3 Expansion – Construct Adjacent Treatment Module for Further Expansion (3)**

- Construct adjacent 0.5-MGD treatment module with aerated lagoon system, clarification and disinfection processes, and associated components.
- Expand headworks, effluent storage capacity, and sludge drying beds similar to Phase 2 retrofit described above.
- Identify/procure additional farmlands for effluent recycling and land application of sludge.

**Notes:**

(1) An Alternate Phase 1a with reduced scope may be implemented due to limited availability of funds. Scope of Phase 1b would potentially change if City implements Alternate Phase 1a project.

(2) Sludge drying beds must be expanded in conjunction with recommended SWWTP improvements.

(3) Potential NWWTP expansions to serve industrial growth. Timing and sizes of expansions would depend on rate of growth and types of Industrial-Park developments that occur.

**Table 4-3**
**Recommended and Potential Sewer Improvements for Industrial Park (Costs in December 2016 Dollars)**

| Project Description | Time Frame (Years) | Pipe Size (inches) | Approx. Length (ft.) | Probable Construction Cost [1] | Probable Project Cost [2] |
|---|---|---|---|---|---|
| **A. Industrial Park Collection System Sewer Extensions** | | | | | |
| 1. Hess Street Sewer | 6-10 | 8 | 1,670 | $251,000 | $339,000 |
| 2. Mill Street Sewer | 6-10 | 8 | 1,430 | $215,000 | $290,000 |
| **Total for Industrial Park Sewer Extensions** | | | | **$466,000** | **$629,000** |
| **B. Potential Alternative Sewers for Major Users [3]** | | | | | |
| 1. East Area Parallel Sewer – Cherry Ln. | --- [4] | 15 [5] | 4,800 | $1,200,000 | $1,620,000 |
| 2. South Area Parallel Sewer – Demers Dr. | --- [4] | 18 [5] | 2,400 | $720,000 | $972,000 |
| 3. North Area Parallel Sewer – Berg Drive | --- [4] | 18 [5] | 2,240 | $672,000 | $907,000 |

**Notes:**

(1) Construction cost includes a 25% construction contingency.

(2) Project cost includes a 35% allowance for nonconstruction costs (engineering and administrative).

(3) Potential alternative improvements shown for industrial site readiness planning. Downstream pumping and treatment capacities assume only one of the alternative sewers for major users would be installed in the future.

(4) Timing would depend on when developments for major users occur.

(5) Required sewer size to serve major user(s) must be reevaluated based on actual development proposal(s).

**Table 4-4**
**Recommended PS and Force Main Improvements for**
**Industrial Park and Airport Area (Costs in December 2016 Dollars)**

| Project Description | Time Frame (Years) | Current Capacity (MGD) | Planned Capacity (MGD) | Probable Construction Cost (1) | Probable Project Cost (2) |
|---|---|---|---|---|---|
| 1. Demers PS Renovation – Major maintenance and repair | < 5 | 0.42 | -- | ----- | $200,000 |
| 2. Demers PS Replacement – Expand Capacity | 16-20 | 0.42 | 1.33 | $1,285,000 | $1,735,000 |
| 3. Demers Force Main Replacement – 8" Pipe | --- (3) | -- | 1.33 | $1,137,000 | $1,535,000 |
| 4. Separate Northwest Area PS & Force Main | --- (3) | -- | 1.33 | $1,680,000 | $2,270,000 |
| **Total – Pump Stations & Force Mains** | | | | | **$5,740,000** |

**Notes:**

(1) Construction cost includes a 25% construction contingency.

(2) Project cost includes a 35% allowance for nonconstruction costs (engineering and administrative).

(3) Potential improvement shown for industrial site readiness planning. Timing dependent on developments for major users. Required projects must be reevaluated based on actual development proposal(s).

**Table 4-5**
**Recommended North WWTP and Effluent Recycling Improvements for Industrial Park and Airport Area (Costs in December 2016 Dollars)**

| Project Description | Time Frame (Years) | Current Capacity (MGD) | Planned Capacity (MGD) | Probable Construction Cost [1] | Probable Project Cost [2] |
|---|---|---|---|---|---|
| 1. Phase 1a – Replace clarifier, disinfection system, pumps, etc. | 3-5 | 0.5 | 0.5 | $1,710,000 | $2,310,000 |
| *Alternate Phase 1a – Reduced scope [3]* | | | | *$970,000* | *$1,310,000* |
| 2. Phase 1b – Retrofit Lagoons to Maintain Capacity | 11-15 | 0.5 | 0.5 | $5,890,000 | $7,950,000 |
| 3. Phase 1c – Farmland Acquisition & Irrigation System Expansion | 11-15 | 0.5 | 0.5 | $1,148,000 | $1,550,000 |
| 4. Phase 2 Improvements | --- [4] | 0.5 | 1.0 | | |
| a. Retrofit w/Aerated Lagoon Treatment System | | | | $7,665,000 | $10,350,000 |
| b. Effluent Storage Pond Expansion | | | | $8,993,000 | $12,140,000 |
| c. Farmland Acquisition & Irrigation System Expansion | | | | $3,368,000 | $4,550,000 |
| 5. Phase 3 Improvements | --- [4] | -- | 1.5 | | |
| a. Phase 3 – Construct 0.5-MGD Module (Expand to 1.5 MGD) | | | | $8,961,000 | $12,100,000 |
| b. Effluent Storage Pond Expansion | | | | $8,993,000 | $12,140,000 |
| c. Farmland Acquisition & Irrigation System Expansion | | | | $3,855,000 | $5,205,000 |
| **Total for North WWTP Improvements** | | | | | **$68,295,000** |

**Notes:**

(1) Construction cost includes a 25% construction contingency.

(2) Project cost includes a 35% allowance for nonconstruction costs (engineering and administrative).

(3) Alternate Phase 1a with reduced scope may be implemented instead of full Phase 1a to allow DAF clarifier to operate during winter months. Scope of Phase 1b would potentially change if City implements Alternate Phase 1a project.

(4) Potential improvement shown for industrial site readiness planning. Timing dependent on developments. Required treatment plant projects must be reevaluated based on actual development patterns and growth rate.

NOV 2017

SCALE: 1" = 750'

FARM FIELDS (NO LONGER AVAILABLE FOR RECYCLING)

HWY 26

NWWTP (SEE FIG 4-3)

FARM FIELD (WATER RECYCLING)

MUNICIPAL AIRPORT

DEMERS DR. PUMP STATION

CHERRY LN

FARM FIELDS (WATER RECYCLING)

BIRCH LN

DESERT PEAKS GOLF COURSE (WATER RECYCLING)

GOLF COURSE PUMP STATION

## LEGEND

- UGB
- APPROX SEWER SERVICE AREA BOUNDARY
- WWTP SITE & EFFLUENT STORAGE POND
- IRRIGATION SITE
- MAIN COLLECTION SYSTEM BASIN
- INDUSTRIAL PARK COLLECTION SYSTEM BASINS (INDUSTRIAL & WILLBROOK SUB BASINS)
- PUMP STATION
- PRIMARILY ON-SITE SEPTIC

P:\MAD (City of Madras)\MAD-06 (ISRP)\MAD06 - DWGS\SHEETS\ MAD06-Figure 4-1 Existing WW Facilities Map.dwg


Harper Houf Peterson Righellis Inc.
ENGINEERS♦PLANNERS
LANDSCAPE ARCHITECTS♦SURVEYORS
205 SE Spokane Street, Suite 200, Portland, OR 97202
phone: 503.221.1131 www.hhpr.com fax: 503.221.1171


INDUSTRIAL PARK EXISTING WW FACILITIES

# INDUSTRIAL SITE READINESS PLAN

CITY OF MADRAS, OR

SHEET NO. FIG 4-1

JOB NO. MAD-06

NOV 2017

AREA FOR POTENTIAL FUTURE DEVELOPMENT

FUTURE PS REQ'D FOR AREAS NORTH OF AIRPORT (SITE TO BE DETERMINED)

FUTURE CROSSWIND RUNWAY & TAXIWAY

NORTH WASTEWATER TREATMENT PLANT (SEE FIG 4-3)

NORTH WASTEWATER TREATMENT PLANT

DAIMLER FORCEMAIN

DAIMLER PROVING GROUND

12" EFFLUENT

FM

10" FORCE MAIN

EFFLUENT

8" DEMERS PS FORCEMAIN

(2) 4" FORCE MAINS

12" EFFLUENT

FM

MUNICIPAL AIRPORT

NW BERG DR

DEMERS DR. PUMP STATION

POTENTIAL 18" NORTH AREA SEWER

NORTH AREA

NW CHERRY LN

POTENTIAL 18" SOUTH AREA SEWER

POTENTIAL 15" EAST AREA SEWER

HWY 26

8" HESS RD. SEWER

NW HESS RD

BNSF RR

EAST AREA

NW MILL ST

MILL ST. SEWER

NW ADLER ST

SOUTH AREA

4" FORCE MAIN

FUTURE WILLOWBROOK SUBDIVISION

0 500 1000 2000

SCALE: 1" =1000'

## LEGEND

- UGB
- CITY LIMITS
- FORCE MAIN
- PIPE SIZE (IF >8")
- GRAVITY SEWER
- MANHOLE
- PUMP STATION
- PROPOSED SEWER
- PROPOSED FORCEMAIN
- POTENTIAL SEWER
- POTENTIAL FORCEMAIN
- POTENTIAL PUMP STATION
- POTENTIAL AREAS FOR LARGE INDUSTRIAL USERS


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INDUSTRIAL PARK WASTEWATER FACILITIES IMPROVEMENTS

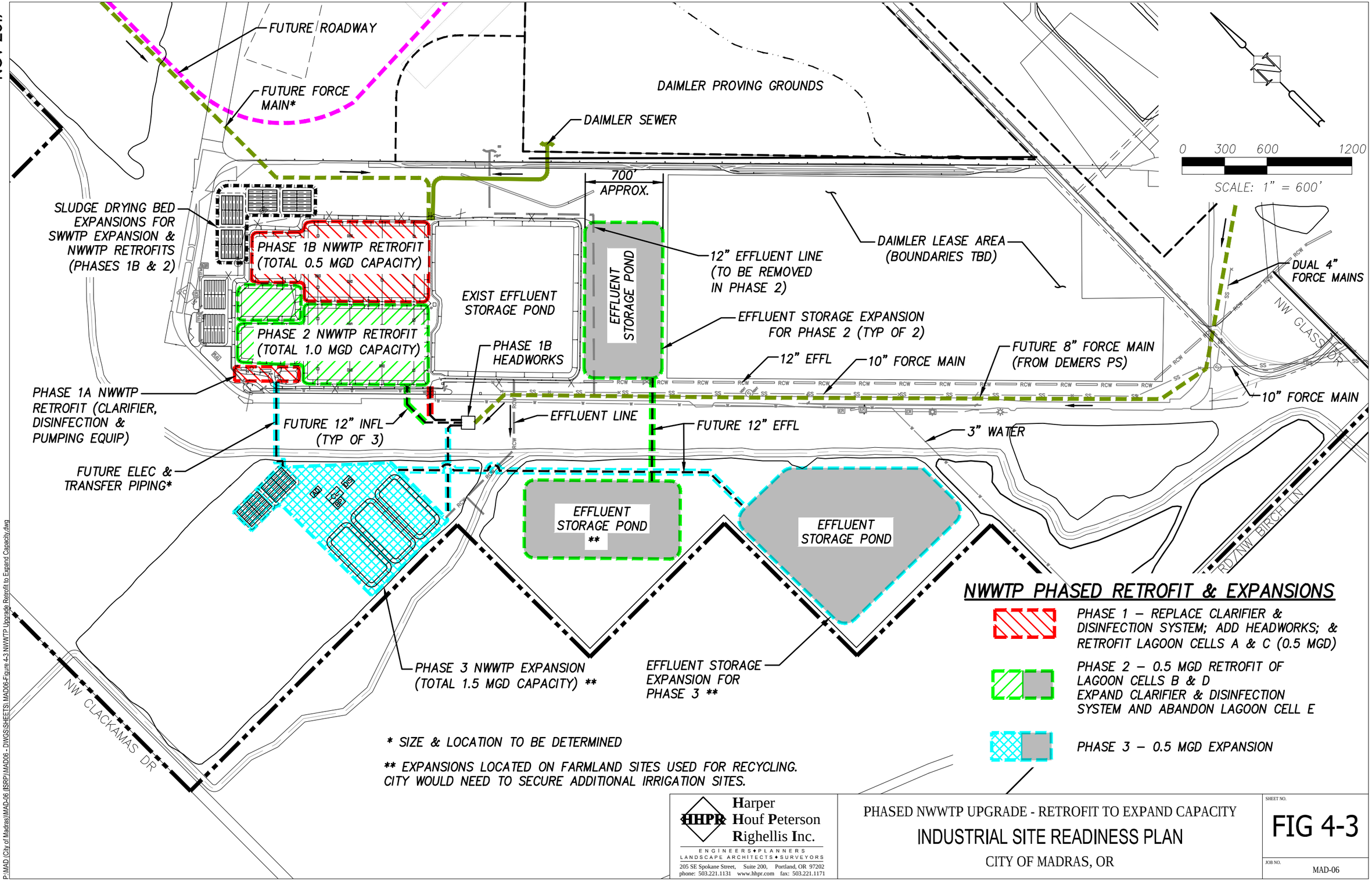
# INDUSTRIAL SITE READINESS PLAN

CITY OF MADRAS, OR

SHEET NO. FIG 4-2

JOB NO. MAD-06

NOV 2017




## NWWTP PHASED RETROFIT & EXPANSIONS

PHASE 1 – REPLACE CLARIFIER & DISINFECTION SYSTEM; ADD HEADWORKS; & RETROFIT LAGOON CELLS A & C (0.5 MGD)

PHASE 2 – 0.5 MGD RETROFIT OF LAGOON CELLS B & D EXPAND CLARIFIER & DISINFECTION SYSTEM AND ABANDON LAGOON CELL E

PHASE 3 – 0.5 MGD EXPANSION

* SIZE & LOCATION TO BE DETERMINED

** EXPANSIONS LOCATED ON FARMLAND SITES USED FOR RECYCLING. CITY WOULD NEED TO SECURE ADDITIONAL IRRIGATION SITES.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PHASED NWWTP UPGRADE - RETROFIT TO EXPAND CAPACITY

# INDUSTRIAL SITE READINESS PLAN

CITY OF MADRAS, OR

SHEET NO. FIG 4-3

JOB NO. MAD-06

P:\MAD (City of Madras)\MAD-06 (ISRP)\MAD06 - DWGS\SHEETS\ MAD06-Figure 4-3 NWWTP Upgrade Retrofit to Expand Capacity.dwg

# CITY OF MADRAS
# INDUSTRIAL SITE READINESS PLAN

# APPENDIX A

## RAIL FEASIBILITY STUDY
## MADRAS AIRPORT INDUSTRIAL AREA

# RAIL FEASIBILITY STUDY

# MADRAS AIRPORT INDUSTRIAL AREA

## 1.0 Background

Currently, two mainline railroads, Union Pacific (UP) and Burlington Northern (BNSF) serve the Madras area. Approximately 12 to 14 freight trains each day pass through the City of Madras daily on route to destinations in California and Arizona in the south and destinations to the north, which include the Pacific Northwest and Canada. The industrial areas at the north and west end of Madras are served by a rail spur that connects the 5 to 6 rail-served shippers with the main line. BNSF's local train service delivers rail cars to these industries on a five-day per week basis.

At present, some existing and potential business and industrial users may not have adequate access to rail services in order to retain or expand business opportunities. Recognizing that all freight rail users do not require "on-site" services and that many use "reload" facilities, this study attempts to answer two questions:

(1) Are there enhancements to the existing spur or industry tracks that would better serve businesses in the Madras industrial area (Section 3)?
(2) Would it be feasible and beneficial to construct a siding to the UP/BNSF mainline for unit train service (Section 4)?

## 2.0 Work Scope

The rail siding feasibility study includes the following elements:

1. Communication with Railroad Companies and Identification of Capacity-Operational Constraints

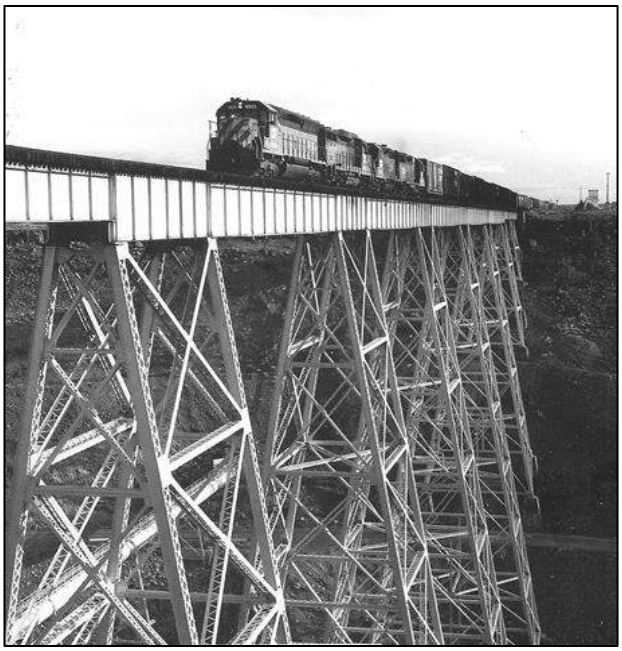
    a. Gather background information of the existing rail services to the industrial area.
    b. Contact BNSF and UP to determine who has market access to the industrial track facilities.
    c. Discuss with UP and BNSF regarding the current capacity limitations and operational constraints.

2. Preliminary Screening of Siding-Reload Facility Alternatives

    a. Discuss with City and obtain City's input as to:
        - Specific businesses/industries needing improved services today;
        - Industries the City envisions serving as part of the industrial area expansion plan.
        - Requirements of rail services by potential future industrial users.
    b. Meet with the City and conduct site reconnaissance to review existing rail operations and to screen and develop up to three preliminary siding and/or reload facility alternatives.
    c. Discuss siding and/or reload facility alternatives with railroad companies.

3. Ranking Siding and/or Reload Facility Alternatives

    a. Prepare conceptual alignment drawings.
    b. Develop order-of-magnitude costs for each alternative. Use the previously proposed improvements to the existing rail spurs and cost estimates (not in the scope of this study) prepared by West Rail Construction Company in October 2011 to develop a total project cost.
    c. Evaluate construction and operational feasibility of each alternative.
    d. Meet with the City, businesses and economic development authorities interested in the potential project.
    e. Develop and select a preferred alternative considering inputs from various stakeholders, construction-operational constraints, and costs.
    f. Write a summary report for the feasibility study.

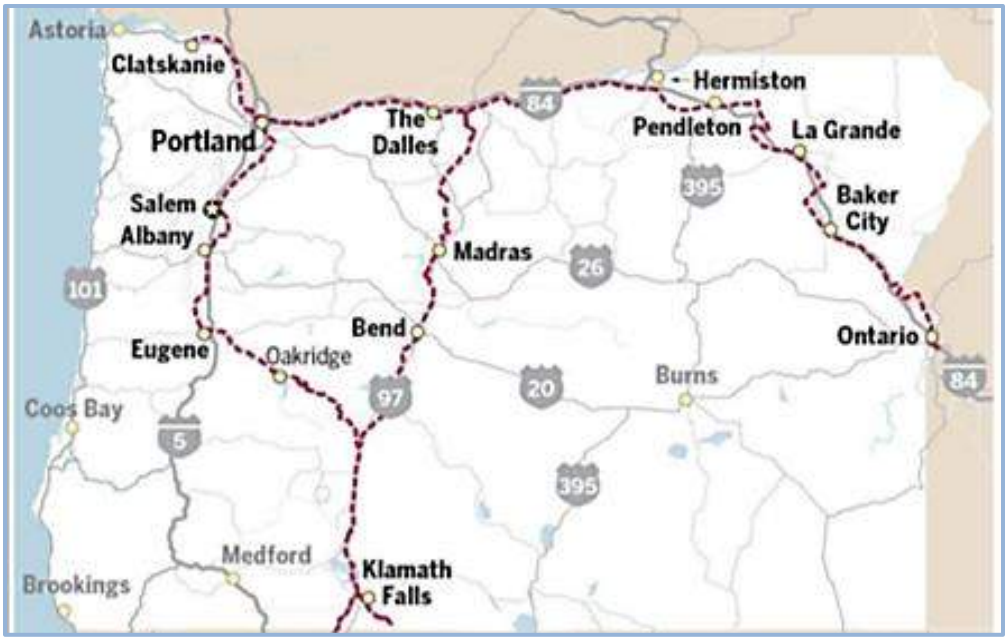


**3.0 Existing Rail Services and Constraints**

**3.1 Railroad Setting.** Known as the Oregon Trunk Branch, the main line trackage that passes through Madras (Map 1.0) extends north to connect with both the BNSF and UP east/west main lines located in the Columbia River Gorge. The primary connection is with BNSF which crosses the Columbia River at Celilo to access destinations in the pacific Northwest and in Canada. South of Madras, the Oregon Trunk Branch passes through Bend and connects with the UP Valley Main at Chemult with BNSF traffic operating over UP on a trackage rights basis until reaching Klamath Falls where BNSF trains return to the BNSF network. This network extends to southern destinations that include California and Arizona.

Shippers located in Madras' industrial park benefit by the fact that they can access both railroads (BNSF and UP) under a trackage rights agreement that was signed over 100 years ago (1910). BNSF operates the local train service that serves the Madras area. Business enroute to the UP is delivered to that railroad at an agreed upon interchange location (such as Portland or Klamath Falls).

BNSF operations are headquartered locally in Bend, OR with regional headquarters located in Pasco and in Seattle. National headquarters are located in Fort Worth, TX. Typically, Madras area rail-served customers interface with both BNSF and UP national customer service centers to schedule rail car orders and billing information. Because local BNSF train crews (which are managed by the trainmaster located in Bend) and equipment operate over the trackage in the Madras area, local BNSF engineering staff routinely inspect the trackage to ensure that the spur and industry tracks meet Federal Railroad Administration (FRA) minimum safety requirements.




**Map 1.0: Principle rail line operating through Madras showing connections to the north and south. BNSF's mainline to California trends to the southeast from Klamath Falls. Both UP and BNSF parallel I-84 in the Columbia River Gorge north of Madras**.

**3.2 Rail-Served Industry in the Madras.** While most of the Oregon Trunk is owned and operated by BNSF, the trackage in the Madras area is actually owned by the UP. The BNSF track chart for the Madras area is included in Appendix A. The two predecessor railroads that combined to build what is now the Oregon Trunk, namely the Deschutes Railroad (owned by UP) and the Oregon Trunk Railway (owned by BNSF), originally constructed different routes through Madras. The surviving line is the route constructed by the Deschutes Railroad and consequently remains the property of the UP. The 1910 agreement stipulated how the two railroads would interact with each other throughout the Pacific Northwest including the operational provision that BNSF would serve the Madras area.

In addition to the main line trackage through Madras and within the BNSF right-of-way, BNSF has installed a 2,950-foot long siding that extends along the east side of the main line from the US-26 viaduct at the north end of the siding to a location just south of NW Depot Road. The trackage that serves the Cenex grain facility is approximately 2,030 feet in length is located east of the siding. Both tracks have turnouts located on each end.

Within the Madras Industrial Park, five or six industry are connected by about 3.2 miles of track as listed in Table 1.0 and shown in Map 2.0. Track lengths are approximate given that an on-site inspection was not performed and it appeared that some of the tracks were covered by asphalt or located inside a building.

The track ownership maps created by UP are shown in Maps 2.1 through 2.3. Tracks shown in red are owned by UP and those shown in green are owned by the industry and the City as presented below.

1. Main line through the industrial park is owned by UP.
2. Spurs off that main line are owned by the following individual industries except that the spur to Wilbur-Ellis is owned by the City of Madras.
   a. Albina
   b. Keith Manufacturing
   c. Ferral Gas
   d. Bright Wood Corp.

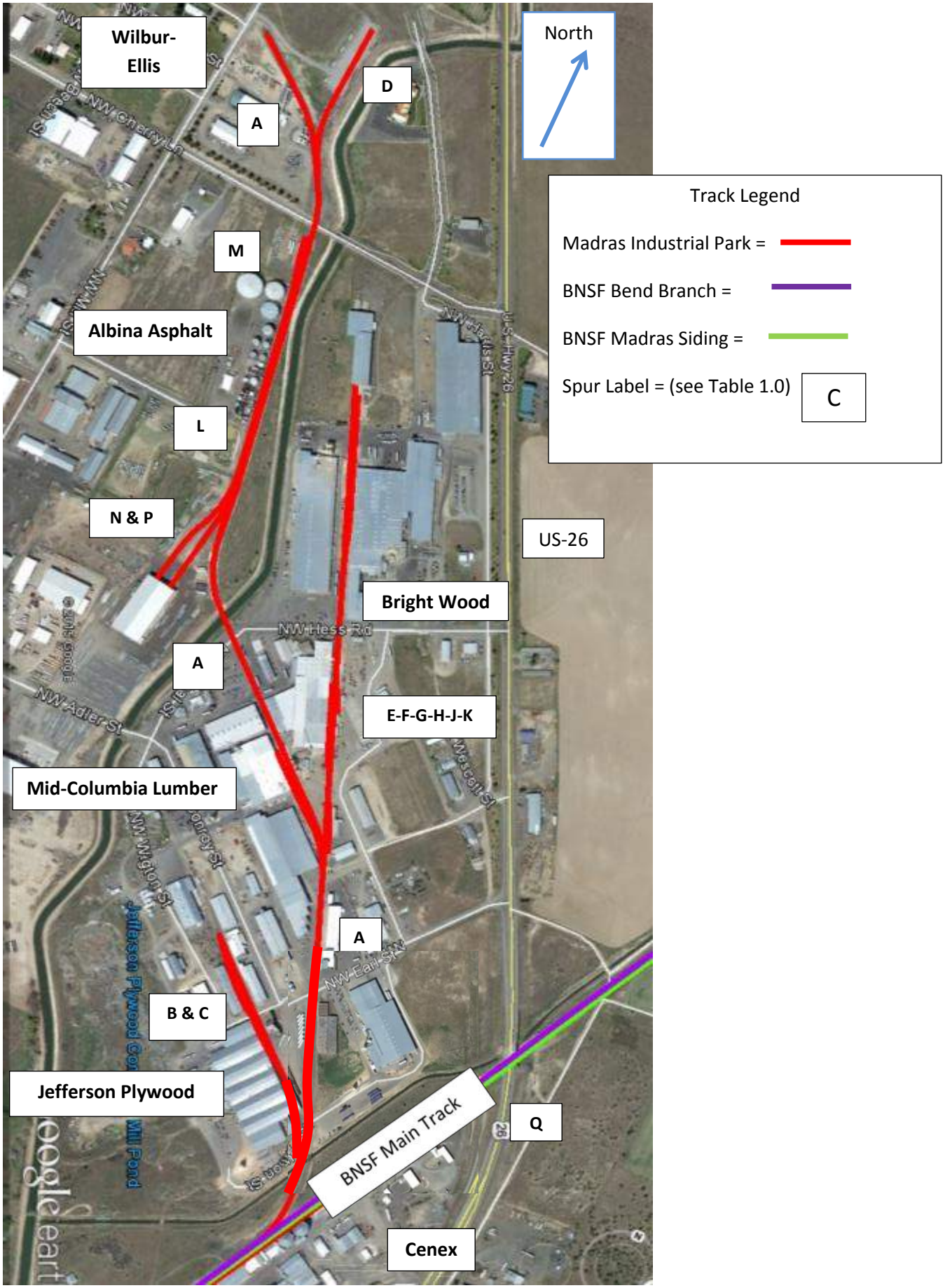
3. Mid-Columbia Lumber does not own the track but they have a ground lease with the City that incorporates the north section of track that they use from UP.
4. All of the mainline and spurs south of the Canal are on City ROW with Easement to UP.
5. The mainline between the Canal and Cherry Lane are on Albina Fuels Property with easement to UP
6. The mainline north of Cherry is on City Legal Lot with easement to UP.

**Table 1.0: Rail Spur trackage within the Madras switching area**

| Track ID * | Length (ft) ** | Primary Shipper | Comments |
|---|---|---|---|
| A | 5,720 | Multiple | Primary Spur Track |
| B | 1,690 | Jefferson Plywood | |
| C | 780 | Jefferson Plywood | |
| D | 840 | Wilbur-Ellis | House Track |
| E | 2,450 | Bright Wood | |
| F | 480 | Bright Wood | |
| G | 220 | Bright Wood | |
| H | 840 | Bright Wood | |
| J | 570 | Bright Wood | |
| K | 315 | Bright Wood | |
| L | 1,550 | Albina Asphalt | |
| M | 235 | Albina Asphalt | |
| N | 620 | Mid-Columbia | |
| P | 670 | Mid-Columbia | |
| **SubTotal** | **16,980** | **Industrial Park** | **Approx. 3.2 miles** |
| Q | 2,030 | Cenex Siding | |
| **Total** | **19,010** | **Madras area** | **Approx. 3.6 miles** |

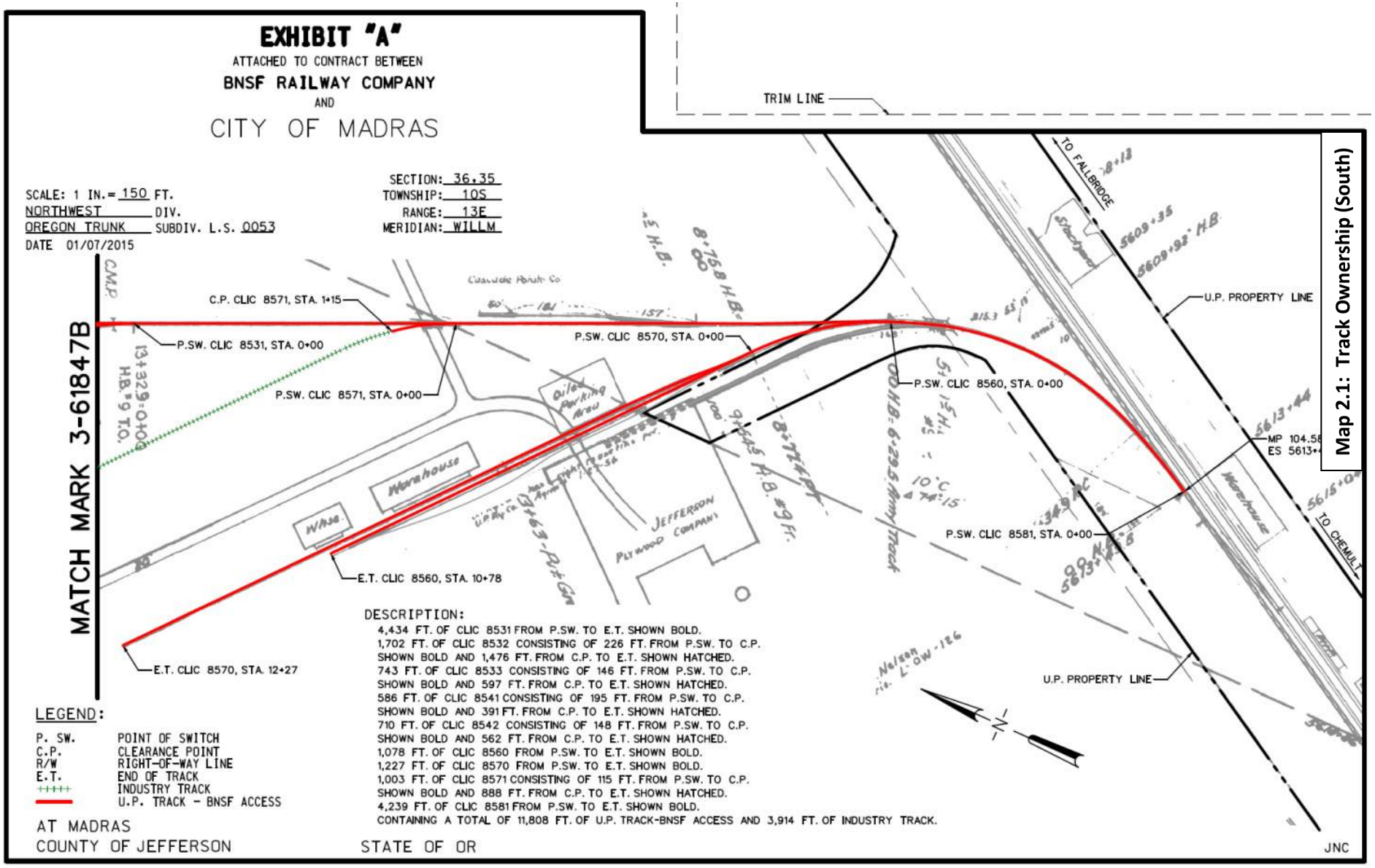
* = Arbitrary name; ** = Approximate track lengths (source: Google Earth)

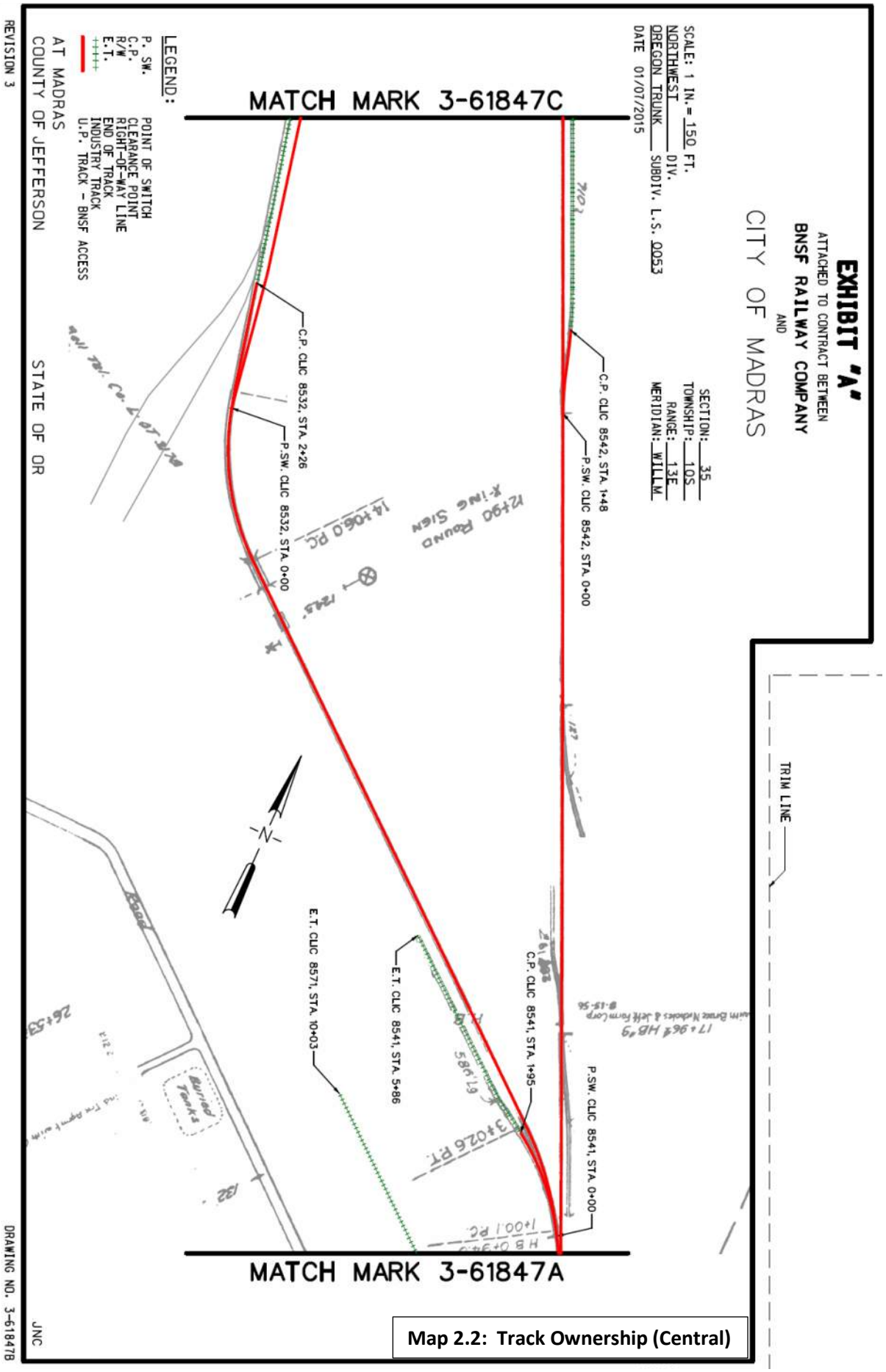
Section 3.3 describes each industry's physical and operational requirements regarding rail service.



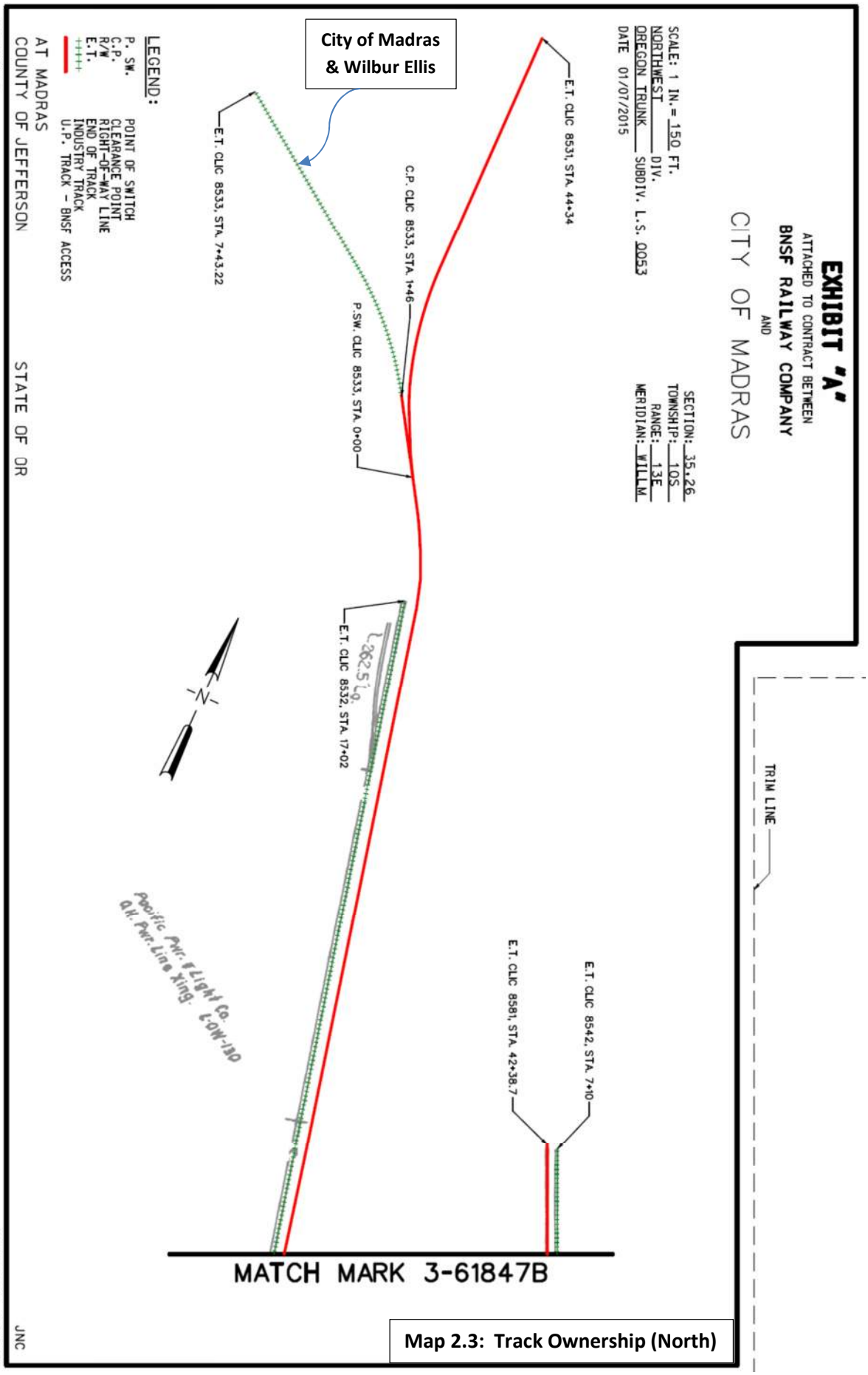

**Map 2.0: Rail-Served Industry in the Madras, Oregon area; source = Google Earth**

**Map 2.1: Track Ownership (South)**






**Map 2.2: Track Ownership (Central)**



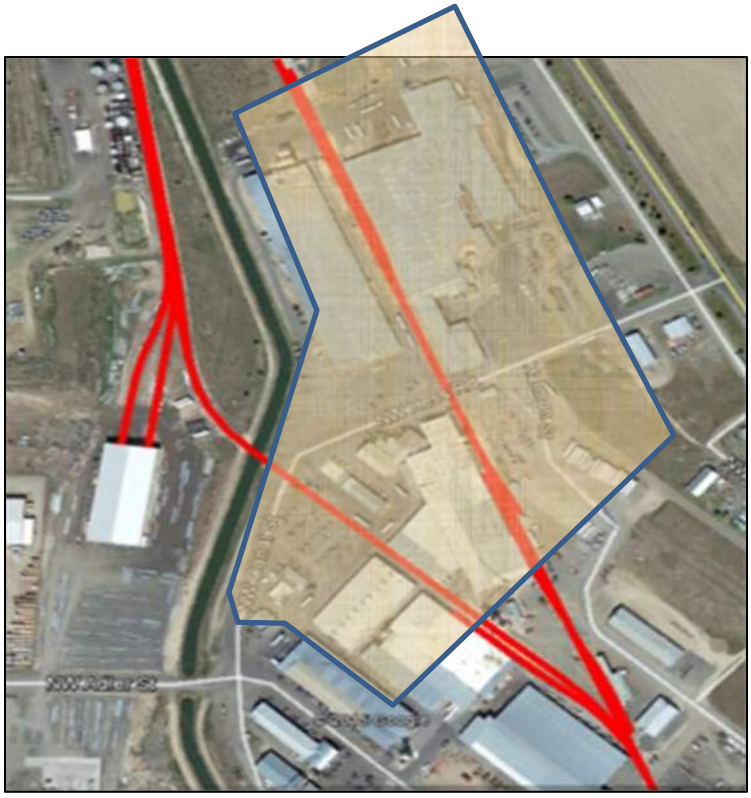

**Map 2.3: Track Ownership (North)**

**3.3 Industry Interviews.** During the week of November 15, 2015, Burgel Rail Group, conducted telephone interviews with the industries in the Madras area currently being served by rail. Nearly all of this industry is located in an industrial park northwest of the Madras town-center with the remaining shippers located along the BNSF main line.

Each industry listed below was interviewed to determine their degree of satisfaction with rail as one of their transportation modes to either receive or ship out products.

**3.3.1 Bright Wood Service**

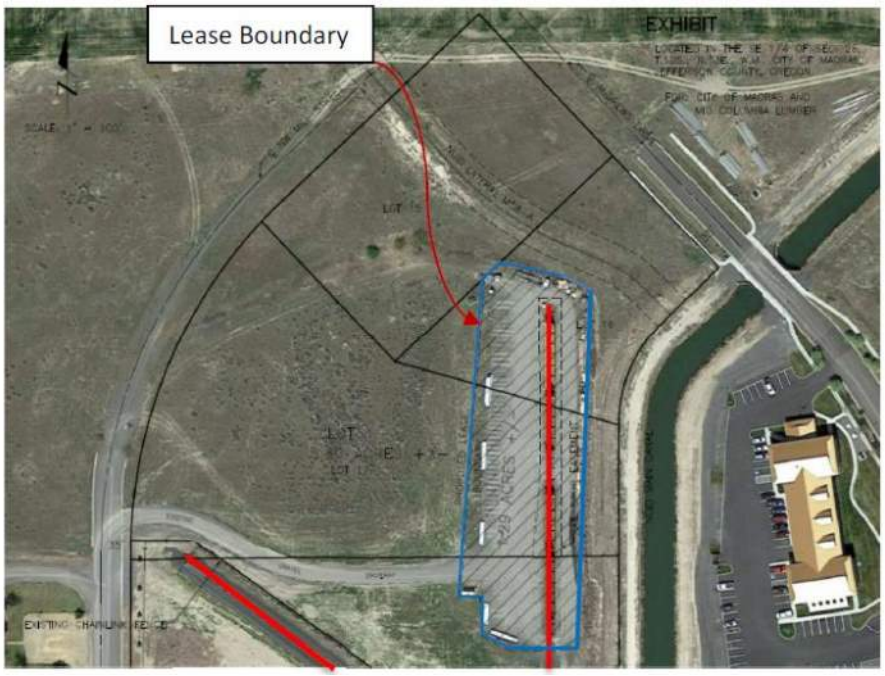
Contact - Chris Leidel, Bright Wood's rail traffic manager. He said that Bright Wood currently has a two-car spot. This works well under most traffic conditions. However, due to traffic flows beyond the control of Bright Wood (such as weather, rail congestion), five loaded cars often arrive simultaneously. When this occurs, Bright Wood begins to unload two of the cars but must wait until these cars are unloaded, then pulled before two of the other loaded cars can be spotted and unloaded. BNSF typically does not give the industry any relief from incurring demurrage and/or constructive placement fees. (These fees are intended to speed up the unloading process so that the railroad doesn't have too many railcars on spot or "in the system". Also, these fees are the railroad's attempt to preclude shippers from using railcars are temporary warehouse storage.) However, when the delays occur on the rail system which tends to bunch the delivery of loaded cars, the railroad may or may not assess these fees. To better control this situation, Chris would like to construct a gravel pad adjacent to one of their tracks that would allow for 2-3 more cars to be spotted and unloaded before demurrage charges kick in. Chris indicated that he would send a sketch of where these improvements could be constructed.



**Map 3.1: Bright Wood area (light tan pattern) within Madras Industrial Park**

Bright Wood Corp.
335 Hess

**3.3.2 Mid-Columbia Lumber.** Discussed rail traffic situation with Adam and with Candance Schultz. They stated that Mid-Columbia often receives 2- to 4 cars of product at their 4-car spot located north of N. Cherry Lane. They were satisfied with this facility. They indicated that they were planning on doubling the capacity of their 4-car spot at their Culver facility to an 8-car spot.

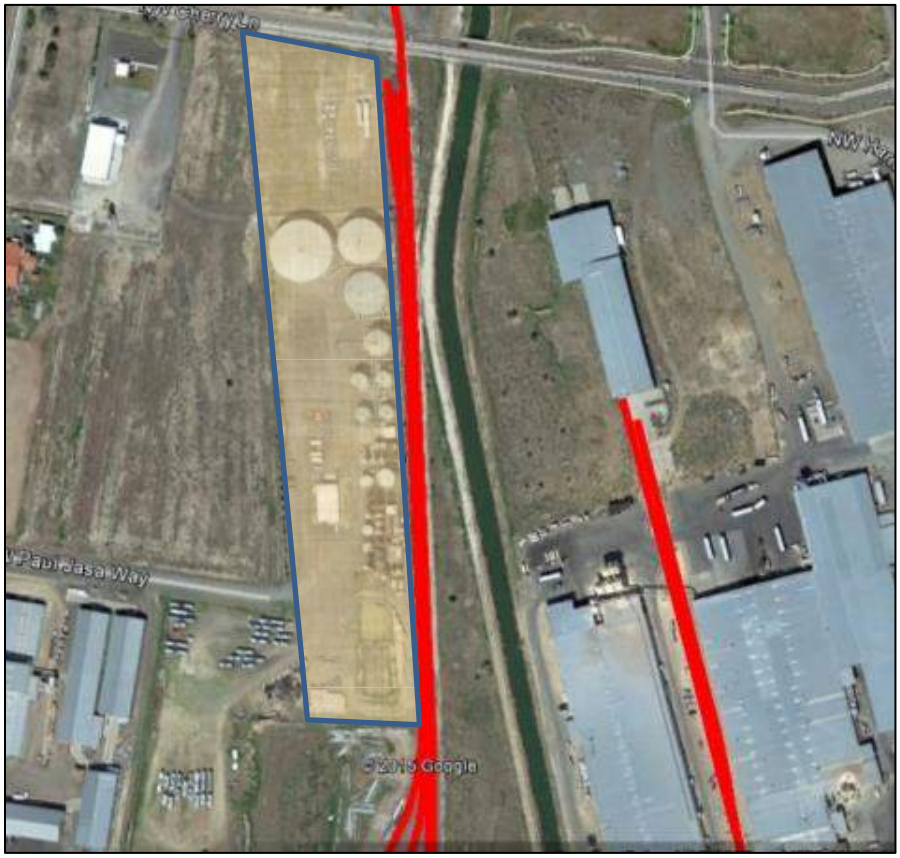



**Map 3.2: Mid-Columbia Rail Car spot (track to the right), north of NW Cherry Lane.**

Mid-Columbia Lumber
380 Adler

### 3.3.3 Albina Asphalt

Contacted Albina Asphalt's Mike (Traffic Manager). Mike said that at the current time, he was satisfied with the rail service.



**Map 3.3 Albina Asphalt (light tan pattern)**

Albina Asphalt – 400 Paul Jasa Way

**3.3.4 Wilbur-Ellis.** Discussed rail traffic situation with Pat, Wilbur-Ellis' traffic manager. He was quite satisfied with their rail car spot.

**Map 3.4 Wilbur Ellis rail facility**

### 3.3.5 Cenex

According to Dean Boyle, Cenex' traffic manager, Cenex seldom uses rail as they are currently not cost-competitive. When they do use rail their volume amounts to roughly 10 cars a year which they use the rail cars for temporary local storage of grain.

**Map 3.5: Cenex (light tan pattern)**

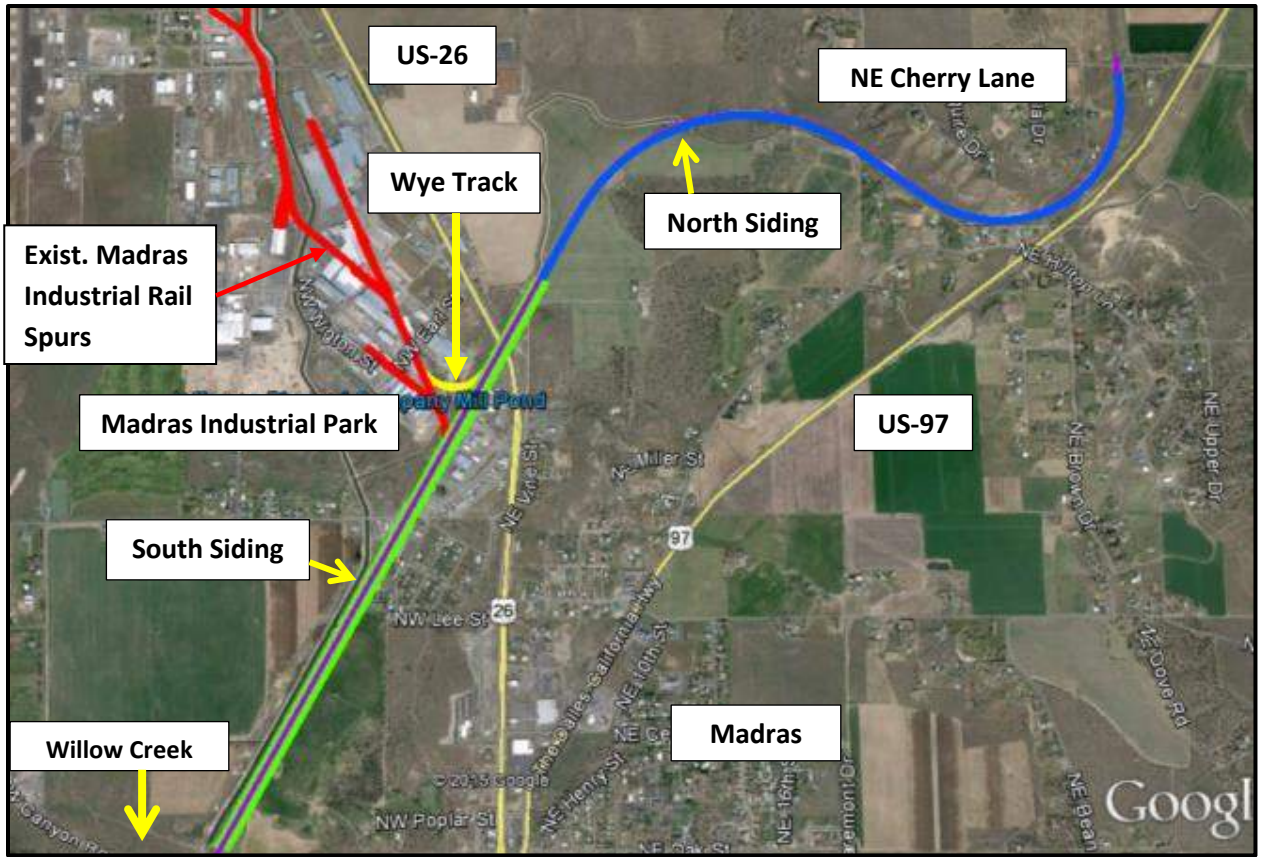
### 3.3.6 Carson Oil

It appears that this spur track has been removed. This area could be used for a reload track as discussed in Section 4.1.

**Figure 1: Screen capture of former location of Carson Oil Spur Looking south from NW Birch Lane. Purple line in background Denotes BNSF main track.**

**3.3.7 BNSF.** Discussions were held with BNSF's Trainmaster Christian Johansen regarding the railroad operations in the Madras area and three main issues were identified:

(1) BNSF is planning to perform track maintenance on trackage in the Madras Industrial Park area in the near future (December, 2015).
(2) BNSF would like to install a wye track just to the north of the existing Madras Industrial Park spur track. An approximate location of the wye is included in the Map 3.6 (shown in yellow) The curvature of this wye is 12.5 degrees (459 foot-radius), the tightest radius allowable (under older standards). It is very likely that BNSF (and UP) would require a softer radius which may necessitate finding an alternative location nearby for the wye track.
(3) BNSF indicated that, due to the number of through trains that now operate on the Bend Branch, considerable congestion occurs in the Madras area. One of their ideas is to construct a portion of double track that would extend from NE Cherry Lane (northeast of Madras) south to the north edge of the Willow Creek trestle, a distance of 16,500 feet (3.1 miles) . The primary purpose of this siding track would be to meet and pass main line trains. However, if industry tracks are located along this siding, it would further allow BNSF to continue to operate main line trains while one of the their local trains are spotting and pulling cars from the rail-served industry.




**Map 3.6 Sketch of BNSF's proposed Madras-area track improvements**

The 3.1 mile-long double track under consideration by BNSF's regional and national planning departments would be broken into two sections: a North Siding (Blue Color) that would be 9,100-feet long and South Siding (Green Color) that would be 7,400-feet long. A universal crossover would be installed where these two siding meet (which is approximately 1000 feet north of the US-26 viaduct. The only at-grade road crossing that these long tracks encounter is NW Birch Lane/Straun Road (see Figure 2) located midway in the South Siding. The construction of the South Siding will require attention to the following engineering issues:

(1) The Hwy 26 bridge appears to have about an 80' clear span with the tracks located to the southeast to accommodate a culvert under the bridge for the adjacent irrigation canal.
(2) In addition, from Hwy 26 to Birch lane there is an existing siding, located on the east side, at what looks like a 15' spacing, with an industry siding (Cenex) further east (also at a 15' spacing). The Cenex facility is located immediately off of this siding.
(3) The lead into the Industrial Park appears to be a No. 11 turnout to a 9 1/2 degree curve and then the bridge over the irrigation canal. There is a No. 9 turnout at the end of the curve into Jefferson Plywood.
(4) It would appear with the location of Cenex, the Cenex siding and the BNSF siding track that the only location for the new siding with 20-25' spacing would be to the west side or a respacing of the main line and the first siding to the east.
(5) A siding on the west side would affect the lead into the Industrial Park as well as the irrigation canal at the Hwy 26 bridge.
(6) A respacing of the main to allow for a wider clear distance on the existing siding would seem more feasible.

Appendix B shows a diagram of UP's main line section requirements. As UP is the underlying owner, it will be necessary to use their standards (which are very similar to BNSF's).

**Figure 2: View North at NW Birch Lane.**

## 4.0 Yard and Industry Track Alternatives Development

**4.1 Industry Siding and/or Unit Train Loop Track Facilities.** Maps 4.1 and 4.2 show several locations in the Madras area where it may be feasible to construct an industry spur and/or loop track arrangements in order to attract rail-served distribution centers and bulk commodity customers who may require such facilities. Most of these parcels are fairly level which is important in designing and constructing rail spurs and loop tracks. Appendix C shows the requirements for industry tracks. As UP is the underlying owner of the tracks, their specifications will need to be met.

**4.2 Siding Alternatives**. Sidings for industry and/or reload facilities would be much easier for BNSF to site and approve if the improvements described in Section 3.3.7 (above) are implemented. BNSF's (although UP is the underlying owner in the Madras area) right-of-way varies between 100 and 200 feet in the immediate Madras area. The narrower 100 foot width is more than adequate to accommodate the BNSF main line track, an additional siding track as contemplated by BNSF (North and South Sidings as displayed in Map 3.6) and potentially, an industrial-park siding. UP's standards for track centers are typically 20 feet. Therefore, within a 100-ft wide right-of-way, three tracks could be constructed (20' + 20' track centers) with another 30 feet available on either side for a right-of-way access road and/or a fence. BNSF's main line track center requirements are slightly more restrictive at 25 feet and may prevail in this area.

Reload facilities are usually sited to take advantage of a particular railroad's pricing (rates) structure. In other words, if a shipper receives better rates from UP, then they simply truck their product to a reload facility located on UP trackage. If BNSF rates are more competitive, then the shipper trucks their product to a BNSF reload track. In this sense, a reload facility gives shippers the control they need to manage railroad shipping rates. This is not an advantage in the Madras area because both railroads serve the greater Madras area due to historic agreements.

Locating a reload facility is a fairly straightforward process that depends on (1) which direction BNSF would access the track, (2) gradient, (3) truck access and (4) other geographical considerations. Because the railroad would like to retain their ROW for through-train purposes, the major portion of the reload track would probably be located just outside of their ROW. Note the example of new track installation in Figure 3 where the track parallel to UP's main line was placed just outside of the UP ROW line.

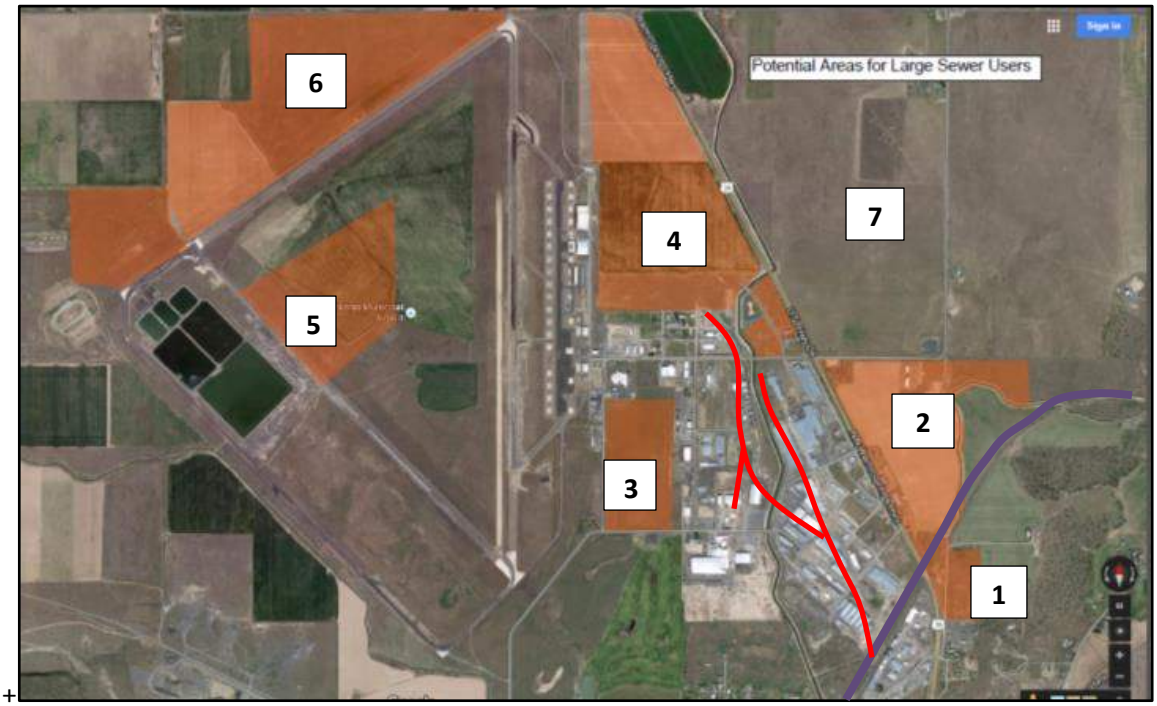
**Figure 3: Recently completed intermodal facility located just east of Boardman on Union Pacific's main line (located in extreme left hand corner). Siding was constructed just off of UP's right-of-way and was paid for using the *Connect*Oregon funding program.**

Industry sidings would be designed to meet the needs of the prospective shipper. Typically, BNSF (and UP) would prefer to access rail-served customers from a siding track that parallels their main track so they could continue to operate their main line trains without interruption while the industry was being switched. Indeed, if the spur track enters the main track directly, additional costs could be incurred as the railroad would in all likelihood insist on (1) a more expensive turnout, (2) a to-be-determined length of siding track whereby the local train service could depart and clear the main line should through-train congestion dictate that the local clear the main, (3) a double split-point derail that may be signalized, and (4) increased signal costs that in turn provide greater safety to through trains operating on the main track.

Customers that currently receive train service along the Madras Industrial Spur have avoided these costs. However, BNSF has indicated that too much time is spent negotiating this spur to serve these customers. Current rail served customers north of Cherry Lane require BNSF to operate through a maze of poorly maintained 90# industrial tracks, with insufficient clearance, with multiple crossings and paved area and through the middle of Mid-Columbia Lumber operations with fork lifts and pedestrians walking out of buildings within feet of the operating track. It is no wonder that BNSF would not be excited to expand to unit train operations (Loop Track A) north of Cherry Lane. Perhaps new rail-served customers could be located much closer to the BNSF main track thereby achieving low installation costs while meeting the needs of BNSF to minimize the switching time now required to spot and pull industry located north of NW Cherry Lane. Another possibility might be to rehabilitate the industrial trackage in the

Jefferson Plywood area to serve as a reload facility. A third possibility could be to replace the siding that was formerly located at the Carson Oil site (Section 3.3.6) very near NW Depot Street.

In designing the rail spur, various factors must be considered, such as (1) number and types of railcars expected daily, (2) spotting as well as loading/unloading requirements including necessity to access both sides of car; tie down requirements; fall-protection while loading/unloading; Inspection requirements; and hazardous material conditions, (3) track level vs building level requirements and (4) direction to be served by BNSF's local train service (i.e.which direction the turnout should face).




**Map 4.1 Potential areas where large-scale industry could be sited. Purple line shows the BNSF main track and the red line, the approximate location of the Madras Indusrial Spur Track. The text below describes how each numbered parcel could be connected to BNSF.**

Rail access could be provided to the parcels described in Map 4.1 as follows:

- Parcel 1 could be accessed by BNSF by extending the Madras siding north from its current end underneath the US-26 viaduct to reach this parcel.
- Parcel 2 could be served by a variation of one of the rail leads described in Section 4.3.3.
- Parcel 3 could be reached by extending the Madras Industrial Rail Spur to the west just after its crosses the irrigation canal. BNSF may request that the Madras Industrial Rail Spur be upgraded to accommodate a higher track speed so that they may serve an industry located at Parcel 3.
- Parcel 4 could be accessed by extending the Madras Industrial Rail Spur north from its current termination just north of NW Cherry Lane. However, this distance is over a mile and BNSF would likely insist the spur trackage between their main track and Parcel 4 be upgraded to operate at 20 MPH so they wouldn't spend too much time moving up and

down the spur track to access Parcel 4. Parcel 4 is large enough to accommodate a loop track. Loop Track A is described in greater detail in Section 4.3.

- Parcels 5 and 6 may not be accessible by rail given the restrictions of the Airport Protection Zone. There appear to be issues with height restrictions and proximity to the runways (could an airplane land or take-off as a freight train passed by the end of the run-way?) and there could be conflicts with airport master-planning (could the runways be extended if a rail track passes near the current end of the runway?) These parcels could, however, be served by trucks and/or a reload service.
- Parcel 7 rail service is described in Section 4.3.

Accessing Parcels 3 and 4 are only recommended for rail service if an agreement with BNSF is reached to improve the Madras Industrial Rail Spur. Costs for these improvements are incorporated in the cost estimate for these options.

**4.3 Loop Track Feasibility.** Loop tracks allow shippers to engage with the railroad to transport high-volume commodities from origin to destination. These commodities include grain (corn, soy, wheat), potash, soda ash, coal, crude oil, and other bulk materials. Typically, loop tracks are placed on a fairly level parcel that is at least 1,600- to 2,000 feet in width. This width is necessary to accommodate the 7.5-degree maximum curvature (764-foot radius) stipulated by BNSF (and UP) design standards. The overall length of the loop track would be dictated by the length of train but unit train lengths are usually 7,500 to 10,000 feet long. BNSF would decide the maximum length of each loop track based upon the unit train length needed to serve the prospective new industrial tenant. Typically, this decision would be based on the curvature, gradient and length of passing sidings on the route over which each unit train would negotiate from origin to destination. Due to the numerous curves between the Columbia River and Madras, it is likely that BNSF would limit the length of each unit train operating on this segment to 7,500 feet. Given that the loop track must accommodate both the inbound train as well as the outbound train, usually 15,000- to 20,000 feet of track must be constructed. Usually, the host railroad will require a shipper to build enough track in order to hold at least half of the entire fleet of trains used to move the commodity between origin and destination. Also, a bad-order set-out track is typically specified.

The likely origins (midwest portion of USA and Canada) of most of the bulk commodities that are likely to be handled at a loop track type facility would move to the Madras area on the segment between the Columbia River and Madras. For this reason, access tracks to and from the proposed loop tracks are shown with the primary access to the north. A southern access is shown as this connection may be required by BNSF to move the locomotive set to and from a servicing facility located in Bend.

Several loop track concepts (Loops A, B, C, D) are included in Figures 4, 6, 7 and 8. All loops meet the 7,500 foot minimum train-length criteria. Doubling the loop by providing a 2nd interior loop would meet the 15,000-foot minimum in-the-clear train storage length. Also, turnouts must be located on tangent track. For this reason, wherever possible on these diagrams, tracks are extended to connect with the main line at a tangent. If it is necessary for a track to connect with a loop track, it will be necessary to design a length of tangent track in the curve in order to place the turnout on a segment of tangent track. Main line turnouts would be No. 15's and other turnouts, No. 11's.

Loop tracks are usually constructed on level grade. This is due to the fact that, during the loading or unloading process, the movement of the rail cars under the tipple is regulated by either a car-mover or a set of locomotives, the speed of which is precisely controlled. Precise movement control is necessary so that the loading/unloading equipment (that is normally operated remotely) can be easily attached or disconnected from the cargo doors. Also, uniform movement of the train under the tipple or over the unloading pit is important so that the flow of commodity to the conveyor belts is also uniform. The movement of a train on a level track helps to ensure the uniformity needed whereas if the track wasn't level, then it would be difficult to control the movement of the train resulting in an uneven flow of commodities to the conveyor belts.

### 4.3.1 Parcel 4 –

**Alternative 1 – Loop Track A:** 6,800 foot loop track could be placed inside Parcel 4 as shown in Figure 4-1. This design just barely accommodates curves of 7.5 degrees which is the minimum curvature recommended by both BNSF and UP on trackage on which they will allow their equipment to operate. The overall length of the loop track is slightly less than the optimal length desired by BNSF. However, a second loop track could be situated just inside the loop shown to attain the requisite length. It should be remembered that tracks located inside the 7.5 degree radius curves will be slightly sharper than the railroad standard.

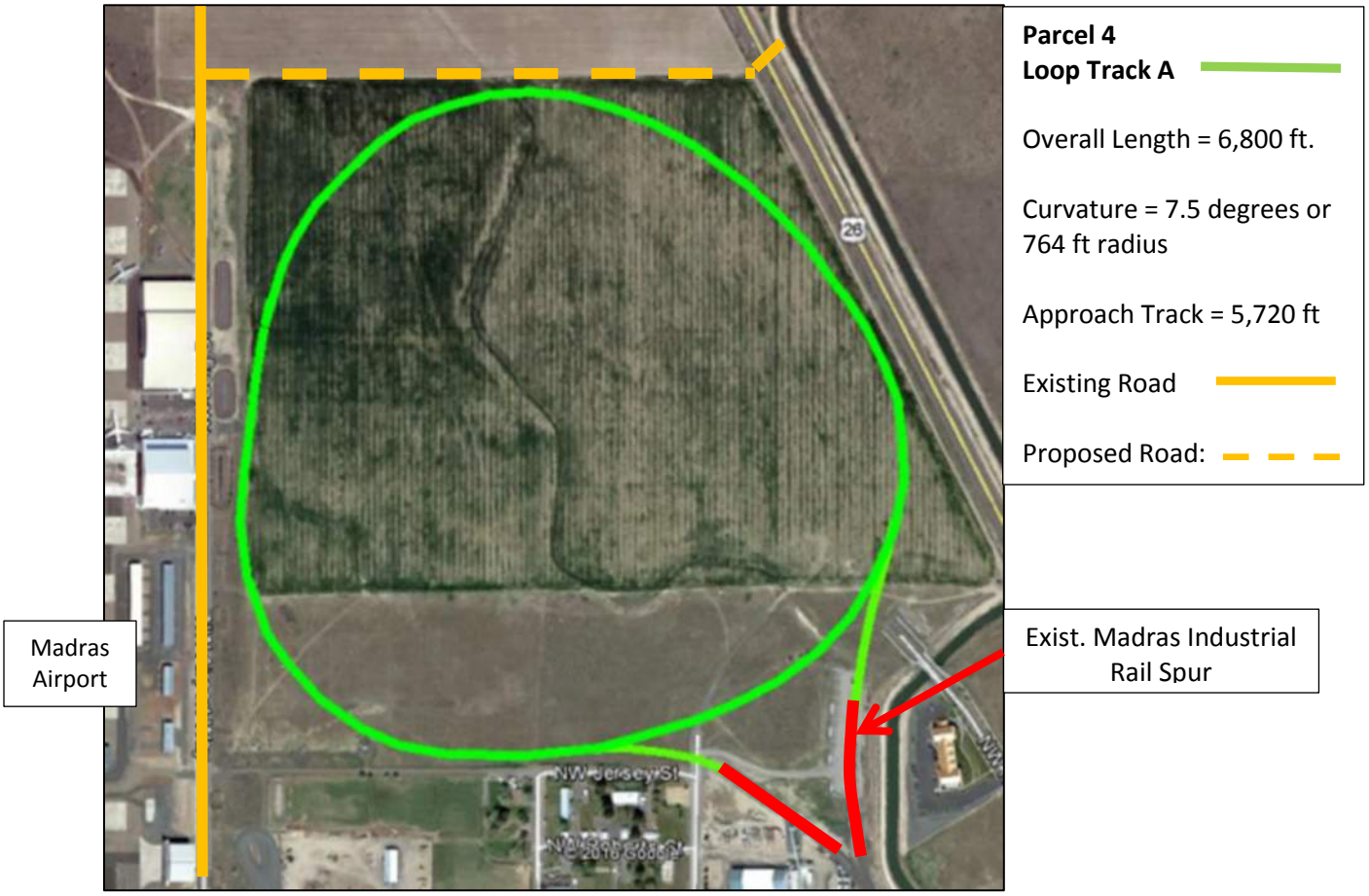



**Figure 4-1: Parcel 4, Loop Track A**

The disadvantage of Loop "A" is that it is located about a mile from the main track at the end of the Madras Industrial Track (which can be accessed from the south end of the loop). Because it is likely that commodities would move to the Madras area from the north (see text), a wye track (discussed in Section 3.7) should be constructed in conjunction with the installation of a loop track on Parcel 4. In addition, rehabilitation of the existing spurs might be necessary. The evaluation is not part of this study scope. To provide a total project cost, the previous cost estimates prepared by West Rail Construction Company in October 2011 (See Appendix D) are assumed and adjusted with an escalation factor. Costs to rehabilitate the existing spurs and to install the wye track have been included in the Loop Track A cost estimate (see Section 5). The City of Madras is considering an expansion of their airport, as well as the placement of a new street to access the airport directly from Hwy 26. (Dashed orange line in Figure 4.) Both of these projects might preclude the installation of Loop Track A within Parcel 4.

**Alternative 2 – Rail Spur Extensions:** Figure 4-2 shows two potential rail spur extensions (in green). These spurs would begin at the current northern end of the Madras Industrial Rail Spur. Alternative 2A will extend from the current Wilbur-Ellis spur northwesterly to serve Parcel 4; whereas Alternative 2B will extend from the current Mid-Columbia Lumber spur along the easterly boundary of the industrial park to serve Parcel 4. In order to avoid disrupting loading or unloading operations for cars spotted on the existing rail spur, it may be necessary to install a turnout to bypass under this circumstance. Alternative 2B will require re-platting of lots in the industrial park. Costs to rehabilitate the existing spurs and to install the spur extension with a turnout have been included in Section 5. Extending the existing spurs northerly presents a viable option to serve the future industrial development and would cost less than the Alternative 1 – Loop Track A above.

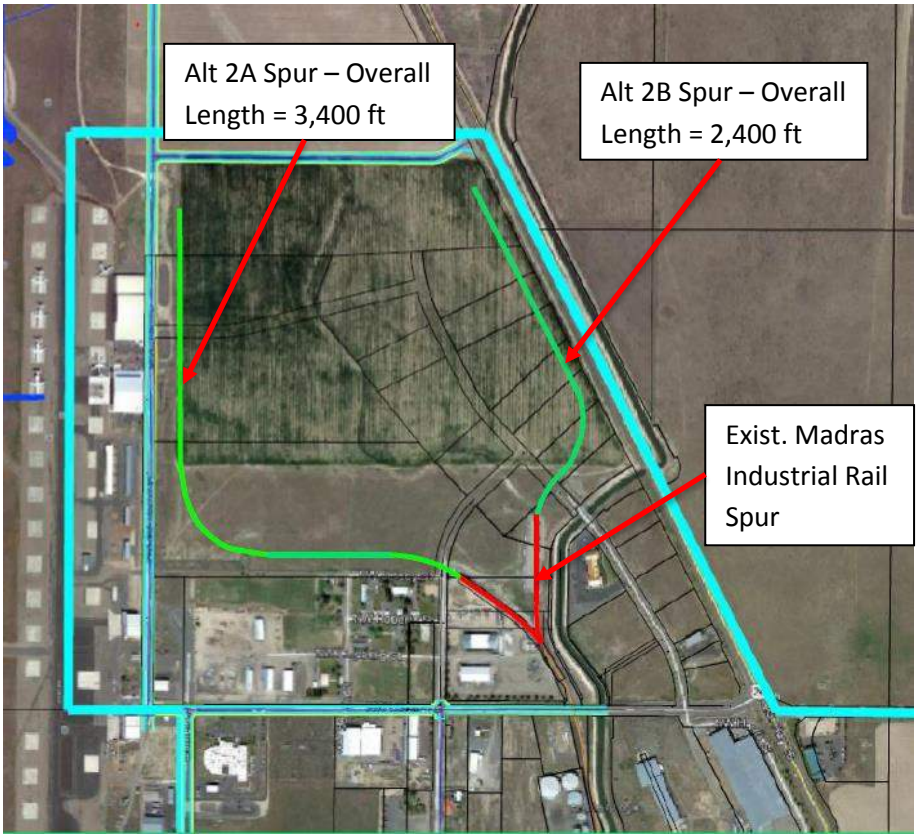



**Figure 4-2: Parcel 4, Rail Spur Extensions**

**4.3.2 Parcel 7.** The City of Madras suggested that a large parcel (Parcel 7) located northeast of the City and east of Hwy US-26 be considered for a potential loop track facility. This parcel has several distinct advantages including: proximity to the BNSF main track, relatively flat terrain and sufficient area in which to place a large loop track arrangement. Figure 5 shows the approximate elevations of selected points within Parcel 7. These data points indicate that a fall of over 60 feet exists between the east and western edge of this parcel. A loop track facility oriented due east/west would need considerable grading in order to develop a level grade required for a loop track.

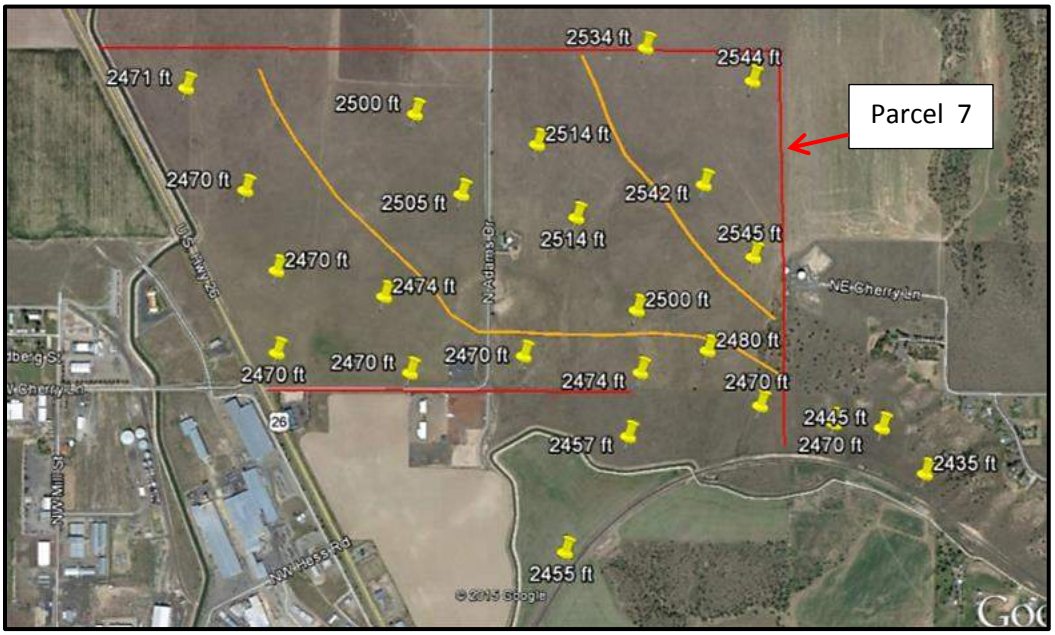



**Figure 5: Selected elevations shown in Parcel 7. These elevations range from approximately 2470 feet on the west side of the parcel to 2540 feet on the east. Thin orange lines denote approximate location of a 30 foot contour difference. For this reason, Loop Tracks B and C have been aligned with these contours in order to minimize grading costs.**

**4.3.3 Parcel 7 – Loop Track B.** This loop track configuration is 7,800 feet in length and is located on level ground adjacent to US-26. The primary disadvantage of this location is that it is just over one mile between the BNSF main track and the entrance to the loop.

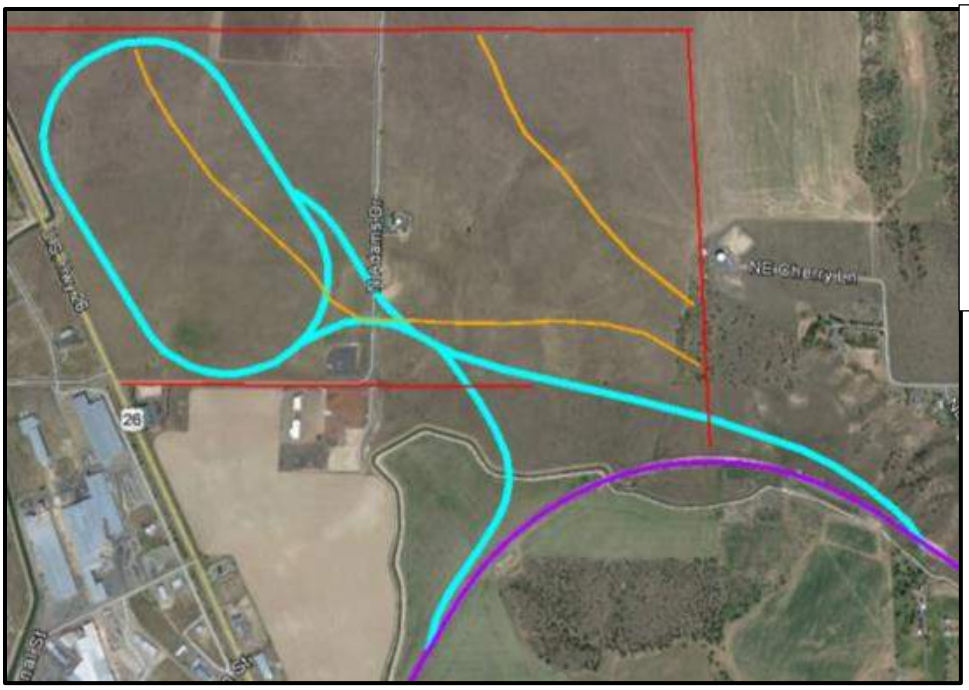



**Figure 6: Loop Track B that can accommodate a 7,800 foot train operating over 7.5 degree curves.**

**4.3.4 Parcel 7 – Loop Track C.** Loop track C is located fairly close (3,700 feet) to the BNSF main track and could accommodate a train that is 8,700 feet in length. Of course, the loop could be shortened to handle a shorter train if so desired.

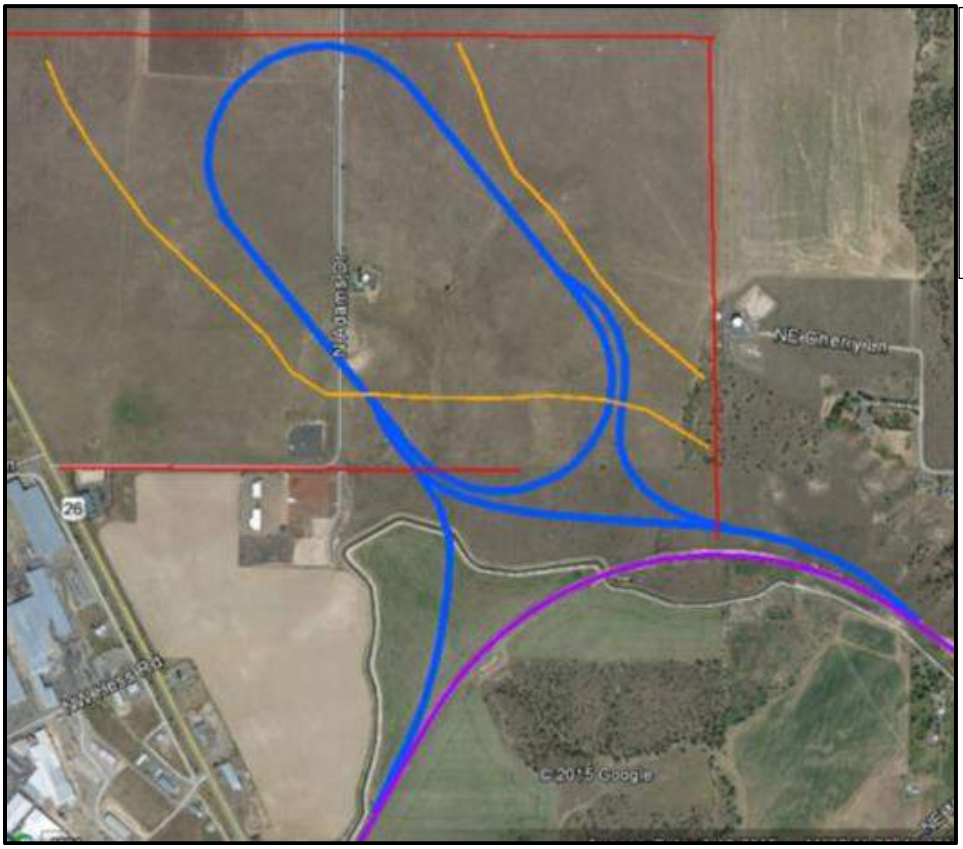
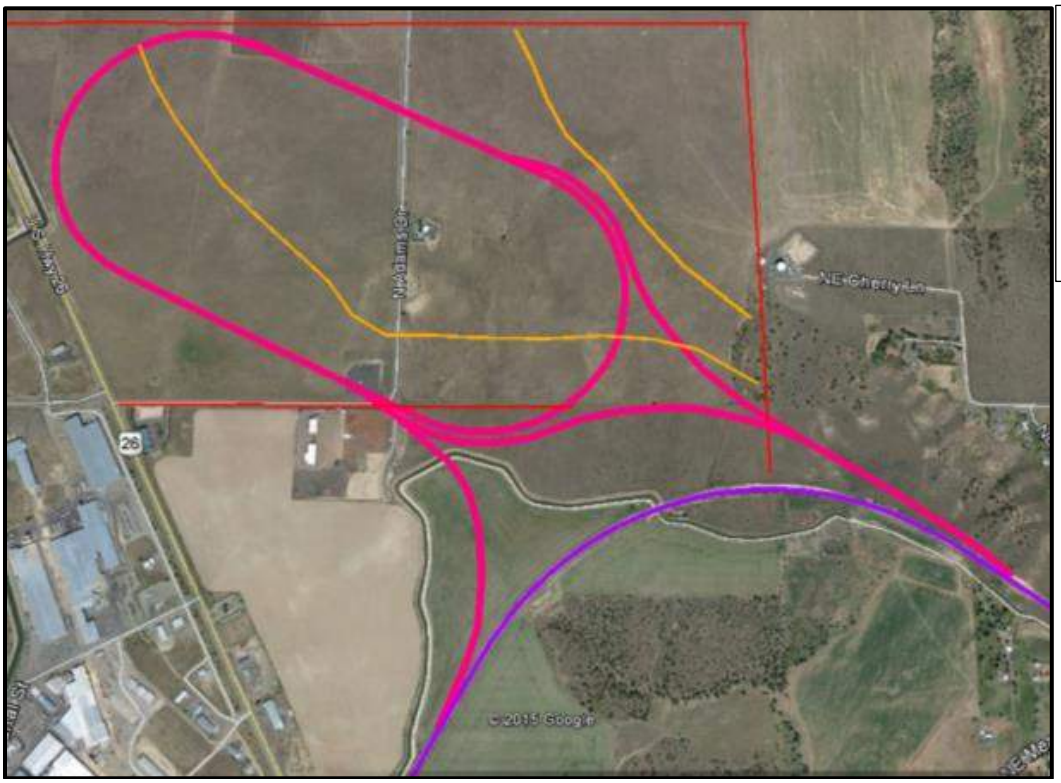



**Figure 7: Loop Track C has its primary access to the BNSF main track to the north . Overall loop track length is 8,600 feet and is designed with 7.5 degree curves.**

**4.3.5 Parcel 7 – Loop Track D.** Loop Track D has been included in this study simply to show the maximum size of a loop track located on Parcel 7. This design would certainly accommodate any length of bulk train that is now routinely operating on the nation's rail network . Distance to the BNSF main line is approximately 4,800 feet. The primary disadvantage with this design is that there is an over 60 foot difference in elevation between the eastern and western edges of the loop track.




**Parcel 7**
**Loop D** = 11,100 feet with 5.7 degree curves.

Approach Tracks = 10,500 feet

**Figure 8: Loop Track D is likely to be the largest loop possible to be placed on Parcel 7. The overall length of the loop track is 11,100 feet with 5.7 degree (1,000 foot radius) curves. This diagram is only shown to display what is possible at this site. Note that the difference in elevation between the eastern and western edges of the loop is over 60 feet.**

## 5.0 Concept-Level Project Costs

Recent BNSF main line construction costs average approximately $800/track foot. Costs for the Oregon Trunk might have been slightly lower given the lower overall volume of trains likely to operate through Madras. However, recent stipulations by the Federal Railroad Administration (FRA) for the railroad industry to protect all train movements with an additional overlay safety system, known as Positive Train Control (PTC), have pushed costs up to these figures. Some of the trackage will essentially be constructed on existing track bed (for instance, roughly 2,900 feet of the proposed South Siding will use rehabilitated siding track which is essentially completely new track , rail, ties, fasteners and ballast) and this cost might be slightly less ($600/TF). It will be necessary, however, to shift the track centers of this siding out to 25 feet. Consequently, per foot costs for main line trackage will use this $800/track foot figure. Yard costs average $160/TF. The probable project costs are order-of-magnitude, concept-level

estimates and include a construction contingency of 25% and an overall allowance of 35% for engineering, permitting and other non-construction costs. Further study will allow the development of more refined costs and the use of a lower contingency.

**5.1 Madras Industrial Park Wye (potential *Connect*Oregon project)**

| ***Item*** | ***Unit Costs*** | ***Quantity*** | ***Costs*** | ***Comments*** |
|---|---|---|---|---|
| Track (Yard) | $160/TF | 1,200 track ft | $192K | |
| Turnouts – Hand Throw No. 15 - Signalized | $300K each | 1 | $300K | |
| Turnouts – Hand Throw No.11 – Yard | $100K each | 1 | $100K | |
| Signal and Crossings | Lump Sum | 1 | $210K | |
| Bridge | $5,000/ft | 40 ft | $200K | Irrigation Canal |
| ROW | TBD | | | |
| Approximate costs (without ROW) | | | $1.00M | |
| Construction Contingency (25%) | | | $0.25M | |
| Total Construction | | | $1.25M | |
| Engineering/Permitting/Others (35%) | | | $0.44M | |
| **Concept-Level Project Cost Estimate** | | | **$1.69M** | |

**5.2 South Siding (potential *Connect*Oregon project)**

| ***Item*** | ***Unit Costs*** | ***Quantity*** | ***Costs*** | ***Comments*** |
|---|---|---|---|---|
| Track (Rehab to Main Line) | $600/TF | 2,400 TF | $1.4M | See Note |
| Track (Main Line) | $800/TF | 5,000 TF | $4.0M | See Note |
| Turnouts – Hand Throw No. 11 Signalized | $150K each | 2 | $0.3M | Access to Cenex spur |
| Signal and Crossings | Lump Sum | 1 | $0.2M | |
| Bridge | $5,000/ft | none | | |
| ROW | TBD | | | |
| Approximate costs (without ROW) | | | $5.9M | |
| Construction Contingency (25%) | | | $1.5M | |
| Total Construction | | | $7.4M | |
| Engineering/Permitting/Others (35%) | | | $2.6M | |
| **Concept-Level Project Cost Estimate** | | | **$10.0M** | |
| Note: The $600- to $800/TF cost is nearly all inclusive in terms of grading, track, connecting turnouts, signaling, PTC. Exceptions are noted in the table. | | | | |

**5.3 North Siding**

| *Item* | *Unit Costs* | *Quantity* | *Costs* | *Comments* |
|---|---|---|---|---|
| Track (Main Line) | $800/TF | 9,100 track ft | $7.3M | |
| Crossings | $500/ft | none | | |
| Bridges | $7,000/ft | 2 @ 40 ft each | $0.6M | Two Irrigation canal crossings |
| ROW | TBD | | | |
| Approximate costs (without ROW) | | | $7.9M | |
| Construction Contingency (25%) | | | $2.0M | |
| Total Construction | | | $9.9M | |
| Engineering/Permitting/Others (35%) | | | $3.5M | |
| **Concept-Level Project Cost Estimate** | | | **$13.4M** | |
| Note: The $600/TF to $800/TF costs are nearly all inclusive in terms of grading, track, connecting turnouts, signaling, PTC. Exceptions are noted in the table. | | | | |

**5.4 Universal Crossovers – MP 104.1**

| *Item* | *Unit Costs* | *Quantity* | *Costs* | *Comments* |
|---|---|---|---|---|
| 4 - No. 15 Turnouts | $300K/turnout | 4 | $1.20M | |
| ROW Road | $30/LF | 2000 LF | $60K | |
| Approximate costs (without ROW) | | | $1.26M | |
| Construction Contingency (25%) | | | $0.32M | |
| Total Construction | | | $1.58M | |
| Engineering/Permitting/Others 35%) | | | $0.55M | |
| **Concept-Level Project Cost Estimate** | | | **$2.13M** | |

**5.5 Summary – Madras Area Track Improvements**

| *Item* | *Estimated Costs* | *Comments* |
|---|---|---|
| Madras Wye | $1.7M | |
| South Siding | $10.0M | |
| North Siding | $13.4M | |
| Universal Crossover | $2.1M | |
| **Approximate costs (without ROW)** | **$27.2M** | |

**5.6 Alternative Loop Track or Spur Extension Layouts – Estimated Costs (no ROW or grading costs included herein)**

| Loop or Spur | Parcel | Loop or Spur Track (ft) | Loop or Spur Cost[1] | Approach Tracks (ft) | Approach Cost | Turnout Cost [2] | Rehab Cost -Exist Spurs or Mainline | Const rCost | Est. Project Cost [3] |
|---|---|---|---|---|---|---|---|---|---|
| Alt 1 – Loop A | 4 | 6,800 | $1.1M | 5,720 | $0.9M | Wye - $1.5M | $1.0M | $4.5M | **$7.6M** |
| Alt 2A Spur | 4 | 3,400 | $0.6M | ---- | ---- | $0.8M | $1.0M | $2.4M | **$4.1M** |
| Alt 2B Spur | 4 | 2,400 | $0.4M | ---- | ---- | $0.8M | $1.0M | $2.2M | **$3.7M** |
| B | 7 | 7,800 | $1.2M | 9,400 | $1.5M | $0.8M | Part of 5.3 | $3.5M | **$5.9M** |
| C | 7 | 8,700 | $1.4M | 8,950 | $1.4M | $0.8M | Part of 5.3 | $3.6M | **$6.1M** |
| D | 7 | 11,100 | $1.8M | 10,500 | $1.7M | $0.8M | Part of 5.3 | $4.3M | **$7.3M** |
| | 1. Assume unit yard-track cost of $160/TF<br>2. Assume Turnout Cost of $0.8M lump sum<br>3. Project costs include a construction contingency (25%) and an allowance for engineering /permitting/ other nonconstruction costs (35%) | | | | | | | | |

## 6.0 Recommendations and Phased Implementation of Rail Improvements

The recommended rail improvements and phased improvements with concept level project costs are summarized below:

**Phase 1**

| Item # | Description of Improvements | Concept-Level Project Cost |
|---|---|---|
| 1 | South Siding (Section 3.3.7 & Section 5.2) | $10.0M |
| 2 | Madras Wye (Section 3.3.7 & Section 5.1) | $1.7M |
| 3 | Alt 2A Spur Extension/Exist Rail Rehab (Section 4.3.1 & Section 5.6) | $4.1M |
| | **Concept-Level Project Cost Estimate** | **$15.8M** |

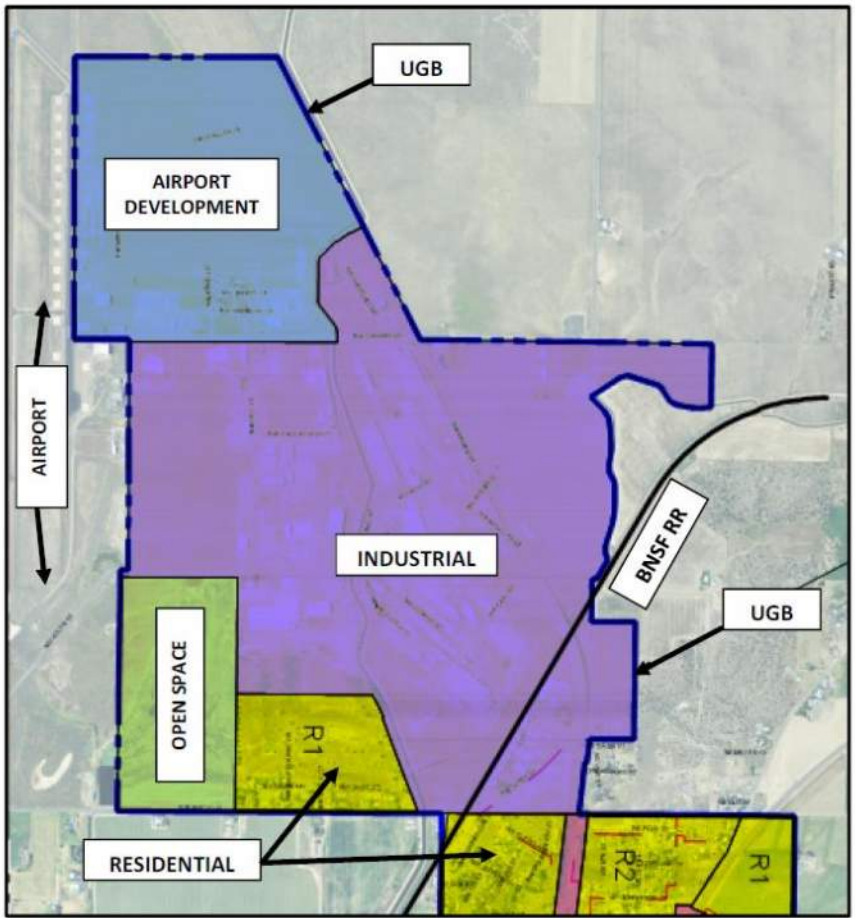
**Phase 2**

| Item # | Description of Improvements | Concept-Level Project Cost |
|---|---|---|
| 1 | North Siding (Section 3.3.7 & Section 5.3) | $13.4M |
| 2 | Loop C (Section 4.3.4 & Section 5.6) | $6.1M |
| 4 | Universal Crossover (Section 3.3.7 & Section 5.4) | $2.1M |
| | **Concept-Level Project Cost Estimate** | **$21.6M** |

The priority of the work to be pursued will be subject to discussions between BNSF and the City of Madras. The installation of the South Siding and Madras Wye might be funded using the *Connect*Oregon program. This work effort would benefit the City of Madras and associated industries as BNSF would be able to route their main line trains around the local train service switching from the main track. This separation is critical since fluidity of service is important to the industries shipping with the railroad and it helps keep the operating costs of the railroad at reasonable levels.

## 7.0 Land Use Considerations

Map 7.0 shows the existing urban growth boundary (UGB) in the siding-feasibility study area and identifies current City zoning for the land lying within the UGB. Railroad facilities are an allowed use on land within the UGB zoned for Industrial or Airport Development uses. The airport is on County land outside the UGB, which is zoned for Airport Management. As discussed in Section 4.2 with regard to Land Parcels 5 and 6 (see Map 4.1), airport restrictions likely preclude the extension of a rail spur onto airport land.




**Map 7.0: Urban Growth Boundary and Land-Use Zoning in Study Area**

**7.1 Industrial Rail Siding.** The industrial siding described in Subsection 4.2 would be located within the existing railroad ROW. Therefore, zoning restrictions would not impact the feasibility of the siding construction. But to provide direct service to adjacent users or to provide truck access to and from a reload facility at least part of the siding must be sited on ROW within the boundaries of land zoned for industrial use. Also, planning efforts for a reload facility will be simplified if road improvements for truck access are also located within the limits of industrial land.

**7.2 Alternative Rail Loop Tracks and Spur Extensions.** Loop A shown in Figure 4-1 and spur extensions shown in Figure 4-2 lie on City land zoned for Airport Development. This zoning is intended to provide space for commercial and industrial development relating to air transportation and rail facilities are an allowed use within this zoning category.

Loops B, C and D (Figures 6,7 and 8, respectively) are shown almost entirely outside the existing UGB on County land that is zoned for Exclusive Farm Use (EFU). It is likely a rail loop would only be extended into this area (Parcel 7 on Map 4.1) after it has been brought into the urban growth area (within the UGB) and rezoned as Industrial land. If rail track and appurtenant facilities were proposed for EFU land, an Administrative Review permit would be required. The proposal would also need to comply with the State Transportation Planning Rule as it pertains to rural-zoned lands.

**7.3 Potential Parcels for Large-Scale Industry.** Parcels 1 thru 4 shown in Map 4.1 are all located on land currently zoned for industry, but a siding within the railroad ROW could only provide direct service to parts of Parcels 1 and 2. Parcel 2 could also potentially be served directly by alternative Rail Loops B, C and D described in Subsections 4.3.3 thru 4.3.5.

Rail services to Parcels 3 thru 6, and potentially to portions of Parcels 1 and 2 would only be provided via a reload facility that would accommodate truck traffic to and from these parcels. Therefore, a reload facility would also entail street extensions or improvements to support truck access.

As discussed in Subsection 7.2, Parcel 7 is outside the UGB on land zoned for EFU.

## APPENDICES

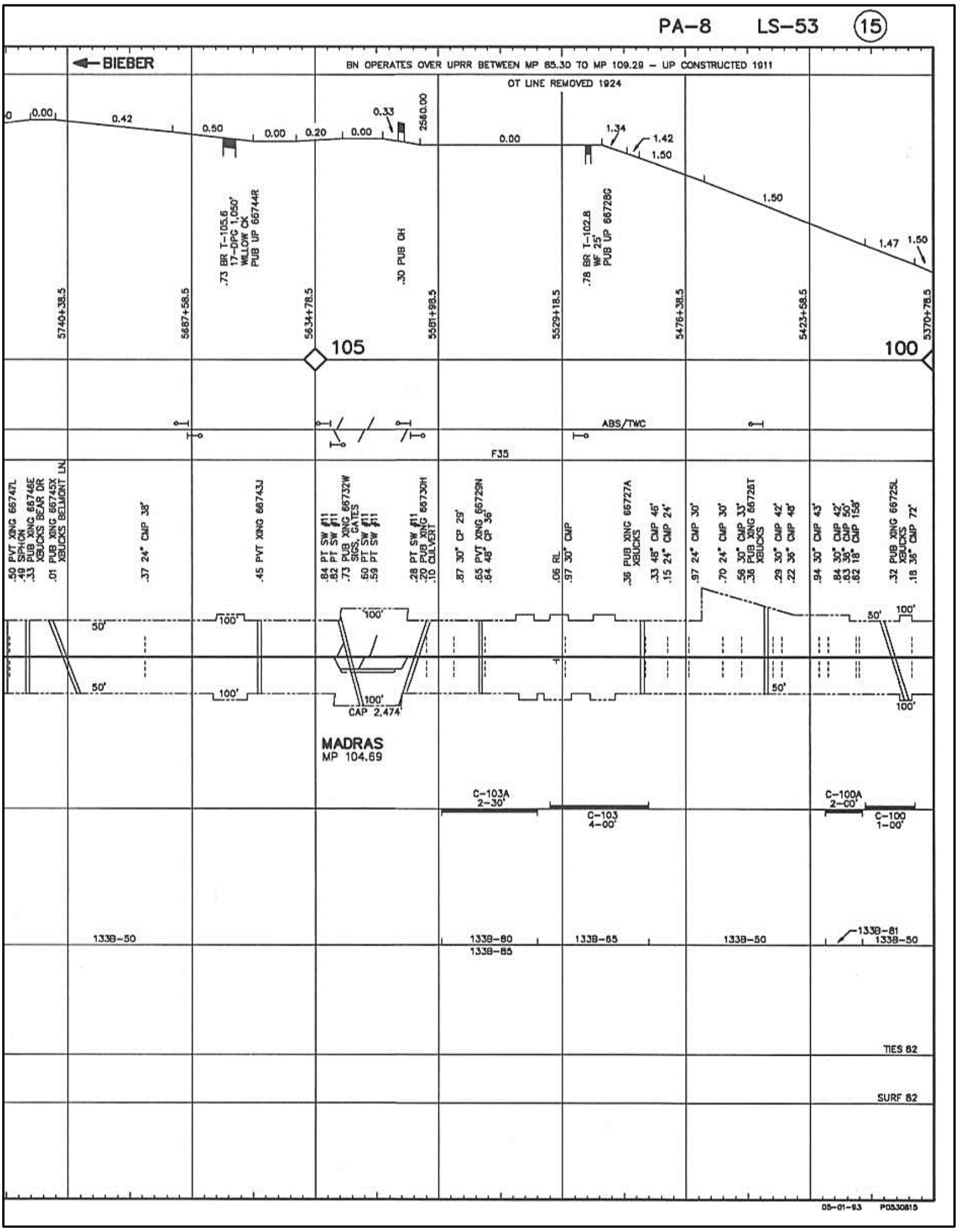
**Appendix A = BNSF Track Chart – Madras Area**

**Appendix B = Union Pacific Main Line Track Standard**

**Appendix C = Union Pacific Yard Track Standard**

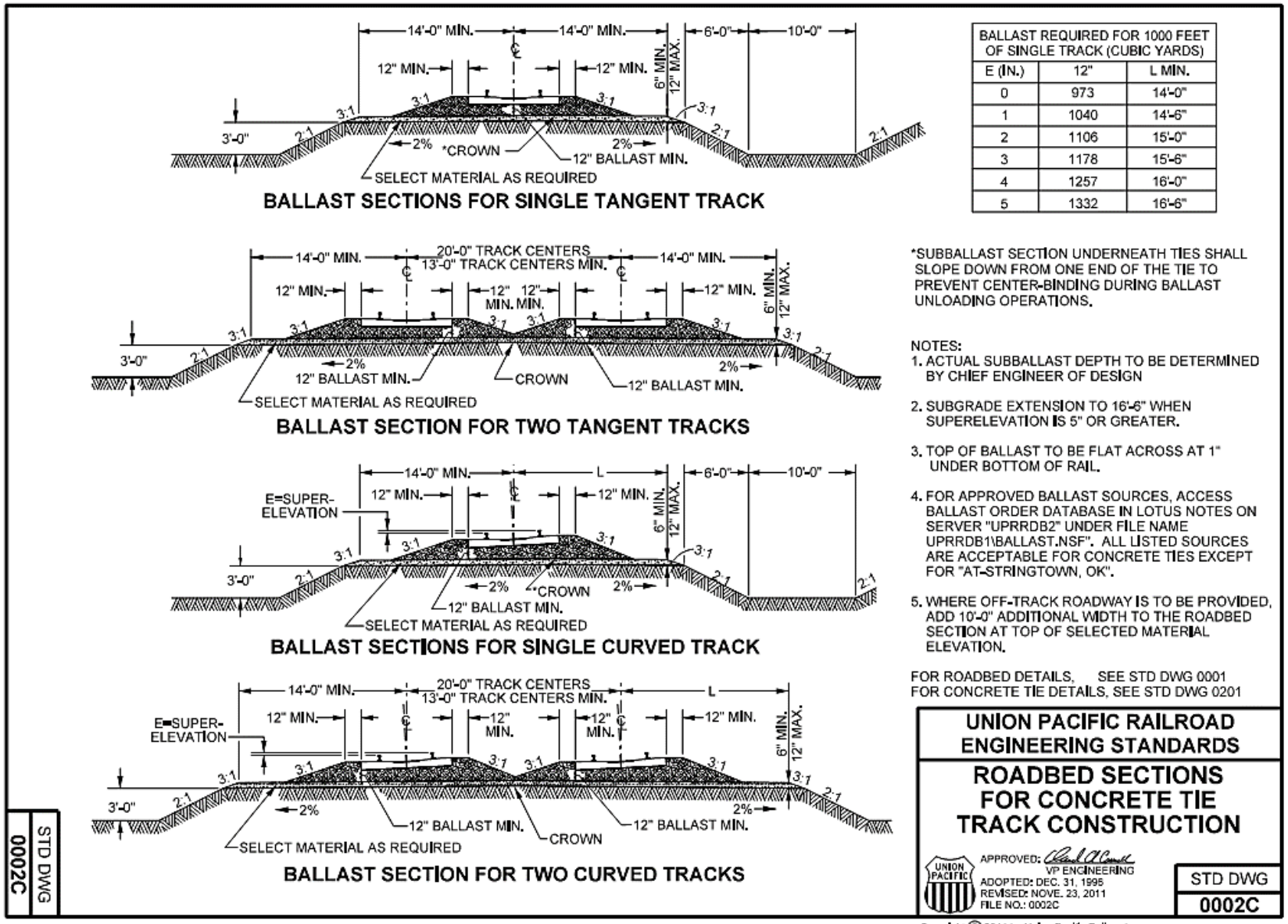
**Appendix D = Rehabilitation of Existing Madras Rail Spurs**
**by West Rail Construction Company**
**Dated October 21, 2011**

## Appendix A – BNSF Track Chart – Madras Area




Appendix A: BNSF track chart for the Madras area. This chart shows relevant track data for the BNSF Oregon Trunk main line including (from top to bottom): ownership history, gradient, major bridges, signaling, track speed, road crossings including FRA number of each crossing, milepost locations, right-of-way width, curves, and maintenance data.

## Appendix B – Union Pacific Main Line Track Standard




| BALLAST REQUIRED FOR 1000 FEET OF SINGLE TRACK (CUBIC YARDS) | | |
|---|---|---|
| E (IN.) | 12" | L MIN. |
| 0 | 973 | 14'-0" |
| 1 | 1040 | 14'-6" |
| 2 | 1106 | 15'-0" |
| 3 | 1178 | 15'-6" |
| 4 | 1257 | 16'-0" |
| 5 | 1332 | 16'-6" |

*SUBBALLAST SECTION UNDERNEATH TIES SHALL SLOPE DOWN FROM ONE END OF THE TIE TO PREVENT CENTER-BINDING DURING BALLAST UNLOADING OPERATIONS.

NOTES:
1. ACTUAL SUBBALLAST DEPTH TO BE DETERMINED BY CHIEF ENGINEER OF DESIGN
2. SUBGRADE EXTENSION TO 16'-6" WHEN SUPERELEVATION IS 5" OR GREATER.
3. TOP OF BALLAST TO BE FLAT ACROSS AT 1" UNDER BOTTOM OF RAIL.
4. FOR APPROVED BALLAST SOURCES, ACCESS BALLAST ORDER DATABASE IN LOTUS NOTES ON SERVER "UPRRDB2" UNDER FILE NAME UPRRDB1\BALLAST.NSF". ALL LISTED SOURCES ARE ACCEPTABLE FOR CONCRETE TIES EXCEPT FOR "AT-STRINGTOWN, OK".
5. WHERE OFF-TRACK ROADWAY IS TO BE PROVIDED, ADD 10'-0" ADDITIONAL WIDTH TO THE ROADBED SECTION AT TOP OF SELECTED MATERIAL ELEVATION.

FOR ROADBED DETAILS, SEE STD DWG 0001
FOR CONCRETE TIE DETAILS, SEE STD DWG 0201

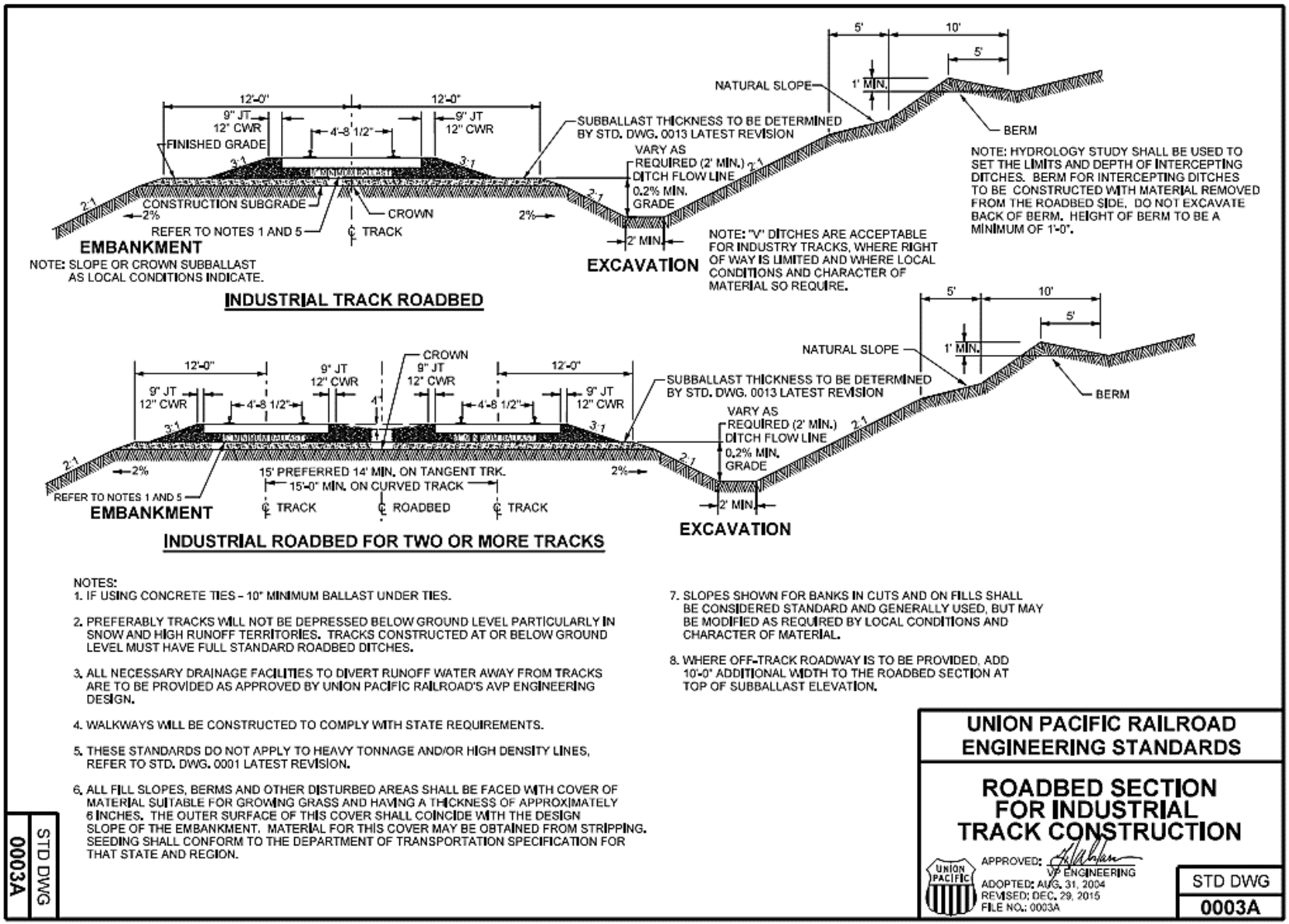
**UNION PACIFIC RAILROAD ENGINEERING STANDARDS**

**ROADBED SECTIONS FOR CONCRETE TIE TRACK CONSTRUCTION**

APPROVED: VP ENGINEERING
ADOPTED: DEC. 31, 1995
REVISED: NOVE. 23, 2011
FILE NO.: 0002C

STD DWG 0002C

## Appendix C – Union Pacific – Industrial Yard Track Standards




NOTES:

1. IF USING CONCRETE TIES – 10" MINIMUM BALLAST UNDER TIES.
2. PREFERABLY TRACKS WILL NOT BE DEPRESSED BELOW GROUND LEVEL PARTICULARLY IN SNOW AND HIGH RUNOFF TERRITORIES. TRACKS CONSTRUCTED AT OR BELOW GROUND LEVEL MUST HAVE FULL STANDARD ROADBED DITCHES.
3. ALL NECESSARY DRAINAGE FACILITIES TO DIVERT RUNOFF WATER AWAY FROM TRACKS ARE TO BE PROVIDED AS APPROVED BY UNION PACIFIC RAILROAD'S AVP ENGINEERING DESIGN.
4. WALKWAYS WILL BE CONSTRUCTED TO COMPLY WITH STATE REQUIREMENTS.
5. THESE STANDARDS DO NOT APPLY TO HEAVY TONNAGE AND/OR HIGH DENSITY LINES, REFER TO STD. DWG. 0001 LATEST REVISION.
6. ALL FILL SLOPES, BERMS AND OTHER DISTURBED AREAS SHALL BE FACED WITH COVER OF MATERIAL SUITABLE FOR GROWING GRASS AND HAVING A THICKNESS OF APPROXIMATELY 6 INCHES. THE OUTER SURFACE OF THIS COVER SHALL COINCIDE WITH THE DESIGN SLOPE OF THE EMBANKMENT. MATERIAL FOR THIS COVER MAY BE OBTAINED FROM STRIPPING. SEEDING SHALL CONFORM TO THE DEPARTMENT OF TRANSPORTATION SPECIFICATION FOR THAT STATE AND REGION.
7. SLOPES SHOWN FOR BANKS IN CUTS AND ON FILLS SHALL BE CONSIDERED STANDARD AND GENERALLY USED, BUT MAY BE MODIFIED AS REQUIRED BY LOCAL CONDITIONS AND CHARACTER OF MATERIAL.
8. WHERE OFF-TRACK ROADWAY IS TO BE PROVIDED, ADD 10'-0" ADDITIONAL WIDTH TO THE ROADBED SECTION AT TOP OF SUBBALLAST ELEVATION.

STD DWG 0003A

**UNION PACIFIC RAILROAD ENGINEERING STANDARDS**

**ROADBED SECTION FOR INDUSTRIAL TRACK CONSTRUCTION**

APPROVED: VP ENGINEERING
ADOPTED: AUG. 31, 2004
REVISED: DEC. 29, 2015
FILE NO.: 0003A

STD DWG 0003A

# Appendix D

# Rehabilitation of Existing Madras Rail Spurs

# by West Rail Construction Company

# Dated October 21, 2011

**West Rail Construction Company, LLC**

**P.O. 820626 Vancouver, WA 98682**

**PH** 360-260-0668

**Mbl** 360-518-3671

**Fx** 360-260-0670

**vernb@westrailconstruction.com**

www.westrailconstruction.com

QUALITY SAFETY INTEGRITY

October 21, 2011 CITY.MADRAS.IND.PARK.docx

Ian Townsend
The Harris Group, Inc
1750 NW Naito Parkway
Portland OR 97209 2530

RE: Madras City Industrial Park

Rehabilitation of East West Lead / Service Track Wilber Ellis

Ian;

Following our site walk and meeting with the City of Madras, West Rail offers the following synopsis of our visual inspection last Friday October 14, 2011. I offer a verbal description of my recommendations, followed by a budgetary cost estimate. Also, I include a separate cost for new service spur to Wilber Ellis.

This inspection was limited only to lead tracks; our budget excludes work on industry spurs other than working on serving the turnouts. West Rail is aware that the City owns all track in the business park, However, there does not appear to be sufficient funds to address industry spurs.

General Layout of the Industrial Park: For discussion the park can be thought of as three areas;

1. the WEST LEAD: that track from BNSF connection starts by crossing a lateral canal, bridge 1, and proceeds Northwesterly thru the business park, crossing in order, the following streets: Harmon Street , Earl Street, Hogan Street(industrial); then turns west and crosses Canal Street. At that point the track crosses the larger feed canal, Bridge 2, turns and proceeds North, crossing Cherry lane and ends about 1050-feet north of Cherry Lane. *Note I am calling the beginning of the track across Bridge 1 as West Lead because of what I think Railroad traffic patterns are; the turnout alignments would traditionally call this part of the east lead.*

**West Rail Construction Company, LLC**

**P.O. 820626 Vancouver, WA 98682**

**PH** 360-260-0668

**Mbl** 360-518-3671

**Fx** 360-260-0670

**vernb@westrailconstruction.com**

www.westrailconstruction.com

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2. The EAST LEAD: from the West Lead, starting just past Hogan Street, and proceeding Northwest approximately 3050 feet. Track crosses a couple gravel industrial crossings and NW Hess Road traveling along and between buildings and ending before Cherry Lane.
3. STORAGE TRACKS: There are three tracks leaving the West Lead starting past Bridge 1. These track do not appear to have been used in considerable time. The middle track is constructed with a rail having a 6" rail base and has reconstruction value roughly estimated value after removal between $20-30K or more. The North track is getting revenue for car storage, the south track is not useable because of clearance issues from building modifications. We have budgeted in the West Lead to remove its serving turnout and install straight track. the balance of this track could be removed and components used for repair of the East Lead in future maintenance.

WEST LEAD: Remarks were made at the meeting that the City may attempt or may have a client to install a unit train loop track North of the Industrial Park, therefore we advise to raise the existing track corridor to meet unit train specification.

- All 90# rails over Bridge 1 to Hogan Street be relayed with a larger 6" base rail. BNSF specification's for unit train require a minimum of 5-$^{1}/_{2}$" base rail section, there is a good quantity of 6" rail base in the park now and we suggest that the Park continue to upgrade to a 131, 132, or 136# rail sections. *A 133# rail section which is found in the park now is also "ok" but may not be preferred because of future availability.*
- There is about a quarter mile of 100# rail in the lead along Albina Industry this track appears to be in fairly good condition but needs to a larger rail to meet unit train requirements.
- Crossties replacement - the curve on bridge 1 is showing maintenance efforts to hold gage - the bridge which has a steel substructure needs new wood ties. We suggest spot tie replacement in the balance of the industrial park - there are areas where the track is covered in asphalt and we have allowed for that increased cost in our budget to a stated figure.
- We allow Street Crossing upgrades with concrete plank for Earl, and Canal Streets. Canal Street already has big rail in a poured concrete crossing, it is not welded. The rails through the streets will be welded. All crossties will replaced using 10 foot long hardwood ties. All work includes 5 each approach ties in/out of the crossing per BNSF standards. Asphalt approaches at each street will be redone as required - pending further engineering. There is no signal work included.

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- The Cherry Lane Crossing is in good shape however the road approaches are breaking-up and need asphalt patching before the expensive crossing system needs replaced.
- Note there is some signal system in this track to the east of Canal Street used to warn the warehouse bay doors of train approach. No work is anticipated.
- There are three turnouts that are budgeted for work - one to be reconstructed with new ties and large rails, two being reconstructed with existing large rail and 100% new switch ties. We also include a large guard rail type switch point guard on one switch separating East and West Lead tracks - anticipating the larger volume of unit train traffic and the wear of the switch point in curved track going West.

EAST LEAD: Our recommendation is to replace ties in this track and keep the 90# rails -therefore.

- Replace spot marked ties though-out the lead track.
- Clean debris off the track.
- At the Hess Street Crossing; upgrade both track to a 6" base rail, also reconstruction of the adjacent turnout with 6" rails and hardwood switch ties - include welding rails through the street, installing concrete planks and new asphalt road approaches and new asphalt between tracks. This work will be determined by future engineering.
- All track will be inspected for loose bolts or missing bolts as part of the tie program and track cleanup.
- The City should plan additional contingent monies for broken rails, broken bars, and further items that are not included in this budget. (Note *our budget has contingency of 5% due to the work occurring 14-18 month in the future and the uncertainty of the steel and wood markets).*
- We bring attention that the siding near Hogan Street is not in service and 90# material can be salvaged or the switch could be reconstrued to put this siding into service - however the timber dock which this siding served is in poor shape. This appears to be a good site fro a "team track".
- Note there is a stub track towards Hess Street, with out a wheel stop or bumpers. The track was shortened in the past - this short stub might currently be used for switching purpose or it might be removed completely.

Regarding Wilber Ellis New Service: Construction of new track to Wilber Ellis with relay 112/115# rails and new wood ties, including subballast and minor grade preparation - I anticipate a cost about

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$200,000; (plus engineering). This cost includes coming off the existing switch location without relocation which would allow only one or two railcars at a time.

West Rail appreciates this opportunity to work with your firm. Please call if there are is questions, or if I can be of further assistance.

Sincerely;

Vernon Boley
CEM
West Rail Construction
360-518-3671

following: budget EAST/ WEST LEADS track work

**West Rail Construction Company, LLC**

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**Mbl** 360-518-3671

**Fx** 360-260-0670

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www.westrailconstruction.com

WRC WEST RAIL CONSTRUCTION

QUALITY SAFETY INTEGRITY

| Madras Industrial Park Budget Costs | | units | qunatity | | 21-Oct-11 |
|---|---|---|---|---|---|
| 1.00 | Mobilization | lot | 1 | $27,000.00 | $27,000 |
| 2.00 | Item 1 WEST LEAD: Relay 90 lb with 133# rail | tf | 143 | $81.00 | $11,583 |
| 3.00 | Item 1 Replace switchties with standard ties with new ballast (rail above) | ea | 50 | $125.00 | $6,250 |
| 4.00 | Item 1 Replace all bridge ties 9 -1/2" x 8 -1/2" x 14 foot and 24 foot | ea | 29 | $250.00 | $7,250 |
| 5.00 | Item 1 Surface Line and Dress Skin Lift supply ballast rock needed | tf | 200 | $7.00 | $1,400 |
| 6.00 | Item 2 Remove 90# turnout and Reconstruct w 133RE / New ties | ea | 1 | $65,000.00 | $65,000 |
| 7.00 | Item 2: Harmon Street Remove Wd Plank Gravel Xing reconstruct w 133# + new ties | tf | 60 | $110.00 | $6,600 |
| 8.00 | Item 2: Harmon Street Install asphalt crossing and 10 foot road approach | ton | 54 | $150.00 | $8,100 |
| 9.00 | Item 2 Surface Line and Dress track work / turnout | tf | 150 | $4.00 | $600 |
| 10.00 | Item 3 Replace 90# rails w/ 133# (39' - jointed) | tf | 700 | $80.00 | $56,000 |
| 11.00 | Item 3 Replace spotted crossties about 5 per 39 foot rail section in 700 TF | ea | 75 | $140.00 | $10,500 |
| 12.00 | Item 3 Earl St. rail included above: Install 10 foot HW ties / conc plank | tf | 41 | $370.00 | $15,170 |
| 13.00 | Item 3 Earl St. thermite rail welds | ea | 3 | $350.00 | $1,050 |
| 14.00 | Item 3: Compromise Joints bolted / may not be required / | pair | 2 | $500.00 | $1,000 |
| 15.00 | Item 3 Surface Line and Dress Track after work, | TF | 700 | $4.50 | $3,150 |
| 16.00 | Item 3 Earl Street Asphalt Patching Approaches | ton | 40 | $150.00 | $6,000 |
| 17.00 | Item 4 Remove and Salvage ballast to T.O.R. | TF | 400 | $5.00 | $2,000 |
| 18.00 | Item 4 Relay 90# w/ 6" base rail, (connect to 133# west) | TF | 400 | $80.00 | $32,000 |
| 19.00 | Item 4 Replace ties; 6 / rail in 400 feet | ea | 60 | $150.00 | $9,000 |
| 20.00 | Item 4 Surface Line and Dress Complete, salvaged rock | TF | 400 | $3.00 | $1,200 |
| 21.00 | Item 5: Retie No 9 Turnout 100% and tamp | ea | 1 | $12,000.00 | $12,000 |
| 22.00 | Item 5: Retie No 7 Turnout 100% and tamp | ea | 1 | $12,000.00 | $12,000 |
| 23.00 | Item 5 Install FM Guard on No 9 turnout | ea | 1 | $5,000.00 | $5,000 |
| 24.00 | Item 5 Allowance for misc switch materials both turnouts | lot | 1 | $2,500.00 | $2,500 |
| 25.00 | Item 5 Past turnout on lead- change ties 50 ties in 180 feet curved track | ea | 50 | $140.00 | $7,000 |
| 26.00 | Item 6 Remove asphalt and concrete (as required) with disposal | tf | 600 | $15.00 | $9,000 |
| 27.00 | Item 6 Replace ties under asphalt 100% or heavy count cluster with-in 850TF | ea | 250 | $150.00 | $37,500 |
| 28.00 | Item 6 Clean Track buried in sawdust | tf | 200 | $10.00 | $2,000 |
| 29.00 | Item 6 Allowance for Asphalt Patching | ton | 250 | $150.00 | $37,500 |
| 30.00 | Item 6 Surface Line and Dress Track, w/ salvaged rock | tf | 650 | $3.00 | $1,950 |
| 31.00 | Item 7 Canal Street Crossing Demo Existing Poured Concrete | sf | 1295 | $20.00 | $25,900 |
| 32.00 | Item 7 Weld Existing 133# in CWR thru Xing + bridge | ea | 12 | $350.00 | $4,200 |
| 33.00 | Item 7 Aphalt Patching 15 foot approach Canal Road Xing | ton | 40 | $150.00 | $6,000 |
| 34.00 | Item 7 10 foot wood ties and Concrete Panels | tf | 41 | $350.00 | $14,350 |
| 35.00 | Item 8 Relay 100# rails to 133# | tf | 1450 | $80.00 | $116,000 |
| 36.00 | Item 8 Replace ties light replacement 3 / rail in tangent track (along Albina) | ea | 100 | $170.00 | $17,000 |
| 37.00 | Item 9 Remove and Repave Cherry Street Crossign Approaches | ton | 12 | $200.00 | $2,400 |
| 38.00 | Item 10 EAST LEAD: Replace selected ties in 385 feet 90# track, S,L,D, | ea | 45 | $160.00 | $7,200 |
| 39.00 | Item 10 Remove gravel crossign for track repair | tf | 40 | $15.00 | $600 |
| 40.00 | Item 11 No 9 131# turnout 100% retie | ea | 1 | $12,500.00 | $12,500 |
| 41.00 | Item 12 Replace selected crossties in 437 feet of 90# track | ea | 60 | $155.00 | $9,300 |
| 42.00 | Item 12 Install Earth and tie BP | ea | 1 | $3,800.00 | $3,800 |
| 43.00 | Item 12 Clean Dirt on Track | tf | 60 | $10.00 | $600 |
| 44.00 | Item 13 Reconstruct No 7 Turnout with 133# rail and new ties | ea | 1 | $65,000.00 | $65,000 |
| 45.00 | Item 14 Replace 50 ties most clustered off end of crossing | ea | 50 | $150.00 | $7,500 |
| 46.00 | Item 15 Hess RD Crossing Complete Track 1 with rails | tf | 72 | $750.00 | $54,000 |
| 47.00 | Item 15 Hess RD Crossing Complete Track 2 with rails | tf | 64 | $750.00 | $48,000 |
| 48.00 | Item 15 Hess RD Aspahlt Patch/ Approach | ton | 60 | $140.00 | $8,400 |
| 49.00 | Item 15 Bolted Compromise Bars 90/133 | pair | 6 | $500.00 | $3,000 |
| 50.00 | Item 15 Thermite Welds | ea | 16 | $350.00 | $5,600 |
| 51.00 | Item 16 Selective switchties replacement | lf | 250 | $25.00 | $6,250 |
| 52.00 | Item 17 Selective crossties 1 / 5 average in 600TF | ea | 70 | $150.00 | $10,500 |
| 53.00 | Item 18 Clean Track ofd sage brush and Dirt local spoil | tf | 200 | $5.00 | $1,000 |
| | Contingency 5% | | | | $39,970 |
| | Rehabilitation Funds | | | | $866,373 |