Storm Water Runoff Control Plan

1. **Storm Water Management Program SWMP**

1.1. Regulatory Requirements

The City of Paso Robles (City) is classified as a small municipal separate storm water system (MS4) and as such is subject to the National Pollution Discharge Elimination System (NPDES) Phase II (General Permit) and California Environmental Quality Act (CEQA) regulations. As part of the General Permit requirements the City has developed and implemented a Storm Water Management Program (SWMP). The current general permit requires that the SWMP include Best Management Practices (BMPs), measurable goals, and effectiveness measures and time tables for the following six Minimum Control Measures (MCMs):

- Public Education
- Public Participation
- Illicit Discharge Detection and Elimination
- Construction Site Storm Water Runoff Control
- Post Construction Storm Water Management
- Pollution Prevention/Good Housekeeping for Municipal Operations

1.2. Objectives of SWMP

The goal of the SWMP is to define strategies and guidelines for the protection of water quality and the reduction of pollutant discharges to the Maximum Extent Practicable (MEP). MEP is the technology based standard established by Congress in the Clean Water Act (CWA) section 402(p)(3)(B)(iii). The MEP approach is an ever evolving, flexible, and advancing concept which considers technical and economic feasibility.

The City is a participant in a joint effort among other regional MS4s in an effort to derive a methodology for creating hydromodification control criteria; this joint effort is sponsored by the Central Coast Regional Water Quality Control Board (RWQCB). From this effort the City has developed interim hydromodification criteria as outlined in the "Low Impact Development (LID) for Storm Water Control: Interim Design Guidance for New and Redevelopment Projects" (LID Guidelines).

1.3. Developers Responsibility

Two of the MCMs, Construction Site Storm Water Runoff Control, and Post Construction Storm Water Management, required for the SWMP are directly related to project construction activities. Construction site runoff control measures are addressed in Storm Water Pollution Prevention Plans (SWPPPs) which are currently required for all construction projects with an area of disturbance of one acre or more.

In order to achieve the goals of the Post Construction Storm Water Management Plan MCM the City has required that developers incorporate Low Impact Design (LID) techniques into their projects. The City has published LID Guidelines to assist project applicants to successfully incorporate LID design principles into their projects, and to set numeric storm water control requirements. The LID Guidelines also sets applicability thresholds for projects based on size and type of development. Under these guidelines the Paso Robles RV Resort project is a Tier 3 project and as such must comply with the requirement of the LID Guidelines. The applicant has prepared a Storm Water Runoff Control Plan (SWRCP) in order to demonstrate that the LID Guideline requirements have been met. The SWRCP illustrates the LID principles that been used to plan the project and the LID BMPs that have been incorporated into the design of the project in order to achieve the goals of the Post Construction Storm Water Management Plan MCM.

2. **Low Impact Design (LID)**

LID principles and techniques have been shown to be effective at managing storm water runoff and is an accepted method to meet the MEP standard. The implementation of LID principles and techniques has the primary goals of maintaining the hydrologic function of the project site and maintaining the existing characteristics and water quality of runoff to receiving water bodies. These goals are achieved first through project planning to reduce impacts, and second by mitigating the remaining impacts using structural BMPs.

2.1. LID Planning Objectives

Project planning can greatly reduce the impacts of development using the following strategies:

- Reduction of impervious surfaces by using narrower roads, and using alternative road layout to require shorter roads.
- Reduction of impervious surfaces by using pervious pavements such as permeable pavers and pervious concrete or asphalt.
- Reduction of impervious surfaces by constructing taller structures with multiple floors instead of sprawling one story structures.
- Plan site to follow the exiting contours of the land which in turn minimizes grading, and preserves natural drainage courses and native vegetation.
- Disconnect impervious surfaces from storm drain facilities by directing roof and paving runoff to vegetated areas.

2.2. LID BMP Objectives

Construction activities almost always have impacts that can't be avoided by careful planning. These impacts must be mitigated by employing structural BMPs. These impacts can be mitigated using the following LID principles:

- Mitigate runoff impacts using natural and engineered infiltration and retention techniques to promote infiltration and ground water recharge, allow pollutant removal, and maintain existing flow patterns and runoff quantities.
- Employ bioretention to provide retention and treatment of pollutants.
- Disperse LID measures uniformly across the site to mimic natural conditions.

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Exhibit M1
Stormwater Control Plan
PD 08-001 & CUP 08-001 Amend.
(PR RV Park)

- Mitigate runoff impacts at the source to the extent feasible to mimic natural conditions and build redundancy within the mitigation measures.

2.3. Common LID practices

- Preservation of native vegetation.
- Reduce impervious surfaces to mitigate increased runoff.
- Disconnect impervious surfaces to promote sheet flow to vegetated areas.
- Maximize Bioretention.
- Vegetated swales, buffers, and strips.
- Disconnect roof gutters from storm drains and direct runoff to vegetated areas.
- Utilize rain gardens and vegetated retention basins.
- Utilize permeable pavements.
- Amend soils to increase infiltration rates.
- Limit use of storm drain systems to promote sheet flow to vegetated areas.

2.4. LID BMP Design Criteria

The City LID Design Guidelines have set forth the following design criteria which were used in the preliminary LID BMP design of the project:

- The LID BMPs were sized to maintain the existing 85th percentile 24-hour runoff volume. The pre-developed and post-developed runoff volumes were calculated using the modified rational method using 0.75" 24 hour rainfall depth, and weight runoff coefficients from the County of San Luis Obispo Department of Public Works Public Improvement Standards drawings H-3 and H-3a.
- Although not specifically required by the City LID Design Guidelines, the project retention/detention facilities were sized to maintain the peak flow flows during the 85th percentile and the 25-year design storms. These peak flows were also calculated using the rational method.
- Runoff velocities leaving the site were maintained to pre-developed levels and characteristics.

3. **Project description**

The Paso Robles RV Resort proposes developing a 332 space RV resort at the north end of Golden Hill Road in the City of Paso Robles California.

3.1. Existing Condition:

The existing site is located on 3 parcel covering approximately 161 acres at the end of Golden Hill Road in the City Paso Robles California. The site is currently undeveloped and is covered primarily with grasses and several mature oak trees. The site generally slopes towards the Huerhuero Creek which runs along the west side of the site. The eastern 2/3 of the site is relatively flat with slopes generally less than 5 %. The slopes on the northern 1/3 of the site are steeper with slopes ranging from 10% to 20% and approaching 30% near Huerhuero Creek. The Huerhuero Creek has a broad, clean, deep granular sand bottom with a heavily vegetated riparian border. The Huerhuero Creek is tributary to the Salinas River and has an approximately 97,000 acre watershed with an estimated 100-year peak flow of 14,800 cfs. Despite its high 100-year peak the Creek is ephemeral and has little to no base flow during a typical rain season.

Golden Hill Road improvements and public right-of-way currently ends at the southern project boundary. A private driveway serving the Circle B residential development accesses Golden Hill Road at this location. This area experiences frequent flooding and sediment deposits are found at the end of the street after average storm events. As part of the project LID improvements a retention basin will be constructed on Parcel 2 to mitigate a portion of the existing flooding and sedimentation problems at this location. The runoff at this location is primarily generated by the commercial/industrial developments located on the east side of Golden Hill Road from Highway 46 to the site. The runoff is conveyed to this location in Golden Hill Road which receives runoff from Tractor Street and Wisteria Lane; the approximate watershed area is 120 acres.

3.2. Site Investigation

A boundary and topographic survey of the site was performed. The topographic information was used to determine the limits of the watersheds affecting the site and to determine the existing flow patterns on the site. Visual field surveys were also conducted to determine the ground cover on the site and to confirm the existing flow patterns and watershed limits. An extensive field survey was conducted to locate all the trees on the site and to determine the disposition of these trees. This survey found that the majority of these trees were mature and in good conditions, but some were found to be in poor condition or dead.

NRCS soils maps show that the site is predominately covered with soils from the Hydrologic Soils Group (HSG) type C which have moderately slow to slow infiltration rates. The soils in and around the Huerhuero Creek are from the HSG type A which have high to very high infiltration rates. A preliminary geotechnical investigation of the site generally confirmed the information obtained from the NRCS soils map. A hydrologic and hydraulic analysis was performed for the site for both the pre and post developed conditions. The results of these analyses were used in planning LID measures in order to meet the SWMP objectives.

3.3. Proposed Development

The Paso Robles RV Resort project proposes constructing a 332 space RV Resort and involves three parcels located at the north end of Golden Hill Road, in the City of Paso Robles. The majority of the project development occurs on Parcel 1 (±72 acres). Parcel 2 (±62 acres) will not be developed and has been dedicated to the City of Paso Robles as public open space. Parcel 3 (±23 acres) will not be developed as part of this project, but approximately 5

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(PR RV Park)

Storm Water Runoff Control Plan

acres will be used to install LID measures for the benefit of the project, and 2 acres for the extension of Golden Hill Road to the project entrance. The project development footprint covers approximately 50 acres of which more than 20 acres will be left undisturbed. Proposed project improvements include internal road, RV spaces, dry camping spaces, the Golden Hill Road Extension, sewer, water and utilities, a guest registration center, two guest comfort facilities, 3 swimming pools, and all drainage and LID systems. A 100 foot wide offer of dedication along the west side of the site has been made for the future extension of Golden Hill Road past the project entrance. This extension will not be developed as a part of this project.

The project LID BMPs were not sized considering its future development, but a review of the site shows that sufficient LID measures can be incorporated within the 100' right-of-way to mitigate the impervious surfaces generate by its future development.

4. Project specific implementation of LID measures.

The project was planned and designed to implement LID principles and techniques to reduce and mitigate the impacts to site runoff caused by construction. The project employed both planning and structural BMP techniques.

4.1. Project Planning Techniques

The following elements were implemented in planning the project in order to reduce the impacts to the hydrologic function of the site and to reduce impervious areas:

- The Project was planned to minimize grading and soil disturbance by following the natural contours of the land to the extent feasible.
- Project improvements and roads were located to reduce the impacts on the grove of oak trees covering much of the project site.
- The Project improvements were located away from existing drainage courses to reduce impacts to the existing flow patterns.
- Impervious surfaces were reduced by eliminating street sidewalks and reducing road widths to the extent feasible.
- Most RV parking spaces are paved with gravel instead of using asphalt or concrete paving.
- Project has dedicated a significant portion of the project site to be preserved as open space and exclude future development.
- Where feasible curb and gutter has been eliminated from the project and streets have been sloped to discharge runoff to vegetated areas. When concentrated street flows could not be avoided every attempt was made to discharge this flow to a bioretention swale or rain garden instead of being collected in a central storm drain system. Elimination of curb and gutter increase contact time with the ground and promotes sheet flow allowing for increased infiltration and removal of pollutants.

4.2. LID structural BMP measures employed in project

The project will employ several BMP measures to mitigate impacts by promoting bioretention, infiltration, and ground water recharge. The BMPs will serve the function of treating runoff and maintaining existing peak flows, runoff volumes, and drainage patterns, closely mimicking the existing hydrologic function of the site. The use of multiple BMP techniques adds a level of redundancy to the LID design that improves the overall treatment of the runoff. Multiple small BMPs were used when possible to control runoff at the source and to allow even distribution around the site which more closely mimics the existing hydrologic function of the site. The following BMPs will be employed in the LID measures for the site:

- Bioretention swales will be employed on the site to convey runoff across the site instead of collecting in a central storm drain system. The swales have been designed to retain runoff from the 85th percentile storm; retention occurs within the vegetation, in the interstitial spaces within the soil, and in short term surface storage. Eliminating storm drain pipes allows more contact time with the ground allowing for treatment and infiltration, and increases the time of concentration which decreases peak flows. An added feature of the bioretention swale and other bioretention facilities is the creation of wildlife habitat.

Appropriate plant species within the bioretention swales will be selected based on climate, soil conditions, and varied moisture conditions with guidance from the Central California Coast Technical Assistance Memo (TAM) LID Plant Guidance for Bioretention. Soils to be used within the Bioretention swale will be specified with guidance from the "Regional Bioretention Soil Guidance & Model Specification Bay Area storm Water Management Agencies Association", Technical Memorandum. Links to both of these memos can be found at: http://centralcoastlidi.org/Central_Coast_LIDI/LID_Structural_BMPs.html.

- Rain Gardens will be employed in open spaces to promote infiltration, bioretention, and allow pollutant removal. They have been designed to retain runoff from the 85th percentile storm. Rain Gardens are similar to Bioretention swales in that they will utilize the same plants and soil specification. The Rain Gardens are not used for conveyance of runoff but instead act as terminal storage facilities much like miniature retention ponds. In some cases they will be designed to overflow to the central storm drain system through riser pipes; even then they are still designed to retain the 85th percentile storm.
- Infiltration/Retention Ponds used in conjunction with other LID measures to reduce peak flows and runoff volumes, provide retention, and promote infiltration and ground water discharge. The Retention Ponds are similar to rain gardens but on a larger scale; they will be planted with similar plant species and have similar soils. They have been designed to retain both the 85th percentile and 25 year storms and will also act to detain the 100 year storm and mitigate the peak flows to the pre-developed 100 year rate. The typical retention pond will be a maximum of 4 feet deep with side slopes of 4:1 or flatter. These ponds will be graded to blend into the surrounding topography in order to be visual appealing.

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(PR RV Park)

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Storm Water Runoff Control Plan

- Drywells maybe used in conjunction with infiltration/retention ponds to increase infiltration rates where surface soil infiltration rates are found to be inadequate.
- In some cases Gravel Trenches will be used in combination with bioretention swales to increase retention capacity and increase infiltration rates.
- Level Spreaders will be employed where possible in situations where concentrated flows could not be avoided such as at the end of drain pipes and swales. Level Spreaders diffuse concentrated flows into sheet flow and dissipates velocities, which in turn mimics the existing flow patterns and reduces erosion. In cases where space limitations or steep slopes preclude using level spreaders, conventional velocity dissipaters such as rip-rap aprons will be employed.
- Pervious pavements such as permeable pavers or pervious concrete were considered for use in the parking areas. Because of the heavy loads caused by the RVs it was conceded impractical to use pavers for the RV parking spaces and that pervious concrete was cost prohibitive in these applications. Instead the parking spaces will be gravel based and runoff mitigated using bioretention swales and rain gardens. The passenger vehicle parking spaces located at the registration building and at the two comfort buildings will be paved but if additional mitigation measures are required, permeable pavers will be considered for use instead of asphalt paving.

5. Summary

It has been shown that the Paso Robles RV Resort project has been planned to reduce hydromodification impacts to the extent feasible using LID planning techniques. The remaining impacts will be successfully mitigated using LID BMPs and the hydrologic function of the developed site will closely mimic the existing conditions. The existing characteristics of runoff leaving the site including peak flow, volumes, velocities and water quality will also closely mimic the existing condition.

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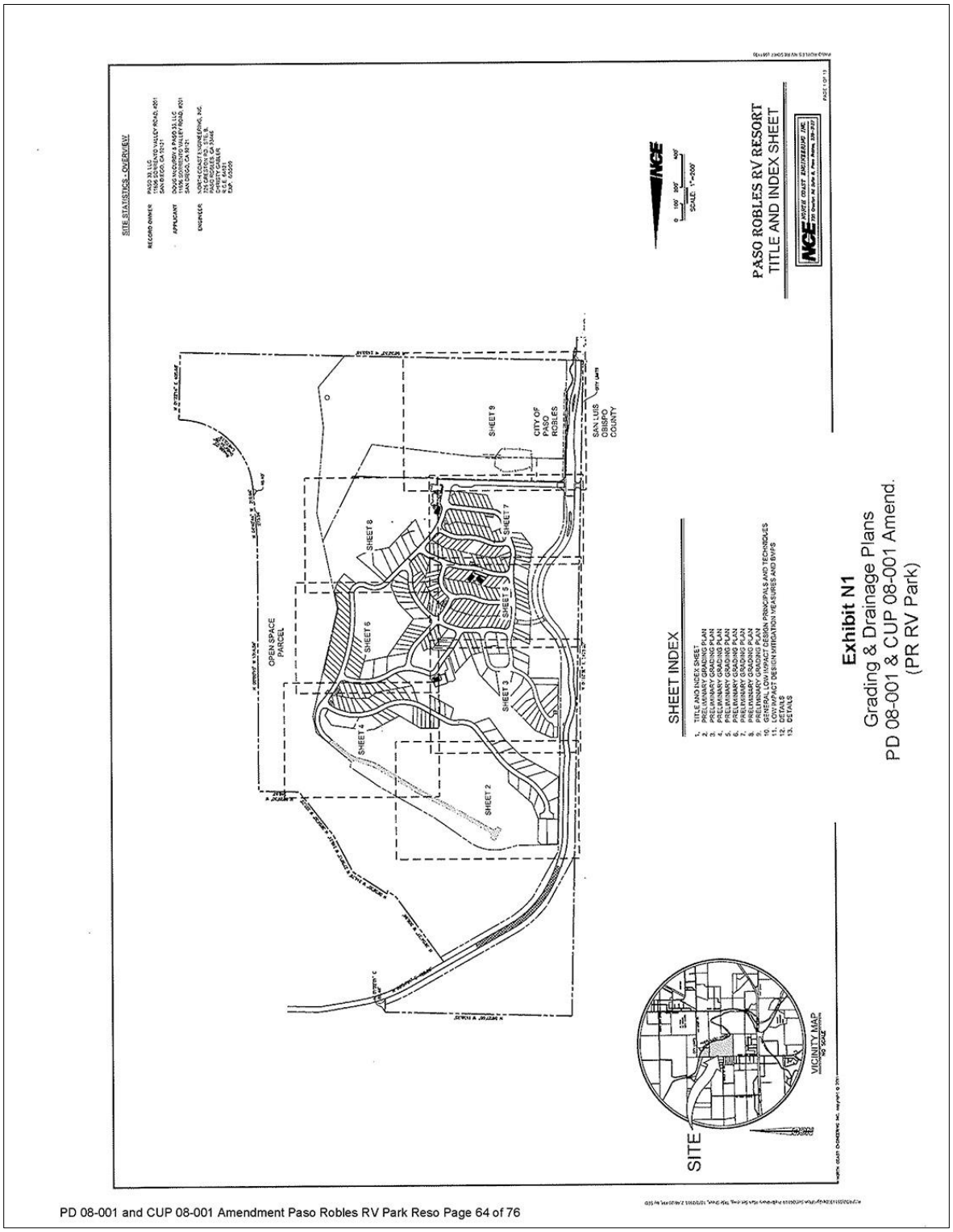
Stormwater Control Plan
PD 08-001 & CUP 08-001 Amend.
(PR RV Park)



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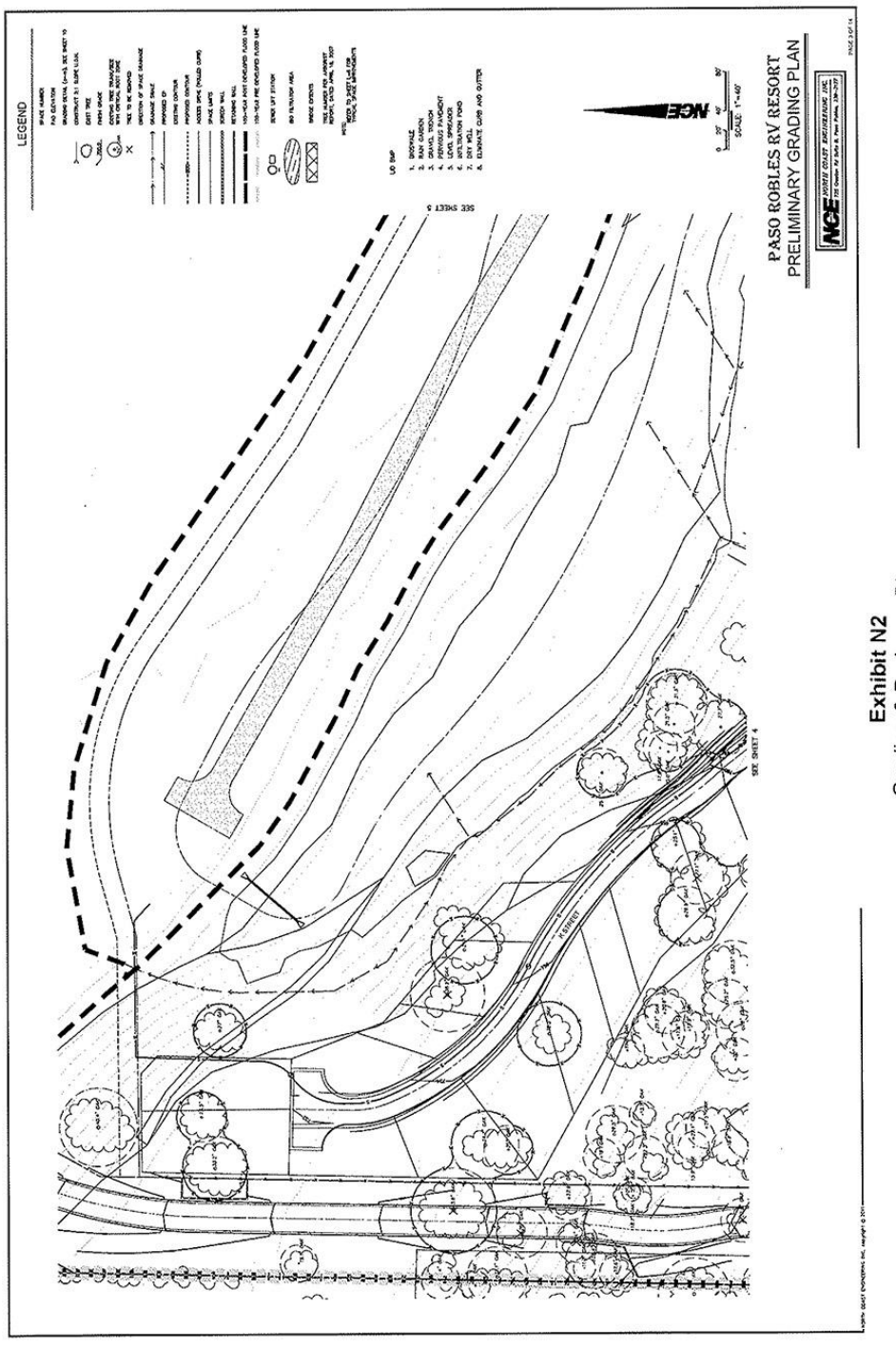
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PASO ROBLES RV RESORT
PRELIMINARY GRADING PLAN
Exhibit N2
Grading & Drainage Plans
PD 08-001 & CUP 08-001 Amend.
(PR RV Park)
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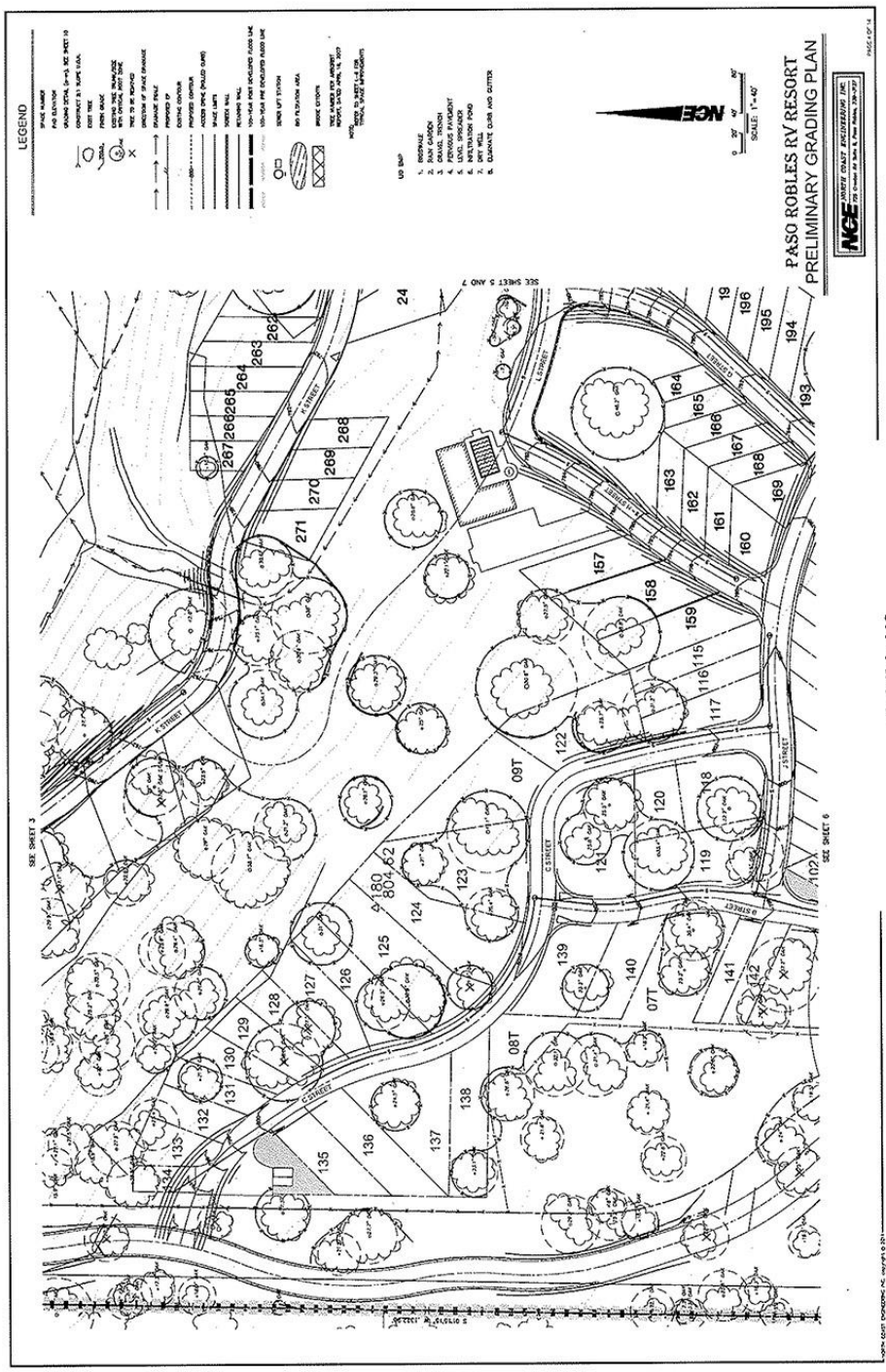
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PASO ROBLES RV RESORT
PRELIMINARY GRADING PLAN
NCE
SCALE 1"=40'
Exhibit N3
Grading & Drainage Plans
PD 08-001 & CUP 08-001 Amend.
(PR RV Park)
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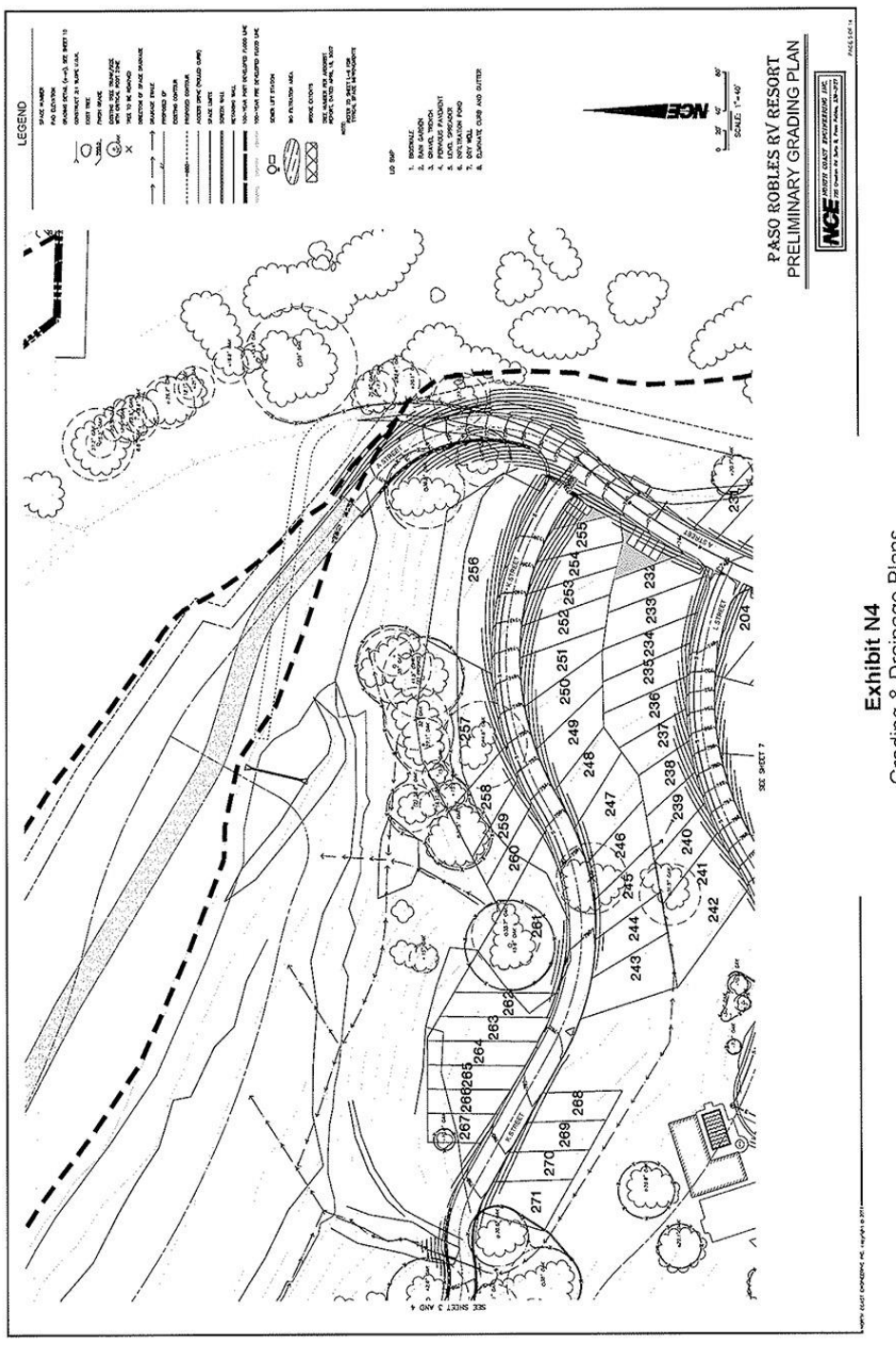

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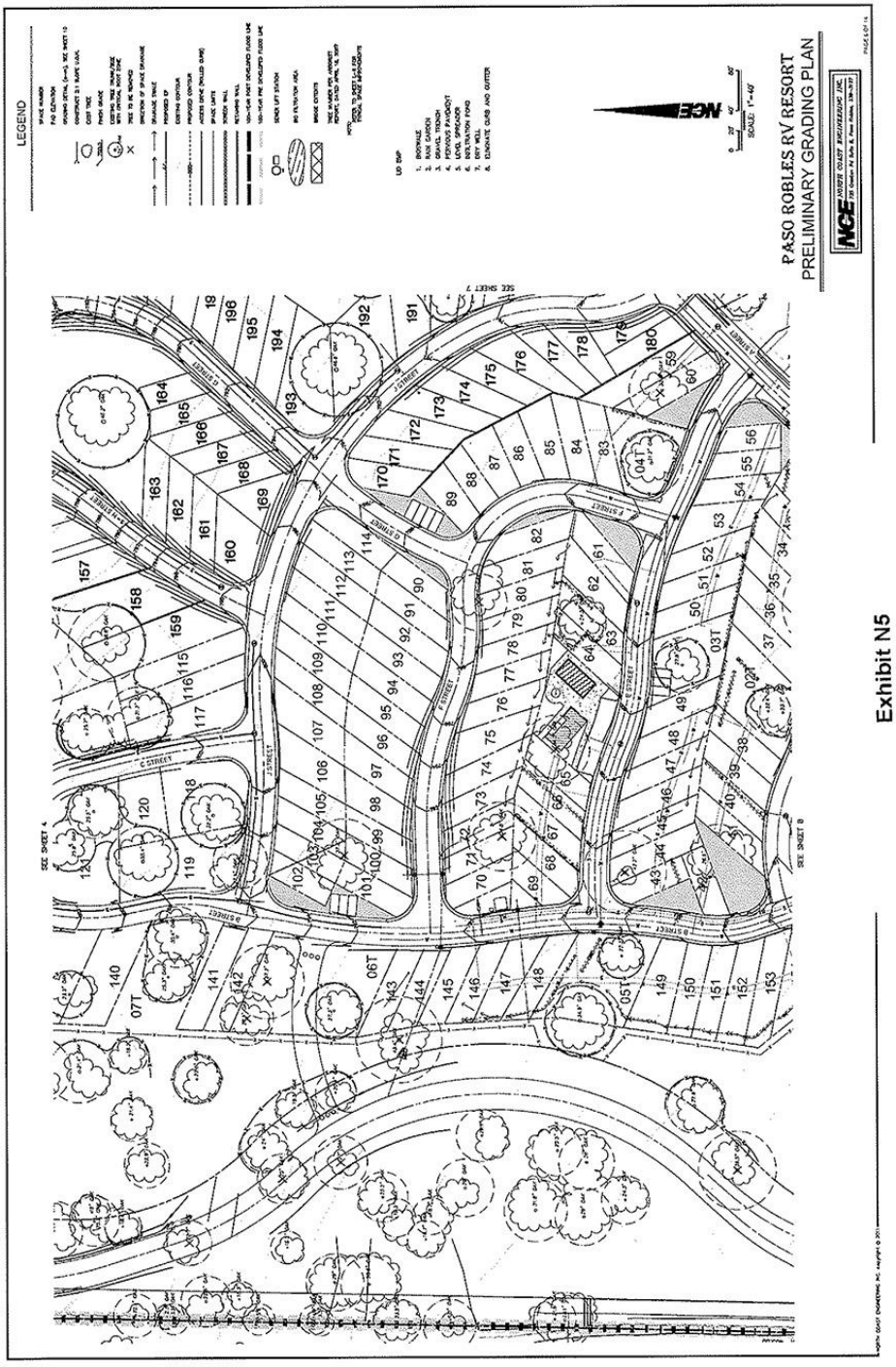
PASO ROBLES RV RESORT
PRELIMINARY GRADING PLAN
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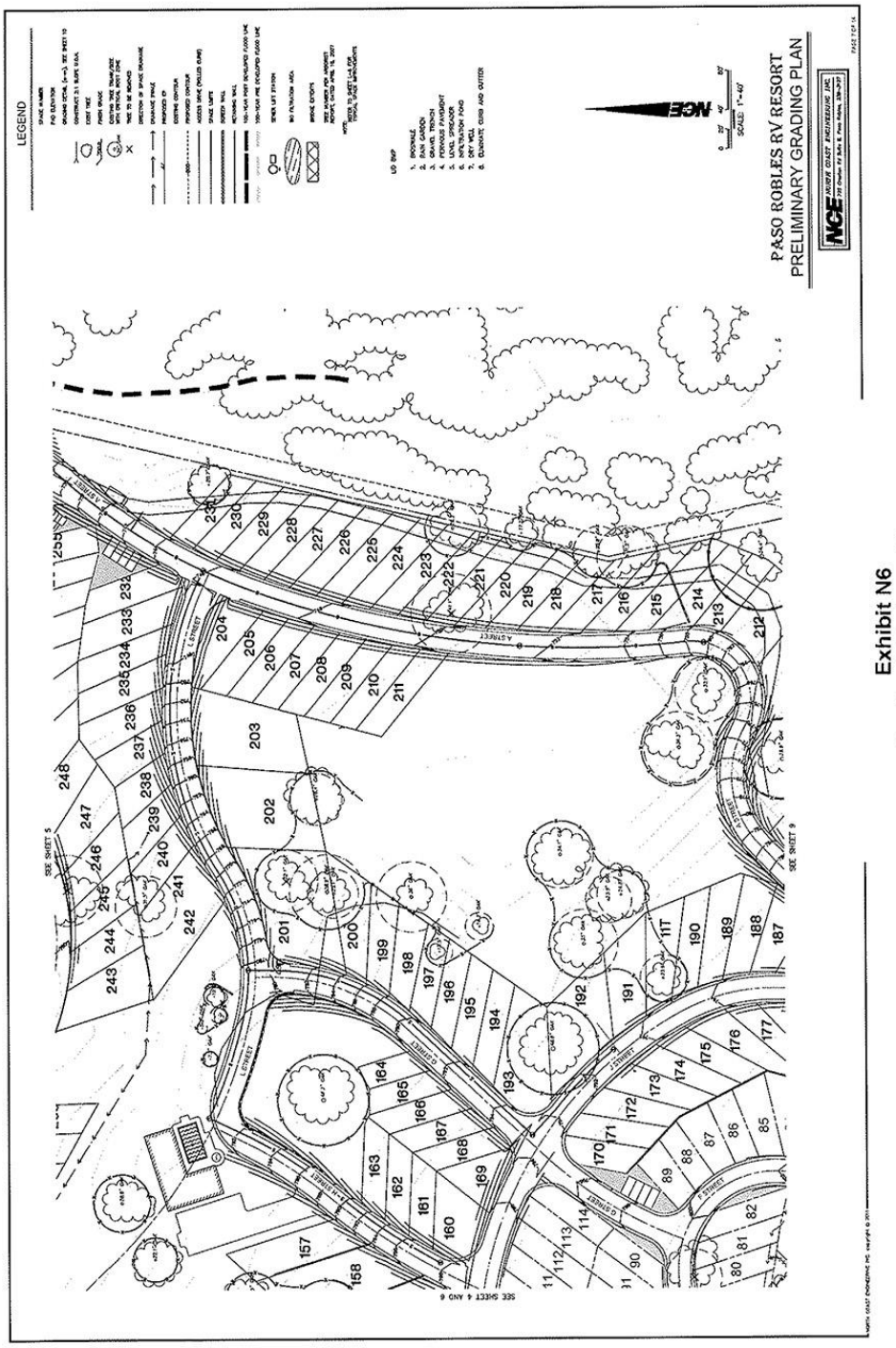
Grading & Drainage Plans
PD 08-001 & CUP 08-001 Amend.
(PR RV Park)



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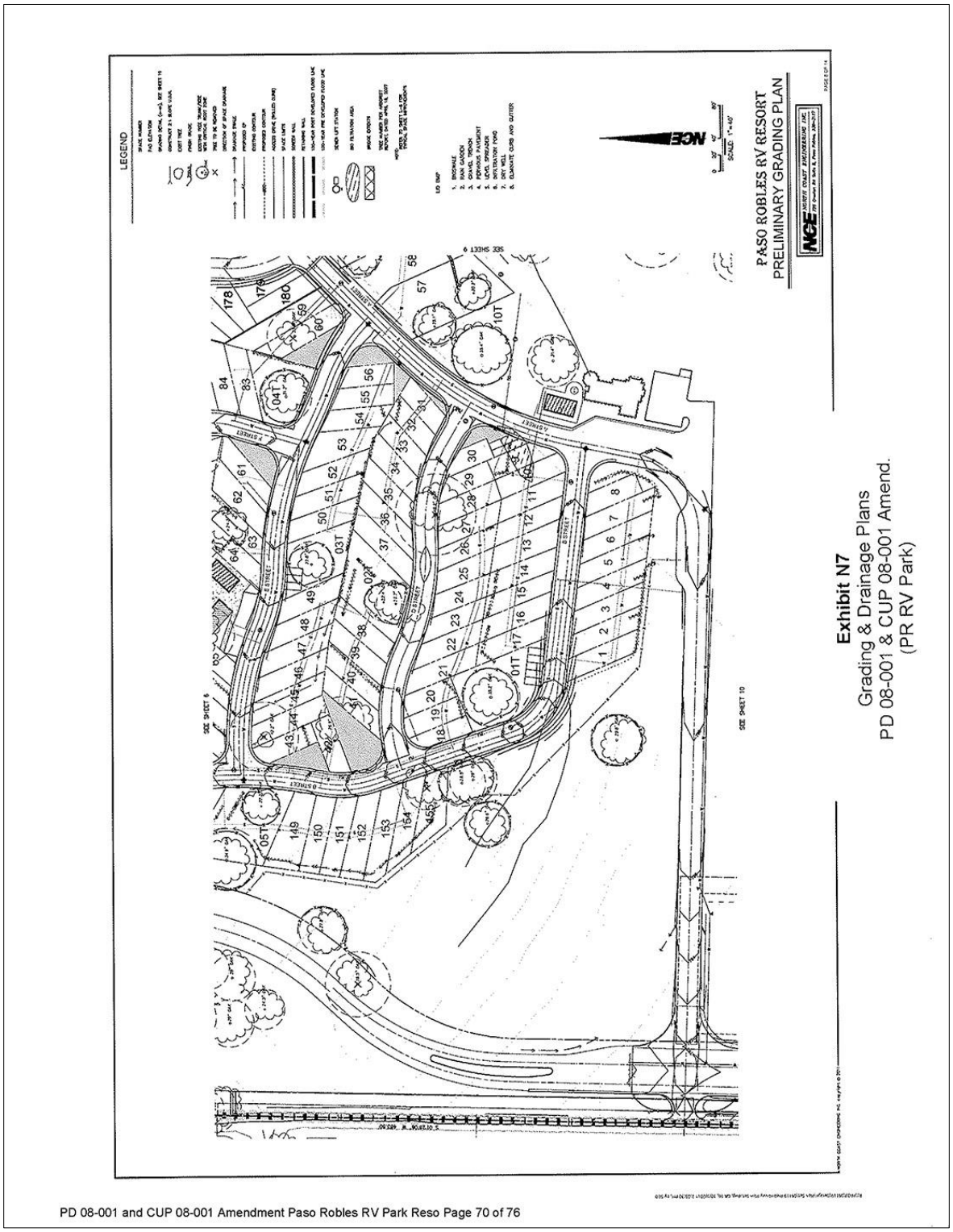
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PRELIMINARY GRADING PLAN
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Grading & Drainage Plans
PD 08-001 & CUP 08-001 Amend.
(PR RV Park)
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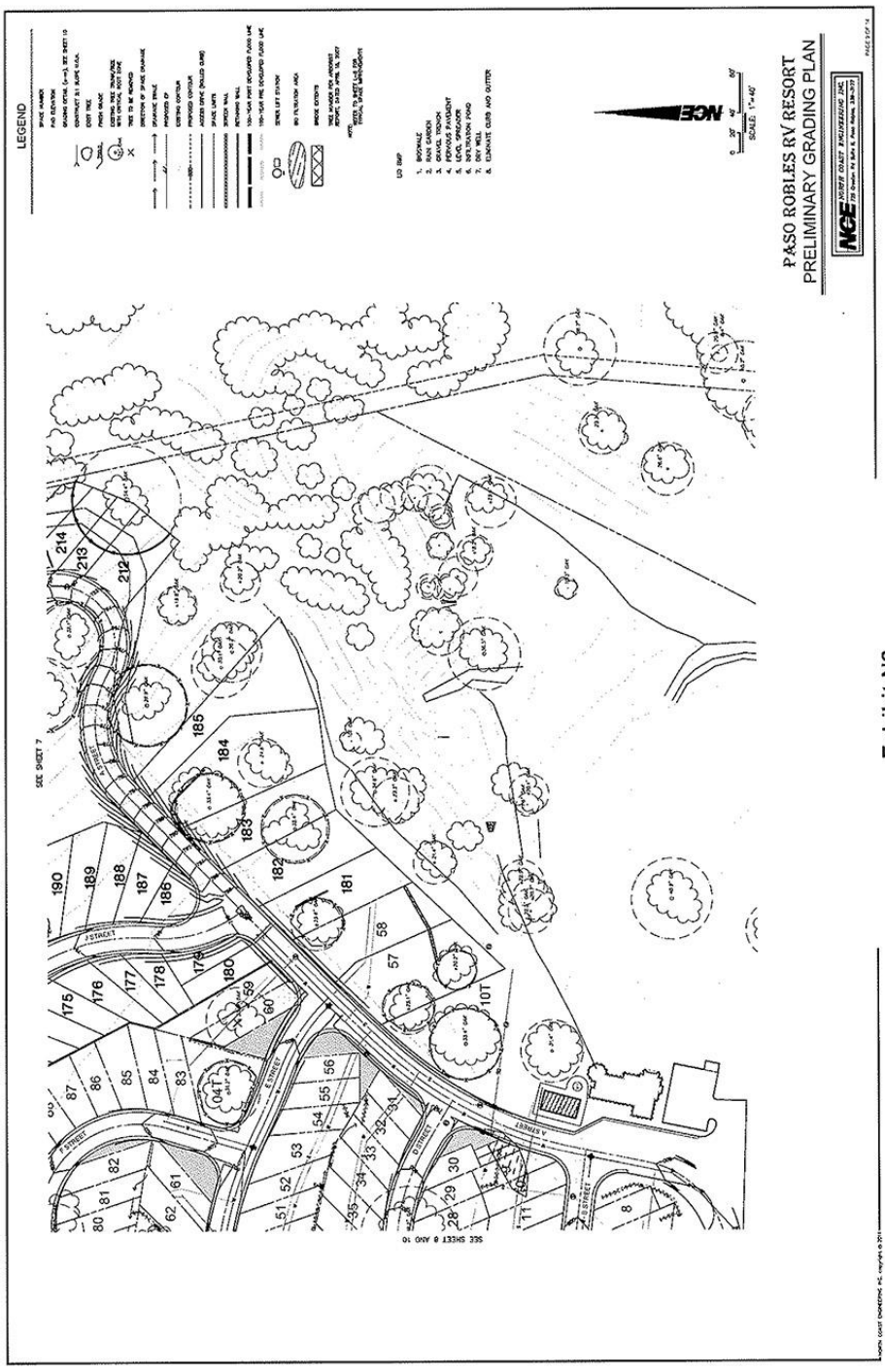
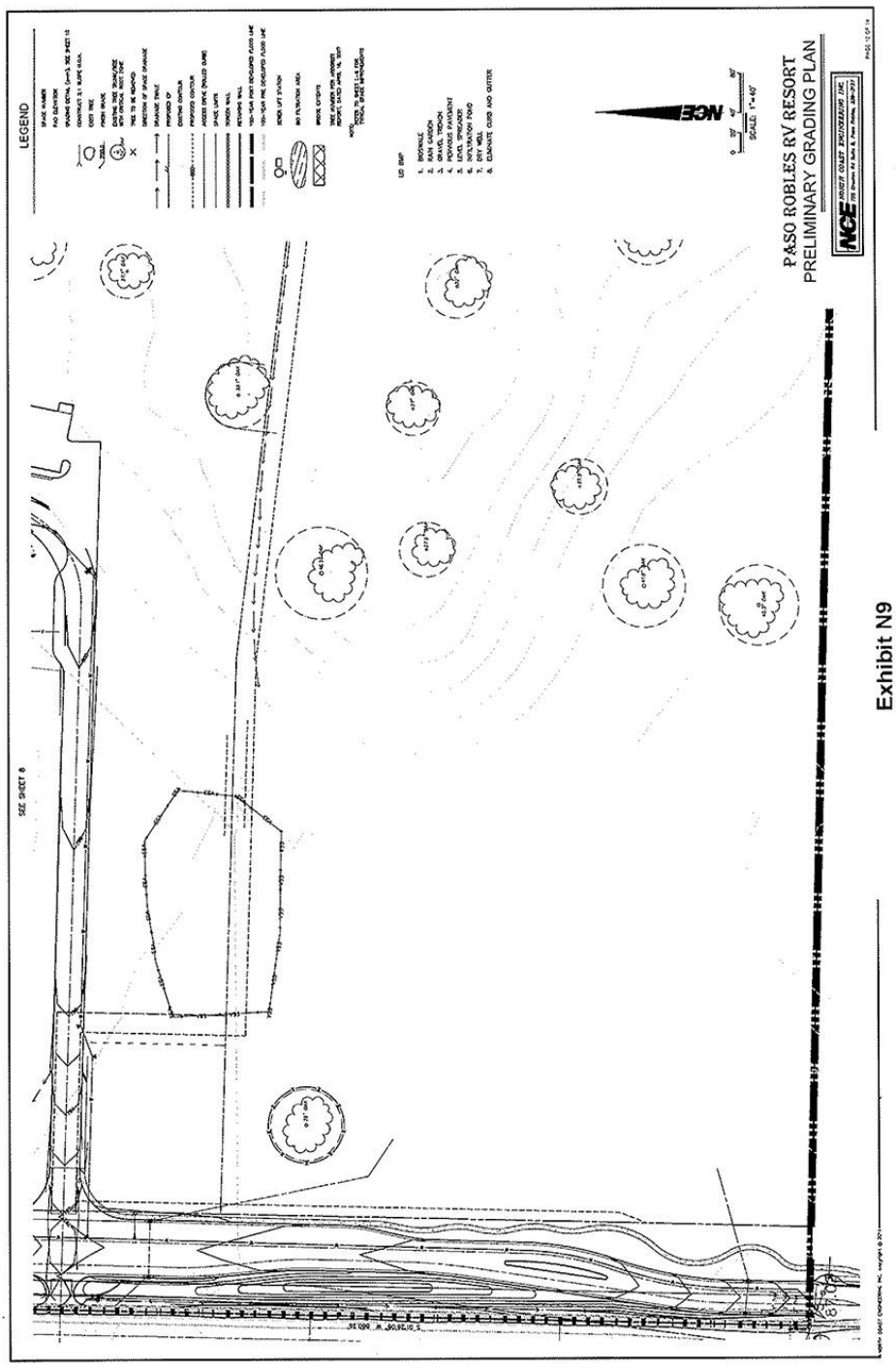

PASO ROBLES RV RESORT
PRELIMINARY GRADING PLAN
LEGEND
SEE SHEET 7
SEE SHEET 9 AND 10
J STREET
A STREET
B STREET
Exhibit N8
Grading & Drainage Plans
PD 08-001 & CUP 08-001 Amend.
(PR RV Park)



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GENERAL LOW IMPACT DESIGN PRINCIPLES AND TECHNIQUES

#	Mitigation	Description	Pros	Cons
	Reduce Impervious Surfaces	Reduction of impervious areas by eliminating roads, reducing road widths, use of pervious pavements	Reduce runoff increases	
	Mitigate at Source	Use bio-swales and rain gardens to store and treat runoff on individual spaces.	Mitigate runoff in smaller areas	
	Promote Sheet Flow to Vegetated Areas	Allow infiltration in vegetated areas, treat runoff.	Reduce runoff volumes to central storm drain system. Treat runoff.	
	Disconnect from Storm Drains	Promotes sheet flow and infiltration in vegetated areas.	Reduce runoff volumes to central storm drain system. Treat runoff.	
	Reduce Grading	Grade site following natural contours where possible, reduce need for walls	Reduce and treat runoff by reducing concentrated flows and promoting surface infiltration, reduce the need for walls and maintain native drainage patterns.	
	Sheet Flow Away from Streets	Grade sites to drain away from streets; allows infiltration on vegetated areas	Reduce and treat runoff, decrease concentrated flows. Reduce need for central storm drain system.	May increase standing water in some areas for short periods of time.
	Reduce Storm Drains	Use surface channels were feasible instead of storm drains to minimize concentrated flows and to increase the contact time between water and soil. This allows runoff to be treated and infiltrated in vegetated areas.	Reduce and treat runoff, reduces the need for central storm drain system	May increase standing water in some areas for short periods of time.
	Remove Walls	Minimize grading to follow existing contours were possible. Reduce the need for walls by using slopes were feasible.	Reduced construction costs. Reduce concentrated flows at walls. Reduced construction costs.	May reduce usable flat areas on some spaces.
	Disconnect Rain Gutters from Storm Drain	Direct roof runoff to landscaped and vegetated areas, treat runoff through infiltration.	Reduce and treat runoff, reduces the need for central storm drain system	

PASO ROBLES RV RESORT
GENERAL LOW IMPACT DESIGN
PRINCIPALS AND TECHNIQUES

NCE NORTH COAST ENGINEERING INC.

Exhibit N10
Grading & Drainage Plans
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(PR RV Park)

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LOW IMPACT DESIGN MITIGATION MEASURES AND BMPS

#	Mitigation	Description	Pros	Cons
1	Bio-Swales	Vegetated swales that stores and treats runoff by promoting infiltration. Check dams required on slopes greater than 2% to maximize storage. Storage can be increased by adding gravel trenches. Bio-swales typically found at rear of spaces.	Reduces and treats runoff through storage and infiltration. Reduces the need for central storm drain system	Increased construction cost, part of which may be offset by the reduction of storm drain costs. Standing water for short periods of time
2	Rain Gardens	Small scale retention ponds in vegetated areas that treat and store runoff promoting infiltration. Typical ponded depth of 6" to 12". Typically found at rear of spaces and in open spaces. To treat and store runoff from spaces. Can also be used to treat and store runoff from streets by using over-side drains instead of connecting to storm drain system. Can connect to storm drain system through riser pipes, but allows for infiltration and treatment before entering central storm drain system.	Reduces and treats runoff through storage and infiltration. Reduces the need for central storm drain system	Increased construction cost, part of which may be offset by the reduction of storm drain costs. Standing water for short periods of time
3	Gravel Trenches	Trenches filled with high porosity gravel, typically 2' to 3' wide and 2' to3' deep. Allows subsurface storage and treatment of runoff until it can be infiltrated. Can be used in conjunction with bio-swales to increase their storage capacity.	Reduce and treat runoff through infiltration. No standing water.	Increased construction cost
4	Level Spreaders	Small ponded area at the terminus of swales and storm drains to return concentrated to sheet flow.	Reduce and treat runoff through infiltration and vegetation. Maintains native flow conditions and reduces erosion.	Increased construction cost
5	Infiltrations Ponds	Large scale detention/retention ponds used to mitigate runoff increase in large storm events. Use of infiltration to maintain runoff volumes at approximately the native rate. Ponds can be lightly vegetated, i.e. vineyards, but must not impede the ability to maintain pond. Poor infiltration rates will require larger shallower ponds to mitigate runoff.	Reduce and treat runoff through infiltration.	Soil infiltration rates may not be high enough to drain the ponds in a timely manner and may cause standing water for long periods of time.
6	Dry Wells	Used in conjunction with infiltration ponds to increase infiltration rates in the ponds. The dry wells are large diameter pipes (24" to 48") installed to a depth where	Reduce footprint of infiltration ponds, reduce time period of standing water.	Increased construction and maintenance costs.
7	Eliminate Curb and Gutter	Allow runoff to sheet onto lots and open spaces where feasible. Promotes surface infiltration and runoff treatment in vegetated areas.	Reduce and treat runoff, reduces the need for central storm drain system	

PASO ROBLES RV RESORT
LOW IMPACT DESIGN MITIGATION MEASURES AND BMPS

NCE NORTH COAST ENGINEERING INC.

Exhibit N11
Grading & Drainage Plans
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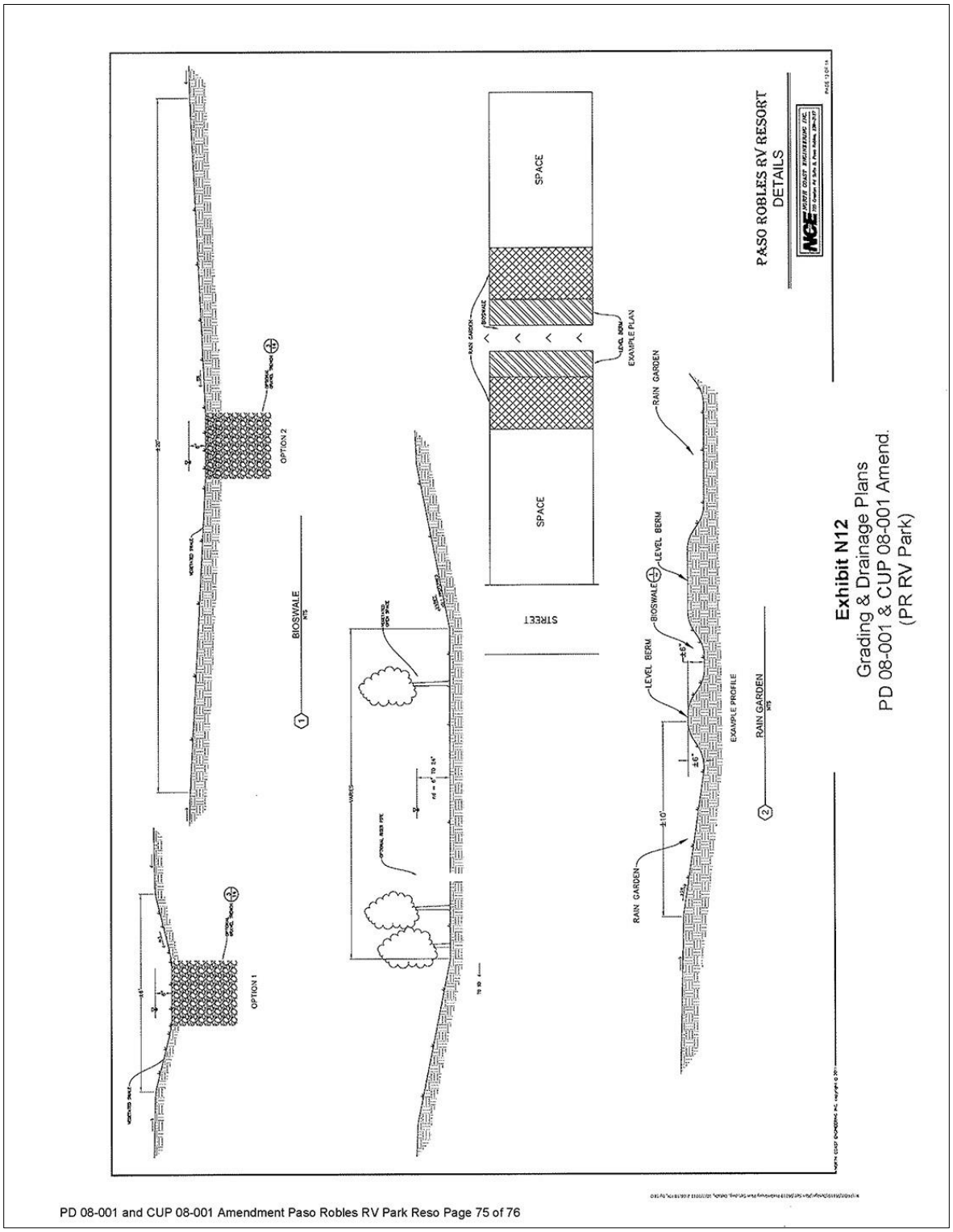
PASO ROBLES RV RESORT
DETAILS
Exhibit N12
Grading & Drainage Plans
PD 08-001 & CUP 08-001 Amend.
(PR RV Park)
SPACE
SPACE
STREET
EXAMPLE PLAN
RAIN GARDEN
BIOSWALE
LEVEL BERM
EXAMPLE PROFILE
OPTION 1
OPTION 2
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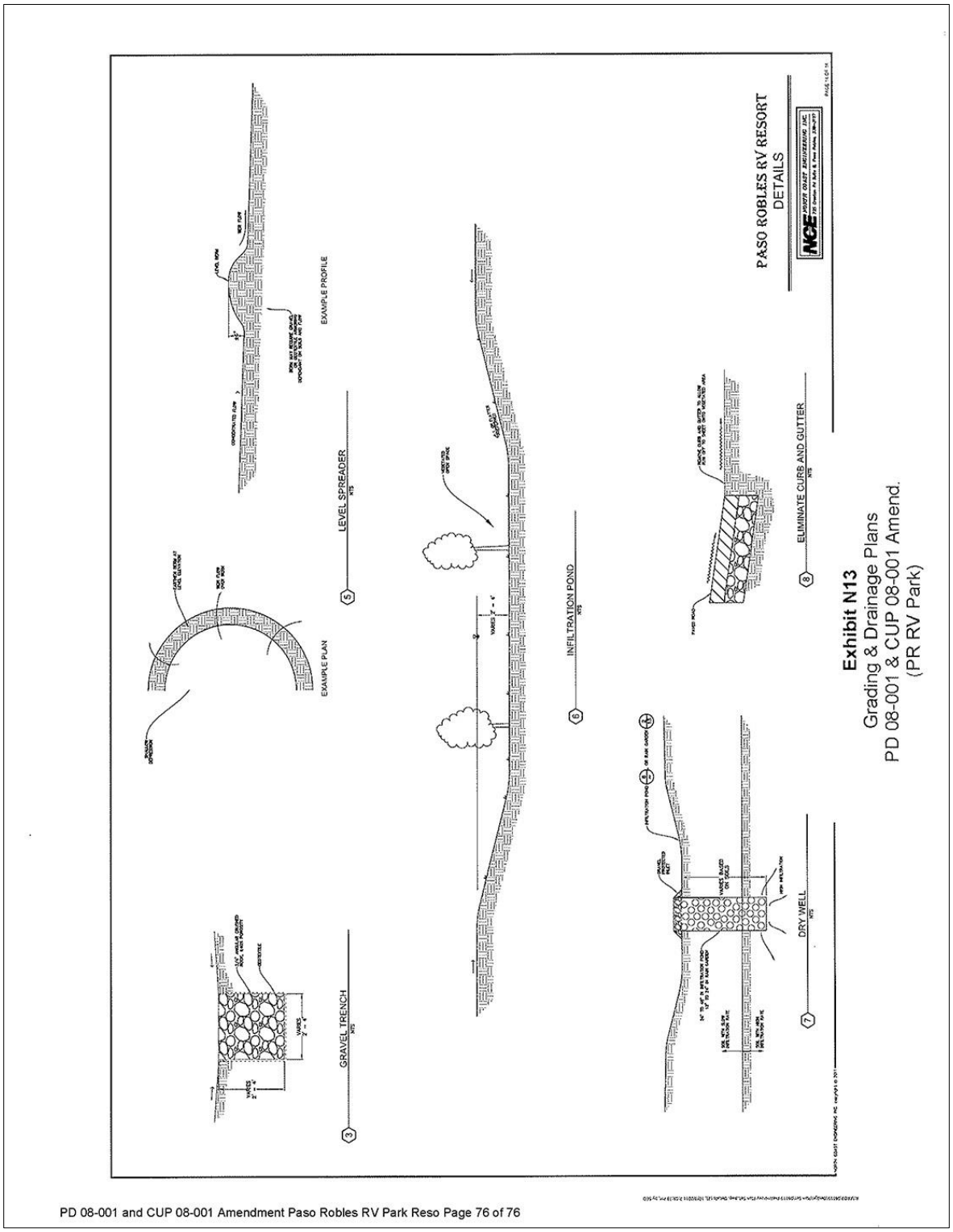
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DETAILS
Exhibit N13
Grading & Drainage Plans
PD 08-001 & CUP 08-001 Amend.
(PR RV Park)
EXAMPLE PROFILE
EXAMPLE PLAN
LEVEL SPREADER
INFILTRATION POND
ELIMINATE CURB AND GUTTER
GRAVEL TRENCH
DRY WELL
PD 08-001 and CUP 08-001 Amendment Paso Robles RV Park Reso Page 76 of 76

Comment I-119: Attachment 3.

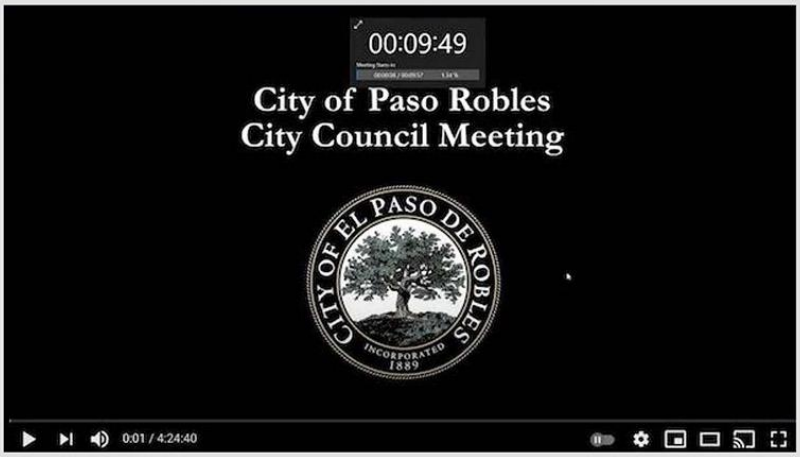
"Paso Robles City Council opposes new power lines over Highway 46" by News Staff of Paso Robles Daily News

ATTACHMENT 3

Paso Robles Daily News

Paso Robles City Council opposes new power lines over Highway 46

Posted: 6:40 am, January 20, 2021 by News Staff



Click here to view the meeting on Youtube.

–At its Tuesday night meeting, the Paso Robles City Council voted unanimously to oppose a proposed PG&E power line that would cross Highway 46 and travel across several businesses on the east side of Paso Robles.

Community Development Director Warren Frace showed slides of the proposed Estrella Substation and Paso Robles Area Reinforcement Project. Representatives of Cava Robles RV Park, Vina Robles Winery, Riboli Winery, and several other businesses in the area spoke against the proposal. PG&E is proposing improvements to the Estrella Substation and Paso Robles Area Reinforcement Project which includes the construction of towers 70' to 105' tall to transport electricity across the freeway.

Hans Michel, the owner of Vina Robles said their facility values the visual experience of visitors to that part of Paso Robles and says large power lines near the eastern entrance of the city will compromise that visual experience. Others said the power lines and large towers would ruin their businesses. Steve Baker of Cava Robles RV Resort said that PG&E has an alternative that is preferable environmentally.

Ultimately the council voted 5-0 to oppose the development, but City Manager Tom Frutchey advised the council this may be a long process, and the city needs to be prepared to fight the proposal at each step. The council's vote will be sent to the California Public Utility Commission.

The council also received a report from Police Chief Ty Lewis on cleaning the riverbed. He compared it to painting the Golden Gate Bridge. When they're finished making their way through the riverbed, they return to the beginning. He did not comment on Tuesday afternoon's bank robbery after which the robber escaped into the riverbed to elude officers.

The city council also received a report from Paso Robles Fire Department Battalion Chief Randy Harris and Assistant City Manager Sarah Johnson-Rios regarding COVID-19. Harris says the vaccination program is underway at the Paso Robles Event Center. Reservations were taken last week and filled up by one Friday afternoon. He says they will take

reservations again on Thursday. One can make a reservation for vaccination by going to the county website www.readyslo.org, or by calling (805) 543-2444.

Assistant City Manager Sarah Johnson-Rios said the council approved in December spending $235,000 to assist local businesses. That money has gone to support parklets in the city, and also provide propane for heating out-of-door dining. The city is also introducing a new program that allows local businesses to sell gift cards which include a 20-percent discount. The city pays for that discount up to $5,000 per business. The gift cards are going on sale now at more than 50 businesses in Paso Robles.

Administrative Services Director Ryan Cornell reported the city's financial standing is good. He says the city has just under $20 million dollars in reserves, which is about 50-percent of the annual budget. He recommends deferral of Transient Occupancy Tax Collections for hotels, motels, and short-term rentals. However, it would put the minimum deferral at $3,000 a month.

The Paso Robles City Council also hired Oasis Associates to do environmental planning work to expedite the state's sale of the El Paso de Robles Youth Correctional Facility on Airport Road. The state has decided to sell the property and there are several interested buyers. The City of Paso Robles is not buying the property, but expediting the sale.

Related

Paso Robles City Council meeting highlights for Jan. 19
January 22, 2021
In "Politics"

NextEra, PG&E return to community for feedback on local infrastructure project
June 14, 2016
In "Region"

Public feedback sought for upcoming electric infrastructure project
November 24, 2015
In "Community"

Comment I-120: Attachment 4.

Land Use Element of City of El Paso de Robles General Plan 2003

ATTACHMENT 4

LAND USE ELEMENT

1.0 Introduction

This Land Use Element provides for the opportunity for infill development within the City limits and expansion of the City limits to incorporate potential annexation areas.

Since adoption of the Land Use Element in 2003, the City has completed annexation of the Sphere and Expansion Areas shown on Figure LU-2. Following completion of the Olsen Ranch and Beechwood Annexations in 2004 and the Linne Road (Our Town) Annexation in 2005, there are 19.9 square miles (12,739 acres) within City Limits.

Population Planning Threshold

Resolution 03-232, by which the General Plan was comprehensively updated in December 2003, established a population planning threshold of 44,000 persons. That population threshold was calculated on the assumption that the sum of all existing dwelling units (in 2003) and the maximum number of potential dwelling units authorized by the Land Use Element would be occupied by an average of 2.7 persons per household (average household size reported for the City in the 2000 U.S Census).

As discussed below, the population planning threshold remains at 44,000 persons. However, in 2012, the City Council approved adjustments to the underlying assumptions defining the occupancy of dwelling units.

Population Projection

The General Plan sets a vision and supporting policy focused on expected development between 2003 and the plan's 2025 horizon year. This projection is not a statement of policy that the City should or will take actions to manage the rate of development to conform to the projection.

When the General Plan Update was adopted in December 2003, based on the pace of development activity at that time, it was anticipated that residential build-out of the City, resulting in a population of 44,000, would occur by 2025. However, the national economic slowdown that began in 2007, coupled with the history of periodic slowdowns over prior decades, has caused the City to consider that build-out and an attendant population of 44,000 may take more than 20 additional years: to 2045 or longer, to attain. Table LU-3B contains a population projection prepared in 2014 that takes into consideration the periodic fluctuations in the economy as well as the anticipated availability of finished subdivided lots in the various specific plan areas. Table 1-E in the Land Use Element Appendix provides greater detail for the figures shown in Table LU-3B. It is important to note that the population projection in Table LU-3B and Table 1-E in the Land Use Element Appendix is an estimate of population growth in response to the expected pace of development.

Projected Number of Dwelling Units

A key component of determining the future population is to identify the numbers of existing and potential dwelling units. Table LU-3 provides an accounting of these units.

Vacancy Rate

In 2012, the City acknowledged that, at any point in time, a percentage of built units will be vacant, and that an appropriate vacancy rate is a hallmark of a healthy economy: helping

provide access to housing and stabilize housing prices. According to the U.S. Census, between 1980 and 2010, the housing vacancy rate has averaged 6.22 percent. However, noting that the vacancy rate fluctuates with the state of the economy, the City finds it prudent to adopt a more-conservative vacancy rate of 5.0 percent.

Average Household Size

According to the U.S. Census, the household size has averaged 2.66 persons between 1980 and 2010. The General Plan now (2012) assumes that each dwelling unit will be occupied with an average 2.66 persons.

Build-Out Population

At such time that the 16,818 units shown in Table LU-3 are built, it is assumed that 5.0% of them will be vacant and that the other 95.0 percent will be occupied with an average of 2.66 persons, yielding a population of 42,499.

The City Council may consider general plan amendments that increase the numbers of dwelling units at build-out provided that the build-out population does not exceed the population planning threshold of 44,000 persons.

Commercial and Industrial

Land designated for commercial and industrial development is projected to be more than adequate to accommodate the demands associated with the planned for population growth.

There is sufficient commercially designated area within the City to accommodate a projected 2.90 million additional square feet of floor area through the Year 2025 (refer to Table LU-1B). Industrially-designated land could accommodate up to 1.50 million additional square feet of City of El Paso de Robles General Plan 2003 floor space through the Year 2025. Much of the industrial development is anticipated to be concentrated near the airport.

2.0 Land Use Goals, Policies and Action Items

GOAL LU-1: Land Uses. Strive to maintain a balanced community, where the majority of residents can live, work, and shop.

POLICY LU-1A: Land Use Categories. Provide an appropriate mix and diversity of land uses.

Action Item 1. Amend/update the Zoning Ordinance to ensure that there is a Zoning District for each General Plan Land Use Category on Table LU-2.

Action Item 2. Allow projects in the Mixed Use land use category and/or in Specific Plan areas to be developed with more than one land use.

Table LU-1A. General Plan Development Potential

Land Use Category	Acreage	Percent
Commercial	1,271	10.0%
Business Park/Industrial	1,721	13.5%
Other/Public Facilities	1,947	15.3%
Agriculture & Open Space	2,572	20.0%
Residential	5,228	41.2%
Total	12,739	100%

Table LU-1B. General Plan Development Potential

Land Use	Existing	Potential	Total
Residential	11,711 DU	5,107 DU	**16,818 DU**
Commercial	4,044,000 sf	2,896,000 sf	**6,940,000 sf**
Industrial	2,093,000 sf	1,498,000 sf	**3,591,000 sf**

Notes:
1. DU = Dwelling Unit; existing numbers of DU per December 31, 2011 Land Use Inventory; See Table LU-3 for details on potential DU
2. Actual full commercial and industrial buildout would be driven largely by market factors and other considerations beyond the control of the City.

Table LU-2. General Plan Land Use Distribution

Land Use Category	Acres	Percent
Agriculture	**814**	**7.3%**
Residential Categories		
Residential Rural (1 du/5 acres)	0	0.0%
Residential Suburban (1 du/2.5 acres)	642	5.8%
Residential - Single Family - 1 (1 du/acre)	419	3.8%
Residential - Single Family - 2 (2 du/acre)	272	2.5%
Residential - Single Family - 3 (3 du/acre)	772	7.0%
Residential - Single Family - 4 (4 du/acre)	1,590	14.3%
Residential - Single Family - 6 (6 du/acre)	18	0.2%
Residential - Multiple Family - 8 (8 du/acre)	287	2.8%
Residential - Multiple Family - 9 (9 du/acre)	17	0.2%
Residential - Multiple Family - 12 (12 du/acre)	178	1.6%
Residential - Multiple Family - 16 (16 du/acre)	0	0.0%
Residential - Multiple Family - 20 (20 du/acre)	47	0.4%
Mobile Home Park (5 du/acre)	58	0.5%
Residential Total	**4,300**	**39.0%**
Commercial Categories		
Neighborhood Commercial	55	0.5%
Office Professional	29	0.3%
Downtown Commercial	41	0.4%
Community Commercial	97	0.9%
Regional Commercial	175	1.6%
Commercial Service	505	4.6%
Commercial Total:	**902**	**8.1%**
Mixed Use Categories		
Mixed Use 8 (Commercial and Multi-Family - 8)	18	0.2%
Mixed Use 12 (Commercial and Multi-Family - 12)	37	0.3%
Mixed Use Total:	**55**	**0.5%**
Industrial Categories		
Business Park	1,676	15.1%
Industry	52	0.5%
Industrial Total:	**1,728**	**15.6%**
Other Categories		
Public Facilities	1,654	14.9%
Parks and Open Space	1,634	14.5%
Other Categories Total:	**3,288**	**29.5%**
TOTAL	**11,087**	**100.0%**

Notes:
1. Source: Land Use Inventory, updated to reflect General Plan Amendments through June 30. 2011. All acreages are net (exclude dedicated rights-of-way for streets and highways).
2. It is expected that the Chandler Ranch Area Specific Plan will include changes to some of the above acreage in order to attain the 1,439 dwelling units provided by the General Plan.

Table LU-3A. Summary of Potential Residential Development (Dwelling Units)

Area/Land Use Categories	Existing Dwelling Units	Potential Dwelling Units	Total Dwelling Units
West Side (includes area south of 1st Street)			
Uptown/Town Centre (UTTC) Specific Plan *	2,202	985	3,187
Outside of UTTC - Single Family Residential	702	119	821
Outside of UTTC - Multi-Family Residential	319	86	405
Outside of UTTC - Non-Residential Use	43	0	43
Subtotal	3,266	1,190	4,456
East Side			
Borkey Area Specific Plan - Single Family	396	33	429
Borkey Area Specific Plan – Multi-Family	107	193	300
Union/46 Specific Plan (SF)	816	134	950
Chandler Ranch Area Specific Plan - Single Family	1	1,291	1,292
Chandler Ranch Area Specific Plan – Multi-Family	12	135	147
Olsen Ranch Specific Plan – Single Family	4	574	578
Olsen Ranch Specific Plan – Multi-Family	0	95	95
Beechwood Area Specific Plan – Single Family	5	469	474
Beechwood Area Specific Plan – Multi-Family	0	200	200
Outside of Specific Plan Areas – Single Family	5,122	117	5,239
Outside of Specific Plan Areas – Mobile Homes	310	0	310
Outside of Specific Plan Areas – Multi-Family	1,587	648	2,235
Non-Residential Use	85	28	113
Subtotal	8,445	3,919	12,362
Total	**11,711**	**5,107**	**16,818**

Source: City of Paso Robles Land Use Inventory - December 31, 2011

* UTTC: Existing units as of 12/31/11; potential units assumes 989 potential units minus 4 net units added since 01/01/10.

Table LU-3B: Population Projection

Year	Population [1]	Total Dwelling Units [2]
2010	29,800 [3]	11,652
2012	30,200 [4]	11,711
2015	30,100 [5]	11,917
2020	32,300	12,775
2025	34,400	13,602
2030	37,700	14,933
2035	39,900	15,775
2040	41,900	16,586
2045	42,800	16,924

Notes:
1. All population figures are rounded to the nearest 100. Except for 2010 and 2012, population figures are estimates based on household size and vacancy rate in Section 1 of this Land Use Element.
2. Numbers of dwelling units in 2010 and 2012 are based total numbers of existing units reported on City's Land Use Inventory;
3. Source: 2010 U.S. Census Bureau
4. Source: 2012 State Department of Finance (DOF) E-5 Report (for January 1, 2012)
5. Population "decrease" caused by application of the General Plan's assumptions stated in Section 1 of this Land Use Element. The 2012 DOF population estimate reported 2.73 persons per household, which yielded a higher population estimate than projected in 2015.

POLICY LU-1B: Airport Land Use Compatibility. As a general policy, new residential development is an undesirable land use within the Airport Influence Area.

Action Item 1. Prohibit further subdivision of land within the Airport Land Use Review Area (AP Overlay Area), or changes to land use or zoning, in a manner that would accommodate additional dwelling units. Existing parcels would, however, be entitled to be occupied by existing or new residential dwelling in accordance with current General Plan and Zoning.

GOAL LU-2: Image/Identity. Maintain/enhance the City's image/ identity.

POLICY LU-2A: Citizen Participation. Foster citizen participation in the planning process.

POLICY LU-2B: Visual Identity. Promote architectural and design excellence by imposing stringent design and construction standards for commercial, industrial, mixed-use, and multi-family projects.

Action Item 1. Amend/Update the Zoning Ordinance to define standards. Encourage property-owners to upgrade existing buildings and sites to conform to these standards.

Action Item 2. Adopt design standards to clearly articulate how important public views, gateways and landmarks (as shown on Figure CE-3) are to be maintained/ enhanced. This is to include, but not be limited to:

- Enhancing views along highways, roads, streets, and rail corridors with landscaping, building setbacks, enhanced architecture and signage/monuments.
- Ensuring that residential building lots are of sufficient size to preserve the topographic and aesthetic features of the landscape.

Action Item 3. Require utilities to be placed underground in new development projects, except for those circumstances where this requirement is not reasonably related to the specific project. Voltage lines of 44 KV or greater are excluded from this undergrounding requirement.

Action Item 4. Continue to enhance the downtown as a priority.

Action Item 5. Require new development to mitigate its share of the impacts to the natural and built environment as feasible and appropriate.

POLICY LU-2C: Local Heritage. Preserve/enhance downtown and the historic Vine Street neighborhood through adherence to established guidelines.

Action Item 1. Establish a Vine Street Historic Overlay District and adopt design guidelines.

Action Item 2. Review new development projects for consistency with the Downtown design guidelines and the Vine Street neighborhood guidelines.

POLICY LU-2D: Neighborhoods. Strive to maintain and create livable, vibrant neighborhoods and districts with:

- Attractive streetscapes,
- A pedestrian friendly setting,
- Coordinated site design, architecture, and amenities,
- Adequate public and private spaces; and,
- A recognizable and high quality design aesthetic.

Action Item 1 (Accessory Structures). Review/Revise the Zoning Ordinance, as necessary, to address the size, use and appearance of accessory structures to ensure neighborhood compatibility.

Action Item 2 (Quality of Life). Preserve health and safety, and strengthen the integrity of distinct and identifiable neighborhoods and districts, by protecting local streets from cut through traffic, speeding, parking intrusion, and traffic congestion and by implementing traffic calming measures.

a. Maintain/enhance traffic flow of arterial streets bordering residential neighborhoods, and develop neighborhood traffic management plans where deemed appropriate.

b. Provide well designed streets that provide for multiple benefits including public safety, mobility and storm water management. Integrate storm water management design features in an aesthetically pleasing manner to; intercept pollutants in storm water, recharge ground water, reduce storm water volume and velocity on streets that drain to the Salinas River, Huer Huero Creek, and other smaller tributaries for purposes of protecting and preserving riparian habitats and enhancing water resources.

Action Item 3 (Traffic Calming). Develop safety and traffic calming measures to be incorporated into the design of streets to ensure that they are compatible with the character of the residential neighborhood and other districts with pedestrian activity. These measures are to include, but not be limited to: narrow lanes, landscaped parkways, traffic circles, textured crosswalks, angled parking, and/or other measures.

Action Item 4 (Safety/Security). Review and update, as necessary, the City's Building Security & Construction Standards for new development projects to address:

- Exterior lighting,
- Surveillance devices,
- Illuminated street numbering,
- Locking devices for doors,

- Pedestrian safety devices,
- City Security Plan requirements, and
- City requirements/standards to incorporate considerations related to safety and defensibility into project design and site layout.

Action Item 5 (Light/Glare – New Development). Require all new lighting to be shielded and directed downward in such a manner as to not create off-site glare or adversely impact adjacent properties. The style, location and height of the lighting fixtures shall be submitted with the building plans and shall be subject to approval by the Development Review Committee prior to issuance of building or grading permits, as appropriate.

Action Item 6 (Light/Glare – Existing Development). Continue to enforce the General Performance Standards for All Uses (Section 21.21.040 of the City's Zoning Ordinance) specifies that: "No direct glare, whether produced by floodlight, high-temperature processes such as combustion or welding or other processes, so as to be visible from any boundary line of the property on which the same is produced shall be permitted. Sky-reflected glare from the building or portions thereof shall be so controlled by reasonable means as are practical to the end that said sky-reflected glare will not inconvenience or annoy persons or interfere with the use and enjoyment of property in and about the area where it occurs.

POLICY LU- 2E: "Purple Belt"(Open Space/Conservation Areas Around the City). Create a distinct "Purple Belt" surrounding the City by taking actions to retain the rural, open space, and agricultural areas.

Action Item 1. Coordinate with the County and private organizations to identify boundaries of and obtain support for a "purple-belt" that buffers the eventual edge of the City through the preservation of existing, and encouragement of future agriculture and open space.

Action Item 2. As feasible, acquire development rights/easements within the designated purple belt area. Use these development rights/easements to limit land uses within the designated purple belt to agricultural and/or open space.

Action Item 3. Take steps to ensure that the County retains surrounding lands in very low-density rural residential, open space (including natural resource), and agricultural uses. Oppose the creation of new parcels within the County.

Action Item 4. Implement strategies that help preserve or protect agriculture beyond the City limits, including:

- Establishment of agricultural buffer easements, berms and/or vegetative screening, on property proposed for urban development as a condition of approval of discretionary development applications.
- Implement the City's adopted "right-to-farm" ordinance.
- Participation in the Williamson Act and other farmland preservation programs.

Action Item 5. Require disclosure agreements for new non-agricultural development within 500 feet of an existing agricultural use. Such disclosure agreements should describe potential nuisances (e.g., dust, noise, pesticide spraying, etc.) associated with normal agricultural operations.

POLICY LU- 2F: Planning Impact Area (PIA): Maintain and periodically update a Planning Impact Area (PIA) to indicate the maximum potential geographical boundaries to which the City may grow in the foreseeable future (within the 2003-2025 planning period and beyond), or areas within which development patterns would have an immediate impact upon the City, and identify land use categories that would be assigned if unincorporated land were annexed.

Action Item 1: Evaluate annexation requests for conformance with adopted General Plan goals, policies and action items (including the requirement that financing mechanisms or alternative measures be put into effect in order to ensure fiscal neutrality), as well as public infrastructure and service plans.

Action Item 2: Continue to review and comment on planning efforts and development projects being considered by the County within the City's Planning Impact Area.

POLICY LU- 2G: Specific Plans. Require for large, vacant and/or underutilized areas, as well as for areas with special planning needs, as follows (refer to Figure LU-3):

- Areas outside of and southeast of the 2003 City limits, within Subarea "D" (proposed Annexation Areas between Linne Road and Creston Road). Two specific plans, which include:
- Olsen Ranch Specific Plan
- Beechwood Area Specific Plan
- Chandler Ranch Area Specific Plan
- Oak Park Area Specific Plan
- Uptown/Town Centre Specific Plan
- Other areas as established by the City Council

Limitations on Chandler Ranch Area Specific Plan, Olsen Ranch Specific Plan, Beechwood Area and Uptown/Town Centre Specific Plans.

The following shows the maximum number of dwelling units that can be accommodated within each of the specific plans. These numbers may be reduced, depending on topographic, environmental, or other development constraints:

- *Chandler Ranch Area Specific Plan:* *1,439 dwellings*
- *Olsen Ranch Specific Plan:* *673 dwellings*
- *Beechwood Area Specific Plan:* *674 dwellings*
- *Uptown/Town Centre Specific Plan* *989 dwellings*

Within the scope of a specific plan, the Planning Commission and City Council have the authority to:

☑ Provide flexibility in terms of:
- Distribution of densities within the geographic area covered
- Parcel sizes and location (including clustering to retain unique site features)
- Development Standards and other Zoning Ordinance requirements
- Allowable land uses by providing an opportunity for mixed use provisions (e.g. neighborhood serving commercial land uses) within the overall residential densities anticipated in the General Plan. This flexibility includes the ability to provide for multi-family land uses as long as the total dwelling unit count is within the scope of the General Plan designation for the geographic area under consideration.

☑ Address community-wide issues on a comprehensive basis, including:
- Fiscal impacts
- Infrastructure phasing and financing
- Parks and Trails
- Project Amenities
- Coordinated Architecture

Action Item 1. Encourage establishment of Specific Plans for other areas where it would be appropriate to:

a) Retain unique site features.
b) Insure a cohesive development pattern for the area (A Specific Plan could establish site planning, design and architectural parameters that could integrate the uses of the different parcels in the area).
c) Lend themselves to long-term development and infrastructure phasing;
d) Allow for flexibility in site planning in order to encourage creative and higher quality design and to ensure compatibility with surrounding land uses.

Action Item 2. As part of the environmental review of new Specific Plans, require preparation of fire station analysis identifying staffing requirements, station location, and response times.

POLICY LU- 2H: Downtown. Continue to revitalize the historic Downtown. Focus efforts on developing Downtown Paso Robles as the specialty retail, government, office, cultural, conference, and entertainment center of the City and North County region.

Action Item 1. Continue requiring new projects to implement the adopted Downtown Design Guidelines and to adhere to the development standards of the Zoning Ordinance.

Action Item 2. Promote a vibrant Downtown using the following methods:

- Implement the City's Economic Development Strategy.
- Continue to support Main Street and Chamber of Commerce efforts to use media, publications and technology to encourage retailers and entrepreneurs to locate and build in downtown.
- Encourage Main Street to recruit specialty stores to the Downtown

- Promote special events in the downtown developed by the City, Farmer's Market, Main Street, Chamber of Commerce and other community groups.
- Accommodate and encourage special festivals and events, and public art in the Downtown area.

POLICY LU-2I: Infill. Encourage infill development as a means of accommodating growth, while preserving open space areas, reducing vehicle miles traveled, and enhancing livability/quality of life. Infill includes:

1. Mixed use development in the Downtown and/or in areas within walking distance to transit, employment centers, and commercial services where the environmental impacts of the development would be minimized;

2. Residential infill in/near established neighborhoods;

3. Increased densities on sites which can accommodate the increases without having an adverse effect on adjacent properties;

4. Targeted residential infill to help address the needs of Cuesta College students and employees, City and school district employees, seniors, lower income households and other special needs groups; and rehabilitation of older apartment complexes.

Action Item 1. Amend the Zoning Ordinance to allow mixed-use projects in the Downtown and other suitable locations (near transit, multi-modal transportation facilities, commercial services, and/or employment centers).

Action Item 2. Prior to or concurrent with consideration of any mixed use projects, stringent design and construction standards shall be established.

POLICY LU-2J: Public Art. Art is in public places is an essential element of the Community's quality of life, contributing to what makes Paso Robles a special place to live, work and shop.

Action Item 1. Public and private development projects shall be required to contribute toward the establishment and maintenance of art in public places, based on a formula and process to be established by the City Council.

POLICY LU-2K: Support environmental responsibility. Manage the natural landscape to preserve the natural beauty and rural identity of the community, which enhances ecological functions and maintains environmental and public health.

Action Item 1. Require new development, either on public or private property, to mitigate its share of impacts from storm water on the natural environment through implementation of Low-Impact Development (LID) storm water management features.

GOAL LU-4: Public Services and Facilities. Maintain/improve the quality of life enjoyed by residents.

POLICY LU-4A: Service Levels. Strive to ensure that City services and facilities are maintained at current levels and/or adopted standards, and are funded as revenues become available. These standards are summarized as follows:

Police	Maintain a ratio of 0.5 non-sworn personnel per 1,000 population. Maintain a ratio of 1.4 to 1.6 sworn personnel per 1,000 population.
Emergency Services **Public Works** (Water, Sewer, Storm Drainage, Solid Waste)	Strive to achieve a 4 minute response to 90% of the calls for service. Maintain a ratio of 0.8 to 1.3 Firefighters per 1,000 population. Public facilities to be designed to meet the current and planned land uses, provisions to be made for continued operation, maintenance, and upgrades as necessary.
Library	Maintain 0.5 square feet per capita of library facilities.

Action Item 1. Direct City revenues toward continuing to fund the public services and on-going maintenance/operation of public facilities and utilities provided by the City (water, sewer, storm drains, police, emergency services, library, recreational services, and solid waste).

Action Item 2. Require new development in annexation areas and/or specific plan areas to establish funding mechanisms to pay for the construction, maintenance, and operation of required City services and facilities on an on-going basis: (1) at current levels; or (2) per adopted City standards, as well as in compliance with state and federal mandates; and/or (3) as deemed necessary during the environmental review and/or the fiscal impact review process.

Action Item 3. Require a fiscal impact analysis for new development in annexation areas and/or specific plan areas and condition projects accordingly so as to ensure that they will be fiscally neutral and not result in a net loss for the City.

Action Item 4. As part of implementation of the General Plan Update:

- Review/refine the existing Growth Management Plan to address Emergency service needs on a periodic basis.
- Revise/update the City's Master Plans of Water, Sewer, Storm Drainage, and Solid Waste and City standards and specifications for public facilities.
- Update the Capital Improvement Program so that it is in conformance with the revised Master Plans.
- Investigate expansion of branch libraries to serve outlying areas and adding new outreach programs, including a book mobile.
- Implement planned City library expansion into the 2nd floor of the existing library and develop City hall relocation plans, as feasible.
- Maintain the Youth Arts Center satellite library.

Table 1-E
Population Projection Details

	Potential # Units	Jan 1 2015	Jan 1 2020	Jan 1 2025	Jan 1 2030	Jan 1 2035	Jan 1 2040	Jan 1 2045	Residual
West Side									
Uptown/Town Centre Specific Plan									
Multi-family, vacant lots	105	12	30	30	30	0	0	0	3
Multi-family, under-developed lots	541	8	110	75	40	30	40	30	208
Multi-family, mixed use potential	295	0	0	0	0	44	50	40	161
Outside UTCSP Area									
Single family, vacant finished lots	97	10	20	15	20	15	5	0	12
Single family, under-developed lots	22	0	2	1	2	1	2	1	13
Single family, vacant subdividable parcels	3	0	1	1	1	0	0	0	0
Multi-family, vacant lots	17	0	16	1	0	0	0	0	0
Multi-family, under-developed lots	90	1	5	7	10	7	10	7	43
Subtotal for West Side	**1,170**								**440**
East Side									
Borkey Area Specific Plan									
Single family, vacant finished lots	13	0	11	0	0	0	0	0	2
Single family, vacant subdividable parcels	15	2	2	2	2	2	2	2	1
Multi-family, vacant lots	188	0	188	0	0	0	0	0	0
Union/46 Specific Plan									
Single family, vacant finished lots	18	6	7	3	2	0	0	0	0
Single family, subdividable parcels	49	0	8	8	13	5	5	5	5
Chandler Ranch Specific Plan									
Single family (does not include 12 existing units)	1,291	0	0	200	300	250	350	191	0
Multi-family	135	0	0	75	60	0	0	0	0
Beechwood Specific Plan									
Single family (does not include 5 existing units)	469	0	100	120	180	69	0	0	0
Multi-family	200	0	0	50	50	50	50	0	0
Olsen Ranch Specific Plan									
Single family (does not include 4 existing units)	574	0	0	80	184	120	190	0	0
Multi-family	95	0	0	0	50	45	0	0	0
Outside Specific Plan Areas									
Single family, vacant lots	94	10	20	10	20	10	15	8	1
Multi-family, vacant parcels	440	5	150	100	80	40	35	29	1
Multi-family, under-developed lots	197	0	40	25	40	25	35	25	7
Multi-family on mixed use zoned property	28	0	28	0	0	0	0	0	0
Subtotal	**3,806**								**17**
General Plan Amendments Active in 2014									
Borkey Area Specific Plan - Single Family	271	0	120	24	77	30	20	0	0
Beechwood Area Specific Plan - Mixed types	241	0	0	0	150	89	2	0	0
Furlotti Annexation - Single Family	30	0	0	0	20	10	0	0	0
Subtotal	**542**								0
Total	**5,518**	**54**	**858**	**827**	**1,331**	**842**	**811**	**338**	**457**

Notes:
1. Source for Potential # Units is the City's Land Use Inventory dated December 31, 2013.
2. Figures in Jan 2015, Jan 2020,... columns assume units complete (Certificates of Occupancy issued) as of Dec 31 of the previous year.
3. Inclusion of dwelling units in General Plan Amendments Active in 2014 does not indicate pre-approval of these applications, but provides an estimate of their development in the event that they are approved.

LU-5

Comment I-121: Attachment 5.

"Corona Audible Noise of 110 KV High Voltage Overhead Transmission Lines" (SAIEE, Innes House, Johannesburg)

ATTACHMENT 5

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CORONA AUDIBLE NOISE OF 110 KV HIGH VOLTAGE OVERHEAD TRANSMISSION LINES

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Abstract: The corona discharge mechanism and the resulting audible noise of high voltage overhead transmission lines with a nominal voltage class equal or higher than 220kV is largely solved and published. In the course of reconstructing a 110kV line the local approving authority has forced the grid operator to investigate the corona noise before and after the reconstruction, especially the effect of changing from single to bundle conductor.
Therefore an experimental setup in the high voltage laboratory of the Institute of High Voltage Engineering and System Management of the University of Technology has been build and acoustic measurements on single and bundle conductor were performed. To prove the impact of typical, various weather conditions to the corona discharges field tests are also realized. With this results general predications of the corona audible noise of 110kV high voltage overhead transmission lines can be derived.

1 INTRODUCTION

At places of raised electric field strengths high voltage overhead transmission lines can produce spontaneous, pulse-like corona discharges (acoustic sound emission or A-levels) which become apparent by crackling noise. By wet or humid weather conditions a distinctive 100 hertz hum (2f or tonale emission) can appear beside the acoustic sound emission [1].

To take into account the increased awareness of the population concerning noise exposure, the local approving authority has forced the grid operator to investigate the corona noise before and after the reconstruction of an 110kV overhead line (OHL), especially the effect of changing from single to bundle conductor.

This paper describes the results of sound measurements in different conductor-configurations in a high voltage laboratory and verification of these results on the basis of field tests.

2 GENERAL DEFINITIONS OF SOUND MEASUREMENT

In this Paper the following sound pressure levels are used:

Name	Description
$L_{A,95\%}$	**Basis level in dB** In 95% of the observation time exceeded A-valued sound pressure level of any noise.
$L_{A,eq}$	**A-valued energy-equivalent long-term sound level in dB** Single indication, which describes the sound events with fluctuating sound pressure levels. It is that sound level which has the same energy concentration like the fluctuating noise by constant steady influence for a given relation time.
$L_{Z,eq}$	**Unvalued energy-equivalent long-term sound level in dB**
$L_{A,Max}$	**Maximum level in dB** The highest sound level within the measuring time

Table 1: sound pressure levels

"A-valued" means the weighting of the measured unvalued sound pressure levels with a function considering that human beings have a different frequency-dependent hearing.

3 CALCULATION OF THE CONDUCTOR-GRADIENT

Substantially for the appearance of corona discharge is the existence of effectual conductor-gradient on the conducting wire. The middle conductor-gradient of one outer conductor is generally calculated according to the equation below [2]:

$$Ei = \frac{Ci'}{2 \cdot \pi \cdot \varepsilon_0 \cdot r} \cdot [1 + 2 \cdot (n-1) \cdot \sin\left(\frac{\pi}{n}\right) \cdot \frac{r}{a}] \cdot \frac{V}{\sqrt{3}} \qquad (1)$$

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Ei	middle conductor-gradient of one outer conductor
Ci'	capacitance per unit length of the conductor i at the co-system
ε_0	dielectric constant $8.8 \cdot 10^{-12}$ F/m
V	nominal voltage (phase to phase)
a	subconductor distance of the bundle conductor
r	subconductor radius
n	number of the subconductor's

The capacity Ci' must be determined from the geometrical data of the outer conductors, the earth wire and the tower geometry. For a symmetrical line with two systems the middle capacity of one conductor can be determined by the following approximation formula:

$$\overline{C}' = \frac{2 \cdot \pi \cdot \varepsilon_0}{\ln\left(\frac{D \cdot DmRs}{r \cdot DmRr}\right)} \quad (2)$$

$$D = \sqrt[3]{D_{RS} \cdot D_{ST} \cdot D_{RT}} \quad (3)$$

$$DmRs = \sqrt[3]{D_{RS} \cdot D_{St} \cdot D_{Rt}} \quad (4)$$

$$DmRr = \sqrt[3]{D_{Rr} \cdot D_{Se} \cdot D_{Tt}} \quad (5)$$

$\overline{C}'$	middle capacitance per unit length of one conductor of the co-system
ε_0	dielectric constant $8.8 \cdot 10^{-12}$ F/m
r	subconductor radius
D_{Xy}	middle outer conductor's distance of the phase X to the phase y
DmRs, DmRr	middle outer conductor distance of different systems
D	middle outer conductor's distance of one system

By the bundle conductor the partial radius becomes the equivalent radius r_B.

$$r_B = \sqrt[n]{n + r + r_T^{(n-1)}} \quad (6)$$

r_B	equivalent radius
n	number of the subconductors
r	subconductor radius
r_T	pitch circle radius

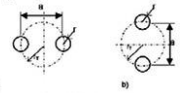

Figure 1) examples of double bundle configurations a) horizontally and b) vertically

The results of the conductor-gradient-calculation with the Al/St 240/40 wire in different configurations and various tower designs used in the field tests are shown in the Table 2. Besides, the shown voltages in tables and in the figures are phase-earth voltages.

tower design	operating voltage in kV	conductor-type	conductor-configuration	conductor-gradient in kV/cm
„ton“	68	Al/St 240/40	single conductor	9,5
	68	Al/St 240/40	2-bundle conductor	6,9
„lyra“	69	Al/St 240/40	single conductor	9,8

Table 2) calculation of the conductor-gradient

The critical conductor-gradient cited in the literature concerning annoying corona discharge emission of 16-17kV/cm were fallen short under the examined conditions (see table 2).

4 LABORATORY MEASUREMENT

4.1 Description of the high-voltage laboratory and the measuring set-up

The sound measurements on different conductor-configurations were carried out in the high voltage-laboratory of the test research institute for high voltage engineering Graz GmbH (VAH) of the University of Technology of Graz. The high voltage laboratory is located 353 metres above the sea level and is performed completely shielded to be able to measure interference-free in the hall and to not disturb the environment through unintentional hf-transmission. For the realisation of the sound measurement the high-voltage-cascade was supplied by a variable AC transformer. The connection of the specimen occurred by means of a 9kOhm resistor and a central electrode. A 3m long pipe with an external diameter of 22.5mm was taken down on the central electrode to the specimen and the conductor was connected through a T-connector electrically as well as mechanically. The basic set up of the measurements is shown in figure 2.

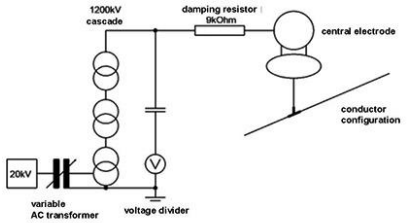

Figure 2) basic set-up

The specimen itself was mounted horizontal in the hall and stretched on both sides of the hall by means of composite insulator and chain block. Besides, the specimen's length was approx. 25 metres long. The ends of the insulator and the connectors were shielded with doubletorus (external diameter of 600mm).

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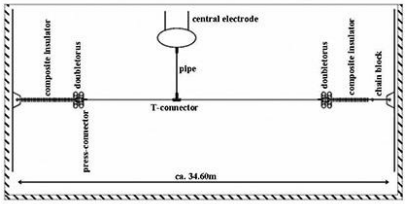

Figure 3) scheme of the single conductor configuration

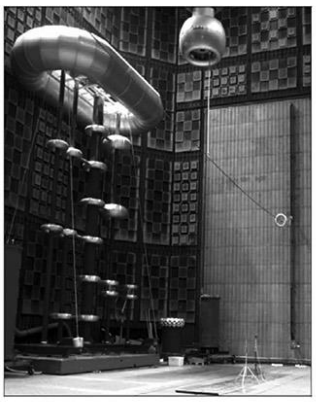
Figure 4) laboratory set-up of the single conductor measurement

In addition to fix the double bundle a plastic rope was mounted on the right double torus, so the vertical mounting orientation could be reached by the hall crane. The field distance holders were mounted at the end of the press-connectors and at the T-connector.

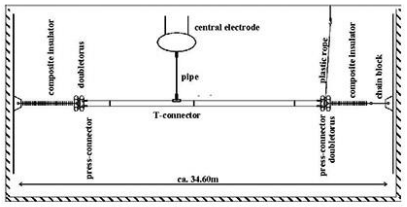

Figure 5) scheme of the double bundle configuration

4.2 Description and set-up of the sound level measuring instrument

The sound level measuring instrument 2250 of the company Brühl and Kjaer was used. The measuring microphone was mounted in a distance of 3 metres vertically below the conductor and led by shielded cables in the control room to the analyzer.

4.3 Atmospheric measuring conditions in the high voltage laboratory

During the measurements the climate in the hall was 22.4°C, 61.9% relative dampness (corresponds 11.9 g / m ³ H2O) and 1015hPa (relative air pressure).

4.4 Measurement of the quiescent noise level in the laboratory

The measurement of the quiescent level occurred with built up specimen and without supply of the cascade. Besides, possible disturbing noise and background noise just as the own noise of the measuring instruments were also detected. The quiescent noise level in the hall moved by the $L_{A,\,eq}$ between 20.4dB and 24.7dB and by the $L_{A,\,95\%}$ between 19.0dB and 19.8dB. The evaluation of the noise emission of the transformer (transformer hum) resulted sound levels at the $L_{A,\,eq}$ from 21.7dB to 26.1dB and at the $L_{A,\,95\%\ of}$ from 19.6dB to 20.1dB.

4.5 Measurements on the single conductor configuration

For the single conductor configuration a used wire piece from the rebuilt 110kV line Malta - Außerfragant (system number 115 / 3B and 115 / 4C) was used.
The used line conductor was a 240/40 aluminium/steel composite wire with a nominal external diameter of 21.84mm. The surface of the conductor showed cokings by the many years of use. The conductor was mounted with the T-connector at 5.9 metre height and by the microphone at a height of 6.07 metres above the hall bottom.

operating voltage in kV	$L_{A,eq}$ in dB	$L_{A,Max}$ in dB	$L_{A,95\%}$ in dB
70	22.3	33.6	19.7
120	25.5	40.2	21.5

Table 3) measurement results of the single conductor, measuring time 5 minutes

The following diagrammes show the third-octave-band unvalued frequency spectra by different operating voltages.

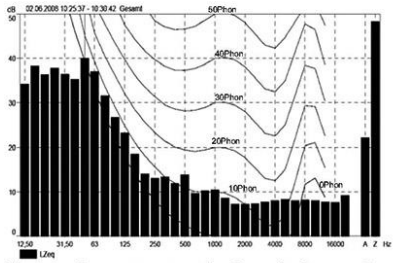

Figure 6) spectrum of the single conductor measurement with a voltage of 70kV, measuring time 5 minutes

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The envelopes mark the curves of the same volume in phon after Fletcher and Munson.

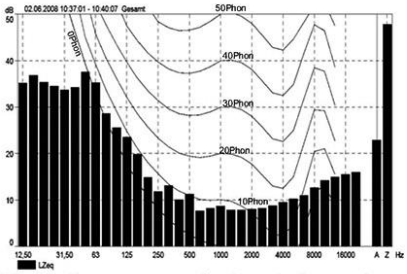

Figure 7) spectrum of the single conductor measurement with a voltage of 120kV, measuring time 5 minutes

By a voltage of 120kV a light increase of the high frequency levels is recognizable, but not audible.

4.6 Measurements on the double bundle configuration

For the double bundle configuration in vertical position (subconductor distance of 400mm) a brand new conductor was used. The height above the hall bottom of the lowest conductor was by T-connector 5.52 metres and by the microphone 5.38 metres. At the beginning of the measurements the conductors were "branded" with 200kV for 5 minutes to delete possible foulings.

operating voltage in kV	$L_{A,eq}$ in dB	$L_{A,Max}$ in dB	$L_{A,95\%}$ in dB
70	20.7	33.2	19.3
120	23.3	44.6	19.7

Table 4) measurement results of the double bundle configuration, measuring time for 70kV and 120kV in each case 5 minutes

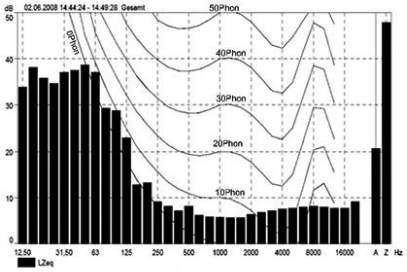

Figure 8) spectrum of the double bundle measurement with a voltage of 70kV, measuring time 5 minutes

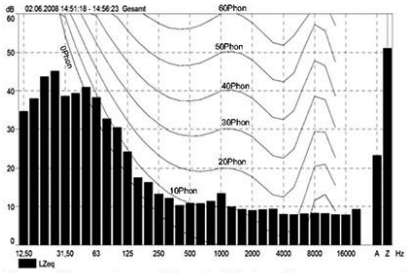

Figure 9) spectrum of the double bundle measurement with an operating voltage of 120kV, measuring time 5 minutes

4.7 Results of the laboratory measurement

With an operating voltage of approximately 70kV no essential noise emission over the quiescent level was noticed at both conductor-configurations (single and bundle conductor). The simulation of an earth-fault (increase of the phase-earth voltage in both "healthy" phases to 120kV) showed a higher noise level by the single conductor configuration than the double bundle configuration. This is a result of the conductor-gradient-decreasing-effect of the double bundle configuration.

5 FIELD MEASUREMENTS

5.1 General

To verify the laboratory-results other sound level measurements were carried out on selected 110kV overhead line locations. The sound level measuring instrument was again the 2250 of the company Brühl and Kjaer. The choice of the measuring locations occurred according to the accessibility and the quiescent level at the respective place (traffic, waters, railroad, wind, etc.). To minimize the quiescent level all measurements were hold during late night hours.

5.2 Measurement at a 110kV OHL of the type "ton-tower"

5.2.1 Description of the measuring place and the measuring set up

Measuring place:
The measuring place was located between mast No. 146 and No. 145 of the 110kV OHL "ton-tower" with the system number 112/2 (southern system) and 112/5 (northern system) near the places Projern and Dellach.

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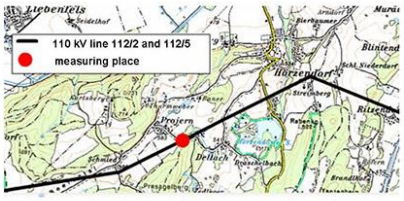

Figure 10) description of the measuring location

During the measurement the vertical distance between microphone and the tower symmetry line was 4 metres The distance between microphone (spike) and the lowest conductor (system 112/2) 5.5 metres. The measuring place is lying 517 metres above the sea level and is well protected against the wind.

Conductor and overhead earth wire:
The system 112/2 consists of an 240/40 aluminium/steel composite wire and runs between the substation St. Veit and the substation Landskron. The system 112/5 consists of an 260/40 aluminium/stalum composite wire and runs between the substation Brueckl and the substation Windischbach. The earth wire type is a 56 / E24. AlMgSI/Stalum.

Tower geometry, span field length and insulators:
The "ton-tower" consist of screwed angle-frameworks with open profiles. As insulators full-core-long-rod-insulators in double configuration with electric arc protection armatures were used.

The span field 145 - 146 measures a length of 280 metres and has in the measuring point a bottom distance of 9.42 metres (distance between the lowest conductor of the system 112/2 and the surface of the earth level).

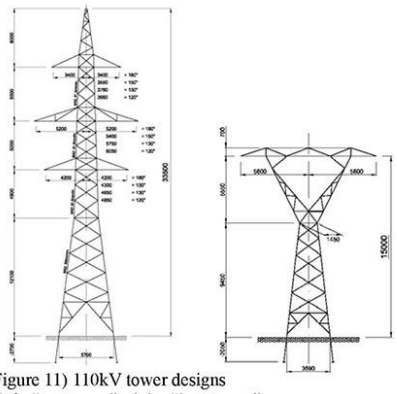

Figure 11) 110kV tower designs
(left: "ton-tower", right: "lyra-tower")

5.2.2 Atmospheric conditions at the measuring location

During the measurement the climate at the measuring place was 2.4°C, 73.8% rel. dampness (corresponds 5.4 g / m ³ H2O) and 1080hPa (relative air pressure). During the measurement it was absolutely calm.

5.2.3 Measurement at the 110kV OHL "ton-tower"

The measurement started about 22.08 CET and lasted 5 minutes. During the measurement the operating voltage in both systems was 68.13kV (phase-earth voltage).

operating voltage in kV	$L_{A,eq}$ in dB	$L_{A,Max}$ in dB	$L_{A,95\%}$ in dB
68.13	20.9	21.5	20.7

Table 5) measurement results of the 110kV OHL "ton-tower"

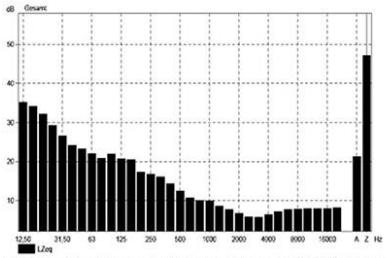

Figure 12) spectrum of the measurement of the 110kV OHL "ton-tower"

5.3 Measurement at a 110kV OHL of the type "lyra-tower"

5.3.1 Description of the measuring place and the measuring set up

Measuring place:
The measuring place was between mast No. 168 and No. 169 of the 110kV OHL "lyra-tower" with the system number 111 / 3A near the place Kras.

Figure 13) description of the measuring location

During the measurement the vertical distance between microphone and the tower symmetry line was 4 metres. The distance between microphone and the lowest conductor (system 112/2) 3.0 metres. The measuring place is lying 654 metres above the sea level.

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Conductor:
The system 111 / 3A consists of an 240/40 aluminium/steel composite wire and runs between the substation Landskron and the substation Gummern.

Tower geometry, span field length and insulators:
The "lyra-tower" consist of screwed angle-frameworks with open profiles. As insulators full-core-long-rod-insulators in double configuration with electric arc protection armatures were used.

The span field 168 - 169 measures a length of 250 metres and has in the measuring point a bottom distance of 10.10 metres.

5.3.2 Atmospheric conditions at the measuring location

During the measurement the climate at the measuring place was 0.3°C, 72.0% rel. dampness (corresponds 3.6 g / m ³ H2O) and 1113hPa (relative air pressure). The measurement was influenced strongly by wind caused sounds.

5.3.3 Measurement at the 110kV OHL "lyra-tower"

The measurement started at about 00.25 CET and lasted 5 minutes. In the system 111 / 3A the operating voltage during the measurement was 68.7kV (phase-earth voltage).

operating voltage in kV	$L_{A,eq}$ in dB	$L_{A,Max}$ in dB	$L_{A,95\%}$ in dB
68.7	33.8	48.8	32.6

Table 6) measurement results of the 110kV OHL "lyra-tower"

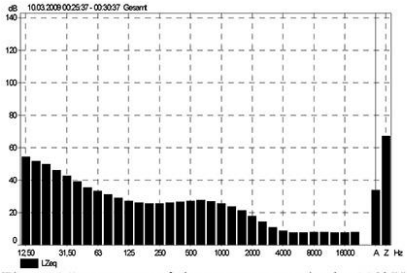

Figure 14) spectrum of the measurement in the 110kV OHL "lyra-tower"

5.4 Results of the field measurements

In comparison to the laboratory measurement the biggest problem with the field tests was the relatively high quiescent sound level. However, laboratory conditions could be reached by the transfer of the measurements during the night hours. Nevertheless, it turned out that also with favourable measuring conditions the background noise was always stronger than a possible corona discharge noise of the line itself. Also the analysis of the spectra could not deliver any indication of corona discharge noise (no striking 100 hertz level and no audible broadband increase of the sound level between 1kHz and 16kHz).

6 CONCLUSION AND VIEW

Several measurements were executed in the laboratory as well as in the field to investigate the corona discharge emission from 110kV overhead lines. Nevertheless, the analyses of the measurement-results showed that under the prevailing climatic conditions and an operating voltage of 69kV phase-earth voltage (phase-phase voltage of 120kV) the phenomenon of corona discharge emission could not be attested neither in the laboratory nor in the field test.
Also the critical conductor gradients cited in the literature concerning annoying corona discharge emission of 16-17kV/cm were fallen short by the examined conductor-configurations, conductor-types and the tower-configurations by far.

All field measurements were executed under dry weather conditions. In addition to these investigations further field measurements on 110kV overhead lines under humid air conditions are planed.

7 EXPRESSION OF THANKS

This paper would not have been possible without vigorous support by the Carinthian government, department 15, subdivision sound and electrical engineering. Hence, our special thanks go to Mr. Ewald Holzer and Mr. Jürgen Ruppitsch.

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