June 2018


CAMP PENDLETON STATION
OCEANSIDE TRANSIT CENTER
CARLSBAD VILLAGE STATION
POINSETTIA STATION
ENCINITAS STATION
SOLANA BEACH STATION
DEL MAR SPECIAL EVENTS PLATFORM
SORRENTO VALLEY STATION
OLD TOWN STATION
AIRPORT INTERMODAL TRANSPORTATION CENTER
SAN DIEGO SANTA FE DEPOT
SAN DIEGO CONVENTION CENTER

# Infrastructure Development Plan

## for the LOSSAN Rail Corridor in San Diego County

SANDAG

wsp

# ON-CALL TRANSIT PLANNING SERVICES

*SAN DIEGO ASSOCIATION OF GOVERNMENTS*

# INFRASTRUCTURE DEVELOPMENT PLAN FOR THE LOSSAN RAIL CORRIDOR IN SAN DIEGO COUNTY

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**June 7, 2018**

**San Diego Association of Governments**

*Update of the Infrastructure Development Plan for the Los Angeles-San Diego-San Luis Obispo (LOSSAN) Rail Corridor in San Diego County*

# FINAL

# INFRASTRUCTURE DEVELOPMENT PLAN FOR THE LOSSAN RAIL CORRIDOR IN SAN DIEGO COUNTY

## AGREEMENT NO. 15019-OS

Prepared by: Lauren German — 06/07/2018 (Date)

Reviewed, Approved & Released by: Lane Fernandes — 06/07/2018 (Date)

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# 1.0 INTRODUCTION

The San Diego coastal rail corridor (Corridor) is the southern terminus of the 351-mile Los Angeles-San Diego-San Luis Obispo (LOSSAN) Rail Corridor. The LOSSAN Rail Corridor is the second busiest intercity passenger rail corridor in the nation supporting commuter, intercity, and freight rail services. The San Diego Subdivision is the southern end of the LOSSAN corridor and is a 60-mile section from the Orange County line to the Santa Fe Depot in Downtown San Diego. Currently, two-thirds of the Subdivision is double tracked. Trains traverse six coastal lagoons and the coastal cities of Oceanside, Carlsbad, Encinitas, Solana Beach, Del Mar, and San Diego. Within San Diego County, the Corridor is owned by the North County Transit District (NCTD) from the Orange County line at Milepost (MP) 207.4 to the southern limits of the City of Del Mar at MP 245.7. The San Diego Metropolitan Transit System (SDMTS) owns the Corridor in the City of San Diego from Del Mar at MP 245.7 to the Santa Fe Depot at MP 267.5.

The passenger rail services operating on the LOSSAN Rail Corridor in San Diego County include the Amtrak Pacific Surfliner intercity service (Surfliner), Metrolink commuter service, and NCTD's COASTER commuter service. Starting at Control Point (CP) SONGS, just south of the Orange County line, and continuing to the Santa Fe Depot in Downtown San Diego, NCTD dispatches all trains operating on the Corridor. COASTER commuter trains operate south from the Oceanside Transit Center (OTC) to the Santa Fe Depot. The Southern California Regional Rail Authority (SCRRA) operates Metrolink commuter trains between Los Angeles, the Inland Empire, Orange County and OTC. The BNSF Railway (BNSF) and Pacific Sun Railroad (a subsidiary of the BNSF) are the freight rail operators on the Corridor, operating trains from the Port of San Diego north, as well as serving the various industries along the Corridor and the Escondido Subdivision between the Cities of Oceanside and Escondido. BNSF owns the right-of-way south of the Santa Fe Depot, but no revenue commuter or intercity passenger trains currently operate on this segment of right-of-way. By 2035, the number of trains operating along the Corridor is expected to rise dramatically based on the current service plans of each operator. As a result, critical improvements are needed in areas that will benefit all users.

Previously, SANDAG had coordinated the prioritization of rail improvements along the San Diego Subdivision with the rail owners and operators in 2009 with the *San Diego-LOSSAN Corridor Project Prioritization Analysis* and again in 2013 with the *Infrastructure Development Plan for the LOSSAN Rail Corridor in San Diego County* (IDP). The 2013 IDP detailed the service plans for each operator and the capital improvements needed to implement them. SANDAG has completed additional improvements and in some cases, changed the scopes of future projects since that time and, therefore, an update to that plan is now warranted.

The purpose of this revision to the IDP is to update the previous planning "roadmap" to outline project priorities in the event additional funding opportunities become available. An operational analysis of future scenarios was developed to revisit the rail improvement projects previously identified in the 2013 IDP and analyze updated operating scenarios that support the *San Diego Forward: The Regional Plan* (Regional Plan) and help refine the phasing plan for these projects using a "service-driven" method. A signal optimization/re-spacing plan was developed to facilitate further service enhancements, including better reliability and running times. An expanded analysis of potential grade separations was also conducted, which resulted in a prioritized list of potential grade separations along the San Diego Subdivision. SANDAG is currently developing the next update of the Regional Plan. Updating the IDP will support development of this plan. For reference, the relevant detailed technical memoranda and reports for the various analyses performed along the Corridor are included in the appendices.

The complete vision for the LOSSAN Rail Corridor is based on an agreed program of rail improvements between the various transportation and regional agencies along the corridor from San Luis Obispo to San Diego, which include:

- San Luis Obispo Council of Governments (SLOCOG) – www.slocog.org
- Santa Barbara County Association of Governments (SBCAG) – www.sbcag.org

- Ventura County Transportation Commission (VCTC) – www.goventura.org
- Southern California Association of Governments (SCAG) – www.scag.ca.gov
- Los Angeles County Metropolitan Transportation Authority (LA Metro) – www.metro.net
- Orange County Transportation Authority (OCTA) – www.octa.net
- Riverside County Transportation Commission (RCTC) – www.rctc.org
- North County Transit District (NCTD) – www.gonctd.com
- San Diego Association of Governments (SANDAG) – www.sandag.org
- San Diego Metropolitan Transit System (MTS) – www.sdmts.com
- Southern California Regional Rail Authority (SCRRA) – www.metrolinktrains.com
- California Department of Transportation (Caltrans) – www.dot.ca.gov/rail
- BNSF Railway (BNSF) – www.bnsf.com
- Union Pacific Railroad (UPRR) – www.up.com
- National Railroad Passenger Corporation (Amtrak) – www.amtrak.com
- LOSSAN Rail Corridor Agency (LOSSAN) – www.lossan.org
- California High-Speed Rail Authority (CHSRA) – www.hsr.ca.gov

The goal of the collective efforts of these agencies is to improve capacity, ridership, travel times, operational flexibility and reliability, and on-time performance for all services operating on the Corridor.

# 2.0 TRANSPORTATION PLANS AND VISIONS

## 2.1 STATEWIDE

The recently released *DRAFT 2018 California State Rail Plan, Connecting California,*[1] (Draft SRP) "establishes a statewide vision describing a future integrated rail system that provides comprehensive and coordinated service to passengers through more frequent service, and convenient transfers between rail services and transit. This integrated system uses the existing rail system more efficiently; expands the coverage and mix of rail services in several key corridors; scales proposed services to meet anticipated market demand; and facilitates network-wide coordination through scheduled, or "pulsed," transfers."[2] (See excerpts in **Appendix 1**).

The Draft SRP defines a vision for passenger service as one where "you could reliably board a train at least every 30 minutes at a station in denser urban regions, or at least every 60 minutes at any station in the rest of the state, and travel seamlessly to any city in California…." Proposed, phased passenger improvements and investments in LOSSAN South identified in the Draft SRP include:

**Short-Term (by 2022)**

- Introduce initial integrated 60-minute express and 30-minute local service between Los Angeles and San Diego.

**Mid-Term (by 2027)**

- Complete maintenance facility investments for integrated service.
- 30-minute service to all local stations.

**Long-Term (by 2040)**

- 30-minute express service between Los Angeles and San Diego with timed connections at Oceanside and the San Diego Airport.
- Creation of a California High-Speed Rail (HSR) station in San Diego as the Hub for HSR, intercity rail, regional rail, and high-capacity transit.

## 2.2 CORRIDORWIDE

The LOSSAN Rail Corridor Agency is a Joint Powers Board established in 1989 to provide a forum for the transportation and regional agencies along the Corridor (listed in the previous section) to collaborate on ways to increase ridership, revenue, capacity, reliability, and safety on the LOSSAN Rail Corridor.

In July of 2015, Caltrans executed an Interagency Transfer Agreement (ITA) with the newly established LOSSAN Joint Powers Authority (JPA) and officially transferred the administration and management of the Surfliner service to the LOSSAN JPA. The Orange County Transportation Authority (OCTA) became the Managing Agency for the LOSSAN Agency, taking over administrative duties from SANDAG.

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[1] Public release draft was made available on October 11, 2017, and is accessible at http://www.dot.ca.gov/californiarail/.

[2] Draft SRP, p. 3.

The LOSSAN Agency continued its vision for the Corridor that focuses on expanding and enhancing the integration of the Corridor's passenger rail services, identifying a Corridorwide capital improvement program, enhancing local transit connections at both commuter and intercity stations, developing an integrated fare policy, and providing better customer information.

In support of this vision and to advance a long-term Corridorwide strategy to increase the market for passenger rail in southern California, the LOSSAN Agency completed the *LOSSAN Corridorwide Strategic Implementation Plan* (SIP) in April 2012 (see excerpts in **Appendix 2**). This SIP includes the establishment of a 20-year service objective for the entire Corridor and identifies a range of infrastructure improvements required to support this objective.

This SIP was created as a first step in implementing the new Corridorwide vision of passenger rail services. The purpose of the SIP was to collectively provide, in a strategic document, a roadmap to identifying "the infrastructure to allow more peak period trains, faster through-express trains and additional service improvements that meet current and future conventional and high-speed intercity, commuter and freight demands". Specific long-term goals were also identified and include:

- Additional commuter and intercity service including all-stop, "cross-county", commuter service between Los Angeles and San Diego.
- New San Diego stops at the Airport Intermodal Transportation Center and the San Diego Convention Center.
- Conversion of peak period intercity service to limited stop express.

The LOSSAN Rail Corridor Agency is required to submit an annual business plan to the State of California by April 1st of each year. The *LOSSAN Rail Corridor Agency Business Plan FY2017-18 to FY2018-19* (see Executive Summary in **Appendix 3**) includes operating plans and strategies new to the Agency since the publication of the 2012 LOSSAN Plan.

- LOSSAN added a 12th roundtrip to the Surfliner service between Los Angeles and San Diego with an early morning departure from San Diego and a mid-evening departure from Los Angeles.
- LOSSAN effectively worked with Amtrak to implement the "robust timetable" that was introduced in June 2016, which was developed to improve the overall reliability of the Surfliner, Metrolink, and COASTER rail services.
- The LOSSAN Agency is also working to identify additional equipment to supplement the existing Surfliner fleet in order to meet demand during peak travel periods, which can lead to standing room-only conditions.

An update to the LOSSAN SIP is expected in 2019. The future service goals for the Surfliner are based on the Draft SRP.

## 2.3 REGIONAL

### 2.3.1 San Diego Forward: The Regional Plan

The Regional Plan (see excerpts in **Appendix 4**) is the blueprint for major transportation improvement projects in the San Diego region. The Regional Plan includes projects to increase the percentage of double tracking significantly through 2050, with a phased approach that includes projects to be completed by 2020 and 2035.

The Regional Plan also calls for a grade separation at Leucadia Boulevard, a station at the San Diego Convention Center, a San Diego International Airport Intermodal Transportation Center, a Del Mar Fairgrounds special events platform, and a COASTER service extension to Camp Pendleton. The full build-out scenario defined in the Regional Plan provides for a two-track railroad through San Diego County with the remaining sections of single track through the City of Del Mar and at the San Diego-Orange County line (SANDAG, 2015). The next update of the Regional Plan is scheduled for 2019.

### 2.3.2 Metrolink 10-Year Strategic Plan 2015-2025

The *Metrolink 10-Year Strategic Plan 2015-2025* (Metrolink Strategic Plan) (see excerpts in **Appendix 5**) was approved by the SCRRA Board of Directors in March 2016 and outlines the agency's Mission, Vision, and Values and includes action plans and goals to keep the agency "on track" as it serves the Southern California region. The Metrolink Strategic Plan presented a two-part strategy of how to strengthen the core of the Metrolink organization and system and how the system may grow. The Scenario 1 growth alternative evaluated the enhancement of the existing Metrolink network based on service assumptions that SCRRA member agencies believe could be realistic funded over the next 10 years. This growth scenario was used as the basis for assumptions included in this report.

## 2.4 SUB-REGIONAL

### 2.4.1 San Diego-LOSSAN Corridor Project Prioritization Analysis

Preceding the LOSSAN SIP to set a long-term vision for the entire Corridor, SANDAG, in collaboration with NCTD, Caltrans, Amtrak, and BNSF completed the *San Diego-LOSSAN Corridor Project Prioritization Analysis* in 2009 (see excerpts in **Appendix 6**), which prioritized 40 rail improvement projects along the LOSSAN Rail Corridor in San Diego County into three tiers, each needed in order to increase service. This ranking was based on the service plans of each operator, as they were defined during the study. Projects were evaluated on both a quantitative and qualitative basis, with rail operations weighted the heaviest. SANDAG used this analysis to both seek federal funding and develop an Early Action Plan of corridor projects.

This plan consisted of 28 capital improvement projects focused on adding track capacity to the corridor and totaling $1.2 billion of which more than $760 million has been programmed for specific projects. Currently, 16 of these projects are in various stages of engineering design and construction, including the first priority tier of 12 projects which are largely open to the public.

The IDP updated this prioritization in 2013 and 2018.

### 2.4.2 Public Works Plan/Transportation & Resource Enhancement Program

SANDAG and Caltrans District 11 (San Diego) released the draft *Public Works Plan/Transportation and Resource Enhancement Program* (PWP/TREP) in March 2013. The PWP/TREP proposes transportation, community, and resource enhancement improvements along the LOSSAN and Interstate 5 (I-5) Corridors within a 27-mile stretch of coastal North County from La Jolla to Oceanside. It is an implementation blueprint for $6.5 billion of rail, highway, environmental and coastal access improvements, the majority of which are consistent with other plans like the Regional Plan. It is a single, integrated regulatory document approved in 2014 by the California Coastal Commission in an effort to streamline project review that could otherwise require multiple coastal development permits.

Rail improvement projects that improve the movement of freight, passengers, and/or are needed to maintain the rail line for interstate rail traffic are subject to review by the Coastal Commission through the federal consistency certification process. These consistency determinations are made by the Coastal Commission and are subject to public review and comment.

### 2.4.3 Federal Surface Transportation Board

The railroad right-of-way (ROW) is subject to the jurisdiction of the Federal Surface Transportation Board (STB). The project falls under the STB ruling, which stipulates that State and Local environmental regulation has been found to be preempted by federal statute (49 U.S.C. 10501(b)) for railroad projects when the tracks are used for interstate freight transport. Therefore, the project is not subject to the California Environmental Quality Act (CEQA). The STB ruling is based on the premise that projects that improve railroad reliability and capacity on tracks used for interstate commerce are not subject to regulatory compliance with state and local regulations due to the interstate commerce clause in the United States Constitution. The proposed improvements are for the purpose of improving railroad reliability and capacity of the LOSSAN Corridor, which is used to transport interstate freight.

# 3.0 RIGHT-OF-WAY DESCRIPTION AND SUMMARY

The San Diego Subdivision is entirely publicly-owned between NCTD and MTS. Starting at the Orange County Line and continuing just south of the Santa Fe Depot, NCTD dispatches all trains operating on the Corridor. BNSF Railway owns the right-of-way and dispatches trains south of the Santa Fe Depot, however, this section does not currently host revenue passenger service and is not considered a part of the LOSSAN Rail Corridor.

Currently, there are eight stations in San Diego County: Oceanside, Carlsbad Village, Carlsbad Poinsettia, Encinitas, Solana Beach, Sorrento Valley, Old Town and Santa Fe Depot. The COASTER serves every station while Amtrak intercity trains regularly serve Oceanside, Solana Beach, Old Town, and Santa Fe Depot. A limited number of Amtrak intercity trains serve a select number of commuter rail stations in San Diego County.

The Corridor is just over 60 miles in length from the Orange County Line to the Santa Fe Depot (41 miles from Oceanside to San Diego) with approximately two-thirds of it currently double-tracked with 34 rail-highway at-grade crossings. The entire right-of-way is in the process of being fitted with Positive Train Control (PTC).

PTC is a system for monitoring and controlling train movements to provide increased safety. In September 2008, Congress approved a new rail safety law that set a deadline of December 15, 2015 for implementation of PTC technology across most of the U.S. rail network. NCTD spearheaded this multi-million-dollar effort within San Diego County, which included the installation of new fiber optic cable from the County Line to Santa Fe Depot in San Diego. SCRRA was responsible for its installation north of the San Diego / Orange County line. The Federal Railroad Administration (FRA) previously mandated that PTC be complete and operational by 2016. In late 2015, Congress extended the deadline by at least three years to December 31, 2018, with the possibility of an extension to a date no later than December 31, 2020. NCTD is on target to implement PTC before the deadline of December 31, 2018.

NCTD is responsible for all maintenance of the right-of-way in San Diego County, which is currently accomplished under a contract with Bombardier Transportation. The right-of-way is maintained to FRA Class V track standards allowing for a top speed of 89 miles per hour (mph) in some areas. Given the abundance of capital work, as well as required maintenance on the right-of-way, on any given day there can be a number of work zones within the Corridor to allow for the maintenance and construction of infrastructure. These designated work zones require train traffic to slow and receive radio clearance from the train dispatcher in order to proceed into these work zones. These work zones, which can also require the complete shutdown of the Corridor for a period up to 72 hours, can have a significant impact on train operations and on time performance.

# 4.0 NEW STATIONS AND PLATFORMS

The addition of “new” stations or platforms are assumed for 2035, per the Regional Plan, and will have an impact on the development of schedules and travel times as well as capacity improvement needs. Capacity becomes a key component of adding new stations, which require adjustments in schedules and overall travel time, which in turn can shift the location where trains “meet” while operating in opposing directions (and, therefore, where double track infrastructure is necessary).

## 4.1 CAMP PENDLETON STATION

This project has been identified at the request of the United States Marine Corps (USMC) to provide service to the base for their residents as well as employees, many of which live off base and are required to commute to work. This project is currently under planning and conceptual design by NCTD and the planned location for the station is directly east from the Stuart Mesa Maintenance Facility (SMMF), at MP 222.2.

This station would require a third track for trains to “turn” off the mainline and an island platform so that trains that currently operate through this section of the corridor could have the potential to service the station in the future. Modifications were assumed to CP Stuart and CP Mesa to allow access to the new station track. However, a preferred track configuration has not yet been agreed to by NCTD or the USMC, therefore, the assumed configuration for this analysis may change in the future.

## 4.2 CONVENTION CENTER PLATFORM/STATION

This platform would be located one half mile south of Santa Fe Depot in San Diego at approximately MP 268.0. It is expected this would be a limited-use platform, used primarily for COASTER service to San Diego Padres Baseball games at PETCO Park, as well as any special events at the San Diego Convention Center or in the Gaslamp District. This project is currently in the planning phase by NCTD.

In 2014, NCTD developed the *San Diego Convention Center Coaster Platform and Siding/Spur Track Feasibility Study*, which called for an eight-car length platform and spur track in this location. In 2015, NCTD participated in a SANDAG-led study of alternatives to increase capacity at the Santa Fe Depot, and recommended that the Convention Center Platform be a permanent double tracked station with two side loading passenger platforms (*San Diego and Santa Fe Depot Track Reconfiguration Alternatives*, April 2015). Additional design work is needed to finalize the platform configuration. For the purpose of this study, the Convention Center Platform was assumed to be a single platform due to right-of-way constraints. The service modeling assumed regular revenue service by 2035 (see Section 5.0).

## 4.3 DEL MAR FAIRGROUNDS SPECIAL EVENTS PLATFORM

This platform would be located immediately adjacent to the Del Mar Fairgrounds at approximately MP 242.8. It is expected this would be a limited-use platform, used for COASTER and Amtrak service to the San Diego County Fair, the annual Del Mar Horse Racing Season, as well as any special events at the Fairgrounds that may merit the service. This project is environmentally cleared and in final design as part of the San Dieguito Double Track Project by SANDAG.

## 4.4 SAN DIEGO INTERNATIONAL AIRPORT INTERMODAL TRANSPORTATION CENTER

The Intermodal Transportation Center (ITC) would be located off Pacific Highway on the north side of San Diego International Airport. In addition to commuter and intercity rail, it is expected that the ITC would include trolley service, bus connections, and future  HSR service. Subsequently, the ITC is expected to become a major transportation hub for downtown San Diego. This project is currently in the planning phase by SANDAG.

# 5.0 OPERATIONAL ANALYSIS OF FUTURE SCENARIOS

The Regional Plan includes projects to increase the percentage of double tracking significantly through 2050, in order to accommodate future passenger and freight service increases. This analysis uses future scenarios to refine the phasing plan of rail improvement projects previously identified in the 2013 IDP.

This updated operations analysis evaluated three scenarios:

- Base Case: This reflects infrastructure projects open or funded through construction as of January 2017 and current levels of service.

- 2020 Scenario: This reflects infrastructure projects to be open or funded through construction as of 2020 and service levels assumed for each operator for 2020.

- 2035 Scenario: This reflects infrastructure projects to be open or funded through construction as of 2035 and service levels assumed for each operator for 2035. Three options were modeled to assess not only the full buildout of the corridor in 2035, but also to assess the operational impacts assuming only part of the planned infrastructure was constructed.

    - 2035A: Full build-out assuming complete double tracking along the Corridor with the exception of near County line and through the City of Del Mar, along the bluffs.

    - 2035B – Includes infrastructure projects in 2035A, but shortens the Carlsbad Village Double Track project to CP Longboard to approximately milepost (MP) 229.0. Existing single track is assumed through the village area.

    - 2035C – Includes infrastructure projects in 2035A, but separates the La Costa to Swami Double Track project into two distinct projects, with only the southern portion, from MP 237.0 (south of Leucadia Boulevard) to CP Swami assumed to be double tracked in 2035.

In addition, it is important from a planning and funding perspective to consider an interim phase of service, therefore, a 2025 phase is included from the 2013 IDP for this purpose, including projects in operation or funded through the construction phase by 2025.

## 5.1 SERVICE DRIVEN PLANS

Service levels included as part of the evaluation and validation of the Base Case scenario were developed using published operating schedules as of January 2017. Service levels presented for the 2020, 2025, and 2035 scenarios are based on information presented in the latest published or in-progress public documents, as referenced in Section 2.0 of this document. All service levels used in the operations analysis were reviewed and agreed to by key corridor stakeholders, including LOSSAN, Metrolink, NCTD, and BNSF.

### 5.1.1 Intercity Service

Today, there are a total of 24 daily intercity trains operating between Los Angeles and San Diego. In the Base Case scenario, these trains are assumed to operate on the April 2017 published schedule.

In the SRP, an additional roundtrip (two daily trips) is proposed for the 2020 scenario between Los Angeles and San Diego. This increases the total number of daily trips to 26 trains. The 2035 intercity frequency goals presented in the 2018 SRP outlines hourly service for the Surfliner trains between Los Angeles and San Diego. This includes six additional daily round trips (12 daily trips) between Los Angeles and San Diego, increasing the daily service to 36 trains. This growth assumption is defined in the SRP as being broken into local and limited stop service, with 28 trains making all stops (the local) and eight limited stop trains.

### 5.1.2 Commuter Service

Commuter service north of Oceanside is operated by Metrolink. No changes in service are planned in 2020 over existing levels. Service goals in 2035 are based on the *Scenario 1* service growth alternative presented in the Metrolink Strategic Plan. This forecast includes two additional round trips (four daily trips) over existing volumes.

Commuter service from Oceanside to San Diego is provided by COASTER, operated by NCTD. Service levels for commuter trains in San Diego County are based on the peak and off-peak service goals laid out in the Regional Plan. The 2020 service level for COASTER as outlined in the Regional Plan is 20-minute peak frequencies and 120-minute off-peak frequencies. By 2035, a total of 54 COASTER trains are assumed to operate in revenue service between Oceanside and San Diego with 20-minute peak frequencies and hourly off-peak frequencies.

The service plan created for the planned 2020 service used the Base Case scenario as the foundation with additional trains added and minor changes to the operating schedules made.

*Service from/to Camp Pendleton in Year 2035*

The service level at the Camp Pendleton Station is assumed to be hourly throughout the revenue-service day with additional service during the peak periods.

*Service from/to Convention Center in Year 2035*

The service level at the Convention Center Station in Year 2035 is assumed to be hourly throughout the revenue-service day with additional service during the peak periods with non-revenue trains moving between the Convention Center station and the MTS Layover Yard for midday layover and turnarounds.

### 5.1.3 Freight Service

For the purposes of considering the freight traffic in the corridor, it was assumed that the daily number of six freight trains operating along the LOSSAN Rail Corridor within San Diego County would increase to 11 by the year 2020. This estimate was based on an estimated growth rate of about 3% per year. In concurrence with BNSF, the 11 trains each day was assumed for 2035 as well.

### 5.1.4 Summary of Service Level Assumptions

The tables presented below summarize the service level assumptions used in the operations analysis. Table 1 summarizes the service level assumptions from the Orange County line to Oceanside, where Metrolink provides the commuter service. Table 2 summarizes the service level assumptions from Oceanside to San Diego, where COASTER provides the commuter service.

**Table 1: Service Level Assumptions – Orange County Line to Oceanside**

| Operator / Line | Base Case | 2020 Plan | 2025* | 2035 Plan | 2035 Frequency Goals (minutes) |
|---|---|---|---|---|---|
| Intercity | 24 | 26 | 32 | 36 | 60 Peak (PK) / 60 Off Peak (OP) |
| Commuter | 16 | 16 | 16 | 20 | 60 PK / 60 OP |
| BNSF Freight | 4 | 8 | 8 | 8 | Not Applicable |
| **TOTAL** | **44** | **48** | **56** | **64** | |

**2025 service level assumptions taken from 2013 IDP.*

**Table 2: Service Level Assumptions – Oceanside to San Diego**

| Operator / Line | Base Case | 2020 Plan | 2025* | 2035 Plan | 2035 Frequency Goals (minutes) |
|---|---|---|---|---|---|
| Intercity | 24 | 26 | 32 | 36 | 60 PK / 60 OP |
| Commuter | 22 | 30 | 36 | 54 | 20 PK / 60 OP |
| BNSF Freight | 6 | 11 | 11 | 11 | Not Applicable |
| TOTAL | 52 | 65 | 79 | 101 | |

**2025 service level assumptions taken from 2013 IDP.*

## 5.2 OPERATIONAL ANALYSIS

### 5.2.1 General Model Input Assumptions

The Berkeley Simulation Software Rail Traffic Controller (RTC) model (the Model) was selected as the platform on which to conduct an operations analysis on service growth scenarios along the LOSSAN Rail Corridor in San Diego County (see **Appendix 7** – the *Operational Analysis of Future Scenarios Final Technical Memorandum* for further details).

### 5.2.2 Train Consist Size and Performance Characteristics

For the dynamic railroad operations simulation modeling, typical train consist size assumptions are based on the train consists currently in operation on the San Diego Subdivision under the Base Case scenario:

- Amtrak Pacific Surfliner (intercity) train: a six-car bi-level passenger car consist powered by one General Motors (GM) F59PHI locomotive
- Metrolink (commuter) train: a five-car bi-level commuter car consist powered by one GM F59PHI locomotive
- COASTER (commuter) train: a five-car bi-level commuter car consist powered by one GM F59PHI locomotive
- BNSF (freight) train: a loaded 60-car, 5,500-ton Vehicle Train consist (4,000 trailing feet) hauled by three GM Electro-Motive Division (EMD) Dash 9's in distributed power formation.[3]

The 2020 and 2035 Operating Scenarios will assume:

- Amtrak Pacific Surfliner (intercity) train: a seven-car bi-level passenger car consist powered by a Siemens Charger Tier-4 locomotive
- Metrolink (commuter) train: a five-car bi-level commuter car consist powered by one Siemens Charger Tier-4 locomotive[4]
- COASTER (commuter) train:

[3] Based on typical freight trains that run on the San Diego Subdivision. Some may be longer and/or heavier but this size is most representative of day to day traffic.

[4] The Siemens Charger Tier-4 locomotive is used for Metrolink for the purposes of this study since the operating characteristics of the F-125 Tier-4 locomotive were not available to meet the schedule of this study.

- o 2020: a five-car bi-level commuter car consist powered by one GM F59PHI locomotive
- o 2035: a six-car bi-level commuter car consist powered by one Siemens Charger Tier-4 locomotive

- BNSF (freight) train[5]: a loaded 60-car, 5,500-ton Vehicle Train consist (4,000 trailing feet) hauled by three GM Electro-Motive Division (EMD) locomotives in distributed power formation.

While it can be reasonably assumed that technology other than the equipment in use today will be in use along the LOSSAN Rail Corridor by 2035, the simulations were based on available operating characteristics of known technology. As such, it was not considered feasible or practical to assume an alternate technology that does not yet exist for the purposes of this analysis.

### 5.2.3 Train Performance Run Time Assumptions

Based on the historical performance of the Surfliner and COASTER services, for planning purposes, the minimum dwell times at mid-line stations for passenger trains are assumed to be the same as the dwell time in the current train operations:

- Surfliner trains: 90 seconds
- All commuter trains: 30 seconds

Minimum terminal turnaround time between two revenue-service trips:

- Surfliner trains: 30 minutes
- All commuter trains: 20 minutes

### 5.2.4 Infrastructure Assumptions

The 2013 IDP included simulations and modeling conducted in 2012 as part of the *San Diego Full Network Build-Out Operations Analysis* to confirm the specific infrastructure improvements necessary to support the service plans that were updated using on the frequencies identified in the 2050 RTP and 2013 California State Rail Plan. It then presented a table to show the phase for each identified project and what, if any, changes to phasing or project components were recommended based on the operations analyses. Additional capital improvements were also identified as necessary to support the proposed service plans developed for the Corridor as well as its overall maintenance. Since the IDP was prepared in 2013, projects and project timelines have changed.

This section defines the infrastructure improvements necessary for the planned service increases for the San Diego Subdivision through 2035 based on the detailed operations analysis (**Appendices 7 and 8**). The infrastructure projects (illustrated in Figure 1) are broken down by proposed phases that correspond to the operational scenarios: Base Case (existing), 2020, 2025, and 2035, and are described below.

*Base Case Scenario*

The infrastructure configuration assumed in the Base Case reflects projects open or funded through construction as of January 2017. These projects include:

[5] Freight train lengths are limited by the siding lengths along the entire corridor between San Diego and San Bernardino as well as the length of second track sections between control points where a freight train can be held without impacting stations or highway-rail at-grade crossings.

- Oceanside Transit Center Pass-Through Track (completed in November 2017)
- San Elijo Lagoon Double Track (CP Cardiff to CP Craven)
    - Chesterfield Drive Crossing Improvements
- Elvira to Morena Double Track
- San Diego River Bridge

*2020 Scenario*

The projects assumed to be open or funded through construction as of 2020 include:

- Poinsettia Station Improvements (will allow for removal of the hold-out rule)
    - The hold-out rule states that an oncoming train may not enter the station while another train is occupying a platform. This is strictly for safety purposes as passengers occasionally run to catch their train and may not expect a train on the opposite track.
- Batiquitos Lagoon Double Track

*2025 and 2035 Scenarios*

Under the 2035 Scenario (or Full Build-Out), three optional infrastructure configurations (shown in Figure 1) were evaluated based on the potential of some of the projects to not be fully constructed or funded. These options of the 2035 Scenario were evaluated to assess the operational impacts assuming only part of the planned infrastructure was constructed.

The projects to be open or funded through construction as of 2035, broken down by options within the scenario, include:

- 2035A – Full build-out assuming complete double tracking along corridor with the exception of County line and through the City of Del Mar, along the bluffs.
    - San Onofre Creek Double Track
    - San Onofre to Pulgas Double Track Phase 1, Stage 2
    - Camp Pendleton Station
    - Eastbrook to Shell Double Track (San Luis Rey River Bridge)
    - Carlsbad Village Double Track with inter-track fencing and other amenities that would not require the application of a hold-out rule at Carlsbad Village Station
    - La Costa to Swami Double Track with inter-track fencing and other amenities that would not require the application of a hold-out rule at Encinitas Station
    - San Dieguito Double Track and Platform – the Del Mar Fairgrounds Special Events Platform includes inter-track fencing and other amenities and would not require the application of a hold-out rule
    - Sorrento to Miramar Phase 2 – Includes curve straightening with shorter travel times.

  - o Airport Intermodal Transportation Center with inter-track fencing and other amenities that would not require the application of a hold-out rule
  - o San Diego Convention Center Station

- 2035B – All infrastructure included in 2035A, but shortens the Carlsbad Village Double Track project to CP Longboard to approximately MP 229.0.
- 2035C – Includes infrastructure projects in 2035A, but separates the La Costa to Swami Double Track project into two distinct projects, with only the southern portion, from MP 237.0 (south of Leucadia Boulevard) to CP Swami assumed to be double tracked in 2035.

A mid-term scenario is taken from the list of 2035 capital improvements that are currently under final design and that are needed to support the 2025 service plan (**Appendix 8**):

- San Onofre to Pulgas Double Track Phase 1, Stage 2
- Eastbrook to Shell Double Track
- San Dieguito Double Track and Del Mar Fairgrounds Special Events Platform
- Sorrento to Miramar Phase 2 Double Track
- Early Action Signal Improvements

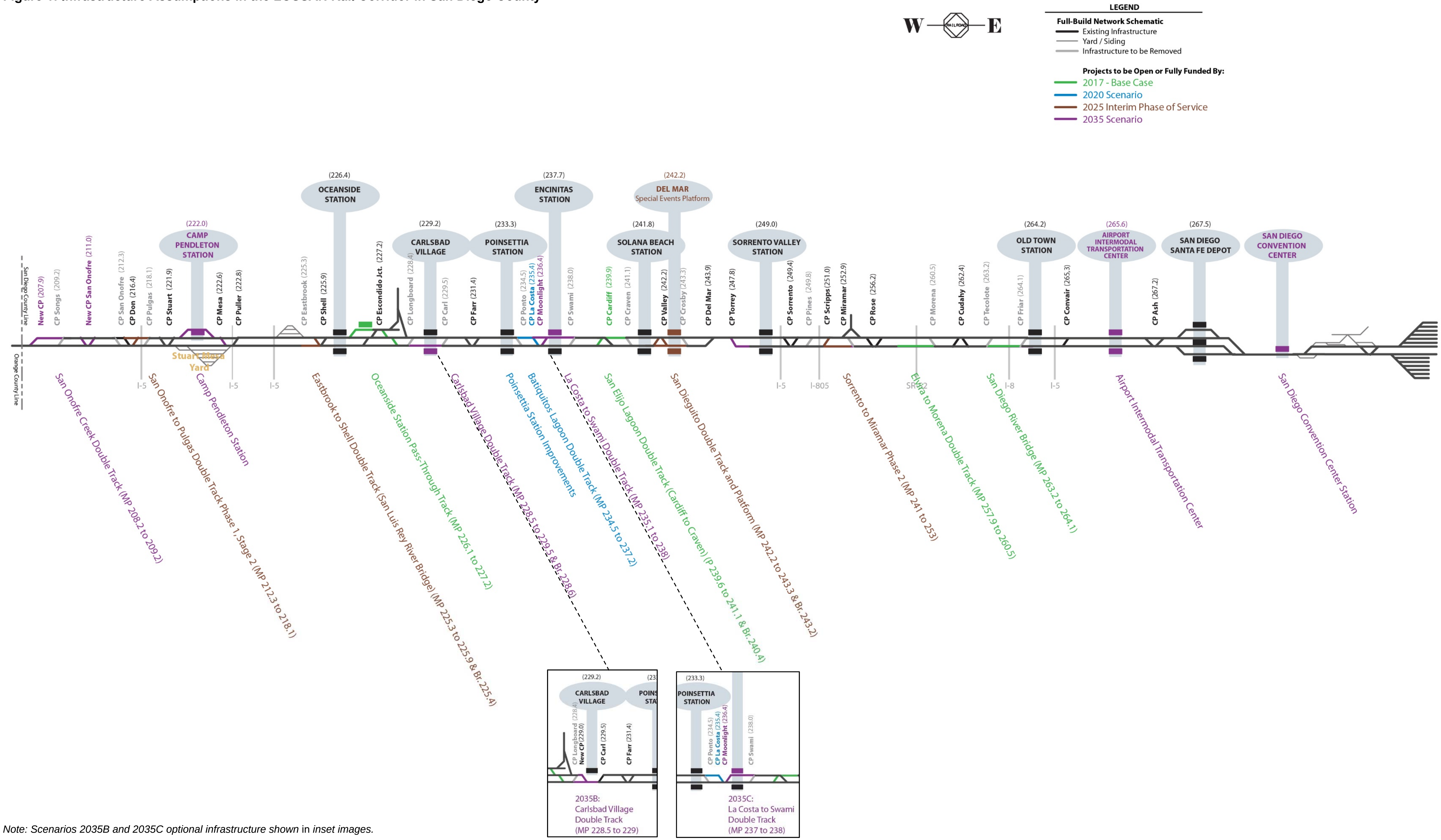
Table 3 summarizes the capital projects necessary by phase through 2035

**Table 3: LOSSAN Capital Projects – San Diego County Project Operations Phasing**

| Project | Phase |
|---|---|
| San Onofre Creek Double Track | 2035 |
| San Onofre to Pulgas Double Track Phase 1, Stage 2 | 2025 |
| Camp Pendleton Station | 2035 |
| Eastbrook to Shell Double Track (San Luis Rey River Bridge) | 2025 |
| Oceanside Transit Center Pass-Through Track (completed in November 2017) | Base |
| Carlsbad Village Double Track | 2035 |
| Poinsettia Station Improvements | 2020 |
| Batiquitos Lagoon Double Track | 2020 |
| La Costa to Swami Double Track | 2035 |
| San Elijo Lagoon Double Track (CP Cardiff to CP Craven) | Base |
| San Dieguito Double Track and Del Mar Fairgrounds Special Events Platform | 2025 |
| Sorrento to Miramar Phase 2 | 2025 |
| Elvira to Morena Double Track | Base |
| San Diego River Bridge | Base |
| Airport Intermodal Transportation Center | 2035 |
| San Diego Convention Center Station | 2035 |
| Early Action Signal Improvements* | 2025 |

**Listed in Table 6*

**Figure 1: Infrastructure Assumptions in the LOSSAN Rail Corridor in San Diego County**




*Note: Scenarios 2035B and 2035C optional infrastructure shown in inset images.*

### 5.2.5 Operational Analysis Key Findings

Each of these operational scenarios identified were put through dynamic simulations in the RTC model. The results of the dynamic simulation, along with associated discussions, are described in this section. Further discussion of key findings and supporting technical data is included in **Appendix 7**.

*Base Case Scenario*

- Many passenger trains are shown to arrive more than three minutes early at stations in the southern portion of the San Diego Subdivision.
- Simulation results (with no randomization testing) showed no major delays or conflicts. Non-randomized simulations assume trains are consistently operating with strict adherence to the schedule.

*2020 Scenario*

- The track capacity in 2020 can accommodate the planned service increases for passenger and freight services.
- The additional COASTER service as proposed in the conceptual service plans exceeds midday layover capacity and requires either an additional layover track in Downtown San Diego or to remain in midday revenue service (as additional revenue-service trains).

*2035 Scenario*

- In general, the track capacity in 2035 can accommodate the planned service increases for passenger and freight services within the San Diego Subdivision, but not so in the remaining single-track section in the Orange Subdivision.
- To allow CP La Costa to CP Swami to be constructed as two independent projects, the Carlsbad Village Double Track Project must be completed first.
- To defer completion of Carlsbad Village Double Track Project, La Costa to Swami Double Track project needs to be completed as one project first.
- Minor to moderate delays of a few minutes could occur if station enhancements are not made at the Sorrento Valley Station that would allow for the elimination of the hold-out rule.
- The single track section between San Juan Capistrano on the Orange Subdivision and CP SONGS on the San Diego Subdivision affects train performance on the San Diego Subdivision south of OTC.
- Existing track assignments at OTC and Santa Fe Depot will need to be changed in order to provide operational flexibility.
- Surfliner trains in longer consists will require operational changes or additional infrastructure at Santa Fe Depot to fill the equipment need for the morning service start-up while assuring uninterrupted through movements of BNSF freight trains. Potential measures include:
    - Store at least one Surfliner consist overnight at the Convention Center Platform, possibly requiring an amendment to the existing shared-use agreement and agreement with BNSF and/or SDMTS, as well as overnight security to protect the train consist.
    - Store at least one Surfliner consist overnight at BNSF yard, requiring an agreement with BNSF.

- Overnight layover at Stuart Mesa Yard with a roundtrip of non-revenue movements or revenue-service “zone service” between Oceanside and Santa Fe Depot.

- An additional Surfliner revenue-service roundtrip (an early morning southbound train and a late night northbound train), or;

- Increase the Surfliner service level between Los Angeles and San Diego by at least one roundtrip, creating an early morning arrival into San Diego and a late-night departure out of San Diego. This requires the available capacity on the main track for the entire length of LOSSAN South Corridor.

- Additional right-of-way and/or infrastructure, which require further analysis to assess feasibility:

  - Additional overnight layover capacity for Surfliner trains at or near Santa Fe Depot.

  - Extend platform tracks at Santa Fe Depot so that the seven-car consists can be “double-parked.”

- Track capacity at OTC will need to be expanded in 2035 to operate efficiently and prevent added delays. Potential measures include:

  - Utilization of the non-main approach track to the Escondido Wye as layup track for turnback movements, or;

  - Conversion of selected Metrolink and COASTER commuter rail trains to cross-county commuter service, the through commuter/regional passenger train service between Los Angeles/Orange County and San Diego County.

# 6.0 EQUIPMENT NEEDS

Service Timetables were developed for each operational scenario analyzed. These timetables included equipment assumptions to assist in identifying the possible equipment cycles and needs to support the operating scenarios. While it should be noted that these equipment assumptions are conceptual, they can assist in identifying the possible COASTER equipment needs associated with projected service level growth for 2020 and 2035.

Table 4 summarizes the equipment needs for each operational scenario. The 2020 service plan estimates the need for seven five-car COASTER consists for revenue operations (not including the 20% future ratio assumed for spare equipment). This is an increase of three consists over existing equipment needs and two additional consists than was estimated for 2020 in the 2013 IDP.

The 2035 service plan estimated the need for nine six-car consists for revenue operations (not including the 20% future ratio assumed for spare equipment). This is three more consists than was estimated for the 2030 full build-out in the 2013 IDP. Additional capacity will be needed at the Stuart Mesa Maintenance Facility, as described in Section 10.1.

The difference in equipment needs identified in this operational analysis and the conclusions presented in the 2013 IDP, under both the 2020 and 2035 scenarios, is because the 2013 IDP assumed the integration of cross-county service with Metrolink equipment providing some of the identified service between Oceanside and San Diego Santa Fe Depot.

**Table 4: COASTER Estimated Equipment Needs**

| | Base Case | | 2020 Plan | | 2025 Service Plan* | | 2035 Plan | |
|---|---|---|---|---|---|---|---|---|
| | Coaches | Engines | Coaches | Engines | Coaches | Engines | Coaches | Engines |
| Revenue Operating Equipment | 20 | 4 | 35 | 7 | 41 | 8 | 54 | 9 |
| *Equipment Needs Increase Over Previous* | *N/A* | *N/A* | *15* | *3* | *6* | *1* | *13* | *1* |
| Spare Equipment (20% future ratio assumed) | 4 | 1 | 7 | 1 | 8 | 2 | 11 | 2 |
| **TOTAL Estimated Equipment Need** | **24** | **5** | **42** | **8** | **49** | **10** | **65** | **11** |
| *Equipment Needs Increase Over Previous (Including Spares)* | *N/A* | *N/A* | *18* | *3* | *7* | *2* | *16* | *1* |

** Number of Coaches and Engines for the 2025 Service Plan is estimated based on the escalation between 2020 and 2035 figures.*

# 7.0 SIGNAL SPACING AND SERVICE ENHANCEMENTS ANALYSIS

This section evaluates the overall performance of the existing signal system along the San Diego Subdivision, identifies locations of lower throughput, and provides recommendations for improving the overall operations of the corridor for both existing conditions and the 2035 full buildout of the corridor, as described in Section 1. For this study, only the full buildout of the corridor, option 2035A, was considered.

The impacts of future service enhancements are also considered in this study, such as the impact or benefit of higher speed operations and express (skip stop) service along a corridor that is assumed to operate under Positive Train Control (PTC). Finally, this study identifies a prioritized list of recommended signal improvements for the mid-term (2020) and the full buildout (2035).

## 7.1 UNDERSTANDING SIGNALS

Signaling systems are one of the most critical elements of the railroad and ensure the safe operations of trains. Similar to highway traffic signals, railroad signals control the flow of traffic to maintain safe distances between trains traveling at high speeds.

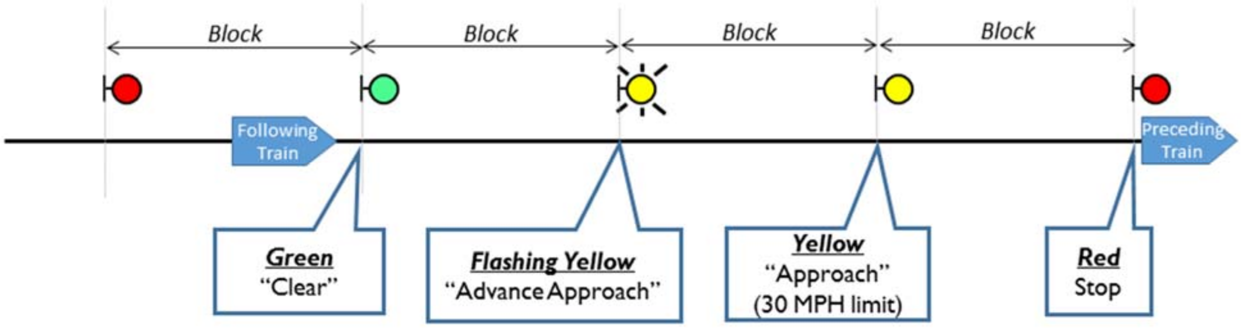
In North American railroads, including NCTD, each wayside signal has three lamps in red, yellow, and green color, and these colors can be displayed in various combinations or visual appearances. Each signal aspect (or visual appearance) is associated with a specific definition determined by each railroad. These definitions can be added to (but not changed) under a set of “Special Instructions” as defined by each railroad. The railroads operating within Southern California have adopted a typical 4-aspect system (though some older corridors still have segments of a 3-aspect system). The basic definition of each aspect in this system is listed in Table 5.

**Table 5: North American Railroad Signal Aspect – 4-Aspect System**

| Signal Aspect Indication | Name | Indication/Meaning | Status of the Preceding Train |
|---|---|---|---|
| Solid red | Stop | Stop before train passes the signal | Occupying the next block |
| Solid yellow | Approach | Proceed prepared to stop at next signal. Passenger trains exceeding 30 MPH immediately reduce to that speed. | Occupying the second block |
| Flashing Yellow | Advance Approach | Be prepared to stop at second signal. Proceed prepared to pass next signal not exceeding 30 MPH. | Occupying the third block |
| Solid green | Clear | Proceed (at the maximum speed allowed) | Not on the same track or occupying farther than the third block |

The segment between each signal is referred to as a “block”. The signals control the movement of trains into the next block. To ensure safe distance between trains, only one train on each track should be within each block at any one time. The implementation of PTC enforces this rule and removes the risk of a train entering to a block already occupied by another train. The basics of the 4-aspect system is summarized in Figure 2.

**Figure 2: Basics of the 4-Aspect System**




The primary purpose of a railroad signaling system is to control movements of the trains by maintaining safe distances between trains. In a high capacity passenger corridor, like the LOSSAN Rail Corridor, signal systems govern the number of trains that can operate on the corridor to address passenger demand. The more trains on a corridor, the more service can be provided to the passengers. The time separation between trains is controlled by the signal system and is referred to as "headway". Headway is the amount of time it takes for a signal to reset to "green" or "clear" after a train passes through. A robust passenger network will require short headways between trains and a signal system where signals can reset to clear in the shortest amount of time, while still maintaining safe distances between trains.

When the headway between two adjacent trains is shorter than the designed minimum headway allowed by the signaling system, the following train operates as Delayed in Block (DIB). This means that the train can proceed only at the reduced speed due to the signal aspect indication *until* the next signal in "clear" aspect is visible, and the train can accelerate back to the maximum authorized speed. While DIB allows trains to move forward as long as the next signal does not indicate "red", it would increase the trip time due to the operation at reduced speed.

### 7.1.1 Signal System for San Diego Subdivision

The signals on the San Diego Subdivision are broken into two classifications, an absolute signal, which requires trains to stop and stay in place when the Stop (red) aspect is presented, or an intermediate signal, which is automatically controlled by the conditions of the track in that signal's block and by the condition of the following signal. Train dispatchers cannot control intermediate signals. Most control points (so named because they are points on the railroad that can be controlled by the train dispatcher) are equipped with remote control, power-operated switches. These switches may lead to a passing siding, take the form of a crossover (allowing movement to an adjacent track), or a become a "turnout" which routes a train to an alternate track (or route).

On the San Diego Subdivision, control points are locations with absolute signals and mostly at where a crossover is located and locations where single track segments split into two track segments or vice versa. However, as more second main line track is constructed on the corridor, many of these control points are being replaced with crossovers (instead of turnouts) or eliminated altogether. Generally, the signal spacing in San Diego is approximately every mile to mile and a half. While location and design of some signals that were in place before the acquisition of the right-of-way by NCTD and MTS are set by Santa Fe Railroad, the location and design of all signals added after NCTD and MTS acquired the track are set based on the minimum line of sight, safe braking distances, and other requirements specified in Chapter 17 of the SANDAG/NCTD Design Criteria *for the LOSSAN Corridor in San Diego County*.

Chapter 17 also requires that the signal aspect indication convention be changed at locations where the block length does not allow trains to comply with the speed, braking distance and movement authority as indicated by the signal. Examples include:

- Restricting aspect (flashing red; “Prepare to stop within a half the range of vision”) needs to be used instead of an Approach aspect where the next signal is “Stop” and is less than 3,000 feet away
- When the preceding signal is in Restricting aspect, the signal needs to indicate Approach Restricting (yellow over flashing red; “Proceed prepared to pass the next signal at restricted speed”)
- Where the distance between the second and the third signals from the signal in Stop aspect is not sufficient to allow trains to slow down to 30 MPH, additional aspects needs to be inserted so that sufficient braking distance could be offered

Historically, the goal for signal spacing along the LOSSAN Rail Corridor (between Los Angeles and San Diego) has been such as to allow for the absolute minimum following headway between passenger trains to be about 8 minutes, which would allow for 2035 service goals of 20-minute peak all-stop commuter service and 60-minute limited-stop intercity service in each direction, concurrently. The system achieving the absolute minimum headway at that level can typically support two passenger trains operating in scheduled headway of 10 minutes.

## 7.2 APPROACH TO ANALYSIS

### 7.2.1 Methodology

In this analysis, the minimum clear-to-clear signal headway for each signal block is computed using the time-distance diagram based on the pure run time of each type of the train (defined here as a Control Train) computed using the RTC model to simulate railroad operations. The following information is identified on each time-distance diagram prepared for the control trains:

- The location of the head end of the Control Train
- The location of the rear end of the Control Train
- Horizontal guideline showing the location of each passenger station, Control Point (CP), and signal

For the computation of headways along the San Diego Subdivision, vertical lines are drawn on the time-distance diagram where the rear-end of the control train passes each signal. To replicate the associated latency in the signaling system (defined in this study as the time it takes for a switch to align and the time it takes for the locomotive engineer to respond to the signal aspect), vertical lines are shifted along the x-axis.

Once all information has been added to the time-distance diagram, progression of the signal aspects (e.g. red, yellow, flashing yellow, or green) is annotated on the diagram. This identifies the moment when the trailing train could receive the Clear (or green) aspect when entering the next signal block. The headway is then computed by taking the time at which the Control train receives a clear aspect at a given signal and subtracting the time at which the head end of the trailing train passes the same signal. The minimum headway presented in this report reflects absolute headway: this means that the minimum headway presented assumes that the trailing train enters a signal block at the moment the signal indication turns to a Clear aspect, without any consideration to engineer response times.

For this analysis, two alternatives were defined and evaluated for each scenario:

- Base Case Scenario
    1. COASTER Train Following Freight Train: assumes an all-stop COASTER train is trailing a freight train

2. COASTER Train Following COASTER Train: assumes an all-stop COASTER train is trailing another all-stop COASTER train

- 2035A Scenario

1. COASTER Train Following Freight Train: assumes an all-stop COASTER train is trailing a freight train

2. COASTER Train Following COASTER Train: assumes an all-stop COASTER train is trailing another all-stop COASTER train

In addition to calculating minimum headways of trains operating in the same direction along the corridor, the minimum opposing headway (or the minimum time separation between two trains making opposing movements on single track segments) was also evaluated using the same methodology, but with consideration given to the time it takes for a switch to align

### 7.2.2 Assumptions

*Infrastructure and Signal Locations*

Assumed track layout for both the Base Case Scenario and 2035A Scenarios are based on the infrastructure assumed in the *Operational Analysis of Future Scenarios Technical Memorandum*, which is also presented in Section 5.2.4 of this report.

The locations of signals under the Base Case Scenario reflect existing signal locations (and infrastructure and signals currently under construction). The location of the signals under the 2035A Scenario were based on the locations identified in the IDP prepared in 2013.

Locations and names of the Signals assumed in both the Base Case and 2035A Scenarios can be found in **Appendix 8** as part of the *Signal Spacing and Service Enhancements Analysis Final Tech Memorandum*.

*Consist Characteristics*

Consist configurations for Control Trains and the Following Train are as follows:

- Passenger train
  - Base Case: Five Bombardier Bi-Level Coaches hauled by one F59PHI locomotive
  - 2035A Case: Six Bombardier Bi-Level Coaches hauled by one Tier-4 passenger locomotive
- Freight train (for both Cases)
  - Sixty-car, 4,200 trailing ton train hauled by three Dash-9 locomotives in distributed power formation (two in front, one in rear: 5,000 feet long including locomotives)

*Signal System Characteristics*

The following assumptions are made in the number of signal aspects for this analysis:

- For the Base Case Scenario infrastructure, all new signals and relocated signals as a part of the on-going and planned double-track projects are installed as a 4-aspect system whereas the signals currently in place as 3-aspect signals would remain as 3-aspect signals.

- Under the 2035A Scenario, the signal system for the entire length of San Diego Subdivision would be upgraded from the current mixture of 3-aspect and 4-aspect signal blocks to all 4-aspect signal blocks except for the end-line locations.

Latency of the signaling system is assumed to be identical to the ones for the existing system. Based on the train dispatching data provided by NCTD, signal system latency assumes:

- 10 seconds for loss of shunt (or time before a track circuit detects the wheels and axles of a train)
- Additional 23 seconds to establish routes by re-aligning railroad switch(es)

*Operational Parameters*

- Dwell time of the passenger trains at intermediate stations is assumed to be 30 seconds.
- Freight trains are assumed to enter and exit at maximum authorized speed (MAS) and operate without making any stops along the San Diego Subdivision.
- Ideal sight distance of the wayside signal is assumed to be 2,000 feet, as specified in the current SANDAG/NCTD signal design criteria.
- Response time of the locomotive engineer is assumed to be 5 seconds.

## 7.3 SIMULATION ANALYSIS RESULTS AND RECOMMENDATIONS

### 7.3.1 Base Case

*Same Direction Following Headway*

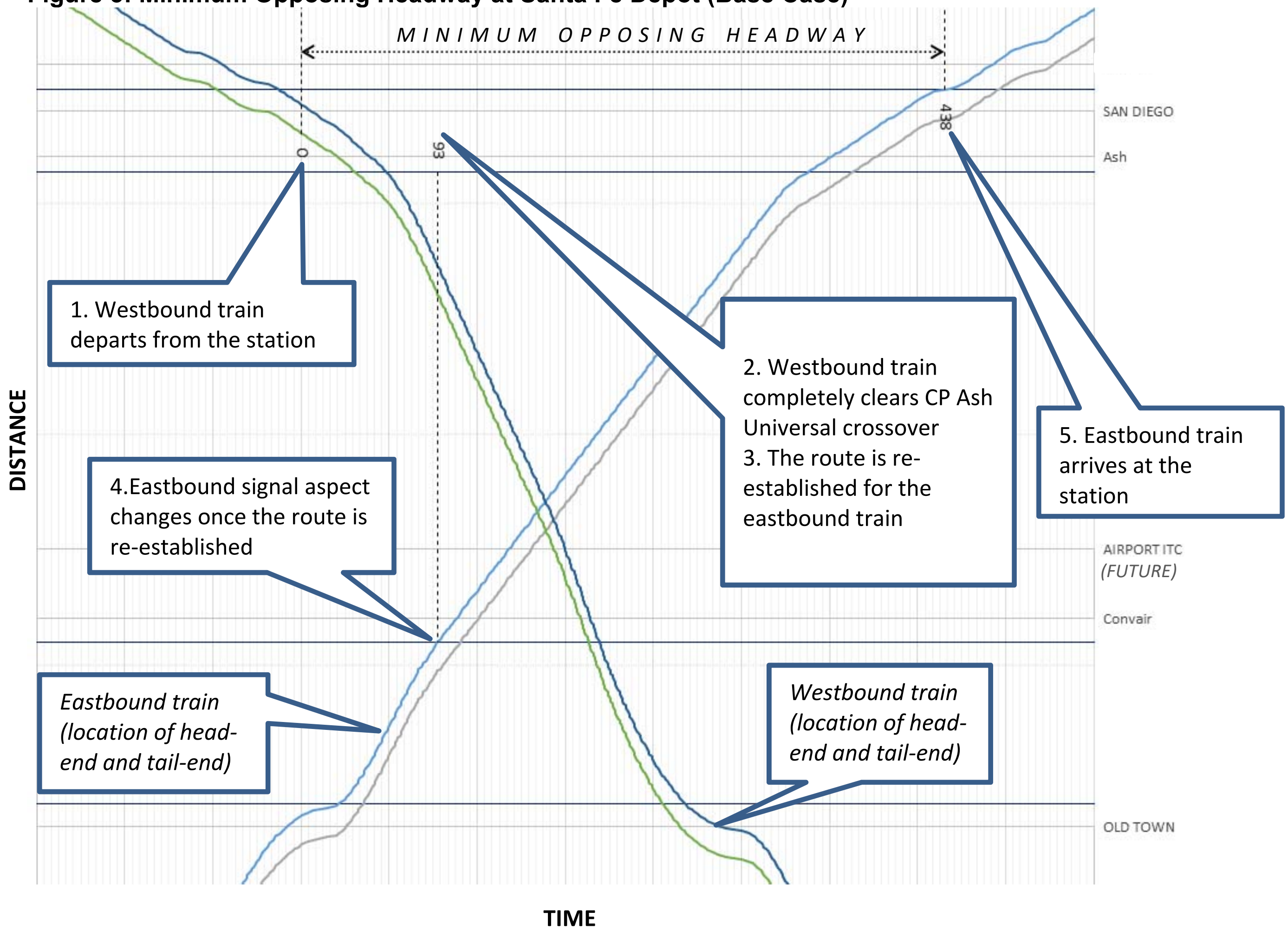
Results indicate that the minimum headway under existing conditions, where a passenger train is trailing a freight train, is generally 8.5 minutes. Exceptions to this are located in the corridor segments between Solana Beach and CP Morena and near the Santa Fe Depot where headways were calculated to be as much as 18.5 minutes in the westbound direction. Additional data on the minimum headways between trains operating in the same direction for each signal location assumed for the Base Case Scenario is shown in Appendix A (in table format) and Appendix B (as a time-distance diagram) of **Appendix 9**.

For the alternative where a passenger train is trailing another passenger train, the analysis also identified three locations where the 8.5-minute threshold could not be met, which included CP Friar (eastbound only), between CP Sorrento and CP Miramar (eastbound only), and between CP Rose and CP Miramar (westbound only). At these locations, the minimum allowable headway was determined to be 9.5 minutes.

*Opposing Headway at San Diego Santa Fe Depot*

The minimum headways possible of opposing movements for trains arriving to and departing from the Santa Fe Depot, as determined in this analysis, is about 6.5 minutes. Due to the slow track speed for trains arriving into the Santa Fe Depot and long signal block length, it takes a long period of time until the inbound train arrives and stops at Santa Fe Depot Station platform even though the route for the inbound train can be established in approximately 1.5 minutes after the outbound train departs from the station platform, as shown in Figure 3.

**Figure 3: Minimum Opposing Headway at Santa Fe Depot (Base Case)**




*Horizontal line: eastbound signal locations.*

### 7.3.2 2035A Scenario

*Same Direction Following Headway*

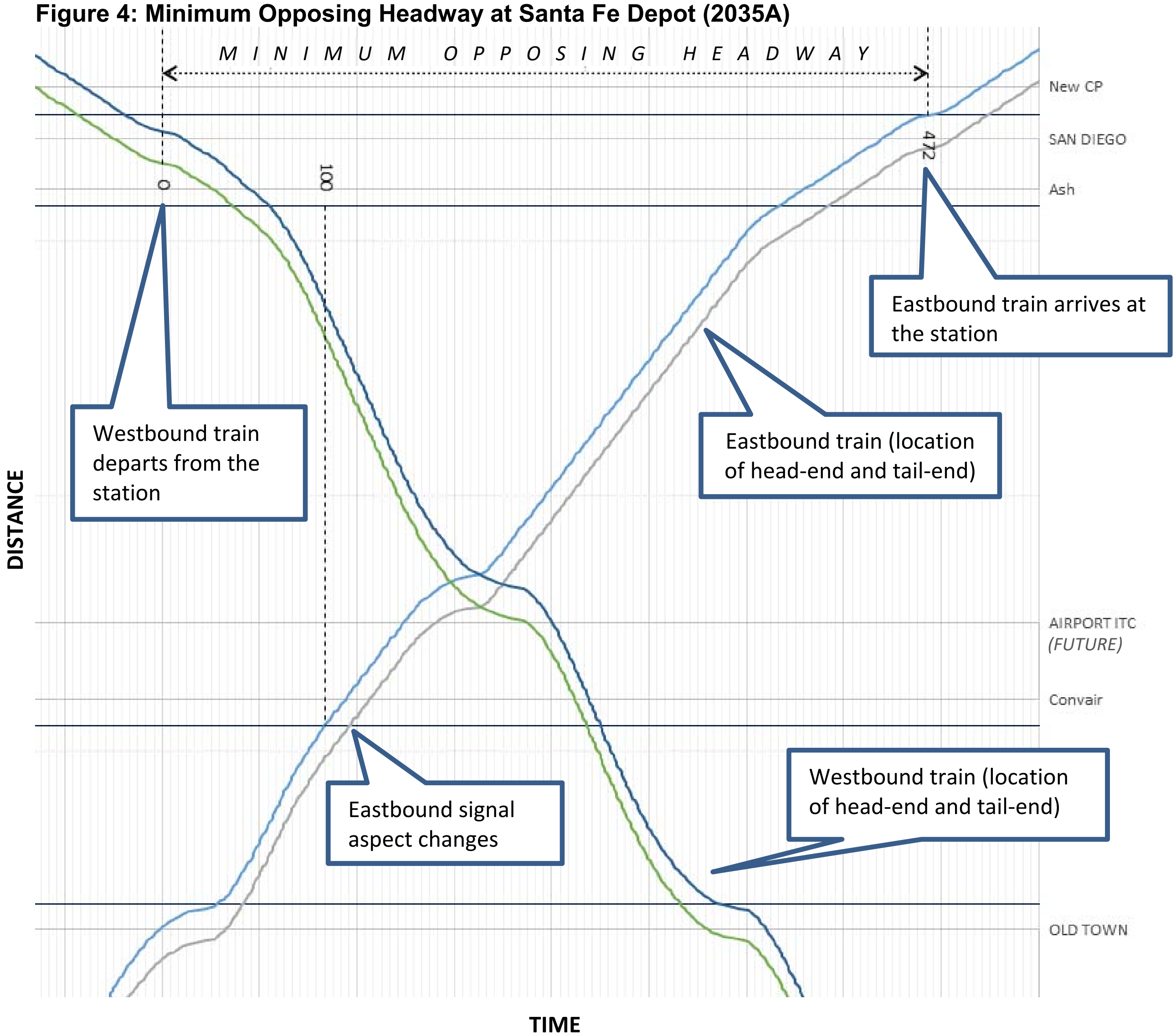
The calculation results indicate that the minimum headway under the 2035A Scenario, where a passenger train is trailing a freight train, is maintained at about 8.5 minutes north of Del Mar. South of Del Mar to the Santa Fe Depot, headways were calculated to be as much as 17 minutes in the westbound direction. Additional data on the minimum headways between trains operating in the same direction for each signal location assumed for the Base Case Scenario is shown in Appendix C (in table format) and Appendix D (as a time-distance diagram) of **Appendix 9**.

The increase in the headway timing south of Del Mar is due to the capital projects respacing the signals further apart, allowing only a single intermediate signal between control points, and increasing the time it takes for a train to traverse a signal block.

*Opposing Headway at San Diego Santa Fe Depot*

The minimum headways possible of opposing movements for trains arriving to and departing from the Santa Fe Depot, as determined in the 2035A Scenario analysis, is about 7 minutes. This is longer than was determined for the Base Case Scenario. This is due to the increase in train lengths, resulting in trains taking additional time to clear the controlling signals at CP Ash, as shown in Figure 4.

**Figure 4: Minimum Opposing Headway at Santa Fe Depot (2035A)**



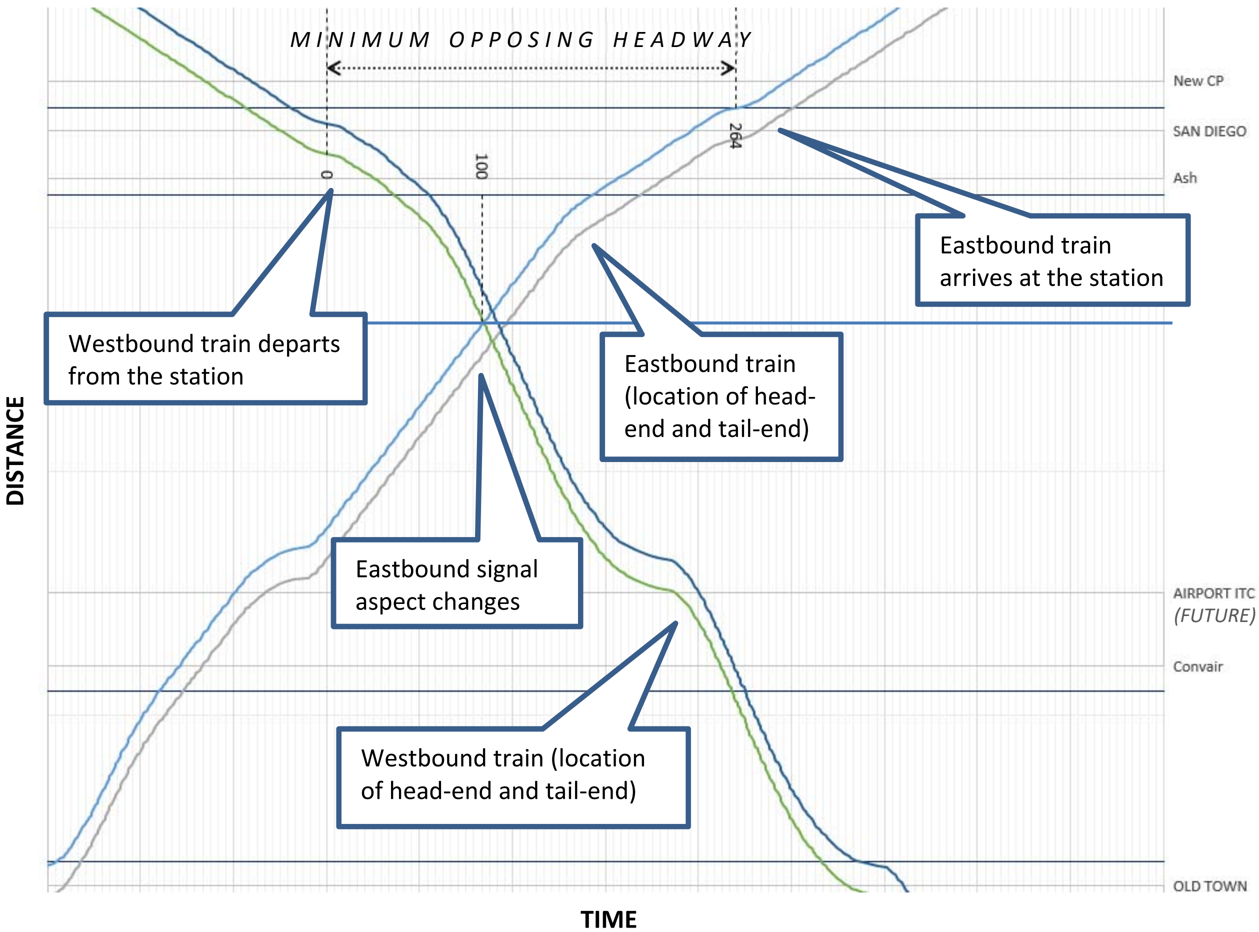

*Horizontal line: eastbound signal locations.*
*See Figure 4 for detailed operational sequence.*

One observation made was that the Airport ITC will require a new inbound station signal since the proposed station location is identified as being between the signals of CP Convair and CP Ash with no intermediate signal currently in between. Without new intermediate signal(s) between these two CPs, all eastbound trains would be departing the ITC Delayed in Block (DIB) and operating at reduced speed to the Santa Fe Depot. This can also influence the headways of trains departing the Santa Fe Depot.

It should be noted that the intermediate signal at this location could potentially provide opposing headway reduction even if the Airport ITC is not built because it would break the existing blocks into two or more and allow the route to be re-established sooner than the existing configuration. Shorter blocks in this area would also allow closer following headway, which could result in two trains traveling toward the same direction to follow closer as these trains enter or exit Santa Fe Depot.

The options identified also reduce the headway for opposing movements arriving to and departing from the Santa Fe Depot. As illustrated in **Error! Reference source not found.**, the clearance time for a train departing the station following the arrival of another train has been reduced to about four and a half minutes. This equates to roughly 40 percent improvement in headways.

**Figure 5: Minimum Opposing Headway at Santa Fe Depot with Signal Respacing (2035A)**




*Horizontal line: eastbound signal locations.*
*See Figure 4 for detailed operational sequence.*

## 7.4 SUGGESTED SIGNAL OPTIMIZATION IMPROVEMENTS

The 2035A Scenario analysis identified restrictions to the achieving ideal service headways south of Del Mar to the Santa Fe Depot and potential signal improvements. **It is important to note that the options presented here do not take into consideration environmental, geometric, or physical constraints to proposed signal locations**. Before any final determination is made, review of the territory with NCTD signal and operating departments will be required to ensure signals are placed in appropriate locations that will allow for easy visibility, maintenance, and safe braking distance.

The options identified to reduce the minimum headway between a freight train (as the control train) and a trailing passenger train to achieve the optimum headway of 8.5 minutes are summarized in **Appendix 9**. The signals are placed in optimal locations. Though it is easier to install and maintain co-located signals, some signals do not end up with eastbound signal(s) and westbound signal(s) co-locations because field conditions would not allow it, such as:

- Curves
- Speed limit changes
- Speed of the tail end of the train
- Proposed location of the Future Airport ITC platform and ideal signal location to allow the train to enter to the platform while the track beyond the far end of the platform is still occupied

The options for signal optimization are summarized in Appendix C (in table format) and Appendix E (in a time-distance diagram) of **Appendix 9**. A schematic track diagram illustrating the respaced signal locations is presented in Appendix F of **Appendix 9**.

### 7.4.1 Potential Early Action Improvements

The signal optimization analysis presented here and in **Appendix 9** focused on optimizing the 2035A Scenario. However, there are opportunities to implement some of these improvements in the near-term, therefore providing benefit to existing operations. The improvements presented in Table 6 were identified as candidates for near-term implementation because they, 1) focused on eliminating long single blocks, and 2) would not be "throw away" projects in implementing 2035A Scenario infrastructure. These would be stand-alone projects because the mileposts are not included in near-term or mid-term capital projects (Table 6).

**Table 6: Potential Early Action Improvements**

| Direction | MP | Type | Description of Option |
|---|---|---|---|
| EB + WB | 249.9 | Intermediate | Keep existing signals 2492/2494 (previously proposed to be removed in Sorrento-Miramar Phase II project). |
| EB + WB | 250.3 | Intermediate | Add a new intermediate signal between CP Sorrento and proposed intermediate signals 2502/2504. |
| EB | 250.7 | Intermediate | Move proposed intermediate signals 2502/2504 (near MP 250.9) to MP 250.7. |
| EB | 253.7 | Absolute | Add a new signal at an existing hand-thrown right-hand crossover east of CP Miramar. (Potentially powering up hand-thrown crossover). |
| EB + WB | 266.2 | Intermediate | Add three new intermediate signals between the new exit signal at San Diego Airport Intermodal Transportation Center and CP Ash. |
| EB + WB | 266.6 | Intermediate | |
| EB + WB | 266.9 | Intermediate | |
| WB | 253.8 | Absolute | Add a new signal at an existing hand-thrown right-hand crossover east of CP Miramar. (Potentially powering up hand-thrown crossover). |

### 7.4.2 Project Costs

The Rough order of magnitude (ROM) Cost Estimate for an intermediate signal at each location includes the base construction costs, program implementation or soft costs, and contingency.

Total ROM cost estimate for both eastbound and westbound signals is $46,250,000. Further detail can be found in **Appendix 9.**

# 8.0 ANALYSIS OF POTENTIAL GRADE SEPARATIONS

The Regional Plan identifies several highway-rail at-grade crossings where rail-grade separations will help improve the safety of the rail corridor and the throughput of the highway system. By 2050, three new rail-grade separations are proposed along the LOSSAN Rail Corridor: Leucadia Boulevard and two additional grade separation projects yet to be determined.

The 2013 IDP included a map of 34 highway-rail at-grade vehicular crossings of the LOSSAN Rail Corridor in San Diego County, shown in Figure 6, but did not provide additional analysis on rail grade separations. These at-grade crossings were further evaluated to develop a prioritized list of potential grade separations based on vehicle delay, as presented in the *Expanded Analysis of Potential Grade Separations Technical Memorandum* (**Appendix 10**), along the San Diego Subdivision. This evaluation and prioritization can then be used to complement the update to the Regional Plan, which has more in-depth evaluation criteria for prioritizing highway-rail grade separations.

**Figure 6: LOSSAN Rail Corridor At-Grade Crossings from 2013 IDP**

## 8.1 DATA INPUT AND METHODOLOGY

The methodology used is based on previous at-grade crossing prioritization studies conducted along the LOSSAN Rail Corridor and will evaluate 2035 conditions.

The evaluation of vehicle delay at each crossing is based on these criteria:

- 2035 Traffic Volumes
- 2035 Train Trips, Length and Train Speed
- Planned Roadway Classification and Number of Lanes for each Arterial
- Width of highway-rail at-grade crossing for each Arterial
- Additional Delay due to Switching and/or Passenger Loading at Stations
- Arrival and Departure Rates

Additional consideration could be given to improved pedestrian safety based on projected pedestrian traffic across each at-grade crossing in a future analysis.

### 8.1.1 2035 Conditions

*Train Volumes*

Train volumes are based on the service level assumptions outlined in Section 5.1.

Only heavy rail train volumes were considered for this analysis. The San Diego Trolley operates through grade crossings south of Taylor Street, but it operates on separate light-rail tracks. The Mid-Coast Trolley Extension project analyzed grade crossings separately for the service from Santa Fe Depot in Downtown San Diego to the University City community.

*Vehicular Traffic Volumes*

Traffic volumes for 2035 were provided by SANDAG for most of the crossings, via their Transportation Forecast Information Center interactive mapping application: http://tfic.sandag.org/, using the Forecast Series 13 for forecast year 2035. This application provides forecasted average weekday traffic (AWT) volumes, as well as type of roadway, number of lanes, and posted speed.

Traffic volumes for the two private crossings on Camp Pendleton and in the City of Carlsbad and the crossings at Grand Avenue in the City of Carlsbad and Noell Street in the City of San Diego were not available through the Transportation Forecast Information Center interactive mapping application. The AWT volumes for the crossings at Grand Avenue and Noell Street were based on 2009-2013 traffic count data collected by the local jurisdictions and provided by SANDAG. A 1% growth factor per year was the applied to get to an estimated AWT volume for 2035.

Traffic volumes were not available for the private crossings, Stuart Mesa Access and Powerplant Access, so these crossings were not included in the delay analysis.

*Additional Factors*

Additional factors taken into account include variables such as potential switching movements by freight operators, the average speed of a train passing through each crossing, and the average length of a passenger and freight train that can affect the amount of time each at-grade crossing is occupied (gates down), and, therefore, the amount of delay generated at each crossing.

### 8.1.2 Vehicle Delay Methodology

The methodology used to calculate the vehicle delay focuses on the amount of daily and peak hour delay imposed on vehicles traveling through each highway-rail at-grade crossing. Methodology used in the 2005 and 2017 update to the Orange County Transportation Authority (OCTA) highway-rail at-grade crossings study is also used in this study for consistency and comparison.

For determination of the daily and peak hour delays at each crossing, a series of formulas detailed in this section were developed and calculated based on the following factors:

- 2035 Traffic Volumes
- 2035 Projected Train Trips, Length, and Train Speed
- Future Width of Arterial at each Crossing
- Vehicle Arrival and Departure Rates
- Additional Delay due to Switching and/or Passenger Loading at Stations

The formula used in this study has been widely used and has been accepted in additional rail analyses performed throughout Southern California and looks at the delay at an at-grade crossing as a function of the time of crossing gate down time, highway traffic volume, and the rate of vehicle queue discharge after the train has passed (**Appendix 10**).

*Summary of Results*

The following Table 7 summarizes the results of the delay analysis for forecast year 2035.

**Table 7: Forecasted Daily Vehicle Delay per Crossing**

| Crossing Location | City | Average Weekday Vehicle Traffic | 2035 Average Total Vehicle Delay Per Crossing (min) | Rank Based on Traffic Delay |
|---|---|---|---|---|
| Sorrento Valley Boulevard | San Diego | 39,000 | 6,385 | 1 |
| Taylor Street | San Diego | 15,200 | 716 | 2 |
| Grand Avenue | Carlsbad | 6,865 | 592 | 3 |
| Grape Street | San Diego | 30,100 | 553 | 4 |
| 5th Avenue | San Diego | 12,400 | 356 | 5 |
| Ash Street | San Diego | 7,200 | 262 | 6 |
| Hawthorne Street | San Diego | 21,900 | 253 | 7 |
| Washington Street | San Diego | 14,500 | 246 | 8 |
| Palm Street | San Diego | 12,000 | 129 | 9 |
| Market Street | San Diego | 5,900 | 107 | 10 |
| D Street | Encinitas | 1,800 | 103 | 11 |
| Carlsbad Village Drive | Carlsbad | 10,600 | 96 | 12 |
| Broadway | San Diego | 4,500 | 81 | 13 |

| Crossing Location | City | Average Weekday Vehicle Traffic | 2035 Average Total Vehicle Delay Per Crossing (min) | Rank Based on Traffic Delay |
|---|---|---|---|---|
| Kettner Boulevard/G Street | San Diego | 4,175 | 76 | 14 |
| Laurel Street | San Diego | 9,400 | 68 | 15 |
| 1st Avenue | San Diego | 3,300 | 56 | 16 |
| Mission Avenue | Oceanside | 5,100 | 56 | 17 |
| Sassafras Street | San Diego | 7,200 | 52 | 18 |
| Cannon Road | Carlsbad | 9,900 | 50 | 19 |
| Chesterfield Drive | Encinitas | 9,600 | 47 | 20 |
| Front Street | San Diego | 2,300 | 39 | 21 |
| E Street | Encinitas | 5,000 | 38 | 22 |
| Tamarack Avenue | Carlsbad | 6,300 | 36 | 23 |
| Leucadia Boulevard | Encinitas | 6,200 | 34 | 24 |
| Noell Street | San Diego | 3,112 | 25 | 25 |
| Beech Street | San Diego | 1,400 | 24 | 26 |
| Cassidy Street | Oceanside | 4,000 | 20 | 27 |
| Surfrider Way | Oceanside | 1,800 | 10 | 28 |
| Oceanside Boulevard | Oceanside | 1,600 | 8 | 29 |
| Wisconsin Avenue | Oceanside | 1,200 | 6 | 30 |
| Cedar Street | San Diego | 100 | 2 | 31 |
| Coast Boulevard | Del Mar | 100 | 1 | 32 |

As the table indicates, Sorrento Valley Blvd in the City of San Diego is by far the crossing at which motorists are impacted by delays from gate-down time. Much of this has to do with the double track through the intersection as well as the station being adjacent to the crossing. Due to the at-grade pedestrian crossing within the station, there exists a hold-out rule, which means oncoming trains cannot enter the station until the train already in the station has left it. This affects gate-down time when the train waiting to enter is coming from the south and has yet to enter the station but may have already triggered the warning indicators on Sorrento Valley Blvd.

Overall, nine of the top ten crossings in terms of vehicle wait times are all within the City of San Diego limits with the other in the City of Carlsbad. This is important to note because these rankings were compiled based largely on traffic volumes and wait times. This is to be expected as the density and traffic volumes of the City of San Diego largely outpaces that of a more suburban North County.

In conclusion, the Regional Plan develops a regional rail grade separation prioritized list based on 13 criteria including accident history and traffic. Both light rail and heavy rail crossings are included and crossings are included based upon recommendations from local jurisdictions. This analysis is not intended to be the only prioritization but to complement this ranking in future Regional Plans by including the relevant railroad operations data for the LOSSAN crossings.

# 9.0 2013 PARKING DEMAND ASSESSMENT AND FACILITY PRIORITIZATION

## 9.1 STATION PARKING NEEDS ASSESSMENT

The *Station Parking Needs Assessment* was included in the 2013 IDP and developed parking estimates for forecast year 2030 at existing and proposed stations along the LOSSAN Rail Corridor in San Diego County, utilizing available ridership forecasts for both intercity (Surfliner) and commuter (COASTER, Metrolink) rail passengers, station access mode splits, and other relevant information (**Appendix 11**). Parking demand numbers were based on the ridership estimates that were performed as part of the LOSSAN Plan and from survey data available at the time. The following information is included as it was presented in the 2013 IDP.

There were four key steps that were used to derive parking demand: 1) Calculating daily boarding estimates by station; 2) identifying station mode of access splits; 3) calculating boarding estimates by mode of access; and 4) estimating parking demand by station and service type. Further analysis and details on the methodology are included in **Appendix 11**.

Parking demand in 2030 will be influenced by future investments in connecting transit service as well as future smart growth development around stations. According to SANDAG's Regional Transportation Model, a lower proportion of parking would be required to accommodate the increased ridership on the LOSSAN Corridor as more passengers would be able to access the station by transit, walking, or biking. Likewise, higher density developments around stations will impact demand for parking. However, it was assumed that if the investments to the transit network and surrounding land uses were not made, parking demand rates would be similar to current levels.

Therefore, two options were developed to show a range of parking demand estimates. Option 1 includes lower parking rates assuming investments in the transit network and land use changes while Option 2 includes parking rates that are consistent with existing conditions. Furthermore, the parking demand numbers are inclusive of commuter and intercity rail use only. There may be additional demand for other transit services or other community purposes. Table 8 presents the projected 2030 parking supply and demand.

**Table 8: Parking Supply and Demand Summary**

| Station | Existing Supply[6] | Existing Demand[7] | 2030 Projected Demand | | Additional Spaces Needed[8] | |
|---|---|---|---|---|---|---|
| | | | Option 1 | Option 2 | Option 1 | Option 2 |
| Oceanside | 1,259 | 939 | 1,490 | 1,730 | 240 | 480 |
| Carlsbad Village | 540 | 379 | 720 | 890 | 180 | 350 |
| Poinsettia | 335 | 286 | 630 | 820 | 300 | 490 |
| Encinitas | 309 | 294 | 630 | 640 | 330 | 340 |
| Solana Beach | 326 | 296 | 620 | 620 | 300 | 300 |
| Sorrento Valley | 118 | 84 | 280 | 280 | 170 | 170 |
| Old Town San Diego | NA | NA | 170 | 170 | TBD | TBD |
| Airport ITC (Planned) | NA | NA | 120 | 120 | TBD | TBD |

[6] Information provided by NCTD

[7] Average mid-week parking demand based on counts performed in October 2012

[8] Those stations as labeled "TBD" will have parking estimated determined based upon further studies of existing supply utilization.

| Station | Existing Supply[6] | Existing Demand[7] | 2030 Projected Demand | | Additional Spaces Needed[8] | |
|---|---|---|---|---|---|---|
| | | | Option 1 | Option 2 | Option 1 | Option 2 |
| Santa Fe Depot | NA | NA | 120 | 120 | TBD | TBD |
| Convention Center (Planned) | NA | NA | 20 | 20 | TBD | TBD |

*Note: Existing parking supply/demand at Old Town was not included due to the inability to accurately isolate the COASTER parking from trolley, bus and State Park uses. There is no official existing transit parking at the Santa Fe Depot.*

## 9.2 PARKING EXPANSION PROJECT PRIORITIZATION

The Regional Plan calls for additional parking to be constructed at all existing COASTER stations by 2035. SANDAG has drafted Project Study Reports (PSRs) for parking structures at Oceanside, Carlsbad Village, Carlsbad Poinsettia, Encinitas, Solana Beach, and Santa Fe Depot. Previous studies have identified conceptual engineering for parking structures at Sorrento Valley and Old Town. Considering the likelihood that limited funding would become available, a prioritized list of parking structures was created to focus resources on the parking structures that would create the greatest benefit to the LOSSAN corridor and for the San Diego region.

Planning staff from SANDAG and NCTD drafted criteria and conducted a quantitative and qualitative analysis to prioritize parking structures at each COASTER station. The criteria were organized into the following categories:

- Parking Demand
  - Percent Increase in Parking Demand by 2030
  - Additional Spaces Needed by 2030
  - Potential for Shared Parking Demand for Transit
  - Existing Parking Demand
- Ridership
  - Percent Increase in Ridership by 2030
- Project Delivery
  - Magnitude of Temporary Construction Impacts
  - Community Support
  - Public Right of Way
  - Smart Growth Opportunity

The data used to conduct the analysis was derived from the *LOSSAN Plan*, *Station Parking Needs Assessment* (**Appendix 11**), SANDAG COASTER Parking Structure draft PSRs, and other planning documents. Weighting of the criteria was determined by SANDAG and NCTD planning staff by distributing 1/3 of the points for each of the three criteria categories and then prioritizing the importance of the criteria within each category. Table 9 lists the final parking structure rankings.

**Table 9: Parking Expansion Prioritization Results**

| Station | Score | Rank |
|---|---|---|
| Oceanside | 70.6 | 1 |
| Solana Beach | 70.1 | 2 |
| Carlsbad Poinsettia | 62.0 | 3 |
| Carlsbad Village | 61.0 | 4 |
| Old Town | 59.7 | 5 |
| Sorrento Valley | 57.5 | 6 |
| Santa Fe Depot | 56.9 | 7 |
| Encinitas | San Diego | 14,500 |

Additional information on the criteria and prioritization is provided in **Appendix 12**.

# 10.0 FUTURE INFRASTRUCTURE IMPROVEMENTS

In addition to increasing and enhancing track and station capacity, improvements in yard storage are also needed in order to accommodate additional passenger service. The 2013 IDP included the following new capital requirements as a result of the modeling and analysis work performed for the LOSSAN SIP and the subsequent *San Diego Full Network Build-Out Operations Analysis* completed in January 2013.

## 10.1 STUART MESA MAINTENANCE FACILITY

In order to support 2030 service levels identified in the 2013 IDP, it was anticipated that a total of four additional trainsets may need to be stored at the Stuart Mesa Maintenance Facility (SMMF). To do this, the storage capacity of the existing yard will need to be expanded. Four potential options were identified to address capacity improvements to the yard to support the storage of more 5-6 car trainsets and are presented in detail in the *Analysis of Service Capacity and Third Track for Access for Stuart Mesa Maintenance Facility* attached in **Appendix 13**.

The *Final Benefits and Constraints Analysis Technical Memorandum* completed in November 2016 as part of the NCTD Integration of SPRINTER & COASTER Passenger Rail Services, attached as **Appendix 14**, assumed two different operating scenarios for COASTER in 2035 that both require additional capacity at the Stuart Mesa Maintenance Facility.

The first operating scenario is based on the Regional Plan with 54 COASTER trips per day, the same service level presented in Section 5.1, but assumes the coordination/interlining of Metrolink trainsets where possible to reduce capital requirements for the COASTER. The COASTER equipment needs for this scenario is five conventional commuter rail train consists for revenue service, plus one spare. With Metrolink covering the balance of service, three Metrolink bi-level commuter consists for revenue service would need to lay over at night at the Stuart Mesa Maintenance Facility to provide for early morning coordinated service. Combining all of the COASTER and Metrolink storage requirements, a total of 36 COASTER units (locomotives and cars) and 49 Metrolink units (locomotives and cars) would need to be stored overnight at Stuart Mesa. To accommodate this, the footprint of the maintenance building would need to increase by 36 percent and the existing outdoor maintenance-of-way (MOW) storage area is lost.

The second operating scenario assumes a longer peak service period with 60 COASTER trips per day with all service operated by COASTER equipment. The higher service level found the need for two more equipment sets than presented in Section 6.0; 11 revenue sets plus two spares for a total of 13 trainsets. To accommodate this, the footprint of the maintenance building would need to double and the existing outdoor maintenance-of-way (MOW) storage area is lost.

## 10.2 SANTA FE DEPOT POTENTIAL CONSTRAINTS

The *Additional Passenger Track at San Diego Santa Fe Depot and Layover Track at MTS Trolley Yard Technical Memorandum*, attached in **Appendix 15**, showed that capacity for the proposed 2030 service levels identified in the 2013 IDP could be supported on the existing Tracks 1-3 of Santa Fe Depot under optimum conditions, still allowing BNSF to operate freight trains through the Depot on Track 4 during midday periods. Further, during periods when delays may occur, as is the case today, Track 4 can be used as a “relief” track to turn trains that may be operating “out of slot” without presenting significant impact to freight operations.

The *Operational Analysis of Future Scenarios Final Technical Memorandum* (**Appendix 7**) found some capacity constraints in the 2020 and 2035 scenarios. The additional service in 2020 exceeds the midday storage capacity at the Santa Fe Depot, necessitating either additional midday layover storage at or near Santa Fe Depot or one COASTER equipment remaining in revenue service during the midday period by making at least one additional roundtrip. To accommodate capacity for 2035 service levels, some of the passenger train track assignment requirements currently in place may need to be modified to allow the dispatch greater flexibility to process the increased volume of trains. Also, the assumed lengthening of each Surfliner trainset from six cars to seven cars makes the ability to “double park” two trainsets on one platform face at the Santa Fe Depot no longer feasible. In addition, at least one of the four tracks at Santa Fe Depot must remain open overnight for freight train operations. As a result, the 2035 Scenario requires additional overnight storage for the Surfliner trains be considered.

## 10.3 DEL MAR SPECIAL EVENTS PLATFORM OPERATIONS ANALYSIS

A number of operational alternatives for service to the Del Mar Special Events Platform were completed as summarized in the *Del Mar Seasonal Platform Operations Analysis*, which is included in **Appendix 16**. Overall, the conclusion was that passenger service would be required from both Track 1 and Track 2. Furthermore, a number of potential locations for a staging track to queue a 10-car Amtrak special event train for service at the platform following events were analyzed both north and south of the platform. It was concluded that staging should occur south of the platform and that, as one option, it was feasible to stage the train at the Santa Fe Depot during the desired time frame.

# APPENDIX 1

## Excerpts from 2009 San Diego-LOSSAN Corridor Project Prioritization Analysis

# 2018 California State Rail Plan

*Connecting California*

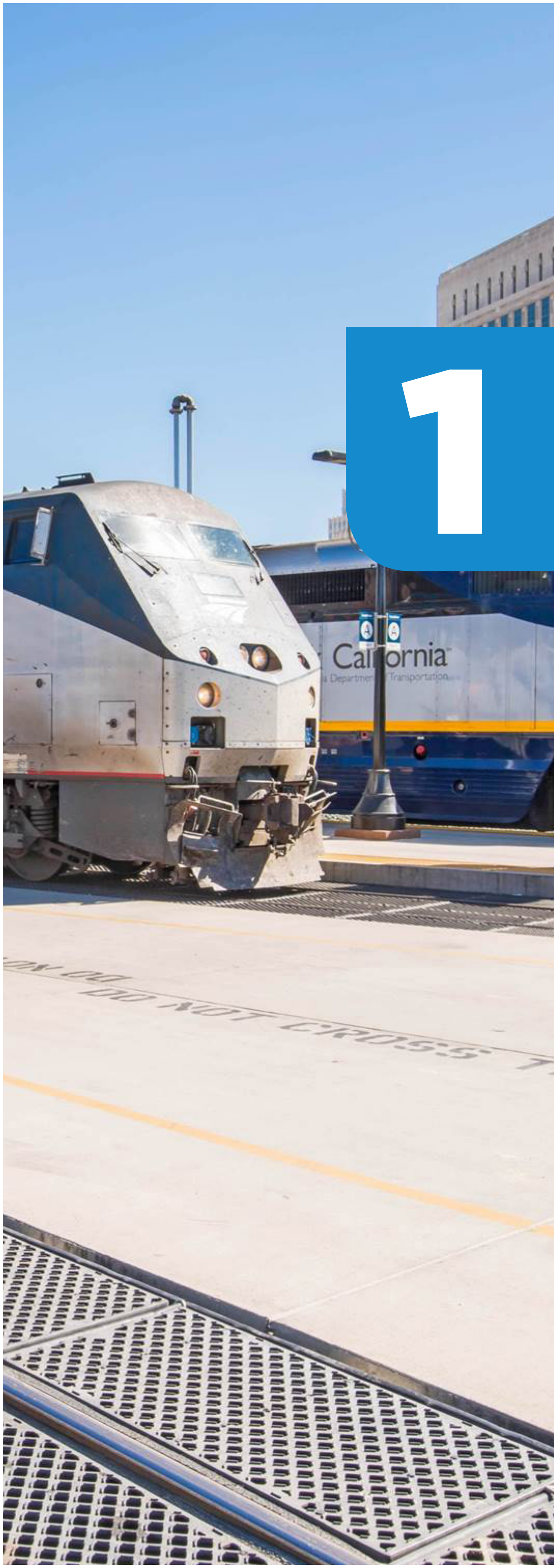
Draft

Caltrans

2018 california state rail plan






# 1 Role of Rail in Statewide Transport

***Caltrans' mission in developing the California State Rail Plan is to provide a framework for a safe, sustainable, integrated, and efficient California rail network that successfully moves people and goods while enhancing the State's economy and livability.***

## 1.1 2018 California State Rail Plan Overview

**California is building the future every day.** California is the world's sixth-largest economy, home to nearly 40 million people, and contains world-class cities, universities, and research centers, and the world's most valuable, innovative, and technologically advanced companies. The State's agricultural industry feeds the nation, and is a center of international trade with ports through which goods and products flow to the rest of the nation. California's iconic parks and landscapes draw visitors from all over the world.

California's success can be enhanced multifold by efficiently connecting and updating the transportation system built on rail networks and highways from the 19th and 20th centuries. The status quo is not enough to support this growing economy and meet its robust economic and environmental future needs. Residents and workers in California's growing mega-regions face increasing vehicle congestion and crippling commute times due to pressures on the housing market and aging transportation infrastructure. This also creates bottlenecks for the movement of goods and access to popular destinations and across California's borders. The quality of life in the state's communities is further impacted by transportation-related air pollution. The state's farms and forests are threatened by erratic patterns of drought and downpour, along with extreme weather generated by greenhouse gas (GHG) emissions and a changing climate.

**California is uniquely poised to meet its challenges.** The State is a national leader in developing a passenger and freight rail network connecting its growing regions. Modern rail is the most cost- and energy-efficient transportation technology to quickly, safely, and affordably connect people to their destinations or goods to their markets. Californians must continue to invest in and build an advanced, integrated statewide rail system befitting both their needs and their ambitions to continue to compete and thrive on the cutting edge of global technology; to lead in efforts to curb climate change; and to grow sustainably and resiliently in a fast-changing world.

The 2018 California State Rail Plan (Rail Plan) establishes a statewide vision describing a future integrated rail system that provides comprehensive and coordinated service to passengers through more frequent service, and convenient transfers between rail services and transit. This integrated system uses the existing rail system more efficiently; expands the coverage and mix of rail services in several key corridors; scales proposed services to meet anticipated market demand; and facilitates network-wide coordination through scheduled, or "pulsed," transfers. For passengers, this integrated system means a faster, more convenient and reliable door-to-door travel experience. For freight movements, this integrated system means better system reliability and a clear pathway to growing capacity, which leads to economic benefits that reverberate locally, regionally, and nationally.

The Rail Plan anticipates exciting new developments in California's rail system, and presents a future vision for statewide rail travel that builds on the State's existing conventional rail, along with opportunities provided by high-speed rail (HSR) and transit; leveraging emerging technologies such as electrification and advanced train control systems that help make rail travel more efficient, faster, safer, and more reliable; making the existing system more cost-effective to operate; and channeling savings to new capital projects and system enhancements. The Rail Plan assesses a changing funding landscape, including the influence of newly funded Senate Bill (SB) 1 (SB1) transportation package and California's Cap-and-Trade Program for reducing GHG emissions. The planned rail system envisioned in the Rail Plan will improve Californians' quality of life by mitigating roadway congestion; reducing vehicle emissions; supporting compact land use; and offering convenient, reliable, and auto-competitive alternative travel and goods movement. The Rail Plan also addresses issues of access—the availability of opportunities within a certain distance—as well as mobility—the ability to move between activity sites.[1] A statewide rail system offers a viable alternative to driving for both local and long-distance trips for all populations, including those who lack access to or cannot afford automobiles, and for people who choose not to drive.

The Rail Plan vision provides a technical framework for realizing the full potential of our existing rail network, and using the current slot times on freight heavy routes in a fully integrated statewide passenger service that draws on detailed input and guidance from key stakeholder initiatives and leadership. In partnership with those same stakeholders, this vision can be achieved in phases, with different levels of integration activated as improvements are delivered over time. The Rail Plan provides for incremental service planning and capital investment decision-making with an ultimate network vision in mind: it offers leadership toward a more integrated, convenient, and efficient statewide rail system.

Chapter 1 provides the statewide context of California's multimodal transportation system, outlining the key trends and opportunities guiding transportation planning; characterizing rail's role in the State transportation system; and highlighting key multimodal policies, programs, and plans on which statewide planning for the rail network is based. This chapter also reviews the rail governance structure and identifies funding opportunities from Federal, State, local, and other sources.

**The California transportation network today:**

- Total highway / roadway centerline miles: 175,818
- Over 13,133 State-owned bridges
- Twelve California seaports, including the nation's largest port complex
- Over 300 airports (Commercial and General Aviation)
- One of the nation's most extensive passenger and freight rail systems with over 10,000 passenger and freight route miles

1 Hanson, Susan, The Geography of Urban Transportation, 2004, accessed 2016.

# 4 Proposed Passenger Improvements and Investments

Chapter 4 presents the service improvements and investments needed to achieve the Rail Plan Vision. The Rail Plan supports near-term plans and proposals being developed in individual corridors and regions, with a 2022 targeted completion date; but presents a flexible, corridor-level framework for developing the passenger rail system over the long-term, 2040 time horizon of the plan. This framework is intended to serve as the basis for State-led service implementation planning to be undertaken in coordination with regional agencies, rail operators, and stakeholders to achieve the 2040 Rail Plan Vision. The Rail Plan does not seek to prescribe specific projects or solutions and their associated costs, but rather to provide a path for implementation and a common understanding of how the State's rail network should develop to meet State goals.

## 4.1 Network Integration Strategic Service Planning

The 2018 State Rail Plan Vision was developed as part of the State's Network Integration Strategic Service Planning (NISSP) process. The overarching goal of the NISSP is to plan for a statewide passenger rail system that maximizes the performance potential of intercity passenger rail as a time and cost competitive travel option for meeting the State's transportation needs and goals. The network planning process undertaken as part of the Rail Plan included an assessment of statewide travel demand, existing rail service and infrastructure, service types responding to market demand in different regions or corridors, and infrastructure elements required to support service levels and address infrastructure constraints. The draft network vision was developed through an iterative process of network planning, ridership and revenue modeling, capital improvement analysis, and operations and revenue analysis.

In addition to the demand and infrastructure analysis from the NISSP, the most recent planning or programming documents in each service area were reviewed to identify projects related to passenger rail. Documents reviewed include RTPs, corridor strategic plans, corridor business plans, and programming documents such as the State Transportation Improvement Program (STIP) and the Safe, Reliable, High-Speed Passenger Train Bond Act for the 21st Century (Proposition 1A).

## 4.2 Pulse Scheduling

State network planning in the Rail Plan is based on *pulse scheduling*, which represents uniform train service patterns that repeat throughout the day on regular, recurring time intervals. This timetable-based planning approach allows for timed transfers between services at hub stations where a transfer is required to complete a trip across the state, or to a location served by local transit. The benefit to users of pulse scheduling is that a repeating timetable allows for easy trip planning and seamless travel by ensuring that connections between trains can be made throughout the day, with minimal transfer times. By not requiring a train for every travel market, pulse scheduling allows fewer trains to serve more destinations through connections, not unlike how the airlines use hubs to allow smaller communities more frequent access to more destinations than would otherwise be possible, and do so at a lower cost. Pulse schedule planning allows cost savings to be realized by reducing the set of infrastructure improvements needed to operate services to only those that are necessary to reliably operate the timetable (e.g., the capacity of a single-track railroad can be maximized to operate services before additional track infrastructure is needed to accommodate higher service frequency).

The Rail Plan has preliminarily identified a 30-minute or 60-minute service frequency (or headway) across most portions of the state by 2040. Because the HSR system will serve as the major artery for the long-distance travel option of the statewide system, the service plans from the *2016 CHSRA Business Plan* were used to determine primary time point hubs for the integrated, statewide network.

## 4.3 State Service and Connectivity Goals

The Rail Plan presents the State's goals for providing and connecting services in different regions. Service goals describe the service-desired train frequencies on the State passenger rail network; reflect the travel times needed to provide services that are competitive with automobile and air travel; and provide for timed connections. Service goals balance travel times with the need to schedule connections between services where transfers are needed for travel between different travel markets. Service goals are also operator-neutral and strategic, rather than prescriptive—the Rail Plan does not determine specific operating and institutional responsibilities, which must be negotiated over time to deliver improvements with the 2040 Vision in mind.

In some cases, service goals are associated with delivery options, where the State goal can be met with different types or services and capital investments to address funding needs or specific geographical and operational constraints. Service delivery options represent the physical improvements and capital investments necessary to achieve the service goals; and ultimately, the 2040 Vision.

### 4.3.1 Phasing

The service goals and service delivery options identified in the Rail Plan provide a strategic framework for service implementation planning, coordination between the State and rail partners, and prioritization of capital improvements in phases tied to the short-term (2022), mid-term (2027), and long-term (2040) Vision in the Rail Plan. The goals of the phased implementation strategy in the Rail Plan are to follow through on the committed, funded service improvements planned across the state (mostly expected to be complete by 2022), which leverages existing assets and prioritizes maximizing use of existing infrastructure. The long-term 2040 Vision defers significant infrastructure investments that are necessary to integrate passenger rail services, and fully realize the possible service and connectivity goals in the 2040 Vision, if funding and regional support are available to deliver those infrastructure elements. The time phases described in the Rail Plan also identify the specific service planning and analysis that are needed for developing and integrating the rail network over time in a manner that is responsive to the needs of local and regional stakeholders. Critically, the time horizons used in the Rail Plan do not tie to the specific completion year of the recommended projects. Some projects may be completed ahead of the specified year; others may be near completed by the Rail Plan date. The project years and corresponding plans serve as important planning markers and meet statutory planning requirements.

### 4.3.2 Interstate Rail Connections

Beyond California's statewide goals, the State has an interest in maintaining long-distance national Amtrak service, with interstate connections to Oregon, Nevada, and Arizona; thereby providing service and access to communities that are not on the high-frequency State passenger rail network. The State also has an interest in developing specific passenger rail corridors in coordination with Nevada and Arizona to provide for future interstate HSR service to Las Vegas, Nevada, and Phoenix, Arizona. These future HSR connections represent significant opportunities for accommodating interstate travel to these important destinations via passenger rail, which will address congestion on interstate highways and at California's airports.

The Rail Plan also seeks to address cross-border congestion between California and Mexico through passenger rail connections at the border, providing service that is integrated with the state network.

### 4.3.3 Host Railroad Coordination

Freight railroad owners desire to improve existing operating efficiency and preserve future capacity to accommodate growing freight rail traffic. Therefore, they are interested in minimizing or improving passenger rail impacts on existing and future freight rail operations. Caltrans will consider the potential impacts of the planned passenger rail service improvements on railroad capacity, and access to yards and customers. Infrastructure investments necessary for increased passenger train volumes will also add capacity and flexibility to freight operations. The goal will be to enable continued, market-responsive growth in goods movement by freight rail, while also providing for increased passenger capacity. This goal will be achieved by early and continuous dialogue with the freight railroad partners, and progressive identification of shared opportunities.

In some cases, ensuring capacity for passenger and freight rail operations will be realized through development of a shared track infrastructure that both freight and passenger trains will use. In other cases, ensuring capacity for freight will involve the development of largely dedicated track for passenger and freight trains in a shared right-of-way, while retaining the ability to share track under certain conditions, or the development of completely separate freight and passenger infrastructure.

The nature of corridor development may change over time as more passenger service is phased in. Limits on passenger train growth in a corridor during early phases of network development will place a premium on using available passenger train slots for the highest-ridership services (often running with more cars on each train than today), while supplementing the service with integrated express bus service during off-peak or lower-demand times of day. Additional growth would be achieved through significant investments in physical infrastructure in partnership with the freight railroads. In return for access for more passenger trains on freight railroads' lines, many funding options will be considered, including various combinations of upfront capital project investments and infrastructure access fees, as well as agreements on future capital investments tied to ensuring reliable service for both freight and passenger services. The partners may conclude that future growth needs will require investing in dedicated passenger rail infrastructure for all or a portion of a corridor.

Additionally, where freight and passenger services share a corridor, opportunities may exist to expand or reorganize tenancy agreements with host railroads for passenger services to gain additional capacity on the freight rail network. The ability of passenger service providers to purchase additional slots for more passenger service is key to scaling services to meet market demand over time, while minimizing large capital outlays for new infrastructure and limiting redundant infrastructure as the network evolves toward the 2040 Vision.

Although the Rail Plan reflects a general understanding of the type of investments appropriate to each corridor, specific decisions will be made through detailed implementation planning and host railroad negotiations. A detailed description of the proposed freight rail improvements and investments is included in Chapter 5.

## 4.4 Service Areas and Organizational Framework

In addition to organizing proposed passenger improvements, the three time horizons in the Rail Plan mark important milestones in building towards the 2040 Vision. The geographic service regions described in this chapter were refined from service regions developed in the network planning effort as a framework for understanding, discussing, and organizing future services. Those service areas were developed to facilitate planning and analysis for services that could be grouped into logical statewide rail travel sheds justified by early market and ridership analysis. HSR and intercity services, as well as several regional services, are likely to operate across more than one service area, and may be described in both where it is necessary to do so.

The Rail Plan defines nine geographic service areas. Exhibit 4.1 represents these geographies visually using current maps of the rail network as it is in 2018. The areas are:

- **Central Valley and Sierra Nevada:** This region includes the State rail network in the San Joaquin and Sacramento Valleys, including service and improvements between Palmdale and Bakersfield in the South, and Sacramento and Redding in the North, as well as connections to Reno, Carson City, the Sierra Nevada, and counties north of Sacramento.
- **North San Francisco Bay Area and the North Coast:** This region includes the State rail network between Sacramento and Oakland/San Francisco, as well as the North San Francisco Bay Area rail network in Marin, Sonoma, Napa, and Solano Counties. The rail network connecting the Stockton area to the San Francisco Bay Area at Martinez is included in this geographic region.
- **South San Francisco Bay Area:** This region includes the State rail network providing services to and from the South San Francisco Bay Area, including the San Francisco-San Jose Peninsula Corridor, the rail network between Oakland and San Jose, and the network carrying services between the Stockton Area and San Jose over the Altamont Pass.
- **Central Coast:** This region encompasses the Central Coast rail network between San Jose in the North and Santa Barbara/Goleta in the South, including the UPRR Coast Route and Monterey and Santa Cruz Branch Lines.
- **Las Vegas to High Speed Rail:** This region encompasses the HSR route being privately developed for service between Las Vegas and Victorville or Palmdale. The developer of the Victorville to Palmdale segment (known as the High Desert Corridor) has not been finalized and could be either public or private sector.
- **LOSSAN North & Antelope Valley:** This region includes the State rail network included in the existing LOSSAN North corridor between San Luis Obispo, Santa Barbara, and Los Angeles. The regional rail corridor between Santa Clarita and Los Angeles is included in this region.
- **Los Angeles Urban Mobility Corridor:** This region includes the high-capacity rail network being developed for different services between Burbank and Anaheim through the Los Angeles Area and Los Angeles Union Station. Services providing connectivity to the state network in the Los Angeles area are included in this region.
- **Inland Empire:** The Inland Empire region includes the rail network connecting San Bernardino and Riverside Counties to Los Angeles, Orange County, and San Diego.
- **LOSSAN South:** The LOSSAN South region includes the existing LOSSAN South Corridor between Los Angeles/Anaheim and San Diego.

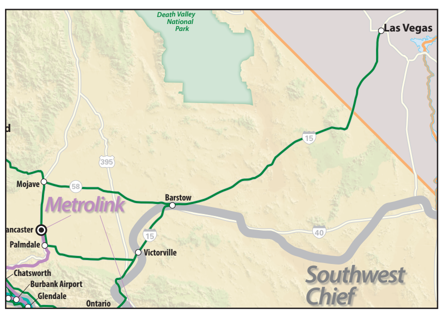
State service goals and improvements, organized by timeframe and geographic region, are described in the sections that follow.

Central Valley and Sierra Nevada

North San Francisco Bay Area and the North Coast

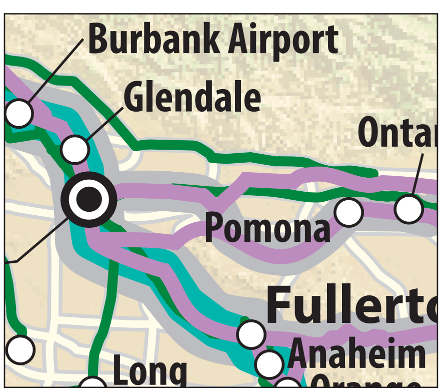
South San Francisco Bay Area

Central Coast

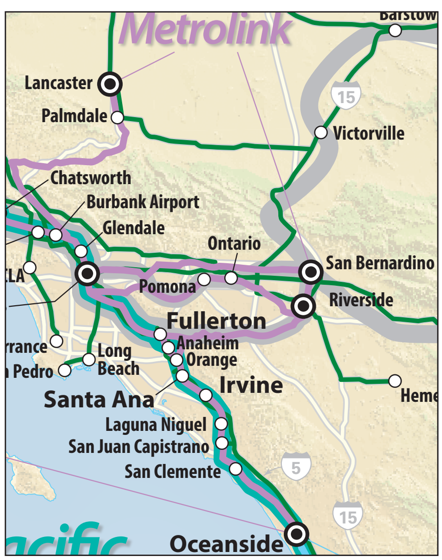


Las Vegas to High Speed Rail

LOSSAN North & Antelope Valley



Los Angeles Urban Mobility Corridor



Inland Empire

LOSSAN South

*Exhibit 4.1: Rail Plan Geographic Service Areas*


*Exhibit 4.2: Caltrans Statewide 2040 Vision Rail Map*

## 4.5 2022 Short-Term Plan – Statewide Goals

The Statewide plan for 2022 identifies service improvements that will lay the foundation for improving and integrating the passenger rail network. These improvements have already been or are being planned; and are funded, or likely to be funded, for construction and implementation, and will be under way or completed by 2022. Additionally, specific planning, environmental, and engineering studies needed to implement service goals in the long-term vision are described here.

Statewide focus areas for the 2022 horizon include:

- Planned and committed projects, including service extensions to Larkspur, Redlands, and Salinas, electrification of the Caltrain service between San Jose and San Francisco, and significant frequency increases throughout the state.
- Completion of significant construction for HSR Valley-to-Valley service and for the ACE extension to Modesto and Ceres.
- Service implementation planning for the 2027 and 2040 time horizons.
- Assisting communities statewide in better connecting transit systems to rail and enhancing station area functions.
- Working with available or identified capacity from existing host railroad agreements; or from opportunities with clear paths for negotiation.
- Strategic planning for fleet management, replacement, and expansion, as well as the expansion or construction of new maintenance facilities that support the fleet.
- Conducting significant research and development and targeted investments in integrated ticketing and travel planning.
- Identifying opportunities to begin developing integrated schedules and repeated patterns, especially in areas of shared regional and intercity operations.
- Make significant progress in implementing alternative fuels or zero-emission technology on both rail and integrated express bus services
- Continuation of California advocacy for continuation of the Federally funded Amtrak long-distance trains: the *Coast Starlight* (Seattle-Los Angeles), the *California Zephyr* (Emeryville-Chicago), the *Southwest Chief* (Los Angeles-Chicago) and the *Sunset Limited* (Los Angeles-New Orleans). These trains provide the only rail service to a number of California communities throughout the state, and connect the state to the national rail network.

### 4.6.9 LOSSAN South

The 2022 Short-Term Plan regional goals support analysis of operating complementary services and stopping patterns in a shared corridor along the South LOSSAN and Orange County corridors between Los Angeles and San Diego. Analysis of timetable and regional scheduling will lead to reliability and service speed improvements.

**Service Goals and Improvements:**

- Introduce initial integrated service featuring hourly express and half-hourly local service between Los Angeles and San Diego (with exceptions to half-hourly local headways based on availability of slots between Los Angeles and Fullerton), taking advantage of expanded capacity of completion of Rosecrans-Marquardt grade separation and completion of multiple double track projects in San Diego region and other infrastructure improvements.

**Planning, Analysis, and Project Development:**

- Plan for achieving 2027 and 2040 phased expansion of service, inclusive of Phase 2 HSR, intercity rail, and regional rail investments connecting Los Angeles and San Diego, improved connectivity to Mexico border crossings, and enhanced local transit connections at key stations along the corridor.
- Identify maintenance facility requirements for integrated services in LOSSAN South corridor.

## 4.7 2027 Mid-Term Plan – Statewide Goals

The 2027 service goals focus on targeted improvements for integrating Phase I of HSR service, and maximizing service in existing rail corridors. By 2027, there will be a minimum service of every 2 hours on the core system, including Integrated Express Bus services to places like Redding and Reno. The 2027 plan is based on funding levels reasonably expected from sources currently available at the Federal, State, and local levels. Some services may be improved well in advance of 2027, while others may be near completion but not yet complete.

Key components of the 2027 plan include:

- Operation of HSR Valley-to-Valley service.
- Initiation of statewide pulse-hub operations on at least a bi-hourly basis, with hourly service on certain high-demand corridors.
- Full use of programmed corridor capacity—e.g., places where agencies intend to have a completed core capacity transit, HSR, or intercity rail project , including:
  - Proposed capacity expansion of the San Bernardino Line.
  - Service expansion and restructuring made possible by the Los Angeles Union Station run-through tracks.
  - Early investment in blended-service corridors (San Jose-San Francisco and Burbank-Anaheim).
  - Growth of service to Modesto, Ceres, and Merced.
  - Planned capacity in the corridor between Sacramento and Roseville.
  - Targeted expansion of service from Oakland and the Central Valley to San Jose.
  - Extension of SMART corridor north of Sonoma County Airport.
- Full use of negotiated slots on existing capacity.
- Targeted connectivity investments at hubs to connect to HSR.
- Fully developed and operational integrated ticketing.
- Assisting communities statewide in better connecting transit systems to rail and enhancing station area functions.
- Implementation of new fleet and maintenance facility strategy.
- Service implementation planning for the 2040 time horizon.

- Plan for HSR services connecting Los Angeles, Ontario, Riverside, and San Bernardino to each other and to San Diego, using electrified east-west express rail corridors. Include identification of opportunities to further upgrade corridor speeds through phased investment when Coachella Valley and Arizona rail service plans reach their recommendations.
- Select corridor for 2040 Coachella Valley regular-interval service.

### 4.8.9 LOSSAN South

The Rail Plan supports improvements by 2027, providing for a regular, frequent service on the LOSSAN South Corridor between Los Angeles and San Diego, supported by Urban Mobility Corridor investments between Los Angeles and Orange Counties. The Rail Plan anticipates that service levels will be fully implemented by 2027 in this corridor, and that future long -distance travel between San Diego and the rest of the state will be served by the State's significant investment in HSR service through the Inland Empire.

#### Service Goals and Improvements:

- Complete maintenance facility investments for integrated services.
- Continue service improvements to solidify half-hourly service to all local stations, with increased reach of half-hourly network due to capacity improvements between Fullerton and Los Angeles, as well as between Fullerton and Riverside.

#### Planning, Analysis, and Project Development:

- Plan for 2040 LOSSAN South network, including increase in express train service to half-hourly, and integration of 2029 HSR services to Anaheim.

## 4.9 2040 Long-Term Vision – Statewide Goals

The 2040 Vision represents the full build-out of the long-term planning goals for the integrated, statewide rail network. The 2040 Vision supports an energy efficient rail network, which will be realized either through traditional catenary-based systems or other zero, or near-zero emission technology. The highlights of the 2040 Vision include:

- HSR expansion and integration beyond the initial operational segments.
- Expansion of network capacity in full realization of the integrated service goals.
- Establishment of regional rail networks providing integration with the statewide network and expanded regional access.
- Intensification of services implemented during the short- and mid-term horizon years.

## 4.10 2040 Long-Term Vision – Regional Goals

### 4.10.1 Central Valley and Sierra Nevada

The 2040 Vision expands the reach of the HSR System to the Northern Central Valley, providing for regular, frequent connections to HSR trains from Sacramento to the San Joaquin Valley and Southern California, while also providing service to communities between Merced and Sacramento, and access to the State passenger rail network.

**Service Goals and Improvements:**

- Phase 1 HSR service, with initial hourly service to local stations, and half-hourly service to local stations by 2040.
- Electrified HSR run-through service from the Central Valley to Sacramento, including new infrastructure to speed trip time.
- Off-peak local service expected to rely on transfers between Bay Area and Sacramento HSR trains at Merced and/or Madera transfer stations to achieve full connectivity.
- HSR express stopping patterns and service at market-driven levels.
- Hourly service between Richmond/Martinez and Stockton, based on transfer location recommended in Northern Bay Area study.
- Half-hourly rail service from Roseville to Sacramento.
- Extend hourly rail service north from Sacramento to Yuba City/Marysville.
- Hourly integrated express bus service north from Sacramento to Woodland and communities in-between.
- Every-2-hour integrated express bus service north from Sacramento to Redding and communities in-between.
- Every–2-hour integrated express bus service east from Sacramento to Carson City.
- Every-2-hour integrated express bus service east from Roseville to Reno.
- Enhance integrated express bus service to national parks from Kings-Tulare, Fresno, and Merced.
- Hourly regional rail service connecting Lemoore, Hanford, King-Tulare HSR station, Visalia, and Porterville, based on 2027 study.
- Implement 2040 recommendations of 2022 study on rail and Integrated Express Bus services between Fresno and Bakersfield.

### 4.10.9 LOSSAN South

The Rail Plan calls for multiple connections from Imperial County and the Mexico border area to the statewide network at San Diego using a combination of potential rail services to San Ysidro, and Integrated Express Bus Service from Imperial County/Mexicali and Otay Mesa/Tijuana Airport, allowing cross-border connections. Regular half-hourly regional services between Los Angeles and San Diego will use both local and express service patterns to fully integrate local stations in Orange and San Diego Counties into the statewide network.

The design of this corridor will have major operational impacts on the rest of the State's rail network. This corridor, together with the Peninsula blended-service corridor in the Bay Area, is the most critical corridor to design early and strategically.

#### Service Goals and Improvements:

- At least half-hourly HSR service to stations between San Diego Airport and the Inland Empire and Los Angeles Union Station, with one-seat rides or connections to destinations throughout the state.
- Half-hourly express service between Los Angeles and San Diego, with timed connections at hubs in Santa Ana, Laguna Niguel, Oceanside, and the San Diego Airport.
- Half-hourly service making all local stops between Los Angeles Union Station and Laguna Niguel. Laguna Niguel could serve as the southern terminus of electrified local services connecting to the LA Urban Mobility Corridor.
- Half-hourly service between Oceanside and Escondido, with connections to HSR services.
- San Diego integrated transit connections to services to San Ysidro, and Integrated Express Bus connections to Otay Mesa and the Tijuana Airport.
    - Creation of a San Diego Hub for HSR, intercity rail, regional rail, and high-capacity transit at the San Diego HSR station.
- Half-hourly service from the Mexico border, possibly from Tijuana—with customs and border pre-clearance—to San Diego, if the service can be delivered with significant improvement in travel time compared to the existing local transit service.
- Integrated Express Bus service from the San Diego Hub to El Centro/Calexico via El Cajon.

### Methodology

Assembling the Capital Program for the Rail Plan followed two tracks: citing costs for established projects; and estimating costs for additional projects. The majority of the Capital Program in the 2040 Vision represents previously identified projects that improve the safety and capacity of existing infrastructure and realizing its potential; and aligns investments for improved accessibility, reliability, safety, and sustainability of the multimodal connectivity of the state. It leverages existing assets and connects and evolves regional rail and local transit networks.

First, established costs for existing and defined projects were identified and citied from publicly available documents. Where relevant, these costs were escalated to 2018 dollars for consistency. Such cited costs make up the bulk of projects listed in the 2022 time horizon, when projects included in the capital plan are further along in the development process.

Second, additional capital costs in the Rail Plan include planning-level estimates that consider complexity, environment, geographic location (urban, suburban, and rural), proximity to active tracks, and other factors that may influence costs. Planning-level estimates of capital cost are within a rough order of magnitude, intended to inform investment decisions, and not be interpreted as engineering-level estimates.

The cost catalog developed for this process follows the Federal Railroad Administration Standardized Cost Categories, with unit costs for typical elements identified based on an average project cost. For high-cost improvements, such as intermodal hubs, a lump-sum cost is assumed based on comparable costs from recent projects of similar scope.

The 2040 Vision provides the service type, frequency (system pulse), required average service speed, departure and arrival times, and route nodes used to develop corridor-specific improvements and build related capital cost estimates. These service plans were used to identify capacity requirements at the corridor level throughout the state, which are the primary basis for all project descriptions and assumptions in this estimate. The corridors were investigated through a survey of the existing infrastructure and conditions. The capacity and capabilities of that infrastructure was compared with future capacity requirements.

### State Capital Investments

The service and connectivity goals, along with corridor-level improvements required to achieve the 2040 Vision, are described in a phased plan with Capital projects identified for the next 4 years (2022); and mid-range needs identified for the next decade (2027), along with long range improvements and investments for long-range (2040) planning towards the envisioned future.

- **2022** catalogs the Capital Plan of ongoing and committed projects as part of an enhanced existing conditions assessment of present and near-term rail services across the state.
- **2027** captures new and established projects and planning studies intended to maximize capacity and utility of the existing passenger rail network, and begin using HSR while connecting it to the statewide integrated network.
- **2040** identifies additional corridor-level investments and service goals needed to fully realize the 2040 Vision, connecting regional networks into a statewide-integrated system.

To achieve the 2040 Vision Network as described in Chapter 4, the Rail Plan identifies a robust, strategic capital investment program that catalogs near-term projects, maximizes returns from existing investments, and builds out and connects regional networks into an integrated statewide system. The full spectrum of passenger rail modes is included in the capital investment program, from Urban Rail projects to potential future HSR extensions.

## 2022 (Near-Term) Infrastructure Investment

The 2022 services goals and Capital Program are focused on identifying the planned, committed, or otherwise under-construction projects that will ultimately serve the network identified in the 2040 Vision. Goals for the 2022 Capital Programs and projects list, which will potentially be achieved earlier than 2022, include relevant State-level projects that are already scoped, scheduled, and budgeted; and establish existing conditions for future capital cost analysis. Although capital projects identified for 2022 have specific operators and modes associated with the service, the subsequent time horizons are intended to be mode- and operator–neutral, and assign costs to service types rather than any specific entity or jurisdiction.

Intercity Rail improvements for 2022 include capacity expansion and speed improvements to existing intercity rail services, grade separations and other safety improvements, and shared freight corridor improvements like new sidings and double-tracking sections. In addition, a number of planning studies have been identified and included in the Capital Program to explore project implementation for future service goals. These projects positively impact the statewide network, improving interregional corridors and overall connectivity goals, inciting State interest in project sponsorship and funding.

There are a number of commuter rail improvements identified in the 2022 Capital Program, including the initial stages of ACE*forward,* SMART, and Caltrain's Peninsula Corridor Electrification Project.

Table 6.1 catalogs capital costs for projects supporting the integrated statewide network in 2022. Costs attributed to locally led, privately sponsored, or CHSRA-programmed projects are included in the overall 2040 Vision.

**Table 6.1: 2022 Short-Term Project List (thousands $)[168]**

| Planning Area | Corridor | 2022 Capital Projects | 2022 Capital Cost (thousands $) | 2022 Pricing Source |
|---|---|---|---|---|
| South Bay Area | San Francisco-San Jose | Peninsula Corridor Electrification Program | $1,980,000 | Caltrain |
| | | Completion of Full Electrified Service + Targeted Corridor Infrastructure Improvements/Grade Sep Planning | $280,000 | Caltrain + Regional Programming |
| | | CBOSS Positive Train Control | $248,000 | Caltrain |
| | | 25th Ave Grade Separation | $165,000 | Caltrain |
| | | South San Francisco Station Improvements | $61,000 | Caltrain |
| South Bay Area | San Jose-Gilroy | PTC Expansion + Added Frequency | $47,000 | FRA Award + Regional Programming |
| South Bay Area | San Jose-Stockton | ACE*forward* Capacity Expansion | $26,000 | TIRCP/AQMD Award |
| South Bay Area | Oakland-San Jose | Coast Subdivision Rail Corridor Improvements | $20,000 | CCJPA |
| South Bay Area | Multiple | Regional Network & Service Integration Project Development (Peninsula, Dumbarton, East Bay, Altamont) | $6,000 | CSRP Pricing Catalog |
| North Bay Area | San Francisco-Oakland | New Transbay Crossing Planning | $10,000 | BART |
| North Bay Area | Multiple | North Bay to Sacramento Network & Service Integration Project Development (Marin, Sonoma, Napa, Solano, Yolo, Sacramento, Contra Costa, Alameda) | $3,000 | CSRP Pricing Catalog |
| North Bay Area | Larkspur-Cloverdale | SMART San Rafael - Larkspur Connection Ferry Connection to San Francisco | $84,000 | SMART |
| | | 2 New Trainsets for expanded capacity | $11,000 | TIRCP Award |
| | | San Rafael Transit Center | $30,000 | SMART |
| Central Valley/ Sierra Nevada | Sacramento-Roseville | Placer County Service Expansion (Increased Capitol Corridor service) | $79,000 | TIRCP Award |
| Central Valley/ Sierra Nevada | Fresno-Stockton | Merced Station Double Tracking | $10,000 | CTC Allocation |
| | | Stockton to Escalon Double Track | $23,000 | CTC Allocation |
| | | Stockton Maintenance Facility Lead Track & Stockton Wye | $32,000 | Caltrans |
| | | Bi-Hourly + Morning Express Service Expansion | $36,000 | Caltrans |

168 Estimated costs in 2018 dollars. These costs are planning-level estimates and require further study in implementation.

**Table 6.1: 2022 Short-Term Project List (thousands $)(continued)**

| Planning Area | Corridor | 2022 Capital Projects | 2022 Capital Cost (thousands $) | 2022 Pricing Source |
|---|---|---|---|---|
| Central Valley/ Sierra Nevada | Multiple | HSR-Connected Corridors Network & Service Integration Project Development | $4,000 | CSRP Pricing Catalog |
| | | Regional Network & Service Integration Project Development (Kern, Kings, Tulare, Fresno, Madera,Shasta,Yuba, Butte, Tehama, Shasta) | $2,000 | CSRP Pricing Catalog |
| Central Coast | San Jose-Goleta | Central Coast Network & Service Integration Project Development | $2,000 | CSRP Pricing Catalog |
| Central Coast | San Jose-Goleta | Central Coast Layover Facility & Station Expansion | $23,000 | Caltrans |
| Central Coast | Salinas-San Jose | Kick Start Service | $85,000 | TAMC + CSRP Pricing Catalog |
| LOSSAN North | San Luis Obispo-Los Angeles | LOSSAN North Frequency Expansion (including peak hour Los Angeles – Goleta service), Corridor Performance & Travel Time Improvement, including Van Nuys Station Double Tracking | $110,000 | Caltrans |
| LOSSAN North | Goleta to Chatsworth | Seacliff siding and extension | $23,000 | Caltrans |
| Vegas to Palmdale | Victorville to Las Vegas<br>*Palmdale to Victorville* | Nevada-High Desert Corridor Network & Service Integration Project Development | $1,000 | CSRP Pricing Catalog |
| LA Urban Mobility Corridor | Multiple | LACMTA-Statewide Network Service Integration Project Development | $2,000 | CSRP Pricing Catalog |
| LA Urban Mobility Corridor | LA-Fullerton | Rosecrans / Marquardt Avenue Grade Sep | $155,000 | Project Funding Plan |
| LA Urban Mobility Corridor | LAUS | Metro Frequency Improvement @ LAUS | $162,000 | TIRCP Award |
| Inland Empire | San Bernardino-Redlands | Redlands Passenger Rail Project | $265,000 | SBCTA |
| Inland Empire | Multiple | HSR-Connected Corridors Network & Service Integration Project Development; Blue Ribbon Commission for CA-AZ Rail Service | $4,000 | CSRP Pricing Catalog |
| LOSSAN South | Irvine-Oceanside | Laguna Niguel-SJC Passing Siding | $25,000 | TIRCP Award |
| | | San Onofre-Pulgas Phase 2 | $29,000 | NCTD |

**Table 6.1: 2022 Short-Term Project List (thousands $)(continued)**

| Planning Area | Corridor | 2022 Capital Projects | 2022 Capital Cost (thousands $) | 2022 Pricing Source |
|---|---|---|---|---|
| LOSSAN South | Oceanside-Sorrento Valley | San Elijo Lagoon Double Track | $76,000 | SANDAG |
| | | Batiquitos Lagoon Double Track | $69,000 | SANDAG |
| | | Poinsettia Station Improvements | $29,000 | SANDAG |
| LOSSAN South | Sorrento Valley-Santa Fe Depot | San Diego River Bridge, Elvira-Morena Double Track | $286,000 | TIRCP Award |
| LOSSAN South | San Diego-Mexican Border | US-Mexico Network & Service Integration Project Development | $1,000 | CSRP Pricing Catalog |
| Statewide | Multiple | Amtrak Equipment Replacement, Fleet Capacity Expansion & Maintenance Facility Planning, ADA Access Improvements | $300,000 | Caltrans |
| Statewide | Multiple | Corridor Service Improvement - Capitalized Maintenance | $16,000 | Caltrans |
| Statewide | Multiple | Mobility Hub Project Development | $5,000 | CSRP Pricing Catalog |
| Statewide | Multiple | Fare Integration & Demonstration | $10,000 | Caltrans |
| **Total** | | | | **$4,835,000** |

### 2027 (Mid-Term) Infrastructure Investment

The 2027 Capital Program and service goals are focused on maximizing the potential of existing infrastructure, making full use of available passenger rail capacity, and making key investments in regional networks to prepare for integration with HSR. In identifying service goals for 2027, every rail network in the state was carefully examined to identify latent capacity for additional service, while assessing it against the ridership potential of the corridor. Goals for the 2027 Capital Program include identifying achievable mid-term improvements that affordably increase opportunities for additional long-distance passenger rail trips per day, while strengthening an integrated rail network that leverages HSR investments and enables rapid statewide travel by rail, creating more options for auto-dependent communities.

Key projects in the 2027 Capital Program include preparing regional networks to connect to and leverage HSR service. Additional service frequencies and improved speeds connecting greater Los Angeles, Orange County, and the Inland Empire to HSR hubs at Burbank, Los Angeles Union Station, and Anaheim are key investments in this time period. Similarly, investments include improving blended-speed regional service expansions in the Central Valley, for interim connections from HSR in Merced to Stockton and Sacramento.

HSR capital costs include projects necessary to complete valley to valley service delivery.

Intercity rail improvements include further capacity improvements, service expansions, and infrastructure around the state. The 2027 Capital Program includes supporting extended service in Sonoma County to Cloverdale; enhanced capacity between San Jose and Sacramento with improving travel times, frequency, and other right-of-way improvements building toward electrification of the corridor; and increasing service frequencies north of Sacramento to Placer County.

The plan supports increased service on the coastal corridors, using strategic track investments, sidings, layover facilities, and other capacity and speed improvements to bring service to the coast throughout the day. Additional service on the Central Coast, providing connections north to the San Francisco Bay Area, and connections south to the Los Angeles area, will provide residents and businesses with frequent, fast, and reliable connections within the Central Coast, and beyond to high-speed hubs in Gilroy and Burbank.

Urban Rail investments include expansions of Los Angeles, San Diego, Sacramento, and San Francisco Bay Area rail transit networks largely funded through local ballot initiatives. These projects are extensions and connections in the existing transit networks identified and led by relevant local stakeholders. Major investments include the completion of BART service to San Jose, numerous expansions of the LA Metro system, and extending rail service to the Sacramento International Airport.

The Las Vegas High Speed Rail (Las Vegas HSR) project is included in the 2027 capital project time horizon.

Table 6.2 catalogs capital costs for projects supporting the integrated statewide network in 2027. Costs attributed to locally led, privately sponsored, or CHSRA-programmed projects are included in the overall 2040 Vision.

**Table 6.2: 2027 Capital Costs[169]**

| Planning Area | Capital Cost [thousands $] |
|---|---|
| South Bay Area | $7,320,000 |
| North Bay Area | $520,000 |
| Central Valley/Sierra Nevada | $1,150,000 |
| Central Coast | $250,000 |
| LOSSAN North | $550,000 |
| Las Vegas HSR | $10,500,000 |
| LA Urban Mobility Corridor | $2,500,000 |
| Inland Empire | $950,000 |
| LOSSAN South | $950,000 |
| Statewide | $22,310,000 |
| **Total** | **$47,000,000** |

169 Estimated costs in 2018 dollars. These costs are planning-level estimates and require further study in implementation.

### 2040 (Long-Term) Infrastructure Investment

The 2040 Capital Program is focused on completion of the full build-out of regional networks to integrate the statewide system and High Speed Rail with unified service throughout the state. The program represents the long-term investments needed to achieve the passenger rail service goals described in the 2040 Vision (see Chapter 4). These include incremental projects built to expand and connect previously described services in the 2022 and 2027 programs, wider-scale investments to modernize services through electrification and connectivity improvements at station hubs, and large infrastructure projects like HSR expansion, intermodal hubs, new Transbay tube, and urban rail transit investments.

HSR expansion plays of key importance to the 2040 Capital Program, and includes electrified blended service from Sacramento to Merced and through the Inland Empire, as well as HSR service to San Diego.

Intercity rail improvements for 2040 include electrification of express services in both Northern and Southern California, complementing HSR in network hubs with pulsed service schedules to achieve the 2040 Vision.

This includes wide-scale electrification of intercity services in the San Jose-Oakland-Sacramento corridor, Central Valley from Merced to Sacramento, and Inland Empire, from Los Angeles separately to San Bernardino and Riverside, and on to the Coachella Valley. Large investments are identified for a shared second Transbay tube (hosting regional and intercity rail) to improve San Francisco-to-Oakland capacity, and improve overall Northern California network functionality. Complementary services to the HSR expansion are included in both the Sacramento-to-Merced corridor, east-west in the Central Valley, and throughout the Inland Empire. These projects require numerous grade separations and track improvements to support service speeds and safety in identified corridors.

The end result is a modern, energy efficient, and fully integrated statewide network providing the frequent, fast, and pulse scheduled services described in the 2040 Vision. This network will provide seamless service to passengers, and serve as the high-level State investment needed for California to be increasingly economically competitive while true to its environmental and equity goals, improving quality of life across the state.

Table 6.3 catalogs capital costs for projects supporting the integrated statewide network in 2040.

**Table 6.3: 2040 Capital Costs[170]**

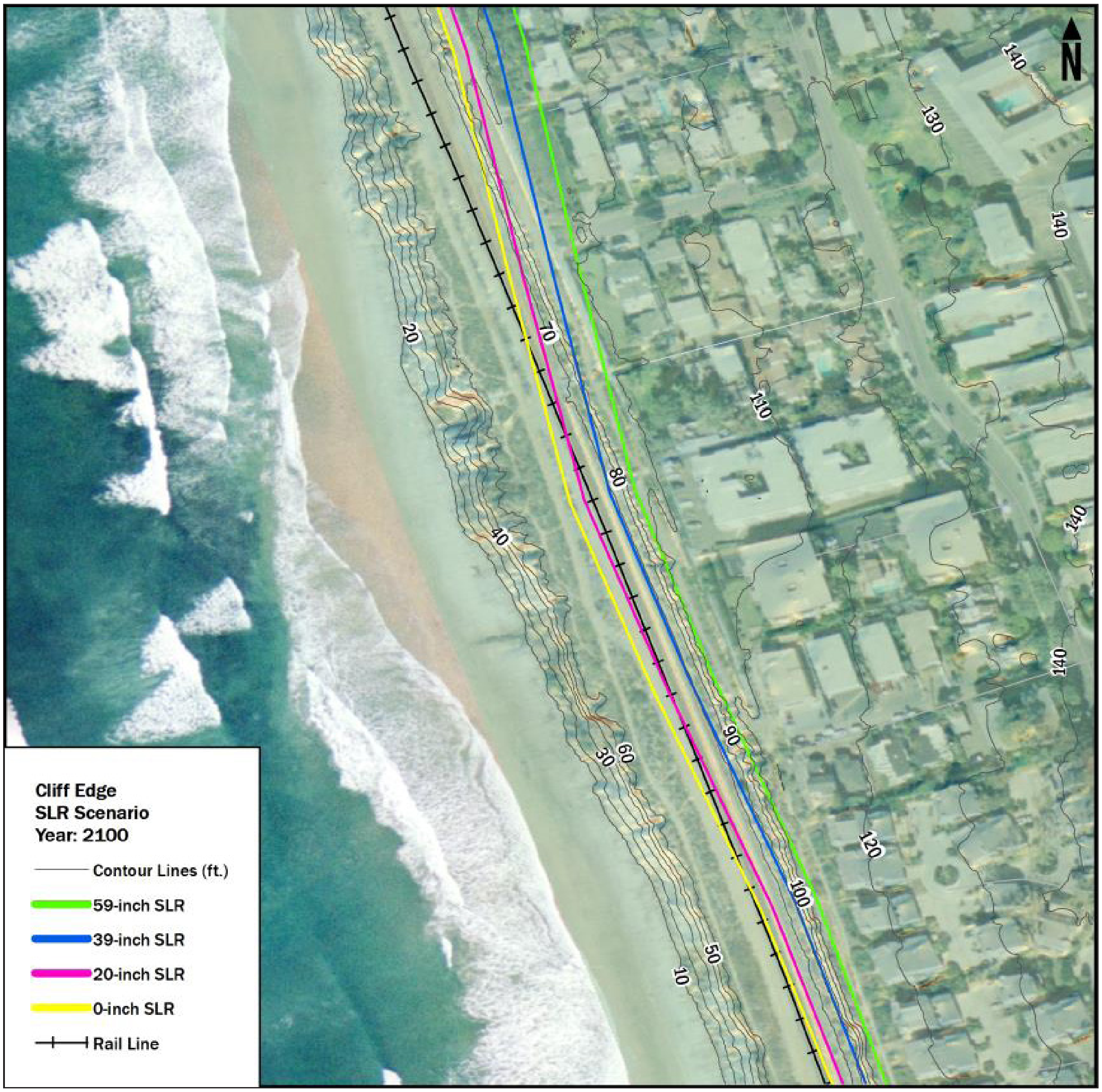
| Planning Area | Capital Cost [thousands $] |
|---|---|
| South Bay Area | $5,000,000 |
| North Bay Area | $18,400,000 |
| Central Valley/Sierra Nevada | $4,900,000 |
| Central Coast | $1,500,000 |
| LOSSAN North | $700,000 |
| Inland Empire | $17,300,000 |
| LOSSAN South | $1,200,000 |
| Statewide | $36,000,000 |
| **Total** | **$85,000,000** |

170 Estimated costs in 2018 dollars. These costs are planning-level estimates and require further study in implementation.

## Del Mar Bluffs

The portion of the San Diego Line in San Diego County is owned by the NCTD, which purchased it from the former Atchison Topeka and Santa Fe Railway (now part of the BNSF) in the late 1980s. The line hosts *Pacific Surfliner* Corridor trains, COASTER commuter trains, and BNSF freight service. A section of the line runs across the Del Mar Bluffs above the Pacific Ocean. On weekdays, about 50 trains, mostly passenger, traverse the Del Mar Bluffs.

As seen in Exhibit 6.9, sea level rise will accelerate erosion of the bluffs, threatening stability and the viability of the route. Indeed, erosion by 2100 could eliminate the rail line completely, as well as adjacent homes, absent preventative measures.




Sources: LiDAR Surface for Contours: NOAA Coastal LiDAR; SLR Retreat Lines: Coastal Storm Modeling System: USGS; Rail Lines: State of California

***Exhibit 6.7: Erosion of the Del Mar Bluffs in San Diego County***

## 6.4 Rail Studies and Reports

### 6.4.1 Coordinating Rail Policies and Plans

The 2022 project list and service goals were developed by reviewing recent and ongoing strategic, vision, and service plans published by stakeholder passenger rail agencies and service providers around the state. Those plans were used to identify near-term goals, and to begin the implementation planning toward the 2040 Vision.

#### Existing Rail Plans

Those plans include, but are not limited to:

- ACE*forward*, 2015
- Amtrak FY2015 Budget and Business Plan, 2015
- Amtrak Strategic Plan 2014-2018
- BART Sustainable Communities Operations Analysis, 2013
- Bay Area Council Economic Institute – The Northern California Megaregion, 2016
- Caltrain Strategic Plan, 2014
- Capitol Corridor Business Plan, 2015
- CCJPA Business Plan FY 2015-2017
- CCJPA Vision Plan, 2014
- CHSRA 2016 Business Plan
- CTC Annual Report to the California Legislature, 2014
- FRA Southwest Multi-State Rail Planning Study, 2014
- LA Metro Long Range Transportation Plan, 2009
- LOSSAN Rail Corridor Agency Business Plan FY 2015-2017
- Monterey Bay – 2035 Metropolitan Transportation Plan / Sustainable Communities Strategy, 2014
- NCTD Comprehensive Strategic Operating and Capital Plan FY 2016
- Sacramento Regional Transit District – Strategic Plan 2015-2020
- SCAG – Regional Transportation Plan / Sustainable Communities Strategy, 2012
- SFMTA Strategic Plan FY 2013-2018
- SJJPA 2015 Business Plan
- TAMC 2014 Monterey County Regional Transportation Plan
- VTA – VTP2040

### 6.4.2 Environmental Policy

Freight and passenger rail implementation can bring tremendous positive environmental and economic benefits to the State. They can also impact communities and the natural environment. The most common effects include contribution to air pollution and GHG emissions, and physical impacts such as noise and light pollution.

As mentioned in Chapters 1 and 3; in recent years, California has enacted several laws and executive orders to reduce climate change–inducing GHG emissions through efficient land use and transportation planning, increased energy efficiency, and other actions.

Executive Order S–3–05, signed in 2005, established State GHG emission reduction targets to reduce California's contribution to global climate change. The Global Warming Solutions Act, AB 32, signed into law in 2006, expanded on these goals. It requires that California's GHG emissions be reduced to 1990 levels by the year 2020 (Chapter 488). AB 32 is a multi-sector, interdisciplinary approach to reducing GHG emissions in the State. In accordance with its responsibilities under AB 32, the CARB adopted a *Scoping Plan* in December 2008 (readopted in August 2011) that quantified the statewide GHG emission reduction target, and identified reductions that would result from specific programs. This included the HSR project, which is expected to reduce GHG emissions by 1 million metric tons annually in CO2 equivalent. Other related legislative bills outline individual regulations for specific sectors.

SB 375 – the Sustainable Communities and Climate Protection Act of 2008 – promotes integrated transportation and land use planning to reduce GHG emissions from passenger vehicle travel, and help California meet AB 32 goals. SB 375 requires CARB to develop regional GHG emissions reduction targets for passenger vehicle travel, setting benchmarks in 2020 and 2035 for each of the State's 18 MPOs. SB 375 requires that California's MPOs each draft an SCS as part of their RTP, which describes the transportation and land use strategies the MPO regions will use to meet the regional GHG emissions reduction targets established by the CARB.

Although SB 375 has a regional focus, SB 391 highlights the critical roles that Caltrans and other State agencies play in addressing interregional travel issues, including the reduction of GHG emissions associated with interregional travel. The California Interregional Blueprint (CIB) defines strategies to address interregional travel needs, while ensuring that CTP 2040 identifies statewide policies and investment priorities needed to support the State's GHG emission reduction goals. These goals include reducing GHG emissions to 80 percent below 1990 levels by 2050, as called for in Executive Order S-3-05.

### 6.4.3 Future Planning Studies

The Rail Plan is ultimately an iterative strategic document. It will be updated every 4 years, scaled and adjusted as the State rail network is built out, and as market factors and other key indicators, like climate change, dictate. Undoubtedly, the scope and detail of specific services and projects will continue to be refined in future revisions to this document. Ongoing planning studies are particularly important to integrating networks to ensure the right investments are being made, in the right markets, at the right time. When done properly, thorough and consistent planning will guide State policymakers and regional stakeholders through the ongoing process of optimizing current investments, and scaling appropriately toward an effective and integrated regional and statewide network.

While capital rail improvements and studies across the state are ongoing, the Rail Plan intends to conduct planning studies with the help of local and regional partners in the Rail planning regions; to be completed in the near-term (2022) time horizon for possible project implementation, either in the mid- or long-term time horizons.

#### Statewide

- **Statewide Grade Separation Corridor Prioritization Study.**
  Although Caltrans and the CPUC put out an annual lists of prioritized grade separation projects, an additional study or criteria is needed to consider grade separations not as stand-alone safety or traffic relief projects, but rather as rail corridor based projects. When organized and pursued strategically as part of an identified corridor, grade-separation projects can dramatically improve rail capacity and passenger service.
- **Statewide Inter-Agency Service Integration Plan**
  The 2040 Vision describes in great detail the types and intensities of service to be provided in various corridors around the state. However, more study is needed to make recommendations on rail governance and service integration to ensure that the various rail providers can proactively align and scale their services as the statewide network comes online.
- **Study of Potential Future Freight Rail Impacts Related to 'Self-Driving' Trucking Technology**
  The Rail Plan is written in a dynamic time for new technology in the trucking industry. A number of private-sector efforts are under way to bring various self-driving or driverless vehicle technologies to trucking. These technologies are in relatively early stages of development, and exist on a spectrum from advances in driver assistance like automatic braking capabilities, to "platooning," where one or more driverless trucks automatically follow a traditional human-driven truck, to full automation of truck operations. The ultimate adoption and scalability of these technologies is unknown, but could have major impacts on the freight rail industry, including potential traffic diversions. A comprehensive study is needed to understand the opportunities and challenges these technologies may present for the rail industry; where and how the technology would be applicable in ways that compete or complement freight rail; potential impacts on highway maintenance resulting from new trucking volumes (some arising from diversions from rail); and the ways in which the State can plan for infrastructure investments accordingly.

# APPENDIX 2

## Excerpts from 2012 LOSSAN Corridorwide Strategic Implementation Plan

# LOS ANGELES-SAN DIEGO-SAN LUIS OBISPO

# CORRIDORWIDE STRATEGIC IMPLEMENTATION PLAN

# LONG-TERM BUSINESS CASE OPERATIONS ANALYSIS

## TECHNICAL MEMORANDUM

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**March 1, 2012**

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# 1.0 EXECUTIVE SUMMARY

In January 2010, a Strategic Assessment of the Los Angeles-San Diego-San Luis Obispo (LOSSAN) Rail Corridor was completed that included an initial proposal for near-term, mid-term, and long-term passenger rail service improvements for the Corridor. (See Figure 1.0.1 for a map of the LOSSAN Corridor.) The LOSSAN Joint Powers Board (JPB) is currently undertaking the next phase of work, the preparation of a Strategic Implementation Plan, which includes the development of a business case for future service alternatives. The goals established for the Corridorwide Strategic Implementation Plan study are to:

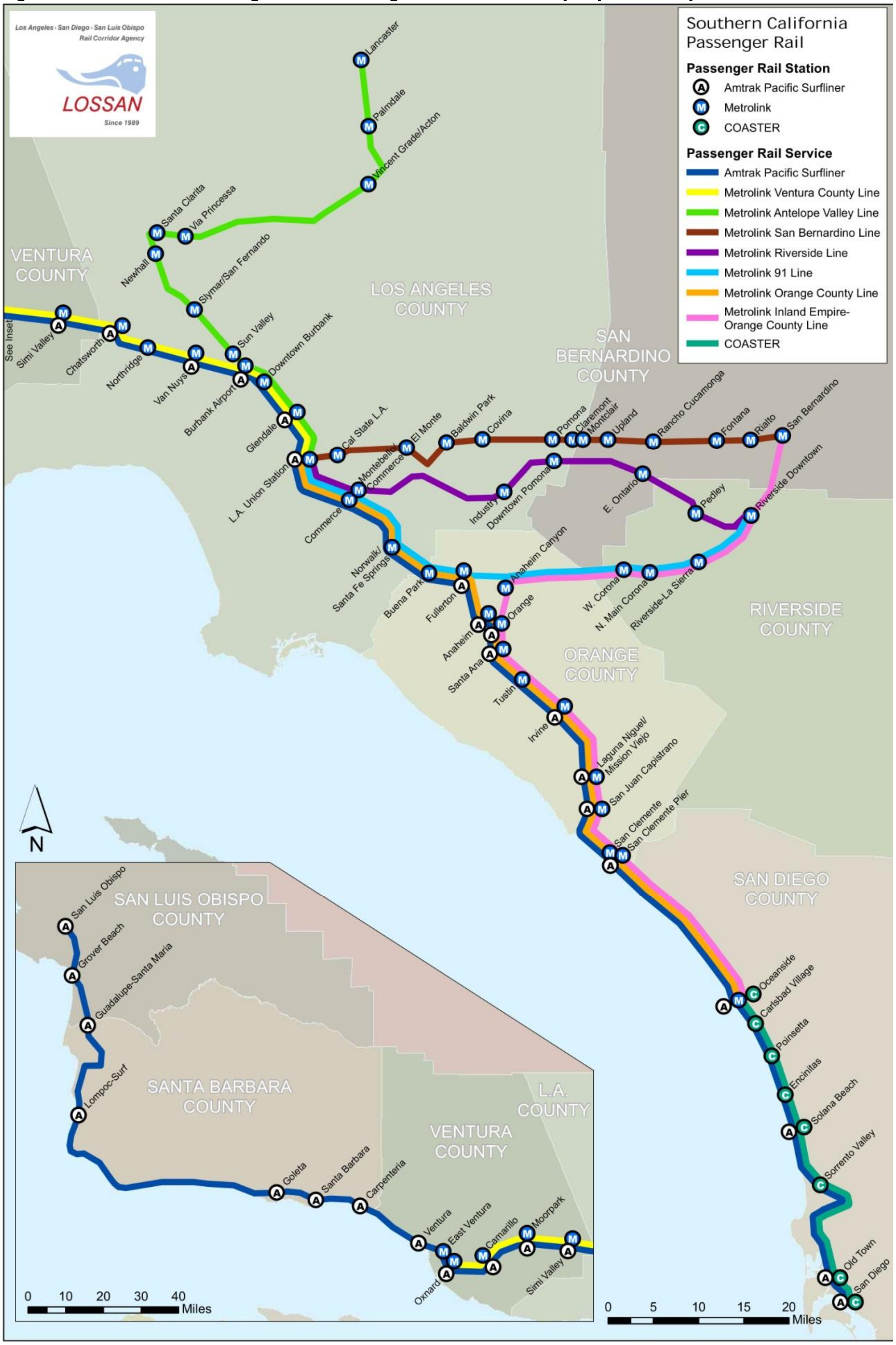
- Collectively provide for the necessary infrastructure to support more peak period trains, faster through-express trains and additional service improvements that meet current and future rail service demands both north and south of Los Angeles Union Station.
- Integrate and implement a regional fare policy and develop a common fare media that is based in part on early implementation lessons in the corridor (electronic revenue collection).
- Integrate and/or coordinate operations and develop more efficient operating schedules and dispatching for corridor services.
- Implement a strategy for seamless rail travel in the corridor.
- Collaborate to identify and establish new services for un-served and underserved markets.
- Integrate and improve traveler information and standardized to the extent possible.
- Coordinate with Long-Distance Passenger Rail and connecting Motorcoach Services.

The purpose of this report is to evaluate and report on the rail operations modeling results and capital needs identification in support of the business case for the Strategic Implementation Plan, which focuses on the addressing the first and third goal identified above.

The business case that has been defined and will be agreed to by the Corridor agency members of the LOSSAN JPB for the long-term (2030) is, in part, dependant on the results of modeling the projected ridership, service and operational scenarios. Three scenarios were identified for ridership and service/operations modeling that focused on assumed terminal and connection locations for the proposed high speed train (HST) system as described in the California High Speed Train Project (CHSTP) and how conventional passenger rail operations (ie. Metrolink, COASTER and Amtrak) could better facilitate rail to rail connections with the statewide HST network. These scenarios included:

- *Version 1: No High Speed Train Service* – In this version, no high speed train (HST) service is assumed in the Los Angeles or San Diego Metropolitan regions. This version would be based on the service levels and stopping patterns agreed to by the Project Working Group (PWG) for the Pacific Surfliner, Metrolink and COASTER. This version will assume the completion of the infrastructure projects identified by the Project Working Group (PWG) as "likely" for each county.
- *Version 2: HST Blended Service* – This version assumes HST service will terminate in the San Fernando Valley and assumes as its base, the infrastructure and service plan assumptions identified in Version 1.. This analysis will then "build" off of Version 1 to address the anticipated capacity and service levels increases associated with the extension of the HST into the Los Angeles metropolitan region.
- *Version 3: Dedicated Passenger Track* – This version assumes the extension of the HST service to Anaheim. For this version, it was assumed that a new 2-track dedicated passenger corridor would be constructed between Los Angeles and Fullerton to be shared by the HST, Pacific Surfliner and Los Angeles-Orange County commuter trains. South of Fullerton to Anaheim, an upgrade to the existing track and corridor was assumed to support the joint operation of HST, Pacific Surfliner and Los Angeles-Orange County commuter operations.

**Figure 1.0.1 - The Los Angeles-San Diego-San Luis Obispo (LOSSAN) Rail Corridor**



A concept level analysis of passenger rail operations along the LOSSAN Corridor was conducted on the Version 1 scenario to assess the feasibility of the assumed 2030 service plan to maintain or improve operational flexibility, reliability, performance, and capacity for rail operations along the Corridor.

Service level assumptions were based on increases identified as feasible from a policy and funding standpoint for COASTER, Metrolink and Amtrak's Pacific Surfliner, and agreed to by the PWG. It should be noted that the 2030 service levels presented for this analysis may not currently be covered in the operators' financially-constrained long-term funding scenarios. Operating assumptions for this analysis also included a consolidated rolling stock/equipment cycle plan for COASTER and Metrolink trainsets to address the vehicle fleet needs for "through" commuter service operating between Los Angeles, San Diego and Riverside Counties without the need for transfers. The service planning goals established for this operations analysis by the PWG included:

- Additional commuter and intercity services consistent with state and regional plans
- Additional through-commuter service between Los Angeles and San Diego
- Introduction of the Coast Daylight service between Los Angeles and San Francisco
- Additional commuter service between Ventura and Santa Barbara
- New San Diego stops at Intermodal Transportation Center, Del Mar Fairgrounds, and Convention Center
- Express COASTER service
- Peak period intercity trains converted to limited stop express services
- Integration of future high-speed train service

An initial service plan was developed and presented to the PWG for review and approval prior to being applied in the simulation model for validation against the assumed 2030 infrastructure.

The simulations conducted for this analysis included 30 infrastructure improvements with a combined estimated total cost of $2.037 billion in current dollars, which can feasibly be funded by 2030. These projects are distributed throughout the rail corridor as follows:

- 14 projects in San Diego County with an estimated total cost of $883 million
- 3 projects in Orange County with an estimated total cost of $105 million
- 4 projects in Los Angeles County with an estimated total cost of $844 million
- 5 projects in Ventura County with an estimated total cost of $115 million
- 4 projects in Santa Barbara and San Luis Obispo Counties with an estimated total cost of $90 million

The 2030 Long-Term service plan was modeled using the Berkeley Simulation Software Rail Traffic Controller (RTC) to determine the feasibility of the assumed infrastructure to support the desired future train volumes.

The initial service plan as presented to the PWG was found to be infeasible due to the sections of single track that were assumed to remain in place south of Los Angeles. Completing a second track along the entire length of the Corridor is not envisioned to be feasible by 2030, given the number of environmentally and politically sensitive areas; consequently, a number of iterations to the service plan were tested to identify a service pattern that could feasibly operate along the corridor given the infrastructure assumptions assumed by the PWG. Overall, this revised service plan was able to achieve most of the original service goals and was found to be feasible assuming a few additional infrastructure recommendations, which included:

- Extension of Serra siding in Orange County south approximately 1 mile into Dana Point

- Extension of double track north of Control Point (CP) San Onofre in San Diego County by approximately 1.3 miles

A number of train movement conflicts were observed along the BNSF Railway (BNSF) San Bernardino Subdivision (CP Soto to Fullerton Junction), many of which could potentially be mitigated through dispatching changes, where trains are dispatched differently than presented in the simulation model. Such changes to dispatching could include pocketing freight trains for overtakes or reverse running passenger trains along segments of the corridor, where passenger trains operate on the opposite track than they typically would. In the latter case, effective public address systems and message boards and/or signage would be needed to ensure passengers are aware of the change in advance.

However, dispatching changes may not be possible for all observed conflicts and additional infrastructure may be necessary to help address some of the conflicts related to the “backup” of freight trains waiting to enter into Hobart or Commerce intermodal yards. It is important to note that these two yards are located on the San Bernardino Subdivision, which is owned and operated by the BNSF and is their primary transcontinental corridor connecting the Ports of Los Angeles and Long Beach (via the Alameda Corridor) with the rest of the country. A portion of this subdivision is included within the LOSSAN Corridor and supports the operation of Amtrak’s Southwest Chief and Pacific Surfliner trains and Metrolink’s Orange County and 91 Line trains.

Despite the recommended infrastructure projects summarized above, the remaining sections of single track assumed in 2030 south of Los Angeles, located in San Juan Capistrano, San Clemente and Del Mar, will also continue to create challenges for operators as they attempt to keep trains running on time in order to make their meets. Any deviation from the train schedules, including late yard departures, signal problems, or rolling stock mechanical issues, could cause cascading delays along the Corridor, including to the segment north of Los Angeles.

As with the southern portion of the Corridor, the initial service plan for the northern segment, as presented to the PWG, was found to be infeasible given the numerous sections of single track that remained. The results of the modeling and analysis indicated that in order to reliably operate this initial service plan, between 18 and 20 miles of additional double track between Los Angeles and San Luis Obispo would be required, in addition to the projects already identified by the PWG.

The full extent of additional double track needed to reliably operate these service levels is not envisioned to be feasible to construct by 2030 given the expected limitations on funding and the number of environmentally and politically sensitive areas. Consequently, a number of iterations to the service plan were tested in the model to identify a service plan that could feasibly operate along the Corridor given the infrastructure assumptions assumed by the PWG. Overall, this revised service plan was found to be feasible assuming several additional infrastructure improvements, including approximately 9 to 12 miles of new double track and several station modifications north of Los Angeles, in addition to the projects already identified by the PWG. These additional infrastructure improvements are detailed in Section 6.0 of this Analysis and were tested through the iterative modeling process.

# 2.0 INTRODUCTION

The long term operations analysis was prepared in collaboration with the Los Angeles-San Diego-San Luis Obispo (LOSSAN) Technical Advisory Committee (TAC) and Project Working Group (PWG). This report presents the results of the analysis performed on the proposed service plan for 2030. The purpose of this analysis is; 1) to develop a workable passenger rail service plan for 2030, and 2) to identify the infrastructure requirements needed as service increases.

The business case that has been developed and agreed upon by the Corridor agencies for the long-term (2030) involves the modeling of both ridership and operational scenarios. Three scenarios were developed for ridership and operations modeling that focused on assumed terminal and connection locations for the HST and methods by which conventional passenger rail operations (i.e. Metrolink, COASTER and Amtrak) could better establish "rail to rail" connections with the statewide HST network. These scenarios included:

- *Version 1: No High Speed Train Service* – In this version, no high speed train (HST) service is assumed in the Los Angeles or San Diego Metropolitan regions. This version would be based on the service levels and stopping patterns agreed to by the Project Working Group (PWG) for the Pacific Surfliner, Metrolink and COASTER. This version will assume the completion of the infrastructure projects identified by the Project Working Group (PWG) as "likely" for each county.
- *Version 2: HST Blended Service* – This version assumes HST service will terminate in the San Fernando Valley. This version will focus on the potential increase in conventional intercity and commuter service levels and infrastructure capacity (as compared to Version 1) that may be necessary to operate a reliable feeder/distributer service to connect the LOSSAN Corridor with the southern terminus of the initial HST dedicated alignment in the San Fernando Valley.
- *Version 3: Dedicated Passenger Track* – This version assumes the extension of the HST service to Anaheim. For this version, it was assumed that a new 2-track dedicated passenger corridor would be constructed between Los Angeles and Anaheim Fullerton to be shared by the HST, Pacific Surfliner and Metrolink Los Angeles-Orange County Line commuter trains. South of Fullerton to Anaheim, , and an upgrade to the existing track and corridor was assumed to support the joint operation of HST, Pacific Surfliner and Los Angeles-Orange County commuter operations. Freight service and the Metrolink Perris Valley and 91 Line trains would continue to operate on the existing BNSF Railway (BNSF) triple track alignment between Fullerton and Los Angeles. This version has already been studied in part between Los Angeles and San Diego as part of the California High Speed Train Project (CHSTP). North of Los Angeles, the infrastructure presented in Version 1 would be assumed since the HST is anticipated to be on its own dedicated alignment. South of Anaheim, it is again assumed that the conventional passenger trains would operate on the infrastructure presented in Version 1, since the HST is not anticipated to operate further south than Anaheim on the LOSSAN Corridor.

The PWG requested that the California High-Speed Rail Authority take the lead in completing the operations analysis for Versions 2 and 3. The analysis for Version 2 is pending further development of the proposed high-speed rail service plan for southern California and therefore not included in this document. A previous analysis performed along the LOSSAN corridor between Los Angeles and San Diego already assumed the infrastructure identified in Version 3, and were included in the Draft of the Los Angeles to San Diego Rail Corridor Service Rationalization Analysis Report completed in February 2010. However, additional simulations or analysis may be necessary to determine the operational feasibility of service north of Los Angeles under this Version.

This report presents a summary of the analysis conducted on the Version 1 scenario. This scenario was selected for initial analysis by the PWG in order to provide a "base case" in comparing the potential service plan and infrastructure modifications required to support operations under the Version 2 and 3 scenarios.

# 3.0 SERVICE DESIGN CRITERIA

This section outlines the guiding principles that provided the basis for the service design of the three scenarios for long term, implementable service increases along the LOSSAN Corridor. The following criteria were defined based on the direction provided by the PWG and TAC.

- Most peak period Pacific Surfliner trains become limited stop trains between Los Angeles and San Diego. Stops are San Diego, Solana Beach, Oceanside, Irvine, Anaheim, and Los Angeles.
- One round trip Pacific Surfliner train north of Los Angeles becomes limited stop. All other Pacific Surfliner trains have a new stop at Moorpark.
- Fullerton remains a shared stop between commuter and intercity passenger trains. Norwalk remains a commuter station only.
- Because of the higher level of commuter rail service, Pacific Surfliner trains no longer serve Laguna Niguel or Orange stations. San Juan Capistrano remains a Surfliner stop.
- Limited stop Commuter service can be allowed between Fullerton and Los Angeles, alternating between Orange County Line and Perris Valley Line trains.
- Limit commuter operations between Ventura and Santa Barbara Counties to 2 equipment sets
- Commerce station to remain with service provided by a limited number of Orange County Line commuter trains.

# 4.0 SIMULATION MODEL APPLICATION

The Berkeley Simulation Software Rail Traffic Controller (RTC) model (the Model) was selected as the platform on which to conduct the operations analysis for the LOSSAN Corridor Business Case. The Model was selected because it provides a variety of analytical and reporting capabilities encompassing the range of information required for this analysis and realistically simulates higher-speed train operations in a mixed-use operational environment (intercity, commuter and freight services). The advantage of the Model is that it is designed as a flexible tool that can be further modified, refined and upgraded as needed to evaluate different operational and infrastructure assumptions and configurations.

Referencing the service design criteria established by the members of the LOSSAN TAC and PWG, as well as the BNSF and Union Pacific Railroad (UPRR) train count information, the Model was used to simulate a 2030 service scenario operating on the assumed infrastructure envisioned to be complete by 2030 on the LOSSAN Corridor.

The Model accurately simulates passenger and freight operations based on train set performance characteristics along a specified corridor, including different geometric parameters and infrastructure configurations.

# 5.0 INPUT & ASSUMPTIONS

This section identifies the principal inputs and assumptions used to develop and simulate the service scenario for 2030. The key inputs and assumptions include:

- Train Performance Characteristics
- Infrastructure Assumptions
- Operating Assumptions and Service Plan

## 5.1 TRAIN PERFORMANCE CHARACTERISTICS

Train set performance characteristics and consist composition define the type of rail vehicle fleet that will be used in the services along the Corridor. For this model case, these parameters were based on the existing consists and train set equipment, as follows:

- For commuter services, trains are powered by General Motors F59PHI and Motive Power MP36PH locomotives capable of achieving maximum operating speeds of 110mph and 90mph, respectively.
- For intercity services, trains are powered by General Motors F59PHI locomotives capable of achieving a maximum operating speed of 110mph.
- For freight services, trains are powered by a range of motive power, typically the General Electric Dash 9-44CW and General Motors GP-38 locomotives capable of achieving maximum operating speeds that approach 70mph.

For purposes of simulating the cases described above, the train set performance characteristics (i.e. tractive effort curve, braking effort curve, weight, etc.) were based on representative consists as agreed upon by the PWG, Metrolink, Amtrak, or COASTER operations staff for each passenger and freight train classification. These configurations are conservative assumptions that are representative of typical consists currently operating on or planned to be operated on the Corridor. Specific consist assumptions are described in more detail under the Operational Assumptions section of this chapter.

## 5.2 INFRASTRUCTURE ASSUMPTIONS

The PWG defined infrastructure improvements that could feasibly be funded prior to, and constructed by, 2030. These projects were identified by the PWG and incorporated into the model for purposes of simulating their effect on operations under the 2030 service plan. The specific configuration(s) of these projects were conceptualized using the best railroad design practices for the region, since many had not yet been designed or gone beyond conceptual engineering. A summary of the infrastructure improvements that have been coded into the RTC model and simulated as part of this long-term operations analysis is presented below.

### 5.2.1 San Luis Obispo County

*CTC Installation*

Currently, rail traffic along most of the corridor in San Luis Obispo County is dispatched using Track Warrant Control (TWC). Turnouts for sidings in this section are typically hand operated or spring switches (not powered), which require additional time to allow the train crew to manually align switches to correctly route trains into sidings during meets with trains operating in the opposing direction.

The installation of Centralized Traffic Control (CTC) will establish remotely controlled power switches that provide expeditious access to the sidings used for meets between trains, improving the overall safety, travel time and reliability of operations between Santa Barbara and San Luis Obispo.

### 5.2.2 Santa Barbara County

*Island CTC Installation*

As with San Luis Obispo County, rail traffic north of the Santa Barbara Station is dispatched using Track Warrant Control (TWC). Turnouts for sidings in this section are typically hand operated or spring switches (not powered), which require additional time to allow for the train crew to manually align switches to correctly route trains into sidings during meets.

The installation of “islands” or “pockets” of CTC will establish remotely controlled power switches that provide expeditious access to the sidings used for meets between trains, improving the overall safety, travel time and reliability of operations between Santa Barbara and San Luis Obispo. Those locations where “islands” of CTC were assumed to be constructed are based on the list of projects presented in the *LOSSAN North Corridor Strategic Plan* (completed in October 2007), and includes:

- Capitan Siding
- Concepcion Siding
- Honda Siding
- Tangair Siding
- Narlon Siding
- Devon Siding
- Waldorf Siding
- Guadalupe Siding

*North Goleta Station and Siding*

This project envisions the construction of a new “stub-ended” station track on the west side of the existing Elwood siding, located about 1 mile north (railroad west) of the current Goleta Amtrak Station. This new station is intended to be the northern terminal of the proposed Ventura-Santa Barbara commuter rail service. This facility is expected to better serve the businesses and office parks in north Goleta, by having a station located within better proximity to these employment centers. The siding associated with this station would provide a location for trains to turn or layup during the midday, allowing them (the trains) to remain “clear” of the UPRR mainline. For this study, it is assumed that the siding would be long enough to store up to two 5-car passenger trainsets.

*Ortega Siding*

The Ortega Siding is located approximately 6 miles south of the Santa Barbara Amtrak Station. This siding was taken out of service following damage sustained during severe weather, but has remained a stub track facing toward north (railroad west). This project would rebuild the siding as a new 2-mile double-ended controlled siding where trains can meet and pass between the Carpinteria and Santa Barbara Stations. This would provide needed capacity and operating flexibility to what is currently constrained by 15 miles of continuous single-track territory with no passing sidings.

### 5.2.3 Ventura County

*CP Las Posas to MP 423 Second Main Track*

This project would extend the existing Moorpark Siding north (railroad west) by approximately 3.5 miles to the Milepost 423. In order to allow more than 1 train to occupy each track within the extended siding at this location, new intermediate signals would be installed west of the Moorpark Station. This is expected to improve the reliability of the rail service by reducing the length of the existing single-track section while potentially improving the travel time. This would facilitate reducing the amount of schedule ”pad” that is currently in place to compensate for delays that may occur as a result of late trains operating on the single track segment.

*Leesdale Siding Extension*

As the initial phase of a continuous second main track construction between Camarillo and Oxnard Stations, this project envisions the upgrade to the existing 3,700 foot long Leesdale Siding, which is currently accessed with hand-thrown turnouts, and extending the siding southward (railroad east) by 1.5 miles to Las Posas Road. This siding modification would also install high-speed remotely controlled power switches at each end of the extended siding. It is assumed that this project will increase the track capacity in this section by improving the reliability of rail service as a result of improved timeliness of meets and passes between the existing sidings near the Camarillo Station and Oxnard Stations.

*Oxnard to Camarillo Second Main Track*

This project would be Phase 2 of the second main track construction that connects the existing sidings at the Camarillo Station and Oxnard Station. It (the project) would connect the Camarillo, Leesdale, and Oxnard sidings and create approximately 9 miles of continuous double-track through Ventura County. As a part of this project, a universal crossover would be installed north of the Camarillo Station for additional operational flexibility.

*Seacliff Siding Extension and Curve Realignment*

The Seacliff siding project would extend the existing 1 mile long Seacliff siding north (railroad west) to MP 383.8 to provide approximately 2.5 miles of second main track. This project would include the realignment of a curve near MP 384.5 to allow for additional speed increases in this section and to minimize the impacts of storm run-off.

### 5.2.4 Los Angeles County

*Los Angeles Union Station (LAUS) Run-Thru Tracks*

Currently, the track layout for Los Angeles Union Station (LAUS) is based on the original 1939 stub-ended terminal configuration where all trains serving the station arrive and depart through the same set of tracks, requiring every train that serves LAUS to “turn”. This stub-ended layout requires additional tracks compared to that of a through-running configuration (with similar service levels) because of the additional time required for trains to occupy station platform tracks (during the turnaround process). The Union Station Run-Thru Tracks project would construct a new approach to the station from the south (over US Route 101) and provide a connection to the existing platform tracks from 3 through 6. This would reduce the overall dwell time at the station for through trains (i.e. Pacific Surfliner trains or through-routed Metrolink trains), making additional capacity available to service the projected increase in train volumes in 2030. It should also be noted that work is underway by the California High Speed Rail Authority (CHSRA) and the Los Angeles County Metropolitan Transportation Authority (LA Metro) on a LAUS Master Plan. Once complete, this document may recommend additional changes to the track or platform configuration of the station.

*CP Raymer to CP Bernson Second Main Track*

The segment of the Corridor between CP Raymer (MP 453.1) and CP Bernson (MP 446.8) is one of the last remaining segments of single track on Metrolink’s Ventura County Line in the San Fernando Valley and is recognized as an existing bottleneck location for the LOSSAN North Corridor. As part of this project, modifications to the Northridge station would be necessary to construct a new platform to serve the new second track.

*Van Nuys Station Second Platform*

The Van Nuys Station is currently located along a double track section of the Corridor; however, there is only one station platform. As a result, this section of the corridor is operated as if it were a single track segment since trains operating in both directions must "share" the same platform. This project assumes the construction of a second platform at the current location of the Van Nuys Station.

It should be noted that an existing UPRR freight yard is located immediately opposite the existing station that could potentially restrict the ability to expand the existing station. Should future studies conclude it to be infeasible to expand the existing station, additional solutions will need to be identified that could include relocating the Van Nuys Station to an alternate location in the future.

### 5.2.5 Orange County

*Laguna Niguel to San Juan Capistrano Passing Siding*

The remaining single track segments in south Orange County are some of the largest remaining bottleneck locations for the southern portion of the LOSSAN Corridor. This project would be the first step in addressing the capacity issue associated with the single track in Orange County by constructing a passing siding immediately south of the existing CP Avery. This siding would be about 1.8 miles in length and provide a location for trains to meet between the existing Serra Siding and the current southern termination point of double track at Laguna Niguel. The siding would end prior to reaching the developed area of the historic district in the City of San Juan Capistrano.

*Irvine 3rd Main Track Extension*

This project would provide an 8.5-mile long section of triple track in the "heart" of Orange County. The segment would be located between the Red Hill Avenue crossing in the City of Tustin and CP Bake in the City of Lake Forest. The passenger platforms at Irvine and Tustin Stations also would be modified to provide access/egress to and from the new third main track. This length of triple track will be capable of supporting limited stop service, overtakes, and short-turning of trains off the mainline.

*Anaheim Canyon Station Double Track*

While not on the LOSSAN Corridor, the double tracking of the Anaheim Canyon Station provides significant benefit to the LOSSAN Corridor. Located along Metrolink's Olive Subdivision, this station improvement would provide a capacity improvement to the Olive subdivision, which connects Riverside with Orange and San Diego Counties. Currently, the Olive Subdivision is single track, which means that trains would need to wait on either end of the subdivision for opposing trains to clear. This configuration has the potential to cause delays on the LOSSAN Corridor, as trains are "held" in Orange. With the assumed increase in service of the Inland Empire – Orange County (IEOC) Line trains between Riverside, Orange and San Diego Counties, providing additional capacity to the Olive Subdivision will be important to maintaining the operational reliability of the LOSSAN Corridor.

### 5.2.6 San Diego County

*CP San Onofre to CP Pulgas Double Track*

This project envisions the construction of a second main track between CP San Onofre (MP 212.3) and CP Pulgas (MP 218.3) eliminating the single-track section between 2 existing sidings. As a part of the project, CP Pulgas is assumed to be relocated to the mid-point of this new double-track section near MP 216.4 and converted to a control point (CP) with a universal crossover.

*CP Eastbrook to CP Shell Double Track*

This double tracking project also includes the replacement of an existing aging single-track ballast-deck-through-girder bridge over the San Luis Rey River near the Oceanside Station. In combination with the CP San Onofre to CP Pulgas Double Track Project, completion of this improvement would establish a fully double tracked railroad between CP Songs (MP 209.2) and the Oceanside Station, a distance of over 18 miles. As a part of this project, CP Shell is assumed to be upgraded to a control point (CP) with a universal crossover that allows trains to traverse between main tracks as they arrive at or depart from the Oceanside Station.

*Carlsbad Village Double Track*

This project assumes the completion of the second main track between CP Longboard (MP 228.4) and CP Carl (MP 229.5). Since conceptual designs for this project were not available at the time of this analysis, the following assumptions were made with regard to the infrastructure configuration:

- A second passenger platform would be constructed at the Carlsbad Village COASTER Station.
- CP Longboard would be "retired", with a new left-hand crossover to be located at CP Escondido Junction.

*CP Ponto to CP Moonlight and CP Moonlight to CP Swami Double Track*

These projects envision the completion of the second main track through the City of Encinitas between CP Ponto (MP 234.5) and CP Swami (MP 238.0). Since conceptual designs for these projects were not available at the time of this analysis, the following assumptions were made with regards to the infrastructure configuration:

- A second passenger platform would be constructed at the Encinitas COASTER Station
- A new control point (CP) with a universal crossover would be installed near Leucadia Boulevard in the City of Encinitas.

*CP Cardiff to CP Craven Double Track*

This project assumes the completion of the second main track between CP Cardiff (MP 239.6) and CP Craven (MP 241.1). Since conceptual designs for this project were not available at the time of this analysis, the following assumptions were made based on previous discussion with NCTD staff.

- CP Craven would be "retired" and a single left-hand crossover would be constructed at the current location of CP Cardiff.

*San Dieguito Bridge Double Track*

This project envisions the replacement of an existing single-track trestle over San Dieguito Bridge with a new double-track bridge. When complete, this improvement would extend the second main track from CP Valley (MP 242.2) south (railroad east) to CP Crosby (MP 243.3). It was assumed that the existing Del Mar Siding would remain as a controlled siding at its current location. A seasonal Del Mar Fairgrounds platform was not assumed as part of this infrastructure assumption since only year-round stops were included.

*Sorrento to Miramar Phase 2 Double Track*

This improvement would be Phase 2 of the project to complete the double-tracking along the Sorrento grade between CP Pines (MP 249.8) and CP Miramar (MP 252.9).

*CP Tecolote to CP Friar Double Track*

This project would close the existing double-track "gap" between CP Tecolote (MP 263.2) and CP Friar (MP 264.1) near the Old Town Station. When completed, this improvement would be a part of a 19.5-mile continuous double-track section from Sorrento Valley and downtown San Diego.

*San Diego Airport Intermodal Transportation Center*

A proposed intermodal station presented by the San Diego Association of Governments would have a new station constructed approximately 1.8 miles north of the Santa Fe Depot in downtown San Diego to service travelers arriving or departing from the San Diego Airport. This station would be serviced by both commuter and intercity rail operations.

*San Diego Convention Center Station*

A proposed extension of limited commuter service presented by the San Diego Association of Governments (SANDAG) and NCTD would have some trains extending south of the Santa Fe Depot in downtown San Diego (the current terminus of passenger rail service) to a new San Diego Convention Center station located approximately 0.70 miles south of the Santa Fe Depot along Harbor Boulevard.

## 5.3 OPERATIONAL ASSUMPTIONS

Before preparing the service plans capable of supporting feasible long-term service increases in the LOSSAN Corridor, basic operational assumptions were identified to help form the foundation from which all the scenarios were developed. These assumptions included:

- Projects that could feasibly be funded and constructed by 2030 will be assumed as part of the infrastructure for the long-term scenario.
- Maximum length of "work day" for one crew cannot exceed 11 hours and 59 minutes.
- Crews report "on duty" 30 minutes before the initial departure from the lay-up yard.
- Minimum terminal turnaround time between two revenue-service trips is 15 minutes.
- Timetables represent weekday operations only along the LOSSAN Corridor.
- UPRR freight train movements are based on discussions and data obtained from observations made at the Metrolink Operations Center (MOC) in Pomona, California on June 30, 2011 and increased at an assumed rate of 2% per year until 2030.
- BNSF freight train movements are based on data obtained from observations made over a 24-hour / seven day week period in May 2007, and increased at an assumed rate of 2% per year until 2030. This assumed rate increase is consistent with previous studies conducted along the LOSSAN Rail Corridor that included freight operations.

### 5.3.1 Service Increase Assumptions

The service increases that were assumed in the service scenario and simulated in the model represent only weekday services and are based on the Service Design Criteria, outlined in Section 3.0 of this report, and agreed to by the TAC and PWG. The service increase assumptions that were modeled as part of this analysis are summarized on Table 5.3.1. Continuous coordination and collaboration occurred with the three passenger rail operators (Amtrak, Metrolink and COASTER) during the development of these assumptions to ensure the service increases proposed were implementable in the long-term. While deemed feasible, it should be noted that all of the 2030 service levels presented for simulation by the PWG may not currently be covered in the operators' financially-constrained long-term funding scenarios.

As part of this service plan, two “modified” services have been incorporated into the corridor. These include through commuter trains operated (without transfers) between Los Angeles and San Diego (LA-SD) and between the Inland Empire and San Diego (IE-SD). These services were created in an attempt to; 1) reduce congestion at the Oceanside Transit Center from the termination of trains operating from the Inland Empire, Los Angeles and San Diego, and 2) to help cater to those passengers who currently transfer from one commuter service to another in Oceanside. These new “through” commuter services are incorporated into the total commuter train count desired for 2030 by the PWG for operation in Los Angeles, Orange, Riverside and San Diego Counties and are not seen as an “independent” service.

**Table 5.3.1 – Weekday Service Increase Assumptions**

| Operator | Line | 2011 Base Line | 2014 | 2030 Proposed Service |
|---|---|---|---|---|
| COASTER | Coast | 22 | 28 | 40 |
| Metrolink | Coast | 0 | 1 | 0 |
| Metrolink/COASTER | LA-SD* | 0 | 3 | 10 |
| Metrolink/COASTER | IE-SD* | 0 | 0 | 4 |
| Metrolink | Orange County | 19 | 16 | 18 |
| Metrolink | OC Intra-County | 0 | 10 | 14 |
| Metrolink | IEOC | 14 | 16 | 24 |
| Metrolink | 91/Perris Valley | 9 | 12 | 32 |
| Metrolink | Antelope Valley | 30 | 30 | 46 |
| Metrolink | Burbank-Bob Hope | 11 | 11 | 8 |
| Metrolink | Ventura County | 20 | 20 | 36 |
| Metrolink | Ventura-Santa Barbara | 0 | 2 | 8 |
| Amtrak | Pacific Surfliner (All Stop)** | 21 | 22 | 28 |
| Amtrak | Pacific Surfliner (Limited Stop)** | 1 | 2 | 8 |
| Amtrak | Coast Starlight | 2 | 2 | 2 |
| Amtrak | Southwest Chief | 2 | 2 | 2 |
| Amtrak | Sunset Limited | 0 | 0 | 2 |
| **TOTAL** | | **151** | **177** | **282** |

** These trains are based on the operating assumption to include a consolidated rolling stock/equipment cycle plan for COASTER and Metrolink trainsets to address the vehicle fleet needs for “through” commuter service operating between Los Angeles, San Diego and Riverside Counties without the need for transfers.*
*** Includes suggested timeslots for proposed Coast Daylight service between Los Angeles and San Francisco. Based on previous discussions, this includes timeslots for 1 overnight train in each direction and 1 daytime train in each direction.*

# 6.0 MODEL OUTPUT RESULTS

The operations simulation model built to represent the physical and service characteristics of the Corridor between San Luis Obispo, Santa Barbara, Los Angeles and San Diego was updated from the network originally developed by Parsons Brinckerhoff for Amtrak's California 20-Year Rail System Improvement Plan, and subsequently updated for simulations conducted as part of the Los Angeles to San Diego Rail Corridor Strategic Business Plan and the Orange County Transportation Authority (OCTA) Metrolink Service Expansion Program. The purpose for updating the model was to determine the feasibility of the infrastructure projects indentified in this report to support the Version 1 2030 service scenario developed in collaboration with the LOSSAN TAC and PWG. This operational modeling helps demonstrate the viability of the service levels identified by the TAC and PWG. It also provides basis for a capital project action plan so that agency stakeholders can prioritize their future corridor capital investments.

This chapter summarizes the simulation outputs and observations from the model results utilizing the 2030 passenger train volumes agreed to by the PWG and increased freight train assumptions that were based on data obtained through extensive field reviews conducted in May of 2007 of the BNSF operations between Fullerton Junction and Hobart Yard and June of 2011 for the UPRR operations between Los Angeles and San Luis Obispo. These reviews were accomplished by direct discussion and observations of BNSF and UPRR train movements from Metrolink's Train Control facilities in Pomona, California.

An initial Version 1 service plan was prepared using the design criteria set forth by the PWG. However, when coded into the model and simulated, this initial Version 1 service plan was found to be infeasible. From this initial simulation, it was determined that in order to reliably operate the service plan, full double track of the Corridor would be required between Los Angeles and San Diego and between 18 and 20 miles of additional infrastructure beyond what was already identified by the PWG would be necessary north of Los Angeles. The development of this initial service plan did not take into consideration the remaining capacity constraints on the Corridor but instead based the service on "clock faced" departures and arrivals from LAUS.

As a result, a number of iterations to the service plan were tested to identify a plan that could feasibly operate along the Corridor given the infrastructure assumptions assumed by the PWG. A revised service plan was identified and found to be more feasible and realistic considering the additional infrastructure recommendations that were identified. A summary of the observations and recommended infrastructure improvements, broken up by service segment, is presented below.

The associated Version 1 timetable and terminal track assignment assumptions that were used as input to the model are provided for reference in the Appendix of this report.

### 6.1.1 San Luis Obispo to Goleta

**Table 6.1.1 – San Luis Obispo to Goleta Total Train Trips**

| Operator / Line | May 2011 Volume | 2014 Volume | 2030 Volume | Service Growth (2014 to 2030) |
|---|---|---|---|---|
| Amtrak Pacific Surfliner (All Stop) | 4 | 4 | 5* | 1 |
| Amtrak Pacific Surfliner (Limited Stop) | 0 | 0 | 3* | 3 |
| Amtrak Coast Starlight | 2 | 2 | 2 | 0 |
| UPRR Freight | 6 | 6 | 8 | 2 |
| **TOTAL** | **12** | **12** | **18** | **6** |

** Includes suggested timeslots for proposed Coast Daylight service between Los Angeles and San Francisco. Based on previous discussions, this includes timeslots for 1 overnight train in each direction and 1 daytime train in each direction.*

The UPRR owns and dispatches this segment of the corridor. The total miles of additional double tracking recommended for this segment of the corridor beyond the improvements provided by the PWG is approximately six miles. These improvements focused on four primary projects, which include:

- CTC installation for the Surf/Lompoc siding.
- 3.5 mile extension of second track north of the Grover Beach station and the construction of a second platform at Grover Beach. The revised service plan for 2030 that was developed and utilized for this development creates meets for two Pacific Surfliners and both train 14 and 11 (the Coast Starlights) at the Grover Beach station.
- 1.2 mile extension of second track north of the Waldorf siding, just south of the Guadalupe Station. The extension of this siding not only allows for moving meets between Pacific Surfliner trains, but also extends the siding for possible meets with UPRR freight traffic.
- 1-mile extension of second track south of Devon siding.
- 0.5 mile extension of second track north of Capitan siding.

### 6.1.2 Goleta to East Ventura

**Table 6.1.2 – Goleta to East Ventura Total Train Trips**

| Operator / Line | May 2011 Volume | 2014 Volume | 2030 Volume | Service Growth (2014-2030) |
|---|---|---|---|---|
| Amtrak Pacific Surfliner (All Stop) | 10 | 10 | 10* | 0 |
| Amtrak Pacific Surfliner (Limited Stop) | 0 | 0 | 4* | 4 |
| Amtrak Coast Starlight | 2 | 2 | 2 | 0 |
| Metrolink Ventura-SB Commuter Train | 0 | 2 | 8 | 6 |
| UPRR Freight | 4 | 4 | 6 | 2 |
| **TOTAL** | **16** | **18** | **30** | **12** |

** Includes suggested timeslots for proposed Coast Daylight service between Los Angeles and San Francisco. Based on previous discussions, this includes timeslots for 1 overnight train in each direction and 1 daytime train in each direction.*

The UPRR owns and dispatches this segment of the corridor. The total miles of additional double tracking recommended for this segment of the corridor beyond the improvements provided by the PWG is between 1.5 to four miles. These improvements focused on three primary projects, which include:

- 1.2 mile extension of proposed Ortega siding. Several intercity trains still hold on the Ortega siding for meets with trains operating in the opposing direction. This additional capacity would allow for moving meets of these trains.
- Second track for west leg of Montalvo Wye. The distance for this additional improvement can vary between 0.5 to 3.5 miles (as far north as the Ventura Siding), with 0.5 miles being the minimum recommended improvement and the longer addition contributing to greater service reliability. During peak periods, up to three trains at a time were observed to operate through this area, which included a Ventura County Line train entering into the south leg of the wye heading to the East Ventura station, a southbound Pacific Surfliner operating through the west leg of the wye enroute to Oxnard and a Ventura-Santa Barbara commuter train operating along the north leg of the wye headed towards North Goleta. While the existing configuration could support the operation, additional capacity is recommended to mitigate trains operating “out of slot”.
- Additional infrastructure will be required for the East Ventura station. Currently, the station can support three trainsets stored overnight. The service plan as simulated requires as many as six trainsets to be stored overnight; four in support of the Ventura County Line and two in support of the Ventura – Santa Barbara commuter service.

### 6.1.3 East Ventura to Moorpark

**Table 6.1.3 –East Ventura to Moorpark Total Train Trips**

| Operator / Line | May 2011 Volume | 2014 Volume | 2030 Volume | Service Growth (2014-2030) |
|---|---|---|---|---|
| Amtrak Pacific Surfliner (All Stop) | 10 | 10 | 10* | 0 |
| Amtrak Pacific Surfliner (Limited Stop) | 0 | 0 | 4* | 4 |
| Amtrak Coast Starlight | 2 | 2 | 2 | 0 |
| Metrolink Ventura County Line | 6 | 6 | 18 | 12 |
| UPRR Freight | 6 | 6 | 8 | 2 |
| **TOTAL** | **24** | **24** | **42** | **18** |

** Includes suggested timeslots for proposed Coast Daylight service between Los Angeles and San Francisco. Based on previous discussions, this includes timeslots for 1 overnight train in each direction and 1 daytime train in each direction.*

The UPRR owns and dispatches this segment of the corridor. No additional track capacity projects are recommended for this segment of the corridor beyond the improvements provided by the PWG.

With all of the assumed infrastructure improvements, the remaining single-track section in this segment of the Corridor would be less than 10 miles, leaving more than a half of the territory double tracked. The operational analysis suggests that on the main line of the corridor between East Ventura and Moorpark, the improved infrastructure should be adequate to accommodate the assumed service levels. The extended double track near Camarillo and Moorpark appeared to create additional track capacity that allows all scheduled trains to meet and pass with no or very minor delays in this section.

While no additional track capacity was identified as necessary, a second platform at the Oxnard station is recommended to allow for train meets. The track through the station is already double tracked, but due to the location of a freight yard on the east side of the right-of-way, only a single platform is provided. This in effect forces the passenger trains to operate as if the segment was single track.

### 6.1.4 Moorpark to Chatsworth

**Table 6.1.4 – Moorpark to Chatsworth Total Train Trips**

| Operator / Line | May 2011 Volume | 2014 Volume | 2030 Volume | Service Growth (2014-2030) |
|---|---|---|---|---|
| Amtrak Pacific Surfliner (All Stop) | 10 | 10 | 10* | 0 |
| Amtrak Pacific Surfliner (Limited Stop) | 0 | 0 | 4* | 4 |
| Amtrak Coast Starlight | 2 | 2 | 2 | 0 |
| Metrolink Ventura County Line | 14 | 14 | 36 | 22 |
| UPRR Freight | 6 | 6 | 8 | 2 |
| **TOTAL** | **32** | **32** | **60** | **28** |

** Includes suggested timeslots for proposed Coast Daylight service between Los Angeles and San Francisco. Based on previous discussions, this includes timeslots for 1 overnight train in each direction and 1 daytime train in each direction.*

This segment of the corridor is owned by the Ventura County Transportation Commission (VCTC) within Ventura County and LA Metro in Los Angeles County and the line is dispatched by Metrolink. The total miles of additional double tracking recommended for this segment of the corridor beyond the improvements provided by the PWG is 1.6 miles. This improvement focused on the following project:

- 1.6 mile extension of the Santa Susana siding, through the Simi Valley station. This would also require a second platform at Simi Valley. There are several meets that occur at this location, where northbound trains hold for southbound trains. An adjustment to the timetable was not identified as a feasible solution due to conflicts that would otherwise then occur at other locations along the corridor should any adjustment to the assumed service plan be made.

### 6.1.5 Chatsworth to Burbank-Bob Hope Airport

**Table 6.1.5 –Chatsworth to Burbank-Bob Hope Airport Total Train Trips**

| Operator / Line | May 2011 Volume | 2014 Volume | 2030 Volume | Service Growth (2014-2030) |
|---|---|---|---|---|
| Amtrak Pacific Surfliner (All Stop) | 10 | 10 | 10* | 0 |
| Amtrak Pacific Surfliner (Limited Stop) | 0 | 0 | 4* | 4 |
| Amtrak Coast Starlight | 2 | 2 | 2 | 0 |
| Metrolink Ventura County Line | 20 | 20 | 36 | 16 |
| UPRR Freight | 6 | 6 | 8 | 2 |
| **TOTAL** | **38** | **38** | **60** | **22** |

** Includes suggested timeslots for proposed Coast Daylight service between Los Angeles and San Francisco. Based on previous discussions, this includes timeslots for 1 overnight train in each direction and 1 daytime train in each direction.*

This segment of the corridor is owned by LA Metro and dispatched by Metrolink. Analysis of the simulation suggests that the completion of a second track through this segment (between CP Raymer and CP Bernson) improves the reliability of future service compared with the reliability of both the existing and short-term conditions. However, the increases in freight traffic assumed in 2030 do present the possibility for conflicts as freight trains depart from or enter into the freight yard at the old GMCO facility, located adjacent to the Van Nuys Station. The GM facility is no longer there, but the yard continues to be used and there is no indication from UPRR on discontinuing use of the yard at this time. Since the yard is accessible from only Main Track 1, the section of track between CP Raymer and CP Bernson would need to be treated as a single-track section for freight operations. One option for mitigating this conflict would be to construct a universal crossover at CP Raymer so that the freight yard becomes accessible from both main tracks.

### 6.1.6 Burbank-Bob Hope Airport to Los Angeles Union Station

**Table 6.1.6 – Burbank-Bob Hope Airport to Los Angeles Union Station Total Train Trips**

| Operator / Line | May 2011 Volume | 2014 Volume | 2030 Volume | Service Growth (2014-2030) |
|---|---|---|---|---|
| Amtrak Pacific Surfliner (All Stop) | 10 | 10 | 10* | 0 |
| Amtrak Pacific Surfliner (Limited Stop) | 0 | 0 | 4* | 4 |
| Amtrak Coast Starlight | 2 | 2 | 2 | 0 |
| Metrolink Ventura County Line | 20 | 20 | 36 | 16 |
| Metrolink Burbank-Bob Hope Turn | 11 | 11 | 8 | -3 |
| Metrolink Antelope Valley Line** | 30 | 30 | 46 | 16 |
| UPRR Freight*** | 11 | 11 | 18 | 7 |
| **TOTAL** | **84** | **84** | **124** | **40** |

** Includes suggested timeslots for proposed Coast Daylight service between Los Angeles and San Francisco. Based on previous discussions, this includes timeslots for 1 overnight train in each direction and 1 daytime train in each direction.*

***This service splits off of the LOSSAN Corridor at Burbank Junction and heads towards Palmdale and Lancaster.*

****Some of these trains split off of the LOSSAN Corridor at Burbank Junction and head towards Palmdale and Lancaster.*
*Note: These numbers do not include the non-revenue train movements between Los Angeles Union Station and Metrolink's Central Maintenance Facility. While these trains are anticipated to affect available capacity on the corridor, a detailed analysis on equipment manipulation options to include the San Bernardino and Riverside Line services is required to determine the actual impact these non-revenue movements may have on corridor capacity.*

This segment of the corridor is owned by LA Metro and dispatched by Metrolink. While no additional track capacity was identified as necessary, Burbank Junction was identified as being constrained as a result of the volume of service projected for 2030. Burbank Junction is where the Ventura County Line and Pacific Surfliner trains operating to and from Ventura, Santa Barbara and San Luis Obispo Counties merge services to and from LAUS with the Antelope Valley Line trains operating to and from Palmdale and Lancaster. During a morning peak hour, as many as 16 trains were assumed to operate through Burbank Junction (9 inbound to Los Angeles and 7 outbound). Burbank Junction is where the Metrolink Antelope Valley Line (AVL) trains enter and leave the LOSSAN Corridor in their operation between Lancaster and Los Angeles. From this location to Los Angeles, the AVL trains share track with Metrolink Ventura County Line trains and Amtrak's Pacific Surfliner and Coast Starlight. Since Burbank Junction is an at-grade "interlocking" between two railroad subdivisions (or lines), conflicting movements were observed between trains traveling along these two lines when they "meet" at Burbank Junction. This "meet" forces one train to hold until the other train clears the Junction, forcing the train that was "held" to become delayed and operate "out of slot".

With the volume of service operating through Burbank Junction, particularly during the peak periods, this leaves little room for any freight operations. While minimal, freight operations do currently occur during the trailing edge of peak periods on some days, particularly associated with the switching yard adjacent to the former GM facility in Van Nuys. The volume of passenger service during and trailing the peak periods shifted freight operations in the simulation to times further away from the peak periods to more midday and late evening hours.

In addition, due to the large volume of passenger rail service that was provided in the 2030 service plan, the eight Burbank Turn trains assumed initially in the service plan had to be removed in order to ensure reliable operations. With the assumed volume of Ventura County Line and Pacific Surfliner trains operating through the Burbank-Bob Hope Airport station to and from LAUS, there was insufficient capacity at the Burbank-Bob Hope Airport station to accommodate the "turning" of trains. Currently, Burbank Turn trains operate as a connecting service between LAUS and the Burbank Bob-Hope Airport station. With the assumed levels of service for 2030 increasing 80-percent on the Ventura County Line and 40-percent on the Pacific Surfliner, the Burbank Turn trains were no longer seen as necessary and were removed from the service plan to mitigate the conflicts being caused at the Burbank-Bob Hope Airport when trying to "turn" these trains.

In order to evaluate the viability of the Ventura County and Pacific Surfliner service increases as a substitute for the current Burbank Turn trains, a schedule comparison analysis is summarized in Table 6.1.7 and a more detailed comparison matrix is provided in Appendix C. The summary presented in Table 6.1.7 illustrates that the morning and afternoon peak period service levels for the LAUS-Burbank/Bob Hope Airport service are generally comparable between existing and proposed 2030 service levels. Additionally, the 2030 service plan provides more trips in general between the two locations as well as a wider span of service hours when compared to today's schedules.

**Table 6.1.7 – Comparison of Service Levels at Burbank-Bob Hope Airport (Existing vs. 2030 Service)**

| Services to/from Burbank-Bob Hope Airport Station | Total AM Peak Period Trains* | Total PM Peak Period Trains** | Total Daily Trains | Daily Service Span (HH:MM) | Total Hours of Service (HH:MM) |
|---|---|---|---|---|---|
| 2011 Inbound to LAUS | 8 | 7 | 21 | 5:49AM – 9:45PM | 15:56 |
| 2011 Outbound from LAUS | 8 | 8 | 22 | 5:39AM – 7:32PM | 13:54 |
| 2030 Inbound from LAUS | 8 | 6 | 26 | 5:07AM – 9:41PM | 16:34 |
| 2030 Outbound from LAUS | 7 | 7 | 26 | 6:10AM – 10:21PM | 16:11 |

** AM Peak Period is any passenger trip between LAUS and Burbank-Bob Hope Airport operating between 6:00 AM and 9:00 AM*
*** PM Peak Period is any passenger trip between LAUS and Burbank-Bob Hope Airport operating between 3:00 PM and 6:00 PM*

### 6.1.7 Los Angeles Union Station to Fullerton

**Table 6.1.8 – Los Angeles Union Station to Fullerton Total Train Trips**

| Operator / Line | May 2011 Volume | 2014 Volume | 2030 Volume | Service Growth (2014-2030) |
|---|---|---|---|---|
| Amtrak Pacific Surfliner (All Stop) | 21 | 22 | 28 | 6 |
| Amtrak Pacific Surfliner (Limited Stop) | 1 | 2 | 8 | 6 |
| Amtrak Southwest Chief | 2 | 2 | 2 | 0 |
| Amtrak Sunset Limited | 0 | 0 | 2 | 2 |
| Metrolink/COASTER LA-SD Commuter Service | 0 | 3* | 10 | 7 |
| Metrolink Orange County Line | 19 | 16* | 18 | 2 |
| Metrolink 91/Perris Valley Line | 9 | 12 | 32 | 20 |
| BNSF Freight | 82 | 82 | 118 | 36 |
| **TOTAL** | **134** | **139** | **218** | **79** |

** No net reduction in service, three existing Orange County Line trains are replaced by 3 new LA-SD Commuter trains*

This segment of the corridor is owned by LA Metro, along the West River Bank of the River Subdivision and the BNSF along the San Bernardino Subdivision. Metrolink is responsible for dispatching of operations along the West River Bank and the BNSF along the San Bernardino Subdivision.

Operations in this corridor are currently dominated by freight traffic and it is anticipated that this pattern will continue in the future. While the proposed service plan was identified as being feasible, due to the volume of freight operations along this segment, delays to passenger trains will continue to be a risk to reliability along this segment of the LOSSAN corridor as BNSF balances their freight operations with the peak period passenger commute needs. While assumptions were made for increased service along the BNSF by 2030, actual economic conditions determine freight volumes and will ultimately drive the need for additional infrastructure projects along this segment of the corridor.

Based on the assumptions made in this analysis, no additional infrastructure projects were identified as being necessary to support passenger operations along this segment of the corridor.

### 6.1.8 Fullerton to Orange

**Table 6.1.9 – Fullerton to Orange Total Train Trips**

| Operator / Line | May 2011 Volume | 2014 Volume | 2030 Volume | Service Growth (2014-2030) |
|---|---|---|---|---|
| Amtrak Pacific Surfliner (All Stop) | 21 | 22 | 28 | 6 |
| Amtrak Pacific Surfliner (Limited Stop) | 1 | 2 | 8 | 6 |
| Metrolink/COASTER LA-SD Commuter Service | 0 | 3* | 10 | 7 |
| Metrolink Orange County Line | 19 | 16* | 18 | 2 |
| Metrolink OC Intra-County Line | 0 | 10 | 14 | 4 |
| BNSF Freight | 4 | 4 | 4 | 0 |
| UPRR Freight | 2 | 2 | 2 | 0 |
| **TOTAL** | **47** | **59** | **84** | **25** |

** No net reduction in service, three existing Orange County Line trains are replaced by 3 new LA-SD Commuter trains*

As part of the 2030 service plan, the Fullerton to Orange segment is anticipated to have 78 passenger trains serving this portion of the Corridor. This segment is owned by the OCTA and is dispatched by Metrolink. The BNSF and UPRR both maintain trackage rights along this section and it was assumed that they would continue to operate limited freight service.

The results of the simulation indicate that the assumed infrastructure for 2030 in this segment of the LOSSAN Corridor can feasibly support the operations of the Version 1 timetable while maintaining or improving operational flexibility, reliability, performance, and capacity for rail operations along the Corridor. No additional infrastructure improvements were identified as necessary or recommended for this segment.

### 6.1.9 Orange to Laguna Niguel / Mission Viejo

**Table 6.1.10 – Orange to Laguna Niguel / Mission Viejo Total Train Trips**

| Operator / Line | May 2011 Volume | 2014 Volume | 2030 Volume | Service Growth (2014-2030) |
|---|---|---|---|---|
| Amtrak Pacific Surfliner (All Stop) | 21 | 22 | 28 | 6 |
| Amtrak Pacific Surfliner (Limited Stop) | 1 | 2 | 8 | 6 |
| Metrolink/COASTER LA-SD Commuter Service | 0 | 3* | 10 | 7 |
| Metrolink/COASTER IE-SD Commuter Service | 0 | 0 | 4 | 4 |
| Metrolink Orange County Line | 19 | 16* | 18 | 2 |
| Metrolink OC Intra-County Line | 0 | 10 | 14 | 4 |
| Metrolink IEOC Line | 14 | 16 | 24 | 8 |
| BNSF Freight | 6 | 6 | 8 | 2 |
| UPRR Freight | 2 | 2 | 2 | 0 |
| **TOTAL** | **63** | **77** | **116** | **39** |

** No net reduction in service, three existing Orange County Line trains are replaced by 3 new LA-SD Commuter trains*

As part of the 2030 service plan, the Orange to Laguna Niguel / Mission Viejo segment is anticipated to have 106 passenger trains serving this portion of the Corridor. This segment is owned by the OCTA and is dispatched by Metrolink. The BNSF and UPRR both maintain trackage rights along this section and it was assumed that they would continue to operate limited freight service.

The results of the simulation indicate that the assumed infrastructure for 2030 in this segment of the LOSSAN Corridor can feasibly support the operations of the Version 1 timetable while maintaining or improving operational flexibility, reliability, performance, and capacity for rail operations along the Corridor.

However, with passenger operations in this segment increased by nearly 85-percent over existing volumes, the ability to slot freight traffic into the corridor becomes more difficult. In order to facilitate freight operations, freight trains were routinely “pocketed” where possible to allow passenger trains to pass or overtake the freight train.

In addition, no capacity issues were identified with the Laguna Niguel / Mission Viejo (LNMV) Station Turnback Facility, despite relocating the existing CP Avery pocket track approximately 0.5 miles further south (railroad east) as part of the Laguna Niguel to San Juan Capistrano passing siding project. The equipment cycles assumed for the LNMV station under the Version 1 2030 service plan, presented sufficient turnaround time to mitigate the increased time necessary to travel the additional distance to turn in this relocated “pocket” track. No additional infrastructure improvements were identified as necessary or recommended for this segment.

### 6.1.10 Laguna Niguel / Mission Viejo to Oceanside

**Table 6.1.11 – Laguna Niguel / Mission Viejo to Oceanside Total Train Trips**

| Operator / Line | May 2011 Volume | 2014 Volume | 2030 Volume | Service Growth (2014-2030) |
|---|---|---|---|---|
| Amtrak Pacific Surfliner (All Stop) | 21 | 22 | 28 | 6 |
| Amtrak Pacific Surfliner (Limited Stop) | 1 | 2 | 8 | 6 |
| Metrolink/COASTER LA-SD Commuter Service | 0 | 3* | 10 | 7 |
| Metrolink/COASTER IE-SD Commuter Service | 0 | 0 | 4 | 4 |
| Metrolink Orange County Line | 10 | 7* | 4 | -3 |
| Metrolink IEOC Line | 6 | 6 | 0 | -6 |
| BNSF Freight | 4 | 4 | 6 | 2 |
| **TOTAL** | **42** | **44** | **60** | **16** |

** No net reduction in service, three existing Orange County Line trains are replaced by 3 new LA-SD Commuter trains*

As part of the 2030 service plan, the Laguna Niguel / Mission Viejo to Oceanside segment is anticipated to have 54 passenger trains serving this portion of the Corridor. This segment is owned by the OCTA in Orange County and dispatched by Metrolink. In San Diego County, this segment is owned and dispatched by North County Transit District (NCTD). The BNSF maintains trackage rights along this section and it was assumed that they would continue to operate limited freight service.

The results of the simulation indicate that the assumed infrastructure for 2030 in this segment of the LOSSAN Corridor can feasibly support the operations of the revised Version 1 timetable while maintaining or improving operational flexibility, reliability, performance, and capacity for rail operations along the Corridor.

However, despite the investment assumed in double tracking the corridor in 2030, the Laguna Niguel to Oceanside segment continues to have the majority of the single track within the South Corridor. The long sections of single track in south Orange County and through north Camp Pendleton were observed as continuing to have the potential to exacerbate delays for trains already operating “out of slot” as well as cause additional trains to run late due to the “domino effect”. This was assumed to remain one of two single track segments of the southern LOSSAN corridor in the 2030 Long-Term Operations Analysis and because of this, this segment had the greatest influence in the development of the 2030 service plan. A schedule was required that focused not on clock faced departures, but on making the “meets” that would be necessary around the remaining single track segments.

To assist in mitigating the potential delays, it is recommended that the Serra siding be lengthened south by approximately one mile, to the Beach Road crossing in Dana Point and for double track to continue north of CP Songs in San Diego County by one to 1.5 miles. These capacity improvements will help in allowing trains more opportunities for “moving meets” in south Orange County and north San Diego County, rather than holding for the opposing train.

Unless additional capacity can be provided, any new trains that begin service in this segment may require additional “pad” or “recovery” time to accommodate the additional time that will be necessary for trains to “hold” for meets with other trains operating “out of slot”, thereby lengthening travel times rather than reducing them.

### 6.1.11 Oceanside to San Diego

**Table 6.1.12 – Oceanside to San Diego Total Train Trips**

| Operator / Line | May 2011 Volume | 2014 Volume | 2030 Volume | Service Growth (2014-2030) |
|---|---|---|---|---|
| Amtrak Pacific Surfliner (All Stop) | 21 | 22 | 28 | 6 |
| Amtrak Pacific Surfliner (Limited Stop) | 1 | 2 | 8 | 6 |
| Metrolink/COASTER LA-SD Commuter Service | 0 | 3 | 10 | 7 |
| Metrolink/COASTER IE-SD Commuter Service | 0 | 0 | 4 | 4 |
| Metrolink Coast Line | 0 | 1* | 0 | -1 |
| COASTER | 22 | 28 | 40 | 12 |
| BNSF Freight | 6 | 6 | 8 | 2 |
| **TOTAL** | **50** | **62** | **98** | **36** |

** This is a late night Metrolink train that operates between San Diego and Oceanside as the return to Train 608 that is extended to San Diego from Oceanside in 2014, which is replaced by the increase in Metrolink/Coaster LA-SD Commuter service in 2030.*

As part of the 2030 service plan, the Oceanside to San Diego segment is anticipated to have 90 passenger trains serving this portion of the Corridor. This segment is owned by the NCTD north of the City of Del Mar and by San Diego Metropolitan Transit System (SDMTS) within the City of San Diego. The entire segment is dispatched by NCTD. The BNSF maintains trackage rights along this section and it was assumed that they would continue to operate limited freight service.

The results of the simulation indicate that the assumed infrastructure for 2030 in this segment of the LOSSAN Corridor can feasibly support the operations of the Version 1 timetable while maintaining or improving operational flexibility, reliability, performance, and capacity for rail operations along the Corridor, with one exception. The dense passenger operations that are projected to operate in this segment of the corridor in 2030 precluded the ability to operate “express” COASTER commuter trains between Oceanside and San Diego. These trains were originally identified in the service planning goals established for the corridor by the PWG. The travel time differences between the local (all stop) commuter trains and the express (limited stop) trains created conflicts associated with the remaining single track in Del Mar. In order to avoid meets near this single track segment, the timetable was initially laid out with the intention of using repetitive departures each hour so that meets between trains were predictable and occurred at approximately the same location throughout the day. As the service plan was refined to reflect the desired stopping pattern variations requested for both commuter and intercity trains it was quickly identified that the number of different stopping patterns being included in the timetable prevented a repeatable pattern from being identified and subsequently created conflicts that were associated with the single track in Del Mar. A number of iterations were run in the model in an attempt to identify a repetitive timetable capable of supporting express COASTER trains however, it was concluded that in order to preserve the ability of the corridor to support reliable operations, express COASTER trains would need to be removed from the 2030 service plan.

In addition, with passenger operations in this segment increased by 96-percent over existing volumes, the ability to slot freight traffic into the corridor becomes more difficult. In order to facilitate freight operations, freight trains were routinely “pocketed” where possible to allow passenger trains to pass or overtake the freight train.

Despite the investment assumed in double tracking the corridor in 2030, the Oceanside to San Diego segment continues to have single track through the City of Del Mar. This section of single track was observed as continuing to have the potential to contribute to delays for both intercity and commuter trains operating “out of slot”. This is the second of two single track segments of the southern LOSSAN Corridor in the 2030 Long-Term Operations Analysis. No mitigation was identified for this capacity need beyond the “tunnel” alternative identified in the Los Angeles to San Diego (LOSSAN) Proposed Rail Corridor Improvements Final Program Environmental Impact Report / Environmental Impact Statement (Finalized in 2007) and the LOSSAN Corridor Strategic Plan. Two tunnel alternatives have been identified in these past studies, one traveling under Camino Del Mar within the City of Del Mar (Milepost 243.6 to 246.0) and the other traveling under Interstate 5 (Milepost 243.3 to 247.9). Regional funding for any tunnel option is not anticipated before the 2041 – 2050 time horizon.

No additional capacity was identified as necessary for this segment, beyond the completion of double track through the City of Del Mar. Operations were identified as feasible in downtown San Diego, both at the Santa Fe Depot and the new convention center station. Sufficient capacity for the 90 passenger trains was provided on Tracks 1, 2 and 3 of the Santa Fe Depot to continue to allow BNSF to operate trains through the depot on Track 4 during mid-day periods. In addition, no additional storage tracks were identified as necessary in the SDMTS yard, where COASTER trains currently layover during the mid-day.

# 7.0 CONCLUSION

The service level assumptions simulated as part of the 2030 Long-Term scenario and approved by the LOSSAN TAC and PWG were reviewed and tested against the agreed to infrastructure assumptions for this analysis. The results of the simulation indicated that elimination of the assumed Burbank-Bob Hope trains identified for service in 2030 is necessary to preserve operational reliability of the Ventura County Line and Pacific Surfliner services. In addition, the remaining single track in Del Mar (San Diego County) coupled with the dense passenger operations that are projected to operate between Oceanside and San Diego in 2030 precluded the ability to operate “express” COASTER commuter trains. As a result, the total service levels assumed for 2030 were reduced by a total of eight trains north of Los Angeles. There was no reduction in the number of trains assumed south of Los Angeles. The revised service levels are reflected in Table 7.0.1 below.

**Table 7.0.1 – Revised Weekday Service Increase Assumptions**

| Operator | Line | 2011 Base Line | 2014 | 2030 Proposed Service |
|---|---|---|---|---|
| COASTER | Coast | 22 | 28 | 40 |
| Metrolink | Coast | 0 | 1 | 0 |
| Metrolink/COASTER | LA-SD* | 0 | 3 | 10 |
| Metrolink/COASTER | IE-SD* | 0 | 0 | 4 |
| Metrolink | Orange County | 19 | 16 | 18 |
| Metrolink | OC Intra-County | 0 | 10 | 14 |
| Metrolink | IEOC | 14 | 16 | 24 |
| Metrolink | 91/Perris Valley | 9 | 12 | 32 |
| Metrolink | Antelope Valley | 30 | 30 | 46 |
| Metrolink | Burbank-Bob Hope | 11 | 11 | 0** |
| Metrolink | Ventura County | 20 | 20 | 36 |
| Metrolink | Ventura-Santa Barbara | 0 | 2 | 8 |
| Amtrak | Pacific Surfliner (All Stop) | 21 | 22 | 28*** |
| Amtrak | Pacific Surfliner (Limited Stop) | 1 | 2 | 8*** |
| Amtrak | Coast Starlight | 2 | 2 | 2 |
| Amtrak | Southwest Chief | 2 | 2 | 2 |
| Amtrak | Sunset Limited | 0 | 0 | 2 |
| **TOTAL** | | **151** | **177** | **274** |

** These trains are based on the operating assumption to include a consolidated rolling stock/equipment cycle plan for COASTER and Metrolink trainsets to address the vehicle fleet needs for “through” commuter service operating between Los Angeles, San Diego and Riverside Counties without the need for transfers.*

*** Was initially assumed to be 8 trains, but initial simulations identified insufficient capacity to turn trains on mainline at Burbank-Bob Hope Airport. Increase in level of frequency of Ventura County Line trains assumed sufficient to meet demands of passengers despite elimination of this service.*

**** Includes suggested timeslots for proposed Coast Daylight service between Los Angeles and San Francisco. Based on previous discussions, this includes timeslots for 1 overnight train in each direction and 1 daytime train in each direction.*

In addition, the infrastructure configurations approved by the LOSSAN TAC and PWG were reviewed and tested as part of this operations analysis. The results of the simulation indicated that the assumed infrastructure for 2030 for the LOSSAN Corridor can feasibly support the operations of the Version 1 timetable while maintaining operational flexibility, reliability, performance, and capacity for rail operations along the Corridor;however additional recommendations to improve system reliability were identified in most corridor segments and are summarized in Table 7.0.2.

The additional infrastructure projects recommended as part of this operations analysis are summarized in the table below and totaled between nine and 12 miles of second main track and station improvements in the northern corridor and between two and three miles of additional second main track in the southern corridor.

**Table 7.0.2 – Additional Recommended Infrastructure Projects for 2030**

| County | Description | Length (miles) |
|---|---|---|
| San Luis Obispo | Extension of second track north of the Grover Beach station and the construction of a second platform. | 3.5 |
| Santa Barbara | Extension of second track north of the Waldorf siding, just south of the Guadalupe Station. | 1.2 |
| Santa Barbara | Extension of second track south of Devon siding | 1.0 |
| Santa Barbara | Extension of second track north of Capitan siding | 0.5 |
| Santa Barbara | Extension of proposed Ortega Siding | 1.2 |
| Ventura | Second track for west leg of Montalvo Wye, could be as far north as the Ventura Siding. | 0.5 to 3.5 |
| Ventura | Station modifications or relocation of East Ventura Station to support additional layover of trains overnight | N/A |
| Ventura | Add Oxnard Station north platform | N/A |
| Ventura | Extension of the Santa Susana siding, through the Simi Valley station | 1.6 |
| Los Angeles | Universal crossover at CP Raymer | N/A |
| Orange | Extension to the south of the Serra siding | 1.0 |
| San Diego | Extension of second track north of CP Songs | 1.0 to 1.5 |
| **Total** | | **11.5 to 15** |

Due diligence requires us to note that in a planning level document such as this operations analysis, the infrastructure improvements identified are based on a specific service plan. These infrastructure project recommendations may change depending on the preferred service plan ultimately chosen for implementation in 2030.

In addition, the UPRR has noted that the RTC simulations contained in this study were prepared and conducted without specific input from or validation by the Union Pacific Railroad. Any change to or increase in passenger service on Union Pacific tracks or right-of-way is subject to an independent determination by the Union Pacific of any necessary capacity or other requirements consistent with Union Pacific's then current Union Pacific Commuter Access Principles.

Furthermore, the significant level of remaining single track infrastructure along the entire LOSSAN Corridor will continue to be the most significant operational limitation having the greatest impact on performance, in particular the sections of single track through Ventura County and north Los Angeles County, as well as San Diego County and south Orange County. These single track segments will continue to have the potential to contribute to cascading delays across the entire corridor that occur when trains are not on schedule and operating “out of slot”.

Despite the remaining segments of single track, significant travel time improvements were observed in each of the primary corridor segments when compared to existing (2011) travel times. Based on the model outputs of the simulation conducted using the modified service plan and additional infrastructure projects identified above, the projected improvements in travel time are:

- San Luis Obispo to Los Angeles (Intercity) – 14%
- Los Angeles to San Diego (Intercity) – 6%
- Oceanside to San Diego (Commuter) – 7%

These improvements reflect the benefits of the capital investment assumed over the next 20 years.

# APPENDIX A: GLOSSARY OF TERMS

This section provides an alphabetical listing of the technical terms used in this report.

*BNSF*

- BNSF is an abbreviation used to represent the BNSF Railway, which is a wholly owned subsidiary of the Burlington Northern Santa Fe Corporation, based out of Fort Worth, Texas. The holding company was formed by the September 22, 1995 merger of Burlington Northern, Incorporated and the Santa Fe Pacific Corporation.

*COASTER*

- This is a commuter train service provided by the North County Transit District that runs north-south, serving eight stations between Oceanside and downtown San Diego.

*Consist*

- This is a term used to define what a trainset is comprised or made up of. Typical consists for Metrolink would be 5 bi-level cars and 1 diesel locomotive.

*Control Point (CP)*

- A Control Point is a signalized switch or crossing controlled remotely by a dispatcher at a central operations center.

*Crossover*

- A combination of two switches that connect two adjacent tracks.

*Hold-Out*

- A term used to describe when a train waits outside a station or other rail facility for another train that is servicing that station or facility. This typically occurs in single track territory when only one train can occupy the station or facility at a given time.

*Junction*

- This describes a location where multiple (2 or more) railroad subdivisions come together.

*Layup*

- Term used to describe a train being stored at a particular location for a preset amount of time. This is typically in reference to the action many railroad operators do to trains during the midday, in between rush hour peaks service, when fewer trains are required to operate.

*Metrolink*

- This is the commuter rail service provided by the Southern California Regional Rail Authority that operates lines in several corridors, including the LOSSAN corridor between Oceanside and Ventura, as well as service to Riverside and San Bernardino.

*Out-of-Slot*

- A term used to describe when a train is not operating within its assigned schedule.

*Pacific Surfliner*

- Service name of the intercity train service operated by Amtrak in the LOSSAN corridor between San Diego and San Luis Obispo.

*Pocketing*

- The dispatching procedure of placing one train on a siding to allow another train to pass.

*Signal Block*

- A length of track between consecutive signals.

*Stringlines*

- This term is used to describe an illustration where each line represents a single train and is measured against distance (Y axis) and time (X axis). This type of illustration is useful for identifying locations of train meets and schedule delays.

*Subdivision*

- A section of railroad controlled by UPRR, BNSF, Metrolink, or NCTD where trains are operated subject to specific time tables and special instructions.

*Turn*

- Term used to describe the action taken at a terminal station where train operators switch ends to depart in the opposite direction. This is typical of any “push-pull” commuter or intercity operation where the locomotive remains on one end of the train and the other end is comprised of a control car. The locomotive then either pulls the train or pushes the train depending on the direction of travel.

*Turnback*

- A specific location usually associated with a terminal station, where trains can “turn”. Turning in modern commuter and intercity rail operations, which typically operate “push-pull” equipment, involves the engineer moving from one end of the train to the other and performing designated brake and communication tests to ensure safe operations after “turning”.

*UPRR*

- UPRR is an abbreviation used to represent the Union Pacific Railroad, which is a wholly owned subsidiary of the Union Pacific Corporation based out of Omaha, Nebraska. The Union Pacific Railroad is the largest and one of the oldest railroads in North America, having been incorporated in July of 1862.

*Wye*

- A wye, or triangular junction, is a triangular shaped arrangement of rail tracks with a switch or set of points at each corner. In mainline railroads, this can be used at a rail junction, where three rail lines join, in order to allow trains to pass from any line to any other line. Wyes can also be used for turning railway equipment.

# APPENDIX B: 2030 VERSION 1 TIMETABLE

## WEEKDAY SOUTHBOUND - San Luis Obispo ● Santa Barbara ● Burbank ● Los Angeles

| Train Operator | No. | San Luis Obispo Dp | Grover Beach - Pismo Beach Dp | Guadalupe Dp | Santa Maria (IHOP) (B) Dp | Surf / Lompoc Dp | Lompoc (Visitors Center) (B) Dp | Solvang (B) Dp | Buellton (Burger King) (B) Dp | North Goleta Dp | Goleta Dp | Santa Barbara Ar | Santa Barbara Dp | Carpinteria Dp | Ventura Dp | East Ventura Dp | Oxnard Dp | Camarillo Dp | Moorpark Dp | Simi Valley Dp | Chatsworth Dp | Northridge Dp | Van Nuys Dp | Burbank - Bob Hope Airport Dp | Downtown Burbank Dp | Glendale Dp | Los Angeles Ar |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Commuter | VC01W | | | | | | | | | | | | | | | 3:48 AM | 4:01 AM | 4:11 AM | 4:22 AM | 4:34 AM | 4:46 AM | 4:53 AM | 5:00 AM | 5:07 AM | 5:12 AM | 5:19 AM | 5:29 AM |
| Commuter | VC02W | | | | | | | | | | | | | | | | | | 5:00 AM | 5:11 AM | 5:23 AM | 5:28 AM | 5:36 AM | 5:43 AM | 5:48 AM | 5:54 AM | 6:04 AM |
| Commuter | AV01W | | | | | | | | | | | | | | | | | | From Santa Clarita/Palmdale/Lancaster | | | | → | | 6:07 AM | 6:13 AM | 6:24 AM |
| Commuter | VC03W | | | | | | | | | | | | | | | 4:53 AM | 5:07 AM | 5:17 AM | 5:28 AM | 5:40 AM | 5:52 AM | 5:57 AM | 6:05 AM | 6:12 AM | 6:17 AM | 6:24 AM | 6:34 AM |
| Commuter | AV02W | | | | | | | | | | | | | | | | | | From Santa Clarita/Palmdale/Lancaster | | | | → | | 6:27 AM | 6:34 AM | 6:44 AM |
| Commuter | AV03W | | | | | | | | | | | | | | | | | | From Santa Clarita/Palmdale/Lancaster | | | | → | | 6:40 AM | 6:47 AM | 6:57 AM |
| Commuter | VC04W | | | | | | | | | | | | | | | | | | 6:00 AM | 6:11 AM | 6:23 AM | 6:28 AM | 6:36 AM | 4:43 AM | 6:48 AM | 6:55 AM | 7:05 AM |
| Commuter | AV04W | | | | | | | | | | | | | | | | | | From Santa Clarita/Palmdale/Lancaster | | | | → | | 6:55 AM | 7:02 AM | 7:12 AM |
| Commuter | AV05W | | | | | | | | | | | | | | | | | | From Santa Clarita/Palmdale/Lancaster | | | | → | | 7:09 AM | 7:16 AM | 7:26 AM |
| Commuter | VC05W | | | | | | | | | | | | | | | 5:48 AM | 6:01 AM | 6:11 AM | 6:23 AM | 6:35 AM | 6:47 AM | 6:53 AM | 7:00 AM | 7:07 AM | 7:16 AM | 7:24 AM | 7:34 AM |
| Commuter | AV06W | | | | | | | | | | | | | | | | | | From Santa Clarita/Palmdale/Lancaster | | | | → | | 7:25 AM | 7:32 AM | 7:42 AM |
| Commuter | VC06W | | | | | | | | | | | | | | | | | | 6:46 AM | 6:56 AM | 7:09 AM | 7:15 AM | 7:22 AM | 7:29 AM | 7:34 AM | 7:40 AM | 7:50 AM |
| Amtrak | CD/PS04E | 3:43 AM | - | 4:14 AM | - | 4:45 AM | - | - | - | - | 5:43 AM | 5:56 AM | 5:58 AM | - | 6:29 AM | - | 6:41 AM | 6:53 AM | - | 7:19 AM | 7:32 AM | - | - | 7:48 AM | - | 7:58 AM | 8:09 AM |
| Commuter | AV07W | | | | | | | | | | | | | | | | | | From Santa Clarita/Palmdale/Lancaster | | | | → | | 8:00 AM | 8:07 AM | 8:17 AM |
| Commuter | AV08W | | | | | | | | | | | | | | | | | | From Santa Clarita/Palmdale/Lancaster | | | | → | | 8:08 AM | 8:16 AM | 8:26 AM |
| Commuter | VC07W | | | | | | | | | | | | | | | 6:50 AM | 7:03 AM | 7:13 AM | 7:25 AM | 7:39 AM | 7:51 AM | 7:57 AM | 8:05 AM | 8:12 AM | 8:18 AM | 8:25 AM | 8:35 AM |
| Commuter | AV09W | | | | | | | | | | | | | | | | | | From Santa Clarita/Palmdale/Lancaster | | | | → | | 8:27 AM | 8:34 AM | 8:44 AM |
| Commuter | VC08W | | | | | | | | | | | | | | | | | | 7:54 AM | 8:05 AM | 8:18 AM | 8:24 AM | 8:31 AM | 8:38 AM | 8:43 AM | 8:49 AM | 8:59 AM |
| Commuter | AV10W | | | | | | | | | | | | | | | | | | From Santa Clarita/Palmdale/Lancaster | | | | → | | 8:55 AM | 9:02 AM | 9:12 AM |
| Commuter | AV11W | | | | | | | | | | | | | | | | | | From Santa Clarita/Palmdale/Lancaster | | | | → | | 9:19 AM | 9:25 AM | 9:36 AM |
| Commuter | VC09W | | | | | | | | | | | | | | | 8:12 AM | 8:27 AM | 8:37 AM | 8:51 AM | 9:03 AM | 9:15 AM | 9:21 AM | 9:28 AM | 9:35 AM | 9:41 AM | 9:47 AM | 9:58 AM |
| Commuter | VSB01W | | | | | | | | | 7:21 AM | 7:25 AM | 7:36 AM | 7:38 AM | 7:49 AM | 8:07 AM | 8:19 AM | | | | | | | | | | | |
| Amtrak | PS07E | | | | | | | | | | 7:57 AM | 8:08 AM | 8:10 AM | 8:23 AM | 8:42 AM | - | 8:56 AM | 9:08 AM | 9:22 AM | 9:38 AM | 9:52 AM | - | 10:03 AM | 10:12 AM | - | 10:22 AM | 10:34 AM |
| Commuter | VC10W | | | | | | | | | | | | | | | 9:43 AM | 9:56 AM | 10:06 AM | 10:19 AM | 10:31 AM | 10:43 AM | 10:49 AM | 10:56 AM | 11:03 AM | 11:08 AM | 11:15 AM | 11:25 AM |
| Commuter | AV12W | | | | | | | | | | | | | | | | | | From Santa Clarita/Palmdale/Lancaster | | | | → | | 11:17 AM | 11:24 AM | 11:34 AM |
| Amtrak | PS09E | | | | | | | | | | 10:47 AM | 10:58 AM | 11:00 AM | - | 11:31 AM | - | 11:43 AM | 11:55 AM | - | 12:21 PM | 12:34 PM | - | - | 12:50 PM | - | 1:00 PM | 1:11 PM |
| Commuter | AV13W | | | | | | | | | | | | | | | | | | From Santa Clarita/Palmdale/Lancaster | | | | → | | 1:07 PM | 1:15 PM | 1:25 PM |
| Commuter | VC11W | | | | | | | | | | | | | | | 11:58 AM | 12:11 PM | 12:21 PM | 12:32 PM | 12:44 PM | 12:56 PM | 1:02 PM | 1:09 PM | 1:16 PM | 1:21 PM | 1:28 PM | 1:38 PM |
| Commuter | AV14W | | | | | | | | | | | | | | | | | | From Santa Clarita/Palmdale/Lancaster | | | | → | | 2:07 PM | 2:14 PM | 2:25 PM |
| Amtrak | PS11E | | | | | | | | | | 12:33 PM | 12:44 PM | 12:46 PM | 1:03 PM | 1:23 PM | - | 1:35 PM | 1:47 PM | 2:01 PM | 2:15 PM | 2:28 PM | - | 2:39 PM | 2:48 PM | - | 2:58 PM | 3:10 PM |
| Commuter | AV15W | | | | | | | | | | | | | | | | | | From Santa Clarita/Palmdale/Lancaster | | | | → | | 3:07 PM | 3:15 PM | 3:25 PM |
| Commuter | VC12W | | | | | | | | | | | | | | | 1:56 PM | 2:09 PM | 2:19 PM | 2:30 PM | 2:42 PM | 2:54 PM | 3:00 PM | 3:07 PM | 3:14 PM | 3:19 PM | 3:26 PM | 3:36 PM |
| Commuter | AV16W | | | | | | | | | | | | | | | | | | From Santa Clarita/Palmdale/Lancaster | | | | → | | 3:52 PM | 3:58 PM | 4:09 PM |
| Amtrak | PS13E | 11:40 AM | 11:58 AM | 12:13 PM | - | 12:45 PM | - | - | - | - | 1:47 PM | 2:02 PM | 2:04 PM | 2:14 PM | 2:34 PM | - | 2:46 PM | 2:58 PM | 3:12 PM | 3:26 PM | 3:39 PM | - | 3:51 PM | 3:59 PM | - | 4:09 PM | 4:21 PM |
| Commuter | VC13W | | | | | | | | | | | | | | | | | | 3:30 PM | 3:45 PM | 3:57 PM | 4:03 PM | 4:10 PM | 4:17 PM | 4:22 PM | 4:28 PM | 4:38 PM |
| Commuter | AV17W | | | | | | | | | | | | | | | | | | From Santa Clarita/Palmdale/Lancaster | | | | → | | 4:27 PM | 4:34 PM | 4:45 PM |
| Commuter | AV18W | | | | | | | | | | | | | | | | | | From Santa Clarita/Palmdale/Lancaster | | | | → | | 5:07 PM | 5:14 PM | 5:25 PM |
| Commuter | VC14W | | | | | | | | | | | | | | | | | | 4:30 PM | 4:43 PM | 4:54 PM | 5:00 PM | 5:07 PM | 5:14 PM | 5:19 PM | 5:25 PM | 5:35 PM |
| Commuter | AV19W | | | | | | | | | | | | | | | | | | From Santa Clarita/Palmdale/Lancaster | | | | → | | 5:27 PM | 5:35 PM | 5:45 PM |
| Commuter | AV20W | | | | | | | | | | | | | | | | | | From Santa Clarita/Palmdale/Lancaster | | | | → | | 5:38 PM | 5:44 PM | 5:55 PM |
| Commuter | VC15W | | | | | | | | | | | | | | | | | | 5:00 PM | 5:11 PM | 5:24 PM | 5:30 PM | 5:37 PM | 5:44 PM | 5:48 PM | 5:56 PM | 6:06 PM |
| Commuter | AV21W | | | | | | | | | | | | | | | | | | From Santa Clarita/Palmdale/Lancaster | | | | → | | 6:02 PM | 6:09 PM | 6:19 PM |
| Amtrak | CD/PS15E | 1:49 PM | 2:07 PM | 2:23 PM | - | 2:56 PM | - | - | - | - | 3:54 PM | 4:09 PM | 4:11 PM | 4:22 PM | 4:41 PM | - | 4:53 PM | 5:09 PM | 5:23 PM | 5:37 PM | 5:50 PM | - | 6:02 PM | 6:10 PM | - | 6:20 PM | 6:31 PM |
| Commuter | VC16W | | | | | | | | | | | | | | | | | | 5:40 PM | 5:57 PM | 6:09 PM | 6:14 PM | 6:22 PM | 6:29 PM | 6:34 PM | 6:40 PM | 6:51 PM |
| Commuter | VSB02W | | | | | | | | | 4:02 PM | 4:13 PM | 4:24 PM | 4:26 PM | 4:36 PM | 4:55 PM | 5:07 PM | | | | | | | | | | | |
| Commuter | AV22W | | | | | | | | | | | | | | | | | | From Santa Clarita/Palmdale/Lancaster | | | | → | | 7:07 PM | 7:14 PM | 7:25 PM |
| Amtrak | AMTK11CS | 2:48 PM | - | - | - | - | - | - | - | - | - | 5:37 PM | 5:39 PM | - | - | - | 5:54 PM | - | - | 6:41 PM | - | - | 7:11 PM | 7:20 PM | - | - | 7:40 PM |
| Commuter | VC17W | | | | | | | | | | | | | | | | | | 6:49 PM | 7:03 PM | 7:15 PM | 7:21 PM | 7:28 PM | 7:35 PM | 7:41 PM | 7:47 PM | 7:57 PM |
| Commuter | VSB03W | | | | | | | | | 5:19 PM | 5:22 PM | 5:33 PM | 5:35 PM | 5:51 PM | 6:09 PM | 6:21 PM | | | | | | | | | | | |
| Amtrak | PS18E | 4:45 PM | 5:03 PM | 5:18 PM | - | 5:50 PM | - | - | - | - | 6:48 PM | 7:01 PM | 7:03 PM | 7:15 PM | 7:35 PM | - | 7:47 PM | 7:59 PM | 8:13 PM | 8:27 PM | 8:40 PM | - | 8:51 PM | 9:00 PM | - | 9:10 PM | 9:22 PM |
| Commuter | VC18W | | | | | | | | | | | | | | | 8:03 PM | 8:12 PM | 8:23 PM | 8:35 PM | 8:47 PM | 8:58 PM | 9:04 PM | 9:11 PM | 9:18 PM | 9:24 PM | 9:30 PM | 9:41 PM |
| Commuter | VSB04W | | | | | | | | | 7:10 PM | 7:21 PM | 7:32 PM | 7:34 PM | 7:49 PM | 8:08 PM | 8:20 PM | | | | | | | | | | | |
| Commuter | AV23W | | | | | | | | | | | | | | | | | | From Santa Clarita/Palmdale/Lancaster | | | | → | | 9:37 PM | 9:44 PM | 9:54 PM |

| | |
|---|---|
| Ventura County Line | 18 |
| Antelope Valley Line | 23 |
| Burbank Turn | 0 |
| Ventura-Goleta Commuter Service | 4 |
| Pacific Surfliner | 5 |
| Coast Daylight / Pacific Surfliner | 2 |
| Long Distance | 1 |

**WEEKDAY SOUTHBOUND - Los Angeles ● Fullerton ● Irvine ● Oceanside ● San Diego**

| Train Operator | No. | Los Angeles | Commerce | Norwalk - Santa Fe Springs | Buena Park | Fullerton | Anaheim | Orange | Santa Ana | Tustin | Irvine | Laguna Niguel - Mission Viejo | San Juan Capistrano | San Clemente North Beach | San Clemente Pier | Oceanside | Oceanside | Carlsbad Village | Carlsbad - Poinsettia | Encinitas | Solana Beach | Sorrento Valley | Old Town San Diego | Airport Transportation Center | San Diego | San Diego | Convention Center |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Dp | Dp | Dp | Dp | Dp | Dp | Dp | Dp | Dp | Dp | Dp | Dp | Dp | Dp | Ar | Dp | Dp | Dp | Dp | Dp | Dp | Dp | Dp | Ar | Dp | Ar |
| Commuter | SD01E | | | | | | | | | | | | | | | | 3:55 AM | 4:04 AM | 4:09 AM | 4:14 AM | 4:19 AM | 4:27 AM | 4:46 AM | 4:49 AM | 4:54 AM | | |
| Commuter | SD02E | | | | | | | | | | | | | | | | 4:55 AM | 5:04 AM | 5:09 AM | 5:14 AM | 5:19 AM | 5:27 AM | 5:46 AM | 5:49 AM | 5:54 AM | | |
| Commuter | SD03E | | | | | | | | | | | | | | | | 5:35 AM | 5:44 AM | 5:49 AM | 5:54 AM | 5:59 AM | 6:10 AM | 6:29 AM | 6:32 AM | 6:36 AM | 6:38 AM | 6:42 AM |
| Commuter | IEOC01E | | From San Bernardino/Riverside | | | | → | 4:08 AM | 4:13 AM | 4:19 AM | 4:25 AM | 4:37 AM | | | | | | | | | | | | | | | |
| Commuter | SD04E | | | | | | | | | | | | | | | | 5:55 AM | 6:06 AM | 6:11 AM | 6:16 AM | 6:21 AM | 6:29 AM | 6:48 AM | 6:51 AM | 6:55 AM | | |
| Commuter | IESD01E | | From San Bernardino/Riverside | | | | → | 5:10 AM | 5:15 AM | 5:21 AM | 5:27 AM | 5:37 AM | 5:42 AM | 5:52 AM | - | 6:13 AM | 6:18 AM | 6:24 AM | 6:29 AM | 6:35 AM | 6:40 AM | 6:49 AM | 7:09 AM | 7:12 AM | 7:16 AM | 7:18 AM | 7:24 AM |
| Commuter | SD05E | | | | | | | | | | | | | | | | 6:40 AM | 6:49 AM | 6:54 AM | 6:59 AM | 7:04 AM | 7:12 AM | 7:31 AM | 7:34 AM | 7:39 AM | | |
| Amtrak | PS01E | 5:14 AM | - | - | - | 5:42 AM | 5:50 AM | - | 5:59 AM | - | 6:10 AM | - | 6:25 AM | - | - | 6:55 AM | 6:57 AM | - | - | - | 7:13 AM | - | - | 7:43 AM | 7:49 AM | | |
| Commuter | SD06E | | | | | | | | | | | | | | | | 7:11 AM | 7:21 AM | 7:26 AM | 7:31 AM | 7:36 AM | 7:44 AM | 8:03 AM | 8:06 AM | 8:11 AM | | |
| Commuter | IEOC02E | | From San Bernardino/Riverside | | | | → | 5:35 AM | 5:40 AM | 5:46 AM | 5:52 AM | 6:02 AM | | | | | | | | | | | | | | | |
| Commuter | IEOC03E | | From San Bernardino/Riverside | | | | → | 6:05 AM | 6:10 AM | 6:16 AM | 6:22 AM | 6:34 AM | | | | | | | | | | | | | | | |
| Commuter | PVL01E | 5:52 AM | - | 6:11 AM | 6:18 AM | 6:23 AM | → | | To Riverside/Perris Valley | | | | | | | | | | | | | | | | | | |
| Commuter | SD07E | | | | | | | | | | | | | | | | 7:29 AM | 7:39 AM | 7:44 AM | 7:49 AM | 7:54 AM | 8:02 AM | 8:21 AM | 8:24 AM | 8:29 AM | | |
| Commuter | IEOC04E | | From San Bernardino/Riverside | | | | → | 6:35 AM | 6:40 AM | 6:46 AM | 6:52 AM | 7:02 AM | | | | | | | | | | | | | | | |
| Commuter | PVL02E | 6:22 AM | - | 6:42 AM | - | 6:52 AM | → | | To Riverside/Perris Valley | | | | | | | | | | | | | | | | | | |
| Commuter | SD08E | | | | | | | | | | | | | | | | 7:55 AM | 8:04 AM | 8:09 AM | 8:14 AM | 8:19 AM | 8:27 AM | 8:46 AM | 8:49 AM | 8:54 AM | | |
| Commuter | LASD01E | 6:34 AM | - | 6:54 AM | 7:00 AM | 7:05 AM | 7:12 AM | 7:16 AM | 7:21 AM | 7:27 AM | 7:34 AM | 7:44 AM | 7:50 AM | 8:00 AM | - | 8:21 AM | 8:26 AM | 8:30 AM | 8:36 AM | 8:42 AM | 8:47 AM | 8:56 AM | 9:16 AM | 9:19 AM | 9:25 AM | 9:27 AM | 9:31 AM |
| Amtrak | PS02E | 6:14 AM | - | - | - | | 6:47 AM | - | - | - | 7:04 AM | - | - | - | - | 7:47 AM | 7:49 AM | - | - | - | 8:04 AM | - | - | - | 8:39 AM | | |
| Commuter | IEOC05E | | From San Bernardino/Riverside | | | | → | 7:00 AM | 7:05 AM | 7:11 AM | 7:17 AM | 7:29 AM | | | | | | | | | | | | | | | |
| Commuter | OC01E | 6:44 AM | 6:57 AM | 7:07 AM | 7:13 AM | 7:18 AM | 7:25 AM | 7:29 AM | 7:34 AM | 7:40 AM | 7:47 AM | 7:57 AM | | | | | | | | | | | | | | | |
| Commuter | IEOC06E | | From San Bernardino/Riverside | | | | → | 7:40 AM | 7:45 AM | 7:51 AM | 7:57 AM | 8:09 AM | | | | | | | | | | | | | | | |
| Amtrak | PS03E | 7:14 AM | - | - | - | | 7:48 AM | - | - | - | 8:05 AM | - | - | - | - | 8:49 AM | 8:51 AM | - | - | - | 9:06 AM | - | - | - | 9:41 AM | | |
| Commuter | IESD02E | | From San Bernardino/Riverside | | | | → | 8:04 AM | 8:09 AM | 8:15 AM | 8:21 AM | 8:31 AM | 8:36 AM | 8:45 AM | - | 9:08 AM | 9:13 AM | 9:17 AM | 9:23 AM | 9:28 AM | 9:34 AM | 9:43 AM | 10:02 AM | 10:06 AM | 10:11 AM | | |
| Commuter | PVL03E | 6:59 AM | - | 7:18 AM | 7:25 AM | 7:30 AM | → | | To Riverside/Perris Valley | | | | | | | | | | | | | | | | | | |
| Commuter | MSEP01E | | | | | 8:14 AM | 8:21 AM | 8:25 AM | 8:31 AM | 8:37 AM | 8:44 AM | 8:53 AM | | | | | | | | | | | | | | | |
| Amtrak | PS04E | 8:16 AM | - | - | - | 8:42 AM | 8:50 AM | - | 9:01 AM | - | 9:12 AM | - | 9:27 AM | - | - | 9:59 AM | 10:01 AM | - | - | - | 10:16 AM | - | - | 10:46 AM | 10:52 AM | | |
| Commuter | OC02E | 8:27 AM | 8:41 AM | 8:51 AM | 8:57 AM | 8:02 AM | 9:09 AM | 9:13 AM | 9:18 AM | 9:24 AM | 9:31 AM | 9:47 AM | | | | | | | | | | | | | | | |
| Commuter | SD09E | | | | | | | | | | | | | | | | 10:44 AM | 10:48 AM | 10:53 AM | 10:58 AM | 11:03 AM | 11:11 AM | 11:30 AM | 11:33 AM | 11:38 AM | | |
| Amtrak | PS05E | 9:14 AM | - | - | - | 9:42 AM | 9:50 AM | - | 9:59 AM | - | 10:10 AM | - | 10:26 AM | - | - | 10:57 AM | 10:59 AM | - | - | - | 11:15 AM | - | - | 11:45 AM | 11:52 AM | | |
| Commuter | PVL04E | 9:29 AM | - | 9:50 AM | 9:56 AM | 10:01 AM | | | → | To Riverside/Perris Valley | | | | | | | | | | | | | | | | | |
| Commuter | MSEP02E | | | | | 10:09 AM | 10:16 AM | 10:20 AM | 10:26 AM | 10:32 AM | 10:39 AM | 10:51 AM | | | | | | | | | | | | | | | |
| Commuter | SD10E | | | | | | | | | | | | | | | | 11:44 AM | 11:48 AM | 11:53 AM | 11:58 AM | 12:03 PM | 12:11 PM | 12:30 PM | 12:33 PM | 12:38 PM | | |
| Amtrak | PS06E | 10:14 AM | - | - | - | 10:43 AM | 10:51 AM | - | 11:00 AM | - | 11:12 AM | - | 11:27 AM | - | - | 11:57 AM | 11:59 AM | - | - | - | 12:17 PM | - | - | 12:47 PM | 12:53 PM | | |
| Commuter | IEOC07E | | From San Bernardino/Riverside | | | | → | 11:05 AM | 11:10 AM | 11:15 AM | 11:22 AM | 11:34 AM | | | | | | | | | | | | | | | |
| Commuter | LASD02E | 10:34 AM | - | 10:53 AM | 11:00 AM | 11:05 AM | 11:12 AM | 11:16 AM | 11:21 AM | 11:27 AM | 11:34 AM | 11:44 AM | 11:49 AM | 11:58 AM | - | 12:20 PM | 12:25 PM | 12:29 PM | 12:34 PM | 12:40 PM | 12:46 PM | 12:55 PM | 1:15 PM | 1:18 PM | 1:23 PM | 1:25 PM | 1:30 PM |
| Amtrak | PS07E | 11:16 AM | - | - | - | 11:42 AM | 11:50 AM | - | 12:00 PM | - | 12:11 PM | - | 12:26 PM | - | - | 12:59 PM | 1:01 PM | - | - | - | 1:16 PM | - | - | 1:46 PM | 1:52 PM | | |
| Commuter | PVL05E | 11:29 AM | - | 11:50 AM | 11:57 AM | 12:02 PM | | | → | To Riverside/Perris Valley | | | | | | | | | | | | | | | | | |
| Commuter | MSEP03E | | | | | 12:09 PM | 12:16 PM | 12:20 PM | 12:26 PM | 12:32 PM | 12:39 PM | 12:51 PM | | | | | | | | | | | | | | | |
| Commuter | SD11E | | | | | | | | | | | | | | | | 1:29 PM | 1:33 PM | 1:38 PM | 1:43 PM | 1:48 PM | 1:56 PM | 2:15 PM | 2:18 PM | 2:23 PM | | |
| Amtrak | PS08E | 12:14 PM | - | - | - | 12:43 PM | 12:51 PM | - | 1:00 PM | - | 1:12 PM | - | 1:27 PM | - | - | 1:59 PM | 2:01 PM | - | - | - | 2:17 PM | - | - | 2:47 PM | 2:53 PM | | |
| Commuter | IEOC08E | | From San Bernardino/Riverside | | | | → | 1:05 PM | 1:10 PM | 1:15 PM | 1:22 PM | 1:34 PM | | | | | | | | | | | | | | | |
| Commuter | LASD03E | 12:34 PM | - | 12:54 PM | 1:00 AM | 1:06 AM | 1:13 AM | 1:17 PM | 1:22 PM | 1:28 PM | 1:35 PM | 1:45 PM | 1:50 PM | 1:59 PM | - | 2:21 PM | 2:26 PM | 2:30 PM | 2:35 PM | 2:41 PM | 2:46 PM | 2:56 PM | 3:15 PM | 3:19 PM | 3:24 PM | | |
| Amtrak | PS09E | 1:16 PM | - | - | - | 1:43 PM | 1:52 PM | - | 2:01 PM | - | 2:12 PM | - | 2:28 PM | - | - | 3:00 PM | 3:02 PM | - | - | - | 3:17 PM | - | - | 3:47 PM | 3:54 PM | | |
| Commuter | PVL06E | 1:29 PM | - | 1:48 PM | 1:55 PM | 2:00 PM | | | → | To Riverside/Perris Valley | | | | | | | | | | | | | | | | | |
| Commuter | MSEP04E | | | | | 2:09 PM | 2:16 PM | 2:20 PM | 2:26 PM | 2:32 PM | 2:39 PM | 2:51 PM | | | | | | | | | | | | | | | |
| Commuter | SD12E | | | | | | | | | | | | | | | | 3:12 PM | 3:16 PM | 3:21 PM | 3:26 PM | 3:31 PM | 3:39 PM | 3:58 PM | 4:01 PM | 4:06 PM | | |
| Commuter | SD13E | | | | | | | | | | | | | | | | 3:42 PM | 3:46 PM | 3:51 PM | 3:56 PM | 4:01 PM | 4:10 PM | 4:29 PM | 4:32 PM | 4:37 PM | | |
| Amtrak | PS10E | 2:14 PM | - | - | - | 2:44 PM | 2:52 PM | - | 3:01 PM | - | 3:13 PM | - | 3:27 PM | - | - | 3:59 PM | 4:01 PM | - | - | - | 4:16 PM | - | - | 4:46 AM | 4:52 AM | | |
| Commuter | IEOC09E | | From San Bernardino/Riverside | | | | → | 3:05 PM | 3:10 PM | 3:15 PM | 3:22 PM | 3:34 PM | | | | | | | | | | | | | | | |
| Commuter | OC03E | 2:45 PM | 2:57 PM | 3:06 PM | 3:13 PM | 3:18 PM | 3:25 PM | 3:29 PM | 3:34 PM | 3:40 PM | 3:47 PM | 3:59 PM | | | | | | | | | | | | | | | |
| Commuter | SD14E | | | | | | | | | | | | | | | | 4:19 PM | 4:23 PM | 4:28 PM | 4:33 PM | 4:38 PM | 4:47 PM | 5:06 PM | 5:09 PM | 5:14 PM | | |
| Commuter | SD15E | | | | | | | | | | | | | | | | 4:44 PM | 4:48 PM | 4:53 PM | 4:58 PM | 5:03 PM | 5:12 PM | 5:31 PM | 5:34 PM | 5:39 PM | | |
| Amtrak | PS11E | 3:15 PM | - | - | - | 3:41 PM | 3:49 PM | - | 3:58 PM | - | 4:10 PM | - | 4:25 PM | - | - | 4:56 PM | 4:58 PM | - | - | - | 5:14 PM | - | - | 5:43 PM | 5:50 PM | | |
| Commuter | OC04E | 3:24 PM | 3:36 PM | 3:46 PM | 3:52 PM | 3:57 PM | 4:04 PM | 4:08 PM | 4:13 PM | 4:19 PM | 4:26 PM | 4:38 PM | | | | | | | | | | | | | | | |
| Commuter | PVL07E | 3:39 PM | - | 3:59 PM | 4:06 PM | 4:11 PM | → | | To Riverside/Perris Valley | | | | | | | | | | | | | | | | | | |
| Commuter | OC05E | 3:54 PM | - | 4:18 PM | - | 4:27 PM | 4:33 PM | 4:38 PM | 4:43 PM | 4:49 PM | 4:56 PM | 5:06 PM | | | | | | | | | | | | | | | |
| Commuter | SD16E | | | | | | | | | | | | | | | | 5:24 PM | 5:30 PM | 5:35 PM | 5:40 PM | 5:44 PM | 5:53 PM | 6:12 PM | 6:15 PM | 6:19 PM | | |
| Commuter | PVL08E | 4:09 PM | - | 4:28 PM | 4:34 PM | 4:40 PM | → | | To Riverside/Perris Valley | | | | | | | | | | | | | | | | | | |
| Commuter | SD17E | | | | | | | | | | | | | | | | 5:49 PM | 5:53 PM | 5:58 PM | 6:03 PM | 6:08 PM | 6:16 PM | 6:35 PM | 6:38 PM | 6:43 PM | | |
| Amtrak | PS12E | 4:14 PM | - | - | - | | 4:52 PM | - | - | - | 5:10 PM | - | - | - | - | 5:53 PM | 5:55 PM | - | - | - | 6:14 PM | - | - | - | 6:49 PM | | |
| Commuter | MSEP05E | | | | | 4:49 AM | 4:57 PM | 5:01 PM | 5:07 PM | 5:12 PM | 5:19 PM | 5:32 PM | | | | | | | | | | | | | | | |
| Commuter | PVL09E | 4:29 PM | - | 4:49 PM | | 4:58 PM | | | | | | | | | | | | | | | | | | | | | |
| Commuter | LASD04E | 4:36 PM | - | 4:55 PM | 5:02 PM | 5:07 PM | 5:14 PM | 5:18 PM | 5:23 PM | 5:29 PM | 5:36 PM | 5:46 PM | 5:52 PM | 6:02 PM | - | 6:23 PM | 6:28 PM | 6:32 PM | 6:38 PM | 6:44 PM | 6:49 PM | 6:58 PM | 7:18 PM | 7:22 PM | 7:27 PM | | |
| Commuter | OC06E | 4:47 PM | 4:59 PM | 5:08 PM | - | 5:18 PM | 5:25 PM | 5:29 PM | 5:34 PM | 5:40 PM | 5:47 PM | 5:59 PM | | | | | | | | | | | | | | | |
| Commuter | PVL10E | 4:59 PM | - | 5:18 PM | 5:24 PM | 5:30 PM | → | | To Riverside/Perris Valley | | | | | | | | | | | | | | | | | | |
| Commuter | IEOC10E | | From San Bernardino/Riverside | | | | → | 5:45 PM | 5:50 PM | 5:55 PM | 6:02 PM | 6:12 PM | | | | | | | | | | | | | | | |
| Commuter | SD18E | | | | | | | | | | | | | | | | 6:46 PM | 6:50 PM | 6:55 PM | 7:00 PM | 7:05 PM | 7:14 PM | 7:33 PM | 7:36 PM | 7:41 PM | | |
| Amtrak | PS13E | 5:14 PM | - | - | - | 5:40 PM | 5:48 PM | - | 5:58 PM | - | 6:09 PM | - | 6:24 PM | - | - | 6:55 PM | 6:57 PM | - | - | - | 7:13 PM | - | - | 7:43 PM | 7:49 PM | | |
| Commuter | IEOC11E | | From San Bernardino/Riverside | | | | → | 6:09 PM | 6:14 PM | 6:20 PM | 6:27 PM | 6:38 PM | | | | | | | | | | | | | | | |
| Commuter | PVL11E | 5:24 PM | - | 5:44 PM | 5:50 PM | 5:55 PM | → | | To Riverside/Perris Valley | | | | | | | | | | | | | | | | | | |
| Commuter | LASD05E | 5:34 PM | - | 5:55 PM | 6:01 PM | 6:06 PM | 6:13 PM | 6:17 PM | 6:22 PM | 6:28 PM | 6:35 PM | 6:45 PM | 6:51 PM | 7:00 PM | - | 7:21 PM | 7:26 PM | 7:30 PM | 7:36 PM | 7:41 PM | 7:47 PM | 7:56 PM | 8:16 PM | 8:19 PM | 8:25 PM | | |
| Commuter | PVL12E | 5:49 PM | - | 6:08 PM | - | 6:18 PM | → | | To Riverside/Perris Valley | | | | | | | | | | | | | | | | | | |
| Amtrak | AMTK4SC | 6:04 PM | - | - | - | 6:42 PM | → | | To Chicago | | | | | | | | | | | | | | | | | | |
| Amtrak | PS14E | 6:15 PM | - | - | - | | 6:48 PM | - | - | - | 7:06 PM | - | - | - | - | 7:48 PM | 7:50 PM | - | - | - | 8:05 PM | - | - | - | 8:40 PM | | |
| Commuter | PVL13E | 6:24 PM | - | 6:44 PM | 6:51 PM | 6:56 PM | → | | To Riverside/Perris Valley | | | 12:09 AM | | | | | | | | | | | | | | | |
| Commuter | OC07E | 6:34 PM | - | 6:54 PM | 7:01 PM | 7:06 PM | 7:13 PM | 7:17 PM | 7:22 PM | 7:28 PM | 7:35 PM | 7:45 PM | 7:51 PM | 7:59 PM | - | 8:21 PM | | | | | | | | | | | |
| Commuter | SD19E | | | | | | | | | | | | | | | | 8:29 PM | 8:34 PM | 8:39 PM | 8:45 PM | 8:51 PM | 9:00 PM | 9:20 PM | 9:23 PM | 9:28 PM | | |
| Commuter | PVL14E | 6:54 PM | - | 7:13 PM | - | 7:22 PM | → | | To Riverside/Perris Valley | | | | | | | | | | | | | | | | | | |
| Commuter | IEOC12E | | From San Bernardino/Riverside | | | | → | 7:35 PM | 7:40 PM | 7:46 PM | 7:52 PM | 8:04 PM | | | | | | | | | | | | | | | |
| Amtrak | PS15E | 7:16 PM | - | - | - | 7:45 PM | 7:53 PM | - | 8:02 PM | - | 8:13 PM | - | 8:27 PM | - | - | 9:00 PM | 9:02 PM | - | - | - | 9:17 PM | - | - | 9:47 PM | 9:53 PM | | |
| Commuter | PVL15E | 7:24 PM | - | 7:43 PM | 7:49 PM | 7:55 PM | | | → | To Riverside/Perris Valley | | | | | | | | | | | | | | | | | |
| Commuter | MSEP06E | | | | | 8:04 PM | 8:11 PM | 8:15 PM | 8:21 PM | 8:27 PM | 8:34 PM | 8:46 PM | | | | | | | | | | | | | | | |
| Commuter | SD20E | | | | | | | | | | | | | | | | 9:49 PM | 9:53 PM | 9:58 PM | 10:03 PM | 10:08 PM | 10:16 PM | 10:35 PM | 10:38 PM | 10:43 PM | | |
| Amtrak | PS16E | 8:14 PM | - | - | - | 8:42 PM | 8:50 PM | - | 8:59 PM | - | 9:10 PM | - | 9:26 PM | - | - | 9:57 PM | 9:59 PM | - | - | - | 10:14 PM | - | - | 10:45 PM | 10:52 PM | | |
| Commuter | OC08E | 8:29 PM | 8:43 PM | 8:53 PM | 8:59 PM | 9:04 PM | 9:11 PM | 9:15 PM | 9:21 PM | 9:27 PM | 9:33 PM | 9:46 PM | | | | | | | | | | | | | | | |
| Amtrak | PS17E | 9:14 PM | - | - | - | 9:42 PM | 9:50 PM | - | 9:59 PM | - | 10:10 PM | - | 10:26 PM | - | - | 10:57 PM | 10:59 PM | - | - | - | 11:14 PM | - | - | 11:44 PM | 11:51 PM | | |
| Commuter | PVL16E | 9:24 PM | - | 9:45 PM | 9:52 PM | 9:57 PM | | | → | To Riverside/Perris Valley | | | | | | | | | | | | | | | | | |
| Commuter | MSEP07E | | | | | 10:13 PM | 10:18 PM | 10:22 PM | 10:28 PM | 10:34 PM | 10:41 PM | 10:50 PM | 10:56 PM | 11:05 PM | - | 11:26 PM | | | | | | | | | | | |
| Amtrak | PS18E | 10:16 PM | - | - | - | 10:42 PM | 10:50 PM | - | 10:59 PM | - | 11:11 PM | - | 11:26 PM | - | - | 11:58 PM | 12:00 AM | - | - | - | 12:06 AM | - | - | 12:46 AM | 12:52 AM | | |
| Amtrak | AMTK2SL | 10:44 PM | - | - | - | 11:19 PM | → | | To New Orleans | | | | | | | | | | | | | | | | | | |
| Commuter | OC09E | 11:39 PM | - | 11:58 PM | 12:04 AM | 12:10 AM | 12:17 AM | 12:21 AM | 12:26 AM | 12:32 AM | 12:39 AM | 12:49 AM | 12:54 AM | 1:03 AM | - | 1:25 AM | | | | | | | | | | | |

| | |
|---|---|
| Coaster | 27 |
| Orange County Line | 14 |
| Inland Empire Orange County Line | 14 |
| Perris Valley Line | 16 |
| Orange County MSEP | 7 |
| Pacific Surfliner | 18 |
| Long Distance | 2 |

**WEEKDAY NORTHBOUND - San Diego ● Oceanside ● Irvine ● Fullerton ● Los Angeles**

| | | Convention Center | San Diego | San Diego | Airport Transportation Center | Old Town San Diego | Sorrento Valley | Solana Beach | Encinitas | Carlsbad - Poinsettia | Carlsbad Village | Oceanside | Oceanside | San Clemente Pier | San Clemente North Beach | San Juan Capistrano | Laguna Niguel - Mission Viejo | Irvine | Tustin | Santa Ana | Orange | Anaheim | Fullerton | Buena Park | Norwalk - Santa Fe Springs | Commerce | Los Angeles |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Train Operator | No. | Dp | Ar | Dp | Dp | Dp | Dp | Dp | Dp | Dp | Dp | Ar | Dp | Dp | Dp | Dp | Dp | Dp | Dp | Dp | Dp | Dp | Dp | Dp | Dp | Dp | Ar |
| Commuter | PVL01W | | | | | | | | | | | | | | | | | | From Riverside/Perris Valley | | → | 5:16 AM | 5:21 AM | 5:27 AM | - | 5:49 AM |
| Commuter | OC01W | | | | | | | | | | | | | | | | 4:55 AM | 5:04 AM | 5:10 AM | 5:17 AM | 5:22 AM | 5:26 AM | 5:33 AM | 5:39 AM | 5:45 AM | 5:55 AM | 6:07 AM |
| Commuter | PVL02W | | | | | | | | | | | | | | | | | | From Riverside/Perris Valley | | → | 5:49 AM | - | 5:58 AM | - | 6:18 AM |
| Commuter | OC02W | | | | | | | | | | | | 4:46 AM | - | 5:12 AM | 5:21 AM | 5:27 AM | 5:37 AM | 5:43 AM | 5:50 AM | 5:55 AM | 5:59 AM | 6:06 AM | 8:12 AM | 6:19 AM | - | 6:42 AM |
| Amtrak | AMTK3SC | | | | | | | | | | | | | | | | | | From Chicago | | → | 6:15 AM | - | - | - | 6:54 AM |
| Commuter | PVL03W | | | | | | | | | | | | | | | | | | From Riverside/Perris Valley | | → | 6:24 AM | - | 6:36 AM | - | 7:03 AM |
| Commuter | OC03W | | | | | | | | | | | | 5:15 AM | - | 5:40 AM | 5:49 AM | 5:55 AM | 6:04 AM | 6:11 AM | 6:17 AM | 6:22 AM | 6:27 AM | 6:34 AM | 6:39 AM | 6:45 AM | - | 7:06 AM |
| Commuter | PVL04W | | | | | | | | | | | | | | | | | | | | | | 6:44 AM | - | 6:56 AM | - | 7:17 AM |
| Commuter | OC04W | | | | | | | | | | | | | | | | 6:19 AM | 6:29 AM | 6:35 AM | 6:42 AM | 6:47 AM | 6:51 AM | 6:58 AM | 7:04 AM | 7:10 AM | 7:20 AM | 7:33 AM |
| Commuter | IEOC01W | | | | | | | | | | | | | | | | 6:49 AM | 6:59 AM | 7:06 AM | 7:12 AM | 7:18 AM | | → | To San Bernardino/Riverside | | | |
| Amtrak | PS01W | | | 5:14 AM | - | - | - | 5:47 AM | - | - | - | 6:02 AM | 6:04 AM | - | - | - | - | 6:47 AM | - | - | - | 7:06 AM | - | - | - | - | 7:41 AM |
| Commuter | PVL05W | | | | | | | | | | | | | | | | | | From Riverside/Perris Valley | | → | 7:19 AM | 7:24 AM | 7:30 AM | - | 7:52 AM |
| Commuter | LASD01W | | | 5:30 AM | 5:34 AM | 5:37 AM | 5:56 AM | 6:05 AM | 6:10 AM | 6:15 AM | 6:20 AM | 6:24 AM | 6:29 AM | - | 6:50 AM | 6:58 AM | 7:02 AM | 7:11 AM | 7:16 AM | 7:23 AM | 7:27 AM | 7:31 AM | 7:38 AM | 7:42 AM | 7:48 AM | - | 8:07 AM |
| Amtrak | AMTK1SL | | | | | | | | | | | | | | | | | | From New Orleans | | → | 7:48 AM | - | - | - | 8:18 AM |
| Commuter | MSEP01W | | | | | | | | | | | | 6:34 AM | - | 7:00 AM | 7:09 AM | 7:15 AM | 7:25 AM | 7:32 AM | 7:39 AM | 7:44 AM | 7:48 AM | 7:57 AM | | | | |
| Amtrak | PS02W | | | 6:06 AM | - | - | - | 6:39 AM | - | - | - | 6:54 AM | 6:56 AM | - | - | - | - | 7:38 AM | - | - | - | 7:56 AM | - | - | - | - | 8:29 AM |
| Commuter | PVL06W | | | | | | | | | | | | | | | | | | From Riverside/Perris Valley | | → | 8:09 AM | 8:14 AM | 8:20 AM | - | 8:42 AM |
| Commuter | OC05W | | | | | | | | | | | | | | | | 7:37 AM | 7:49 AM | 7:55 AM | 8:02 AM | 8:07 AM | 8:11 AM | 8:18 AM | 8:24 AM | 8:30 AM | 8:44 AM | 8:57 AM |
| Commuter | IEOC02W | | | | | | | | | | | | | | | | 7:49 AM | 7:59 AM | 8:06 AM | 8:13 AM | 8:18 AM | | → | To San Bernardino/Riverside | | | |
| Commuter | LASD02W | | | 6:30 AM | 6:34 AM | 6:37 AM | 6:56 AM | 7:05 AM | 7:10 AM | 7:15 AM | 7:20 AM | 7:24 AM | 7:29 AM | - | 7:48 AM | 7:56 AM | 8:01 AM | 8:09 AM | 8:15 AM | 8:21 AM | 8:26 AM | 8:30 AM | 8:36 AM | 8:41 AM | 8:47 AM | - | 9:07 AM |
| Commuter | OC06W | | | | | | | | | | | | | | | | 8:19 AM | 8:29 AM | 8:35 AM | 8:42 AM | 8:47 AM | 8:51 AM | 8:58 AM | 9:04 AM | 9:10 AM | 9:20 AM | 9:33 AM |
| Amtrak | PS03W | | | 7:04 AM | 7:09 AM | - | - | 7:39 AM | - | - | - | 7:55 AM | 7:57 AM | - | - | 8:28 AM | - | 8:42 AM | - | 8:53 AM | - | 9:02 AM | 9:11 AM | - | - | - | 9:43 AM |
| Commuter | PVL07W | | | | | | | | | | | | | | | | | | From Riverside/Perris Valley | | → | 9:19 AM | 9:24 AM | 9:30 AM | - | 9:50 AM |
| Commuter | IEOC03W | | | | | | | | | | | | | | | | 8:39 AM | 8:49 AM | 8:56 AM | 9:02 AM | 9:08 AM | | → | To San Bernardino/Riverside | | | |
| Commuter | MSEP02W | | | | | | | | | | | | | | | | 9:09 AM | 9:19 AM | 9:25 AM | 9:32 AM | 9:37 AM | 9:41 AM | 9:51 AM | | | | |
| Commuter | SD01W | | | 7:34 AM | 7:38 AM | 7:41 AM | 8:00 AM | 8:09 AM | 8:14 AM | 8:19 AM | 8:24 AM | 8:28 AM | | | | | | | | | | | | | | | |
| Commuter | PVL08W | | | | | | | | | | | | | | | | | | From Riverside/Perris Valley | | → | 9:59 AM | 10:04 AM | 10:10 AM | - | 10:30 AM |
| Commuter | SD02W | | | 7:59 AM | 8:03 AM | 8:06 AM | 8:25 AM | 8:33 AM | 8:38 AM | 8:43 AM | 8:48 AM | 8:52 AM | | | | | | | | | | | | | | | |
| Amtrak | PS04W | | | 8:11 AM | 8:16 AM | - | - | 8:46 AM | - | - | - | 9:02 AM | 9:04 AM | - | - | 9:33 AM | - | 9:48 AM | - | 9:59 AM | - | 10:08 AM | 10:16 AM | - | - | - | 10:46 AM |
| Commuter | LASD03W | | | 8:30 AM | 8:34 AM | 8:37 AM | 8:56 AM | 9:05 AM | 9:10 AM | 9:15 AM | 9:20 AM | 9:24 AM | 9:29 AM | - | 9:50 AM | 9:58 AM | 10:03 AM | 10:11 AM | 10:17 AM | 10:23 AM | 10:28 AM | 10:32 AM | 10:38 AM | 10:43 AM | 10:49 AM | - | 11:08 AM |
| Commuter | SD03W | | | 8:54 AM | 8:58 AM | 9:01 AM | 9:20 AM | 9:29 AM | 9:34 AM | 9:39 AM | 9:44 AM | 9:48 AM | | | | | | | | | | | | | | | |
| Amtrak | PS05W | | | 9:12 AM | 9:17 AM | - | - | 9:49 AM | - | - | - | 10:05 AM | 10:07 AM | - | - | 10:37 AM | - | 10:52 AM | - | 11:03 AM | - | 11:12 AM | 11:20 AM | - | - | - | 11:51 AM |
| Commuter | MSEP03W | | | | | | | | | | | | | | | | 11:09 AM | 11:19 AM | 11:25 AM | 11:32 AM | 11:37 AM | 11:41 AM | 11:51 AM | | | | |
| Commuter | SD04W | | | 9:29 AM | 9:33 AM | 9:36 AM | 9:55 AM | 10:03 AM | 10:09 AM | 10:14 AM | 10:18 AM | 10:25 AM | | | | | | | | | | | | | | | |
| Commuter | PVL09W | | | | | | | | | | | | | | | | | | From Riverside/Perris Valley | | → | 11:59 AM | 12:04 PM | 12:10 PM | - | 12:30 PM |
| Amtrak | PS06W | | | 10:12 AM | 10:17 AM | - | - | 10:47 AM | - | - | - | 11:03 AM | 11:05 AM | - | - | 11:35 AM | - | 11:50 AM | - | 12:01 PM | - | 12:10 PM | 12:18 PM | - | - | - | 12:47 PM |
| Commuter | OC08W | | | | | | | | | | | | | | | | 12:09 PM | 12:19 PM | 12:25 PM | 12:32 PM | 12:37 PM | 12:41 PM | 12:48 PM | 12:54 PM | 1:00 PM | 1:10 PM | 1:24 PM |
| Commuter | SD05W | | | 10:29 AM | 10:33 AM | 10:36 AM | 10:55 AM | 11:04 AM | 11:09 AM | 11:14 AM | 11:19 AM | 11:25 AM | | | | | | | | | | | | | | | |
| Commuter | IEOC04W | | | | | | | | | | | | | | | | 11:59 AM | 12:09 PM | 12:16 PM | 12:23 PM | 12:28 PM | | → | To San Bernardino/Riverside | | | |
| Amtrak | PS07W | | | 11:12 AM | 11:17 AM | - | - | 11:47 AM | - | - | - | 12:03 PM | 12:05 PM | - | - | 12:34 PM | - | 12:49 PM | - | 1:00 PM | - | 1:11 PM | 1:19 PM | - | - | - | 1:51 PM |
| Commuter | MSEP04W | | | | | | | | | | | | | | | | 1:09 PM | 1:19 PM | 1:25 PM | 1:32 PM | 1:37 PM | 1:41 PM | 1:51 PM | | | | |
| Commuter | SD06W | | | 11:59 AM | 12:03 PM | 12:06 PM | 12:25 PM | 12:33 PM | 12:39 PM | 12:44 PM | 12:48 PM | 12:52 PM | | | | | | | | | | | | | | | |
| Commuter | PVL10W | | | | | | | | | | | | | | | | | | From Riverside/Perris Valley | | → | 1:57 PM | 2:05 PM | 2:12 PM | - | 2:34 PM |
| Amtrak | PS08W | | | 12:12 PM | 12:17 PM | - | - | 12:47 PM | - | - | - | 1:03 PM | 1:05 PM | - | - | 1:34 PM | - | 1:49 PM | - | 2:00 PM | - | 2:09 PM | 2:17 PM | - | - | - | 2:48 PM |
| Commuter | SD07W | | | 12:59 PM | 1:03 PM | 1:06 PM | 1:25 PM | 1:33 PM | 1:38 PM | 1:43 PM | 1:48 PM | 1:55 PM | | | | | | | | | | | | | | | |
| Commuter | IEOC05W | | | | | | | | | | | | | | | | 2:09 PM | 2:19 PM | 2:26 PM | 2:33 PM | 2:38 PM | | → | To San Bernardino/Riverside | | | |
| Amtrak | PS09W | | | 1:12 PM | 1:17 PM | - | - | 1:47 PM | - | - | - | 2:03 PM | 2:05 PM | - | - | 2:34 PM | - | 2:49 PM | - | 3:00 PM | - | 3:11 PM | 3:19 PM | - | - | - | 3:52 PM |
| Commuter | LASD04W | 1:15 PM | 1:22 PM | 1:30 PM | 1:34 PM | 1:37 PM | 1:56 PM | 2:05 PM | 2:10 PM | 2:15 PM | 2:20 PM | 2:24 PM | 2:29 PM | - | 2:51 PM | 2:59 PM | 3:04 PM | 3:09 PM | 3:18 PM | 3:24 PM | 3:29 PM | 3:33 PM | 3:39 PM | 3:44 PM | 3:49 PM | - | 4:08 PM |
| Commuter | MSEP05W | | | | | | | | | | | | | | | | 3:24 PM | 3:34 PM | 3:40 PM | 3:47 PM | 3:52 PM | 3:56 PM | 4:06 PM | | | | |
| Amtrak | PS10W | | | 2:12 PM | 2:17 PM | - | - | 2:47 PM | - | - | - | 3:03 PM | 3:05 PM | - | - | 3:35 PM | - | 3:50 PM | - | 4:01 PM | - | 4:10 PM | 4:18 PM | - | - | - | 4:48 PM |
| Commuter | PVL11W | | | | | | | | | | | | | | | | | | From Riverside/Perris Valley | | → | 4:29 PM | - | 4:38 PM | - | 5:01 PM |
| Commuter | IEOC06W | | | | | | | | | | | | | | | | 3:54 PM | 4:04 PM | 4:10 PM | 4:16 PM | 4:21 PM | | → | To San Bernardino/Riverside | | | |
| Commuter | SD08W | | | 2:44 PM | 2:48 PM | 2:51 PM | 3:10 PM | 3:18 PM | 3:23 PM | 3:28 PM | 3:33 PM | 3:40 PM | | | | | | | | | | | | | | | |
| Commuter | IEOC07W | | | | | | | | | | | | | | | | 4:24 PM | 4:34 PM | 4:41 PM | 4:48 PM | 4:53 PM | | → | To San Bernardino/Riverside | | | |
| Amtrak | PS11W | | | 3:14 PM | - | - | - | 3:48 PM | - | - | - | 4:04 PM | 4:06 PM | - | - | - | - | 4:48 PM | - | - | - | 5:05 PM | - | - | - | - | 5:44 PM |
| Commuter | IEOC08W | | | | | | | | | | | | | | | | 4:49 PM | 4:59 PM | 5:06 PM | 5:13 PM | 5:18 PM | | → | To San Bernardino/Riverside | | | |
| Commuter | PVL12W | | | | | | | | | | | | | | | | | | From Riverside/Perris Valley | | → | 5:19 PM | 5:24 PM | 7:30 PM | - | 5:50 PM |
| Commuter | LASD05W | 3:18 PM | 3:22 PM | 3:30 PM | 3:34 PM | 3:37 PM | 3:56 PM | 4:04 PM | 4:09 PM | 4:14 PM | 4:19 PM | 4:23 PM | 4:28 PM | - | 4:49 PM | 4:57 PM | 5:02 PM | 5:10 PM | 5:16 PM | 5:22 PM | 5:27 PM | 5:31 PM | 5:38 PM | 5:42 PM | 5:48 PM | - | 6:08 PM |
| Commuter | IEOC09W | | | | | | | | | | | | | | | | 5:19 PM | 5:29 PM | 5:36 PM | 5:43 PM | 5:48 PM | | → | To San Bernardino/Riverside | | | |
| Commuter | SD09W | | | 3:49 PM | 3:53 PM | 3:56 PM | 4:15 PM | 4:23 PM | 4:28 PM | 4:33 PM | 4:38 PM | 4:48 PM | | | | | | | | | | | | | | | |
| Amtrak | PS12W | | | 4:04 PM | 4:11 PM | - | - | 4:42 PM | - | - | - | 4:57 PM | 4:59 PM | - | - | 5:29 PM | - | 5:43 PM | - | 5:54 PM | - | 6:03 PM | 6:12 PM | - | - | - | 6:44 PM |
| Commuter | PVL13W | | | | | | | | | | | | | | | | | | From Riverside/Perris Valley | | → | 6:19 PM | 6:24 PM | 6:30 PM | - | 6:51 PM |
| Commuter | MSEP06W | | | | | | | | | | | | | | | | 5:49 PM | 5:59 PM | 6:05 PM | 6:12 PM | 6:17 PM | 6:21 PM | 6:31 PM | | | | |
| Commuter | IESD01W | | | 4:34 PM | 4:37 PM | 4:40 PM | 4:59 PM | 5:07 PM | 5:13 PM | 5:18 PM | 5:22 PM | 5:26 PM | 5:31 PM | - | 5:52 PM | 6:01 PM | 6:05 PM | 6:13 PM | 6:19 PM | 6:26 PM | 6:31 PM | | → | | To San Bernardino/Riverside | | |
| Commuter | IEOC10W | | | | | | | | | | | | | | | | 6:24 PM | 6:34 PM | 6:41 PM | 6:47 PM | 6:53 PM | | → | | To San Bernardino/Riverside | | |
| Commuter | PVL14W | | | | | | | | | | | | | | | | | | From Riverside/Perris Valley | | → | 6:49 PM | - | 6:58 PM | - | 7:19 PM |
| Amtrak | PS13W | | | 5:12 PM | - | - | - | 5:46 PM | - | - | - | 6:01 PM | 6:03 PM | - | - | - | - | 6:46 PM | - | - | - | 7:03 PM | - | - | - | - | 7:37 PM |
| Commuter | PVL15W | | | | | | | | | | | | | | | | | | From Riverside/Perris Valley | | → | 7:25 PM | 7:31 PM | 7:37 PM | - | 7:57 PM |
| Commuter | OC07W | | | | | | | | | | | | | | | | 6:45 PM | 6:59 PM | 9:05 AM | 7:12 PM | 7:17 PM | 7:21 PM | 7:28 PM | 7:36 PM | 7:46 PM | 7:57 PM | 8:09 PM |
| Commuter | SD10W | | | 4:57 PM | 5:01 PM | 5:04 PM | 5:23 PM | 5:31 PM | 5:36 PM | 5:41 PM | 5:46 PM | 5:53 PM | | | | | | | | | | | | | | | |
| Commuter | SD11W | | | 5:34 PM | 5:38 PM | 5:41 PM | 6:00 PM | 6:08 PM | 6:13 PM | 6:18 PM | 6:23 PM | 6:32 PM | | | | | | | | | | | | | | | |
| Commuter | IEOC11W | | | | | | | | | | | | | | | | 7:14 PM | 7:24 PM | 7:30 PM | 7:36 PM | 7:41 PM | | → | To San Bernardino/Riverside | | | |
| Commuter | PVL16W | | | | | | | | | | | | | | | | | | From Riverside/Perris Valley | | → | 7:49 PM | 7:54 PM | 8:00 PM | - | 8:20 PM |
| Commuter | SD12W | | | 5:55 PM | 5:59 PM | 6:02 PM | 6:21 PM | 6:30 PM | 6:35 PM | 6:40 PM | 6:45 PM | 6:52 PM | | | | | | | | | | | | | | | |
| Amtrak | PS14W | | | 6:05 PM | 6:10 PM | - | - | 6:40 PM | - | - | - | 6:56 PM | 6:58 PM | - | - | 7:28 PM | - | 7:43 PM | - | 7:54 PM | - | 8:03 PM | 8:12 PM | - | - | - | 8:44 PM |
| Commuter | SD13W | 6:05 AM | 6:09 PM | 6:17 PM | 6:21 PM | 6:24 PM | 6:43 PM | 6:51 PM | 6:56 PM | 7:01 PM | 7:06 PM | 7:13 PM | | | | | | | | | | | | | | | |
| Commuter | SD14W | | | 6:34 PM | 6:38 PM | 6:41 PM | 7:00 PM | 7:08 PM | 7:13 PM | 7:18 PM | 7:23 PM | 7:30 PM | | | | | | | | | | | | | | | |
| Commuter | SD15W | | | 7:04 PM | 7:08 PM | 7:11 PM | 7:30 PM | 7:38 PM | 7:44 PM | 7:49 PM | 7:53 PM | 8:00 PM | | | | | | | | | | | | | | | |
| Commuter | IEOC12W | | | | | | | | | | | | | | | | 8:24 PM | 8:34 PM | 8:41 PM | 8:48 PM | 8:53 PM | | → | To San Bernardino/Riverside | | | |
| Amtrak | PS15W | | | 7:12 PM | 7:17 PM | - | - | 7:47 PM | - | - | - | 8:03 PM | 8:05 PM | - | - | 8:34 PM | - | 8:49 PM | - | 9:00 PM | - | 9:09 PM | 9:17 PM | - | - | - | 9:48 PM |
| Commuter | IESD02W | 7:21 AM | 7:30 PM | 7:33 PM | 7:37 PM | 7:40 PM | 7:59 PM | 8:07 PM | 8:12 PM | 8:17 PM | 8:22 PM | 8:26 PM | 8:31 PM | - | 8:52 PM | 9:00 PM | 9:05 PM | 9:13 PM | 9:19 PM | 9:26 PM | 9:31 PM | | → | To San Bernardino/Riverside | | | |
| Commuter | MSEP07W | | | | | | | | | | | | | | | | 9:14 PM | 9:24 PM | 9:30 PM | 9:37 PM | 9:42 PM | 9:46 PM | 9:56 PM | | | | |
| Commuter | SD16W | | | 7:59 PM | 8:03 PM | 8:06 PM | 8:25 PM | 8:34 PM | 8:39 PM | 8:44 PM | 8:49 PM | 8:56 PM | | | | | | | | | | | | | | | |
| Amtrak | PS16W | | | 8:12 PM | 8:17 PM | - | - | 8:47 PM | - | - | - | 9:03 PM | 9:05 PM | - | - | 9:36 PM | - | 9:50 PM | - | 10:01 PM | - | 10:10 PM | 10:19 PM | - | - | - | 10:49 PM |
| Commuter | SD17W | | | 8:34 PM | 8:38 PM | 8:41 PM | 9:00 PM | 9:09 PM | 9:14 PM | 9:19 PM | 9:24 PM | 9:30 PM | | | | | | | | | | | | | | | |
| Commuter | OC09W | | | | | | | | | | | | | | | | 10:09 PM | 10:16 PM | 10:25 PM | 10:32 PM | 10:37 PM | 10:41 AM | 10:48 PM | 10:54 PM | 11:00 PM | 11:10 PM | 11:23 PM |
| Amtrak | PS17W | | | 9:12 PM | 9:17 PM | - | - | 9:47 PM | - | - | - | 10:03 PM | 10:05 PM | - | - | 10:36 PM | - | 10:50 PM | - | 11:01 PM | - | 11:10 PM | 11:22 PM | - | - | - | 11:52 PM |
| Commuter | SD18W | | | 9:29 PM | 9:33 PM | 9:36 PM | 9:55 PM | 10:04 PM | 10:09 PM | 10:14 PM | 10:19 PM | 10:26 PM | | | | | | | | | | | | | | | |
| Commuter | SD19W | | | 9:59 PM | 10:03 PM | 10:06 PM | 10:25 PM | 10:33 PM | 10:44 PM | 10:48 PM | 10:52 PM | 11:05 PM | | | | | | | | | | | | | | | |
| Amtrak | PS18W | | | 10:12 PM | 10:17 PM | - | - | 10:47 PM | - | - | - | 11:03 PM | 11:05 PM | - | - | 11:34 PM | - | 11:49 PM | - | 12:00 AM | - | 12:09 AM | 12:17 AM | - | - | - | 12:48 AM |
| Commuter | SD20W | | | 10:59 PM | 11:03 PM | 11:06 PM | 11:25 PM | 11:33 PM | 11:39 PM | 11:44 PM | 11:48 PM | 12:07 AM | | | | | | | | | | | | | | | |

| | |
|---|---|
| Coaster | 27 |
| Orange County Line | 14 |
| Inland Empire Orange County Line | 14 |
| Perris Valley Line | 16 |
| Orange County MSEP | 7 |
| Pacific Surfliner | 18 |
| Long Distance | 2 |

## WEEKDAY NORTHBOUND - Los Angeles ● Burbank ● Santa Barbara ● San Luis Obispo

| Train Operator | No. | Los Angeles Dp | Glendale Dp | Downtown Burbank Dp | Burbank - Bob Hope Airport Dp | Van Nuys Dp | Northridge Dp | Chatsworth Dp | Simi Valley Dp | Moorpark Dp | Camarillo Dp | Oxnard Dp | East Ventura Ar | Ventura Dp | Carpinteria Dp | Santa Barbara Ar | Santa Barbara Dp | Goleta Dp | North Goleta Ar | Buellton (Burger King) (B) Dp | Solvang (B) Dp | Lompoc (Visitors Center) (B) Dp | Surf / Lompoc Dp | Santa Maria (HOP) (B) Dp | Guadalupe Dp | Grover Beach - Pismo Beach Dp | San Luis Obispo Ar |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Commuter | VSB01W | | | | | | | | | | | | 5:56 AM | 6:10 AM | 6:28 AM | 6:41 AM | 6:43 AM | 6:52 AM | 6:56 AM | | | | | | | | |
| Commuter | VSB02W | | | | | | | | | | | | 6:53 AM | 7:03 AM | 7:20 AM | 7:33 AM | 7:35 AM | 7:44 AM | 7:48 AM | | | | | | | | |
| Commuter | VC01W | 6:10 AM | 6:20 AM | 6:26 AM | 6:31 AM | 6:38 AM | 6:46 AM | 6:53 AM | 7:05 AM | 7:17 AM | 7:30 AM | 7:40 AM | 7:55 AM | | | | | | | | | | | | | | |
| Commuter | AV01W | 6:22 AM | 6:32 AM | 6:39 AM | → | | To Santa Clarita/Palmdale/Lancaster | | | | | | | | | | | | | | | | | | | | |
| Commuter | VC02W | 6:30 AM | 6:40 AM | 6:46 AM | 6:51 AM | 6:58 AM | 7:05 AM | 7:11 AM | 7:27 AM | 7:38 AM | | | | | | | | | | | | | | | | | |
| Commuter | AV02W | 6:56 AM | 7:06 AM | 7:13 AM | → | | To Santa Clarita/Palmdale/Lancaster | | | | | | | | | | | | | | | | | | | | |
| Commuter | VSB03W | | | | | | | | | | | | 8:49 AM | 8:59 AM | 9:17 AM | 9:29 AM | 9:31 AM | 9:40 AM | 9:44 AM | | | | | | | | |
| Commuter | VC03W | 7:19 AM | 7:29 AM | 7:35 AM | 7:40 AM | 7:47 AM | 7:54 AM | 8:00 AM | 8:14 AM | 8:25 AM | 8:35 AM | 8:45 AM | 9:00 AM | | | | | | | | | | | | | | |
| Commuter | AV03W | 7:29 AM | 7:39 AM | 7:46 AM | → | | To Santa Clarita/Palmdale/Lancaster | | | | | | | | | | | | | | | | | | | | |
| Commuter | VC04W | 7:38 AM | 7:48 AM | 7:54 AM | 7:59 AM | 8:06 AM | 8:13 AM | 8:19 AM | 8:30 AM | 8:41 AM | | | | | | | | | | | | | | | | | |
| Amtrak | CD/PS01W | 7:45 AM | 7:55 AM | - | 8:07 AM | 8:16 AM | - | 8:27 AM | 8:39 AM | 8:52 AM | 9:04 AM | 9:16 AM | - | 9:28 AM | 9:47 AM | 10:01 AM | 10:03 AM | 10:16 AM | - | - | - | - | 11:13 AM | - | 11:45 AM | 12:16 PM | 12:37 PM |
| Commuter | AV04W | 7:54 AM | 8:04 AM | 8:10 AM | → | | To Santa Clarita/Palmdale/Lancaster | | | | | | | | | | | | | | | | | | | | |
| Commuter | AV05W | 8:14 AM | 8:24 AM | 8:31 AM | → | | To Santa Clarita/Palmdale/Lancaster | | | | | | | | | | | | | | | | | | | | |
| Commuter | VC05W | 8:29 AM | 8:39 AM | 8:46 AM | 8:51 AM | 8:58 AM | 9:05 AM | 9:10 AM | 9:25 AM | 9:38 AM | | | | | | | | | | | | | | | | | |
| Commuter | AV06W | 8:37 AM | 8:47 AM | 8:54 AM | → | | To Santa Clarita/Palmdale/Lancaster | | | | | | | | | | | | | | | | | | | | |
| Amtrak | PS02W | 8:44 AM | 8:54 AM | - | 9:05 AM | 9:14 AM | - | 9:25 AM | 9:47 AM | 9:59 AM | 10:21 AM | 10:33 AM | - | 10:45 AM | 10:21 AM | 11:18 AM | 11:20 AM | 11:31 AM | | | | | | | | | |
| Commuter | VC06W | 9:12 AM | 9:23 AM | 9:29 AM | 9:34 AM | 9:41 AM | 9:48 AM | 9:54 AM | 10:05 AM | 10:17 AM | 10:27 AM | 10:37 AM | 10:53 AM | | | | | | | | | | | | | | |
| Commuter | AV07W | 9:39 AM | 9:49 AM | 9:56 AM | → | | To Santa Clarita/Palmdale/Lancaster | | | | | | | | | | | | | | | | | | | | |
| Commuter | VC07W | 9:56 AM | 10:06 AM | 10:12 AM | 10:17 AM | 10:24 AM | 10:31 AM | 10:37 AM | 10:52 AM | 11:03 AM | | | | | | | | | | | | | | | | | |
| Amtrak | AMTK14CS | 10:35 AM | - | - | 10:51 AM | 11:02 AM | - | - | 11:25 AM | - | - | 11:55 AM | - | - | - | 12:37 PM | 12:39 PM | - | - | - | - | - | - | - | - | - | 3:02 PM |
| Amtrak | PS04W | 11:00 AM | 11:10 AM | - | 11:21 AM | - | - | 11:39 AM | 11:57 AM | - | 12:14 PM | 12:25 PM | - | 12:38 PM | - | 1:08 PM | 1:10 PM | 1:21 PM | - | - | - | - | 2:19 PM | - | 2:57 PM | 3:12 PM | 3:32 PM |
| Commuter | AV08W | 11:49 AM | 11:59 AM | 12:05 PM | → | | To Santa Clarita/Palmdale/Lancaster | | | | | | | | | | | | | | | | | | | | |
| Commuter | VC08W | 12:39 PM | 12:49 PM | 12:55 PM | 1:00 PM | 1:07 PM | 1:14 PM | 1:20 PM | 1:31 PM | 1:42 PM | | | | | | | | | | | | | | | | | |
| Amtrak | PS06W | 12:56 PM | 1:06 PM | - | 1:17 PM | 1:25 PM | - | 1:37 PM | 1:49 PM | 2:02 PM | 2:14 PM | 2:25 PM | - | 2:41 PM | 3:00 PM | 3:14 PM | 3:16 PM | 3:27 PM | - | - | - | - | 4:29 PM | - | 5:01 PM | 5:28 PM | 5:48 PM |
| Commuter | AV09W | 1:44 PM | 1:54 PM | 2:00 PM | → | | To Santa Clarita/Palmdale/Lancaster | | | | | | | | | | | | | | | | | | | | |
| Commuter | AV10W | 2:24 PM | 2:34 PM | 2:41 PM | → | | To Santa Clarita/Palmdale/Lancaster | | | | | | | | | | | | | | | | | | | | |
| Commuter | VC09W | 2:37 PM | 2:47 PM | 2:53 PM | 2:58 PM | 3:05 PM | 3:12 PM | 3:18 PM | 3:34 PM | 3:45 PM | | | | | | | | | | | | | | | | | |
| Amtrak | PS08W | 3:34 PM | 3:44 PM | - | 3:56 PM | 4:05 PM | - | 4:16 PM | 4:29 PM | 4:43 PM | 4:55 PM | 5:07 PM | - | 5:20 PM | 5:41 PM | 5:55 PM | 5:57 PM | 6:08 PM | | | | | | | | | |
| Commuter | VSB04W | | | | | | | | | | | | 5:34 PM | 5:48 PM | 6:07 PM | 6:20 PM | 6:22 PM | 6:31 PM | 6:35 PM | | | | | | | | |
| Commuter | AV11W | 3:49 PM | 3:59 PM | 4:06 PM | → | | To Santa Clarita/Palmdale/Lancaster | | | | | | | | | | | | | | | | | | | | |
| Commuter | AV12W | 4:16 PM | 4:26 PM | 4:33 PM | → | | To Santa Clarita/Palmdale/Lancaster | | | | | | | | | | | | | | | | | | | | |
| Commuter | VC10W | 4:24 PM | 4:34 PM | 4:41 PM | 4:46 PM | 4:53 PM | 5:00 PM | 5:05 PM | 5:19 PM | 5:35 PM | 5:46 PM | 6:03 PM | 6:18 PM | | | | | | | | | | | | | | |
| Commuter | AV13W | 4:34 PM | 4:44 PM | 4:51 PM | → | | To Santa Clarita/Palmdale/Lancaster | | | | | | | | | | | | | | | | | | | | |
| Commuter | VC11W | 4:44 PM | 4:54 PM | 5:01 PM | 5:06 PM | 5:13 PM | 5:20 PM | 5:25 PM | 5:45 PM | 5:57 PM | | | | | | | | | | | | | | | | | |
| Commuter | AV14W | 4:54 PM | 5:04 PM | 5:11 PM | → | | To Santa Clarita/Palmdale/Lancaster | | | | | | | | | | | | | | | | | | | | |
| Commuter | VC12W | 5:04 PM | 5:14 PM | 5:20 PM | 5:25 PM | 5:32 PM | 5:39 PM | 5:45 PM | 6:04 PM | 6:17 PM | 6:27 PM | 6:37 PM | 6:51 PM | | | | | | | | | | | | | | |
| Commuter | AV15W | 5:11 PM | 5:21 PM | 5:28 PM | → | | To Santa Clarita/Palmdale/Lancaster | | | | | | | | | | | | | | | | | | | | |
| Amtrak | PS10W | 5:34 PM | 5:44 PM | - | 5:56 PM | 6:04 PM | - | 6:16 PM | 6:28 PM | 6:41 PM | 6:53 PM | 7:04 AM | - | 7:16 PM | 7:40 PM | 7:54 PM | 7:56 PM | 8:07 PM | | | | | | | | | |
| Commuter | AV16W | 5:18 PM | 5:28 PM | 5:35 PM | → | | To Santa Clarita/Palmdale/Lancaster | | | | | | | | | | | | | | | | | | | | |
| Commuter | VC13W | 5:25 PM | 5:36 PM | 5:42 PM | 5:47 PM | 5:54 PM | 6:01 PM | 6:07 PM | 6:20 PM | 6:31 PM | | | | | | | | | | | | | | | | | |
| Commuter | AV17W | 5:44 PM | 5:54 PM | 6:01 PM | → | | To Santa Clarita/Palmdale/Lancaster | | | | | | | | | | | | | | | | | | | | |
| Commuter | VC14W | 5:55 PM | 6:05 PM | 6:11 PM | 6:16 PM | 6:23 PM | 6:30 PM | 6:36 PM | 6:50 PM | 7:04 PM | 7:14 PM | 7:24 PM | 7:39 PM | | | | | | | | | | | | | | |
| Commuter | AV18W | 6:05 PM | 6:15 PM | 6:21 PM | → | | To Santa Clarita/Palmdale/Lancaster | | | | | | | | | | | | | | | | | | | | |
| Commuter | AV19W | 6:10 PM | 6:24 PM | 6:31 PM | → | | To Santa Clarita/Palmdale/Lancaster | | | | | | | | | | | | | | | | | | | | |
| Commuter | VC15W | 6:29 PM | 6:40 PM | 6:46 PM | 6:51 PM | 6:58 PM | 7:05 PM | 7:11 PM | 7:24 PM | 7:36 PM | | | | | | | | | | | | | | | | | |
| Commuter | AV20W | 6:49 PM | 6:59 PM | 7:06 PM | | | | | | | | | | | | | | | | | | | | | | | |
| Commuter | VC16W | 7:03 PM | 7:13 PM | 7:20 PM | 7:25 PM | 7:32 PM | 7:39 PM | 7:44 PM | 7:56 PM | 8:07 PM | 8:18 PM | 8:27 PM | 8:42 PM | | | | | | | | | | | | | | |
| Commuter | AV21W | 7:13 PM | 7:23 PM | 7:31 PM | → | | To Santa Clarita/Palmdale/Lancaster | | | | | | | | | | | | | | | | | | | | |
| Commuter | AV22W | 7:44 PM | 7:54 PM | 8:01 PM | → | | To Santa Clarita/Palmdale/Lancaster | | | | | | | | | | | | | | | | | | | | |
| Commuter | VC17W | 8:44 PM | 8:54 PM | 9:00 PM | 9:05 PM | 9:12 PM | 9:19 PM | 9:25 PM | 9:36 PM | 9:47 PM | | | | | | | | | | | | | | | | | |
| Amtrak | CD/PS13W | 8:19 PM | 8:30 PM | - | 8:41 PM | - | - | 8:59 PM | 9:11 PM | - | 9:32 PM | 9:43 PM | - | 9:55 PM | - | 10:24 PM | 10:26 PM | 10:39 PM | - | - | - | - | 11:36 PM | - | 12:08 PM | - | 12:38 PM |
| Commuter | VC18W | 9:59 PM | 10:09 PM | 10:16 PM | 10:21 PM | 10:28 PM | 10:35 PM | 10:40 PM | 10:52 PM | 11:03 PM | | | | | | | | | | | | | | | | | |
| Commuter | AV23W | 10:14 PM | 10:24 PM | 10:31 PM | → | | To Santa Clarita/Palmdale/Lancaster | | | | | | | | | | | | | | | | | | | | |

| | |
|---|---|
| Ventura County Line | 18 |
| Antelope Valley Line | 23 |
| Burbank Turn | 0 |
| Ventura-Goleta Commuter Service | 4 |
| Pacific Surfliner | 5 |
| Coast Daylight / Pacifc Surfliner | 2 |
| Long Distance | 1 |

# APPENDIX C: SERVICE LEVELS AT BURBANK-BOB HOPE AIRPORT STATION

LOSSAN Strategic Implementation Plan Long Term Operations Analysis

Comparison of Service Levels and Options between LAUS and Burbank-Bob Hope Airport - Existing vs. 2030 Proposed Timetable

EXISTING SERVICE LEVELS:

INBOUND:

| | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Service Operator: | M | M | M | M | M | M | M | Am | M | M | Am | M | M | M | Am | M | M | M | Am | Am | Am |
| Burbank-Bob Hope Airport | 5:49am | 6:13am | 6:45am | 7:23am | 8:02am | 8:35am | 8:46am | 8:59am | 9:10am | 11:06am | 11:44am | 3:10pm | 3:37pm | 4:15pm | 4:22pm | 4:55pm | 5:05pm | 5:53pm | 6:37pm | 6:48pm | 9:23pm |
| LA Union Station | 6:15am | 6:38am | 7:12am | 7:50am | 8:28am | 9:00am | 9:15am | 9:25am | 9:40am | 11:35am | 12:15pm | 3:40pm | 4:00pm | 4:40pm | 4:55pm | 5:20pm | 5:30pm | 6:20pm | 7:10pm | 7:15pm | 9:45pm |

= AM Peak Period of approx. 6:00A - 9:00A

= PM Peak Period of approx. 3:00P - 6:00P

M = Metrolink

Am = Amtrak

OUTBOUND:

| | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Service Operator: | M | M | M | Am | Am | M | M | M | Am | M | Am | M | Am | M | M | M | M | M | M | M | M | Am |
| LA Union Station | 5:38am | 6:50am | 7:15am | 7:35am | 7:45am | 8:00am | 8:25am | 8:50am | 9:05am | 9:50am | 12:25pm | 1:00pm | 3:00pm | 3:05pm | 3:15pm | 3:35pm | 4:25pm | 4:33pm | 5:10pm | 5:55pm | 6:40pm | 7:10pm |
| Burbank-Bob Hope Airport | 6:01pm | 7:11am | 7:36am | 8:00am | 8:08am | 8:25am | 8:50am | 9:15am | 9:27am | 10:11am | 12:47pm | 1:23pm | 3:22pm | 3:30pm | 3:36pm | 3:56pm | 4:46pm | 4:58pm | 5:31pm | 6:16pm | 7:01pm | 7:32pm |

= AM Peak Period of approx. 6:00A - 9:00A

= PM Peak Period of approx. 3:00P - 6:00P

M = Metrolink

Am = Amtrak

2030 PROPOSED TIMETABLE:

INBOUND:

| | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Service Operator: | M | M | M | M | M | M | Am | M | M | M | Am | M | Am | M | Am | M | Am | M | M | M | Am | M | Am | M | Am | M |
| Burbank-Bob Hope Airport | 5:07am | 5:43am | 6:12am | 6:43am | 7:07am | 7:29am | 7:48am | 8:12am | 8:38am | 9:35am | 10:12am | 11:03am | 12:54pm | 1:16pm | 2:48pm | 3:14pm | 3:59pm | 4:17pm | 5:14pm | 5:44pm | 6:10pm | 6:29pm | 7:20pm | 7:35pm | 9:00pm | 9:18pm |
| LA Union Station | 5:29am | 6:04am | 6:34am | 7:05am | 7:34am | 7:50am | 8:09am | 8:35am | 8:59am | 9:58am | 10:34am | 11:25am | 1:16pm | 1:38pm | 3:10pm | 3:36pm | 4:21pm | 4:38pm | 5:35pm | 6:06pm | 6:31pm | 6:51pm | 7:40pm | 7:57pm | 9:22pm | 9:41pm |

= AM Peak Period of approx. 6:00A - 9:00A

= PM Peak Period of approx. 3:00P - 6:00P

M = Metrolink

Am = Amtrak

OUTBOUND:

| | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Service Operator: | M | M | M | M | Am | M | Am | M | M | Am | Am | M | Am | M | Am | M | M | M | Am | M | M | M | M | M | Am | M |
| LA Union Station | 6:10am | 6:30am | 7:19am | 7:38am | 7:45am | 8:29am | 8:44am | 9:12am | 9:56am | 10:35am | 10:54am | 12:39pm | 12:56pm | 2:37pm | 3:34pm | 4:24pm | 4:44pm | 5:04pm | 5:34pm | 5:25pm | 5:55pm | 6:29pm | 7:03pm | 8:44pm | 8:19pm | 9:59pm |
| Burbank-Bob Hope Airport | 6:31am | 6:51am | 7:40am | 7:59am | 8:07am | 8:51am | 9:05am | 9:34am | 10:17am | 10:51am | 11:15am | 1:00pm | 1:17pm | 2:58pm | 3:56pm | 4:46pm | 5:01pm | 5:25pm | 5:56pm | 5:47pm | 6:16pm | 6:51pm | 7:25pm | 9:05pm | 8:40pm | 10:21pm |

= AM Peak Period of approx. 6:00A - 9:00A

= PM Peak Period of approx. 3:00P - 6:00P

M = Metrolink

Am = Amtrak

# APPENDIX D: AGENCY COMMENTS

# APPENDIX D: LOSSAN LONG-TERM OPERATIONS ANALYSIS REPORT COMMENTS

**LOSSAN Strategic Implementation Plan**

Comment Review Form

Submittal Title: Draft LOSSAN Long-Term Operations Analysis Report

Date: December 28, 2011

| General Comment No. | Agency Comment No. | Page #/Section Reference | Reviewer Agency | Comment | Date Received | Response | Comment Addressed (Y/N) |
|---|---|---|---|---|---|---|---|
| 1 | 1 | 1 | SCAG | Add space between parentheses and "is" in first sentence of second paragraph | 1/19/2012 | Comment addressed | Y |
| 2 | 2 | 1 | SCAG | Add space between "2030" and "distributed" in 6th paragraph | 1/19/2012 | Comment addressed | Y |
| 3 | 3 | 1 | SCAG | Version 2 includes the "phased implementation approach" to the CA HST system, but does not assume phased implementation improvements/projects in the baseline. The technical reasons for this should be listed at some point in the report. | 1/19/2012 | The baseline for this scenario are the projects already identified as feasible and necessary to support the base line service levels for 2030 (Version 1). Version 2 will identify what additional improvements are necessary to support feeder/distributre service in support of the HST. Text description of Version 2 rewritten to hopefully clarify this point. | Y |
| 4 | 4 | 2 | SCAG | Change "then" to "than" in the 3rd paragraph | 1/19/2012 | Comment addressed | Y |
| 5 | 5 | 2 | SCAG | Add the term "pocketing" to the project glossary | 1/19/2012 | Comment addressed, see Glossary | Y |
| 6 | 6 | 1-2 | SCAG | This is an executive summary, so it is obviously meant for non-specialists. The analytical purpose, methods, and goals of the work in this report should be explicitly discussed in 2-3 sentences in the first paragraph of the executive summary | 1/19/2012 | Comment addressed, see additional text | Y |
| 7 | 7 | 3 | SCAG | Regarding second bullet, see comment #3 above | 1/19/2012 | See response to comment 3. | Y |
| 8 | 8 | 10 | SCAG | RE: table 5.3.1 asterisk below table appears to relate to 2030 proposed Burbank Bob Hope service; however there are asterisks in the 2011 Base intra county OC, 2014 OC, and Antelope Valley Line cells that do not appear to be linked to any explanatory caption or text | 1/19/2012 | Comment addressed | Y |
| 9 | 9 | 11 | SCAG | The introductory text should more explicitly discuss, in 2-3 sentences, why operational modeling is important in LOSSAN business/implementation plan development, and how agency stakeholders can employ the results moving forward | 1/19/2012 | Comment addressed, see additional text | Y |
| 10 | 10 | 12 | SCAG | In section 6.1.2, bullet 2, the distance for improvements "can vary between .05 to 3.5 miles "Why is this so? What are the benefits of these strategies per the model output? | 1/19/2012 | The 0.5 miles is the minimum recommended improvement. The longer the additional capacity improvement, the greater benefit to service reliability. This has been clarified in the report. | Y |
| 11 | 11 | 17 | SCAG | Add "(LN/MV)" immediately after "Laguna Niguel / Mission Viejo Station Turnback Facility" in 3rd paragraph | 1/19/2012 | Comment addressed | Y |
| 12 | 12 | 17 | SCAG | Change "LMNV" to "LNMV" in second sentence of 3rd paragraph | 1/19/2012 | Comment addressed | Y |
| 13 | 13 | 17 | SCAG | Text in the 4th paragraph is somewhat confusing. Suggest re-wording for additional clarity ( such as '*this segment is owned by OCTA in Orange County and dispatched by SCCRA, in San Diego County the track is owned and dispatched by NCTD'*) | 1/19/2012 | Comment addressed, text reworded | Y |
| 14 | 14 | 17 | SCAG | Re: the final paragraph Is the single track in the Pendleton section "contributing" to additional trains running out of slot, or is it exacerbating (and extending delays) the situation when trains are already out of slot? | 1/19/2012 | Comment addressed, clarification added | Y |
| 15 | 15 | 19 | SCAG | There appears to be no output for scenarios 2 and 3. If those scenarios are going to be analyzed by another party in the future, shouldn't that be mentioned here? | 1/19/2012 | Text added: The PWG requested that the California High-Speed Rail Authority take the lead to complete the operations analysis and ridership/revenue forecast for Versions 2 and 3. That analysis is pending further development of the proposed high-speed rail service plan for southern California and therefore not included in this document. | Y |
| 16 | 16 | 20 | SCAG | The glossary is excellent. Great work. 1 comment – "Coaster" is a term that is defined, but "Metrolink" and "Surfliner" are terms that are not. | 1/19/2012 | Comment addressed, see Glossary | Y |
| 17 | CT-1 | Schedule | Caltrans | Basic schedule is OK, meets goal of trains running once per hour; unfortunate that trains could not run more of a memory schedule, as trains on less of one than previous versions, but challenges of being overridden by operating needs of remaining single track understood, as well as changes in the pattern throughout the day due to skip-stops during peak hours; I do wish to confirm the total slots available for intercity regional service is 18 rt, and is not precluded by the two Amtrak long-distance rt's. | 1/24/2012 | The assumption made in this analysis was 36 trips (18 RT) Los Angeles-San Diego for the Pacific Surfliner. This is separate from the long distance trains assumed in the simulations. | Y |
| 18 | CT-2 | Schedule | Caltrans | May be a good visual in timetable to add column at end of from:/to: for trains coming from or leaving the corridor, for ease of understanding, such as overnight/day coast trains, Metrolinks going to Riverside or Antelope Valley, Amtrak Long Distance; | 1/24/2012 | Notes have been added to the timetable to identify where a train is originating from or terminating at when entering or leaving the LOSSAN Corridor. | Y |
| 19 | CT-3 | Page 1 | Caltrans | Version 2: Seems unlikely that this could possibly assume "the same infrastructure and service assumptions", since the massive influx of transferring passengers will require a much higher level of service than Version 1 -- but perhaps I am misreading what the intent of the sentence is. | 1/24/2012 | See response to comment 3. | Y |
| 20 | CT-4 | Page 1 | Caltrans | Version 3: The description talks about "a new 2-track dedicated passenger corridor" between Los Angeles and Anaheim, but does not mention that full build-out of HSR will also require such a corridor between Los Angeles and Burbank Jct. and north over the Tehachapi Mountains. | 1/24/2012 | The description in the report does mention "North of Los Angeles, the infrastructure presented in Version 1 would be assumed since the HST is anticipated to be on its own dedicated alignment". Shared use of the HST corridor is not anticipated with conventional rail north of Los Angeles at this time. | Y |
| 21 | CT-5 | Page 1 | Caltrans | I think the order is wrong (geographically at least) LA-SD-SLO corridor; but maybe that's what it is referred to as. | 1/24/2012 | This is the official title in use. | Y |

## APPENDIX D: LOSSAN LONG-TERM OPERATIONS ANALYSIS REPORT COMMENTS

| General Comment No. | Agency Comment No. | Page #/Section Reference | Reviewer Agency | Comment | Date Received | Response | Comment Addressed (Y/N) |
|---|---|---|---|---|---|---|---|
| 22 | CT-6 | Page 2 | Caltrans | ¶3 - There could also be loading issues with passengers if trains come in on changing tracks, unless a PA system and signs clearly let passengers know in advance. | 1/24/2012 | Comment addressed, text added | Y |
| 23 | CT-7 | Page 3 | Caltrans | 2.0 - Version 1 -- I may be reading this wrong, but in the Ex. Summary there was talk of the need for the additional miles of double track to make the 2030 plan workable, yet here it says it is only assuming the projects "likely" to be built are part of Version 1. | 1/24/2012 | The Executive Summary provides a summary of the findings from the entire report; Section 2.0 explains the initial assumptions for capital improvements for modeling purposes. Additional improvements are found to be needed to support reliable service based on PWG service assumptions, as discussed in Section 6.0, third paragraph. | Y |
| 24 | CT-8 | Page 5 | Caltrans | Top Bullet: This list of locomotives should either be expanded to what is out there or not mentioned at all. | 1/24/2012 | The list represents the locomotives assumed in the simulation model and is presented for documentation purposes. The list of passenger locomotives is consistent with available locomotive technology operating on the corridor today. While it could be assumed different technology may be operating by 2030, only known technologies can be simulated in the model. | Y |
| 25 | CT-9 | Page 5 | Caltrans | 5.2.1 - The locations of these "Island CTC" installations is not given. The locations must be given in order to model, so they should be listed here. | 1/24/2012 | Comment acknowledged. Island CTC should actually be under Santa Barbara County and included in the model:<br>- Capitan Siding<br>- Concepcion Siding<br>- Honda Siding<br>- Tangair Siding<br>- Narlon Siding<br>- Devon Siding<br>- Waldorf Siding<br>- Guadalupe Siding and Station<br>While not identified previous, based on this service plan island CTC would also be necessary for the Surf/Lompoc siding. This additional infrastructure has been isolated now in the final report as "new" infrastructure. | Y |
| 26 | CT-10 | Page 5 | Caltrans | Some opeational flexibility could be achieved, especially for expected events, if the station track were a through track rather than stub end. | 1/24/2012 | Assuming this is in reference to the North Goleta Station. While a "through" station would offer additional operational flexibility, the layout and configuration of the station as presented in this analysis was driven by the direction given by the Santa Barbara County Associated Governments (SBCAG). | Y |
| 27 | CT-11 | Page 6 | Caltrans | Not a mentioned item, but when I was out on a tour of the line last week, I was told by Amtrak personnel that the 2nd platform Camarillo station can't practically be used because the way the pedestrian connection was built constrains the ability of passengers to move to the other platform in a timely manner, so they don't use it. This should be addressed -- if not here, somewhere. | 1/24/2012 | Comment acknowledged. While pedestrian flow around stations is a critical component to a successful passenger rail service, review of this is outside the scope of this analysis, which focuses on rail operations and capacity requirements. | Y |
| 28 | CT-12 | Page 7 | Caltrans | Van Nuys 2nd Platform -- I'm a bit confused by the description as it implies a 2nd platform needs to be built, yet cannot be built. Instead, could a solution be described? | 1/24/2012 | Comment acknowledged. Text rewritten to help clarify issue. | Y |
| 29 | CT-13 | Page 9 | Caltrans | Heading of SD Airport Center is over a description of the Convention Center station. | 1/24/2012 | Comment addressed | Y |
| 30 | CT-14 | Page 10 | Caltrans | Is the pattern of Sunset Limited trains due to an assumption the train will move to the BNSF track in the future? | 1/24/2012 | RCTC is working with Amtrak, BNSF and UPRR to possibly reroute the Sunset Limited onto the BNSF at Colton Crossing so that it may provide service between the Coachella Valley and Riverside. The Sunset was rerouted to the BNSF in the model at the request of RCTC. This assumption was not rejected by Amtrak. | Y |
| 31 | 1 | 10 | SCRRA | Metrolink service between LAUS and Bubank-Bob Hope Airport was eliminated in the 2030 Proposed Service scenario. This is primarily a connection service for passengers commuting from the Inland Empire and Orange County to destinations in the Glendale/Burbank area. Therefore, timing and integration wtih connecting commuter trains is crucial for passenger mobility. Increased service on the Ventura County Line may not be a feasible substitute for the Burbank connecting trains. Future High Speed Train service in the region is unlikely to serve the same market. | 1/24/2012 | Please see additional footnote information on Table 5.3.1 and additional discussion and analysis of this issue in Section 6.1.6 and Appendix C. | Y |
| 32 | 1 | General Comments | UP | 1. Regarding the proposed new or extended sidings north of LA - to have true utility for meeting and passing trains, sidings must be free and clear of any at grade road crossings. | 1/20/2012 | Agree. This should be true for all siding extensions presented that are not associated with a station. Where a second track / platform is recommended at a station it is to allow more than one passenger train to meet at the station and was not identified as necessary for "meets" with freight trains based on the assumed service plan. | Y |

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|---|---|---|---|---|---|---|---|
| 33 | 2 | General Comments | UP | 2. I know we have discussed this point before, there needs to be an acknowledgement in this report that makes if clear to the reader that the RTC simulations contained in this study were prepared and conducted without input from or validation by Union Pacific Railroad. Any change to or increase in passenger service on Union Pacific tracks or right-of-way will be subject to an independent determination by Union Pacific of any necessary capacity or other requirements consistent with Union Pacific's then current Union Pacific Commuter Access Principles (current version attached). | 1/20/2012 | Comment addressed, disclaimer added in Section 7 | Y |
| 34 | 1 | 12 | SBCAG | On page 12, 6.1.2, there is a mention of extending the Ortega siding by 1.2 miles and that trains currently hold here. There is no Ortega siding—it was destroyed about 20 years ago by a storm, but the reference might be to the Seacliff siding, where trains do hold. | 1/19/2012 | Please see Section 5.2.2 which indicates that the Ortega siding would be rebuilt as part of the initial set of infrastructure assumptions. | Y |
| 35 | 2 | 6 | SBCAG | Typo page 6, signal should be single | 1/19/2012 | Comment addressed | Y |
| 36 | 3 | 13 | SBCAG | Typo page 13, "between" | 1/19/2012 | Comment addressed | Y |
| 37 | 4 | 14 | SBCAG | Typo page 14, exiting should be existing | 1/19/2012 | Comment addressed | Y |
| 38 | 5 | 6 | SBCAG | Typo page 6, Carpinteria | 1/19/2012 | Comment addressed | Y |
| 39 | 1 | 10 | RCTC | On Table 5.3.1 there are several * in the table but only 1 footnote. | 1/20/2012 | Comment addressed | Y |
| 40 | 2 | | RCTC | On The Long Term Timetable from Convention Center to LA, it says AM instead of PM on the 6:05 and 7:21 departures out of Conv Ctr. | 1/20/2012 | Comment noted, Timetable to be corrected. | Y |
| 41 | 1 | | SLOCOG | Are you cutting the 7am ish train southbound out of SLO in the 2030 model? That's no good in my book … | 1/18/2012 | This change was part of the service plan discussed and agreed to by the PWG | Y |
| 42 | 1 | 1/1.0 | SANDAG | In the paragraph "Service level…" we should incorporate the overall service planning goals initially identified by the PWG:<br>• Additional commuter and intercity services consistent with state and regional plans<br>• Additional through commuter service between Los Angeles and San Diego<br>• Introduction of the Coast Daylight service between Los Angeles and San Francisco<br>• Additional commuter service between Ventura and Santa Barbara<br>• New San Diego stops at Intermodal Transportation Center, Del Mar Fairgrounds, and Convention Center<br>• Express COASTER service<br>• Peak period intercity trains converted to limited stop express services<br>• Integration of future high-speed train service | 2/8/2012 | Comment addressed, goals added | Y |
| 43 | 2 | 2/1.0 | SANDAG | "The initial service …" - although original service plan was found infeasible and after many iterations, we found one that was feasible, we should state that we were still able to attain most of the original service goals (Express COASTER service still a problem without Del Mar but didn't we adhere to all others?) | 2/8/2012 | Comment addressed | Y |
| 44 | 3 | 2/1.0 | SANDAG | "A number of …" - in terms of SB Sub, say "from a to b".<br>Change "then presented" to "than" | 2/8/2012 | Comment addressed | Y |
| 45 | 4 | 2/1.0 | SANDAG | "As with the …" add "be" in … San Luis Obispo would be required. | 2/8/2012 | Comment addressed | Y |
| 46 | 5 | 2/1.0 | SANDAG | "Extension of Serra Siding **in Orange County** south approximately... | 2/8/2012 | Comment addressed | Y |
| 47 | 6 | 3/2.0 | SANDAG | ~~This service scenario~~ … to **The long term operations analysis…** | 2/8/2012 | Comment addressed | Y |
| 48 | 7 | 3/2.0 | SANDAG | First paragraph: "the purpose of this anlaysis is **(1) to develop a workable passenger rail service plan for 2030 and (2)** to identify... | 2/8/2012 | Comment addressed | Y |
| 49 | 8 | 3/2.0 | SANDAG | In Version 1 paragraph, change TWG to PWG | 2/8/2012 | Comment addressed | Y |
| 50 | 9 | 3/3.0 | SANDAG | I don't believe "All" peak period Surfliner trains because limited stop, I think we were saying "Most". Please clarify | 2/8/2012 | Comment addressed | Y |
| 51 | 10 | 7/5.2.4 | SANDAG | Instead of "Union Station Run Thru" use LAUS Run-Thru … | 2.8/12 | Comment addressed | Y |
| 52 | 11 | 7/5.2.4 | SANDAG | Also in this top paragraph at the end, should we mention that work is underway by CHSRA and LA Metro on the LAUS Master Plan and that although this is the current configuration of the platforms, the master plan may recommend changes. | 2/8/2012 | Comment addressed | Y |
| 53 | 12 | 8/5.2.6 | SANDAG | Add "." after the bullets on this page for consistency. | 2/8/2012 | Comment addressed | Y |
| 54 | 13 | 8/5.2.6 | SANDAG | Ponto to Moonlight and Moonlight to Swami are currently separate projects. Maybe just change the title to reflect this and start the paragraph with "These projects…"? | 2/8/2012 | Comment addressed | Y |
| 55 | 14 | 9/5.2.6 | SANDAG | Change last sentence: A seasonal Del Mar Fairgrounds ~~station~~ **platform** was not assumed as part of this infrastructure assumption since only year-round stops were included. | 2/8/2012 | Comment addressed | Y |
| 56 | 15 | 9/5.6 | SANDAG | Change project title to "Sorrento to Miramar Phase 2 Double Track" | 2/8/2012 | Comment addressed | Y |
| 57 | 16 | 9/5.2.6 | SANDAG | You discuss the convention center platform under the section for the Airport ITC. | 2/8/2012 | Comment addressed | Y |
| 58 | 17 | 10/5.3.1 | SANDAG | Table 5.3.1 is not referenced in text | 2/8/2012 | Comment addressed | Y |
| 59 | 18 | 10/5.3.1 | SANDAG | Table 5.3.1 - should the 2nd line in table be included?<br>Also the "**" and "***" are not defined. | 2/8/2012 | 1st Comment: Yes, because it was used in the Short-Term Operations Analysis and this table is indented to present a comparsion between the various timeframes.<br>2nd Comment: Comment addressed | Y |

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|---|---|---|---|---|---|---|---|
| 60 | 19 | 10/5/3/1 | SANDAG | Should the assumptions for the Amtrak Long-Distance services be identified. Also, include a brief discussion of the assumptions for the Coast Daylight. | 2/8/2012 | Two of the identified "Pacific Surfliner" trains actually operate in possible timeslots for the Coast Daylight and could be assumed to be operating as the Coast Daylight. These include the 3:43AM and 1:49PM departure from SLO to LA and the 7:45AM and 8:19PM departure from LA to SLO. This allows for one midday train in each direction and one overnight train in each direction. | Y |
| 61 | 20 | 10/6.0 | SANDAG | Need to include the UPRR footnote in the report. Perhaps in this section or 4.0? | 2/8/2012 | Disclaimer added to Section 7 with other report caveats | Y |
| 62 | 21 | 13/6.1.4 | SANDAG | In several of these next sections you say the track owner and then "and the line is operated by Metrolink". In others you say ML is the dispatcher. We should be consistent. If it's operated, isn't Amtrak also an operator on the line? | 2/8/2012 | Comment addressed; changed "operated" to "dispatched" for clarification | Y |
| 63 | 22 | 14/6.1.5 | SANDAG | What does this mean: Analysis of the simulation suggested that the completion of second track thru this segment improves ths ervice over the reliability of both the exiting (existing?) and short-term conditions? | 2/8/2012 | Reword attempted for clarity | Y |
| 64 | 23 | 14/6.1.5 and .6 | SANDAG | Is there both a GEMCO and GM facility near the Van Nuys station or should these be the same? | 2/8/2012 | These are one and the same. The text has been clarified in the report. | Y |
| 65 | 24 | 18/6.1.11 | SANDAG | Correct references for reports:<br>Los Angeles to San Diego (LOSSAN) Proposed Rail Corridor Improvements Final Program Environmental Impact Report / Environmental Impact Statement (Finalized in 2007)<br>LOSSAN Corridor Strategic Business Plan | 2/8/2012 | Comment addressed | Y |
| 66 | 25 | Appendix A | SANDAG | Footer says this is "LOSSAN Strategic Implementation Plan". Also, should page numbers be "A" and "B"? | 2/8/2012 | Comment addressed | Y |
| 67 | 26 | Appendix A | SANDAG | Under definition of subdivision, add "NCTD" | 2/8/2012 | Comment addressed | Y |
| 68 | 27 | 19/7.0 | SANDAG | Section 6.1.3. discusses the recommendation for the Oxnard Station North Platform but this is not shown in Table 7.1.1 | 2/12/2012 | Comment addressed, station improvement added to Table | Y |
| 69 | 28 | General | SANDAG | In an early presentation, we discussed travel time savings. I'm wondering why we didn't include in the draft report. For example, we showed these findings:<br>Oceanside to San Diego (Commuter): 7%<br>LA to San Diego (Intercity): 6%<br>LA to San Luis Obispo (Intercity): 14% | 2/12/2012 | Comment acknowledged. Statistics added to Conclusion section of report. | Y |
| 70 | 29 | 12/6.1.2 | SANDAG | Shouldn't Santa Barbara be changed to Goleta? | 2/16/2012 | Agreed. | Y |
| 71 | 30 | 13/6.1.4<br>14/6.1.5 | SANDAG | 2030 Intercity Volume shows 14 trains north of LA to Chatsworth then only 12 trains between Chatsworth and Goleta. Is there a Surfliner that turnsback at Chatsworth or is this a typo? | 2/16/2012 | Comment Acknowledged. This is a typo and has been corrected. There should be 14 intercity trains between Los Angeles and Goleta. | Y |
| 72 | 31 | 14/6.1.6 | SANDAG | Consider adding a footnote to Table 6.1.6 noting the services that split off at Burbank Jct. rather than go to Burbank Airport like the AVL and some freight. | 2/16/2012 | Comment addressed | Y |
| 73 | 1 | Page 1, 1st/2nd parag | OCTA | Strategic Assesment "completed" in January 2012, not "prepared"; missing space between (2030) and "is"; business case has not yet been agreed to by Corridor agencies, should state "will be"; change 1st sentence to state "results of modeling the PROJECTED ridership" | 2/10/2012 | Comment addressed | Y |
| 74 | 2 | Page 1, Sec 1.0 | OCTA | Need to modify description of versions. Version 1 assumes no HST in corridor. Version 2 assumes HSR that terminates in San Fernando Valley. Version 3 assumes new dedidcated 2-track for HSR, Amtrak and OC Metrolink between Los Angeles and Fullerton, shared with existing track south to Anaheim. | 2/10/2012 | Comment addressed | Y |
| 75 | 3 | Page 1, 7th parag | OCTA | Service level assumptions based on increases identified as feasible, but not necessarily financially constrained | 2/10/2012 | Comment addressed | Y |
| 76 | 4 | Page 1, last parag | OCTA | Should state the projected/estimated/ROM cost for the 30 infrastructure projects. Also should used numeral 30 instead of word; missing space between "2030 distributed" | 2/10/2012 | Comment addressed | Y |
| 77 | 5 | Page 2, 2nd parag | OCTA | Second sentence should state "Completing a second track along ***the entire length of the*** Corridor is not envisioned…." | 2/10/2012 | Comment addressed | Y |
| 78 | 6 | page 3, Sec 2.0 | OCTA | Description of versions needs to be rewritten to be more accurate. Should explicitly state no HSR is assumed in Version 1; Version 3 should state dedicated passenger corridor would be Los Angeles to Fullerton -- will not extend to Anaheim. | 2/10/2012 | Comment addressed | Y |
| 79 | 7 | page 6, 5.2.3 | OCTA | 1st paragraph should say "single" track segment, not "signal" | 2/10/2012 | Comment addressed | Y |
| 80 | 8 | page 7, first full sentence | OCTA | Begin Sentence with "This Stub-ended layout…" Correct double period at end of sentence | 2/10/2012 | Comment addressed | Y |
| 81 | 9 | page 7, 5.2.5 | OCTA | First parag, last sentence, reword to say, "The siding would end prior to reaching the developed are of the historic district in the City of San Juan Capistrano. | 2/10/2012 | Comment addressed | Y |
| 82 | 10 | page 7, 5.2.5, second parag | OCTA | Thrid sentence should read … platforms at Irvine and Tustin Stations also would be modified…" | 2/10/2012 | Comment addressed | Y |
| 83 | 11 | page 8, 5.2.6, last parag | OCTA | Title of section states "San Diego Airport Intermodal Transportation Center", but description is of new southern terminus at Convention Center, which is not adjacent to airport | 2/10/2012 | Comment addressed | Y |
| 84 | 12 | page 9, 5.3.` | OCTA | Should state that desired service levels for 2030 were deemed feasible, but were not necessarily financially constrained | 2/10/2012 | Comment addressed | Y |

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|---|---|---|---|---|---|---|---|
| 85 | 13 | page 10 | OCTA | Legend at bottom of chart needs to be updated. No explanation of ** and ***. Also should clarify if this is the original service plan agreed to by PWG or revised version that takes corridor constraints into account | 2/10/2012 | Comments addressed. Weekday service assumptions are clarified as those agreed to by the PWG. Explanation of reduction of 900 trains is presented in Section 6.1.6 and summarized in new service level table in "Conclusions". | Y |
| 86 | 14 | Sec 6.0 | OCTA | No limited-stop Surfliners shown north of LA, which conflicts with service design criteria in 3.0; also, timetables at end of report show 14 Surfliners north of LA, not 12 as stated in tables 6.1.1-6.1.4 | 2/10/2012 | Comments addressed. PS04E and PS04W are identified as limited stop in the timetable skipping Van Nuys, Moorpark & Carpinteria (which were agreed to by the PWG). There is an error in the timetable in that PS04W shows a stop in Moorpark, but this will be corrected in final report. | Y |
| 87 | 15 | Page 14, 6.1.5 | OCTA | Second sentence has typos and needs to be rephrased to make sense: "the service over the reliability of both the **exiting". Next sentence:** Increases in freight traffic assumed in 2030 **"do" not "does** | 2/10/2012 | Comment addressed | Y |
| 88 | 1 | | L.A. Metro | General comment - The report uses the number and the word spelling of the number in various places within the document. Suggest using the standard of the word spelling of the number for 0-10 and the number above that, including fractions. | 2/13/2012 | We have tried to catch these instances. | Y |
| 89 | 2 | | L.A. Metro | General comment - There are several text editing errors throughout the document. | 2/13/2012 | Comment addressed - hopefully we have caught most of these in going through all the comments. | Y |
| 90 | 3 | | L.A. Metro | General comment - It would be helpful if there were maps and other graphical data that could be referenced throughout the document. | 2/13/2012 | Reference Map added to Chapter 1, page 4. | Y |
| 91 | 4 | | L.A. Metro | General comment - The use of the Pacific Surfliner with the definition of "Commuter trains" can be problematic. We do not want to establish the DNA of the LOSSAN service. The reality of this service is that at times the trains are used in both manners. While there is a specific definition or identifier of intercity, the reality is that with Rail 2 Rail and other means, intercity trains are used by rail commuters along this corridor. | 2/13/2012 | Agreed - In partial response, we have added definitions for all the services to the Glossary | Y |
| 92 | 5 | | L.A. Metro | Page 2, Paragraph three, second sentence - suggest editing to say "…where passenger trains operate on the opposite track than they typically would." | 2/13/2012 | Comment addressed | Y |
| 93 | 6 | | L.A. Metro | Page 2, third paragraph - Should define what the Hobart and Commerce yards are. Also, when talking about freight traffic, there should be a mention of the Alameda Corridor connection to this corridor and what that means. | 2/13/2012 | Comment addressed | Y |
| 94 | 7 | | L.A. Metro | Page 2, fourth paragraph - Should mention that a deviation could include being late for spots due to mechanical and other issues. This is a problem now with trains late leaving their yards. | 2/13/2012 | Comment addressed | Y |
| 95 | 8 | | L.A. Metro | Page 2, last paragraph - There should be a very brief discussion about what projects were identified and what that process was. | 2/13/2012 | Reference provided to Section 6 of report | Y |
| 96 | 9 | | L.A. Metro | Page 3, second paragraph - The term "HST" is used. This needs to be defined. | 2/13/2012 | Defined on Page 1, second paragraph | Y |
| 97 | 10 | | L.A. Metro | Page 3, first bullet - Was "TWG" supposed to be "PWG"? | 2/13/2012 | Yes, Comment Addressed | Y |
| 98 | 11 | | L.A. Metro | Page 3, third bullet - There is a reference to the Metrolink Perris Valley Line. Unless Riverside is redefining all of the Riverside service between LAUS and Perris Valley as this line then this is misleading. It is my understanding that this is increased service to Riverside and that the Perris Valley Line is a subset. | 2/13/2012 | Comment acknowledged. The Perris Valley Line is the RCTC label for the service that will be extended to the Perris Valley. As it is currently envisioned, a number of trains that will be extended include many of the existing and future 91-Line trains. Additional reference to "91 Line" trains has been added to the text. | Y |
| 99 | 12 | | L.A. Metro | Page 3 and 4 bullets - It appears that these define the service. However there is a later reference to a "LA-SD Commuter Train". It is not clear where that fits or what it is. Are the bullets indicative of the stations that are served now? Is this report stating that some station served now by a specific service will not be served by that service in the future? | 2/13/2012 | See response to L.A. Metro Question 26. The bulleted points in this section reflect a Service Design Criterion developed by the PWG and TAC to limit the number of stops on Pacific Surfliner Intercity service and replace service at those stations with a higher level of commuter service. | Y |
| 100 | 13 | | L.A. Metro | Section 5.0, introductory sentence - "include:" is used twice. | 2/13/2012 | Comment addressed | Y |
| 101 | 14 | | L.A. Metro | Section 5.0, general comment - Throughout this section it is mentioned to install CTC. However, this will have Positive Train Control installed by 2030. This should be addressed. Also, what is the impact of the installation of Positive Train Control on operations and speed? | 2/13/2012 | Comment acknowledged. PTC as it is envisioned today will be an overlay of the existing CTC signaling system and will simply enforce the wayside signal and/or cab signal indications. While there is some speculation at this time on whether or not PTC may actually slow down average speeds on passenger corridors, PTC was not assumed in the model to affect the speed or capacity of the corridors. | Y |
| 102 | 15 | | L.A. Metro | Section 5.0, general comment - There is reference to infrastructure improvements at various segments. Suggest including who owns the tracks in this segment rather than making the reader wait until further in the document. | 2/13/2012 | Comment addressed. | Y |
| 103 | 16 | | L.A. Metro | Page 6, top of page, end of sentence started on Page 5 - suggest changing "commuter" to "passenger". | 2/13/2012 | Comment addressed | Y |
| 104 | 17 | | L.A. Metro | Page 7, first paragraph - There is a double period at the end of the first full sentence. | 2/13/2012 | Comment addressed | Y |
| 105 | 18 | | L.A. Metro | Page 7, first paragraph - The last sentence mentions Pacific Surfliner trains, however, it would be beneficial for Metrolink trains to do this as well. Suggest rewording to show the real flexibility that this allows. | 2/13/2012 | Comment addressed | Y |

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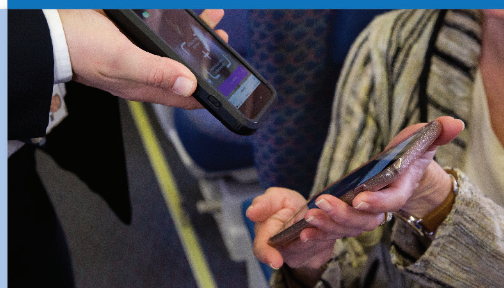
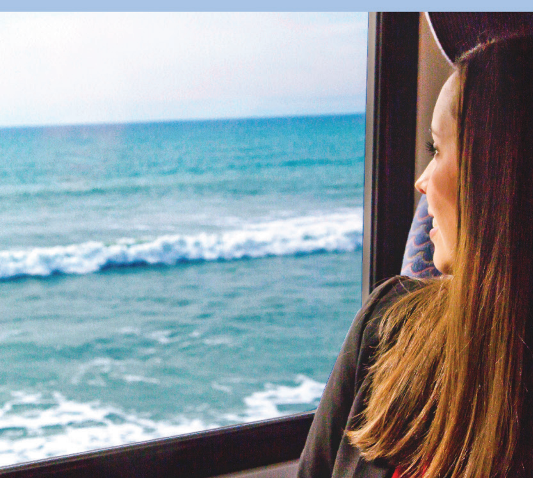
|---|---|---|---|---|---|---|---|
| 106 | 19 | | L.A. Metro | Page 7, second paragraph - The discussion of the CP Raymer to CP Bernson double track refers to this as "one of the last remaining segments of single track in the San Fernando Valley. It is suggested to restate this and not use that specific term. There are several other single track segments on another line that cloud this. If you state that this is on the LOSSAN Corridor in addition to what is said then that would help clarify. | 2/13/2012 | Comment acknowledged. Text rewritten to clarify on the "Metrolink's Ventura County Line in the San Fernando Valley". | Y |
| 107 | 20 | | L.A. Metro | Page 7, last paragraph - Should define what IEOC means. | 2/13/2012 | Comment addressed | Y |
| 108 | 21 | | L.A. Metro | Table 5.3.1 - Should add a reference to the timetables for details. There are locations of asterisks that do not make sense. The discussion note refers to Bob Hope Airport yet there are two separate asterisk references. The limited discussion about the service to Bob Hope Airport up to this point makes the note very confusing and indicates that we are not going to be serving this important destination as much as we do today. This needs to be clarified. Also, there are other asterisks that are not defined. This is the first reference of a LA-SD commuter train that does not currently exist. There needs to be discussion of what this is. | 2/13/2012 | Please see additional footnote information on Table 5.3.1 and additional discussion and analysis of this issue in Section 6.1.6 and Appendix C. Other comments addressed. | Y |
| 109 | 22 | | L.A. Metro | Section 6.1 - There is a repeated use of "…operates this segment of corridor." in each of the opening paragraphs in this area. Suggest adding "the". | 2/13/2012 | Comment addressed | Y |
| 110 | 23 | | L.A. Metro | Page 14, Section 6.1.5 - This is where the service to Bob Hope Airport should be addressed. The first sentence needs to state "…completion of a second track…". What are the allocated freight slots in this segment? How is that handled currently? | 2/13/2012 | Comment acknowledged. There is no limit to the number of slots that UPRR can use to operate trains. Limitations identified in shared use agreements typically focus on preserving passenger only operations during defined peak periods (which typically are 6AM to 9AM and 3PM to 6PM) and giving the host railroad (Metrolink) authority to approve the schedule of any freight operations on the corridor so long as it allows the freight railroad to continue to provide quality freight service. | Y |
| 111 | 24 | | L.A. Metro | Page 14, Section 6.1.6 - The note under the table refers to trains between CMF and LAUS. Do these trains affect capacity? How is Burbank Junction a constraint? How do the AVL trains affect this segment? The last sentence needs a grammatical check. What GM Facility? Is this gone? The last sentence in this section refers to the shifting of freight operations. How is this done and what do the agreements state regarding this? | 2/13/2012 | Comment acknowledged. Text in report for this section clarified to better address questions presented. | Y |
| 112 | 25 | | L.A. Metro | Page 15, Section 6.1.6 - This is the discussion of the service to Bob Hope Airport. The tone of this discussion implies that since it is difficult to turn trains because of the additional service to the north, the specific service to the airport is eliminated. This may not be the reality. Can this paragraph be restructured to state what is exactly happening and how this airport will be served? Any reduction of service to the airport is not acceptable. | 2/13/2012 | Please see additional footnote information on Table 5.3.1 and additional discussion and analysis of this issue in Section 6.1.6 and Appendix C. Other comments addressed. | Y |
| 113 | 26 | | L.A. Metro | Page 15, Section 6.1.7 - What are the "LA-SD Commuter trains"? These are not discussed anywhere to this point. | 2/13/2012 | On Page 1, Section 1, the report states, "Operating assumptions for this analysis also included a consolidated rolling stock/equipment cycle plan for COASTER and Metrolink trainsets to address the vehicle fleet needs for "through" commuter service operating between Los Angeles, San Diego and Riverside Counties without the need for transfers." The LA-SD Commuter trains are examples of this interlining of services and equipment to improve corridor capacity as well as passenger connectivity. | Y |
| 114 | 27 | | L.A. Metro | Page 15, Section 6.1.7, second paragraph - There should be a discussion of available slots and how the development of infrastructure is related to the available slots. | 2/13/2012 | The slots that will be available in 2030 are unknown at this time since negotiations are currently underway with the BNSF on this topic. Service levels simulated as part of this analysis reflect the levels of service presented and approved by the regional agencies, which are the agencies currently negotiating with BNSF. | Y |
| 115 | 28 | | L.A. Metro | Page 17, Section 6.1.10 - It should be noted that the segment of the LOSSAN Corridor south of CP Songs will be dispatched by NCTD, it is not currently. | 2/13/2012 | Comment addressed | Y |
| 116 | 29 | | L.A. Metro | Section 6.1.11 - What is meant by the note under the table? What is replacing this train? | 2/13/2012 | This is one of the Coaster-Metrolink interlined-trains for equipment efficiency that is implemented in the near-term plan but replaced by the increase in Metrolink/Coaster LA-SD Commuter service in 2030. Footnote clarified. | Y |
| 117 | 30 | | L.A. Metro | Page 18, Section 6.1.11, last paragraph - Should explain what the "tunnel" alternative is. | 2/13/2012 | Comment addressed, explanation provided | Y |

# APPENDIX 3

## LOSSAN Rail Corridor Agency Business Plan FY2017-18 to FY2018-19 – Executive Summary





# LOSSAN

## RAIL CORRIDOR AGENCY BUSINESS PLAN

FY 2017-18 to FY 2018-19

PREPARED FOR CALIFORNIA STATE TRANSPORTATION AGENCY

UPDATED APRIL 2017


# EXECUTIVE SUMMARY

The Los Angeles – San Diego – San Luis Obispo (LOSSAN) Rail Corridor Agency (Agency) is a joint powers authority (JPA) formed in 1989 that works to increase ridership, revenue, capacity, reliability, coordination, and safety on the rail corridor between San Diego, Los Angeles, and San Luis Obispo. On September 29, 2012, Governor Jerry Brown signed SB 1225 (Chapter 802, Statutes of 2012), which authorizes the LOSSAN Agency to oversee the state-supported Pacific Surfliner intercity passenger rail service operating on the LOSSAN rail corridor, subject to approval of an interagency transfer agreement (ITA) with the State of California, which became effective on July 1, 2015.

The Pacific Surfliner travels along a 351-mile coastal rail corridor through six counties: San Diego, Orange, Los Angeles, Ventura, Santa Barbara, and San Luis Obispo, and is currently the second busiest intercity passenger rail corridor in the United States, and the busiest state-supported Amtrak route. The LOSSAN Agency is governed by a Board of Directors (Board) composed of 11 voting members representing rail owners, operators, and planning agencies along the LOSSAN rail corridor, as well as four non-voting, ex-officio members, as detailed below.

*Member Agencies*

- San Diego Metropolitan Transit System
- San Diego Association of Governments
- North County Transit District (NCTD)
- Orange County Transportation Authority (OCTA)
- Riverside County Transportation Commission
- Los Angeles County Metropolitan Transportation Authority
- Ventura County Transportation Commission
- Santa Barbara County Association of Governments
- San Luis Obispo Council of Governments

*Ex-Officio Members*

- Amtrak
- California Department of Transportation (Caltrans) Division of Rail and Mass Transportation (DRMT)
- California High-Speed Rail Authority
- Southern California Association of Governments

As required by SB 1225, and per the terms of the ITA, the LOSSAN Agency must submit an annual business plan by April 1 of each year to the Secretary of the California State Transportation Agency (CalSTA). The primary purpose of the business plan is to identify the major goals and objectives for the LOSSAN Agency's management of the Pacific Surfliner intercity passenger rail service, as well as the budget necessary to administer, market, and operate the Pacific Surfliner service during the upcoming two-year period. The business plan summarizes operations, service levels, budget, and capital improvements that have contributed to the success of the Pacific Surfliner service and identifies improvements to sustain and grow its success moving forward.

## Historical Performance of Pacific Surfliner Service

Since 1971, service on the Pacific Surfliner between Los Angeles and San Diego has increased from the original six daily trips to the current level of 24 daily trips, including the 12th daily roundtrip between Los Angeles and San Diego implemented in November 2016, the first service increase in more than a decade. The Pacific Surfliner is the busiest state-supported route in the entire Amtrak national system carrying 2.9 million passengers in federal fiscal year (FFY) 2015-16.

The state subsidy for Pacific Surfliner service has increased in recent years in part due to the increased costs absorbed by the state under the provisions of the Passenger Rail Investment and Improvement Act of 2008 (PRIIA) Section 209. When PRIIA Section 209 was adopted by the federal government in 2008, it eliminated Amtrak's 30 percent financial contribution toward Pacific Surfliner operating costs and established additional capital equipment charges for the use of Amtrak-owned equipment that the state had not previously funded. The annual state subsidy increased from $29.423 million in fiscal year (FY) 2012-13 to $36.819 million in FY 2013-14, which was the first full year under PRIIA Section 209. In subsequent years, the state operating subsidy was budgeted at $44.287 million for FY 2014-15, and was projected to be $46.581 million for FY 2015-16. Operating costs for the Pacific Surfliner service are funded through the Public Transportation Account, which is funded primarily though the state sales tax on diesel fuel.

However, farebox recovery has shown significant improvement over the past two fiscal years, resulting in the actual state subsidy being significantly less than projections. Over the past decade, the Pacific Surfliner has consistently maintained a farebox recovery ratio of more than 50 percent, reaching 78.8 percent in FY 2015-16. Los Angeles, San Diego, Irvine, Oceanside and Solana Beach are the busiest stations of the Pacific Surfliner route, accounting for more than half of total Pacific Surfliner ridership.

## Operating Plan and Strategies

Amtrak operates 12 daily Pacific Surfliner roundtrips between San Diego and Los Angeles. Of those, five daily roundtrips (the 700-series trains) extend north of Los Angeles to Santa Barbara and Goleta, with two roundtrips extending further north to serve San Luis Obispo. Amtrak Thruway bus connections supplement the train service on the LOSSAN rail corridor. In FY 2015-16, approximately 4.3 percent of Pacific Surfliner riders made a portion of their journey on one of three Amtrak Thruway bus routes managed by the LOSSAN Agency.

The Pacific Surfliner serves 31 stations, 17 of which are between San Luis Obispo and Los Angeles, with the remaining 14 located south of Los Angeles in Orange and San Diego counties. Six daily Pacific Surfliner trains currently stop at four COASTER stations under the Rail 2 Rail Program with NCTD.

In FY 2016-17, the LOSSAN Agency worked with Amtrak and Caltrans DRMT to reinstate a 12th Pacific Surfliner round trip between Los Angeles and San Diego seven days a week, marking the first Pacific Surfliner service increase in more than a decade. The LOSSAN Agency also worked with Caltrans DRMT, Amtrak, Metrolink, NCTD, and BNSF Railway to implement Phase 1 of the "robust timetable" work conducted by SMA Consulting in June 2016. These coordinated schedule changes were intended to improve the overall reliability of all passenger rail services operating on the LOSSAN rail corridor.

In FY 2017-18 and 2018-19, the LOSSAN Agency will continue to work cooperatively with Caltrans DRMT to ensure sufficient state funding is provided to operate the Pacific Surfliner and Amtrak Thruway bus services, while exploring opportunities to enhance ridership, revenue, and OTP. The LOSSAN Agency is continuing to evaluate alternatives for retiming existing Pacific Surfliner trains north of Los Angeles to provide a weekday, peak-hour Pacific Surfliner service between Ventura and Santa Barbara counties. While there is no base service level increase anticipated in FY 2017-18, LOSSAN Agency staff will work with Amtrak and Caltrans DRMT to identify opportunities to implement an additional roundtrip from San Diego to Santa Barbara in FY 2018-19. In addition, the LOSSAN Agency will continue to pursue service expansions to accommodate seasonal and event-related travel demand.

During the next two FYs, the LOSSAN Agency plans to implement a number of strategies to further improve Pacific Surfliner service. Areas for improvement include: train monitoring, train and connecting bus schedule adjustments, improved connectivity with local transit services, equipment and crew utilization, response to service disruptions, and service planning.

## Performance Standards and Metrics

As required by SB 1225, CalSTA has established a set of uniform performance standards (UPS) for the three state-supported intercity passenger rail corridors, including the Pacific Surfliner service, to control cost and improve efficiency. The proposed performance measures fall into three major categories (usage, cost efficiency, and service quality) and include: passenger miles, ridership, farebox recovery, cost per passenger mile, endpoint on-time performance, all-stations on-time performance (OTP), and operator responsible delays per 10,000 train miles.

In FY 2015-16, the Pacific Surfliner service saw positive growth in these metrics, with a 3.4 percent increase in ridership, a 4.6 percent increase in revenue, a 2.1 percent increase in passenger miles, and an 11.8 percent increase in farebox recovery, which averaged 78.8 percent. Endpoint on-time performance continued to lag behind the goal of 90 percent, averaging 78 percent in FY 2015-16.

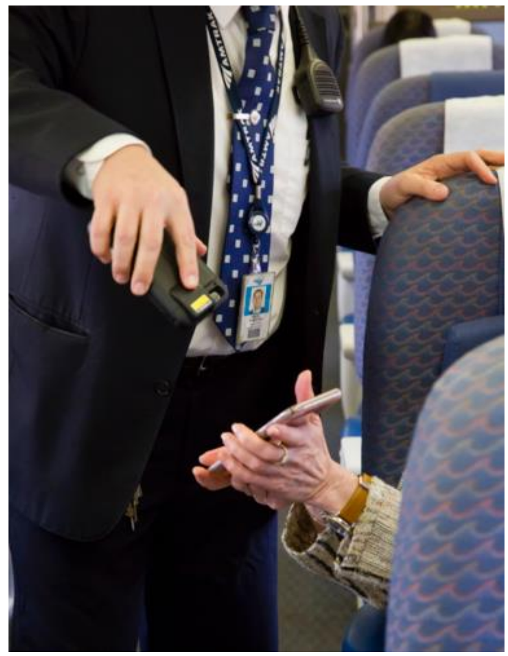
## Capital Improvements

Though much progress has been made over the years, many segments of the LOSSAN rail corridor are still limited by the lack of passing or second main tracks. There is currently more than $5 billion in capital needs that have been identified on various portions of the LOSSAN rail corridor, including additional track capacity, station improvements, and signal and communications improvements.

The LOSSAN Agency continues to coordinate with the member agencies and station owners in an effort to pursue funding opportunities that bring benefits to the larger corridor. As part of that effort, the LOSSAN Agency has worked to develop and maintain a list of capital projects, identifying those in both the planning and implementation phase, with special attention being given to identifying projects that have unfunded elements. An effort is being made to update this list annually through the LOSSAN Staff Working Group. While each member agency or host railroad is responsible for the implementation of its respective capital improvement programs, the LOSSAN Agency uses the list in both funding and legislative pursuits, with a focus on leveraging any existing funds to advance capital projects that benefit the entire LOSSAN rail corridor. This unified voice advocating for capital funding and key projects makes the LOSSAN Agency's requests more compelling and competitive.


In addition to the major capital improvements planned for the LOSSAN rail corridor, the state annually allocates approximately $500,000 to cover minor projects, such as station improvements, signage, and minor safety enhancements; and the California Office of Emergency Services makes approximately $1.9 million per year available for safety and security projects. The LOSSAN Agency will work with member agencies to prepare a prioritized list of candidate projects for the state-funded minor projects program, and also seek joint capital funding opportunities though the Transit and Intercity Rail Capital Program and other grant programs.

## Fare Policy



Pacific Surfliner trains currently offer travel in unreserved coach class and reserved business class. Fares are largely static year-round with the exception of slight increases on select holidays during peak travel periods. Amtrak also offers discounted multi-ride tickets, discounts for group travel, as well as a Rail 2 Rail Program that allows Metrolink and COASTER commuter rail pass holders to ride Pacific Surfliner trains at no additional cost, subject to certain restrictions. The last fare increase on the Pacific Surfliner service took place in June 2013.

Although no base fare increases are planned in FY 2017-18, a complete fare review and restructuring effort is currently underway. The restructuring effort is being undertaken to ensure ticket prices accurately reflect the market, and to assess areas of the existing fare structure with inconsistent discount methodologies. The LOSSAN Agency will work with Amtrak and the state to develop a fare policy that ensures the Pacific Surfliner service is an attractive transportation option that is competitive with the automobile and other competing modes of transportation, while meeting the UPS set by the state, including ridership, revenue, and farebox recovery goals.

The LOSSAN Agency will also explore a variety of other opportunities to increase fare revenue without raising fares, while maintaining and expanding ridership, including promotion of transit transfers, partnerships with major destinations/attractions, enhanced loyalty programs, and development of special event trains.

## Network Integration and High-Speed Rail

The Pacific Surfliner will play a key role in the larger statewide effort of integrating the three state-supported intercity passenger rail services with the future high-speed rail (HSR) system. State-supported intercity passenger rail and the HSR system will also be connected with transit and commuter rail systems throughout the state as the Pacific Surfliner service currently integrates with these systems.

The LOSSAN Agency is working in close coordination with CalSTA, Caltrans DRMT, transit and rail operators along the LOSSAN rail corridor, and other stakeholders on efforts to improve rail and transit service. This includes growing ridership by creating an integrated statewide passenger rail and transit network with coordinated schedules and common fare collection systems. The LOSSAN Agency has also been actively participating in the California State Rail Plan Stakeholder Advisory Committee, which provides input into the 2018 California State Rail Plan. The LOSSAN Agency will continue to participate in the development of the State Rail Plan and will submit a formal comment letter once the draft document is released for public review in April 2017.

The passenger rail services along the LOSSAN rail corridor act as a backbone for transportation throughout the California coastal region. As such, the LOSSAN rail corridor will provide critical connections and feeder/distributor service to support and compliment the HSR system. Integration between the LOSSAN rail corridor and HSR system will provide mutual benefits to each service and must be planned carefully to build upon the existing success of the Pacific Surfliner service.

## Passenger Amenities

The Pacific Surfliner offers its passengers amenities to improve the overall travel experience. The LOSSAN Agency will carry out a number of strategies for enhancing passenger amenities. Key priorities for FY 2017-18 and FY 2018-19 include enhancements to both on-board and station amenities, including business class service, food and beverage offerings, joint promotions, e-newsletter, on-board information system, seating availability notifications, service disruption response, special event service, train status information, transit connectivity, Wi-Fi improvements and landing page, checked baggage and station improvements.

## Equipment


The Pacific Surfliner fleet consists of nine train sets to operate 24 daily trains. Of the 49 bi-level cars that are dedicated to the Pacific Surfliner service, ten are owned by Caltrans DRMT, and the remaining 39 are owned by Amtrak. Caltrans DRMT has 15 new locomotives on order for the Pacific Surfliner service, expected to arrive beginning in 2019-20. The LOSSAN Agency is continuing discussions with Amtrak and Caltrans DRMT regarding options to lease additional equipment on a short-term basis prior to the arrival of new state-owned railcars in order to accommodate peak travel demand, which sometimes exceeds available seating capacity.

Amtrak staff is responsible for all maintenance activities related to the Pacific Surfliner service as part of the annual operating contract with the LOSSAN Agency. The LOSSAN Agency is responsible for administration and maintenance supervision of the Pacific Surfliner fleet, particularly the ten state-owned railcars.

## Marketing

The proposed Pacific Surfliner marketing program for FY 2017-18 focuses on optimizing existing marketing efforts while building a strategic framework to support future Pacific Surfliner marketing initiatives to grow awareness, ridership and revenue. Building a strong foundation will promote strategic marketing programs that utilize cost-effective, data-driven tactics, while also promoting long-term efficiencies as the Pacific Surfliner marketing program matures.

The LOSSAN Agency's initial efforts to create awareness and generate interest in the Pacific Surfliner service included a broad range of activities, from communicating critical rider information and establishing new social media channels to launching new service promotions and working to increase revenue related to key business objectives. The marketing plan for FY 2017-18 focuses on initiatives designed to build on these early accomplishments while laying the groundwork for future success and continuing to demonstrate return on marketing investments.

Marketing tactics will include traditional and digital advertising, as well as video, social media, email blasts, and a state-of-the-art, customer-oriented Web site. All marketing activities and expenditures will be measured to determine efficiency and effectiveness.

## Annual Funding and Separation of Funding

The primary purpose of the business plan is to fulfill the requirement by SB 1225 to develop a two-year business plan on an annual basis to guide the allocation of funds necessary for the LOSSAN Agency to administer, operate, maintain equipment, and market the Pacific Surfliner service.

The total net State operating subsidy for FY 2017-18 is projected to be $38,393,315, which includes the net operating subsidy as well as administrative and marketing funding. The current assumptions for the FFY 2017-18 operating budget include a modest increase in both ridership and revenue of 3 percent over the FFY 2016-17 budget. This yields a projected fare revenue of $80,084,560. Total operating costs for the Pacific Surfliner service are projected to be $112,973,201, an increase of $2,215,161, or 2 percent over the FFY 2016-17 budget. Caltrans DRMT has executed an agreement with Amtrak to directly fund equipment capital charges for the Amtrak-owned railcars and locomotives used on the three state-supported rail corridors, effective October 2015. As a result, equipment capital charges are not included in the operating agreement between Amtrak and the LOSSAN Agency. After subtracting projected fare revenue of $80,084,560, from total operating costs of $112,973,201, the total FFY 2017-18 state operating subsidy payment is projected to be $32,888,641. The FY 2017-18 budget also includes $500,000 for minor projects, including station improvements, signage, and minor safety and security enhancements.

In addition to the operating payment to Amtrak, the state will also fund the administration and marketing of the Pacific Surfliner service. The FY 2017-18 administrative budget is proposed at $3,004,674. This amount assumes staffing levels remain consistent with the FY 2016-17 budget. This amount also assumes administrative employee performance-based salary increases consistent with the managing agency's projected assumptions, as well as no changes from FY 2016-17 in insurance, legal, travel and professional services. The FY 2017-18 marketing budget is proposed to remain consistent with the FY 2016-17 amount of $2,000,000. To ensure state funding for the Pacific Surfliner service is kept separate from funding for OCTA projects and programs, a separation of funding has been established within the LOSSAN managing agency.

## Government Relations and Advocacy

One of the benefits gained through local governance of the Pacific Surfliner service by the LOSSAN Agency is added flexibility in advocating for policies at the state and federal level to improve rail operations, increase funding for operations and capital needs, and allow better coordination and interoperability with connecting transit and rail services.

The annual legislative program adopted by the LOSSAN Board provides overall guidance to LOSSAN Agency advocacy activities, and staff will continue to provide regular legislative updates and bill analyses to the LOSSAN Board consistent with that program. The 2017 LOSSAN Legislative Program provides detail on legislative priorities, including:

- Identify and secure long-term and sustainable funding sources to support passenger rail operations and capital projects in the LOSSAN rail corridor, including securing federal funds made available by the reauthorization of a federal rail title and ensuring the eligibility for the LOSSAN Agency to compete for funding under the state's cap-and-trade program
- Support efforts to further enhance connectivity of regional rail and local transit services within the LOSSAN rail corridor
- Continue to study and advance infrastructure and service improvement projects/programs

In addition, the LOSSAN Agency will work closely with LOSSAN member agencies to pursue opportunities to retain state and federal advocacy services. This will allow the LOSSAN Agency to more effectively represent the interests of its member agencies in Sacramento and Washington, D.C., communicate policy goals and input to legislative and administrative offices, and receive regular updates on issues of importance to the LOSSAN Agency.

At the local level, LOSSAN Agency staff will continue to work with LOSSAN member agencies, local communities, and stakeholder organizations to build awareness of passenger rail services along the LOSSAN rail corridor, developing strategic partnerships to better evolve the services to meet local demands. Increased awareness of these services by local officials can then be leveraged to back consensus based operational improvements and policy activities.

## Safety and Security

Protecting the safety and security of passenger rail service is key to attracting and retaining riders, and ensuring efficient operation of passenger trains on the LOSSAN rail corridor. The goal of the LOSSAN Agency safety program is to instill a comprehensive safety culture that will govern all of the activities associated with the operations and maintenance of the service, while efficiently meeting operational performance goals. The Federal Railroad Administration (FRA) and the California Public Utilities Commission (CPUC) are responsible for overseeing general railroad safety along the LOSSAN rail corridor.

The LOSSAN Agency primarily serves in an oversight and coordination role with regard to safety and security aboard trains, relying on the extensive on-board safety and security programs and policies put in place by Amtrak. Pacific Surfliner passengers benefit from the Amtrak security program, specifically the services of the Amtrak Police Department. There are nine officers and one captain currently assigned to the Pacific Surfliner. As part of the FY 2017-18 budget, two additional Amtrak Patrol Officers are proposed to be added.


The LOSSAN Agency will continue to attend regularly scheduled safety meetings hosted by Amtrak for front-line employees to reiterate that safety is the first priority in delivering Pacific Surfliner service. Amtrak is responsible for all required reporting of safety data to federal, state, and local agencies, including FRA and CPUC. All cab cars and locomotives are equipped with a “forward facing” camera system to aid in accident investigation and soon may be equipped with “inward facing” cameras. As required by the FRA, installation of Positive Train Control (PTC) is progressing, with all Pacific Surfliner locomotives and cab cars expected to be fully compliant with PTC by the revised December 31, 2018 federal deadline.

The LOSSAN Agency will work with right-of-way owners and rail operators to enhance safety and response to incidents along the right-of-way. Public information efforts will include both traditional and social media to build awareness of rail safety.

## Emerging Corridors

In addition to administering the existing Pacific Surfliner rail service, the LOSSAN Agency will continue to work with member agencies to study and pursue expansion opportunities on emerging corridors that provide connectivity within southern California and beyond. Specifically, the LOSSAN Agency expects to focus on connectivity to the California HSR system, as well as the eastern communities throughout Riverside County and the Coachella Valley, and coastal communities up to San Luis Obispo and north to the San Francisco Bay Area. These connections will provide seamless travel opportunities by rail or bus throughout the region and state. Enhanced and emerging corridor rail service and system improvements will contribute to the success of the LOSSAN rail corridor, support future statewide HSR service and regional commuter rail operations, and provide connectivity with local transit systems.

# APPENDIX 4

## Excerpts from 2015 San Diego Forward: The Regional Plan

# SAN DIEGO FORWARD

THE REGIONAL PLAN

October 2015

401 B Street, Suite 800, San Diego, CA 92101 | (619) 699-1900 | SDforward.com | SANDAGregion @SANDAG #SDForward SANDAGregion


*Los Angeles-San Diego-San Luis Obispo (LOSSAN) Rail Corridor:* The COASTER, AMTRAK, and Metrolink rail corridor is the nation's second busiest. Premier passenger rail services connect the San Diego region to Los Angeles and other points north and east. The Regional Plan builds on this corridor by adding more track capacity and improved stations. These enhancements also will benefit shipping, because the LOSSAN corridor serves as the region's main freight rail line. Figure 2.10 illustrates the Southern California intercity and commuter rail services.

*Trolley/SPRINTER/Rapid service:* These routes serve as the trunk lines of the regional transit system. Together, they offer fast and reliable rail and bus travel with limited stops in key travel corridors. The Trolley and SPRINTER operate on their own dedicated rail lines, while *Rapid* service operates on freeway Managed Lanes and on local streets. Planned improvements include:

- The Mid-Coast Trolley extending service from Santa Fe Depot in Downtown San Diego to the University City community, serving Old Town, UC San Diego, and Westfield University Towne Centre.
- SPRINTER double-tracking, which will enable higher frequency service, and the extension of service from Escondido south to Westfield North County.
- A new Trolley line from San Ysidro to Carmel Valley along the I-805/ I-15 corridors via Chula Vista, National City, Southeastern San Diego, Mid-City, Mission Valley, Kearny Mesa, University City, and Sorrento Valley.
- A new Trolley line from Pacific Beach to the El Cajon Transit Center, via Clairemont, Kearny Mesa, Mission Valley, and San Diego State University (SDSU).


**Figure 2.10**

**Southern California Intercity/Commuter Rail and San Diego Region Airport Locations**

**October 2015**


## Separating Key Rail Crossings and Busy Streets from One Another

The transportation system is not just a collection of disconnected modes of travel. At its best, a transportation system integrates all modes of travel into a unified whole, so that people and goods can travel efficiently and safely. Rail-grade separations offer a good example of how our transportation system can work together. When tracks are separated from streets, cars, trucks, bicyclists, pedestrians, and the goods shipped by rail can get to where they're headed without coping with conflicts built in to the system. Rail-grade separations are expensive, and their construction must be prioritized. However, over the years we've added them in key locations throughout the region. The Regional Plan identifies several additional places where rail-grade separations will help the transportation system function more smoothly and safely. By 2050, nine rail-grade separations are proposed along the LOSSAN and SPRINTER corridors. On the Orange and Blue Line Trolley lines, 11 rail-grade improvements are planned by 2050.

**Table A.1**
## Revenue Constrained Projects
*Transit Facilities*

| *TransNet* | Service | Route | Description | Capital Cost ($2014); millions | Capital Cost ($YOE); millions |
|---|---|---|---|---|---|
| *TransNet* | COASTER | 398 | Double tracking (includes grade separations at Leucadia Blvd and two other locations, stations/ platforms at Convention Center/Gaslamp Quarter and Del Mar Fairgrounds, Del Mar Tunnel, and extensions to the Convention Center/Gaslamp Quarter and Camp Pendleton) | $2,710 | $5,174 |
| *TransNet* | SPRINTER | 399 | SPRINTER efficiency improvements and double tracking (Oceanside to Escondido and six rail grade separations at El Camino Real, Melrose Dr, Vista Village Dr/Main St, North Dr, Civic Center, Auto Parkway and Mission Ave) | $946 | $1,339 |
| | SPRINTER | 399 | Branch Extension to Westfield North County | $176 | $437 |
| | SPRINTER | 588 | SPRINTER Express | $244 | $492 |
| *TransNet* | Trolley | 510 | Mid-Coast Trolley Extension | $1,753 | $1,753 |
| | Trolley | 510 | Blue Line/Mid-Coast Frequency Enhancements and rail grade separations at 28th St, 32nd St, E St, H St, Palomar St, at Taylor St and Ash St, and Blue/Orange Track Connection at 12th/Imperial | $431 | $741 |
| | Trolley | 520 | Orange Line Frequency Enhancements and four rail grade separations at Euclid Ave, Broadway/ Lemon Grove Ave, Allison Ave/University Ave, Severin Dr | $267 | $402 |
| | Trolley | 530 | Green Line Frequency Enhancements | $0 | $0 |
| | Trolley | 560 | SDSU to Downtown San Diego via El Cajon Blvd/Mid-City (transition of Mid-City *Rapid* to Trolley) | $2,390 | $5,005 |
| | Trolley | 561 | UTC to COASTER Connection (extension of Route 510) | $343 | $602 |
| | Trolley | 562 | San Ysidro to Carmel Valley via National City/ Chula Vista via Highland Ave/ 4th Ave, Southeast San Diego, Mid-City, Mission Valley, and Kearny Mesa | $2,967 | $5,471 |
| | Trolley | 563 | Pacific Beach to El Cajon Transit Center via Balboa and Kearny Mesa | $1,299 | $2,938 |
| | *Rapid* | 2 | North Park to Downtown San Diego via 30th St, Golden Hill | $39 | $52 |
| | *Rapid* | 10 | La Mesa to Ocean Beach via Mid-City, Hillcrest, Old Town | $87 | $117 |
| | *Rapid* | 11 | Spring Valley to SDSU via Southeast San Diego, Downtown, Hillcrest, Mid-City | $113 | $173 |
| | *Rapid* | 28 | Point Loma to Kearny Mesa via Old Town, Linda Vista | $49 | $76 |
| | *Rapid* | 30 | Old Town to Sorrento Mesa via Pacific Beach, La Jolla, UTC | $105 | $161 |

Table A.2

## Phased Revenue Constrained Projects

*Transit Facilities*

| Year Built By | Service | Route | Description | Capital Cost ($2014); millions | Capital Cost ($YOE); millions |
|---|---|---|---|---|---|
| 2020 | COASTER | 398 | Double tracking (20-minute peak frequencies and 120-minute off-peak frequencies) | $445 | $445 |
| 2020 | Trolley | 510 | Mid-Coast Trolley Extension | $1,753 | $1,753 |
| 2020 | *Rapid* | 225 | South Bay *Rapid* (Otay Mesa to Downtown) and Otay Mesa ITC (formerly Route 628) | $206 | $206 |
| 2020 | *Rapid* | 905 | Extension of Iris Trolley Station to Otay Mesa Port of Entry (POE) route with new service to Otay Mesa East POE and Imperial Beach | $2 | $2 |
| 2020 | Shuttle | 448/449 | San Marcos Shuttle[1] | $0 | $0 |
| 2020 | Airport Express | -- | Airport Express Routes[2] | $52 | $62 |
| 2020 | Transit Lanes | SR 15 from I-805 to I-8 | Addition of two Transit Lanes for routes 235, 280/290, 653, and Airport Express Route to the cross border facility in Otay Mesa | $56 | $56 |
| 2020 | Other | -- | Other Improvements (Vehicles, transit system rehabilitation, maintenance facilities, ITS, regulatory compliance, Park and Ride, transit center expansions) | $632 | $680 |
| 2020 | -- | -- | Local Bus Routes - 15 minutes in key corridors | -- | -- |
| 2035 | COASTER | 398 | Double tracking (20-minute peak frequencies and 60-minute off-peak frequencies, grade separations at Leucadia Blvd, stations/platforms at Convention Center/Gaslamp Quarter and Del Mar Fairgrounds, and extension to Camp Pendleton) | $900 | $1,357 |
| 2035 | SPRINTER | 399 | SPRINTER efficiency improvements (20-minute frequencies by 2025); double tracking Oceanside to Escondido for 10-minute frequencies and six rail grade separations at El Camino Real, Melrose Dr, Vista Village Dr/Main St, North Dr, Civic Center, Auto Pkwy and Mission Ave | $946 | $1,339 |
| 2035 | Trolley | 510 | Phase I - Blue Line Frequency Enhancements and rail grade separations at 28th St, 32nd St, E St, H St, Palomar St, and Blue/Orange Track Connection at 12th/Imperial | $205 | $292 |
| 2035 | Trolley | 520 | Orange Line Frequency Enhancements and four rail grade separations at Euclid Ave, Broadway/Lemon Grove Ave, Allison Ave/University Ave, Severin Dr | $267 | $402 |
| 2035 | Trolley | 561 | UTC to COASTER Connection (extension of Route 510) | $343 | $602 |
| 2035 | Trolley | 562 | Phase I - San Ysidro to Kearny Mesa via Chula Vista via Highland Ave/4th Ave, National City, Southeast San Diego, Mid-City, and Mission Valley | $2,333 | $4,028 |
| 2035 | *Rapid* | 2 | North Park to Downtown San Diego via 30th St, Golden Hill | $39 | $52 |
| 2035 | *Rapid* | 10 | La Mesa to Ocean Beach via Mid-City, Hillcrest, Old Town | $87 | $117 |
| 2035 | *Rapid* | 11 | Spring Valley to SDSU via Southeast San Diego, Downtown, Hillcrest, Mid-City | $113 | $173 |

Table A.2 (continued)

## Phased Revenue Constrained Projects

*Transit Facilities (continued)*

| Year Built By | Service | Route | Description | Capital Cost ($2014); millions | Capital Cost ($YOE); millions |
|---|---|---|---|---|---|
| 2035 | *Rapid* | 28 | Point Loma to Kearny Mesa via Old Town, Linda Vista | $49 | $76 |
| 2035 | *Rapid* | 30 | Old Town to Sorrento Mesa via Pacific Beach, La Jolla, UTC | $105 | $161 |
| 2035 | *Rapid* | 41 | Fashion Valley to UTC/UC San Diego via Linda Vista and Clairemont | $55 | $96 |
| 2035 | *Rapid* | 90 | El Cajon Transit Center to San Diego International Airport ITC via SR 94, City College (peak only) | $20 | $27 |
| 2035 | *Rapid* | 120 | Kearny Mesa to Downtown via Mission Valley | $78 | $104 |
| 2035 | *Rapid* | 473 | Phase I - Solana Beach to UTC/UC San Diego via Hwy 101 Coastal Communities, Carmel Valley | $43 | $66 |
| 2035 | *Rapid* | 550 | SDSU to Palomar Station via East San Diego, Southeast San Diego, National City | $59 | $78 |
| 2035 | *Rapid* | 635 | Eastlake to Palomar Trolley via Main St Corridor | $56 | $98 |
| 2035 | *Rapid* | 638 | Iris Trolley Station to Otay Mesa via Otay, Airway Dr, SR 905 Corridor | $38 | $67 |
| 2035 | *Rapid* | 640A/ 640B | Route 640A: I-5 - San Ysidro to Old Town Transit Center via City College; 640B: I-5 Iris Trolley/Palomar to Kearny Mesa via Chula Vista, National City and City College | $153 | $206 |
| 2035 | *Rapid* | 688/ 689/ 690 | Route 688: San Ysidro to Sorrento Mesa via I-805/I-15/SR 52 Corridors (Peak Only); Route 689:Otay Mesa Port of Entry (POE) to UTC/Torrey Pines via Otay Ranch/Millennia, I-805 Corridor (Peak Only); Route 690: Mid-City to Sorrento Mesa via I-805 Corridor (Peak Only) | $458 | $653 |
| 2035 | *Rapid* | 709 | H St Trolley Station to Millennia via H St Corridor, Southwestern College | $37 | $49 |
| 2035 | *Rapid* | 910 | Coronado to Downtown via Coronado Bridge | $26 | $39 |
| 2035 | *Rapid* | SR 163 DARs | Kearny Mesa to Downtown via SR 163. Stations at Sharp/Children's Hospital, University Ave, and Fashion Valley Transit Center | $150 | $196 |
| 2035 | Streetcar | 553 | Downtown San Diego: Little Italy to East Village[3] | $14 | $21 |
| 2035 | Streetcar | 554 | Hillcrest/Balboa Park/Downtown San Diego Loop[3] | $29 | $38 |
| 2035 | Streetcar | 555 | 30th St to Downtown San Diego via North Park/ Golden Hill[3] | $26 | $45 |
| 2035 | ITC | -- | San Diego International Airport ITC and I-5 Direct Connector Ramps | $170 | $223 |
| 2035 | ITC | -- | Phase I - San Ysidro ITC | $95 | $143 |
| 2035 | Other | -- | Other Improvements (Vehicles, transit system rehabilitation, maintenance facilities, ITS, regulatory compliance, Park and Ride, transit center expansions) | $2,519 | $3,742 |

**Table A.2 (continued)**
## Phased Revenue Constrained Projects

*Transit Facilities (continued)*

| Year Built By | Service | Route | Description | Capital Cost ($2014); millions | Capital Cost ($YOE); millions |
|---|---|---|---|---|---|
| 2035 | -- | -- | Local Bus Routes - 10 minutes in key corridors | -- | -- |
| 2050 | COASTER | 398 | Double tracking (completes double tracking; includes Del Mar Tunnel) plus 2 grade separations | $1,365 | $3,372 |
| 2050 | SPRINTER | 399 | Branch Extension to Westfield North County | $176 | $437 |
| 2050 | SPRINTER | 588 | SPRINTER Express | $244 | $492 |
| 2050 | Trolley | 510 | Phase II - Blue Line rail grade separations at Taylor St and Ash St | $226 | $449 |
| 2050 | Trolley | 520 | Orange Line Frequency Enhancements | $0 | $0 |
| 2050 | Trolley | 530 | Green Line Frequency Enhancements | $0 | $0 |
| 2050 | Trolley | 560 | SDSU to Downtown via El Cajon Blvd/Mid-City (transition of Mid-City *Rapid* to Trolley) | $2,390 | $5,005 |
| 2050 | Trolley | 562 | Phase II - Kearny Mesa to Carmel Valley | $633 | $1,443 |
| 2050 | Trolley | 563 | Pacific Beach to El Cajon Transit Center | $1,299 | $2,937 |
| 2050 | *Rapid* | 103 | Solana Beach to Sabre Springs *Rapid* station via Carmel Valley | $67 | $135 |
| 2050 | *Rapid* | 440 | Carlsbad to Escondido Transit Center via Palomar Airport Rd | $51 | $104 |
| 2050 | *Rapid* | 471 | Downtown Escondido to East Escondido | $32 | $80 |
| 2050 | *Rapid* | 473 | Phase II - Oceanside to Solana Beach via Hwy 101 Coastal Communities | $87 | $176 |
| 2050 | *Rapid* | 474 | Oceanside to Vista via Mission Ave/Santa Fe Rd Corridor | $50 | $127 |
| 2050 | *Rapid* | 477 | Camp Pendleton to Carlsbad Village via College Blvd, Plaza Camino Real | $80 | $161 |
| 2050 | *Rapid* | 235 | Temecula (peak only) Extension of Escondido to Downtown *Rapid* (formerly Route 610) | $98 | $198 |
| 2050 | *Rapid* | 636 | SDSU to Spring Valley via East San Diego, Lemon Grove, Skyline | $39 | $79 |
| 2050 | *Rapid* | 637 | North Park to 32nd St Trolley Station via Golden Hill | $33 | $66 |
| 2050 | *Rapid* | 650 | Chula Vista to Palomar Airport Rd Business Park via I-805/I-5 (peak only) | $82 | $166 |
| 2050 | *Rapid* | 653 | Mid-City to Palomar Airport Rd via Kearny Mesa/I-805/I-5 | $10 | $21 |
| 2050 | *Rapid* | 870 | El Cajon to UTC via Santee, SR 52, I-805 | $7 | $17 |
| 2050 | *Rapid* | 890 | El Cajon to Sorrento Mesa via SR 52, Kearny Mesa | $12 | $29 |
| 2050 | Streetcar | 565 | Mission Beach to La Jolla via Pacific Beach[3] | $25 | $50 |
| 2050 | ITC | -- | Phase II - San Ysidro ITC | $23 | $46 |
| 2050 | Other | -- | Other Improvements (Vehicles, transit system rehabilitation, maintenance facilities, ITS, regulatory compliance, Park and Ride, transit center expansions) | $3,266 | $7,341 |
| | | | **Subtotal** | **$22,854** | **$40,625** |

Table A.5
## Revenue Constrained and Unconstrained Projects

*Transit Facilities*

| Service | Route | Description | Revenue Constrained Peak/Off-Peak (minutes) | Unconstrained Peak/Off-Peak (minutes) | Unconstrained Capital Cost ($2014); millions |
|---|---|---|---|---|---|
| HSR | 598 | Commuter Rail Overlay (Temecula to Airport ITC) | NA | 15/15 | $340 |
| HSR | -- | Extension from Airport ITC to San Ysidro/ Otay Mesa | NA | 15/60 | $2,734 |
| COASTER | 398 | Double tracking, grade separation at Leucadia Blvd and two other locations, stations/ platforms at Convention Center/Gaslamp Quarter and Del Mar Fairgrounds, extension to Convention Center/Gaslamp Quarter and Camp Pendleton, and Del Mar and UTC Tunnels[1] | 20/60 | 15/15 | $5,786 |
| COASTER | 398 | COASTER extension to National City | NA | 15/15 | $900 |
| SPRINTER | 399 | SPRINTER efficiency improvements; double tracking Oceanside to Escondido; includes six rail grade separations at El Camino Real, Melrose Dr, Vista Village Dr/Main St, North Dr, Civic Center, Auto Pkwy and Mission Ave and a Branch Extension to Westfield North County[1] | 10/10 | 7.5/7.5 | $1,122 |
| SPRINTER | 588 | SPRINTER Express | 10/15 | 10/15 | $244 |
| Trolley | 510 | Mid-Coast Trolley Extension | 7.5/7.5 | 7.5/7.5 | $1,753 |
| Trolley | 510 | Blue Line/Mid-Coast Frequency Enhancements and rail grade separations at 28th St, 32nd St, E St, H St, Palomar St, Taylor and Ash St, and Blue/Orange Track Connection at 12th/Imperial | 7.5/7.5 | 7.5/7.5 | $431 |
| Trolley | 520 | Orange Line Frequency Enhancements and four rail grade separations at Euclid Ave, Broadway/ Lemon Grove Ave, Allison Ave/University Ave, Severin Dr | 7.5/7.5 | 7.5/7.5 | $267 |
| Trolley | 530 | Green Line Frequency Enhancements | 7.5/7.5 | 7.5/7.5 | $0 |
| Trolley | 522 | Orange Line Express - El Cajon to San Diego International Airport ITC (ITC) | NA | 10/10 | $198 |
| Trolley | 540 | Blue Line Express - Santa Fe Depot to San Ysidro via Downtown | NA | 10/10 | $391 |
| Trolley | 550 | SDSU to Palomar Station via East San Diego, Southeast San Diego, National City | NA | 7.5/7.5 | $1,582 |
| Trolley | 560 | SDSU to Downtown San Diego via El Cajon Blvd/Mid-City (transition of Mid-City *Rapid* to Trolley) | 7.5/7.5 | 7.5/7.5 | $2,390 |
| Trolley | 561 | UTC COASTER Connection | 7.5/7.5 | 7.5/7.5 | $343 |
| Trolley | 561 | COASTER Connection to Mira Mesa/Carroll Canyon (extension of Route 510) | NA | 7.5/7.5 | $824 |
| Trolley | 562 | San Ysidro to Carmel Valley via Chula Vista, National City, Southeast San Diego, Mid-City, Mission Valley, and Kearny Mesa | 7.5/10 | 7.5/7.5 | $2,967 |

**Table A.5 (continued)**

## Revenue Constrained and Unconstrained Projects

*Transit Facilities (continued)*

| Service | Route | Description | Revenue Constrained Peak/Off-Peak (minutes) | Unconstrained Peak/Off-Peak (minutes) | Unconstrained Capital Cost ($2014); millions |
|---|---|---|---|---|---|
| Trolley | 563 | Pacific Beach to El Cajon Transit Center via Balboa and Kearny Mesa | 7.5/10 | 7.5/7.5 | $1,299 |
| Trolley | 564 | Otay Mesa East Border Crossing to Western Chula Vista via Otay Ranch/Millennia | NA | 7.5/7.5 | $1,001 |
| Trolley | 566 | Palomar St Trolley Station to Carmel Valley via Mid-City, Kearny Mesa (Route 562 Express) | NA | 10/10 | $335 |
| Trolley | 510, 520, 540, 522 and 560 | Downtown Trolley Tunnel | NA | 7.5/7.5 | $2,666 |
| *Rapid* | 2 | North Park to Downtown San Diego via 30th St, Golden Hill | 10/10 | 10/10 | $39 |
| *Rapid* | 10 | La Mesa to Ocean Beach via Mid-City, Hillcrest, Old Town | 10/10 | 10/10 | $87 |
| *Rapid* | 11 | Spring Valley to SDSU via Southeast San Diego, Downtown, Hillcrest, Mid-City | 10/10 | 10/10 | $113 |
| *Rapid* | 28 | Point Loma to Kearny Mesa via Old Town, Linda Vista | 10/10 | 10/10 | $49 |
| *Rapid* | 30 | Old Town to Sorrento Mesa via Pacific Beach, La Jolla, UTC | 10/10 | 10/10 | $105 |
| *Rapid* | 41 | Fashion Valley to UTC/UC San Diego via Linda Vista and Clairemont | 10/10 | 10/10 | $55 |
| *Rapid* | 90 | El Cajon Transit Center to San Diego International Airport ITC via SR 94, City College (peak only) | 10/10 | 10/10 | $20 |
| *Rapid* | 103 | Solana Beach to Sabre Springs *Rapid* station via Carmel Valley | 15/15 | 15/15 | $67 |
| *Rapid* | 120 | Kearny Mesa to Downtown via Mission Valley | 10/10 | 10/10 | $78 |
| *Rapid* | 225 | South Bay *Rapid* (Otay Mesa to Downtown) and Otay Mesa ITC | 15/30 | 10/10 | $206 |
| *Rapid* | 235 | Temecula (peak only) Extension of Escondido to Downtown *Rapid* (formerly Route 610) | 10/NA | 10/NA | $98 |
| *Rapid* | 430 | Oceanside to Escondido (peak only) | NA | 10/10 | $240 |
| *Rapid* | 440 | Carlsbad to Escondido Transit Center via Palomar Airport Rd | 10/10 | 10/10 | $51 |
| *Rapid* | 471 | Downtown Escondido to East Escondido | 10/10 | 10/10 | $32 |
| *Rapid* | 473 | UTC/UC San Diego to Oceanside via Hwy 101 Coastal Communities, Carmel Valley | 10/10 | 10/10 | $130 |
| *Rapid* | 474 | Oceanside to Vista via Mission Ave/Santa Fe Road Corridor | 10/10 | 10/10 | $50 |
| *Rapid* | 477 | Camp Pendleton to Carlsbad Village via College Blvd, Plaza Camino Real | 10/10 | 10/10 | $80 |
| *Rapid* | 550 | SDSU to Palomar Station via East San Diego, Southeast San Diego, National City[2] | 10/10 | NA | $59 |

**Table A.5 (continued)**

## Revenue Constrained and Unconstrained Projects

*Transit Facilities (continued)*

| Service | Route | Description | Revenue Constrained Peak/Off-Peak (minutes) | Unconstrained Peak/Off-Peak (minutes) | Unconstrained Capital Cost ($2014); millions |
|---|---|---|---|---|---|
| *Rapid* | 635 | Eastlake to Palomar Trolley via Main St Corridor | 10/10 | 10/10 | $56 |
| *Rapid* | 636 | SDSU to Spring Valley via East San Diego, Lemon Grove, Skyline | 10/10 | 10/10 | $39 |
| *Rapid* | 637 | North Park to 32nd St Trolley via Golden Hill | 10/10 | 10/10 | $33 |
| *Rapid* | 638 | Iris Trolley to Otay Mesa via Otay, Airway Dr, SR 905 Corridor | 10/10 | 10/10 | $38 |
| *Rapid* | 639 | Iris Trolley Station to North Island via Imperial Beach and Silver Strand, Coronado | NA | 10/10 | $54 |
| *Rapid* | 640A/ 640B | Route 640A: I-5 - San Ysidro to Old Town Transit Center via City College<br>Route 640B: I-5 Iris Trolley/Palomar to Kearny Mesa via Chula Vista, National City and City College | 640A = 10/15<br>640B=15/NA | NA | $153 |
| *Rapid* | 650 | Chula Vista to Palomar Airport Rd Business Park via I-805/I-5 (peak only) | 15/NA | 15/NA | $82 |
| *Rapid* | 652 | Downtown to UTC via Kearny Mesa Guideway/<br>I-805 | NA | 10/10 | $3 |
| *Rapid* | 653 | Mid-City to Palomar Airport Rd via Kearny Mesa/<br>I-805/I-5 | 15/NA | 15/NA | $10 |
| *Rapid* | 688/ 689/ 690 | San Ysidro to Sorrento Mesa via I-805/I-15/SR 52 Corridors; Otay Mesa Port of Entry (POE) to UTC/Torrey Pines via Otay Ranch/Millennia, I-805 Corridor; Mid City to Sorrento Mesa via I-805 Corridor. All Peak Only | 15/NA | 15/NA<br>(no Rt 690) | $458 |
| *Rapid* | 692 | Grossmont Center to Otay Town Center/Millennia via Southwest College, SR125, Spring Valley | NA | 15/15 | $5 |
| *Rapid* | 709 | H St Trolley to Millennia via H St Corridor, Southwestern College | 10/10 | 10/10 | $37 |
| *Rapid* | 870 | El Cajon to UTC via Santee, SR 52, I-805 | 10/NA | 10/15 | $7 |
| *Rapid* | 890 | El Cajon to Sorrento Mesa via SR 52, Kearny Mesa | 10/NA | 10/NA | $12 |
| *Rapid* | 905 | Extension of Iris Trolley Station to Otay Mesa Port of Entry (POE) with new service to Otay Mesa East POE and Imperial Beach | 10/10 | 10/10 | $2 |
| *Rapid* | 910 | Coronado to Downtown via Coronado Bridge | 10/10 | 10/10 | $26 |
| *Rapid* | 940 | Oceanside to Sorrento Mesa via I-5, Carlsbad, Encinitas (peak only) | NA | 10/0 | $39 |
| *Rapid* | SR 163 DARs | Kearny Mesa to Downtown via SR 163. Stations at Sharp/Children's Hospital, University Ave, and Fashion Valley Transit Center | ✓ | ✓ | $150 |

**Table A.5 (continued)**

## Revenue Constrained and Unconstrained Projects

*Transit Facilities (continued)*

| Service | Route | Description | Revenue Constrained Peak/Off-Peak (minutes) | Unconstrained Peak/Off-Peak (minutes) | Unconstrained Capital Cost ($2014); millions |
|---|---|---|---|---|---|
| Shuttle | 448/449 | San Marcos Shuttle[3] | 10/10 | 10/10 | $0 |
| Streetcar | 551 | Chula Vista Downtown[4] | NA | 10/10 | $14 |
| Streetcar | 552 | National City Downtown[4] | NA | 10/10 | $41 |
| Streetcar | 553 | Downtown San Diego: Little Italy to East Village[4] | 10/10 | 10/10 | $14 |
| Streetcar | 554 | Hillcrest/Balboa Park/Downtown San Diego Loop[4] | 10/10 | 10/10 | $29 |
| Streetcar | 555 | 30th St to Downtown San Diego via North Park/Golden Hill[4] | 10/10 | 10/10 | $26 |
| Streetcar | 557 | El Cajon Downtown[4] | NA | 10/10 | $16 |
| Streetcar | 558 | Escondido Downtown[4] | NA | 10/10 | $51 |
| Streetcar | 559 | Oceanside Downtown[4] | NA | 10/10 | $46 |
| Streetcar | 565 | Mission Beach to La Jolla via Pacific Beach[4] | 10/10 | 10/10 | $25 |
| Airport Express | - | Airport Express Routes[5] | 30/30 | 30/30 | $52 |
| Local | - | Local Bus Routes - 15 minutes in key corridors | 15/15 | 15/15 | NA |
| Local | - | Local Bus Routes - 10 minutes in key corridors | 10/10 | 10/10 | NA |
| ITC | - | San Diego International Airport ITC and I-5 Direct Connector Ramps | ✓ | ✓ | $170 |
| ITC | - | San Ysidro ITC | ✓ | ✓ | $118 |
| ITC | - | Otay Mesa East ITC | NA | ✓ | $0 |
| Transit Lanes | SR 15 from I-805 to I-8 | Addition of two transit lanes for routes 235, 280/290, 653, and Airport Express Route to the cross-border facility in Otay Mesa | ✓ | ✓ | $56 |
| Other | - | Other Improvements (Vehicles, transit system rehabilitation, maintenance facilities, ITS, regulatory compliance, park and ride, and transit center expansions) | ✓ | ✓ | $7,696 |
| | | | | **Subtotal** | **$38,690** |

*Managed Lanes / Toll Lanes / Highway Projects / Operational Improvements*

| Freeway | From | To | Existing or Planned Phase | Revenue Constrained | Unconstrained | Unconstrained Capital Cost ($2014) millions |
|---|---|---|---|---|---|---|
| I-5 | SR 905 | SR 54 | 8F | 8F+2ML | 8F+2ML | $308 |
| I-5 | SR 54 | SR 15 | 8F | 10F+2ML | 10F+2ML | $343 |

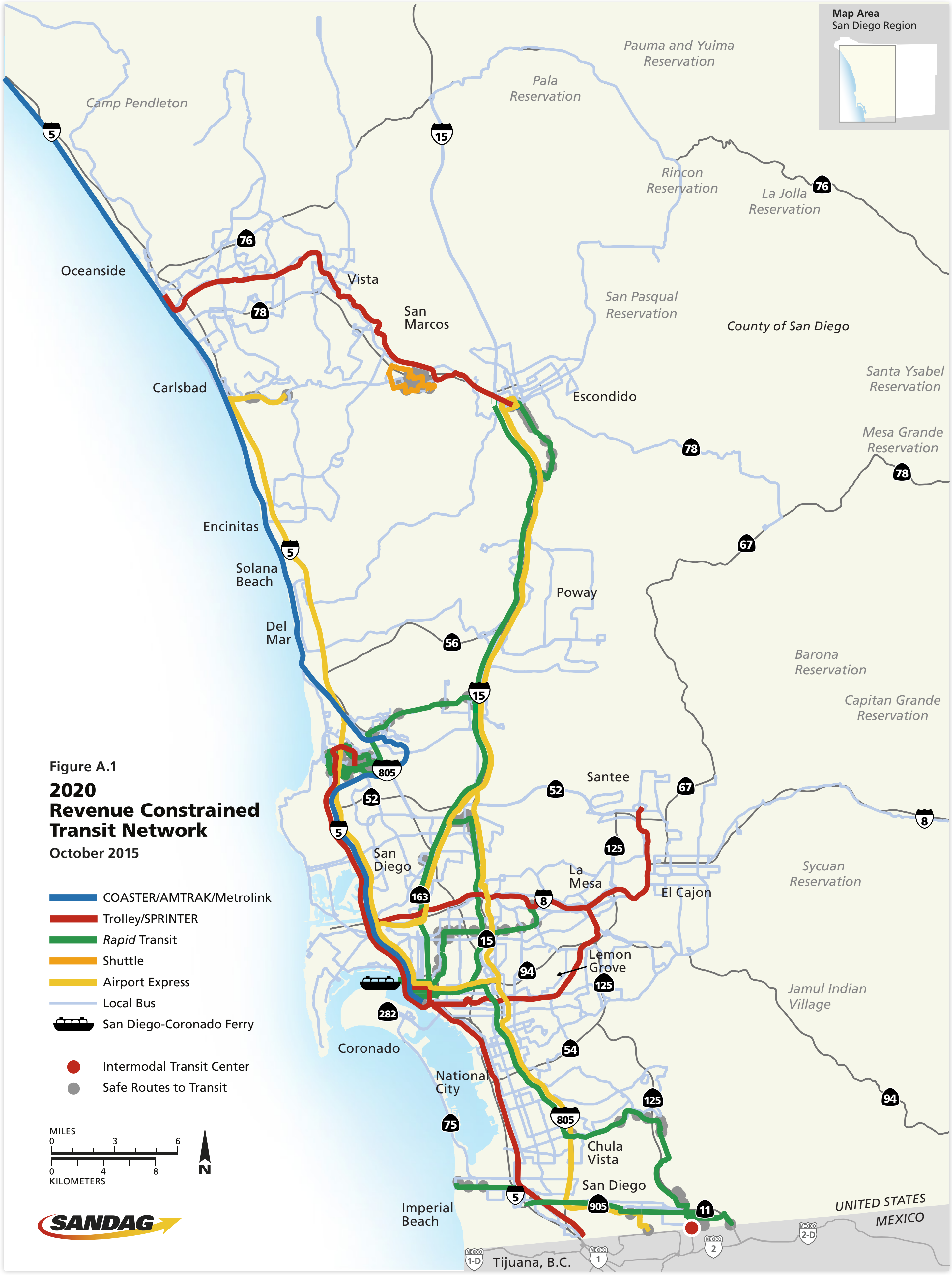



**Figure A.1**

# 2020 Revenue Constrained Transit Network

**October 2015**

- COASTER/AMTRAK/Metrolink
- Trolley/SPRINTER
- *Rapid* Transit
- Shuttle
- Airport Express
- Local Bus
- San Diego-Coronado Ferry
- Intermodal Transit Center
- Safe Routes to Transit

SANDAG

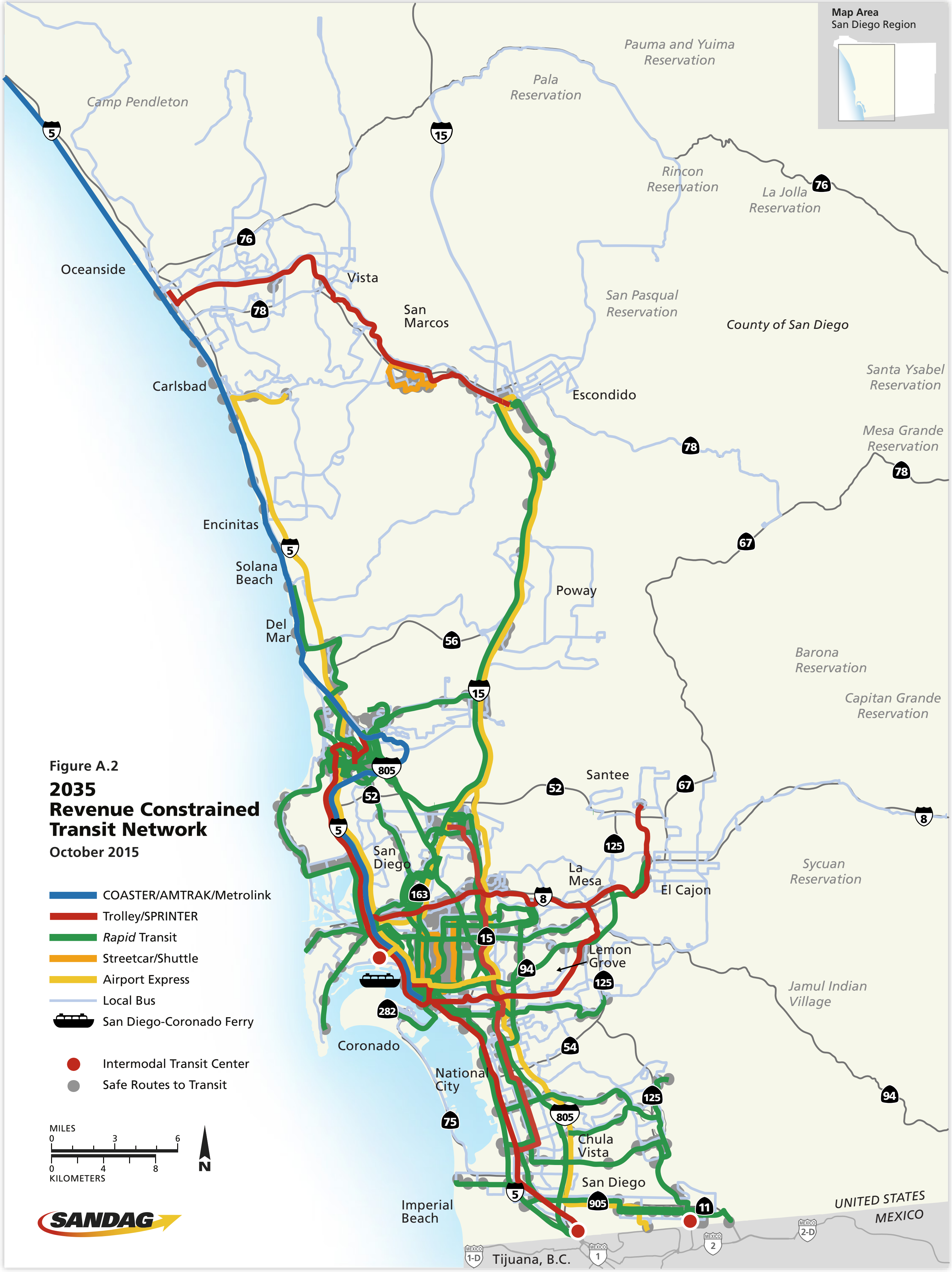



**Figure A.2**

## 2035 Revenue Constrained Transit Network

**October 2015**


**Figure A.3**

**2050**
**Revenue Constrained Transit Network**

**October 2015**

**Table M.11**

## Project Evaluation Criteria

*Rail Grade Separations*

| San Diego Forward: The Regional Plan Goals | No. | Criteria | Description | Proposed Calculation | Max Score | Total Percent | Policy Objectives |
|---|---|---|---|---|---|---|---|
| Innovative Mobility & Planning | 1 | Peak-Period Exposure Index (PPEI) Factor | Product of the existing high directional traffic and the total measured blocking delay during the same three hours of the day experiencing the highest congestion at the crossing | Calculation based on vehicle traffic during a selected three-hour period, total blocking delay during same period, and mathematical constant for time period | 11 | 34 | Mobility Choices |
| | 2 | Peak-Day Total Delay Exposure Index (PDEI) Factor | Product of the existing average daily traffic (ADT), the total number of trains, and an average train crossing delay time factor | Calculation based on average daily traffic, total number of trains, train crossing delay factor, and mathematical constant | 11 | | Mobility Choices |
| | 3 | Pedestrian and Bike/ Disadvantaged Communities Benefits | A) Number of pedestrians and people biking served in top 4 hours | Grade separation pedestrian bike crossing counts | 4 | | Mobility Choices, Complete Communities |
| | | | B) What is the share of disadvantaged communities population in the proximity of the project? | Ratio of disadvantaged communities share of population within 1/2 mile of project compared to disadvantaged communities share of regional population | | | Mobility Choices, Partnerships and Collaboration |
| | 4 | Bus Operations Benefits | Number of buses served an hour, as well as proximity to transit center | Number of buses served by the grade separation | 4 | | Mobility Choices, Complete Communities |
| | 5 | Benefit to Emergency Services | Proximity to emergency service provider and lack of nearby alternative grade-separated crossing | Proximity analysis based on emergency service providers and alternative grade separation crossing | 4 | | Mobility Choices, Complete Communities |

**Table M.11 (continued)**

## Project Evaluation Criteria

*Rail Grade Separations (continued)*

| San Diego Forward: The Regional Plan Goals | No. | Criteria | Description | Proposed Calculation | Max Score | Total Percent | Policy Objectives |
|---|---|---|---|---|---|---|---|
| Healthy Environment & Communities | 6 | Accident History | Accident history in the past five years | Number of qualifying accidents involving vehicles, pedestrians, and bikes with trains, not including accidents involved in attempted suicides | 11 | 26 | Mobility Choices, Preservation and Safety of the Transportation System |
| | 7 | Proximity to Noise Sensitive Receptors | Proximity to sensitive receptors | Proximity analysis based on rail crossing located within 200-500 feet of sensitive receptors | 4 | | Complete Communities, Partnerships and Collaboration |
| | 8 | greenhouse gas Emissions | What is the reduction in $CO_2$ emissions from implementing the project? | Reduction in $CO_2$ emissions | 4 | | Environmental Stewardship, Energy and Climate Change Mitigation and Adaptation |
| | 9 | Serves RCP Smart Growth Areas | Is the project located near RCP Smart Growth Areas? | Population and employment in all smart growth areas within 1/4 mile distance of project | 7 | | Complete Communities, Regional Economic Prosperity, Habitat and Open Space Preservation |

**Table M.11 (continued)**

## Project Evaluation Criteria

*Rail Grade Separations (continued)*

| San Diego Forward: The Regional Plan Goals | No. | Criteria | Description | Proposed Calculation | Max Score | Total Percent | Policy Objectives |
|---|---|---|---|---|---|---|---|
| Vibrant Economy | 10 | Truck Freight Operations | Percentage of daily truck traffic | Percentage of daily traffic of Class 4-Class 13 (as defined by FHWA) | 3 | 15 | Mobility Choices, Regional Economic Prosperity, Binational Collaboration with Baja California |
| | 11 | Funding Request | Percentage of total project costs contributed by the local agency including funds already committed from state, federal, or other source | Percentage of local contribution | 4 | | Partnerships and Collaboration |
| | 12 | Project Cost-Effectiveness | What is the cost-effectiveness of the project? | Enhanced cost-effectiveness measure incorporates the following components:<br>- Number of trains per day<br>- AADT<br>- Gate down time<br>- Percent truck traffic<br>- Safety | 8 | | Mobility Choices, Regional Economic Prosperity, Binational Collaboration with Baja California, Environmental Stewardship, Energy and Climate Change Mitigation and Adaptation, Preservation and Safety of the Transportation System |

**Table M.11 (continued)**

## Project Evaluation Criteria

*Rail Grade Separations (continued)*

| San Diego Forward: The Regional Plan Goals | No. | Criteria | Description | Proposed Calculation | Max Score | Total Percent | Policy Objectives |
|---|---|---|---|---|---|---|---|
| Regional Housing Needs Assessment (RHNA) | 13 | Regional Housing Needs Assessment (RHNA) (per Board Policy No. 033 adopted January 2012) | RHNA-related criteria as described in Board Policy No. 033. Eligibility for Policy 33 points requires housing element compliance and submittal of Annual Housing Element Progress Reports to SANDAG. | Based on Board Policy No. 033 Criteria: RHNA Share Taken; Regional Share of Cumulative Total of Lower-Income Units Produced; Total Number of Affordable Housing Units; Percent of Lower Income Households | 25 | 25 | Complete Communities, Partnerships and Collaboration |

**Table M.12**

## Rail Grade Separation Project Rankings

| Name | City | Unconstrained Cost ($2014) (millions) | Average Daily Traffic | Trains Per Day | Total Score | Regional Plan Rank | Rail Designation |
|---|---|---|---|---|---|---|---|
| Palomar St | Chula Vista | $41 | 44,364 | 206 | 62.63 | 1 | Light Rail |
| Broadway/ Lemon Grove Ave | Lemon Grove | $82 | 40,403 | 144 | 60.19 | 2 | Light Rail |
| Ash St | San Diego | $103 | 30,575 | 195 | 59.81 | 3 | Light Rail |
| H St | Chula Vista | $41 | 41,861 | 206 | 59.63 | 4 | Light Rail |
| Washington St | San Diego | $41 | 30,345 | 195 | 58.81 | 5 | Light Rail |
| E St | Chula Vista | $41 | 39,783 | 206 | 58.63 | 6 | Light Rail |
| Broadway | San Diego | $113 | 27,845 | 150 | 55.81 | 7 | Light Rail |
| Taylor St | San Diego | $113 | 42,670 | 195 | 55.81 | 7 | Light/Heavy Rail |
| Euclid Ave | San Diego | $41 | 37,000 | 144 | 50.81 | 9 | Light Rail |
| 28th St | San Diego | $41 | 33,225 | 206 | 49.81 | 10 | Light Rail |
| 32nd St | San Diego | $41 | 32,470 | 206 | 46.81 | 11 | Light Rail |
| Civic Center Dr | Vista | $41 | 34,916 | 68 | 44.44 | 12 | Light Rail |
| Auto Parkway and Mission Ave | Escondido | $36 | 27,623 | 68 | 42.13 | 13 | Light Rail |
| Sorrento Valley Blvd | San Diego | $134 | 37,990 | 51 | 40.81 | 14 | Heavy Rail |
| Allison Ave/University Ave | La Mesa | $103 | 24,700 | 144 | 40.50 | 15 | Light Rail |
| North Dr | Vista | $31 | 8,793 | 68 | 39.94 | 16 | Light Rail |
| Vista Village Dr/Main St | Vista | $62 | 24,927 | 68 | 39.44 | 17 | Light Rail |
| Severin Dr | La Mesa | $41 | 8,311 | 288 | 37.94 | 18 | Light Rail |
| El Camino Real | Oceanside | $41 | 38,000 | 68 | 36.06 | 19 | Light Rail |
| Grand Ave/ Carlsbad Village Dr | Carlsbad | $113 | 21,113 | 51 | 35.00 | 20 | Heavy Rail |
| Melrose Dr | Vista | $41 | 25,921 | 68 | 31.94 | 21 | Light Rail |
| Mar Vista Dr | Vista | $31 | 9,665 | 68 | 29.94 | 22 | Light Rail |
| Los Angeles Dr | Vista | $31 | 4,291 | 68 | 29.94 | 22 | Light Rail |
| Guajome St | Vista | $31 | 4,152 | 68 | 26.94 | 24 | Light Rail |
| Leucadia Blvd | Encinitas | $93 | 34,000 | 51 | 18.50 | 25 | Heavy Rail |
| Tamarack Ave | Carlsbad | $93 | 10,568 | 51 | 18.00 | 26 | Heavy Rail |
| Cannon Road | Carlsbad | $93 | 6,416 | 51 | 12.00 | 27 | Heavy Rail |

* Downtown heavy rail trench in San Diego (Washington, Laurel, Hawthorn, Ash and Broadway Streets) excluded from rankings due to construction feasibility issues.

# APPENDIX 5

## Excerpts from Metrolink 10-Year Strategic Plan 2015-2025

# OUR FUTURE is ON TRACK

METROLINK®

## 10-Year Strategic Plan

2015 — 2025

## METROLINK STRATEGY – PART II

### Accommodating Growth and Reaching Markets

Continuing the "back to basics" approach, part two of Metrolink's strategy emphasizes growth at a measured and moderate pace following SCRRA's guiding principle of focus and discipline. Growth is a result of a stable and efficient rail operation with steady or rising ridership and improved performance. Growing service at a moderate pace includes significant emphasis on increasing reliability of the system with better travel time reliability and increased frequency of service, not only for traditional peak period commutes, but also midday and evening service.

As any specific plan for growth requires the consent and commitment of its Member Agencies, this Strategic Plan presents scenarios of growth as illustrations of what resources may be required. At this time, since the core of the Metrolink strategy focuses on fixing the core of Metrolink services as an important step before multi-year commitments can be contemplated by Member Agencies, no explicit commitment to growth is suggested in this Strategic Plan.

These scenarios for growth explored and presented here focus on 2025 service objectives. Each scenario was evaluated to develop estimates of ridership, capital, and operating costs. Each scenario can be also seen as complementary and cumulative to each other.

### Service Growth Scenarios

The scenarios evaluated in this Strategic Plan include:

- No Service Growth Scenario
- Scenario 1: Enhancement of Existing Network
- Scenario 2: Overlay of Additional Service Patterns
- Scenario 3: High-Speed Rail Service Integration

#### *No Service Growth Scenario*

The No Service Growth Scenario represents a "No-Build" scenario between an existing base line condition (2015) and future condition (2025). This scenario assumes no significant change in the level or extent of Metrolink service over the next 10 years and is the scenario against which each of the other growth scenarios are compared. The ridership estimates for this scenario reflect only organic growth based on population and employment growth in the region. The service assumptions are based on the projected service that is planned to be in operation as of December 2016, with the implementation of the service extension to South Perris in Riverside County and to the E Street Transit Center in San Bernardino.

#### *Scenario 1: Enhancement of Existing Network*

The Enhancement of Existing Network Scenario represents a managed growth scenario based on feedback from Member Agencies of service assumptions they believe could be realistic to fund over the next 10 years. The growth for each line was validated against projected market growth along each corridor and refined based on Member Agency input. This scenario focuses on enhancing midday and evening services, addressing the need for additional reverse peak service, the maturity of the Perris Valley Line, the introduction of a new Placentia station in Orange County and a new Hollywood Way/Burbank Airport station in Los Angeles County. It also includes the Eastern Maintenance Facility (EMF) in Colton for regular maintenance of the fleet as well as the development of additional maintenance facility in outlying areas, such as Southern Orange County Riverside County, and the Antelope Valley.

#### *Scenario 2: Overlay of Additional Service Patterns*

This scenario builds upon the improvements in service included in Scenario 1. Scenario 2 is the combination of two sets of service improvements that were analyzed separately and then combined into a single, integrated scenario. The first set of services (Scenario 2A) provides increased frequency of service in both directions of travel on segments of core Metrolink lines (e.g. Los Angeles to Chatsworth, additional express on the San Bernardino Line, etc.). The second set of services (Scenario 2B) entail physical extensions of the Metrolink network, expanding its geographic reach within the greater Southern California region.

### *Scenario 3: High-Speed Rail Service Integration*

This scenario is aimed at maximizing the potential of the Metrolink network to feed and distribute trips to and from the California High-Speed Rail (HSR) line upon its completion from the Central Valley and Bay Area to its interim terminus in the San Fernando Valley at Burbank. It builds off of Scenario 1 and does not include the line extensions considered in Scenario 2, except for the extension of Orange County service from Oceanside to San Diego. Direct service is provided from Newhall through Burbank and Union Station to the Metrolink lines to the southeast of downtown Los Angeles, including the Riverside, Orange County, and 91 Lines.

## Southern California Regional Interconnector Project

LA Metro, in collaboration with stakeholder partners (including Metrolink), is currently designing the Southern California Regional Interconnector Project (SCRIP). This future project will allow trains to operate through Union Station from the northern lines in the Metrolink network (e.g., the Antelope Valley line and the Ventura County line) to the southern lines (e.g., the Orange County line and the 91/Perris Valley line) enabling one-seat ride trips along a corridor that extends from Burbank to Fullerton at high frequencies. As currently envisioned, this project will allow all lines (including the San Bernardino line and the Riverside line) to reduce their dwell times at Union Station, improving travel times, and reducing operating costs significantly. This creates a significant ridership attraction opportunity for the Metrolink network. All of the scenarios defined in this Strategic Plan include enhanced connectivity of services enabled by SCRIP.

## Projected Growth

The weekday and weekend service levels for each scenario, as identified in Table 1 and Table 2, presents the estimated number of total daily trains on each service line in 2025, compared with 2015 service levels, which represent the No Growth scenario. For each of the scenarios, a further breakdown of service levels by time of day and by direction of travel was generated. This more detailed service specification was used as the basis for developing hypothetical weekday timetables for each scenario, which in turn were used to determine infrastructure requirements for increasing railroad capacity, to estimate rolling stock fleet requirements, and to generate ridership and operations and maintenance cost estimates.

Table 1: Summary of Potential 2025 Weekday Growth by Scenario (Total Trains)

| Line | No Service Growth | Scenario 1: Enhancement of Existing Network | Scenario 2A: Overlay of Addt'l Service Patterns | Scenario 2B: Overlay Plus New Route Extensions | Scenario 3: High-Speed Rail Service Integration |
|---|---|---|---|---|---|
| Ventura County (includes Burbank Turns) | 31 | 41 | 51 | 51 | 51 |
| Antelope Valley | 30 | 40 | 48 | 48 | 62 |
| San Bernardino | 38 | 48 | 48 | 48 | 48 |
| Riverside | 12 | 22 | 22 | 22 | 22 |
| Orange County (include OC Local) | 29 | 35 | 41 | 41 | 46 |
| 91/Perris Valley | 9 | 23 | 23 | 23 | 23 |
| Inland Empire-Orange County | 16 | 28 | 28 | 28 | 32 |
| New Services | - | - | - | 60 | - |
| **TOTAL** | **165** | **237** | **261** | **321** | **284** |
| **% Growth Over No-Service** | **--** | **44%** | **58%** | **95%** | **72%** |

Table 2: Summary of Potential 2025 Weekend Growth by Scenario (Total Trains)

| Line | No Service Growth | Scenario 1: Enhancement of Existing Network | Scenario 2: Overlay of Additional Service Patterns | Scenario 3: High-Speed Rail Service Integration |
|---|---|---|---|---|
| Ventura County | - | - | - | - |
| Antelope Valley | 12 | 16 | 16 | 26 |
| San Bernardino (Saturday) | 20 | 26 | 26 | 26 |
| San Bernardino (Sunday) | 14 | 20 | 20 | 20 |
| Riverside | - | - | - | - |
| Orange County | 8 | 10 | 10 | 12 |
| 91/Perris Valley | 4 | 8 | 8 | 8 |
| Inland Empire-Orange County | 4 | 8 | 8 | 8 |
| New Services | - | - | 20 | - |
| **TOTAL** | **42-48** | **62-68** | **82-88** | **74-80** |
| **% Growth Over No-Service** | **--** | **42-48%** | **83-95%** | **67-76%** |

Each growth scenario requires investment in additional track capacity, primarily for double-tracking portions of lines that currently have only a single track, which can include extending existing passing sidings. These improvements are needed to enable increases in reverse-peak and off-peak service as Metrolink transitions from a commuter system that in most corridors primarily serves one-way travel at peak periods to the Los Angeles central business district to a regional rail system offering more balanced travel options throughout the day. Several infrastructure projects have been identified for improving rail system capacity. These are listed in Table 3 and include previously-identified projects as well as a limited number of additional locations where the need for additional main track were identified during the course of developing hypothetical train schedules for the three growth scenarios. The process of developing and then optimizing the train schedules provided the means to assess the usefulness of the alternative infrastructure projects and evaluate and prioritize them.

As the hypothetical future train schedules were developed, the locations where trains running in opposite directions need to pass each other or "meet" were identified. These locations require a 2-track main line or a passing siding if the main line has only a single track. Wherever possible, the train schedules were adjusted to provide meets at existing sidings or double-track locations. Where this was impossible, meets were scheduled at the locations of already identified or planned infrastructure projects. By adopting regular schedule patterns, it was possible in most cases to concentrate multiple meets at the same locations throughout the day.

The results of this analysis are shown in Table 4, which groups infrastructure projects into three priority categories for each of the three growth scenarios. The top category, Priority 1, includes locations where multiple meets occur and where extending double tracking, or lengthening, or constructing sidings is essential to the operational feasibility of the service plan in the identified scenario. Priority 2 projects are less critical, generally only used for meets once or relatively few times during the day. With more detailed scheduling analysis, it might be possible to adjust the frequency and timing of reverse-direction service and shift scheduled meets to adjacent double track sections and, thereby, defer or avoid having to construct these projects. Priority 3 projects are not required to deliver the scheduled service as outlined in the hypothetical schedules. They potentially offer improved service reliability and scheduling flexibility, but it is assumed that these projects could be implemented in a later phase of development, as demand builds for increased service beyond 2025 or if travel patterns change. Figure 23 shows the infrastructure projects in relation to the Metrolink system map.

It is important that alternatives are continually identified and reviewed that could increase capacity or service options at an overall lower infrastructure investment. This Strategic Plan aims to define a strategy for increasing system capacity through both capital investment and improvements in operational efficiency.

The strategy as identified includes four key components:

- Enhancing Infrastructure (including capital projects)
- Evaluating Shared-Use Agreements
- Refining Operations and Maintenance (O&M) Practices
- Optimizing Fleet Usage (to include alternative technologies)

Enhancing the physical infrastructure focuses on expanding the track and station capacity to allow additional and more frequent service and improve on-time performance. Examples of this are summarized in Table 3.

The strategy also involves evaluating the existing shared-use agreements. Exploring the potential for modifying existing shared-use agreements with the freight railroads can allow for additional service, the identification of alternative or additional alignments (e.g. use of the Union Pacific Alhambra Subdivision), and use of shorter trains, buses, or other types of technologies (e.g. Diesel Multiple Units) to fill in midday or off-peak service gaps. These same services could also be utilized as a precursor to test or grow potential ridership in anticipation of future train service and help to refine the O&M practices and optimize fleet usage.

Refinement of O&M practices requires an overall look at how the train crews are utilized and the equipment is maintained. The goal being to identify solutions for reducing overall hours of service for train crews and shifting primary maintenance cycles for equipment to the overnight hours. These solutions can help to improve overall safety as well as provide additional equipment for enhancing daytime operations within the available fleet.

One important capital project not defined in Table 4, but critical to the service growth of the region is SCRIP (see Figure 22). This project is so large in scale, that it stands alone as an infrastructure expansion project. This project is estimated to increase the capacity of each platform track that is modified by 300 percent (from an average of two trains per hour currently, to approximately six trains per hour). This project represents one of the most transformative opportunities for operating cost efficiency and service improvement.

Figure 22: Conceptual Design for the Southern California Regional Interconnector Project

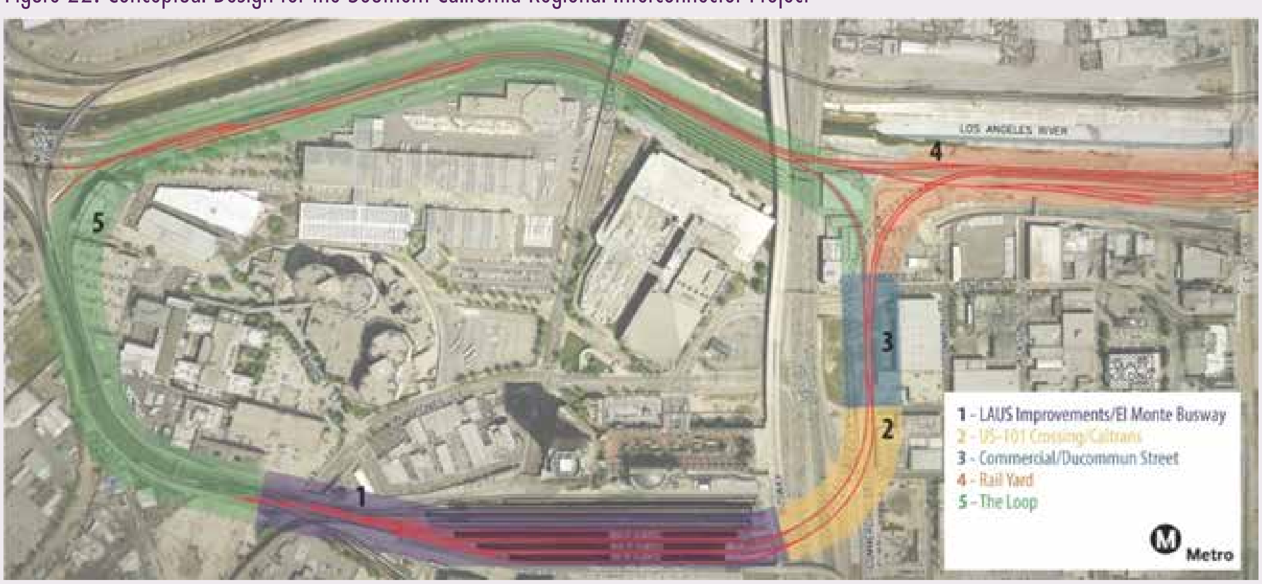


Table 3: Track Capacity Investment Projects

| County(s) | Project | Line(s) | Description |
|---|---|---|---|
| Los Angeles | CP Raymer to CP Bernson Double Track | VCL | Construct 6.4 miles of mainline track and construct a second side platform and a pedestrian underpass at Northridge |
| Los Angeles | CP Brighton to CP Roxford Double Track | AVL | Adding a second track to the AVL line segment where the IOS will be located |
| Los Angeles | Via Princessa to Vincent Grade Double Track | AVL | Double track the portion of the AVL through the canyon |
| Los Angeles | Santa Clarita to Via Princessa Double Track | AVL | Double track of the segment of the AVL. |
| Los Angeles | Santa Clarita to Newhall Double Track | AVL | Includes four grade crossings and Santa Clarita platform |
| Los Angeles | CP Coyote Creek to CP Valley View Third Track **(BNSF)** | OCL / 91L | Complete remaining 1.2 miles of triple track on the BNSF between Fullerton Junction and CP Soto in Los Angeles |
| Orange/Riverside | CP Fullerton Junction to CP West Riverside Third Track **(BNSF)** | OCL / 91L | Complete triple track along BNSF San Bernardino Subdivision consistent with Stage 6 of the Shared-Use Agreement |
| Riverside/San Bernardino | CP West Riverside to CP Rana Third Track **(BNSF)** | IEOC | Complete triple track along BNSF San Bernardino Subdivision consistent with Stage 5 of the Shared-Use Agreement |
| San Bernardino | CP Lilac to CP Rancho Double Track | SBL | 3- mile double track on the San Gabriel Subdivision from CP Lilac to CP Rancho |
| San Bernardino | CP Rancho to CP San Bernardino Junction | SBL | Add a second track over the flyover into San Bernardino |
| San Bernardino | CP Central to CP Archibald Double Track | SBL | 5.5-mile double track on San Gabriel Subdivision from CP Central to CP Archibald |
| San Bernardino | CP Beech to CP Locust Double Track | SBL | 3-mile double track on San Gabriel Subdivision from CP Beech to CP Locust |
| San Bernardino | CP Rochester to CP Nolan Double Track | SBL | San Bernardino Line feeder to HST system |
| Los Angeles | CP Amar to CP Irwin Double Track | SBL | |
| Los Angeles | CP Barranca to CP White Double Track | SBL | |
| Orange | Laguna Niguel to San Juan Passing Siding | OCL / IEOC | The project is the addition of 1.8 miles of new passing siding track |
| San Diego (SANDAG) | CP San Onofre to CP Pulgas Double Track (Stage 2) | OCL / IEOC | Stage 2 of this project include the construction of a 1.6-mile segment of track |
| San Diego (SANDAG) | CP Eastbrook to CP Shell Double Track | OCL / IEOC | Second Main track and Replacement of the San Luis River bridge |
| San Bernardino | CP Rana to CP SB Jct. Double Track Shortway | IEOC | San Bernardino Line feeder to HST system |
| **Additional Projects Needed to Support Strategic Plan Growth Scenarios** | | | |
| San Bernardino | Redlands to New York Street Double Track | SBL | Double Track Between Downtown Redlands and New York Street |
| San Bernardino | CP Jordan to CP Freemont Double Track | SBL | Siding Extension |
| Riverside | CP Eastridge to CP Nuevo Double Track | 91L | Double Track |
| Riverside | CP Highgrove to CP Riverside Fourth Track **(BNSF)*** | 91L | Fourth Main Track |
| Riverside | CP Highgrove to CP Eastridge Double Track | 91L | Double Track |
| Riverside | CP Nuevo to South Perris Double Track | 91L | Double Track |
| Los Angeles | El Monte to Los Angeles **(UPRR)** | SBL | Use of Alhambra Subdivision as option in addition to San Gabriel Subdivision |

* To be constructed by the BNSF Railway should OTP for Perris Valley Line trains fall below 95% as stated in the Perris Valley Line Agreement between the BNSF Railway and RCTC dated November 2, 2012.

Table 4: Track Capacity Improvement Priorities

| Project ID | County(s) | Project | Line(s) | Scenario 1: Enhancement of Existing Network | Scenario 2: Overlay of Additional Service Patterns | Scenario 3: High-Speed Rail Service Integration |
|---|---|---|---|---|---|---|
| A | Los Angeles | CP Raymer to CP Bernson Double Track | VCL | ❶ | ❶ | ❶ |
| B | Los Angeles | CP Brighton to CP Roxford Double Track | AVL | ❶ | ❶ | ❶ |
| C | Los Angeles | Via Princessa to Vincent Grade Double Track | AVL | ❷ | ❷ | ❷ |
| D | Los Angeles | Santa Clarita to Via Princessa Double Track | AVL | ❸ | ❸ | ❸ |
| E | Los Angeles | Santa Clarita to Newhall Double Track | AVL | ❶ | ❶ | ❶ |
| F | Los Angeles | CP Coyote Creek to CP Valley View Third Track **(BNSF)** | OCL / PVL | ❶ | ❶ | ❶ |
| G | Orange/Riverside | CP Fullerton Junction to CP West Riverside Third Track **(BNSF)** | OCL / PVL | ❶ | ❶ | ❶ |
| H | Riverside/ San Bernardino | CP West Riverside to CP Rana Third Track **(BNSF)** | IEOC | ❷ | ❶ | ❶ |
| I | San Bernardino | CP Lilac to CP Rancho Double Track* | SBL | ❶/❸* | ❶ | ❶ |
| J | San Bernardino | CP Rancho to CP San Bernardino Junction | SBL | ❷ | ❶ | ❷ |
| K | San Bernardino | CP Central to CP Archibald Double Track* | SBL | ❶ | ❶ | ❶ |
| L | San Bernardino | CP Beech to CP Locust Double Track | SBL | ❶ | ❶ | ❷ |
| M | San Bernardino | CP Rochester to CP Nolan Double Track | SBL | ❶ | ❶ | ❸ |
| N | Los Angeles | CP Amar to CP Irwin Double Track | SBL | ❷ | ❶ | ❶ |
| O | Los Angeles | CP Barranca to CP White Double Track* | SBL | ❷ | ❷ | ❷ |
| P | Orange | Laguna Niguel to San Juan Passing Siding | OCL / IEOC | ❷ | ❷ | ❷ |
| Q | San Diego | CP San Onofre to CP Pulgas Double Track (Stage 2) | OCL / IEOC | ❶ | ❶ | ❶ |
| R | San Diego | CP Eastbrook to CP Shell Double Track | OCL / IEOC | ❷ | ❷ | ❷ |
| S | San Bernardino | CP Rana to CP SB Jct. Double Track Shortway | IEOC | ❸ | ❸ | ❸ |
| **Additional Projects Needed to Support Strategic Plan Growth Scenarios** | | | | | | |
| T | San Bernardino | Redlands to New York Street Double Track | SBL | N/A | ❶ | N/A |
| U | San Bernardino | CP Jordan to CP Freemont Double Track | SBL | ❶ | N/A | N/A |
| V | Riverside | CP Eastridge to CP Nuevo Double Track | PVL | ❷ | ❶ | ❷ |
| W | Riverside | CP Highgrove to CP Riverside Fourth Track **(BNSF)** | PVL | ❷ | ❶ | ❷ |
| X | Riverside | CP Highgrove to CP Eastridge Double Track | PVL | ❸ | ❷ | ❸ |
| Y | Riverside | CP Nuevo to South Perris Double Track | PVL | ❸ | ❷ | ❸ |
| Z | Los Angeles | El Monte to Los Angeles **(UPRR)** | SBL | ❷ | ❶ | ❷ |

❶ Priority 1 – Required for operation of the service plan

❷ Priority 2 – Potentially avoidable or deferrable to a later phase of development

❸ Priority 3 – Not required for normal service; provides potential future reliability and flexibility

* Project priority is subject to change depending on the service plan proposed and level of express service assumed in the service plan

**Note: Capacity improvement priorities are also subject to funding availability and Member Agency input.**

Figure 23: Comprehensive Map of Track Capacity Improvement Priorities

## Summary of Capital Costs

Capital costs can reflect a wide range of infrastructure investments from track capacity and station construction or enhancements to fleet investments and grade separations. The capital cost estimates by project presented in Table 12 focuses primarily on projects to enhance the overall capacity of the Metrolink system. A comprehensive list of all identified projects is, however, provided in the Technical Appendix and sorted by project type and County for reference.

The growth scenarios developed as part of this Strategic Plan and described earlier each require specific infrastructure improvements to execute.

Table 12: Track Capacity Improvement Cost Estimates (2014 $)

| County(s) | Project | Line(s) | Cost Estimate |
|---|---|---|---|
| Los Angeles | CP Raymer to CP Bernson Double Track | VCL | $88,000,000 |
| Los Angeles | CP Brighton to CP Roxford Double Track | AVL | $108,000,000 |
| Los Angeles | Via Princessa to Vincent Grade Double Track | AVL | $1,086,058,000 |
| Los Angeles | Santa Clarita to Via Princessa Double Track | AVL | $12,000,000 |
| Los Angeles | Santa Clarita to Newhall Double Track | AVL | $40,200,000 |
| Los Angeles | CP Coyote Creek to CP Valley View Third Track **(BNSF)** | OCL / 91L | $120,000,000* |
| Orange/Riverside | CP Fullerton Junction to CP West Riverside Third Track **(BNSF)** | IEOC / 91L | $90,100,000 |
| Riverside/San Bernardino | CP West Riverside to CP Rana Third Track **(BNSF)** | IEOC | $29,600,000 |
| San Bernardino | CP Lilac to CP Rancho Double Track | SBL | $60,500,000 |
| San Bernardino | CP Rancho to CP San Bernardino Junction | SBL | $31,850,000 |
| San Bernardino | CP Central to CP Archibald Double Track | SBL | $97,300,000 |
| San Bernardino | CP Beech to CP Locust Double Track | SBL | $55,000,000 |
| San Bernardino | CP Rochester to CP Nolan Double Track | SBL | $22,750,000 |
| Los Angeles | CP Amar to CP Irwin Double Track | SBL | $91,650,000 |
| Los Angeles | CP Barranca to CP White Double Track | SBL | $70,000,000 - $110,300,000 |
| Orange | Laguna Niguel to San Juan Passing Siding | OCL | $22,800,000 |
| San Diego (SANDAG) | CP San Onofre to CP Pulgas Double Track(Stage 2) | OCL / IEOC | $36,000,000 |
| San Diego (SANDAG) | CP Eastbrook to CP Shell Double Track | OCL / IEOC | $60,000,000 |
| San Bernardino | CP Rana to CP SB Jct. Double Track Shortway | IEOC | $22,750,000 |

| County(s) | Project | Line(s) | Cost Estimate |
|---|---|---|---|
| **Additional Projects Needed to Support Strategic Plan Growth Scenarios** | | | |
| **San Bernardino** | Redlands to New York Street Double Track | Redlands Extension | $9,480,000 |
| **San Bernardino** | CP Jordan to CP Freemont Double Track Extension (0.5 miles) | SBL | $85,000,000 - $95,000,000 |
| **Riverside** | CP Eastridge to CP Nuevo Double Track | 91L | $28,887,000 |
| **Riverside** | CP Highgrove to CP Riverside Fourth Track **(BNSF)**** | 91L | No Additional Cost |
| **Riverside** | CP Highgrove to CP Eastridge Double Track | 91L | $65,510,000 |
| **Riverside** | CP Nuevo to South Perris Double Track | 91L | $51,413,000 |
| **Los Angeles** | El Monte to Los Angeles **(UPRR)** | SBL | Not Available |

* Assumes a grade separation is required to complete the third main track.

** To be constructed by the BNSF Railway should OTP for Perris Valley Line trains fall below 95% as stated in the Perris Valley Line Agreement between the BNSF Railway and RCTC dated November 2, 2012.

# APPENDIX 6

## Excerpts from 2009 San Diego-LOSSAN Corridor Project Prioritization Analysis

# San Diego – LOSSAN Corridor Project Prioritization Analysis


# final project report

prepared for

**California Department of Transportation, San Diego I-5/805 Corridor System Management Plan**

prepared by

**Cambridge Systematics, Inc.**

with

**Ecco Consulting**

July 2009

CAMBRIDGE SYSTEMATICS

Transportation leadership you can trust.

*final project report*

# San Diego – LOSSAN Corridor Project Prioritization Analysis

*prepared for*

Rail Prioritization Working Group, and
California Department of Transportation

*prepared by*

Cambridge Systematics, Inc.
555 12th Street, Suite 1600
Oakland, California 94607

*with*

Ecco Consulting

*date*

July 2009

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# 1.0 Introduction and Overview

The Los Angeles – San Diego – San Luis Obispo (LOSSAN) rail corridor provides a viable transportation alternative to highway travel through San Diego County and to points north. Given the rail corridor's proximity to Interstate Highway 5 (I-5) through urbanized and environmentally sensitive areas, it is particularly important that systemwide transportation improvements are considered as demand for travel in the corridor increases. The identification of adjacent highway and rail projects could potentially lead to coordinated efforts that reduce resource expenditures and minimize impacts to surrounding areas.

The San Diego – LOSSAN Corridor Project Prioritization Analysis is a companion study to the analysis of potential freeway investments for the I-5/805 Congestion Systems Management Plan (CSMP). The rail corridor analysis was initiated to analyze and prioritize potential rail investments in the San Diego County portion of the LOSSAN corridor. The rail analysis quantified operational improvements and other benefits and impacts of potential rail projects, and then prioritized the implementation of these projects to support phased expansion of rail capacity. Results from the rail corridor and freeway analyses will be combined into an overall CSMP that may allow for the coordinated staging/phasing of both rail corridor and highway investments.

## 1.1 Study Corridor Description

This study prioritizes a series of rail improvement projects along a 60-mile stretch of the LOSSAN rail corridor from the Orange County Line in the north to Downtown San Diego in the south. As shown in Figure 1.1, the existing rail track follows the coastline, running somewhat parallel to I-5.

The corridor is utilized by three passenger rail operators – the North County Transit District (NCTD), Metrolink, and Amtrak. NCTD operates COASTER commuter trains from Oceanside Transit Center to Santa Fe Depot with additional stops at Carlsbad Village, Carlsbad Poinsettia, Encinitas, Solana Beach, Sorrento Valley, and Old Town. Amtrak operates intercity passenger rail service from points north to Santa Fe Depot with stops at Oceanside, Solana Beach, and Old Town. Metrolink operates commuter rail service from points north to Oceanside Transit Center. Burlington Northern Santa Fe (BNSF) is the freight rail operator in the corridor, and operates only during specified time windows. Historically, there has been little action to increase freight rail activity in the corridor.

Deficiencies and proposed rail improvement projects in the LOSSAN corridor have been documented in previous reports and studies, including but not limited to the SANDAG 2030 Regional Transportation Plan (RTP); SANDAG Regional Transportation Improvement Plan (RTIP); LOSSAN Program Environmental

Impact Report/Statement (PEIR/EIS); LOSSAN Strategic Plan; and LOSSAN Corridor Strategic Business Plan.[1] Although the level of detail and information provided varies, a number of key issues are consistently raised in these reports, including:

- **Existing Infrastructure.** A large portion of the corridor (30.7 miles or 51 percent) is single-track[2], creating chokepoints when trains in opposing directions meet near a single-track section. These "meet-pass" conflicts are the source of most of the existing rail delay in the corridor. The portions of single-track are interspersed throughout the corridor, creating multiple bottlenecks. For example, a 0.6-mile stretch of double-track from control point (CP) Crosby to CP Del Mar in Del Mar is located between 1.1 miles of single-track to the north and 4.9 miles of single-track to the south. Sidings along the single-track portions also limit the length of trains that can be operated in the corridor.
- **Urbanized Areas.** Sections of the corridor are fully developed on both sides in areas such as Downtown San Diego and Solana Beach. This development limits the available right-of-way for improvement projects, and creates safety concerns at locations where autos or pedestrians cross the existing track. These issues can subject potential improvement projects to increased levels of public scrutiny and opposition.
- **Environmentally Sensitive Areas.** Sections of the corridor pass through environmentally sensitive areas, including multiple lagoons, endangered species habitat, and the Del Mar Bluffs. Improvement projects in these areas can be complex, costly, and subject to substantial opposition.
- **Importance for Goods Movement.** The corridor provides a critical goods movement link that serves domestic freight needs, along with serving the Port of San Diego and the cross-border freight in Baja. This line moves over 30,000 carloads per year which eliminates over 100,000 annual truck trips, many of which would be heavy trucks on I-5. Using rail for the movement of heavy bulk products reduces regional fuel consumption and lowers greenhouse gas emissions from transportation.

## 1.2 Study Approach

The remainder of this report documents the approach used to develop and implement the rail project prioritization process and resulting recommendations.

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1 For a full list of documents referenced in this study, see Appendix A.

2 30.7 miles includes 1.3-mile stretch of double-track recently completed in Oceanside from MP 227.2 to MP 228.5 (Project #4 - Oceanside Double Track).

## Projects for Evaluation

Forty rail improvement projects were identified for evaluation and prioritization. These include track projects such as double-track and tunnel improvements, as well as nontrack projects such as station parking expansions and grade separation projects. Projects were selected from existing corridor documentation as well as the new Rail Prioritization Working Group (RPWG) submissions and stakeholder requests.

Table 1.1 presents a brief summary of each project, while Figure 1.1 depicts the location of each project. Additional information about the individual projects and how they were selected can be found in Section 2.0. Appendix A contains one-page summary sheets for each project.

## Consensus Building

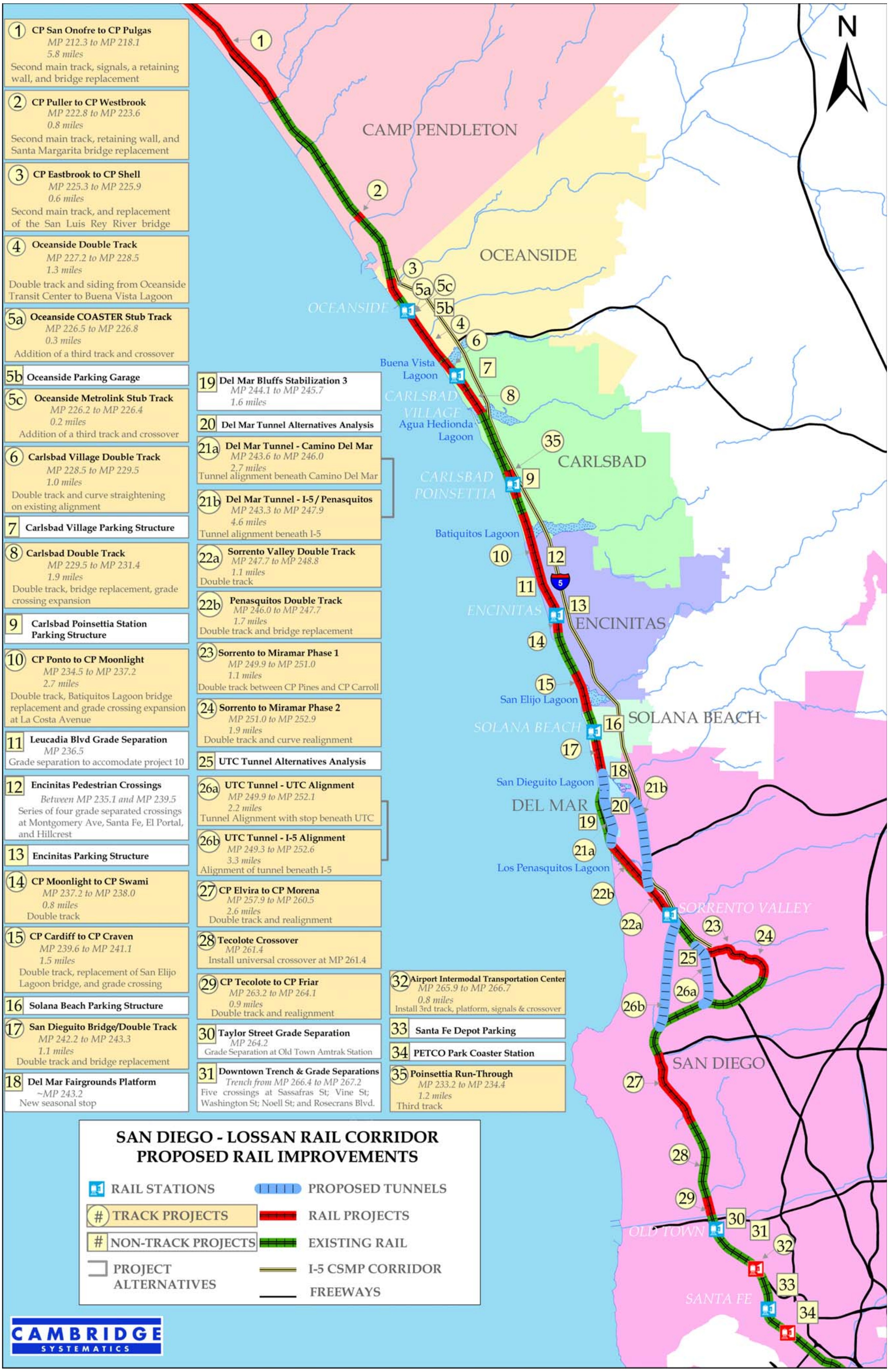
The RPWG comprised of representatives from Amtrak, BNSF, Caltrans District 11, Caltrans Division of Rail, NCTD and SANDAG was established to guide study direction. Regular meetings and conference calls were held with RPWG members to provide opportunities for input at major milestones and review draft deliverables. More detailed information about the consensus building process can be found in Section 3.0.

## Project Analysis and Prioritization

Rail projects were analyzed and then prioritized through a rigorous process that considered rail performance, construction and operating costs, project delivery, and a range of other environmental, safety, community and performance criteria. The process began with extensive project analysis including simulating dozens of combinations of rail projects and service scenarios. This simulation effort was combined with review of prior corridor documents and expert input from RPWG participants. With project information in-hand, prioritization proceeded in a step-wise manner by first identifying the projects needed to support near-term service expansion. This step was followed by identifying additional projects needed to support mid-term service expansion, and finally long-term service expansion.

Rail improvement projects were prioritized based on their relative performance in six categories: Project Cost, Project Delivery, Rail, Roadway, Environmental, and Safety. Each category was populated by specific evaluation measures and subject to a scoring and weighting system developed through an iterative process that incorporated input and feedback from RPWG members. The following is a brief description of the performance categories and evaluation criteria.

Figure 1.1 San Diego – LOSSAN Corridor Proposed Rail Improvement Projects



## Table 1.1 Project Summaries

| # | Project | Location | Description | Extent (in Miles) | Cost ($2008) | Phase |
|---|---|---|---|---|---|---|
| 1 | CP San Onofre to CP Pulgas | Camp Pendleton | Second main track, signals, retaining wall, and bridge replacement from MP 212.3 to MP 218.1, resulting in a 12.6-mile stretch of double-track from CP Songs to CP Puller. | 5.8 | $33,000,000 | Planning |
| 2 | CP Puller to CP Westbrook | Camp Pendleton | Second main track, retaining wall, and Santa Margarita bridge replacement from MP 222.8 to MP 223.6. Considered part of the Base Case in rail simulation runs and is therefore not included in future year prioritization lists. It will result in a 7.2-mile stretch of double-track from CP Pulgas to CP East Brook. | 0.8 | $50,000,000 | PS&E |
| 3 | CP East Brook to CP Shell | Oceanside | Second main track and replacement of the San Luis Rey River bridge from MP 225.3 to MP 225.9. It would result in a 3.6-mile stretch of double-track from CP Westbrook to CP Longboard. | 0.6 | $45,000,000 | Planning |
| 4 | Oceanside Double Track | Oceanside | Second main track and siding from MP 227.2 to MP 228.5. Because Project #4 is already under construction, it was considered part of the Base Case in rail simulation runs, and is not included in future year prioritization lists. It will result in a 2.6-mile stretch of double-track from CP Shell to CP Longboard. | 1.3 | $12,100,000 | Construction |
| 5a | Oceanside Station COASTER Stub Track | Oceanside | Third track and crossover connecting to the south end of existing Oceanside station track and running parallel from MP 226.5 to MP 226.8 to accommodate COASTER trains. | 0.3 | $8,200,000 | Planning |
| 5b | Oceanside Parking | Oceanside | Addition of 500 additional parking spaces at Oceanside Transit Center. | – | $23,000,000 | Planning |
| 5c | Oceanside Station Metrolink Stub Track | Oceanside | Third track and crossover connecting to the north end of existing Oceanside station track and running parallel from MP 226.2 to MP 226.4 to accommodate Metrolink trains. | 0.2 | $6,000,000 | Planning |
| 6 | Carlsbad Village Double Track | Carlsbad | Second main track and curve straightening from MP 228.5 MP 229.5, including double-track through Carlsbad Village Station. It would result in a 3.6-mile stretch of double-track from CP Shell to CP Carl. | 1.0 | $28,000,000 | Planning |
| 7 | Carlsbad Village Parking | Carlsbad | Parking structure with 300 additional spaces at Carlsbad Village COASTER station. | – | $18,800,000 | Planning |
| 8 | Carlsbad Double Track* | Carlsbad | Second main track and bridge replacement over Aqua Hedionda Lagoon from CP Carl (MP 229.5) to CP Farr (MP 231.4). It would result in a 5.0-mile stretch of double-track from CP Carl to CP Ponto. | 1.9 | $18,000,000 | CE |
| 9 | Carlsbad Poinsettia Parking | Carlsbad | New parking structure with 700 additional spaces at the Carlsbad Poinsettia COASTER station in the City of Carlsbad. | – | $21,000,000 | Planning |
| 10 | CP Ponto to CP Moonlight | Encinitas | Second main track, Batiquitos Lagoon bridge replacement, and La Costa Avenue grade crossing expansion from MP 234.5 to MP 237.2. It would result in a 5.8-mile stretch of double-track from CP Farr to CP Moonlight. | 2.7 | $43,000,000 | Planning |
| 11 | Leucadia Blvd Grade Separation | Encinitas | Grade separation of Leucadia Blvd (under-crossing) located at MP 236.5. | – | $150,000,000 | PE/EC |
| 12 | Encinitas Pedestrian Crossings | Encinitas | Series of four grade separated pedestrian crossings at Montgomery, Santa Fe, El Portal, and Hillcrest, between MP 235.1 and MP 239.5. | – | $12,000,000 | PE/EC |
| 13 | Encinitas Station Parking | Encinitas | New parking garage with 600 additional spaces at the Encinitas COASTER station. | – | $18,000,000 | Planning |
| 14 | CP Moonlight to CP Swami | Encinitas | Second main track from MP 237.2 to MP 238.0. It would result in a 2.4-mile stretch of double-track from CP Moonlight to CP Cardiff. | 0.8 | $20,000,000 | Planning |
| 15 | CP Cardiff to CP Craven | Encinitas | Double-track, grade crossing, replacement of San Elijo Lagoon bridge from MP 239.6 to MP 241.1, resulting in a 4.2-mile stretch of double-track from CP Swami to CP Valley. | 1.5 | $60,000,000 | CE |
| 16 | Solana Beach Parking | Solana Beach | Parking structure with 700 new spaces at Solana Beach station. | – | $25,000,000 | Planning |
| 17 | San Dieguito Bridge/Double Track | Del Mar | Second main track and San Dieguito bridge replacement from CP Valley (MP 242.2) to CP Crosby (MP 243.3). It would result in a 2.8-mile stretch of double-track from CP Craven to CP Del Mar. | 1.1 | $76,000,000 | Planning |
| 18 | Del Mar Fairgrounds Platform | Del Mar | New seasonal platform for the Del Mar Fairgrounds, intended to increase passenger access to the rail system. Exact location is still under review. A feasibility study is in progress and will be presented to the SANDAG Board for review in May, 2009. Not included in final prioritized project lists. | – | $10,000,000 | Planning |
| 19 | Del Mar Bluffs Stabilization Phase 3 | Del Mar | Replacement of eroded track bed support, protection of bluff face, and reinforcement of bluff toe from MP 244.1 to MP 245.7 along the Del Mar Bluffs. | 1.6 | $26,400,000 | CE |
| 20 | Del Mar Tunnel Alternatives Analysis | Del Mar | Analysis of the Camino Del Mar and I-5/Penasquitos Del Mar Tunnel alternatives. Not included in final prioritized project lists. | – | $1,300,000 | Planning |
| 21a | Del Mar Tunnel – Camino Del Mar | Del Mar | Tunnel and second main track aligned beneath Camino Del Mar from MP 243.3 to MP 246.0. Alternative to #21b. | 2.7 | $429,600,000 | Planning |
| 21b | Del Mar Tunnel – I-5/Penasquitos | Del Mar | Tunnel and second main track aligned beneath I-5, bypassing the Penasquitos Lagoon and surfacing south of San Dieguito Lagoon (MP 243.3 to MP 247.9). Alternative to #21a. | 4.6 | $659,100,000 | Planning |
| 22a | Sorrento Valley Double Track | Del Mar | Second main track from CP Carmel Mountain (MP 247.7) to CP Torrey (MP 248.8). Would result in a 2.2-mile stretch of double-track from CP Carmel Mountain to CP Pines. | 1.1 | $30,000,000 | PE/EC |
| 22b | Penasquitos Double Track | San Diego | Second main track and bridge replacement through Penasquitos Lagoon from CP Sorrento (MP 246.0) to CP Carmel Mountain (MP 247.7). Would result in a 1.7-mile stretch of double-track. | 1.7 | $80,000,000 | Planning |
| 23 | Sorrento to Miramar Phase I | San Diego | Second main track from CP Pines (MP 249.9) to CP Carroll (MP 251.0) north of Miramar Hill. Would result in a 2.2-mile stretch of double-track from CP Torrey to CP Carroll. | 1.1 | $23,000,000 | PE/EC |
| 24 | Sorrento to Miramar Phase II | San Diego | Construction of a 1.9-mile second main track and curve realignment from CP Carroll (MP 251.0) to CP Cumbres** (MP 252.9) north of Miramar Hill in the City of San Diego. Would result in a 6.9-mile stretch of double-track from CP Carroll to CP Elvira. | 1.9 | $98,700,000 | Planning |
| 25 | UTC Tunnel Alternatives Analysis | San Diego | Analysis of the UTC and I-5 alignment alternatives for the UTC tunnel. Not included in final prioritized project lists. | – | $2,500,000 | Planning |

Table 1.1 Project Summaries (continued)

| # | Project | Location | Description | Extent (in Miles) | Cost ($2008) | Phase |
|---|---|---|---|---|---|---|
| 26a | UTC Tunnel – UTC Alignment | San Diego | Tunnel through Miramar Hill with an underground stop at University Towne Center, from MP 249.9 to MP 255.5 in the City of San Diego. Alternative to 26b. | 5.6 | $435,500,000 | Planning |
| 26b | UTC Tunnel – I-5 Alignment | San Diego | Tunnel through Miramar Hill beneath I-5, from MP 248.9 to MP 257.0. Alternative to 26a. | 8.1 | $517,900,000 | Planning |
| 27 | CP Elvira to CP Morena | San Diego | Second main track and realignment from MP 257.9 to MP 260.5. Would result in a 10.3-mile stretch of double-track from CP Cumbres to CP Tecolote. | 2.6 | $80,000,000 | Planning |
| 28 | Tecolote Crossover | San Diego | Universal crossover at MP 261.4. | – | $2,900,000 | PE/EC |
| 29 | CP Tecolote to CP Friar | San Diego | Second main track and realignment including replacement of the San Diego River bridge from MP 263.2 to MP 264.1. Would result in a 7.0-mile stretch of double-track from CP Morena to CP San Diego. | 0.9 | $44,000,000 | Planning |
| 30 | Taylor Street Grade Separation | San Diego | Grade separation of Taylor Street (under-crossing) at Old Town station (MP 264.2). | – | $80,000,000 | Planning |
| 31 | Downtown Rail Trench and Grade Separations | San Diego | Trench from roughly Palm St (MP 266.4) to Cedar St (MP 267.2) with grade separated under-crossings at Noell, Washington, Vine, and Sassafras. Actual cost may substantially exceed estimated cost due to difficulties constructing trench in dense downtown development. | – | $276,000,000 | Planning |
| 32 | Airport Intermodal Transportation Center | San Diego | Third track, signals, and platform from MP 265.9 to MP 266.7 to facilitate the Destination Lindbergh plan to expand San Diego International Airport. Showed negligible impact on capacity when simulated, and was therefore omitted from final prioritized project lists. | 0.8 | $65,000,000 | Planning |
| 33 | Santa Fe Depot Parking | San Diego | Parking facility with 250 new spaces at Santa Fe Depot. | – | $7,500,000 | Planning |
| 34 | PETCO Park COASTER Station | San Diego | COASTER platform near PETCO Park intended to increase passenger access to the rail system. Not included in final prioritized project lists. | – | $3,000,000 | Planning |
| 35 | Poinsettia Run-Through | Carlsbad | Third track through Carlsbad Poinsettia station. | 1.2 | $8,200,000 | CE |

Highlighting indicates a "track project."

Key:

CE – Conceptual Engineering.

PE/EC – Preliminary Engineering/Environmental Clearance.

PS&E – Plans, Specifications & Estimates.

*Carlsbad Double Track is referred to as CP Carl to CP Farr in previous corridor documents.

**As of July 1, 2009, CP Cumbres will be renamed CP Miramar.

- **Project Cost**. Evaluates the total project cost and resulting operating cost savings of each project.
  - *Total Project Cost.* Includes right-of-way purchases, planning, engineering, and construction.
  - *Operating Cost.* Measures the savings in operating costs attributable to each track project as reported by the rail simulation model. Reported for track projects only.
- **Project Delivery.** Measures the ability to rapidly implement a project including project funding status, complexity, and timing considerations.
  - *Funding Status.* Measures the level of current funding committed to the project expressed as a percentage of the total project cost.
  - *Project Status.* Reflects a project's potential for rapid implementation, including current project phase, environmental clearance status and nearest possible completion date.
  - *Impacts on Existing Service.* A qualitative measure of the severity of a project's impact on existing corridor passenger and freight rail service.
  - *Community Support.* A qualitative measure of each project's relative level of community opposition.
- **Rail**. Measures freight and passenger rail performance for track projects only. With the exception of Freight Train Accommodation, each criterion is based on the rail simulation model outputs. The model platform used for the project was the Rail Traffic Controller© (RTC) software developed by Berkeley Simulation Software, which is used by Class I railroads for operation and planning purposes including BNSF, NCTD and Metrolink.
  - *Freight Train Accommodation.* Measures a track project's ability to increase corridor miles that can accommodate 8,000-foot freight trains as well as its ability to increase total corridor train capacity.
  - *Travel Time Savings.* Measures a track project's total corridor-wide travel time savings
  - *Reliability.* Measures a track project's total passenger delay cost savings, on-time performance (OTP) improvements, and dispatch variation.
  - *Fuel Consumption.* Measures the change in fuel consumption associated with each track project.
- **Roadway.** Measures a project's impact on roadway conditions along the corridor.
  - *Station Area Congestion.* Measures nontrack projects' impact on roadway congestion near the rail corridor.

- *Railroad Crossing Time.* Measures track projects' impact on the total time that at-grade crossings are blocked by trains.

- **Environmental.** Measures a project's potential environmental effects including rail-related emissions and proximity to sensitive areas.
  - *Proximity to Sensitive Areas.* Awards projects that are distant from environmentally sensitive areas.
  - *Emissions.* Awards track projects that result in decreased hydrocarbon (HC), carbon monoxide (CO), nitrogen oxide ($NO_x$) and particulate matter (PM) emissions.

- **Safety.** Measures safety impacts to users and affected parties, awarding projects that alleviate risk exposure.
  - *Risk Exposure.* Measures a project's reduction in the number of intermodal at-grade crossings in the corridor. Applies to nontrack projects only since it does not differentiate among track improvements.

Table 1.2 shows the relative weight of each performance category and the internal weights assigned to individual criteria.

### Table 1.2 Overall Performance Criteria Weights

| Performance Categories | Track Projects: Category Weight | Track Projects: Internal Weights | Nontrack Projects: Category Weight | Nontrack Projects: Internal Weights |
|---|---|---|---|---|
| Project Cost | 25% | • Total Project Cost (75%)<br>• Operating Cost (25%) | 35% | • Total Project Cost (100%) |
| Project Delivery | 20% | • Funding Status (20%)<br>• Project Status (50%)<br>• Impacts on Existing Service (10%)<br>• Community Support (20%) | 25% | • Funding Status (20%)<br>• Project Status (50%)<br>• Impacts on Existing Service (10%)<br>• Community Support (20%) |
| Rail | 40% | • Freight Train Accommodation (10%)<br>• Travel-Time Savings (15%)<br>• Passenger Rail Delay Cost (15%)<br>• Passenger Rail OTP (30%)<br>• Reliability (15%)<br>• Fuel Consumption (15%) | N/A | • Not Applicable |
| Roadway | 5% | • At-Grade Crossing Time (100%) | 10% | • Station Area Congestion (100%) |
| Environmental | 10% | • Proximity to Sensitive Areas (66.7%)<br>• Emissions (33.3%) | 20% | • Proximity to Sensitive Areas (100%) |
| Safety | N/A | • Not Applicable | 10% | • Risk Exposure (100%) |

## 1.3 PRIORITIZED PROJECT RECOMMENDATIONS

Project evaluation focused on identifying projects that are needed to deliver rail performance levels that will, in turn, support future train schedules and ridership levels for three service scenarios (see Section 1.4). Since nearly every track project can improve rail performance to some extent, the project prioritization for each service scenario was also influenced by project delivery issues, cost estimates, environmental factors, and a host of other criteria. Summary results, which are displayed in Figure 1.2, include the following:[3]

- For **near-term** service expansion, eight low-cost track projects are recommended to provide increased operational flexibility near several stations and double track configuration at some key choke points.[4] These projects will result in 9.9 additional miles of double track at an estimated capital cost of $130 million. Nontrack facilities are sufficient to support near-term expansion, so no nontrack projects are needed.
- For **mid-term** service expansion, four additional track projects are recommended to provide continuous double track configuration from Carlsbad northward to CP Songs and for a ten-mile stretch south of University Town Center. These projects will result in 5.7 additional miles of double track at an estimated capital cost of $210 million. In order to accommodate higher ridership, four nontrack projects are recommended to improve passenger and parking capacity at key stations at an estimated cost of $63 million.
- For **long-term** service expansion, five additional double track projects are recommended to provide continuous double track configuration except through Del Mar and Los Penasquitos Lagoon. These projects will result in 7.4 additional miles of double track at an estimated capital cost of $280 million. Three nontrack projects are recommended to improve passenger and parking capacity at key stations at an estimated cost of $63 million.

Each service expansion scenario has further requirements for additional train sets, train set storage at the terminal stations, and expanded maintenance and yard facilities. There will also be a need for increases in operating funding to support increased service. These additional items are fundamental to achieving the service visions described in Section 1.4.

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[3] Projects shown in Figure 1.1 are listed in order of project number, not overall scenario score. Projects within an individual service scenario have equal priority, and can be implemented in any sequence.

[4] The Oceanside Double Track and CP Puller to CP Westbrook projects were considered to be "base case" or "no build" projects for immediate implementation.

Figure 1.2 Final Prioritized Project List

| | SERVICE VISION: WEEKDAY TRAINS | SERVICE VISION: ANNUAL TRIPS[a] | INFRASTRUCTURE NEEDS: TRACK PROJECTS | INFRASTRUCTURE NEEDS: NON-TRACK PROJECTS | INFRASTRUCTURE NEEDS: EQUIPMENT/OTHER NEEDS | INFRASTRUCTURE NEEDS: TOTAL COST |
|---|---|---|---|---|---|---|
| **Existing (2008)** | Amtrak 22-24<br>COASTER 22-26<br>Metrolink 16<br>BNSF 5-7<br>TOTAL: 65-73 | 2.84 Million | N/A | N/A | N/A | N/A |
| **Near-Term Service Expansion** | Amtrak 26<br>COASTER 30<br>Metrolink 16<br>BNSF 7<br>TOTAL: 79 | 3.32 Million | #1 – CP San Onofre to CP Pulgas<br>#5a – Oceanside COASTER Stub Track<br>#5c – Oceanside Metrolink Stub Track<br>#8 – Carlsbad Double Track<br>#22a – Sorrento Valley Double Track<br>#23 – Sorrento to Miramar Phase I<br>#28 – Tecolote Crossover<br>#35 – Poinsettia Run-Through<br>**Subtotal: $130 Million** | NONE<br>**Subtotal: $0** | • Add 5th COASTER Equipment Set<br>• Add 4th Layover Track<br>• Expanded Track and Equipment Maintenance<br>• Schedule Modification<br>**Subtotal: $15 Million** | Capital Cost: **$145 Million**<br>Additional Annual Cost: **$1 Million** |
| **Mid-Term Service Expansion** | Amtrak 32<br>COASTER 36<br>Metrolink 16<br>BNSF 9<br>TOTAL: 93 | 4.07 Million | #3 – CP East Brook to CP Shell<br>#5 – Carlsbad Village Double Track<br>#15 – CP Cardiff to CP Craven<br>#27 – CP Elvira to CP Morena<br>**Subtotal: $210 Million** | #12 – Encinitas Pedestrian Crossings<br>#13 – Encinitas Parking<br>#16 – Solana Beach Parking<br>#33 – Santa Fe Depot Parking<br>**Subtotal: $63 Million** | • Add 6th COASTER Equipment Set<br>• Expanded Track and Equipment Maintenance<br>• Schedule Modification<br>**Subtotal: $13 Million** | Capital Cost: **$285 Million**<br>Additional Annual Cost: **$2 Million** |
| **Long-Term Service Expansion** | Amtrak 36<br>COASTER 54<br>Metrolink 20<br>BNSF 9<br>TOTAL: 119 | 5.07 Million | #10 – CP Ponto to CP Moonlight<br>#14 – CP Moonlight to CP Swami<br>#17 – San Dieguito Bridge/Double Track<br>#24 – Sorrento to Miramar Phase II<br>#29 – CP Tecolote to CP Friar<br>**Subtotal: $280 Million** | #5b – Oceanside Parking<br>#7 – Carlsbad Village Parking<br>#9 – Carlsbad Poinsettia Parking<br>**Subtotal: $63 Million** | • Add 7th COASTER Equipment Set<br>• Add 4th Passenger Track at Santa Fe Depot<br>• Add 5th Layover Track<br>• Expanded Track and Equipment Maintenance<br>• Schedule Modification<br>**Subtotal: $19 Million** | Capital Cost: **$360 Million**<br>Additional Annual Cost: **$5 Million** |

[a] Annual boardings in San Diego County

## 1.4 OTHER ISSUES

The final prioritized list of project recommendations is best understood in the context of several key corridor issues.

### Phased Service Implementation

The prioritization process produced project groups that are keyed to three service scenarios in the San Diego County portion of the LOSSAN corridor. These service scenarios, which are displayed in Table 1.3, represent a progressive expansion of passenger and freight rail service over time:

- **Near-term** service expansion, which equates roughly to year 2015, would expand service to 79 trains each weekday. This expansion would provide 6 to 14 more trains per day compared to 2008, with most service expansion for peak-period COASTER operations and AM and mid-day Amtrak operations.
- **Mid-term** service expansion, which equates roughly to year 2025, would expand service to 93 trains each weekday. This expansion would provide 20 to 28 more trains than 2008, with more service throughout the day for all operators except Metrolink. COASTER trains would run about every 25 minutes in the peak-direction, and about every 90 minutes in the mid-day and evenings. Amtrak would have consistent hourly service in both directions throughout the day. BNSF would add a second manifest train in the mid-day.
- **Long-term** service expansion, which equates roughly to year 2030, would expand service to 119 trains each weekday. This expansion would provide about 50 more trains than 2008, with more service throughout the day for all operators except BNSF. As envisioned in the SANDAG 2030 RTP, COASTER trains would run about every 20 minutes in the peak-direction, and about every 60 minutes in the mid-day and evenings. Amtrak would have consistent hourly service in both directions, with additional trips in peak intercity travel hours.

These service scenarios have been developed and refined in many studies over several years to balance frequent service desires with cost-effective ridership levels. The service levels and ridership potential are achievable only if the operators can deliver fast, reliable train speeds with minimum delays and consistently high on-time performance. Operators also need the flexibility to schedule more trains in <u>both</u> directions during the morning and afternoon peak periods. This flexibility is best provided through investments such as double-tracking that decrease the likelihood of meet-pass conflicts between opposing trains.

Table 1.3 Vision of Future Weekday Service Levels

| | Existing 2008 | | | | Near Term 2015 | | | | Mid Term 2025 | | | | Long Term 2030 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | AM | PM | Off-Peak | Total | AM | PM | Off-Peak | Total | AM | PM | Off-Peak | Total | AM | PM | Off-Peak | Total |
| Metrolink | | | | | | | | | | | | | | | | |
| Laguna Niguel to Oceanside | 5 | 5 | 6 | 16 | 5 | 5 | 6 | 16 | 5 | 5 | 6 | 16 | 7 | 7 | 6 | 20 |
| Amtrak | | | | | | | | | | | | | | | | |
| Los Angeles Union Station to San Diego | 4 | 6 | 12-14 | 22-24 | 5 | 6 | 15 | 26 | 7 | 8 | 17 | 32 | 9 | 8 | 19 | 36 |
| COASTER | | | | | | | | | | | | | | | | |
| Oceanside to San Diego* | 7 | 9-10 | 6-9 | 22-26 | 11 | 11 | 8 | 30 | 13 | 14 | 9 | 36 | 19 | 19 | 16 | 54 |
| BNSF | | | | | | | | | | | | | | | | |
| BNSF – Vehicle Train | 0 | 0 | 2-4 | 2-4 | 0 | 0 | 4 | 4 | 0 | 0 | 4 | 4 | 0 | 0 | 4 | 4 |
| BNSF – Manifest | 0 | 0 | 2 | 2 | 0 | 0 | 2 | 2 | 0 | 0 | 4 | 4 | 0 | 0 | 4 | 4 |
| BNSF – Local | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 2 | 1 |
| | 65 to 73 per weekday | | | | 79 per weekday | | | | 93 per weekday | | | | 119 per weekday | | | |

*Metrolink service levels based on SCRRA Strategic Assessment, 2007. All other service levels based on LOSSAN Corridor Strategic Business Plan, 2007.

## Other Needs

Realizing new service levels will require a number of supplementary improvements in addition to track and station parking projects. These needs will be critical elements of an overall service expansion program. For each new implementation tier, the RTC model has indicated a series of assumptions required for accommodating new service levels. These needs are presented by implementation tier in Figure 1.2, and should serve as a basis for future study on the additional corridor requirements that will be needed to support increased service.

### *Schedule Modification*

RTC model train schedules for 2008 service were developed based on existing BNSF, COASTER, Amtrak, and Metrolink schedules. Future train schedules were based on the *Metrolink Service Expansion Program Final Model Operational Findings* (OCTA, October 31, 2007). For mid- and long-term test cases, slight schedule modifications were made to optimize train meets. However, additional schedule optimization will be necessary to accommodate new trains during and after the phased implementation of expanded corridor service.

### *New COASTER Equipment Sets*

The RTC model indicates that new COASTER equipment sets must be added to accommodate each new service tier. The cost of one COASTER locomotive and five coaches is estimated at $13 million. For a temporary near-term solution, a stopgap trainset could be formed by using a shorter consist with an existing COASTER locomotive.

### *Layover Facility*

Accommodating service increases will require new layover tracks. These additional tracks were located at the MTS Yard for the purposes of the RTC model. However, a new layover facility may be necessary to accommodate mid-term and long-term service expansions. RTC modeling also indicates need for a fourth passenger track at Santa Fe Depot to accommodate long-term service. The cost of an additional layover track is estimated at $2 million. An additional passenger track at Santa Fe Depot is estimated at $3.5 million.

Conceptual discussions unrelated to this report have been held about constructing a new shared maintenance facility in the downtown San Diego area, but this would likely be a long-term solution. In the near term, action should be taken to initiate planning activities, such as locating and eventually constructing a new layover facility in the southern end of the corridor.

### *Expanded Track and Equipment Maintenance*

New track and equipment infrastructure would not necessarily cause inspection periods to change. Still, accommodating additional service and more frequent operations may require a modest increase in ongoing track and equipment maintenance expenses.

## Ultimate Corridor Vision

After conducting dozens of rail simulation runs and looking at a host of other quantitative and qualitative information developed over many years, results from this study support a conclusion that the long-term (2030) service scenario should be delivered without the Del Mar or UTC tunnels.

The long-term service levels of 119 trains per weekday can be supported through the combination of the 17 nontunnel projects shown in Figure 1.1. These 17 projects will provide nearly continuous double track throughout San Diego County at a cumulative cost that is likely equivalent to constructing just one of the tunnels by itself. These 17 projects will nearly eliminate meet-pass conflicts in San Diego County, providing scheduling flexibility for expanded passenger service throughout the day.

Even constructing the Del Mar and UTC tunnels along with double track between the tunnels – at a cost likely in excess of $1.5 billion – will deliver rail performance that is substantially worse than the 17 recommended projects. Importantly, while tunneling options would save about three minutes in travel time between Oceanside and Downtown San Diego, they would actually result in worse delay and on-time performance due to continued meet-pass conflicts at the remaining single track sections. Eliminating meet-pass conflicts through double tracking should be a higher priority than tunneling.

## Schedule-Driven Evaluation

Existing corridor documentation and RPWG review and input were used to populate many performance criteria, but a substantial amount of information was developed through application of the RTC model. In a typical transportation planning evaluation, a demand or simulation model may be used to forecast performance based on system capacity and demand. From this standpoint, this study has been no different – RTC uses rail projects (capacity) and service schedules (demand) to forecast on-time performance, running times, delay, and other performance metrics.

A rail planning process based on RTC has some critical distinctions, however, due to the specificity needed in the service schedules and the dominating influence that these detailed schedules have on resulting performance. A freeway demand or simulation model has demand specified in very broad terms, such as total vehicles per hour. The service schedules used in the RTC model, however, specify departure times for each train; in many cases, departure times might also be included at every station stop. When any project or project combination is added to an existing RTC network, the service schedules must be carefully refined to reflect the likelihood that the location of meet-pass conflicts will change.

The implication of this schedule-driven evaluation is that the simulation model could not be used directly to determine an optimum set of projects for each service scenario. Instead, track projects were simulated individually and in combination with other projects under multiple service scenarios. The simulations were used to identify packages of projects that would enable existing rail performance with increased service levels. The process allowed testing each project's performance robustness, but necessitated that each project's overall rail performance benefit be inferred from multiple simulation runs.

## Key Constraint Points

In addition to reporting performance indicators for each model run, the RTC simulation model reports the total residual delay experienced by trains idling at specific control points throughout the corridor. This information provides a valuable indicator of current stretches of single-track that are the greatest contributors to delay and obstacles to on-time performance.

### *Camp Pendleton to San Clemente*

The 9.3-mile stretch of single track from CP Serra in Orange County to CP Songs in northern San Diego County is the single most critical residual delay area. This portion of track runs from points north of the study area along the coast through the environmentally sensitive San Clemente bluffs. This stretch of track is a substantial contributor to current delay and on-time performance deficiencies for southbound Amtrak trains. In future service scenarios, Amtrak, Metrolink and BNSF trains are often extensively delayed in both directions in this stretch of track, creating a "domino effect" of delay throughout San Diego County as southbound trains miss their assigned timeslot. Even with complete double-tracking south of Camp Pendleton, on-time performance for southbound Amtrak trains is poor due to delays experienced entering San Diego County. In order to accommodate long-term service expansion goals without facing substantial performance reductions, the limitations of single-track operation through the San Clemente bluffs will have to be addressed.

### *Miramar Canyon*

Resolving residual delay through Miramar Canyon is one of the most critical elements in achieving the long-term service vision. The prioritized project list contained in this report assumes the design and construction of Project #24 – Sorrento to Miramar Phase II, which will facilitate true double track operations through Miramar Canyon. This will require either:

- Constructing an additional single track on new alignment combined with extensive upgrades to the existing single track through Miramar Canyon; or
- Constructing an entirely new double-track configuration on the other side of Miramar Canyon.

Analysis results show that simply constructing an additional single track will not facilitate true double-track operation through Miramar Canyon due to slow speeds on the existing single track.

The UTC tunnel is an alternative to Sorrento to Miramar Phase II. Either of the UTC tunnel alternatives could provide the desired double-track operations, although at a cost that is likely at least two or three times the cost of Sorrento to Miramar Phase II.

## Long-Term Future of Rail Through Del Mar

This report recommends a package of surface-level double-track projects that would leave a final 3.8-mile stretch of single-track remaining through Los Penasquitos Lagoon and the Del Mar Bluffs. In order to fulfill the final vision of double-track throughout the LOSSAN corridor, eventual action would be needed to increase capacity through this final stretch of single-track. In the very long term, three plausible scenarios exist to either shorten or eliminate this gap:

1. **Double track from CP Carmel Mountain to CP Sorrento**. The addition of Project #22b – Penasquitos Lagoon Double Track only, leaving a 2.1-mile stretch of single-track along the Del Mar Bluffs
2. **Del Mar Tunnel (Camino Del Mar) + Double-track from CP Carmel Mountain to CP Sorrento**. The addition of Project #22b – Penasquitos Lagoon Double Track and Project #21a – Del Mar Tunnel – Camino Del Mar, completely eliminating the single track through Del Mar; or
3. **Del Mar Tunnel (I-5).** The addition of Project #21b – Del Mar Tunnel – I-5/Penasquitos, connecting CP Carmel Mountain with existing double-track near the Del Mar Fairgrounds, also completely eliminating the single track through Del Mar.

Further study is needed to determine whether the performance savings gained through any of these three options would be worth the additional capital cost expenditure. Initiation of this study should be considered a near-term planning need. However, it should be noted that the passenger train levels associated with the "long-term service expansion" can be successfully delivered with single-track operations through Del Mar.

## Project Costs

The resource documents assembled for this study included project cost estimates developed at different times and reflecting varying levels of project development. All project costs were adjusted to 2008 dollars for this study, and many project costs were updated based on recent Project Study Reports and other design activities. Nonetheless, many projects, particularly the higher-cost ones, have cost estimates that are several years old and/or based on conceptual-level planning activities. Several RPWG members stated an opinion that the currently documented costs are substantially understated for projects such as the Del Mar and UTC tunnels, the San Diego Downtown Trench and Grade Separations, the Taylor Street Grade Separation, Sorrento to Miramar Phase II, and Del Mar Bluffs Stabilization Phase 3.

### Access Projects

Three station platform projects were included in the final project list:

1. Project #18 – Del Mar Fairgrounds Platform;
2. Project #32 – Airport Intermodal Transportation Center (AITC); and
3. Project #34 – PETCO Park COASTER Station.

These projects are unique in that they are primarily intended to provide passenger rail access to key "special generators" within the LOSSAN corridor. The AITC was evaluated alongside track projects, while the Del Mar Fairgrounds Platform and PETCO Park COASTER Station were evaluated with nontrack projects. While the RPWG recognizes that these projects may improve the viability of rail travel for special events, the projects were not included in the final prioritization since they are not integral to achieving one of the service expansion scenarios.

### Grade Separations

Three roadway grade separation projects were included in the final project list:

1. Project #11 – Leucadia Blvd Grade Separation;
2. Project #30 – Taylor Street Grade Separation; and
3. Project #31 – Downtown Trench and Grade Separations.

These projects are intended to reduce at-grade conflicts between roadway and rail traffic. While each is likely to improve roadway performance near the rail corridor, each is also subject to significant construction costs and sizeable impacts to existing service. Furthermore, RTC simulation did not suggest that alleviating these at-grade conflicts was crucial to accommodating increased service levels on the rail corridor. Since they were not critical to achieving near- to long-term service expansion, roadway grade separation projects were not included in final prioritization.

### Non-Capacity Bridge Replacement Through Penasquitos Lagoon

Existing single track through Los Penasquitos Lagoon is supported by three aging timber trestle railway bridges that were built in the 1920s and 1930s. The bridges are located at MP 246.1, MP 246.9, and MP 247.1. Although their replacement will not increase rail capacity, new bridges will be required in order to maintain compliance with Federal Railroad Administration (FRA) standards and to continue to support intercity, commuter, and freight rail services through the corridor. The estimated near-term cost of replacing all three bridges is $21.2 million.

### Positive Train Control

Positive Train Control (PTC) is a rail corridor technology that predicts collisions and overspeed derailments, assigns traffic permissions, and can stop a train before a potential accident occurs. PTC uses complex technology and braking algorithms to automatically bring both passenger and freight trains to a safe stop in the event of an emergency, preventing many unnecessary collisions between trains, over-speed derailments, and conflicts with pedestrians and railroad workers. The system works with equipment installed on corridor trains to prevent unsafe movements and enforce both permanent operational restrictions and temporary restrictions such as speed restrictions through construction areas. The implementation of PTC systems has been identified as a key priority for ensuring safety and increasing efficiency throughout the LOSSAN corridor.

## 1.5 NEXT STEPS

A number of additional steps will be necessary to implement the prioritized rail improvement projects presented in this study, which are listed in Table 1.4. Figure 1.3 shows project locations on the corridor track by implementation tier.

### Integration of CSMP Rail and Highway Phases

The San Diego – LOSSAN Corridor Project Prioritization Analysis is a companion study to the analysis of potential freeway investments for the I-5/805 Congestion Systems Management Plan (CSMP). This rail corridor analysis will be combined with results from the freeway analysis into an overall CSMP that may allow for the coordinated staging/phasing of both rail corridor and highway investments.

### American Recovery and Reinvestment Act Grant Applications

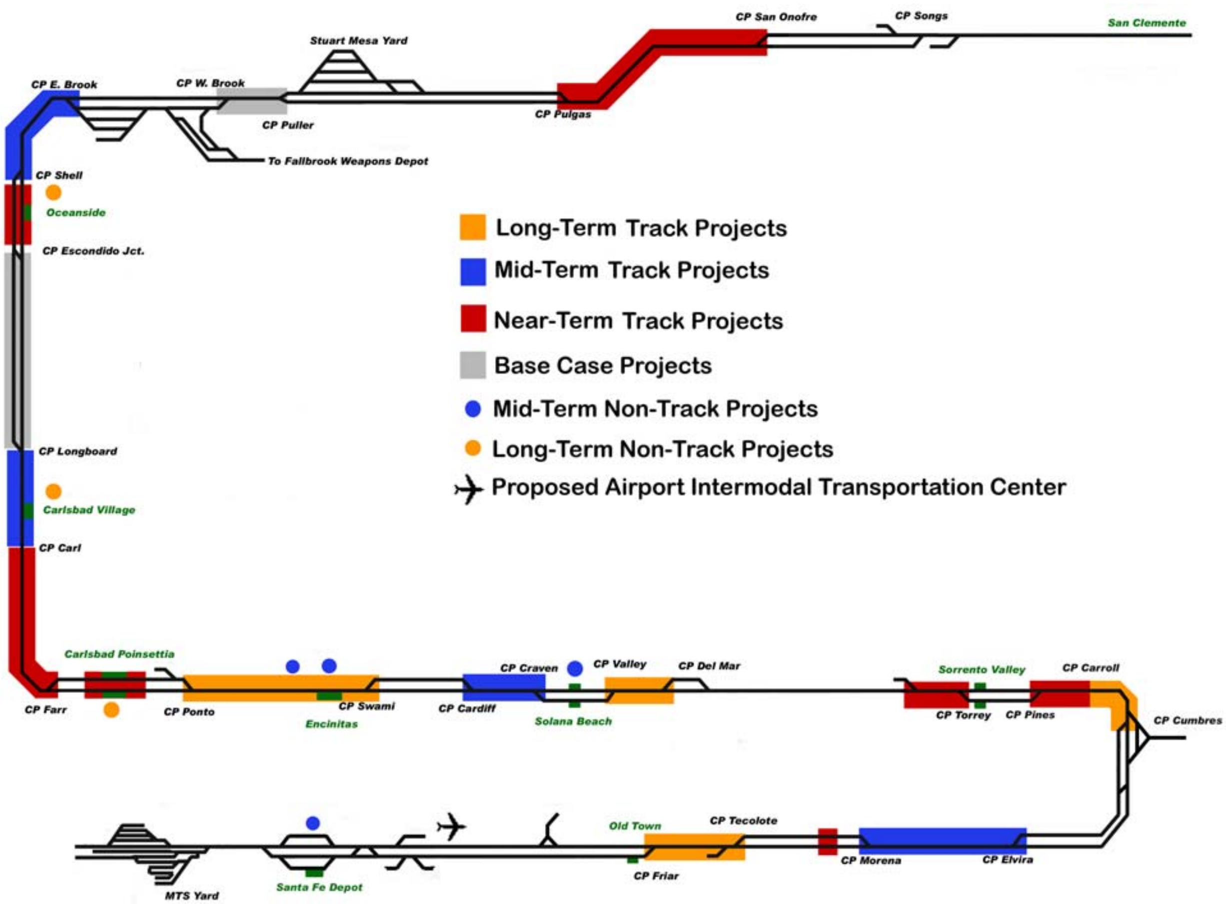
The Federal American Recovery and Reinvestment Act (ARRA), signed into law in February 2009, authorized the release of several billion dollars in new discretionary grants for state and local governments to make capital investments in surface transportation infrastructure. Eligible projects include passenger and freight rail infrastructure improvements. ARRA funds are being awarded to state and local government entities on a competitive basis.

The successful implementation of service expansion projects will require significant funding from a variety of sources. Moreover, this report presents a detailed, quantitative analysis defending the efficacy of the selected projects that will be useful in the grant application process. It is recommended that ARRA grant applications from the San Diego region include the projects selected for near-term service expansion in this report.

## Table 1.4 Prioritized Projects by Implementation Tier

| Implementation | Project | Cost | New Double-Track Miles |
|---|---|---|---|
| Near Term | | | |
| Track Projects | #1 – CP San Onofre to CP Pulgas | $33.0 million | 5.8 |
| | #5a – Oceanside COASTER Stub Track | $8.2 million | – |
| | #5c – Oceanside Metrolink Stub Track | $6.0 million | – |
| | #8 – Carlsbad Double Track | $18.0 million | 1.9 |
| | #22a – Sorrento Valley Double Track | $30.0 million | 1.1 |
| | #23 – Sorrento to Miramar Phase I | $23.0 million | 1.1 |
| | #28 – Tecolote Crossover | $2.9 million | – |
| | #35 – Poinsettia Run-Through | $8.2 million | – |
| Nontrack Projects | – | – | – |
| Total | | $130 million | 9.9 miles |
| Mid Term | | | |
| Track Projects | #3 – CP East Brook to CP Shell | $45.0 million | 0.6 |
| | #6 – Carlsbad Village Double Track | $28.0 million | 1.0 |
| | #15 – CP Cardiff to CP Craven | $60.0 million | 1.5 |
| | #27 – CP Elvira to CP Morena | $80.0 million | 2.6 |
| Nontrack Projects | #12 – Encinitas Pedestrian Crossings | $12.1 million | – |
| | #13 – Encinitas Parking | $18.0 million | – |
| | #16 – Solana Beach Parking | $25.0 million | – |
| | #33 – Santa Fe Depot Parking | $7.5 million | – |
| Total | Mid-Term Total: | $275 million | 5.7 Miles |
| Long Term | | | |
| Track Projects | #10 – CP Ponto to CP Moonlight | $43.0 million | 2.7 |
| | #14 – CP Moonlight to CP Swami | $20.0 million | 0.8 |
| | #17 – San Dieguito Bridge/Double Track | $76.0 million | 1.1 |
| | #24 – Sorrento to Miramar Phase II | $98.7 million | 1.9 |
| | #29 – CP Tecolote to CP Friar | $44.0 million | 0.9 |
| Nontrack Projects | #5b – Oceanside Parking | $23.0 million | – |
| | #7 – Carlsbad Village Parking | $18.8 million | – |
| | #9 – Carlsbad Poinsettia Parking | $21.0 million | – |
| Total | | $340 million | 7.5 Miles |

Figure 1.3 Track Projects to Support Long-Term Service Expansion




## SOFAR Settlement Agreement

In April 2008, SANDAG signed a Settlement Agreement between Save Our Forest and Ranchlands (SOFAR), the Affordable Housing Coalition of San Diego County, Citizens for Responsible Equitable Environmental Development, and the San Diego Public-Transit Riders' Alliance, which resolved a claim filed under the California Environmental Quality Act (CEQA). This report is intended to fulfill the portion of the SOFAR Settlement Agreement that requires implementing a schedule for segments of double track that have been identified in the LOSSAN corridor. In addition, this report provides information that will be useful in the upcoming development of a regional long-range transit plan with urban core emphasis, which is also required by the SOFAR Settlement Agreement.

## 2050 RTP

The SANDAG 2050 RTP is in the process of initial development. The San Diego – LOSSAN Corridor Project Prioritization Analysis is intended to serve as a key reference in the preparation and development of the 2050 RTP.

# APPENDIX 7

## Operational Analysis of Future Scenarios Final Technical Memorandum

**San Diego Association of Governments**

*Update of the Infrastructure Development Plan for the Los Angeles-San Diego-San Luis Obispo (LOSSAN) Rail Corridor in San Diego County*

**FINAL**

**TECHNICAL MEMORANDUM**

**AGREEMENT NO. 15019-OS**

# Operations Scenarios

| | | |
|---|---|---|
| Prepared by: | Lauren German | 6/9/2017<br>Date |
| Technical Analysis Prepared by: | Yu Hanakura | 6/9/2017<br>Date |
| Technical & Quality Review by: | James Campbell | 6/16/2017<br>Date |
| Approved & Released by: | Lane Fernandes | 6/29/2017<br>Date |

| Revision | Date | Description |
|---|---|---|
| 1 | 5/5/2017 | Revised per draft comments from SANDAG |
| 2 | 6/9/2017 | Revised per additional comments from SANDAG |
| | | |
| | | |

# ON-CALL TRANSIT PLANNING SERVICES

*SAN DIEGO ASSOCIATION OF GOVERNMENTS*

# INFRASTRUCTURE DEVELOPMENT PLAN FOR THE LOSSAN RAIL CORRIDOR IN SAN DIEGO COUNTY UPDATE

# OPERATIONAL ANALYSIS OF FUTURE SCENARIOS

## TECHNICAL MEMORANDUM

***Prepared by:***

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**June 29, 2017**

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**APPENDIX B: TIME-DISTANCE DIAGRAMS**

**APPENDIX C: EQUIPMENT CYCLE SPREADSHEETS**

# 1.0 BACKGROUND

The San Diego Subdivision is part of the 351-mile Los Angeles-San Diego-San Luis Obispo (LOSSAN) Rail Corridor. The LOSSAN Rail Corridor is the second busiest intercity passenger rail corridor in the nation supporting commuter, intercity, and freight rail services. The San Diego Subdivision is the southern end of the LOSSAN Rail Corridor and is a 60-mile section from the Orange County line to the Santa Fe Depot in Downtown San Diego. Within San Diego County, the corridor is owned by the North County Transit District (NCTD) from the Orange County line to the southern limits of the City of Del Mar. The San Diego Metropolitan Transit System (SDMTS) owns the Corridor in the City of San Diego from Del Mar to the Santa Fe Depot. Starting at Control Point (CP) SONGS, just south of the Orange County line, and continuing to the Santa Fe Depot in Downtown San Diego, NCTD dispatches all trains operating on the corridor. The BNSF Railway (BNSF) owns the right-of-way south of the Santa Fe Depot, but no revenue commuter or intercity passenger trains currently operate on this segment of right-of-way.

The passenger rail services operating on the LOSSAN Rail Corridor in San Diego County include the Amtrak Pacific Surfliner (Surfliner) intercity service; Metrolink commuter service between Los Angeles, the Inland Empire, and Orange County and the Oceanside Transit Center (operated by the Southern California Regional Rail Authority); and NCTD's COASTER commuter service from the Oceanside Transit Center (OTC) south to the Santa Fe Depot. The *San Diego Forward: The Regional Plan* (Regional Plan) describes 20-minute peak frequencies and 60-minute off-peak frequencies for the COASTER commuter service by 2035.

Since the *Infrastructure Development Plan for the LOSSAN Rail Corridor in San Diego County* (IDP) was prepared in 2013, projects and project timelines have changed, as well as the administrative responsibilities of one of the operators. In July of 2015, the California Department of Transportation (Caltrans) executed an Interagency Transfer Agreement (ITA) with the newly established LOSSAN Joint Powers Authority (JPA) and officially transferred the administration and management of the Amtrak Pacific Surfliner intercity rail service to the LOSSAN JPA. In November 2016, as part of their responsibilities to administer and grow the Surfliner service, LOSSAN added an additional roundtrip (two daily trips) between Los Angeles and San Diego and will be updating their service goals in an update to their *LOSSAN Corridorwide Strategic Implementation Plan* (SIP) in late 2017 and early 2018.

In parallel with this update to the IDP, NCTD and SANDAG are also evaluating options for implementing the service goals outlined in the Regional Plan, while also studying revenue-fleet options to improve service efficiency, flexibility, and greenhouse gas emissions.

The Regional Plan includes projects to increase the percentage of double tracking significantly through 2050, sufficient to support COASTER 2035 service frequencies on the corridor. The Regional Plan also calls for a grade separation at Leucadia Boulevard, a station at the San Diego Convention Center, a San Diego International Airport Intermodal Transportation Center, a Del Mar Fairgrounds special events platform, and a COASTER service extension to Camp Pendleton. The full build-out scenario defined in the Regional Plan provides for a two track railroad through San Diego County with the remaining sections of single track through the City of Del Mar and at the San Diego-Orange County line (SANDAG, 2015). This technical memorandum will revisit the rail improvement projects previously identified in the 2013 IDP and analyze updated operating scenarios that support the Regional Plan and help refine the phasing plan for these projects using a "service-driven" method.

This operations analysis will evaluate three scenarios:

- Base Case: This reflects infrastructure projects open or funded through construction as of January 2017 and current levels of service.

- 2020 Scenario: This reflects infrastructure projects to be open or funded through construction as of 2020 and service levels assumed for each operator for 2020.

- 2035 Scenario: This reflects infrastructure projects to be open or funded through construction as of 2035 and service levels assumed for each operator for 2035. Three options were modeled to assess not only the full buildout of the corridor in 2035, but also to assess the operational impacts assuming only part of the planned infrastructure was constructed.
    - 2035A: Full build-out assuming complete double tracking along corridor with the exception of County line and through the City of Del Mar, along the bluffs.
    - 2035B – Includes infrastructure projects in 2035A, but reduce the Carlsbad Village Double Track project to CP Longboard to approximately milepost (MP) 229.0.
    - 2035C – Includes infrastructure projects in 2035A, but separates the La Costa to Swami Double Track project into two distinct projects, with only the southern portion, from MP 237.0 (south of Leucadia Boulevard) to CP Swami assumed to be double tracked in 2035.

# 2.0 SIMULATION MODEL APPLICATION

The Berkeley Simulation Software Rail Traffic Controller (RTC) model (the Model) was selected as the platform on which to conduct an operations analysis on service growth scenarios along the LOSSAN Rail Corridor in San Diego County. The Model was selected because it provides a variety of analytical and reporting capabilities encompassing the range of information required for this analysis and realistically simulates higher-speed train operations in a mixed-use operational environment (intercity, commuter, and freight services). The advantage of the Model is that it is designed as a flexible tool that can be further modified, refined, and upgraded as needed to evaluate different operational and infrastructure assumptions and configurations.

The Model accurately simulates passenger and freight operations based on train set performance characteristics along a specified corridor, including different geometric parameters and infrastructure configurations.

Referencing the service design criteria established in collaboration between NCTD and SANDAG, the Model was used to simulate Base Case, 2020, and 2035 service scenarios operating on the planned infrastructure along the San Diego Subdivision.

# 3.0 GENERAL MODEL INPUT ASSUMPTIONS

## 3.1 TRAIN CONSIST SIZE AND PERFORMANCE CHARACTERISTICS

For the dynamic railroad operations simulation modeling, typical train consist size assumptions are based on the train consists currently in operation on the San Diego Subdivision under the Base Case scenario:

- Amtrak Pacific Surfliner (intercity) train: a six-car bi-level passenger car consist powered by one General Motors (GM) F59PHI locomotive
- Metrolink (commuter) train: a five-car bi-level commuter car consist powered by one GM F59PHI locomotive
- COASTER (commuter) train: a five-car bi-level commuter car consist powered by one GM F59PHI locomotive

- BNSF (freight) train: a loaded 60-car, 5,500 ton Vehicle Train consist (4,000 trailing feet) hauled by three GM Electro-Motive Division (EMD) Dash 9's in distributed power formation.[1]

The 2020 and 2035 Operating Scenarios will assume:

- Amtrak Pacific Surfliner (intercity) train: a seven-car bi-level passenger car consist powered by a Siemens Charger Tier-4 locomotive
- Metrolink (commuter) train: a five-car bi-level commuter car consist powered by one Siemens Charger Tier-4 locomotive[2]
- COASTER (commuter) train:
  - 2020: a five-car bi-level commuter car consist powered by one GM F59PHI locomotive
  - 2035: a six-car bi-level commuter car consist powered by one Siemens Charger Tier-4 locomotive
- BNSF (freight) train[3]: a loaded 60-car, 5,500 ton Vehicle Train consist (4,000 trailing feet) hauled by three GM Electro-Motive Division (EMD) locomotives in distributed power formation.

While it can be reasonably assumed that technology other than the equipment in use today will be in use along the LOSSAN Rail Corridor by 2035, the simulations were based on available operating characteristics of known technology. As such, it was not considered feasible or practical to assume an alternate technology that does not yet exist for the purposes of this analysis.

### 3.2 TRAIN PERFORMANCE RUN TIME ASSUMPTIONS

Based on the historical performance of the Surfliner and COASTER services, for planning purposes, the minimum dwell times at mid-line stations for passenger trains are assumed to be the same as the dwell time in the current train operations:

- Surfliner trains: 90 seconds
- All commuter trains: 30 seconds

## 4.0 SERVICE LEVEL ASSUMPTIONS

Service levels included as part of the evaluation and validation of the Base Case scenario were developed using published operating schedules as of January 2017. Service levels presented for the 2020 and 2035 scenarios are based on information presented in published or in-progress public documents. All service levels used in the operations analysis were reviewed and agreed to by key corridor stakeholders, including LOSSAN, Metrolink, NCTD, and BNSF.

The service level assumptions for each service are presented below and summarized in tables at the end of this section.

1 Based on typical freight trains that run on the San Diego Subdivision. Some may be longer and/or heavier but this size is most representative of day to day traffic.

2 The Siemens Charger Tier-4 locomotive is used for Metrolink for the purposes of this study since the operating characteristics of the F-125 Tier-4 locomotive were not available to meet the schedule of this study.

3 Freight train lengths are limited by the siding lengths along the entire corridor between San Diego and San Bernardino as well as the length of second track sections between control points where a freight train can be held without impacting stations or highway-rail at-grade crossings.

## 4.1 INTERCITY SERVICE

Today, there are a total of 24 daily intercity trains operating between Los Angeles and San Diego. In the Base Case scenario, all of these trains are assumed to operate on the April 2017 published schedule.

The future service goals for the Surfliner are based on the *2018 California State Rail Plan* (SRP). In the SRP, an additional roundtrip (two daily trips) is proposed for the 2020 scenario between Los Angeles and San Diego. This increases the total number of daily trips to 26 trains. The 2035 intercity frequency goals presented in the 2018 SRP outlines hourly service for the Surfliner trains. This includes six additional daily round trips (12 daily trips) between Los Angeles and San Diego, increasing the daily service to 36 trains. This growth assumption is defined in the SRP as being broken into local and limited stop service, with 28 trains making all stops (the local) and eight limited stop trains.

## 4.2 COMMUTER SERVICE

Commuter service north of Oceanside is operated by Metrolink. No changes in service are planned in 2020 over existing levels. Service goals in 2035 are based on the *Scenario 1* service growth alternative presented in the *Metrolink 10-Year Strategic Plan 2015-2025*. This forecast includes two additional round trips (four daily trips) over existing volumes.

Commuter service from Oceanside to San Diego is provided by COASTER, operated by NCTD. Service levels for commuter trains in San Diego County are based on the peak and off-peak service goals laid out in the Regional Plan. The 2020 service level for COASTER as outlined in the Regional Plan is 20-minute peak frequencies and 120-minute off-peak frequencies. By 2035, a total of 54 COASTER trains are assumed to operate in revenue service between Oceanside and San Diego with 20-minute peak frequencies and hourly off-peak frequencies.

The service plan created for the planned 2020 service used the Base Case scenario as the foundation with additional trains added and minor changes to the operating schedules made.

*Service from/to Camp Pendleton in Year 2035*

The 2035 scenario adds an additional COASTER station at Marine Corps Base Camp Pendleton, north of OTC and adjacent to the primary COASTER maintenance facility at Stuart Mesa. The service level at the Camp Pendleton Station is assumed to be hourly throughout the revenue-service day with additional service during the peak periods. The number of COASTER trains assumed to operate between the Camp Pendleton Station and OTC (both revenue and non-revenue) is summarized in Table 1.

**Table 1: COASTER Train Traffic Level Assumptions – Revenue and Non-Revenue Movements between Stuart Mesa Yard, Camp Pendleton, and OTC**

| | Eastbound | | Westbound | |
|---|---|---|---|---|
| | Revenue (from Camp Pendleton) | Non-Revenue (from Stuart Mesa Yard to OTC) | Revenue (to Camp Pendleton) | Non-Revenue (from OTC to Stuart Mesa Yard) |
| AM Peak | 3 | 5 | 3 | 1 |
| PM Peak | 3 | 0 | 5 | 1 |
| Off-Peak | 10 | 1 | 9 | 4 |
| **Total** | **16** | **6** | **17** | **6** |

*Service from/to Convention Center in Year 2035*

In addition to the Camp Pendleton station, the 2035 scenario also assumes the construction of a new station adjacent to the San Diego Convention Center, south of the Santa Fe Depot. The service level at the

Convention Center Station in Year 2035 is assumed to be hourly throughout the revenue-service day with additional service during the peak periods with non-revenue trains moving between the Convention Center station and the MTS Layover Yard for midday layover and turnarounds.

### 4.3 FREIGHT SERVICE

For the purposes of considering the freight traffic in the corridor, it was assumed that the daily number of six freight trains operating along the LOSSAN Rail Corridor within San Diego County would increase to 11 by the year 2020. This estimate was based on an estimated growth rate of about 3% per year. In concurrence with BNSF, the 11 trains each day was assumed for 2035 as well.

### 4.4 SUMMARY OF SERVICE LEVEL ASSUMPTIONS

The tables presented below summarize the service level assumptions used in the operations analysis. Table 2 summarizes the service level assumptions from the Orange County line to Oceanside, where Metrolink provides the commuter service. Table 3 summarizes the service level assumptions from Oceanside to San Diego, where COASTER provides the commuter service.

**Table 2: Service Level Assumptions – Orange County Line to Oceanside**

| Operator / Line | Base Case | 2020 Plan | 2035 Plan | 2035 Frequency Goals (minutes) |
|---|---|---|---|---|
| Intercity | 24 | 26 | 36 | 60 PK / 60 OP |
| Commuter | 16 | 16 | 20 | 60 PK / 60 OP |
| BNSF Freight | 4 | 8 | 8 | Not Applicable |
| **TOTAL** | **44** | **48** | **64** | |

**Table 3: Service Level Assumptions – Oceanside to San Diego**

| Operator / Line | Base Case | 2020 Plan | 2035 Plan | 2035 Frequency Goals (minutes) |
|---|---|---|---|---|
| Intercity | 24 | 26 | 36 | 60 PK / 60 OP |
| Commuter | 22 | 30 | 54 | 20 PK / 60 OP |
| BNSF Freight | 6 | 11 | 11 | Not Applicable |
| **TOTAL** | **52** | **65** | **101** | |

## 5.0 INFRASTRUCTURE ASSUMPTIONS

This section defines the infrastructure improvements planned for the San Diego Subdivision through 2035. The infrastructure projects (illustrated in Figure 1) are broken down by proposed phases that correspond to the operational scenarios; Base Case (existing), 2020, and 2035 (Full Build-Out), and are described below.

### 5.1 BASE CASE SCENARIO

The infrastructure configuration assumed in the Base Case reflects projects open or funded through construction as of January 2017. These projects include:

- Oceanside Transit Center Pass-Through Track (completed in June 2017)
- San Elijo Lagoon Double Track (CP Cardiff to CP Craven)
    - Chesterfield Drive Crossing Improvements
- Elvira to Morena Double Track

- San Diego River Bridge

## 5.2 2020 SCENARIO

The projects assumed to be open or funded through construction as of 2020 include:

- Poinsettia Station Improvements (will allow for removal of the hold-out rule)
    - The hold-out rule states that an oncoming train may not enter the station while another train is occupying a platform. This is strictly for safety purposes as passengers occasionally run to catch their train and may not expect a train on the opposite track.
- Batiquitos Lagoon Double Track

## 5.3 2035 SCENARIO

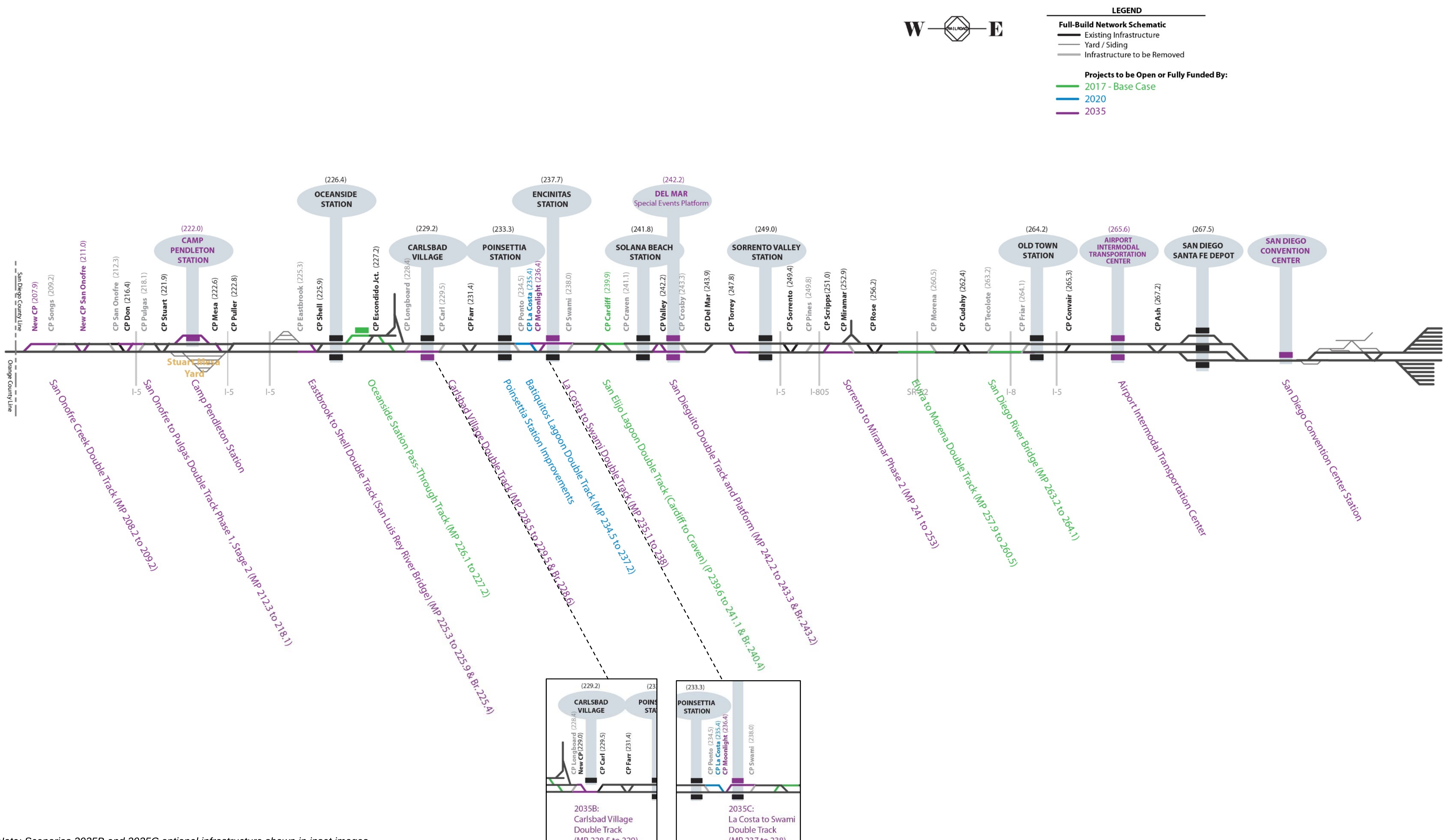
Under the 2035 Scenario (or Full Build-Out), three optional infrastructure configurations (shown in Figure 1) were evaluated based on the potential of some of the projects to not be fully constructed or funded. These options of the 2035 Scenario were evaluated to assess the operational impacts assuming only part of the planned infrastructure was constructed.

The projects to be open or funded through construction as of 2035, broken down by options within the scenario, include:

- 2035A – Full build-out assuming complete double tracking along corridor with the exception of County line and through the City of Del Mar, along the bluffs.
    - San Onofre Creek Double Track
    - San Onofre to Pulgas Double Track Phase 1, Stage 2
    - Camp Pendleton Station
    - Eastbrook to Shell Double Track (San Luis Rey River Bridge)
    - Carlsbad Village Double Track with inter-track fencing and other amenities that would not require the application of a hold-out rule at Carlsbad Village Station
    - La Costa to Swami Double Track with inter-track fencing and other amenities that would not require the application of a hold-out rule at Encinitas Station
    - San Dieguito Double Track and Platform – the Del Mar Fairgrounds Special Events Platform includes inter-track fencing and other amenities and would not require the application of a hold-out rule
    - Sorrento to Miramar Phase 2
    - Airport Intermodal Transportation Center with inter-track fencing and other amenities that would not require the application of a hold-out rule
    - San Diego Convention Center Station
- 2035B – All infrastructure included in 2035A, but reduce the Carlsbad Village Double Track project to CP Longboard to approximately MP 229.0.

- 2035C – Includes infrastructure projects in 2035A, but separates the La Costa to Swami Double Track project into two distinct projects, with only the southern portion, from MP 237.0 (south of Leucadia Boulevard) to CP Swami assumed to be double tracked in 2035.

**Figure 1: Infrastructure Assumptions in the LOSSAN Rail Corridor in San Diego County**




*Note: Scenarios 2035B and 2035C optional infrastructure shown in inset images.*

# 6.0 EQUIPMENT NEEDS

Service Plans were developed for each operational scenario analyzed. These service plans included equipment assumptions to assist in identifying the possible equipment cycles and needs to support the operating scenarios. While it should be noted that these equipment assumptions are conceptual, they can assist in identifying the possible COASTER equipment needs associated with projected service level growth for 2020 and 2035.

Included in Appendix C are the conceptual equipment cycles and estimated mileage for each proposed equipment set for the COASTER commuter service under the Base Case Scenario, 2020 Scenario, and 2035 Scenario. Table 4 summarizes the equipment needs for each operational scenario. The 2020 service plan estimated the need for seven five-car COASTER consists for revenue operations (not including the 20% future ratio assumed for spare equipment). This is an increase of three consists over existing equipment needs and two more consists than was estimated for 2020 in the 2013 IDP.

The 2035 service plan estimated the need for nine six-car consists for revenue operations (not including the 20% future ratio assumed for spare equipment). This is three more consists than was estimated for the 2030 full build-out in the 2013 IDP.

The difference in equipment needs identified in this operational analysis and the conclusions presented in the 2013 IDP, under both the 2020 and 2035 scenarios, is because the 2013 IDP assumed the integration of cross-county service with Metrolink equipment providing some of the identified service between Oceanside and San Diego Santa Fe Depot.

**Table 4: COASTER Estimated Equipment Needs**

| | Base Case | | 2020 Plan | | 2035 Plan | |
|---|---|---|---|---|---|---|
| | Coaches | Engines | Coaches | Engines | Coaches | Engines |
| Revenue Operating Equipment | 20 | 4 | 35 | 7 | 54 | 9 |
| *Equipment Needs Increase Over Previous* | *N/A* | *N/A* | *15* | *3* | *19* | *2* |
| Spare Equipment (20% future ratio assumed) | 4 | 1 | 7 | 1 | 11 | 2 |
| **TOTAL Estimated Equipment Need** | **24** | **5** | **42** | **8** | **65** | **11** |
| *Equipment Needs Increase Over Previous (Including Spares)* | *N/A* | *N/A* | *18* | *3* | *23* | *3* |

# 7.0 ANALYSIS

Each of these operational scenarios identified were put through dynamic simulations in the RTC model. The results of the dynamic simulation, along with associated discussions, are described in this section. Supporting technical data that includes timetables, stringline diagrams (from the dynamic railroad operations simulation results), and the conceptual equipment cycles are included in Appendix A, Appendix B, and Appendix C, respectively.

## 7.1 BASE CASE SCENARIO

**Key Findings**

- Many passenger trains are shown to arrive more than three minutes early at stations in the southern portion of the San Diego Subdivision.
- Simulation results (with no randomization testing) showed no major delays or conflicts.

### Discussion

The dynamic simulation for the Base Case Scenario shows that many of the passenger trains arrive more than three minutes early at stations in the southern portion of the San Diego Subdivision, particularly the Solana Beach and Old Town San Diego stations. This arrival time is approximately three to four minutes prior to scheduled departure time, which could cause longer station dwell times in these instances. Overall, no major delays or conflicts were observed along the corridor in the dynamic simulation of the Base Case Scenario.

**Table 5: COASTER Trains Arriving Three or More Minutes Earlier than Scheduled Departure Time**

| Train No. | Location | Scheduled Departure Time | Arrival Time in the Simulation Result |
|---|---|---|---|
| 634 | Old Town | 6:54 AM | 6:50 AM |
| 638 | Solana Beach | 7:37 AM | 7:34 AM |
| 640 | Old Town | 8:37 AM | 8:34 AM |
| 648 | Solana Beach | 11:33 AM | 11:30 AM |
| 648 | Old Town | 12:07 PM | 12:02 PM |
| 645 | Solana Beach | 1:30 PM | 1:27 PM |
| 653 | Solana Beach | 4:17 PM | 4:14 PM |
| 656 | Old Town | 4:28 PM | 4:24 PM |
| 660 | Old Town | 6:08 PM | 6:04 PM |
| 662 | Old Town | 6:37 PM | 6:34 PM |

The consistency of early arrivals at these two stations suggests that the extension of the double-track sections on the southern slope of Miramar Hill toward San Diego may help in reducing the amount of scheduled pad applied to the passenger trains traveling on both directions needed due to the ability to have running meets.

Further operational analysis and review by the operators is required to properly assess the amount of travel time pad that can be eliminated versus how much is actually needed for each train to ensure the reliability of the service at a corridor-wide level.

## 7.2 2020 SCENARIO

### Key Findings

- The track capacity in 2020 can accommodate the planned service increases for passenger and freight services.
- The additional COASTER service as proposed in the conceptual service plans exceeds midday layover capacity and requires either an additional layover track in Downtown San Diego or more midday service.

### Discussion

***The track capacity in 2020 can accommodate the planned service increases for passenger and freight services.***

The dynamic simulations performed on the 2020 Scenario service plan highlight that the train operations in the remaining single track territory become more reliable when the three COASTER trains in traditional peak direction in each hour are scheduled using approximately 20-minute headways. This is largely due to the reduced length of the single track territory within the San Diego Subdivision and changes to the service plan, including additional trains. The simulation performed further suggests the infrastructure assumed for this operational scenario can accommodate the volume of the trains and service patterns proposed. Observations made of the simulation output suggest that further growth in the service levels, beyond what is identified in this scenario, is limited without additional infrastructure investment.

***The additional COASTER service as proposed in the conceptual service plans exceeds midday layover capacity and requires either an additional layover track in Downtown San Diego or more midday service.***

The simulations performed identified a need to either add an additional layover track in Downtown San Diego or provide more midday COASTER service to eliminate the need to store additional equipment during the midday. While physical space in the MTS yard is available to store an additional trainset in the midday, converting an additional trolley storage track into a COASTER storage track during midday operations would require not only agreement by MTS, but also come under the regulatory approval of both the Federal Railroad Administration (FRA) and California Public Utilities Commission (CPUC). To avoid adding a fourth layover track, one COASTER equipment set would need to remain in revenue service during the midday period by making at least one additional roundtrip.

## 7.3 2035 SCENARIO

### Key Findings

- In general, the track capacity in 2035 can accommodate the planned service increases for passenger and freight services within the San Diego Subdivision, but not so in the remaining single-track section in the Orange Subdivision.
- To allow CP La Costa to CP Swami to be constructed as two independent projects, the Carlsbad Village Double Track Project must be completed first.
- Minor to moderate delays of a few minutes could occur if station enhancements are not made at the Sorrento Valley Station that would allow for the elimination of the hold-out rule.
- The single track section between San Juan Capistrano on the Orange Subdivision and CP SONGS on the San Diego Subdivision affects train performance on the San Diego Subdivision south of OTC.
- Existing track assignments at OTC and Santa Fe Depot will need to be changed.
- Additional overnight layover capacity for Surfliner trains at or near Santa Fe Depot is required due to the longer consist.
- Track capacity at OTC will need to be expanded in 2035 to operate efficiently and prevent added delays.

### Discussion

***In general, the track capacity in 2035 can accommodate the planned service increases for passenger and freight services within the San Diego Subdivision, but not so in the remaining single-track section in the Orange Subdivision.***

The dynamic simulation for the 2035A, 2035B, and 2035C Scenarios show that train service at assumed future levels can be accommodated without significant delays. Any minor issues would likely be able to be addressed through dispatching and train operations. Comparison of the simulation results of the three 2035 Scenarios reveal that the 2035A (Full-Build) option can handle the increased train service levels more reliably with more room for recovery from delays. The infrastructure modifications assumed in 2035B and 2035C options can process the same number of trains with nearly the identical schedule as in the 2035A option, but with less room for recovery from delays.

However, the remaining single track section in the Orange Subdivision appears to affect reliable train operations on the San Diego Subdivision. While the improvements within the San Diego Subdivision, including the northward extension of the double track section from existing CP SONGS to near MP 207.9, offer additional track capacity that could absorb some of the delays originating in the Orange Subdivision during the midday off-peak period, most of the southbound trains carry over delays caused by conflicts in the single track section in the Orange Subdivision into the San Diego Subdivision. Improvement(s) need to be made to the remaining single track section of the Orange Subdivision south of CP Avery to reduce the length of the single track section in order to improve the on-time performance of the trains in San Diego County. Otherwise, southbound peak trains already coming late into the San Diego Subdivision would likely cause delays to northbound traffic even though the additional track capacity created from the double-track projects could potentially absorb delays and prevent the delays to become unrecoverable.

***To allow CP La Costa to CP Swami to be constructed as two independent projects, the Carlsbad Village Double Track Project <u>must be completed first</u>.***

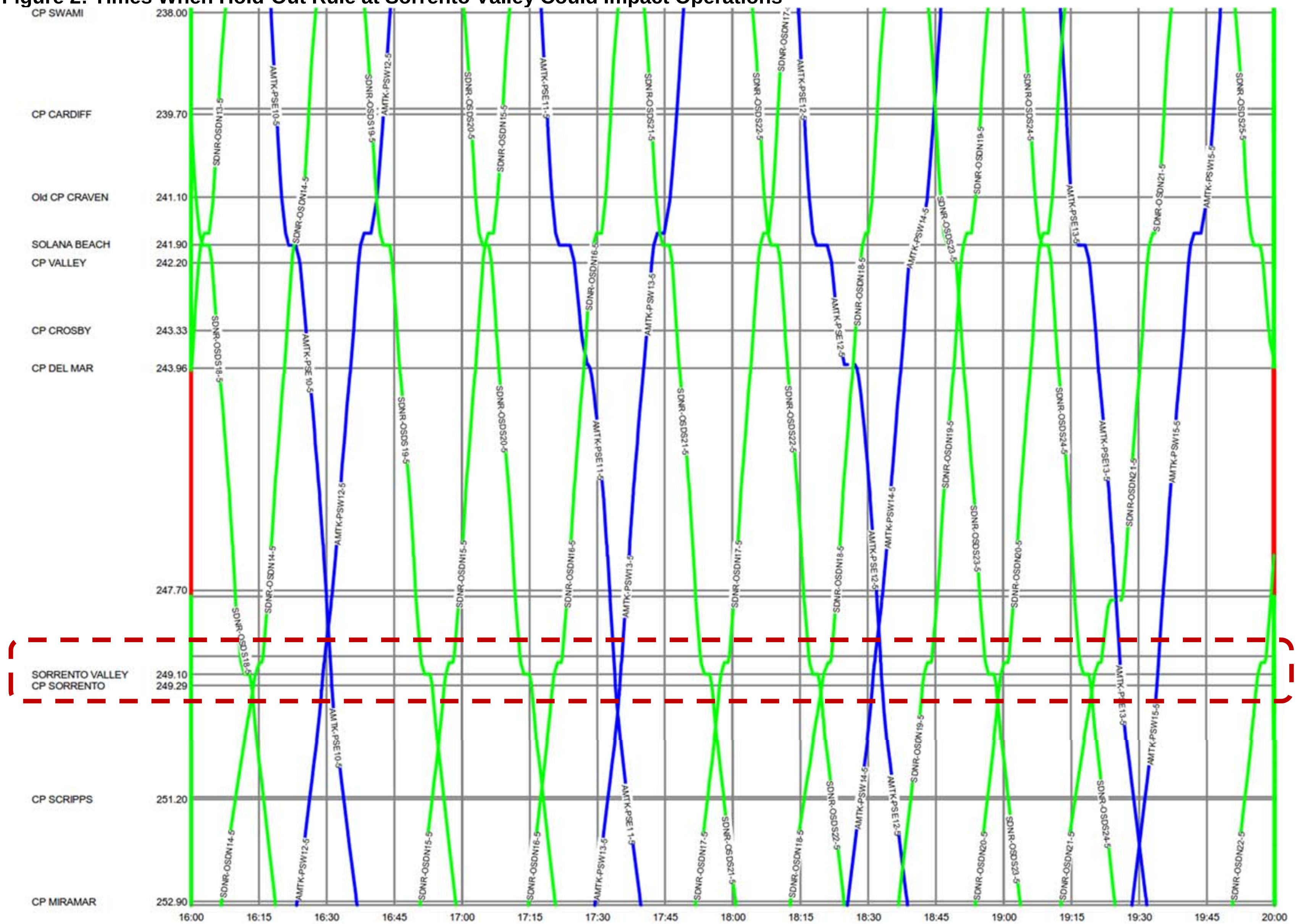
It was determined that in construction of the 2035A Full-Build Scenario, the section of double track through Encinitas (MP 237.0 near Leucadia Boulevard to CP Swami) could likely be constructed as a separate project, without impairing the long-term service. This would allow CP La Costa to CP Swami to be two projects rather than one. The double track section through Downtown Carlsbad must be constructed first to allow meets that the simulation showed necessary at one of these two sections. Conversely, Downtown Carlsbad could potentially remain single track for the assumed service level if the section between CP Longboard and MP 229, as well as new CP La Costa and CP Swami, are both double tracked.

***Minor to moderate delays of a few minutes could occur if station enhancements are not made at the Sorrento Valley Station that would allow for the elimination of the hold-out rule.***

The simulations performed on the 2035A, 2035B, and 2035C Scenarios identified impacts to operations along the San Diego Subdivision along all remaining single track segments in all three scenario options. In Del Mar, it was observed that the hold-out rule in place at the Sorrento Valley Station can further exacerbate these impacts if trains are out of slot (refer to Figure 2). A recommendation of this analysis is to identify a solution for removing the hold-out rule, possibly through constructing a grade separated pedestrian crossing and inter-track fence.

While it would require more detailed simulations to determine the specific benefit of removing the hold-out rule, it is reasonable to assume that it could offer greater operational reliability and schedule recoverability. Given the remaining single track segments of the network, creating greater opportunities for the system to recover from delays will be important. In 2035, the single-track segments in Del Mar (MP 244.0 to 248.0) and at County line (MP 207.4 to 209.2) are assumed in each of the three 2035 scenarios.

**Figure 2: Times When Hold-Out Rule at Sorrento Valley Could Impact Operations**




*Note: Red rectangular: Sorrento Valley Station, where the hold-out rule is applied.*

***Existing track assignments at OTC and Santa Fe Depot will need to be changed.***

Some of the passenger train track assignment requirements currently in place may need to be modified to allow the dispatch greater flexibility to process the increased volume of trains. This is not to suggest that the practice of assigning tracks to specific trains should be eliminated. In fact, to maintain consistency for the passengers, track assignments by train are necessary. The recommendation of this report focuses on assigning tracks by train, not by operator, as is the current practice much of the time.

The existing track assignments by operator include:

- All Surfliner trains assigned to Track 3 at Santa Fe Depot
- All Surfliner trains assigned to Track 1 (the nearside platform from the transit center) at the OTC unless a meet between two Surfliner trains occurs at OTC

At current service levels, these track assignment rules work operationally while offering increased convenience to the customers. However, simulation results indicate that modification to these track assignment practices will be necessary to accommodate meets between two Surfliner trains at OTC and revenue-to-revenue turns of Surfliner trains at Santa Fe Depot. Surfliner trains currently require a minimum of 30 minutes to complete revenue-to-revenue turns.

Currently at Santa Fe Depot, two Surfliner trains do not dwell simultaneously. With the 2035 service increase, due to the longer turnaround times required by intercity trains, Surfliner trains will be required to dwell at two platforms simultaneously. While the model was coded with Surfliner service mostly dedicated to Tracks 2 and 3 and COASTER service mostly dedicated to Tracks 1 and 4, it was not feasible to retain dedicated platforms for each service due to the service plan assumed, minimum scheduled revenue-to-revenue turn dwell time requirement, and trains running through Santa Fe Depot.

At OTC, the occasions in which two Surfliner trains meet at the station platform is limited in today's operations. However, the number of meets between Surfliner trains at or near the station could potentially increase as the service level increases in the future. The service plans assumed for the 2035 Scenarios in this analysis cause almost all Surfliner trains to have meets at OTC, and such meets occur hourly during the revenue-service day. This would not allow assigning all Surfliner trains to Track 1 in the timetable.

***Additional overnight layover capacity for Surfliner trains at or near Santa Fe Depot is required due to the longer consist.***

The increase in service levels for the Surfliner from 24 existing daily trains to 36 daily trains proposed for 2035 will not require any additional trainsets to be stored overnight in Downtown San Diego. However, with the assumed lengthening of each trainset from six cars to seven cars, the ability to "double park" two trainsets on one platform face is no longer feasible. The usable track length at Santa Fe Depot is just under 1,200 feet. Existing Surfliner trainsets with six cars and one locomotive are approximately 585 feet in length, allowing two trainsets to be stored on the same platform track and remain within the 1,200-foot requirement. A seven-car Surfliner consist with one locomotive is 660 feet long. The additional 85 feet of train length for each trainset exceeds the maximum allowable space of the longest platform track at Santa Fe Depot. In addition, at least one of the four tracks at Santa Fe Depot must remain open overnight for freight train operations. As a result, the 2035 Scenario requires an additional overnight storage track for the Surfliner trains be considered.

In order to maintain the number of trainsets in Downtown San Diego necessary for morning service startup, the following potential solutions have been identified, though all of them requires further analysis to assess feasibility:

- Utilize existing infrastructure, with operational changes:
  - Store at least one Surfliner consist overnight at the Convention Center Platform. This may require an amendment to the existing shared-use agreement and agreement with BNSF and/or SDMTS, as well as overnight security to protect the train consist.
  - Store at least one Surfliner consist overnight at BNSF yard, located south of Santa Fe Depot. This requires an agreement with BNSF.
  - Send at least one Surfliner consist to Stuart Mesa Yard, the nearest layover facility in place, either as revenue service only from/to Oceanside or a non-revenue run, for overnight layover, and bring it back to Santa Fe Depot the next morning. This requires a vacant storage track at Stuart Mesa Yard and the available capacity on the main track between Stuart Mesa Yard and San Diego.
  - Increase the Surfliner service level between Los Angeles and San Diego by at least one roundtrip, creating an early morning arrival into San Diego and a late-night departure out of San Diego. This requires the available capacity on the main track for the entire length of LOSSAN South Corridor.
- Additional right-of-way and/or railroad infrastructure:
  - Add at least one storage track at or near Santa Fe Depot.
  - Extend platform tracks at Santa Fe Depot so that the seven-car consists can be "double-parked."
  - Add an overnight layover facility in Downtown San Diego.

***Track capacity at OTC will need to be expanded in 2035 to operate efficiently and prevent added delays.***

Additional track capacity will be needed to operate efficiently and not cause minor delays based on the service plan assumed in this analysis. As noted previously, during peak periods, even without the preferred track assignment for Surfliner trains, there are instances in which two trains occupy Platform 3. In 2035, there were several occasions in the simulation results for the peak periods that the tracks at and near OTC are occupied by more than four trains.

It is difficult to accommodate additional Metrolink, COASTER, and the Surfliner trains making turns at the station due to the track layout. The layout requires trains accessing Track 3 from the north (railroad west) of the station to traverse Track 1, meaning trains cannot enter or exit Track 3 when there is another train occupying or traversing Track 1.

Although minor schedule adjustments of the train service could potentially eliminate some conflicts in the immediate area, it would not be able to eliminate them completely under the service structure and service levels as assumed in this analysis. The remaining single track sections along the Orange Subdivision limit the amount of such adjustments and the number of individual train schedules that could be adjusted. Further, the passenger rail service structure assumed in this analysis does not include cross-county commuter rail service between Metrolink territory and COASTER territory through Oceanside as was assumed in the 2013 IDP. Absence of such through service increases number of trains making turns at OTC, whether the train is turning to another revenue service or not, and increases the duration that tracks are occupied.

In the section between the Orange Subdivision and OTC, the simulation input and output indicates that the existence of the Camp Pendleton Station could conceivably assist with the traffic at OTC during the midday. The peak hour service would likely not see much benefit at OTC from the Camp Pendleton Station as the traffic is much denser due to increased volume of both revenue and non-revenue trains, and there would be longer dwell times at OTC, even if some of these trains were proceeding to Camp Pendleton Station.

However, the simulation results also indicate that extension of COASTER trains currently assumed to originate or terminate at the Camp Pendleton Station in this analysis would be challenging due to assumed track layout and associated track availability at Camp Pendleton Station. This is in part because platform faces at the station are on the main track and the new siding track and could impede movements between the station and Stuart Mesa Yard. This is due to the need to switchback on the main track north of CP Stuart. This limits the number of the trains to serve the station because the main track near Camp Pendleton Station temporarily becomes single track while there are two trains in the station, or when a train is traversing between Stuart Mesa Yard and the station. Increasing service from/to Camp Pendleton could potentially reduce the overall capacity of the main tracks in the segment between the County line and Oceanside and affect scheduling flexibility and operational reliability.

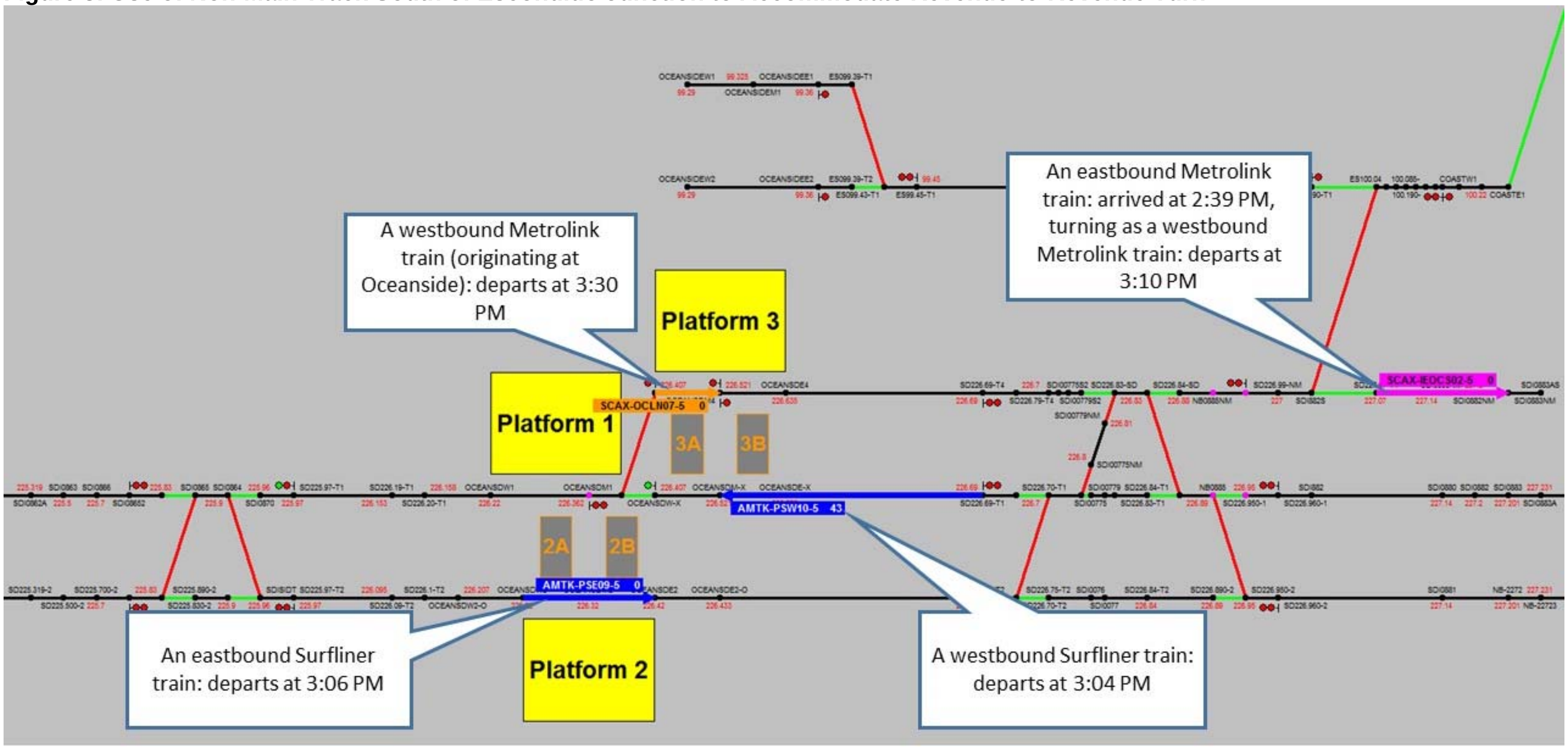
Based on the model simulation results, the following could potentially reduce the number and significance of the conflicts at or near OTC under the 2035 service plan:

- Convert selected commuter rail trains to cross-county commuter service, the through commuter/regional passenger train service between Los Angeles/Riverside/Orange County and San Diego County. This would reduce the number of the trains making turns at OTC.

- Make the existing industrial track south of Escondido Junction, as shown in Figure 3, available on an everyday basis to allow some Metrolink trains that terminate at OTC to make their turn off the main track. This is done at times today, but is not an option everyday due to the occasional storage of maintenance-of-way on-track equipment. Also, this likely would require an upgrade to this track at some point.

- Change operational procedures to allow trains to reduce the minimum scheduled dwell time for trains making turns at OTC and Camp Pendleton Station. While such a change would also require modifications to the signal and communication systems, this could potentially reduce track occupancy at OTC while allowing increasing service from/to Camp Pendleton Station, though further analysis is necessary to validate and assess the significance of this benefit.

**Figure 3: Use of Non-Main Track South of Escondido Junction to Accommodate Revenue-to-Revenue Turn**




*Note: Red and green indicate a switch. Black indicates not a switch.*

# APPENDIX A

## TIMETABLES

**Legend**

*Train Number:*

- PS-E/PS-W: Pacific Surfliner trains
- OSD-N/OSD-S: COASTER trains
- OCL-N/OCL-S: Metrolink Orange County Line trains
- IEOC-N/IEOC-S: Metrolink IEOC Line trains

*Timetable:*

- Trains considered to be operated during peak periods have schedules highlighted in light blue grey

# BASE CASE

| Equipment ID: | C1 | C2 | C3 | SCAX5 | C4 | C1 | AMTK5 | AMTK6 | C2 | SCAX6 | AMTK7 | C1 | AMTK8 | AMTK9 | AMTK10 | C1 | SCAX7 | C3 | AMTK11 | C4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Equipment from:* | SMMF | SMMF | SMMF | SCAX | SMMF | OSD-N631 | AMTK | AMTK | OSD-N635 | SCAX | AMTK | OSD-N639 | AMTK | AMTK | AMTK | OSD-N645 | SCAX | OSD-N651 | AMTK | OSD-N653 |
| | OSD-S630 | OSD-S634 | OSD-S636 | IEOC-S803 | OSD-S638 | OSD-S640 | PS-E562 | PS-E564 | OSD-S644 | OCL-S600 | PS-E566 | OSD-S648 | PS-E768 | PS-E572 | PS-E774 | OSD-S654 | IEOC-S815 | OSD-S656 | PS-E580 | OSD-S660 |
| Los Angeles Union Station dp. | | | | | | | 6:08 AM | 7:26 AM | | 7:58 AM | 8:41 AM | | 9:55 AM | 11:20 AM | 12:33 PM | | | | 2:58 PM | |
| Fullerton dp. | | | | | | | 6:39 AM | 7:56 AM | | 8:32 AM | 9:12 AM | | 10:26 AM | 11:51 AM | 1:04 PM | | | | 3:29 PM | |
| Anaheim dp. | | | | (IEOC) | | | 6:48 AM | 8:04 AM | | 8:40 AM | 9:20 AM | | 10:34 AM | 11:59 AM | 1:12 PM | | (IEOC) | | 3:37 PM | |
| Santa Ana dp. | | | | 5:53 AM | | | 6:58 AM | 8:13 AM | | 8:50 AM | 9:29 AM | | 10:43 AM | 12:08 PM | 1:21 PM | | 1:40 PM | | 3:46 PM | |
| Irvine dp. | | | | 6:07 AM | | | 7:11 AM | 8:27 AM | | 9:04 AM | 9:40 AM | | 10:54 AM | 12:21 PM | 1:34 PM | | 1:54 PM | | 3:59 PM | |
| San Juan Capistrano dp. | | | | 6:26 AM | | | 7:26 AM | 8:43 AM | | 9:20 AM | 9:56 AM | | 11:09 AM | 12:41 PM | 1:49 PM | | 2:09 PM | | 4:14 PM | |
| San Clemente dp. | | | | 6:36 AM | | | ↓ | ↓ | | 9:30 AM | ↓ | | ↓ | ↓ | ↓ | | 2:18 PM | | ↓ | |
| Oceanside Transit Center dp. | 5:07 AM | 6:00 AM | 6:30 AM | 7:03 AM | 7:13 AM | 7:42 AM | 8:05 AM | 9:16 AM | 9:37 AM | 10:01 AM | 10:38 AM | 11:08 AM | 11:47 AM | 1:15 PM | 2:24 PM | 2:42 PM | 2:53 PM | 3:32 PM | 4:52 PM | 5:12 PM |
| Carlsbad Village dp. | 5:11 AM | 6:04 AM | 6:35 AM | | 7:17 AM | 7:46 AM | ↓ | ↓ | 9:42 AM | | ↓ | 11:13 AM | ↓ | ↓ | ↓ | 2:47 PM | | 3:36 PM | ↓ | 5:17 PM |
| Carlsbad Poinsettia dp. | 5:16 AM | 6:09 AM | 6:40 AM | | 7:23 AM | 7:51 AM | ↓ | ↓ | 9:47 AM | | ↓ | 11:18 AM | ↓ | ↓ | ↓ | 2:52 PM | | 3:43 PM | ↓ | 5:22 PM |
| Encinitas dp. | 5:22 AM | 6:14 AM | 6:46 AM | | 7:28 AM | 7:57 AM | ↓ | ↓ | 9:54 AM | | ↓ | 11:25 AM | ↓ | ↓ | ↓ | 3:00 PM | | 3:49 PM | ↓ | 5:28 PM |
| Solana Beach dp. | 5:27 AM | 6:19 AM | 6:55 AM | | 7:37 AM | 8:02 AM | 8:21 AM | 9:34 AM | 10:00 AM | | 10:56 AM | 11:33 AM | 12:08 PM | 1:31 PM | 2:43 PM | 3:05 PM | | 3:54 PM | 5:13 PM | 5:35 PM |
| Sorrento Valley dp. | 5:37 AM | 6:28 AM | 7:08 AM | | 7:47 AM | 8:14 AM | ↓ | ↓ | 10:11 AM | | ↓ | 11:42 AM | ↓ | ↓ | ↓ | 3:14 PM | | 4:03 PM | ↓ | 5:44 PM |
| Old Town San Diego dp. | 5:59 AM | 6:54 AM | 7:31 AM | | 8:10 AM | 8:37 AM | ↓ | 10:08 AM | 10:33 AM | | 11:27 AM | 12:07 PM | 12:41 PM | 2:03 PM | 3:17 PM | 3:36 PM | | 4:28 PM | 5:42 PM | 6:08 PM |
| Santa Fe Depot ar. | 6:08 AM | 7:01 AM | 7:38 AM | | 8:17 AM | 8:45 AM | 8:58 AM | 10:16 AM | 10:40 AM | | 11:35 AM | 12:14 PM | 12:49 PM | 2:11 PM | 3:25 PM | 3:44 PM | | 4:35 PM | 5:50 PM | 6:16 PM |
| *Equipment to:* | *OSD-N631* | *OSD-N635* | *MTS* | *IEOC-N800* | *MTS* | *OSD-N639* | *PS-W769* | *PS-W573* | *MTS* | *SCAX-M* | *PS-W777* | *OSD-N645* | *AMTK* | *AMTK* | *AMTK* | *OSD-N655* | *SCAX* | *OSD-N657* | *PS-W591* | *OSD-N663* |
| *COASTER and Amtrak OTC-SFD Trip Time* | *1:01* | *1:01* | *1:08* | | *1:04* | *1:03* | *0:53* | *1:00* | *1:03* | | *0:57* | *1:06* | *1:02* | *0:56* | *1:01* | *1:02* | | *1:03* | *0:58* | *1:04* |

| Equipment ID: | SCAX1 | AMTK1 | SCAX2 | SCAX3 | SCAX4 | AMTK2 | C1 | SCAX5 | AMTK3 | C2 | AMTK4 | AMTK5 | C1 | AMTK6 | AMTK7 | C1 | AMTK8 | SCAX6 | C3 | SCAX7 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Equipment from:* | *SCAX* | *AMTK-N* | *SCAX* | *SCAX* | *SCAX* | *AMTK-N* | *OSD-S630* | *IEOC-S803* | *AMTK-N* | *OSD-S634* | *AMTK-N* | *PS-E562* | *OSD-S640* | *PS-E564* | *PS-E566* | *OSD-S648* | *PS-E768* | *SCAX-M* | *MTS* | *IEOC-S815* |
| | OCL-N601 | PS-W761 | OCL-N603 | OCL-N605 | OCL-N607 | PS-W763 | OSD-N631 | IEOC-N800 | PS-W565 | OSD-N635 | PS-W567 | PS-W769 | OSD-N639 | PS-W573 | PS-W777 | OSD-N645 | PS-W579 | OCL-N641 | OSD-N651 | OCL-N609 |
| Convention Center dp. | | | | | | | | | | | | | | | | | | | | |
| Santa Fe Depot dp. | | 4:00 AM | | | | 6:06 AM | 6:24 AM | | 6:57 AM | 7:41 AM | 8:23 AM | 9:18 AM | 9:40 AM | 10:41 AM | 11:57 AM | 12:51 PM | 1:33 PM | | 2:05 PM | |
| Old Town San Diego dp. | | 4:07 AM | | | | 6:13 AM | 6:30 AM | | 7:04 AM | 7:47 AM | 8:30 AM | 9:25 AM | 9:46 AM | 10:48 AM | ↓ | 12:57 PM | 1:40 PM | | 2:11 PM | |
| Sorrento Valley dp. | | ↓ | | | | ↓ | 6:52 AM | | ↓ | 8:09 AM | 8:54 AM | ↓ | 10:09 AM | 11:11 AM | ↓ | 1:19 PM | ↓ | | 2:33 PM | |
| Solana Beach dp. | | 4:37 AM | | | | 6:44 AM | 7:02 AM | | 7:37 AM | 8:22 AM | 9:03 AM | 9:58 AM | 10:20 AM | 11:22 AM | 12:32 PM | 1:30 PM | 2:11 PM | | 2:43 PM | |
| Encinitas dp. | | ↓ | | | | ↓ | 7:09 AM | | ↓ | 8:29 AM | 9:09 AM | ↓ | 10:26 AM | 11:30 AM | ↓ | 1:36 PM | ↓ | | 2:49 PM | |
| Carlsbad Poinsettia dp. | | ↓ | | | | ↓ | 7:15 AM | | ↓ | 8:35 AM | 9:15 AM | ↓ | 10:32 AM | 11:36 AM | ↓ | 1:42 PM | ↓ | | 2:55 PM | |
| Carlsbad Village dp. | | ↓ | | | | ↓ | 7:22 AM | | ↓ | 8:41 AM | 9:23 AM | ↓ | 10:38 AM | 11:42 AM | ↓ | 1:47 PM | ↓ | | 3:01 PM | |
| Oceanside Transit Center dp. | 4:38 AM | 4:53 AM | 5:18 AM | 5:42 AM | 6:34 AM | 7:03 AM | 7:27 AM | 7:39 AM | 7:55 AM | 8:46 AM | 9:29 AM | 10:15 AM | 10:43 AM | 11:50 AM | 12:49 PM | 1:53 PM | 2:29 PM | 2:59 PM | 3:07 PM | 3:26 PM |
| San Clemente dp. | 5:06 AM | ↓ | 5:46 AM | 6:10 AM | 7:02 AM | ↓ | | 8:07 AM | ↓ | | ↓ | ↓ | | ↓ | ↓ | | ↓ | 3:27 PM | | 3:54 PM |
| San Juan Capistrano dp. | 5:15 AM | 5:28 AM | 5:55 AM | 6:19 AM | 7:11 AM | 7:36 AM | | 8:16 AM | 8:27 AM | | 10:07 AM | 10:47 AM | | 12:22 PM | 1:22 PM | | 3:01 PM | 3:36 PM | | 4:03 PM |
| Irvine dp. | 5:31 AM | 5:44 AM | 6:11 AM | 6:35 AM | 7:27 AM | 7:54 AM | | 8:32 AM | 8:42 AM | | 10:22 AM | 11:01 AM | | 12:37 PM | 1:37 PM | | 3:16 PM | 3:52 PM | | 4:19 PM |
| Santa Ana dp. | 5:46 AM | 5:56 AM | 6:26 AM | 6:50 AM | 7:42 AM | 8:05 AM | | 8:47 AM | 8:54 AM | | 10:33 AM | 11:12 AM | | 12:48 PM | 1:48 PM | | 3:27 PM | 4:07 PM | | 4:34 PM |
| Anaheim dp. | 5:55 AM | 6:06 AM | 6:35 AM | 6:59 AM | 7:51 AM | 8:14 AM | | (IEOC) | 9:03 AM | | 10:42 AM | 11:22 AM | | 12:57 PM | 1:57 PM | | 3:36 PM | 4:16 PM | | 4:43 PM |
| Fullerton dp. | 6:04 AM | 6:15 AM | 6:44 AM | 7:08 AM | 8:00 AM | 8:22 AM | | | 9:11 AM | | 10:50 AM | 11:30 AM | | 1:05 PM | 2:05 PM | | 3:45 PM | 4:25 PM | | 4:52 PM |
| Los Angeles Union Station ar. | 6:46 AM | 7:03 AM | 7:21 AM | 7:50 AM | 8:40 AM | 8:57 AM | | | 9:46 AM | | 11:25 AM | 12:05 PM | | 1:40 PM | 2:40 PM | | 4:21 PM | (FUL) | | 5:34 PM |
| *Equipment to:* | *SCAX* | *AMTK* | *SCAX* | *SCAX* | *SCAX* | *AMTK* | *OSD-S640* | *SCAX* | *SCAX* | *OSD-S644* | *AMTK* | *AMTK* | *OSD-S648* | *AMTK* | *AMTK* | *OSD-S654* | *AMTK* | *SCAX* | *OSD-S656* | *SCAX* |
| *COASTER and Amtrak SFD-OTC Trip Time* | | *0:53* | | | | *0:57* | *1:03* | | | *1:05* | *1:06* | *0:57* | *1:03* | *1:09* | *0:52* | *1:02* | *0:56* | | *1:02* | |

| | |
|---|---|
| *Oceanside Overnight Storage Need (Commuter: "SMMF"):* | *4* |
| *San Diego Midday Storage Need (Commuter: "MTS"):* | *3* |
| *Oceanside Midday Storage Need (Commuter: "SMMF-M"):* | *0* |
| *Commuter Trainsets Required for Revenue Service:* | *4* |
| *Total Commuter Trainsets Required (10% Spares):* | *5* |
| *DMU Trainsets Required for Revenue Service:* | *0* |

# BASE CASE

| Equipment ID: | SCAX8 | C1 | AMTK12 | SCAX9 | AMTK13 | SCAX10 | SCAX11 | AMTK14 | AMTK15 | SCAX12 | AMTK16 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *Equipment from:* | SCAX | OSD-N655 | AMTK | SCAX | AMTK | SCAX | SCAX | AMTK | AMTK | SCAX | AMTK |
| | OCL-S602 | OSD-S662 | PS-E582 | OCL-S604 | PS-E784 | OCL-S606 | OCL-S608 | PS-E790 | PS-E592 | OCL-S644 | PS-E796 |
| Los Angeles Union Station | 3:19 PM | | 4:08 PM | 4:30 PM | 5:10 PM | 5:46 PM | 6:40 PM | 7:31 PM | 8:25 PM | (FUL) | 10:10 PM |
| Fullerton | 3:56 PM | | 4:39 PM | 5:10 PM | 5:42 PM | 6:23 PM | 7:16 PM | 8:02 PM | 9:00 PM | 10:10 PM | 10:41 PM |
| Anaheim | 4:03 PM | | 4:47 PM | 5:17 PM | 5:51 PM | 6:31 PM | 7:23 PM | 8:10 PM | 9:09 PM | 10:18 PM | 10:49 PM |
| Santa Ana | 4:13 PM | | 4:56 PM | 5:27 PM | 6:00 PM | 6:42 PM | 7:33 PM | 8:19 PM | 9:19 PM | 10:27 PM | 10:59 PM |
| Irvine | 4:27 PM | | 5:09 PM | 5:41 PM | 6:13 PM | 6:56 PM | 7:47 PM | 8:32 PM | 9:30 PM | 10:41 PM | 11:09 PM |
| San Juan Capistrano | 4:46 PM | | 5:24 PM | 5:57 PM | 6:27 PM | 7:12 PM | 8:04 PM | 8:44 PM | 9:45 PM | 10:58 PM | 11:24 PM |
| San Clemente | 4:59 PM | | ↓ | 6:06 PM | ↓ | 7:22 PM | 8:17 PM | ↓ | ↓ | 11:07 PM | ↓ |
| Oceanside Transit Center | 5:28 PM | 5:41 PM | 6:01 PM | 6:37 PM | 7:03 PM | 7:54 PM | 8:46 PM | 9:20 PM | 10:19 PM | 11:35 PM | 11:57 PM |
| Carlsbad Village | | 5:46 PM | ↓ | | 7:08 PM | | | 9:25 PM | ↓ | | 12:02 AM |
| Carlsbad Poinsettia | | 5:51 PM | ↓ | | 7:14 PM | | | 9:31 PM | ↓ | | 12:08 AM |
| Encinitas | | 5:56 PM | ↓ | | 7:23 PM | | | 9:40 PM | ↓ | | 12:17 AM |
| Solana Beach | | 6:01 PM | 6:20 PM | | 7:29 PM | | | 9:46 PM | 10:35 PM | | 12:23 AM |
| Sorrento Valley | | 6:11 PM | ↓ | | 7:39 PM | | | 9:56 PM | ↓ | | 12:33 AM |
| Old Town San Diego | | 6:35 PM | 6:54 PM | | 8:01 PM | | | 10:18 PM | 11:05 PM | | 12:55 AM |
| Santa Fe Depot | | 6:45 PM | 7:02 PM | | 8:09 PM | | | 10:26 PM | 11:11 PM | | 1:03 AM |
| *Equipment to:* | *SCAX* | *OSD-N665* | *AMTK-N* | *SCAX* | *PS-W595* | *SCAX* | *SCAX* | *AMTK-N* | *AMTK-N* | *SCAX* | *AMTK-N* |
| *COASTER and Amtrak OTC-SFD Trip Time* | | *1:04* | *1:01* | | | | | *1:06* | *0:52* | | *1:06* |

**Daily Service Level**

| | |
|---|---|
| Surfliner | 12 |
| COASTER | 11 |
| Metrolink: OC Line | 6 |
| Metrolink: IEOC | 2 |

| Equipment ID: | AMTK9 | C4 | SCAX13 | AMTK10 | C1 | C3 | C2 | C4 | AMTK11 | C1 | AMTK13 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *Equipment from:* | *PS-E572* | *MTS* | *SCAX* | *PS-E774* | *OSD-S654* | *OSD-S656* | *MTS* | *OSD-S660* | *PS-E580* | *OSD-S662* | *PS-E784* |
| | PS-W583 | OSD-N653 | IEOC-N812 | PS-W785 | OSD-N655 | OSD-N657 | OSD-N661 | OSD-N663 | PS-W591 | OSD-N665 | PS-W595 |
| Convention Center | | | | | | | | | | | |
| Santa Fe Depot | 2:47 PM | 3:38 PM | | 3:58 PM | 4:23 PM | 4:55 PM | 5:40 PM | 6:26 PM | 6:50 PM | 7:15 PM | 8:59 PM |
| Old Town San Diego | 2:54 PM | 3:44 PM | | 4:05 PM | 4:29 PM | 5:01 PM | 5:46 PM | 6:32 PM | 6:57 PM | 7:21 PM | 9:06 PM |
| Sorrento Valley | ↓ | 4:06 PM | | ↓ | 4:51 PM | 5:24 PM | 6:08 PM | 6:54 PM | ↓ | 7:43 PM | 9:28 PM |
| Solana Beach | 3:28 PM | 4:17 PM | | 4:36 PM | 5:00 PM | 5:34 PM | 6:20 PM | 7:04 PM | 7:28 PM | 7:53 PM | 9:39 PM |
| Encinitas | ↓ | 4:23 PM | | ↓ | 5:08 PM | 5:40 PM | 6:26 PM | 7:10 PM | ↓ | 7:59 PM | 9:45 PM |
| Carlsbad Poinsettia | ↓ | 4:29 PM | | ↓ | 5:14 PM | 5:46 PM | 6:32 PM | 7:16 PM | ↓ | 8:05 PM | 9:51 PM |
| Carlsbad Village | ↓ | 4:35 PM | | ↓ | 5:21 PM | 5:52 PM | 6:38 PM | 7:22 PM | ↓ | 8:11 PM | 9:57 PM |
| Oceanside Transit Center | 3:45 PM | 4:41 PM | 4:25 PM | 4:53 PM | 5:28 PM | 5:58 PM | 6:45 PM | 7:30 PM | 7:44 PM | 8:18 PM | 10:03 PM |
| San Clemente | ↓ | | 4:53 PM | ↓ | | | | | ↓ | | ↓ |
| San Juan Capistrano | 4:22 PM | | 5:02 PM | 5:34 PM | | | | | 8:17 PM | | 10:35 PM |
| Irvine | 4:38 PM | | 5:18 PM | 5:49 PM | | | | | 8:32 PM | | 10:49 PM |
| Santa Ana | 4:51 PM | | 5:33 PM | 6:00 PM | | | | | 8:43 PM | | 11:01 PM |
| Anaheim | 5:01 PM | | (IEOC) | 6:10 PM | | | | | 8:52 PM | | 11:10 PM |
| Fullerton | 5:10 PM | | | 6:20 PM | | | | | 9:00 PM | | 11:18 PM |
| Los Angeles Union Station | 5:45 PM | | | 6:55 PM | | | | | 9:35 PM | | 11:52 PM |
| *Equipment to:* | *AMTK* | *OSD-S660* | *SCAX* | *AMTK* | *OSD-S662* | *SMMF* | *SMMF* | *SMMF* | *AMTK* | *SMMF* | *AMTK* |
| *COASTER and Amtrak SFD-OTC Trip Time* | *0:58* | *1:03* | | *0:55* | *1:05* | *1:03* | *1:05* | *1:04* | *0:54* | *1:03* | *1:04* |

**Daily Service Level**

| | |
|---|---|
| Surfliner | 12 |
| COASTER | 11 |
| Metrolink: OC Line | 6 |
| Metrolink: IEOC | 2 |

*Oceanside Overnight Storage Need (Commuter: "SMMF"):*
*San Diego Midday Storage Need (Commuter: "MTS"):*
*Oceanside Midday Storage Need (Commuter: "SMMF-M"):*

*Commuter Trainsets Required for Revenue Service:*
*Total Commuter Trainsets Required (10% Spares):*
*DMU Trainsets Required for Revenue Service:*

# 2020 Plan

Pad Time Addition
**Comm. Rail Min.Turnaround Time**

| **Equipment ID:** | **C1** | **C2** | **C3** | **C4** | **AMTK17** | **SCAX1** | **C5** | **C6** | **C1** | **AMTK5** | **AMTK6** | **C2** | **SCAX6** | **AMTK7** | **C1** | **AMTK8** | **AMTK9** | **AMTK10** | **C1** | **SCAX7** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Equipment from:* | SMMF | SMMF | SMMF | SMMF | AMTK | SCAX | SMMF | SMMF | OSD-N631 | AMTK | AMTK | OSD-N635 | SCAX | AMTK | OSD-N639 | AMTK | AMTK | AMTK | OSD-N645 | SCAX |
| | OSD-S630 | OSD-S634 | OSD-SX02 | OSD-S636 | PS-EX02 | IEOC-S803 | OSD-S638 | OSD-SX04 | OSD-S640 | PS-E562 | PS-E564 | OSD-S644 | OCL-S600 | PS-E566 | OSD-S648 | PS-E768 | PS-E572 | PS-E774 | OSD-S654 | IEOC-S815 |
| Los Angeles Union Station dp. | | | | | 5:00 AM | | | | | 6:08 AM | 7:25 AM | | 7:59 AM | 8:41 AM | | 9:55 AM | 11:20 AM | 12:33 PM | | |
| Fullerton dp. | | | | | 5:28 AM | | | | | 6:39 AM | 7:56 AM | | 8:33 AM | 9:12 AM | | 10:26 AM | 11:51 AM | 1:04 PM | | |
| Anaheim dp. | | | | | 5:36 AM | (IEOC) | | | | 6:48 AM | 8:04 AM | | 8:40 AM | 9:20 AM | | 10:34 AM | 11:59 AM | 1:12 PM | | (IEOC) |
| Santa Ana dp. | | | | | 5:45 AM | 5:53 AM | | | | 6:58 AM | 8:13 AM | | 8:50 AM | 9:29 AM | | 10:43 AM | 12:08 PM | 1:21 PM | | 1:40 PM |
| Irvine dp. | | | | | 5:59 AM | 6:07 AM | | | | 7:11 AM | 8:26 AM | | 9:04 AM | 9:40 AM | | 10:54 AM | 12:21 PM | 1:34 PM | | 1:54 PM |
| San Juan Capistrano dp. | | | | | 6:15 AM | 6:26 AM | | | | 7:26 AM | 8:42 AM | | 9:20 AM | 9:54 AM | | 11:09 AM | 12:41 PM | 1:49 PM | | 2:09 PM |
| San Clemente dp. | | | | | ↓ | 6:36 AM | | | | ↓ | ↓ | | 9:30 AM | ↓ | | ↓ | ↓ | ↓ | | 2:18 PM |
| Oceanside Transit Center dp. | 5:07 AM | 6:00 AM | 6:18 AM | 6:38 AM | 6:52 AM | 7:03 AM | 7:05 AM | 7:25 AM | 7:44 AM | 8:05 AM | 9:16 AM | 9:37 AM | 10:01 AM | 10:38 AM | 11:08 AM | 11:47 AM | 1:15 PM | 2:25 PM | 2:42 PM | 2:53 PM |
| Carlsbad Village dp. | 5:11 AM | 6:04 AM | 6:22 AM | 6:43 AM | ↓ | | 7:09 AM | 7:29 AM | 7:48 AM | ↓ | ↓ | 9:42 AM | | ↓ | 11:13 AM | ↓ | ↓ | ↓ | 2:47 PM | |
| Carlsbad Poinsettia dp. | 5:16 AM | 6:09 AM | 6:27 AM | 6:48 AM | ↓ | | 7:15 AM | 7:34 AM | 7:53 AM | ↓ | ↓ | 9:47 AM | | ↓ | 11:18 AM | ↓ | ↓ | ↓ | 2:52 PM | |
| Encinitas dp. | 5:22 AM | 6:14 AM | 6:33 AM | 6:54 AM | ↓ | | 7:20 AM | 7:40 AM | 7:59 AM | ↓ | ↓ | 9:54 AM | | ↓ | 11:25 AM | ↓ | ↓ | ↓ | 3:00 PM | |
| Solana Beach dp. | 5:27 AM | 6:19 AM | 6:38 AM | 7:02 AM | 7:16 AM | | 7:29 AM | 7:45 AM | 8:05 AM | 8:21 AM | 9:34 AM | 10:00 AM | | 10:56 AM | 11:33 AM | 12:08 PM | 1:31 PM | 2:43 PM | 3:05 PM | |
| Sorrento Valley dp. | 5:37 AM | 6:30 AM | 6:48 AM | 7:13 AM | ↓ | | 7:39 AM | 7:55 AM | 8:16 AM | ↓ | ↓ | 10:11 AM | | ↓ | 11:42 AM | ↓ | ↓ | ↓ | 3:14 PM | |
| Old Town San Diego dp. | 5:59 AM | 6:52 AM | 7:10 AM | 7:36 AM | ↓ | | 8:02 AM | 8:17 AM | 8:39 AM | ↓ | 10:08 AM | 10:33 AM | | 11:27 AM | 12:07 PM | 12:41 PM | 2:03 PM | 3:17 PM | 3:36 PM | |
| Santa Fe Depot ar. | 6:08 AM | 7:00 AM | 7:19 AM | 7:43 AM | 7:58 AM | | 8:09 AM | 8:26 AM | 8:48 AM | 8:58 AM | 10:16 AM | 10:40 AM | | 11:35 AM | 12:14 PM | 12:49 PM | 2:11 PM | 3:25 PM | 3:44 PM | |
| *Equipment to:* | *OSD-N631* | *OSD-N635* | *OSD-NX01* | *MTS* | *PS-W567* | *IEOC-N800* | *MTS* | *MTS* | *OSD-N639* | *PS-W769* | *PS-W573* | *MTS* | *SCAX* | *PS-W777* | *OSD-N645* | *PS-W579* | *PS-W583* | *PS-W785* | *OSD-N655* | *OCL-N609* |
| *COASTER and Amtrak OTC-SFD Trip Time* | *1:01* | *1:00* | *1:01* | *1:05* | *1:06* | | *1:04* | *1:01* | *1:04* | *0:53* | *1:00* | *1:03* | | *0:57* | *1:06* | *1:02* | *0:56* | *1:00* | *1:02* | |

| **Equipment ID:** | **SCAX1** | **AMTK1** | **SCAX2** | **SCAX3** | **SCAX4** | **AMTK2** | **C1** | **SCAX1** | **AMTK3** | **C2** | **C3** | **AMTK4** | **AMTK5** | **C1** | **AMTK6** | **AMTK7** | **C1** | **AMTK8** | **SCAX6** | **C4** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Equipment from:* | *SCAX* | *AMTK-N* | *SCAX* | *SCAX* | *SCAX* | *AMTK-N* | *OSD-S630* | *IEOC-S803* | *AMTK-N* | *OSD-S634* | *OSD-SX02* | *PS-EX02* | *PS-E562* | *OSD-S640* | *PS-E564* | *PS-E566* | *OSD-S648* | *PS-E768* | *SCAX-M* | *MTS* |
| | OCL-N601 | PS-W761 | OCL-N603 | OCL-N605 | OCL-N607 | PS-W763 | OSD-N631 | IEOC-N800 | PS-W565 | OSD-N635 | OSD-NX01 | PS-W567 | PS-W769 | OSD-N639 | PS-W573 | PS-W777 | OSD-N645 | PS-W579 | OCL-N641 | OSD-N651 |
| Santa Fe Depot dp. | | 4:00 AM | | | | 6:06 AM | 6:24 AM | | 6:57 AM | 7:20 AM | 7:59 AM | 8:23 AM | 9:18 AM | 9:40 AM | 10:41 AM | 11:57 AM | 12:51 PM | 1:33 PM | | 2:15 PM |
| Old Town San Diego dp. | | 4:07 AM | | | | 6:12 AM | 6:31 AM | | 7:04 AM | 7:26 AM | 8:05 AM | 8:30 AM | 9:25 AM | 9:46 AM | 10:48 AM | ↓ | 12:57 PM | 1:40 PM | | 2:21 PM |
| Sorrento Valley dp. | | ↓ | | | | ↓ | 6:52 AM | | ↓ | 7:48 AM | 8:28 AM | 8:54 AM | ↓ | 10:09 AM | 11:11 AM | ↓ | 1:19 PM | ↓ | | 2:43 PM |
| Solana Beach dp. | | 4:37 AM | | | | 6:44 AM | 7:02 AM | | 7:37 AM | 8:01 AM | 8:39 AM | 9:03 AM | 9:58 AM | 10:20 AM | 11:22 AM | 12:32 PM | 1:30 PM | 2:11 PM | | 2:53 PM |
| Encinitas dp. | | ↓ | | | | ↓ | 7:09 AM | | ↓ | 8:08 AM | 8:46 AM | 9:09 AM | ↓ | 10:26 AM | 11:30 AM | ↓ | 1:36 PM | ↓ | | 2:59 PM |
| Carlsbad Poinsettia dp. | | ↓ | | | | ↓ | 7:15 AM | | ↓ | 8:14 AM | 8:52 AM | 9:15 AM | ↓ | 10:32 AM | 11:36 AM | ↓ | 1:42 PM | ↓ | | 3:05 PM |
| Carlsbad Village dp. | | ↓ | | | | ↓ | 7:22 AM | | ↓ | 8:20 AM | 8:58 AM | 9:23 AM | ↓ | 10:38 AM | 11:42 AM | ↓ | 1:47 PM | ↓ | | 3:11 PM |
| Oceanside Transit Center dp. | 4:38 AM | 4:53 AM | 5:16 AM | 5:42 AM | 6:34 AM | 7:03 AM | 7:27 AM | 7:39 AM | 7:55 AM | 8:25 AM | 9:03 AM | 9:29 AM | 10:15 AM | 10:43 AM | 11:50 AM | 12:49 PM | 1:53 PM | 2:30 PM | 2:59 PM | 3:17 PM |
| San Clemente dp. | 5:02 AM | ↓ | 5:38 AM | 6:04 AM | 6:56 AM | ↓ | | 8:07 AM | ↓ | | | ↓ | ↓ | | ↓ | ↓ | | ↓ | 3:27 PM | |
| San Juan Capistrano dp. | 5:10 AM | 5:28 AM | 5:47 AM | 6:13 AM | 7:05 AM | 7:36 AM | | 8:16 AM | 8:27 AM | | | 10:07 AM | 10:47 AM | | 12:22 PM | 1:22 PM | | 3:01 PM | 3:36 PM | |
| Irvine dp. | 5:27 AM | 5:44 AM | 6:03 AM | 6:29 AM | 7:21 AM | 7:54 AM | | 8:32 AM | 8:42 AM | | | 10:22 AM | 11:01 AM | | 12:37 PM | 1:37 PM | | 3:16 PM | 3:52 PM | |
| Santa Ana dp. | 5:39 AM | 5:56 AM | 6:18 AM | 6:44 AM | 7:34 AM | 8:05 AM | | 8:47 AM | 8:54 AM | | | 10:33 AM | 11:12 AM | | 12:48 PM | 1:48 PM | | 3:27 PM | 4:07 PM | |
| Anaheim dp. | 5:52 AM | 6:06 AM | 6:26 AM | 6:53 AM | 7:44 AM | 8:14 AM | | (IEOC) | 9:03 AM | | | 10:42 AM | 11:22 AM | | 12:57 PM | 1:57 PM | | 3:36 PM | 4:16 PM | |
| Fullerton dp. | 5:59 AM | 6:15 AM | 6:35 AM | 7:02 AM | 7:51 AM | 8:22 AM | | | 9:11 AM | | | 10:50 AM | 11:30 AM | | 1:05 PM | 2:05 PM | | 3:45 PM | 4:25 PM | |
| Los Angeles Union Station ar. | 6:40 AM | 7:03 AM | 7:20 AM | 7:45 AM | 8:35 AM | 8:57 AM | | | 9:46 AM | | | 11:25 AM | 12:05 PM | | 1:40 PM | 2:40 PM | | 4:21 PM | (FUL) | |
| *Equipment to:* | *SCAX* | *AMTK* | *SCAX* | *SCAX* | *SCAX* | *AMTK-M* | *OSD-S640* | *SCAX* | *AMTK* | *OSD-S644* | *SMMF-M* | *AMTK* | *AMTK* | *OSD-S648* | *AMTK* | *AMTK* | *OSD-S654* | *AMTK* | *SCAX* | *OSD-SX06* |
| *COASTER and Amtrak SFD-OTC Trip Time* | | *0:53* | | | | *0:57* | *1:03* | | *0:58* | *1:05* | *1:04* | *1:06* | *0:57* | *1:03* | *1:09* | *0:52* | *1:02* | *0:57* | | *1:02* |

*Oceanside Overnight Storage Need (Commuter: "SMMF"):* *7*
*San Diego Midday Storage Need (Commuter: "MTS"):* *4*
*Oceanside Midday Storage Need (Commuter: "SMMF-M"):* *1*

*Commuter Trainsets Required for Revenue Service:* *7*
*Total Commuter Trainsets Required (10% Spares):* *8*

# 2020 Plan

Pad Time Addition
**Comm. Rail Min.Turnaround Time**

| **Equipment ID:** | **C7** | **C4** | **C3** | **AMTK11** | **C5** | **SCAX8** | **C1** | **AMTK12** | **SCAX9** | **AMTK13** | **SCAX10** | **SCAX11** | **AMTK14** | **AMTK15** | **SCAX12** | **AMTK16** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Equipment from:* | SMMF | OSD-N651 | *SMMF-M* | AMTK | OSD-N653 | SCAX | OSD-N655 | AMTK | SCAX | AMTK | SCAX | SCAX | AMTK | AMTK | SCAX | AMTK |
| | OSD-S656 | OSD-SX06 | OSD-SX08 | PS-E580 | OSD-S660 | OCL-S602 | OSD-S662 | PS-E582 | OCL-S604 | PS-E784 | OCL-S606 | OCL-S608 | PS-E790 | PS-E592 | OCL-S644 | PS-E796 |
| Los Angeles Union Station | | | | 2:58 PM | | 3:19 PM | | 4:08 PM | 4:30 PM | 5:10 PM | 5:46 PM | 6:40 PM | 7:31 PM | 8:25 PM | (FUL) | 10:10 PM |
| Fullerton | | | | 3:29 PM | | 3:56 PM | | 4:39 PM | 5:10 PM | 5:42 PM | 6:23 PM | 7:16 PM | 8:02 PM | 9:00 PM | 10:10 PM | 10:41 PM |
| Anaheim | | | | 3:37 PM | | 4:03 PM | | 4:47 PM | 5:17 PM | 5:51 PM | 6:31 PM | 7:23 PM | 8:10 PM | 9:09 PM | 10:18 PM | 10:49 PM |
| Santa Ana | | | | 3:46 PM | | 4:13 PM | | 4:56 PM | 5:27 PM | 6:00 PM | 6:42 PM | 7:33 PM | 8:19 PM | 9:19 PM | 10:27 PM | 10:59 PM |
| Irvine | | | | 3:56 PM | | 4:27 PM | | 5:09 PM | 5:41 PM | 6:13 PM | 6:56 PM | 7:47 PM | 8:32 PM | 9:30 PM | 10:41 PM | 11:09 PM |
| San Juan Capistrano | | | | 4:14 PM | | 4:46 PM | | 5:24 PM | 5:57 PM | 6:27 PM | 7:12 PM | 8:04 PM | 8:47 PM | 9:45 PM | 10:58 PM | 11:24 PM |
| San Clemente | | | | ↓ | | 4:59 PM | | ↓ | 6:06 PM | ↓ | 7:22 PM | 8:17 PM | ↓ | ↓ | 11:07 PM | ↓ |
| Oceanside Transit Center | 3:32 PM | 4:10 PM | 4:35 PM | 4:52 PM | 5:12 PM | 5:28 PM | 5:41 PM | 6:01 PM | 6:37 PM | 7:03 PM | 7:54 PM | 8:46 PM | 9:20 PM | 10:19 PM | 11:35 PM | 11:57 PM |
| Carlsbad Village | 3:36 PM | 4:14 PM | 4:40 PM | ↓ | 5:17 PM | | 5:46 PM | ↓ | | 7:08 PM | | | 9:25 PM | ↓ | | 12:03 AM |
| Carlsbad Poinsettia | 3:43 PM | 4:21 PM | 4:45 PM | ↓ | 5:22 PM | | 5:51 PM | ↓ | | 7:14 PM | | | 9:32 PM | ↓ | | 12:12 AM |
| Encinitas | 3:49 PM | 4:27 PM | 4:50 PM | ↓ | 5:28 PM | | 5:56 PM | ↓ | | 7:23 PM | | | 9:41 PM | ↓ | | 12:19 AM |
| Solana Beach | 3:54 PM | 4:32 PM | 4:55 PM | 5:11 PM | 5:35 PM | | 6:01 PM | 6:20 PM | | 7:29 PM | | | 9:47 PM | 10:36 PM | | 12:26 AM |
| Sorrento Valley | 4:03 PM | 4:41 PM | 5:05 PM | ↓ | 5:44 PM | | 6:11 PM | ↓ | | 7:39 PM | | | 9:57 PM | ↓ | | 12:36 AM |
| Old Town San Diego | 4:28 PM | 5:06 PM | 5:29 PM | ↓ | 6:08 PM | | 6:35 PM | 7:00 PM | | 8:01 PM | | | 10:19 PM | 11:12 PM | | 12:58 AM |
| Santa Fe Depot | 4:35 PM | 5:13 PM | 5:39 PM | 5:54 PM | 6:16 PM | | 6:45 PM | 7:08 PM | | 8:09 PM | | | 10:30 PM | 11:24 PM | | 1:06 AM |
| *Equipment to:* | *OSD-NX05* | *OSD-N661* | *OSD-NX07* | *PS-W591* | *OSD-N663* | *SCAX* | *OSD-N665* | *PS-WX01* | *SCAX* | *PS-W595* | *SCAX* | *SCAX* | *AMTK* | *AMTK* | *SCAX* | *AMTK* |
| *COASTER and Amtrak OTC-SFD Trip Time* | *1:03* | *1:03* | *1:04* | *1:02* | *1:04* | | *1:04* | *1:07* | | *1:06* | | | *1:10* | *1:05* | | *1:09* |

**Daily Service Level**

| | |
|---|---|
| **Surfliner** | 13 |
| COASTER | 15 |
| Metrolink: OC Line | 6 |
| Metrolink: IEOC Line | 2 |

| **Equipment ID:** | **SCAX7** | **AMTK9** | **C5** | **SCAX13** | **AMTK10** | **C1** | **C6** | **C2** | **C7** | **C4** | **C3** | **C5** | **AMTK11** | **C1** | **AMTK17** | **AMTK13** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Equipment from:* | *IEOC-S815* | *PS-E572* | *MTS* | *SCAX* | *PS-E774* | *OSD-S654* | *MTS* | *MTS* | *OSD-S656* | *OSD-SX06* | *OSD-SX08* | *OSD-S660* | *PS-E580* | *OSD-S662* | *PS-E582* | *PS-E784* |
| | OCL-N609 | PS-W583 | OSD-N653 | IEOC-N812 | PS-W785 | OSD-N655 | OSD-NX03 | OSD-N657 | OSD-NX05 | OSD-N661 | OSD-NX07 | OSD-N663 | PS-W591 | OSD-N665 | PS-WX01 | PS-W595 |
| Santa Fe Depot | | 2:47 PM | 3:38 PM | | 3:58 PM | 4:15 PM | 4:35 PM | 4:52 PM | 5:15 PM | 5:40 PM | 6:08 PM | 6:31 PM | 6:50 PM | 7:15 PM | 7:55 PM | 8:59 PM |
| Old Town San Diego | | 2:54 PM | 3:44 PM | | 4:05 PM | 4:21 PM | 4:41 PM | 4:59 PM | 5:21 PM | 5:46 PM | 6:14 PM | 6:37 PM | 6:57 PM | 7:21 PM | 8:02 PM | 9:06 PM |
| Sorrento Valley | | ↓ | 4:06 PM | | ↓ | 4:43 PM | 5:03 PM | 5:21 PM | 5:43 PM | 6:08 PM | 6:36 PM | 6:59 PM | ↓ | 7:43 PM | ↓ | 9:28 PM |
| Solana Beach | | 3:28 PM | 4:17 PM | | 4:36 PM | 4:52 PM | 5:12 PM | 5:31 PM | 5:55 PM | 6:20 PM | 6:46 PM | 7:09 PM | 7:28 PM | 7:53 PM | 8:33 PM | 9:39 PM |
| Encinitas | | ↓ | 4:23 PM | | ↓ | 5:00 PM | 5:20 PM | 5:34 PM | 6:01 PM | 6:26 PM | 6:52 PM | 7:15 PM | ↓ | 7:59 PM | ↓ | 9:45 PM |
| Carlsbad Poinsettia | | ↓ | 4:29 PM | | ↓ | 5:06 PM | 5:26 PM | 5:40 PM | 6:07 PM | 6:32 PM | 6:58 PM | 7:21 PM | ↓ | 8:05 PM | ↓ | 9:51 PM |
| Carlsbad Village | | ↓ | 4:35 PM | | ↓ | 5:13 PM | 5:33 PM | 5:46 PM | 6:13 PM | 6:38 PM | 7:04 PM | 7:27 PM | ↓ | 8:11 PM | ↓ | 9:57 PM |
| Oceanside Transit Center | 3:26 PM | 3:45 PM | 4:41 PM | 4:25 PM | 4:53 PM | 5:20 PM | 5:40 PM | 5:52 PM | 6:20 PM | 6:45 PM | 7:11 PM | 7:35 PM | 7:44 PM | 8:18 PM | 8:50 PM | 10:03 PM |
| San Clemente | 3:54 PM | ↓ | | 4:53 PM | ↓ | | | | | | | | ↓ | | ↓ | ↓ |
| San Juan Capistrano | 4:03 PM | 4:22 PM | | 5:02 PM | 5:34 PM | | | | | | | | 8:17 PM | | 9:31 PM | 10:35 PM |
| Irvine | 4:19 PM | 4:38 PM | | 5:18 PM | 5:49 PM | | | | | | | | 8:32 PM | | 9:46 PM | 10:49 PM |
| Santa Ana | 4:34 PM | 4:51 PM | | 5:33 PM | 6:00 PM | | | | | | | | 8:43 PM | | 9:57 PM | 11:01 PM |
| Anaheim | 4:43 PM | 5:01 PM | | (IEOC) | 6:10 PM | | | | | | | | 8:52 PM | | 10:07 PM | 11:10 PM |
| Fullerton | 4:52 PM | 5:10 PM | | | 6:20 PM | | | | | | | | 9:00 PM | | 10:17 PM | 11:18 PM |
| Los Angeles Union Station | 5:34 PM | 5:45 PM | | | 6:55 PM | | | | | | | | 9:35 PM | | 10:52 PM | 11:52 PM |
| *Equipment to:* | *SCAX* | *AMTK* | *OSD-S660* | *SCAX* | *AMTK* | *OSD-S662* | *SMMF* | *SMMF* | *SMMF* | *SMMF* | *SMMF* | *SMMF* | *AMTK* | *SMMF* | *AMTK* | *AMTK* |
| *COASTER and Amtrak SFD-OTC Trip Time* | | *0:58* | *1:03* | | *0:55* | *1:05* | *1:05* | *1:00* | *1:05* | *1:05* | *1:03* | *1:04* | *0:54* | *1:03* | *0:55* | *1:04* |

**Daily Service Level**

| | |
|---|---|
| **Surfliner** | 13 |
| COASTER | 15 |
| Metrolink: OC Line | 6 |
| Metrolink: IEOC Line | 2 |

*Oceanside Overnight Storage Need (Commuter: "SMMF"):*
*San Diego Midday Storage Need (Commuter: "MTS"):*
*Oceanside Midday Storage Need (Commuter: "SMMF-M"):*

*Commuter Trainsets Required for Revenue Service:*
*Total Commuter Trainsets Required (10% Spares):*

# 2035 Plan

Pad Time Addition
**Comm. Rail Min.Turnaround Time**

| **Equipment ID:** | | **C1** | **C2** | **C3** | **C4** | **C5** | **C6** | **AMTK5** | **C1** | **C7** | **C8** | **AMTK6** | **SCAX7** | **C2** | **AMTK7** | **C3** | **SCAX8** | **AMTK8** | **SCAX9** | **C7** | **AMTK9** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Equipment from:* | | SMMF | SMMF | SMMF | SMMF | SMMF | SMMF | AMTK | OSD-N01 | SMMF | SMMF | AMTK | SCAX | OSD-N02 | AMTK | OSD-N03 | SCAX | AMTK | SCAX | OSD-N06 | AMTK |
| | | OSD-S01 | OSD-S02 | OSD-S03 | OSD-S04 | OSD-S05 | OSD-S06 | PS-E01 | OSD-S07 | OSD-S08 | OSD-S09 | PS-E02 | OCL-S01 | OSD-S10 | PS-E03 | OSD-S11 | IEOC-S01 | PS-E04 | OCL-S02 | OSD-S12 | PS-E05 |
| Los Angeles Union Station | dp. | | | | | | | 5:11 AM | | | | 6:20 AM | 6:22 AM | | 7:03 AM | | | 8:24 AM | 8:27 AM | | 9:23 AM |
| Fullerton | dp. | | | | | | | 5:38 AM | | | | 6:52 AM | 7:04 AM | | 7:33 AM | | | 8:54 AM | 9:09 AM | | 9:53 AM |
| Anaheim | dp. | | | | | | | 5:46 AM | | | | 7:00 AM | 7:13 AM | | 7:41 AM | | (IEOC) | 9:02 AM | 9:18 AM | | 10:01 AM |
| Santa Ana | dp. | | | | | | | 5:55 AM | | | | 7:09 AM | 7:22 AM | | 7:50 AM | | 8:17 AM | 9:11 AM | 9:27 AM | | 10:10 AM |
| Irvine | dp. | | | | | | | 6:07 AM | | | | 7:21 AM | 7:37 AM | | 8:02 AM | | 8:31 AM | 9:23 AM | 9:42 AM | | 10:22 AM |
| San Juan Capistrano | dp. | | | | | | | 6:21 AM | | | | 7:35 AM | 7:53 AM | | 8:16 AM | | 8:46 AM | 9:37 AM | 9:58 AM | | 10:36 AM |
| San Clemente | dp. | | | | | | | ↓ | | | | ↓ | 8:02 AM | | ↓ | | 8:55 AM | ↓ | 10:07 AM | | ↓ |
| Camp Pendleton | dp. | | | 5:24 AM | | 6:12 AM | | ↓ | 7:02 AM | | | ↓ | ↓ | 8:27 AM | ↓ | 9:02 AM | ↓ | ↓ | ↓ | 10:33 AM | ↓ |
| Oceanside Transit Center | dp. | 3:55 AM | 5:07 AM | 5:35 AM | 6:01 AM | 6:23 AM | 6:41 AM | 6:54 AM | 7:11 AM | 7:27 AM | 7:48 AM | 8:08 AM | 8:30 AM | 8:36 AM | 8:49 AM | 9:13 AM | 9:25 AM | 10:10 AM | 10:35 AM | 10:44 AM | 11:09 AM |
| Carlsbad Village | dp. | 3:59 AM | 5:11 AM | 5:39 AM | 6:05 AM | 6:27 AM | 6:45 AM | ↓ | 7:15 AM | 7:31 AM | 7:52 AM | ↓ | | 8:40 AM | ↓ | 9:17 AM | | ↓ | | 10:48 AM | ↓ |
| Carlsbad Poinsettia | dp. | 4:05 AM | 5:17 AM | 5:45 AM | 6:11 AM | 6:33 AM | 6:51 AM | ↓ | 7:21 AM | 7:37 AM | 7:58 AM | ↓ | | 8:46 AM | ↓ | 9:23 AM | | ↓ | | 10:54 AM | ↓ |
| Encinitas | dp. | 4:11 AM | 5:23 AM | 5:51 AM | 6:17 AM | 6:39 AM | 6:57 AM | ↓ | 7:27 AM | 7:43 AM | 8:04 AM | ↓ | | 8:52 AM | ↓ | 9:29 AM | | ↓ | | 11:00 AM | ↓ |
| Solana Beach | dp. | 4:17 AM | 5:29 AM | 5:57 AM | 6:23 AM | 6:45 AM | 7:03 AM | 7:10 AM | 7:33 AM | 7:49 AM | 8:10 AM | 8:24 AM | | 8:58 AM | 9:05 AM | 9:35 AM | | 10:26 AM | | 11:06 AM | 11:25 AM |
| Sorrento Valley | dp. | 4:26 AM | 5:38 AM | 6:06 AM | 6:32 AM | 6:54 AM | 7:12 AM | ↓ | 7:42 AM | 7:58 AM | 8:19 AM | ↓ | | 9:07 AM | ↓ | 9:44 AM | | ↓ | | 11:15 AM | ↓ |
| Old Town San Diego | dp. | 4:47 AM | 5:57 AM | 6:27 AM | 6:54 AM | 7:15 AM | 7:33 AM | 7:40 AM | 8:03 AM | 8:19 AM | 8:40 AM | ↓ | | 9:28 AM | ↓ | 10:05 AM | | 10:56 AM | | 11:36 AM | 11:55 AM |
| Santa Fe Depot | ar. | 4:55 AM | 6:05 AM | 6:35 AM | 7:02 AM | 7:26 AM | 7:41 AM | 7:46 AM | 8:11 AM | 8:29 AM | 8:48 AM | 8:59 AM | | 9:36 AM | 9:40 AM | 10:13 AM | | 11:02 AM | | 11:44 AM | 12:01 PM |
| Convention Center | ar. | | | 6:41 AM | | | 7:47 AM | | | | | | | | | 10:19 AM | | | | 11:50 AM | |
| *Equipment to:* | | *OSD-N01* | *OSD-N02* | *MTS* | *OSD-N03* | *OSD-N04* | *MTS* | *PS-W05* | *OSD-N05* | *OSD-N06* | *OSD-N07* | *PS-W06* | *SCAX-M* | *OSD-N08* | *PS-W07* | *MTS* | *SCAX-M* | *PS-W08* | *SCAX-M* | *MTS* | *PS-W09* |
| *COASTER and Amtrak OTC-SFD Trip Time* | | *1:00* | *0:58* | *1:00* | *1:01* | *1:03* | *1:00* | *0:52* | *1:00* | *1:02* | *1:00* | *0:51* | | *1:00* | *0:51* | *1:00* | | *0:52* | | *1:00* | *0:52* |

| **Equipment ID:** | | **SCAX1** | **SCAX2** | **AMTK1** | **SCAX3** | **C1** | **SCAX4** | **AMTK2** | **SCAX5** | **C2** | **SCAX6** | **AMTK3** | **C3** | **C5** | **AMTK4** | **C6** | **C7** | **AMTK5** | **C8** | **AMTK6** | **C2** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Equipment from:* | | *SCAX-YD* | *SCAX-YD* | *AMTK-YD* | *SCAX-YD* | *OSD-S01* | *SCAX-YD* | *AMTK* | *SCAX-YD* | *OSD-S02* | *SCAX-YD* | *AMTK* | *OSD-S03* | *OSD-S05* | *AMTK* | *OSD-S06* | *OSD-S08* | *PS-E01* | *OSD-S09* | *PS-E02* | *OSD-S10* |
| | | OCL-N01 | IEOC-N01 | PS-W01 | OCL-N02 | OSD-N01 | OCL-N03 | PS-W02 | OCL-N04 | OSD-N02 | OCL-N05 | PS-W03 | OSD-N03 | OSD-N04 | PS-W04 | OSD-N05 | OSD-N06 | PS-W05 | OSD-N07 | PS-W06 | OSD-N08 |
| Convention Center | dp. | | | | | | | | | | | | | | | | | | 9:21 AM | | |
| Santa Fe Depot | dp. | | | 5:10 AM | | 5:30 AM | | 6:06 AM | | 6:30 AM | | 7:04 AM | 7:34 AM | 7:57 AM | 8:09 AM | 8:30 AM | 8:54 AM | 9:12 AM | 9:29 AM | 10:12 AM | 10:29 AM |
| Old Town San Diego | dp. | | | ↓ | | 5:36 AM | | ↓ | | 6:36 AM | | 7:09 AM | 7:40 AM | 8:04 AM | 8:14 AM | 8:36 AM | 9:00 AM | 9:17 AM | 9:35 AM | 10:17 AM | 10:35 AM |
| Sorrento Valley | dp. | | | ↓ | | 5:55 AM | | ↓ | | 6:55 AM | | ↓ | 7:59 AM | 8:23 AM | ↓ | 8:55 AM | 9:19 AM | ↓ | 9:54 AM | ↓ | 10:54 AM |
| Solana Beach | dp. | | | 5:43 AM | | 6:04 AM | | 6:39 AM | | 7:04 AM | | 7:39 AM | 8:08 AM | 8:32 AM | 8:44 AM | 9:04 AM | 9:28 AM | 9:47 AM | 10:03 AM | 10:47 AM | 11:03 AM |
| Encinitas | dp. | | | ↓ | | 6:09 AM | | ↓ | | 7:09 AM | | ↓ | 8:13 AM | 8:37 AM | ↓ | 9:09 AM | 9:33 AM | ↓ | 10:08 AM | ↓ | 11:08 AM |
| Carlsbad Poinsettia | dp. | | | ↓ | | 6:14 AM | | ↓ | | 7:14 AM | | ↓ | 8:18 AM | 8:42 AM | ↓ | 9:14 AM | 9:38 AM | ↓ | 10:13 AM | ↓ | 11:13 AM |
| Carlsbad Village | dp. | | | ↓ | | 6:19 AM | | ↓ | | 7:19 AM | | ↓ | 8:23 AM | 8:47 AM | ↓ | 9:19 AM | 9:43 AM | ↓ | 10:18 AM | ↓ | 11:18 AM |
| Oceanside Transit Center | dp. | 5:25 AM | 5:43 AM | 6:00 AM | 6:08 AM | 6:26 AM | 6:30 AM | 6:56 AM | 7:05 AM | 7:26 AM | 7:30 AM | 7:56 AM | 8:30 AM | 8:54 AM | 9:01 AM | 9:26 AM | 9:47 AM | 10:04 AM | 10:25 AM | 11:04 AM | 11:25 AM |
| Camp Pendleton | dp. | ↓ | ↓ | ↓ | ↓ | 6:37 AM | ↓ | ↓ | ↓ | 7:37 AM | ↓ | ↓ | 8:38 AM | | ↓ | 9:37 AM | 9:55 AM | ↓ | 10:36 AM | ↓ | |
| San Clemente | dp. | 5:53 AM | 6:11 AM | ↓ | 6:32 AM | | 6:58 AM | ↓ | 7:33 AM | | 7:58 AM | ↓ | | | ↓ | | | ↓ | | ↓ | |
| San Juan Capistrano | dp. | 6:02 AM | 6:20 AM | 6:34 AM | 6:45 AM | | 7:07 AM | 7:26 AM | 7:42 AM | | 8:07 AM | 8:26 AM | | | 9:31 AM | | | 10:34 AM | | 11:34 AM | |
| Irvine | dp. | 6:18 AM | 6:35 AM | 6:49 AM | 7:03 AM | | 7:23 AM | 7:41 AM | 7:58 AM | | 8:23 AM | 8:41 AM | | | 9:46 AM | | | 10:49 AM | | 11:49 AM | |
| Santa Ana | dp. | 6:33 AM | 6:50 AM | 7:00 AM | 7:18 AM | | 7:38 AM | 7:52 AM | 8:13 AM | | 8:38 AM | 8:52 AM | | | 9:57 AM | | | 11:00 AM | | 12:00 PM | |
| Anaheim | dp. | 6:42 AM | (IEOC) | 7:09 AM | 7:27 AM | | 7:47 AM | 8:01 AM | 8:22 AM | | 8:47 AM | 9:01 AM | | | 10:06 AM | | | 11:09 AM | | 12:09 PM | |
| Fullerton | dp. | 6:51 AM | | 7:17 AM | 7:36 AM | | 7:56 AM | 8:09 AM | 8:31 AM | | 8:56 AM | 9:09 AM | | | 10:14 AM | | | 11:17 AM | | 12:17 PM | |
| Los Angeles Union Station | ar. | 7:33 AM | | 7:41 AM | 8:13 AM | | 8:38 AM | 8:29 AM | (FUL) | | 9:38 AM | 9:43 AM | | | 10:46 AM | | | 11:51 AM | | 12:47 PM | |
| *Equipment to:* | | *SCAX* | *SCAX* | *AMTK* | *SCAX* | *OSD-S07* | *SCAX* | *AMTK* | *SCAX* | *OSD-S10* | *SCAX* | *AMTK* | *OSD-S11* | *SMMF-M* | *AMTK* | *SMMF-M* | *OSD-S12* | *AMTK* | *OSD-S13* | *AMTK* | *SMMF-M* |
| *COASTER and Amtrak SFD-OTC Trip Time* | | | | *0:50* | | *0:56* | | *0:50* | | *0:56* | | *0:52* | *0:56* | *0:57* | *0:52* | *0:56* | *0:53* | *0:52* | *0:56* | *0:52* | *0:56* |

| | |
|---|---|
| *Oceanside Overnight Storage Need (Commuter: "SMMF"):* | *9* |
| *San Diego Midday Storage Need (Commuter: "MTS"):* | *4* |
| *Oceanside Midday Storage Need (Commuter: "SMMF-M"):* | *3* |
| *Commuter Trainsets Required for Revenue Service:* | *9* |
| *Total Commuter Trainsets Required (10% Spares):* | *10* |

# 2035 Plan

Pad Time Addition
**Comm. Rail Min.Turnaround Time**

| **Equipment ID:** | **C8** | **AMTK10** | **C9** | **AMTK11** | **C4** | **AMTK12** | **SCAX10** | **C1** | **AMTK13** | **C5** | **C8** | **AMTK14** | **C9** | **C6** | **AMTK15** | **C3** | **SCAX11** | **C2** | **AMTK16** | **C1** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Equipment from:* | OSD-N07 | AMTK | SMMF | AMTK | OSD-N09 | AMTK | SCAX | OSD-N10 | AMTK | SMMF-M | OSD-N11 | AMTK | OSD-N12 | SMMF-M | AMTK | OSD-N14 | SCAX | SMMF-M | AMTK | OSD-N15 |
| | OSD-S13 | PS-E06 | OSD-S14 | PS-E07 | OSD-S15 | PS-E08 | IEOC-S02 | OSD-S16 | PS-E09 | OSD-S17 | OSD-S18 | PS-E10 | OSD-S19 | OSD-S20 | PS-E11 | OSD-S21 | OCL-S03 | OSD-S22 | PS-E12 | OSD-S23 |
| Los Angeles Union Station | | 10:13 AM | | 11:22 AM | | 12:22 PM | | | 1:18 PM | | | 2:17 PM | | | 3:19 PM | | 3:27 PM | | 4:19 PM | |
| Fullerton | | 10:43 AM | | 11:52 AM | | 12:51 PM | | | 1:45 PM | | | 2:47 PM | | | 3:49 PM | | 4:06 PM | | 4:49 PM | |
| Anaheim | | 10:51 AM | | 12:00 PM | | 12:59 PM | (IEOC) | | 1:53 PM | | | 2:55 PM | | | 3:57 PM | | 4:15 PM | | 4:57 PM | |
| Santa Ana | | 11:00 AM | | 12:09 PM | | 1:08 PM | 1:27 PM | | 2:02 PM | | | 3:04 PM | | | 4:06 PM | | 4:24 PM | | 5:06 PM | |
| Irvine | | 11:12 AM | | 12:21 PM | | 1:20 PM | 1:42 PM | | 2:14 PM | | | 3:16 PM | | | 4:18 PM | | 4:39 PM | | 5:18 PM | |
| San Juan Capistrano | | 11:26 AM | | 12:35 PM | | 1:34 PM | 1:58 PM | | 2:28 PM | | | 3:30 PM | | | 4:32 PM | | 4:55 PM | | 5:32 PM | |
| San Clemente | | ↓ | | ↓ | | ↓ | 2:10 PM | | ↓ | | | ↓ | | | ↓ | | 5:04 PM | | ↓ | |
| Camp Pendleton | 11:28 AM | ↓ | 12:20 PM | ↓ | 1:20 PM | ↓ | ↓ | 2:29 PM | ↓ | 3:04 PM | 3:33 PM | ↓ | | 4:36 PM | ↓ | | ↓ | 5:35 PM | ↓ | 6:18 PM |
| Oceanside Transit Center | 11:39 AM | 11:56 AM | 12:29 PM | 1:08 PM | 1:29 PM | 2:10 PM | 2:39 PM | 2:35 PM | 3:06 PM | 3:12 PM | 3:42 PM | 4:06 PM | 4:22 PM | 4:44 PM | 5:08 PM | 5:24 PM | 5:32 PM | 5:48 PM | 6:05 PM | 6:27 PM |
| Carlsbad Village | 11:42 AM | ↓ | 12:33 PM | ↓ | 1:33 PM | ↓ | | 2:39 PM | ↓ | 3:16 PM | 3:46 PM | ↓ | 4:26 PM | 4:48 PM | ↓ | 5:28 PM | | 5:52 PM | ↓ | 6:31 PM |
| Carlsbad Poinsettia | 11:48 AM | ↓ | 12:39 PM | ↓ | 1:39 PM | ↓ | | 2:45 PM | ↓ | 3:22 PM | 3:52 PM | ↓ | 4:32 PM | 4:54 PM | ↓ | 5:34 PM | | 5:58 PM | ↓ | 6:37 PM |
| Encinitas | 11:54 AM | ↓ | 12:45 PM | ↓ | 1:45 PM | ↓ | | 2:51 PM | ↓ | 3:28 PM | 3:58 PM | ↓ | 4:38 PM | 5:00 PM | ↓ | 5:40 PM | | 6:04 PM | ↓ | 6:43 PM |
| Solana Beach | 12:00 PM | 12:15 PM | 12:51 PM | 1:24 PM | 1:51 PM | 2:27 PM | | 2:57 PM | 3:23 PM | 3:34 PM | 4:04 PM | 4:22 PM | 4:44 PM | 5:06 PM | 5:24 PM | 5:46 PM | | 6:10 PM | 6:21 PM | 6:49 PM |
| Sorrento Valley | 12:09 PM | ↓ | 1:00 PM | ↓ | 2:00 PM | ↓ | | 3:06 PM | ↓ | 3:43 PM | 4:13 PM | ↓ | 4:53 PM | 5:15 PM | ↓ | 5:55 PM | | 6:19 PM | ↓ | 6:58 PM |
| Old Town San Diego | 12:30 PM | 12:45 PM | 1:21 PM | 1:54 PM | 2:21 PM | 2:57 PM | | 3:27 PM | 3:53 PM | 4:04 PM | 4:34 PM | 4:52 PM | 5:13 PM | 5:36 PM | 5:54 PM | 6:16 PM | | 6:41 PM | ↓ | 7:17 PM |
| Santa Fe Depot | 12:38 PM | 12:51 PM | 1:29 PM | 2:07 PM | 2:29 PM | 3:03 PM | | 3:35 PM | 3:59 PM | 4:12 PM | 4:42 PM | 4:58 PM | 5:21 PM | 5:44 PM | 6:00 PM | 6:24 PM | | 6:49 PM | 6:56 PM | 7:25 PM |
| Convention Center | | | 1:35 PM | | | | | 3:41 PM | | | 4:48 PM | | | | | | | 6:55 PM | | |
| *Equipment to:* | *OSD-N11* | *PS-W10* | *OSD-N12* | *PS-W11* | *OSD-N13* | *PS-W12* | *OCL-N07* | *OSD-N15* | *PS-W13* | *OSD-N16* | *OSD-N17* | *PS-W14* | *OSD-N18* | *OSD-N19* | *PS-W15* | *OSD-N21* | *SCAX-YD* | *OSD-N22* | *PS-W16* | *OSD-N23* |
| *COASTER and Amtrak OTC-SFD Trip Time* | *0:59* | *0:55* | *1:00* | *0:59* | *1:00* | *0:53* | | *1:00* | *0:53* | *1:00* | *1:00* | *0:52* | *0:59* | *1:00* | *0:52* | *1:00* | | *1:01* | *0:51* | *0:58* |

| **Equipment ID:** | **AMTK7** | **C4** | **AMTK8** | **C1** | **AMTK9** | **C8** | **SCAX7** | **AMTK10** | **SCAX8** | **SCAX10** | **C9** | **AMTK11** | **C4** | **SCAX9** | **C3** | **AMTK12** | **C1** | **C5** | **AMTK13** | **C8** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Equipment from:* | *PS-E03* | *MTS* | *PS-E04* | *MTS* | *PS-E05* | *OSD-S13* | *SCAX-YD* | *PS-E06* | *SCAX-YD* | *IEOC-S02* | *OSD-S14* | *PS-E07* | *OSD-S15* | *SCAX-YD* | *MTS* | *PS-E08* | *OSD-S16* | *OSD-S17* | *PS-E09* | *OSD-S18* |
| | PS-W07 | OSD-N09 | PS-W08 | OSD-N10 | PS-W09 | OSD-N11 | IEOC-N02 | PS-W10 | OCL-N06 | OCL-N07 | OSD-N12 | PS-W11 | OSD-N13 | OCL-N08 | OSD-N14 | PS-W12 | OSD-N15 | OSD-N16 | PS-W13 | OSD-N17 |
| Convention Center | | 11:51 AM | | 12:51 PM | | | | | | | 2:35 PM | | | | 3:42 PM | | 4:26 PM | | | 5:27 PM |
| Santa Fe Depot | 11:12 AM | 11:59 AM | 12:12 PM | 12:59 PM | 1:12 PM | 1:30 PM | | 2:12 PM | | | 2:43 PM | 3:13 PM | 3:30 PM | | 3:49 PM | 4:04 PM | 4:32 PM | 4:57 PM | 5:10 PM | 5:34 PM |
| Old Town San Diego | 11:17 AM | 12:05 PM | 12:17 PM | 1:05 PM | 1:17 PM | 1:36 PM | | 2:17 PM | | | 2:50 PM | ↓ | 3:36 PM | | 3:55 PM | ↓ | 4:39 PM | 5:03 PM | ↓ | 5:40 PM |
| Sorrento Valley | ↓ | 12:24 PM | ↓ | 1:24 PM | ↓ | 1:55 PM | | ↓ | | | 3:09 PM | ↓ | 3:55 PM | | 4:14 PM | ↓ | 4:58 PM | 5:22 PM | ↓ | 5:59 PM |
| Solana Beach | 11:47 AM | 12:33 PM | 12:47 PM | 1:33 PM | 1:47 PM | 2:04 PM | | 2:47 PM | | | 3:18 PM | 3:46 PM | 4:04 PM | | 4:23 PM | 4:38 PM | 5:07 PM | 5:31 PM | 5:43 PM | 6:08 PM |
| Encinitas | ↓ | 12:38 PM | ↓ | 1:38 PM | ↓ | 2:09 PM | | ↓ | | | 3:23 PM | ↓ | 4:09 PM | | 4:28 PM | ↓ | 5:12 PM | 5:36 PM | ↓ | 6:13 PM |
| Carlsbad Poinsettia | ↓ | 12:43 PM | ↓ | 1:43 PM | ↓ | 2:14 PM | | ↓ | | | 3:28 PM | ↓ | 4:14 PM | | 4:33 PM | ↓ | 5:17 PM | 5:41 PM | ↓ | 6:18 PM |
| Carlsbad Village | ↓ | 12:48 PM | ↓ | 1:48 PM | ↓ | 2:19 PM | | ↓ | | | 3:33 PM | ↓ | 4:19 PM | | 4:38 PM | ↓ | 5:22 PM | 5:46 PM | ↓ | 6:23 PM |
| Oceanside Transit Center | 12:04 PM | 12:52 PM | 1:04 PM | 1:52 PM | 2:04 PM | 2:23 PM | 2:38 PM | 3:04 PM | 3:10 PM | 3:30 PM | 3:40 PM | 4:03 PM | 4:26 PM | 4:33 PM | 4:45 PM | 4:56 PM | 5:29 PM | 5:53 PM | 6:00 PM | 6:30 PM |
| Camp Pendleton | ↓ | 12:56 PM | ↓ | 1:56 PM | ↓ | 2:31 PM | ↓ | ↓ | ↓ | ↓ | | ↓ | 4:37 PM | ↓ | | ↓ | 5:40 PM | | ↓ | 6:38 PM |
| San Clemente | ↓ | | ↓ | | ↓ | | 3:02 PM | ↓ | 3:35 PM | 3:58 PM | | ↓ | | 4:58 PM | | ↓ | | | ↓ | |
| San Juan Capistrano | 12:34 PM | | 1:34 PM | | 2:34 PM | | 3:11 PM | 3:34 PM | 3:44 PM | 4:07 PM | | 4:34 PM | | 5:07 PM | | 5:25 PM | | | 6:30 PM | |
| Irvine | 12:49 PM | | 1:49 PM | | 2:49 PM | | 3:27 PM | 3:49 PM | 4:03 PM | 4:23 PM | | 4:49 PM | | 5:23 PM | | 5:41 PM | | | 6:45 PM | |
| Santa Ana | 1:00 PM | | 2:00 PM | | 3:00 PM | | 3:42 PM | 4:00 PM | 4:18 PM | 4:38 PM | | 5:00 PM | | 5:38 PM | | 5:52 PM | | | 6:56 PM | |
| Anaheim | 1:09 PM | | 2:09 PM | | 3:09 PM | | (IEOC) | 4:09 PM | 4:27 PM | 4:47 PM | | 5:09 PM | | 5:47 PM | | 6:01 PM | | | 7:05 PM | |
| Fullerton | 1:17 PM | | 2:17 PM | | 3:17 PM | | | 4:17 PM | 4:36 PM | 4:56 PM | | 5:17 PM | | 5:56 PM | | 6:09 PM | | | 7:13 PM | |
| Los Angeles Union Station | 1:47 PM | | 2:48 PM | | 3:52 PM | | | 4:48 PM | (FUL) | 5:38 PM | | 5:44 PM | | 6:38 PM | | 6:41 PM | | | 7:37 PM | |
| *Equipment to:* | *AMTK* | *OSD-S15* | *AMTK* | *OSD-S16* | *AMTK* | *OSD-S18* | *SCAX* | *AMTK* | *SCAX* | *SCAX* | *OSD-S19* | *AMTK* | *SMMF* | *SCAX* | *OSD-S21* | *AMTK* | *OSD-S23* | *OSD-S24* | *AMTK* | *SMMF* |
| *COASTER and Amtrak SFD-OTC Trip Time* | *0:52* | *0:53* | *0:52* | *0:53* | *0:52* | *0:53* | | *0:52* | | | *0:57* | *0:50* | *0:56* | | *0:56* | *0:52* | *0:57* | *0:56* | *0:50* | *0:56* |

*Oceanside Overnight Storage Need (Commuter: "SMMF"):*
*San Diego Midday Storage Need (Commuter: "MTS"):*
*Oceanside Midday Storage Need (Commuter: "SMMF-M"):*

*Commuter Trainsets Required for Revenue Service:*
*Total Commuter Trainsets Required (10% Spares):*

# 2035 Plan

Pad Time Addition
**Comm. Rail Min.Turnaround Time**

| **Equipment ID:** | **SCAX12** | **C5** | **SCAX13** | **AMTK17** | **C9** | **SCAX14** | **AMTK18** | **C3** | **AMTK19** | **C1** | **AMTK20** | **AMTK21** | **SCAX15** | **AMTK22** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Equipment from:* | SCAX | OSD-N16 | SCAX | AMTK | OSD-N18 | SCAX | AMTK | OSD-N21 | AMTK | OSD-N23 | AMTK | AMTK | SCAX | AMTK |
| | OCL-S04 | OSD-S24 | OCL-S05 | PS-E13 | OSD-S25 | OCL-S06 | PS-E14 | OSD-S26 | PS-E15 | OSD-S27 | PS-E16 | PS-E17 | OCL-S07 | PS-E18 |
| Los Angeles Union Station | 4:27 PM | | (FUL) | 5:14 PM | | 5:22 PM | 6:19 PM | | 7:26 PM | | 8:20 PM | 9:00 PM | (FUL) | 10:14 PM |
| Fullerton | 5:06 PM | | 5:31 PM | 5:46 PM | | 6:04 PM | 6:49 PM | | 7:56 PM | | 8:50 PM | 9:33 PM | 9:44 PM | 10:44 PM |
| Anaheim | 5:15 PM | | 5:40 PM | 5:54 PM | | 6:13 PM | 6:57 PM | | 8:04 PM | | 8:58 PM | 9:41 PM | 9:53 PM | 10:52 PM |
| Santa Ana | 5:24 PM | | 5:49 PM | 6:03 PM | | 6:22 PM | 7:06 PM | | 8:13 PM | | 9:07 PM | 9:50 PM | 10:02 PM | 11:01 PM |
| Irvine | 5:39 PM | | 6:04 PM | 6:15 PM | | 6:37 PM | 7:18 PM | | 8:25 PM | | 9:19 PM | 10:02 PM | 10:17 PM | 11:13 PM |
| San Juan Capistrano | 5:55 PM | | 6:20 PM | 6:29 PM | | 6:53 PM | 7:32 PM | | 8:39 PM | | 9:33 PM | 10:16 PM | 10:33 PM | 11:27 PM |
| San Clemente | 6:04 PM | | 6:29 PM | ↓ | | 7:02 PM | ↓ | | ↓ | | ↓ | ↓ | 10:42 PM | ↓ |
| Camp Pendleton | ↓ | | ↓ | ↓ | 7:26 PM | ↓ | ↓ | | ↓ | 9:40 PM | ↓ | ↓ | ↓ | ↓ |
| Oceanside Transit Center | 6:32 PM | 6:48 PM | 6:57 PM | 7:02 PM | 7:35 PM | 7:30 PM | 8:04 PM | 8:29 PM | 9:12 PM | 9:49 PM | 10:06 PM | 10:49 PM | 11:10 PM | 12:00 AM |
| Carlsbad Village | | 6:52 PM | | ↓ | 7:39 PM | | ↓ | 8:33 PM | ↓ | 9:53 PM | ↓ | ↓ | | ↓ |
| Carlsbad Poinsettia | | 6:58 PM | | ↓ | 7:45 PM | | ↓ | 8:39 PM | ↓ | 9:59 PM | ↓ | ↓ | | ↓ |
| Encinitas | | 7:04 PM | | ↓ | 7:51 PM | | ↓ | 8:45 PM | ↓ | 10:05 PM | ↓ | ↓ | | ↓ |
| Solana Beach | | 7:10 PM | | 7:18 PM | 7:57 PM | | 8:21 PM | 8:51 PM | 9:28 PM | 10:11 PM | 10:22 PM | 11:05 PM | | 12:16 AM |
| Sorrento Valley | | 7:19 PM | | ↓ | 8:06 PM | | ↓ | 9:00 PM | ↓ | 10:20 PM | ↓ | ↓ | | ↓ |
| Old Town San Diego | | 7:40 PM | | 7:48 PM | 8:27 PM | | ↓ | 9:21 PM | 9:58 PM | 10:41 PM | 10:52 PM | 11:35 PM | | 12:46 AM |
| Santa Fe Depot | | 7:49 PM | | 7:56 PM | 8:35 PM | | 8:56 PM | 9:29 PM | 10:04 PM | 10:49 PM | 11:02 PM | 11:45 PM | | 12:52 AM |
| Convention Center | | 7:55 PM | | | | | | | | | | | | |
| *Equipment to:* | *SCAX-YD* | *OSD-N24* | *SCAX-YD* | *PS-W17* | *OSD-N25* | *SCAX-YD* | *PS-W18* | *OSD-N26* | *AMTK-YD* | *OSD-N27* | *AMTK-YD* | *AMTK-YD* | *SCAX-YD* | *AMTK-YD* |
| *COASTER and Amtrak OTC-SFD Trip Time* | | *1:01* | | *0:54* | *1:00* | | *0:52* | *1:00* | *0:52* | *1:00* | *0:56* | *0:56* | | *0:52* |

**Daily Service Level**

| | |
|---|---|
| Surfliner | 18 |
| COASTER | 27 |
| Metrolink: OC Line | 7 |
| Metrolink: IEOC Line | 2 |

| **Equipment ID:** | **C9** | **AMTK14** | **C6** | **C7** | **C3** | **AMTK15** | **C2** | **C1** | **AMTK16** | **C5** | **AMTK17** | **C9** | **C3** | **AMTK18** | **C1** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Equipment from:* | *OSD-S19* | *PS-E10* | *OSD-S20* | *MTS* | *OSD-S21* | *PS-E11* | *OSD-S22* | *OSD-S23* | *PS-E12* | *OSD-S24* | *PS-E13* | *OSD-S25* | *OSD-S26* | *PS-E14* | *OSD-S27* |
| | OSD-N18 | PS-W14 | OSD-N19 | OSD-N20 | OSD-N21 | PS-W15 | OSD-N22 | OSD-N23 | PS-W16 | OSD-N24 | PS-W17 | OSD-N25 | OSD-N26 | PS-W18 | OSD-N27 |
| Convention Center | | | 6:12 PM | 6:29 PM | | | 7:26 PM | | | 8:27 PM | | | | | |
| Santa Fe Depot | 5:55 PM | 6:06 PM | 6:19 PM | 6:35 PM | 6:55 PM | 7:09 PM | 7:33 PM | 7:59 PM | 8:12 PM | 8:34 PM | 9:12 PM | 9:29 PM | 9:59 PM | 10:12 PM | 11:09 PM |
| Old Town San Diego | 6:01 PM | ↓ | 6:25 PM | 6:42 PM | 7:01 PM | ↓ | 7:39 PM | 8:05 PM | ↓ | 8:40 PM | ↓ | 9:35 PM | 10:05 PM | ↓ | 11:15 PM |
| Sorrento Valley | 6:20 PM | ↓ | 6:44 PM | 7:01 PM | 7:20 PM | ↓ | 7:58 PM | 8:24 PM | ↓ | 8:59 PM | ↓ | 9:54 PM | 10:24 PM | ↓ | 11:34 PM |
| Solana Beach | 6:29 PM | 6:40 PM | 6:53 PM | 7:10 PM | 7:29 PM | 7:42 PM | 8:07 PM | 8:33 PM | 8:45 PM | 9:08 PM | 9:45 PM | 10:03 PM | 10:33 PM | 10:45 PM | 11:43 PM |
| Encinitas | 6:34 PM | ↓ | 6:58 PM | 7:15 PM | 7:34 PM | ↓ | 8:12 PM | 8:38 PM | ↓ | 9:13 PM | ↓ | 10:08 PM | 10:38 PM | ↓ | 11:48 PM |
| Carlsbad Poinsettia | 6:39 PM | ↓ | 7:03 PM | 7:20 PM | 7:39 PM | ↓ | 8:17 PM | 8:43 PM | ↓ | 9:18 PM | ↓ | 10:13 PM | 10:43 PM | ↓ | 11:53 PM |
| Carlsbad Village | 6:44 PM | ↓ | 7:08 PM | 7:25 PM | 7:44 PM | ↓ | 8:22 PM | 8:48 PM | ↓ | 9:23 PM | ↓ | 10:18 PM | 10:48 PM | ↓ | 11:58 PM |
| Oceanside Transit Center | 6:51 PM | 6:57 PM | 7:15 PM | 7:32 PM | 7:51 PM | 7:59 PM | 8:29 PM | 8:55 PM | 9:02 PM | 9:30 PM | 10:02 PM | 10:25 PM | 10:55 PM | 11:02 PM | 12:05 AM |
| Camp Pendleton | 7:07 PM | ↓ | | 7:38 PM | | ↓ | 8:40 PM | 9:03 PM | ↓ | | ↓ | | | ↓ | 12:11 AM |
| San Clemente | | ↓ | | | | ↓ | | | ↓ | | ↓ | | | ↓ | |
| San Juan Capistrano | | 7:27 PM | | | | 8:29 PM | | | 9:32 PM | | 10:32 PM | | | 11:32 PM | |
| Irvine | | 7:42 PM | | | | 8:44 PM | | | 9:47 PM | | 10:47 PM | | | 11:47 PM | |
| Santa Ana | | 7:53 PM | | | | 8:55 PM | | | 9:58 PM | | 10:58 PM | | | 11:58 PM | |
| Anaheim | | 8:02 PM | | | | 9:04 PM | | | 10:07 PM | | 11:07 PM | | | 12:07 AM | |
| Fullerton | | 8:10 PM | | | | 9:12 PM | | | 10:15 PM | | 11:15 PM | | | 12:15 AM | |
| Los Angeles Union Station | | 8:44 PM | | | | 9:46 PM | | | 10:49 PM | | 11:52 PM | | | 12:48 AM | |
| *Equipment to:* | *OSD-S25* | *AMTK* | *SMMF* | *SMMF* | *OSD-S26* | *AMTK* | *SMMF* | *OSD-S27* | *AMTK* | *SMMF* | *AMTK* | *SMMF* | *SMMF* | *AMTK* | *SMMF* |
| *COASTER and Amtrak SFD-OTC Trip Time* | *0:56* | *0:51* | *0:56* | *0:57* | *0:56* | *0:50* | *0:56* | *0:56* | *0:50* | *0:56* | *0:50* | *0:56* | *0:56* | *0:50* | *0:56* |

**Daily Service Level**

| | |
|---|---|
| Surfliner | 18 |
| COASTER | 27 |
| Metrolink: OC Line | 8 |
| Metrolink: IEOC Line | 2 |

*Oceanside Overnight Storage Need (Commuter: "SMMF"):*
*San Diego Midday Storage Need (Commuter: "MTS"):*
*Oceanside Midday Storage Need (Commuter: "SMMF-M"):*

*Commuter Trainsets Required for Revenue Service:*
*Total Commuter Trainsets Required (10% Spares):*

# APPENDIX B

## TIME-DISTANCE DIAGRAMS

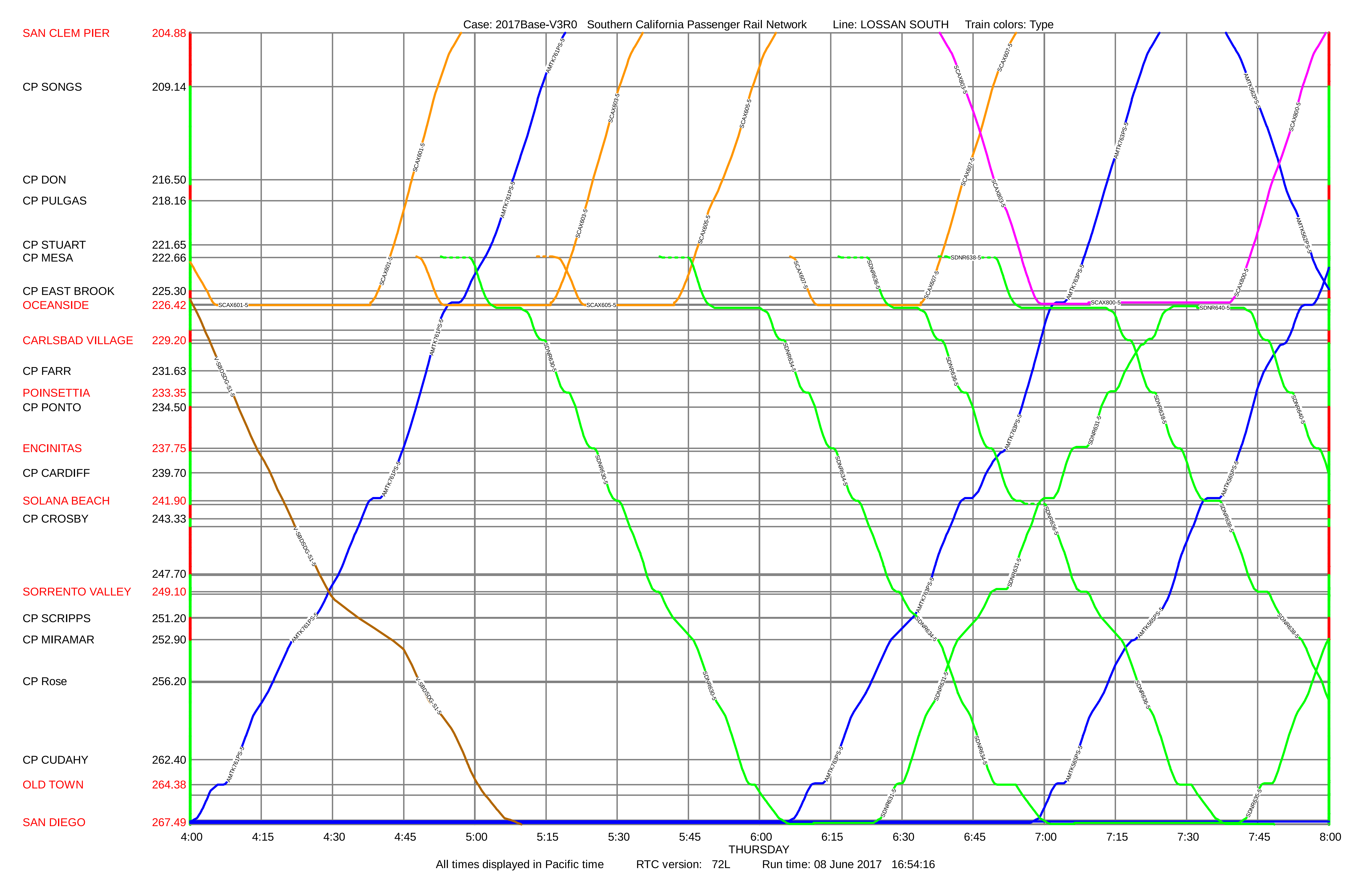
**Legend**

*On Y-axis (location):*

- Dark text: Control Point (CP)
- Light text: Passenger station
- Red line: Single main track section
- Green line: Multiple main track section

*Stringlines (train location relative to time):*

- Blue line: Surfliner train
- Green line: COASTER train
- Orange line: Metrolink Orange County Line train
- Pink line: Metrolink IEOC Line train
- Brown line: Freight train (operated by BNSF)
- Dashed horizontal line: non-scheduled hold (delay)



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SAN CLEM PIER 204.88
CP SONGS 209.14
CP DON 216.50
CP PULGAS 218.16
CP STUART 221.65
CP MESA 222.66
CP EAST BROOK 225.30
OCEANSIDE 226.42
CARLSBAD VILLAGE 229.20
CP FARR 231.63
POINSETTIA 233.35
CP PONTO 234.50
ENCINITAS 237.75
CP CARDIFF 239.70
SOLANA BEACH 241.90
CP CROSBY 243.33
247.70
SORRENTO VALLEY 249.10
CP SCRIPPS 251.20
CP MIRAMAR 252.90
CP Rose 256.20
CP CUDAHY 262.40
OLD TOWN 264.38
SAN DIEGO 267.49
4:00
4:15
4:30
4:45
5:00
5:15
5:30
5:45
6:00
6:15
6:30
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7:00
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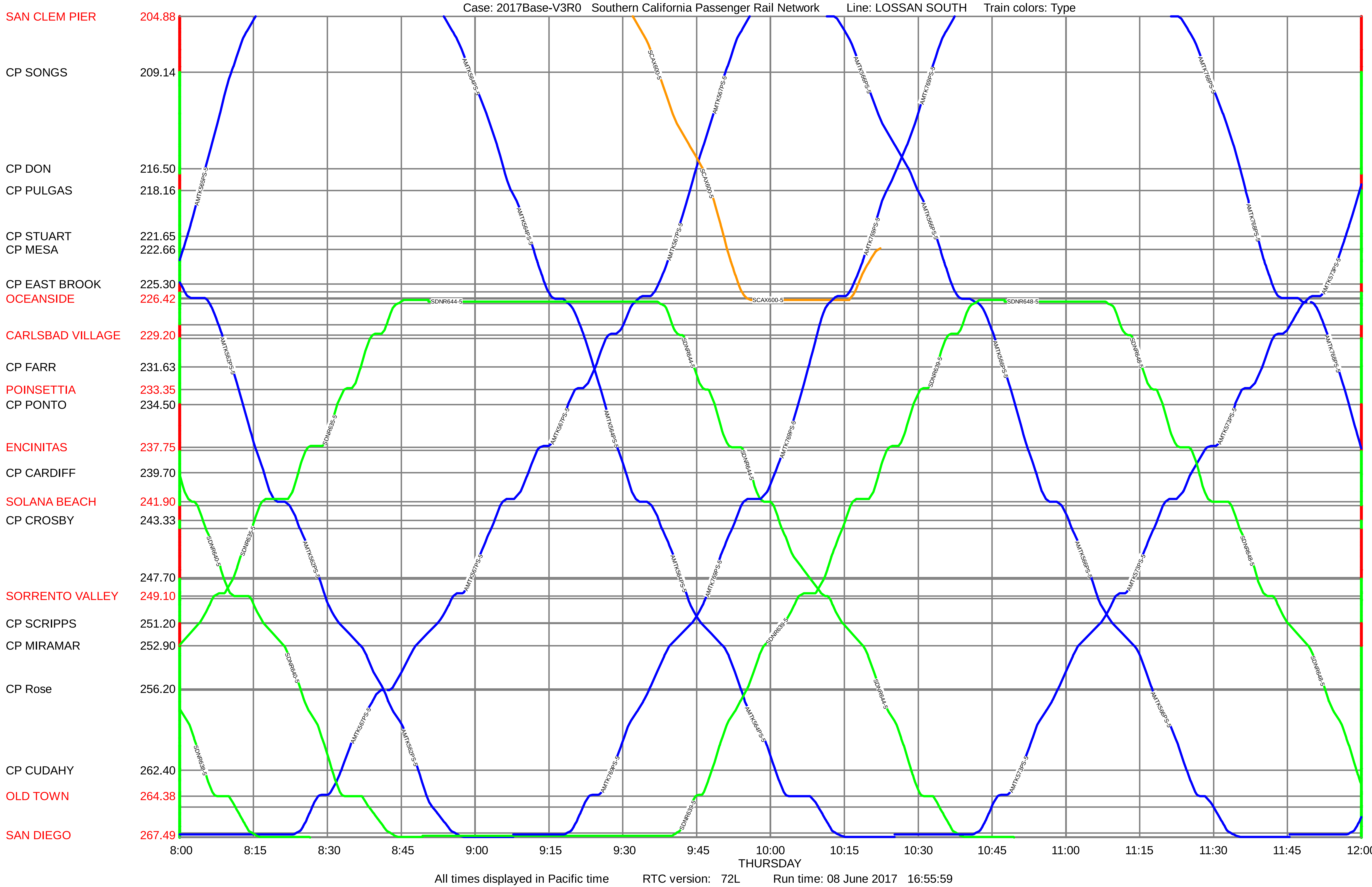
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CP DON 216.50
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CP STUART 221.65
CP MESA 222.66
CP EAST BROOK 225.30
OCEANSIDE 226.42
CARLSBAD VILLAGE 229.20
CP FARR 231.63
POINSETTIA 233.35
CP PONTO 234.50
ENCINITAS 237.75
CP CARDIFF 239.70
SOLANA BEACH 241.90
CP CROSBY 243.33
247.70
SORRENTO VALLEY 249.10
CP SCRIPPS 251.20
CP MIRAMAR 252.90
CP Rose 256.20
CP CUDAHY 262.40
OLD TOWN 264.38
SAN DIEGO 267.49
AMTK565PS-5
AMTK564PS-5
AMTK562PS-5
AMTK567PS-5
AMTK566PS-5
AMTK768PS-5
AMTK769PS-5
AMTK573PS-5
SCAX600-5
SDNR635-5
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SDNR644-5
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9:00
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9:30
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12:00
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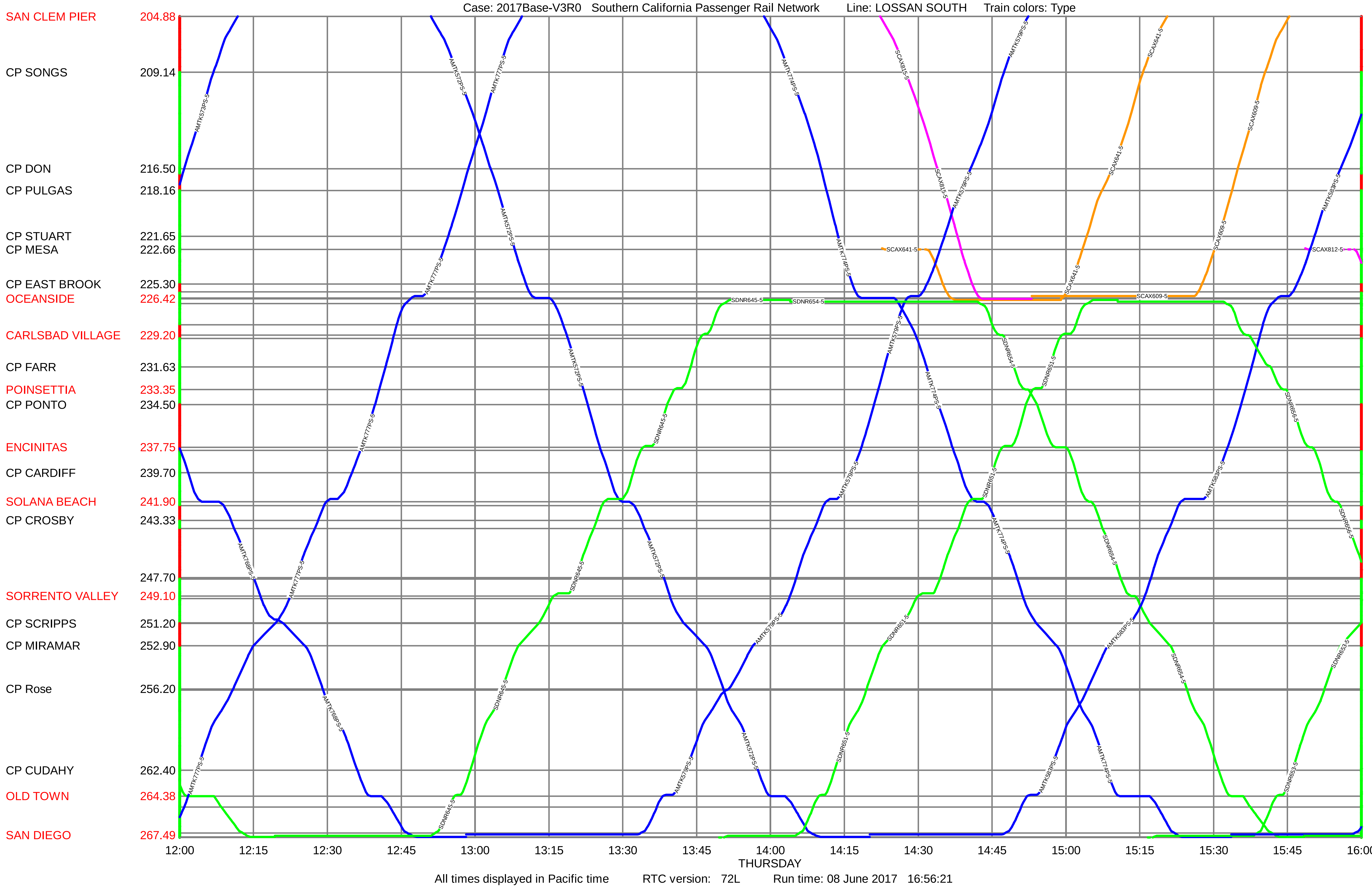
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CP DON 216.50
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CP STUART 221.65
CP MESA 222.66
CP EAST BROOK 225.30
OCEANSIDE 226.42
CARLSBAD VILLAGE 229.20
CP FARR 231.63
POINSETTIA 233.35
CP PONTO 234.50
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CP CARDIFF 239.70
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CP CROSBY 243.33
247.70
SORRENTO VALLEY 249.10
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CP MIRAMAR 252.90
CP Rose 256.20
CP CUDAHY 262.40
OLD TOWN 264.38
SAN DIEGO 267.49
12:00
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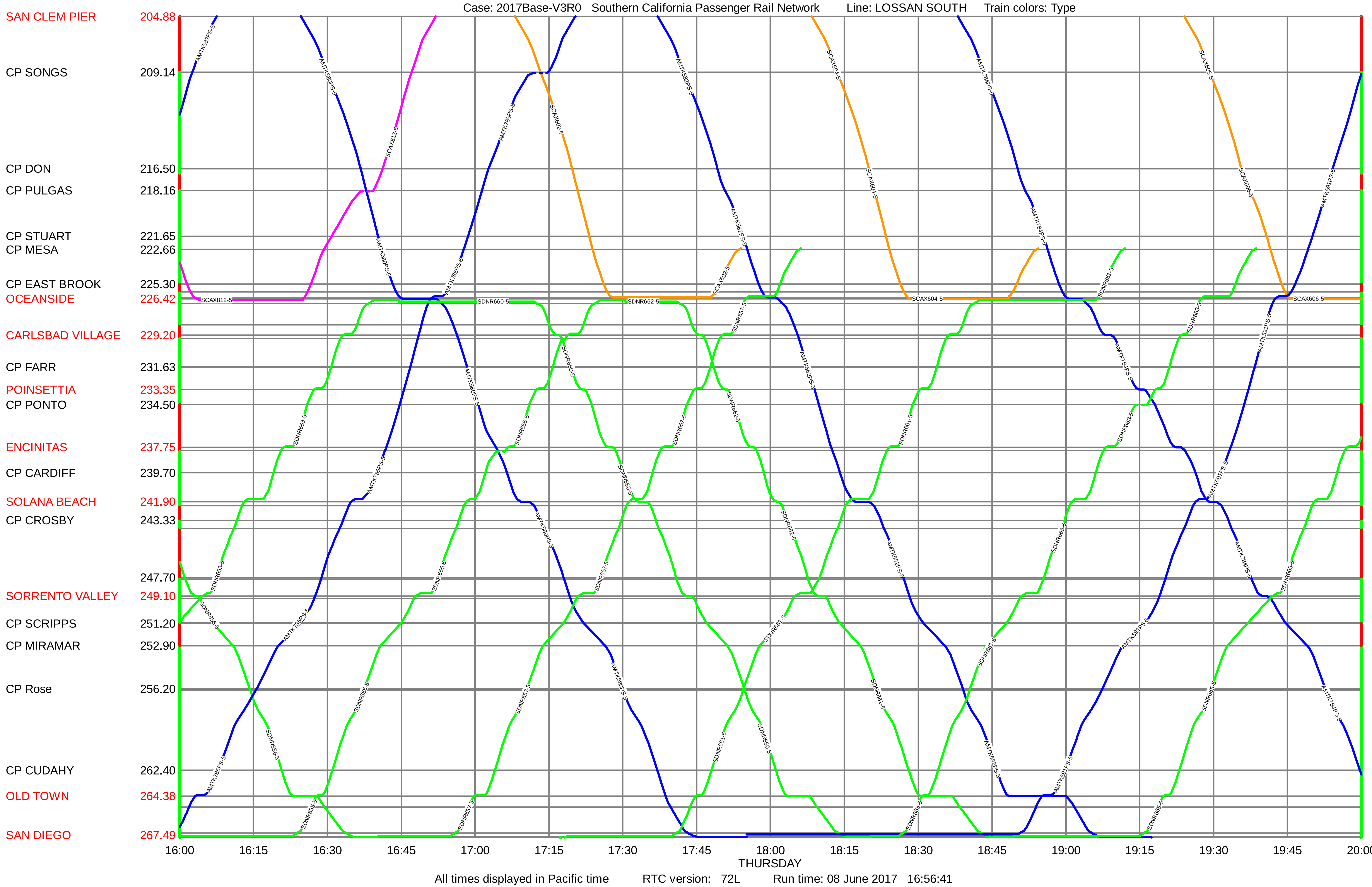

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CP SONGS 209.14
CP DON 216.50
CP PULGAS 218.16
CP STUART 221.65
CP MESA 222.66
CP EAST BROOK 225.30
OCEANSIDE 226.42
CARLSBAD VILLAGE 229.20
CP FARR 231.63
POINSETTIA 233.35
CP PONTO 234.50
ENCINITAS 237.75
CP CARDIFF 239.70
SOLANA BEACH 241.90
CP CROSBY 243.33
247.70
SORRENTO VALLEY 249.10
CP SCRIPPS 251.20
CP MIRAMAR 252.90
CP Rose 256.20
CP CUDAHY 262.40
OLD TOWN 264.38
SAN DIEGO 267.49
16:00
16:15
16:30
16:45
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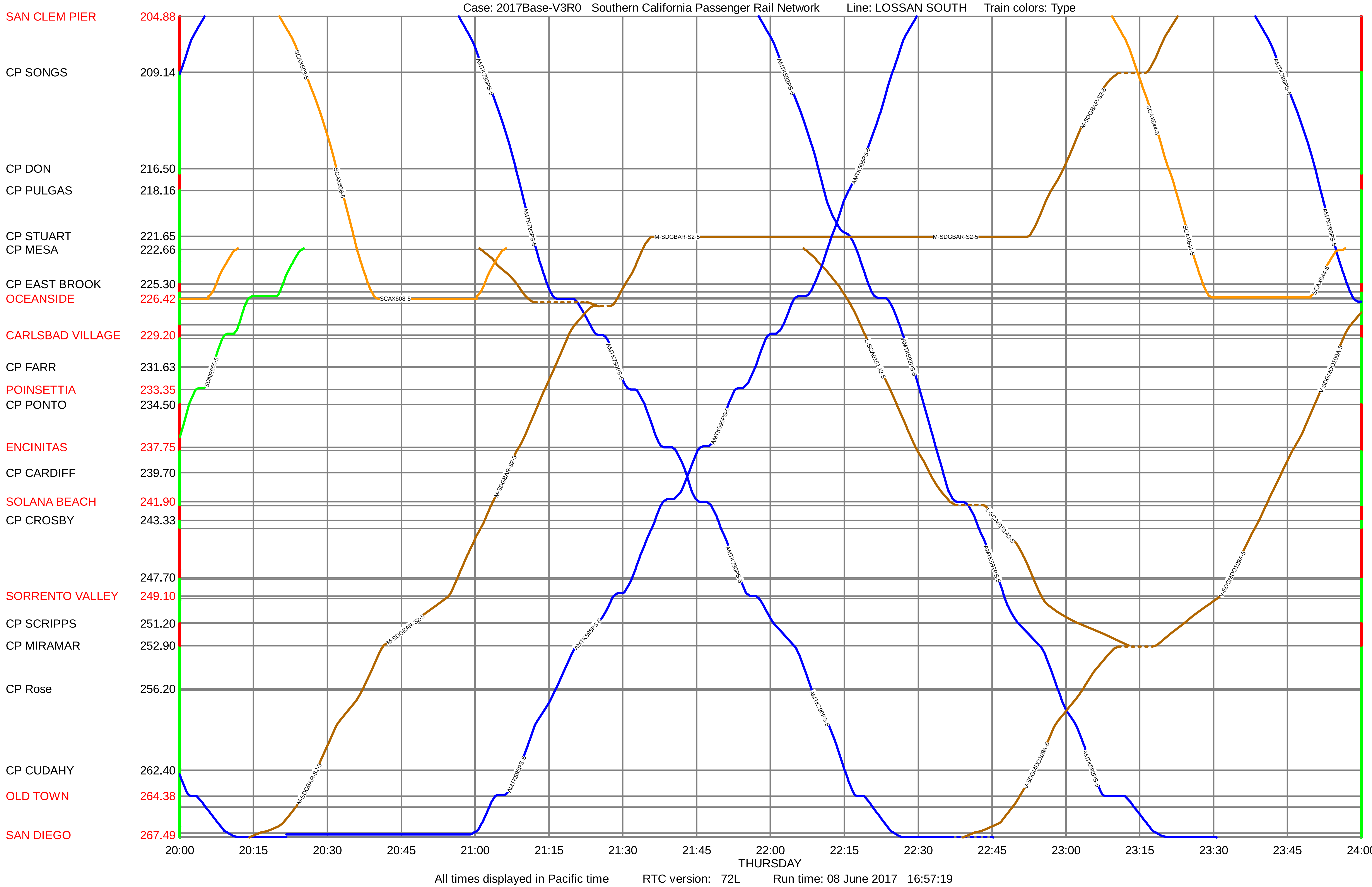

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Line: LOSSAN SOUTH
Train colors: Type
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CP SONGS 209.14
CP DON 216.50
CP PULGAS 218.16
CP STUART 221.65
CP MESA 222.66
CP EAST BROOK 225.30
OCEANSIDE 226.42
CARLSBAD VILLAGE 229.20
CP FARR 231.63
POINSETTIA 233.35
CP PONTO 234.50
ENCINITAS 237.75
CP CARDIFF 239.70
SOLANA BEACH 241.90
CP CROSBY 243.33
247.70
SORRENTO VALLEY 249.10
CP SCRIPPS 251.20
CP MIRAMAR 252.90
CP Rose 256.20
CP CUDAHY 262.40
OLD TOWN 264.38
SAN DIEGO 267.49
20:00
20:15
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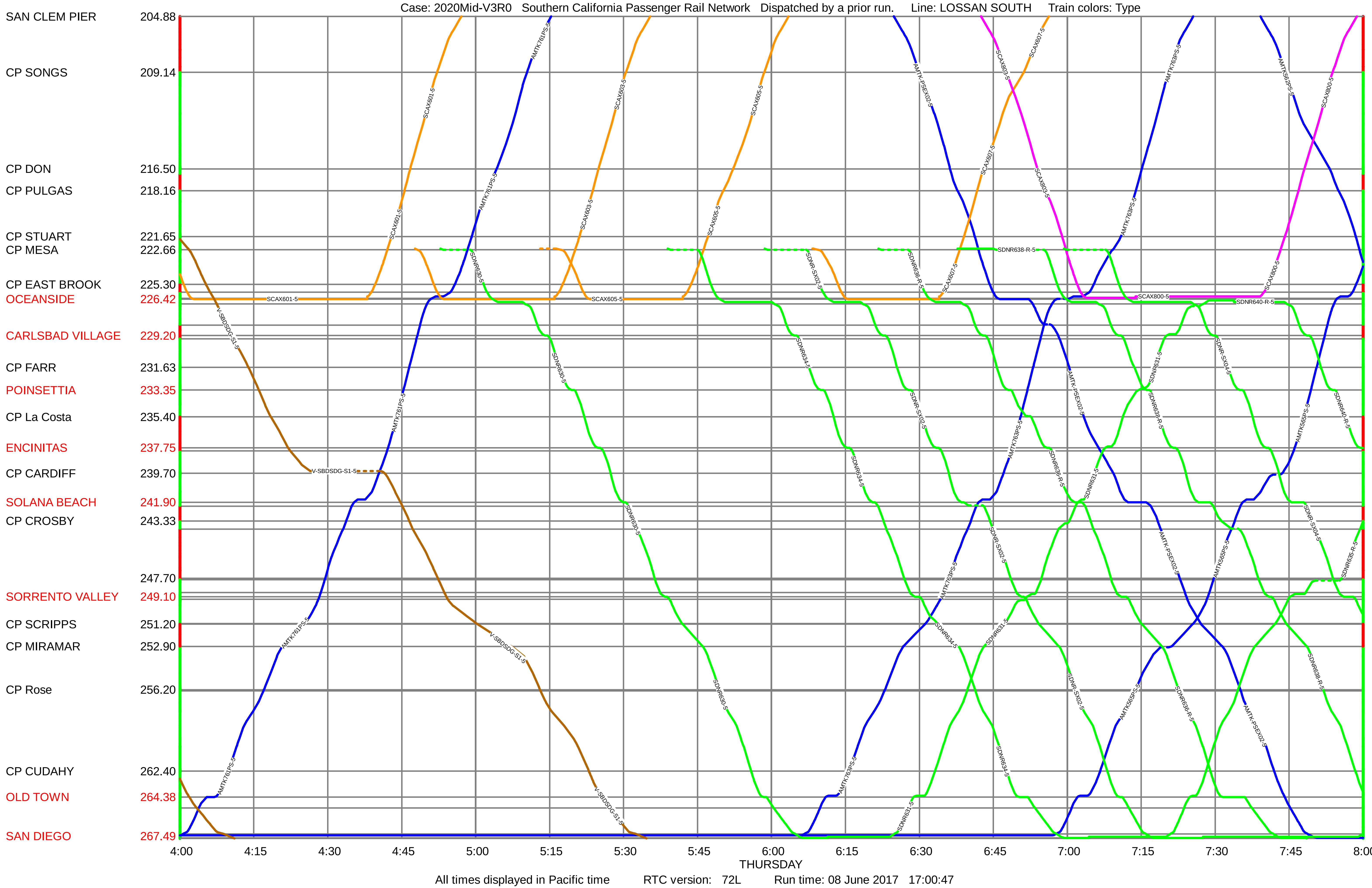
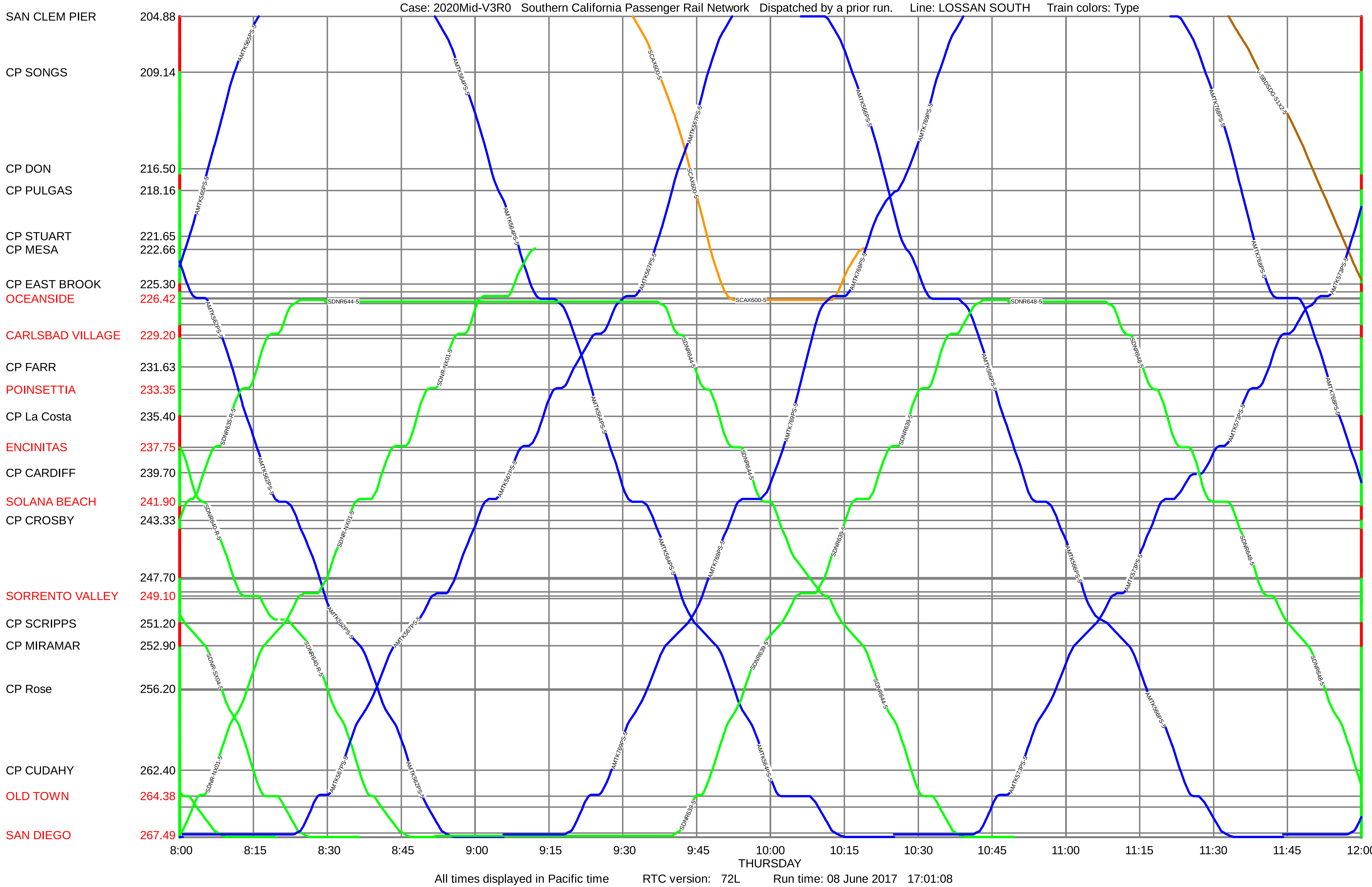
22:45
23:00
23:15
23:30
23:45
24:00
THURSDAY
SCAX608-5
AMTK790PS-5
AMTK592PS-5
AMTK595PS-5
AMTK796PS-5
M-SDGBAR-S2-5
SCAX644-5
SDNR665-5
L-SCA0151A2-5
V-SDGMDO109A-5
All times displayed in Pacific time
RTC version: 72L
Run time: 08 June 2017 16:57:19


Case: 2020Mid-V3R0 Southern California Passenger Rail Network Dispatched by a prior run. Line: LOSSAN SOUTH Train colors: Type
SAN CLEM PIER 204.88
CP SONGS 209.14
CP DON 216.50
CP PULGAS 218.16
CP STUART 221.65
CP MESA 222.66
CP EAST BROOK 225.30
OCEANSIDE 226.42
CARLSBAD VILLAGE 229.20
CP FARR 231.63
POINSETTIA 233.35
CP La Costa 235.40
ENCINITAS 237.75
CP CARDIFF 239.70
SOLANA BEACH 241.90
CP CROSBY 243.33
247.70
SORRENTO VALLEY 249.10
CP SCRIPPS 251.20
CP MIRAMAR 252.90
CP Rose 256.20
CP CUDAHY 262.40
OLD TOWN 264.38
SAN DIEGO 267.49
4:00 4:15 4:30 4:45 5:00 5:15 5:30 5:45 6:00 6:15 6:30 6:45 7:00 7:15 7:30 7:45 8:00
THURSDAY
All times displayed in Pacific time RTC version: 72L Run time: 08 June 2017 17:00:47


Case: 2020Mid-V3R0 Southern California Passenger Rail Network Dispatched by a prior run. Line: LOSSAN SOUTH Train colors: Type
SAN CLEM PIER 204.88
CP SONGS 209.14
CP DON 216.50
CP PULGAS 218.16
CP STUART 221.65
CP MESA 222.66
CP EAST BROOK 225.30
OCEANSIDE 226.42
CARLSBAD VILLAGE 229.20
CP FARR 231.63
POINSETTIA 233.35
CP La Costa 235.40
ENCINITAS 237.75
CP CARDIFF 239.70
SOLANA BEACH 241.90
CP CROSBY 243.33
247.70
SORRENTO VALLEY 249.10
CP SCRIPPS 251.20
CP MIRAMAR 252.90
CP Rose 256.20
CP CUDAHY 262.40
OLD TOWN 264.38
SAN DIEGO 267.49
8:00
8:15
8:30
8:45
9:00
9:15
9:30
9:45
10:00
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11:00
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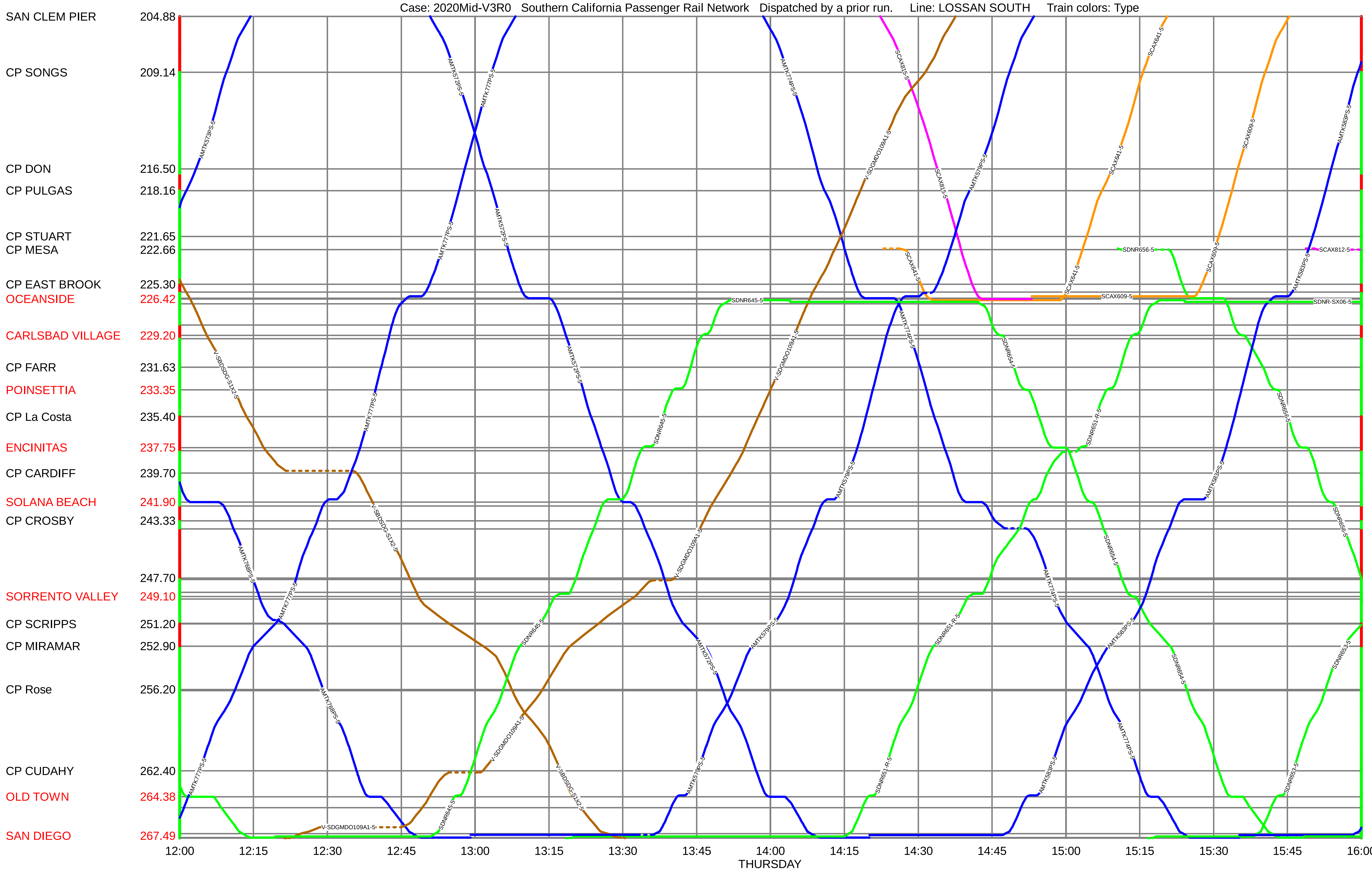
SDNR644-5
SCAX600-5
SDNR648-5
All times displayed in Pacific time RTC version: 72L Run time: 08 June 2017 17:01:08



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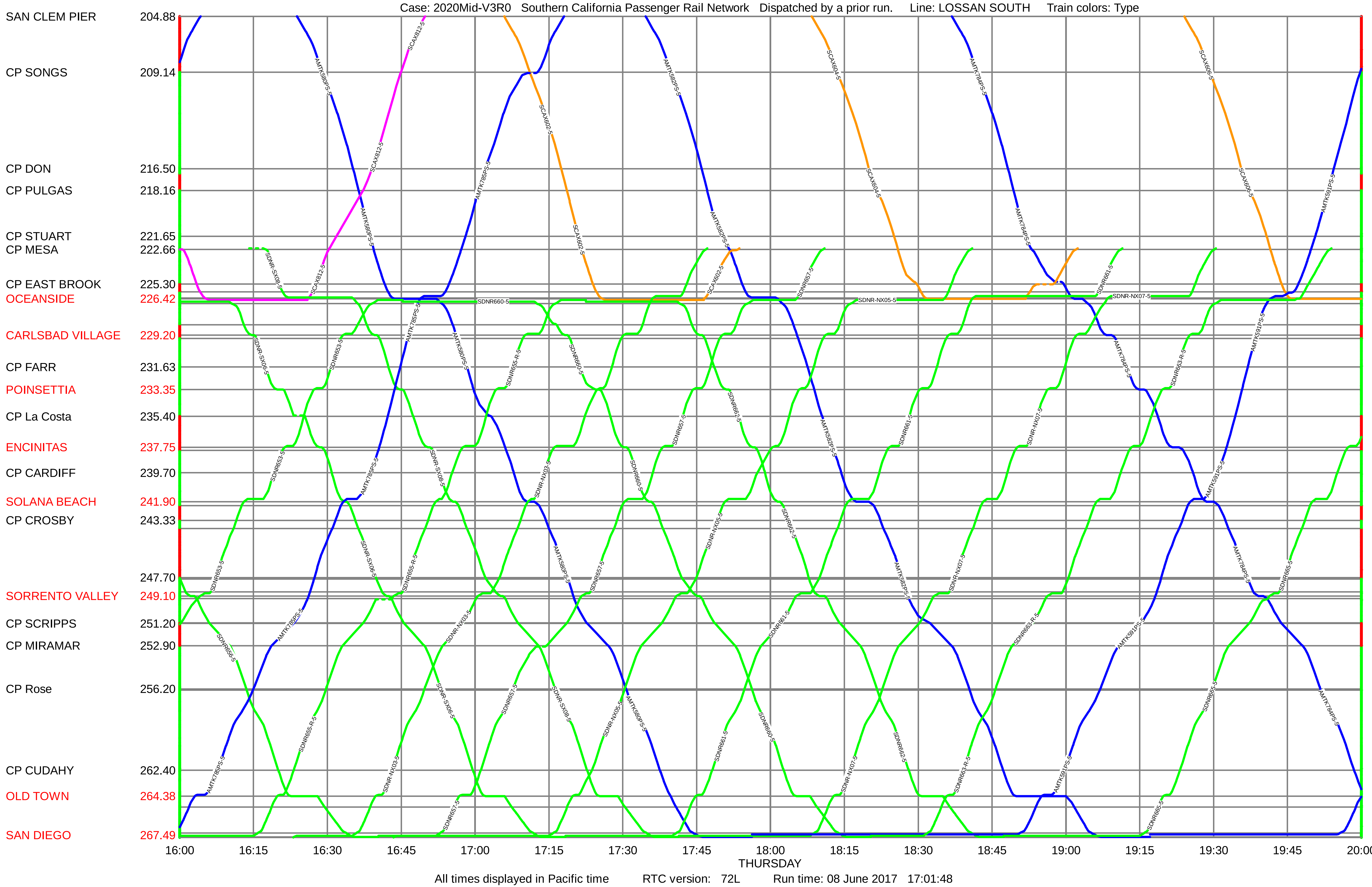
Case: 2020Mid-V3R0 Southern California Passenger Rail Network Dispatched by a prior run. Line: LOSSAN SOUTH Train colors: Type
SAN CLEM PIER 204.88
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CP DON 216.50
CP PULGAS 218.16
CP STUART 221.65
CP MESA 222.66
CP EAST BROOK 225.30
OCEANSIDE 226.42
CARLSBAD VILLAGE 229.20
CP FARR 231.63
POINSETTIA 233.35
CP La Costa 235.40
ENCINITAS 237.75
CP CARDIFF 239.70
SOLANA BEACH 241.90
CP CROSBY 243.33
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SORRENTO VALLEY 249.10
CP SCRIPPS 251.20
CP MIRAMAR 252.90
CP Rose 256.20
CP CUDAHY 262.40
OLD TOWN 264.38
SAN DIEGO 267.49
16:00
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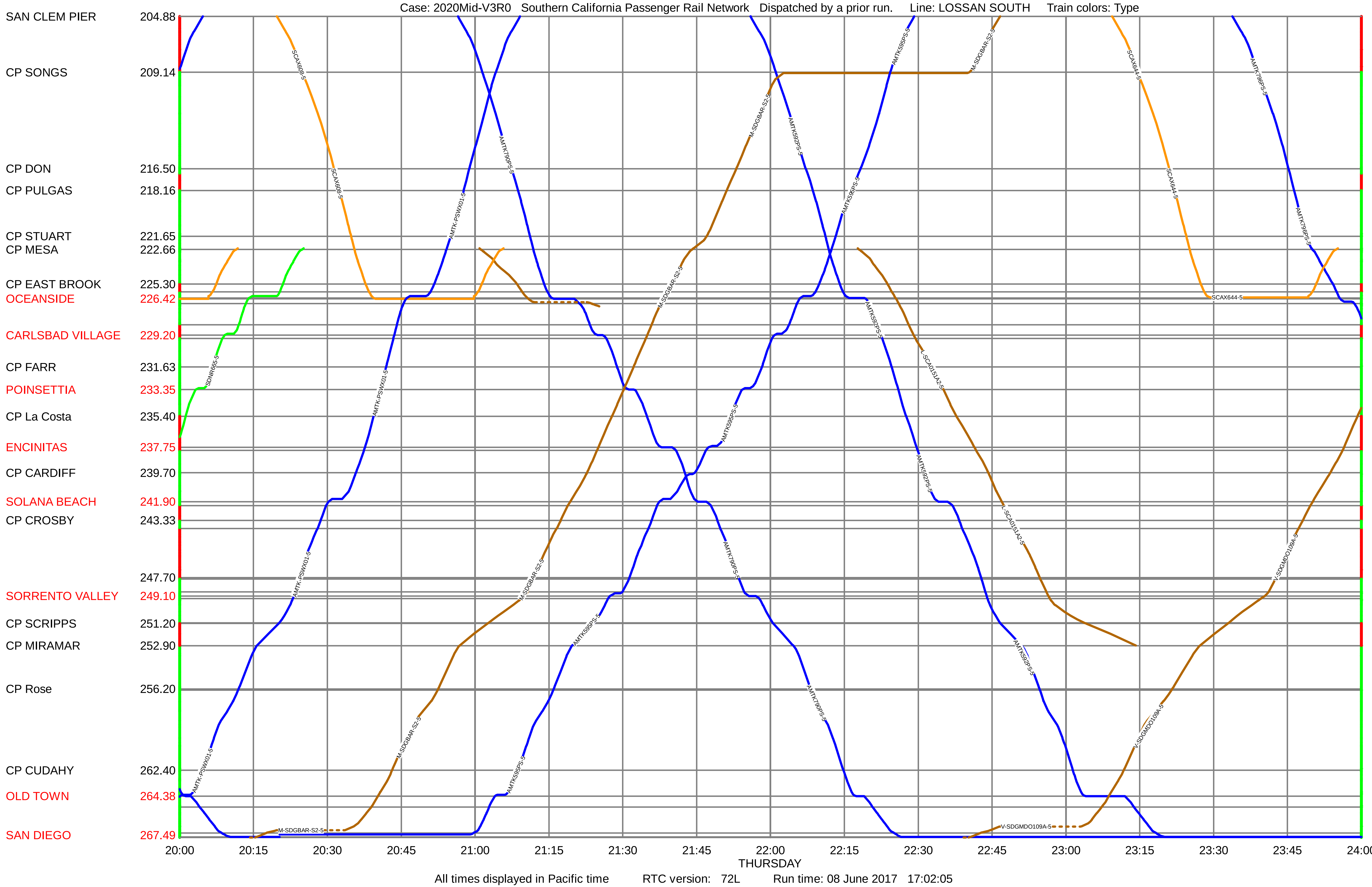
THURSDAY
All times displayed in Pacific time RTC version: 72L Run time: 08 June 2017 17:01:48


Case: 2020Mid-V3R0 Southern California Passenger Rail Network Dispatched by a prior run. Line: LOSSAN SOUTH Train colors: Type
SAN CLEM PIER 204.88
CP SONGS 209.14
CP DON 216.50
CP PULGAS 218.16
CP STUART 221.65
CP MESA 222.66
CP EAST BROOK 225.30
OCEANSIDE 226.42
CARLSBAD VILLAGE 229.20
CP FARR 231.63
POINSETTIA 233.35
CP La Costa 235.40
ENCINITAS 237.75
CP CARDIFF 239.70
SOLANA BEACH 241.90
CP CROSBY 243.33
247.70
SORRENTO VALLEY 249.10
CP SCRIPPS 251.20
CP MIRAMAR 252.90
CP Rose 256.20
CP CUDAHY 262.40
OLD TOWN 264.38
SAN DIEGO 267.49
20:00
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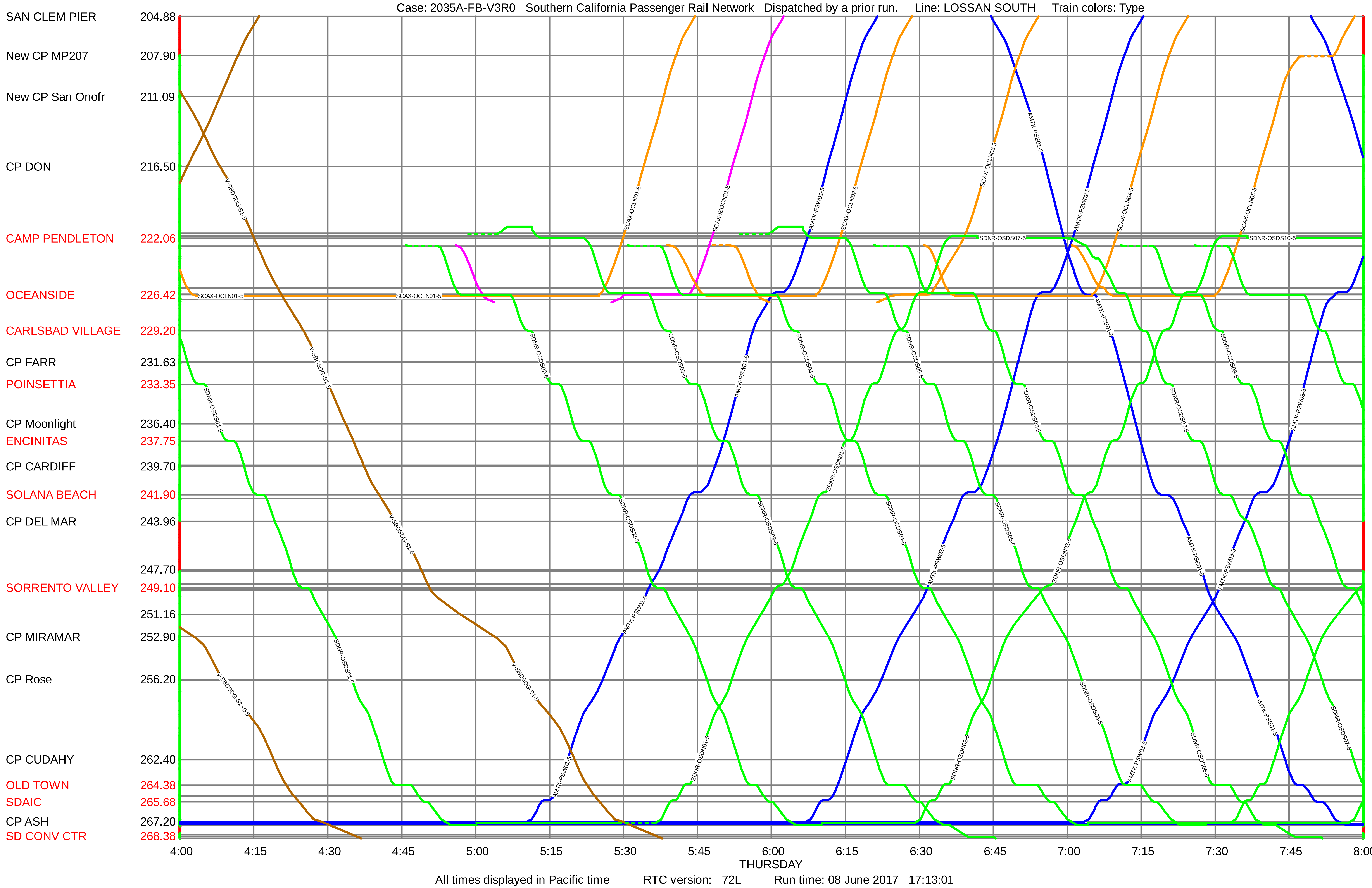
23:45
24:00
THURSDAY
All times displayed in Pacific time RTC version: 72L Run time: 08 June 2017 17:02:05


Case: 2035A-FB-V3R0 Southern California Passenger Rail Network Dispatched by a prior run. Line: LOSSAN SOUTH Train colors: Type
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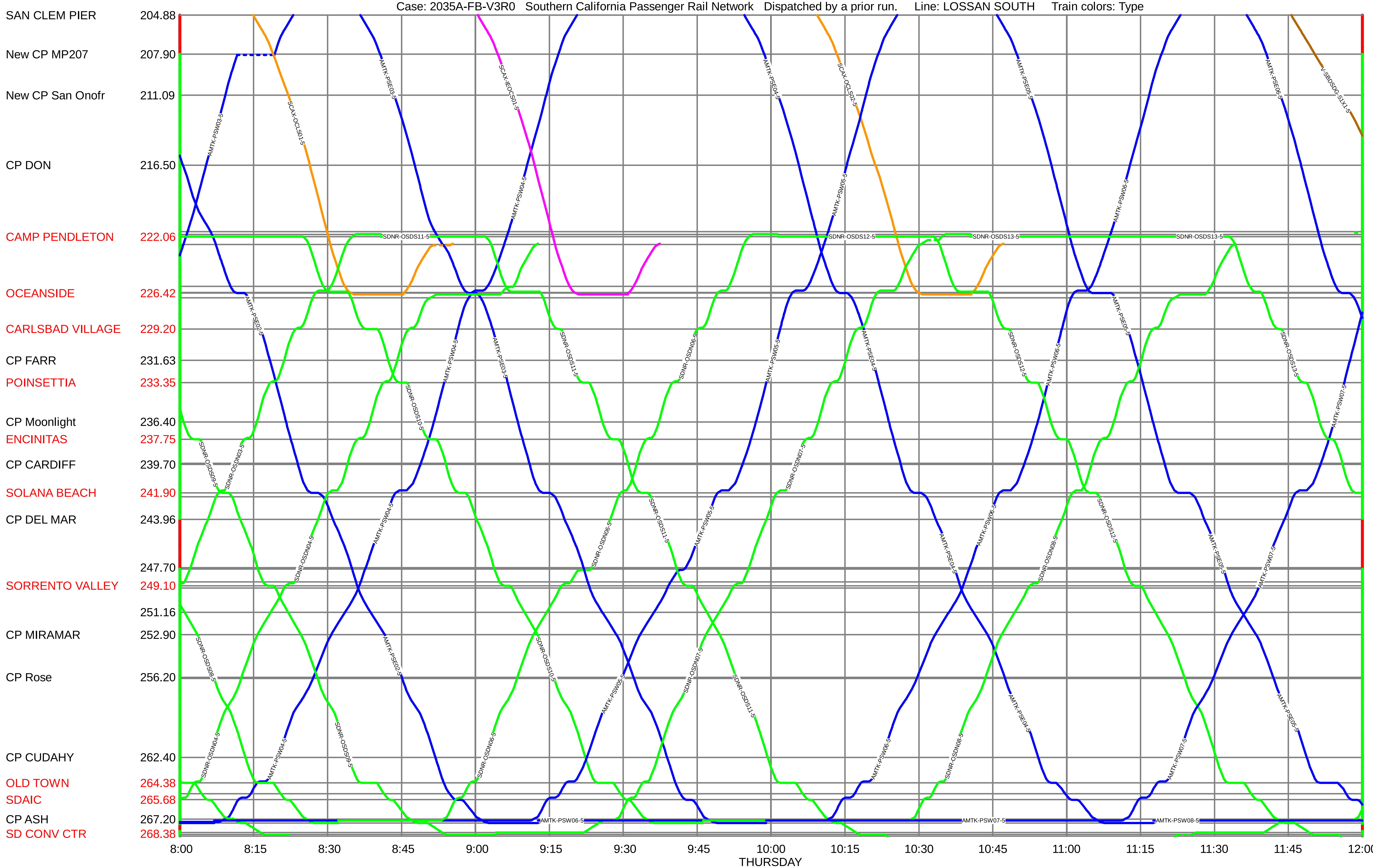
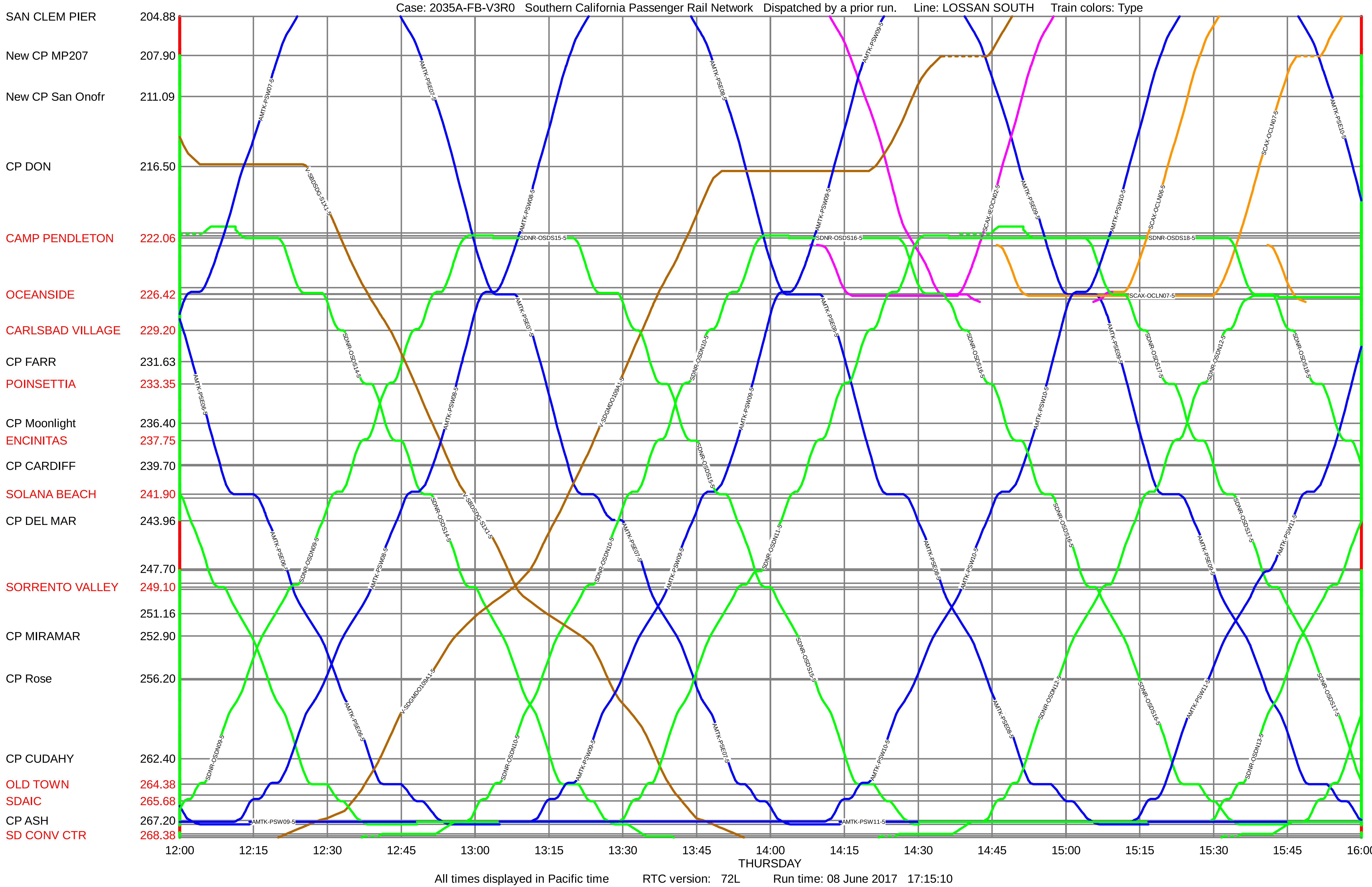
New CP MP207 207.90
New CP San Onofr 211.09
CP DON 216.50
CAMP PENDLETON 222.06
OCEANSIDE 226.42
CARLSBAD VILLAGE 229.20
CP FARR 231.63
POINSETTIA 233.35
CP Moonlight 236.40
ENCINITAS 237.75
CP CARDIFF 239.70
SOLANA BEACH 241.90
CP DEL MAR 243.96
247.70
SORRENTO VALLEY 249.10
251.16
CP MIRAMAR 252.90
CP Rose 256.20
CP CUDAHY 262.40
OLD TOWN 264.38
SDAIC 265.68
CP ASH 267.20
SD CONV CTR 268.38
4:00 4:15 4:30 4:45 5:00 5:15 5:30 5:45 6:00 6:15 6:30 6:45 7:00 7:15 7:30 7:45 8:00
THURSDAY
All times displayed in Pacific time RTC version: 72L Run time: 08 June 2017 17:13:01

Case: 2035A-FB-V3R0 Southern California Passenger Rail Network Dispatched by a prior run. Line: LOSSAN SOUTH Train colors: Type




All times displayed in Pacific time RTC version: 72L Run time: 08 June 2017 17:13:22


Case: 2035A-FB-V3R0 Southern California Passenger Rail Network Dispatched by a prior run. Line: LOSSAN SOUTH Train colors: Type
SAN CLEM PIER 204.88
New CP MP207 207.90
New CP San Onofr 211.09
CP DON 216.50
CAMP PENDLETON 222.06
OCEANSIDE 226.42
CARLSBAD VILLAGE 229.20
CP FARR 231.63
POINSETTIA 233.35
CP Moonlight 236.40
ENCINITAS 237.75
CP CARDIFF 239.70
SOLANA BEACH 241.90
CP DEL MAR 243.96
247.70
SORRENTO VALLEY 249.10
251.16
CP MIRAMAR 252.90
CP Rose 256.20
CP CUDAHY 262.40
OLD TOWN 264.38
SDAIC 265.68
CP ASH 267.20
SD CONV CTR 268.38
12:00
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14:45
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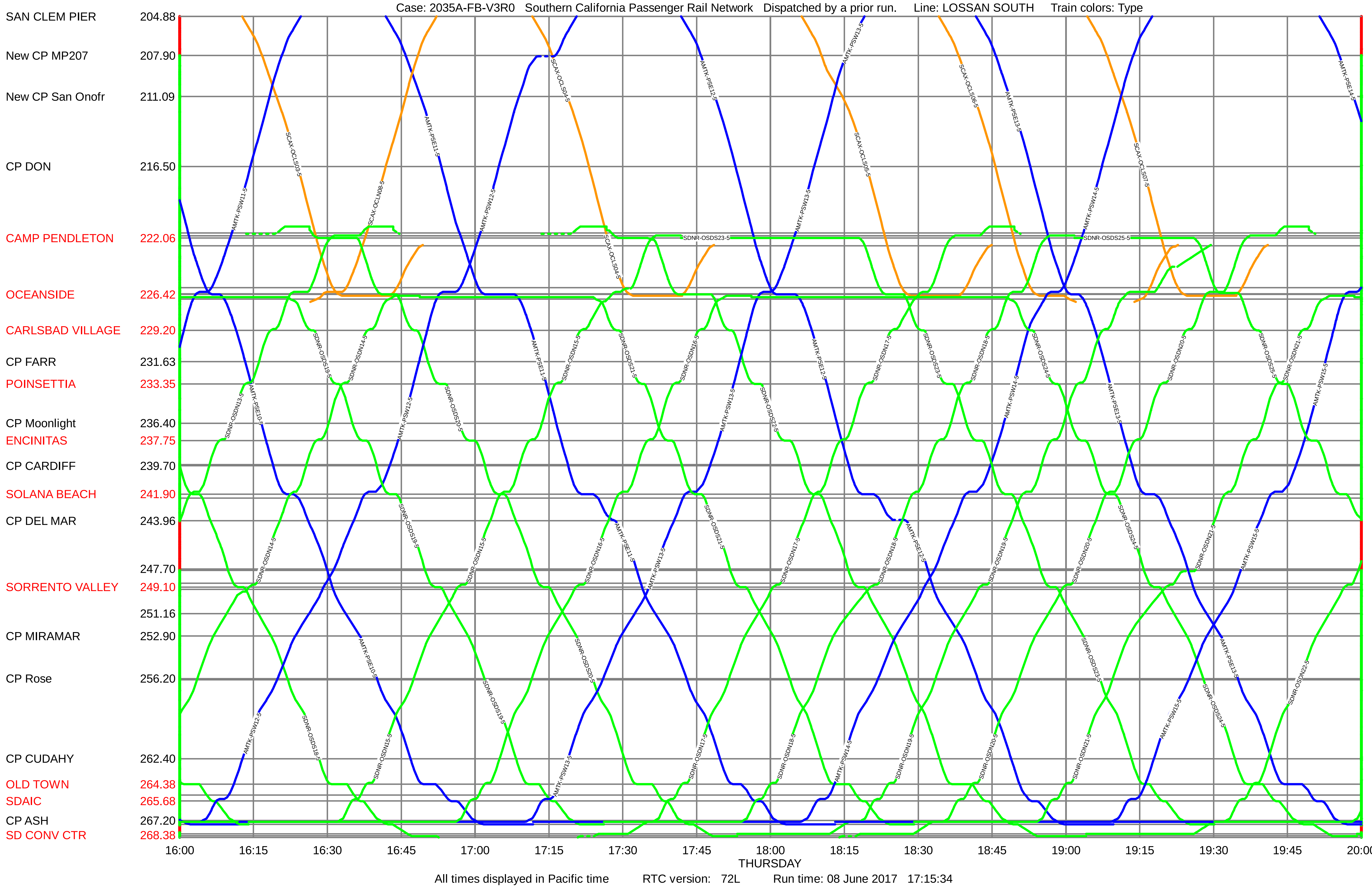
15:45
16:00
THURSDAY
All times displayed in Pacific time
RTC version: 72L
Run time: 08 June 2017 17:15:10


Case: 2035A-FB-V3R0 Southern California Passenger Rail Network Dispatched by a prior run. Line: LOSSAN SOUTH Train colors: Type
SAN CLEM PIER 204.88
New CP MP207 207.90
New CP San Onofr 211.09
CP DON 216.50
CAMP PENDLETON 222.06
OCEANSIDE 226.42
CARLSBAD VILLAGE 229.20
CP FARR 231.63
POINSETTIA 233.35
CP Moonlight 236.40
ENCINITAS 237.75
CP CARDIFF 239.70
SOLANA BEACH 241.90
CP DEL MAR 243.96
247.70
SORRENTO VALLEY 249.10
251.16
CP MIRAMAR 252.90
CP Rose 256.20
CP CUDAHY 262.40
OLD TOWN 264.38
SDAIC 265.68
CP ASH 267.20
SD CONV CTR 268.38
16:00
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17:45
18:00
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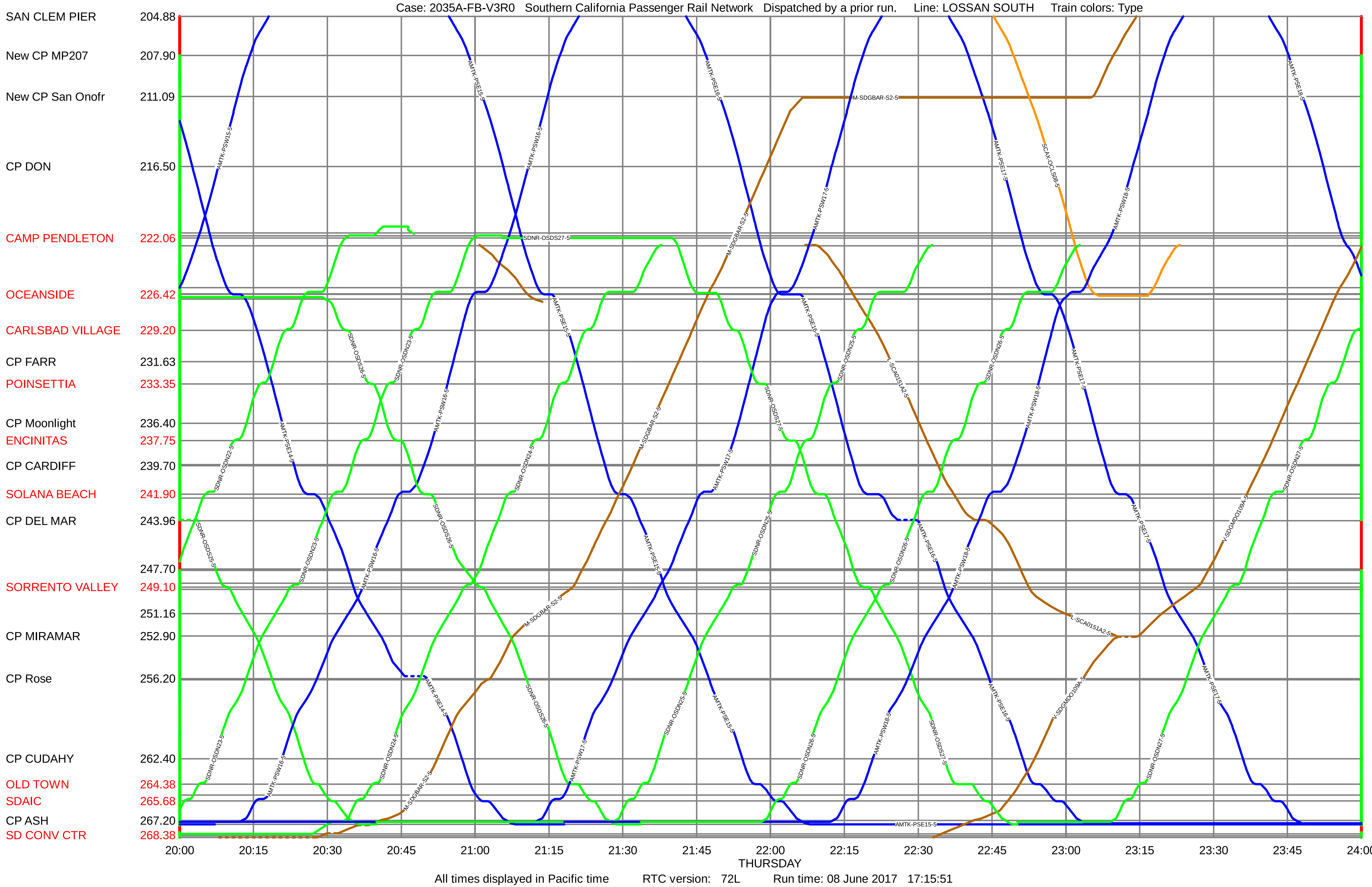
20:00
THURSDAY
All times displayed in Pacific time
RTC version: 72L
Run time: 08 June 2017 17:15:34


Case: 2035A-FB-V3R0 Southern California Passenger Rail Network Dispatched by a prior run. Line: LOSSAN SOUTH Train colors: Type
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New CP MP207 207.90
New CP San Onofr 211.09
CP DON 216.50
CAMP PENDLETON 222.06
OCEANSIDE 226.42
CARLSBAD VILLAGE 229.20
CP FARR 231.63
POINSETTIA 233.35
CP Moonlight 236.40
ENCINITAS 237.75
CP CARDIFF 239.70
SOLANA BEACH 241.90
CP DEL MAR 243.96
247.70
SORRENTO VALLEY 249.10
251.16
CP MIRAMAR 252.90
CP Rose 256.20
CP CUDAHY 262.40
OLD TOWN 264.38
SDAIC 265.68
CP ASH 267.20
SD CONV CTR 268.38
20:00
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20:45
21:00
21:15
21:30
21:45
22:00
22:15
22:30
22:45
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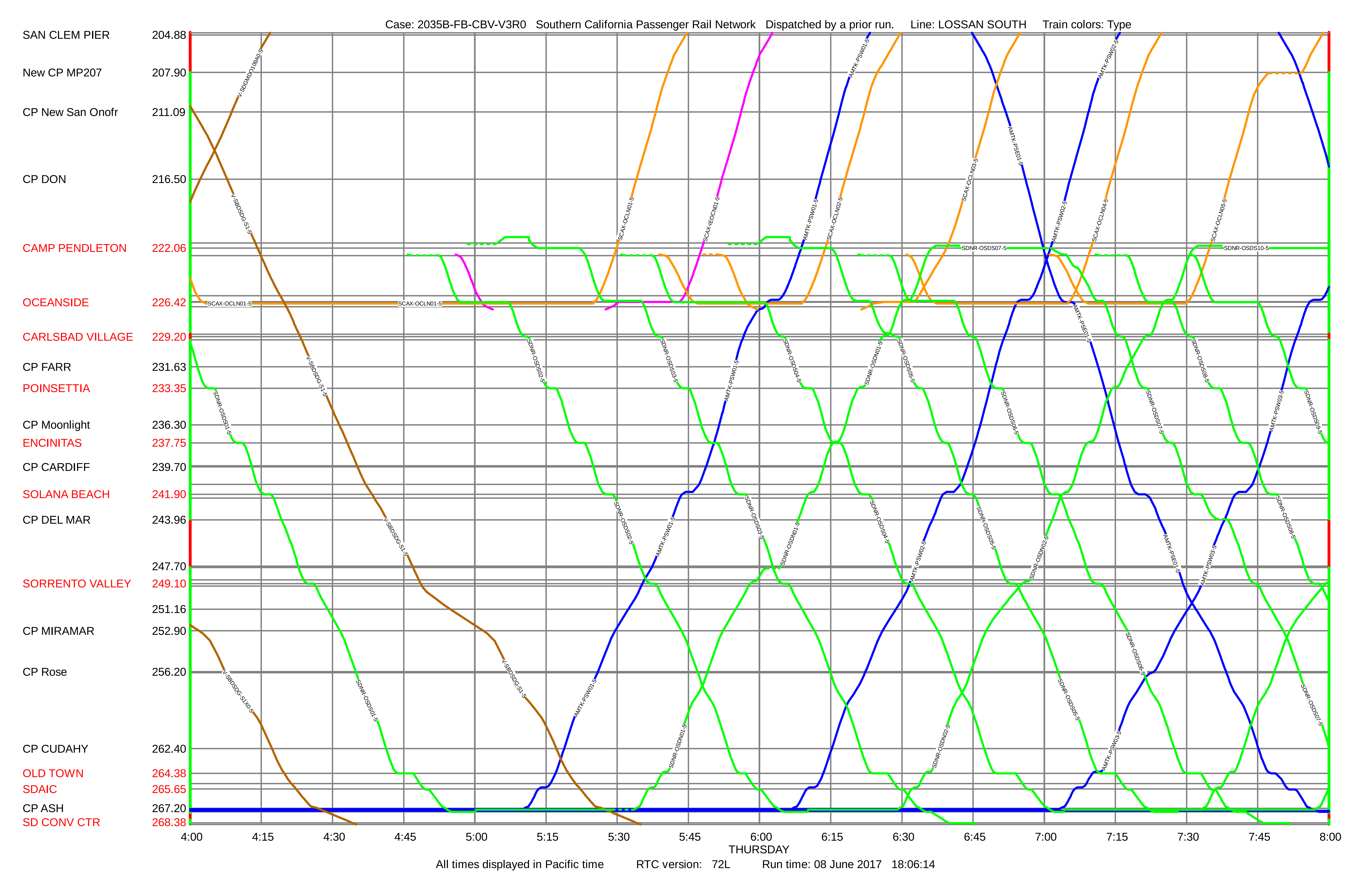
23:45
24:00
THURSDAY
All times displayed in Pacific time
RTC version: 72L
Run time: 08 June 2017 17:15:51


Case: 2035B-FB-CBV-V3R0 Southern California Passenger Rail Network Dispatched by a prior run. Line: LOSSAN SOUTH Train colors: Type
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New CP MP207 207.90
CP New San Onofr 211.09
CP DON 216.50
CAMP PENDLETON 222.06
OCEANSIDE 226.42
CARLSBAD VILLAGE 229.20
CP FARR 231.63
POINSETTIA 233.35
CP Moonlight 236.30
ENCINITAS 237.75
CP CARDIFF 239.70
SOLANA BEACH 241.90
CP DEL MAR 243.96
247.70
SORRENTO VALLEY 249.10
251.16
CP MIRAMAR 252.90
CP Rose 256.20
CP CUDAHY 262.40
OLD TOWN 264.38
SDAIC 265.65
CP ASH 267.20
SD CONV CTR 268.38
4:00
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5:15
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5:45
6:00
6:15
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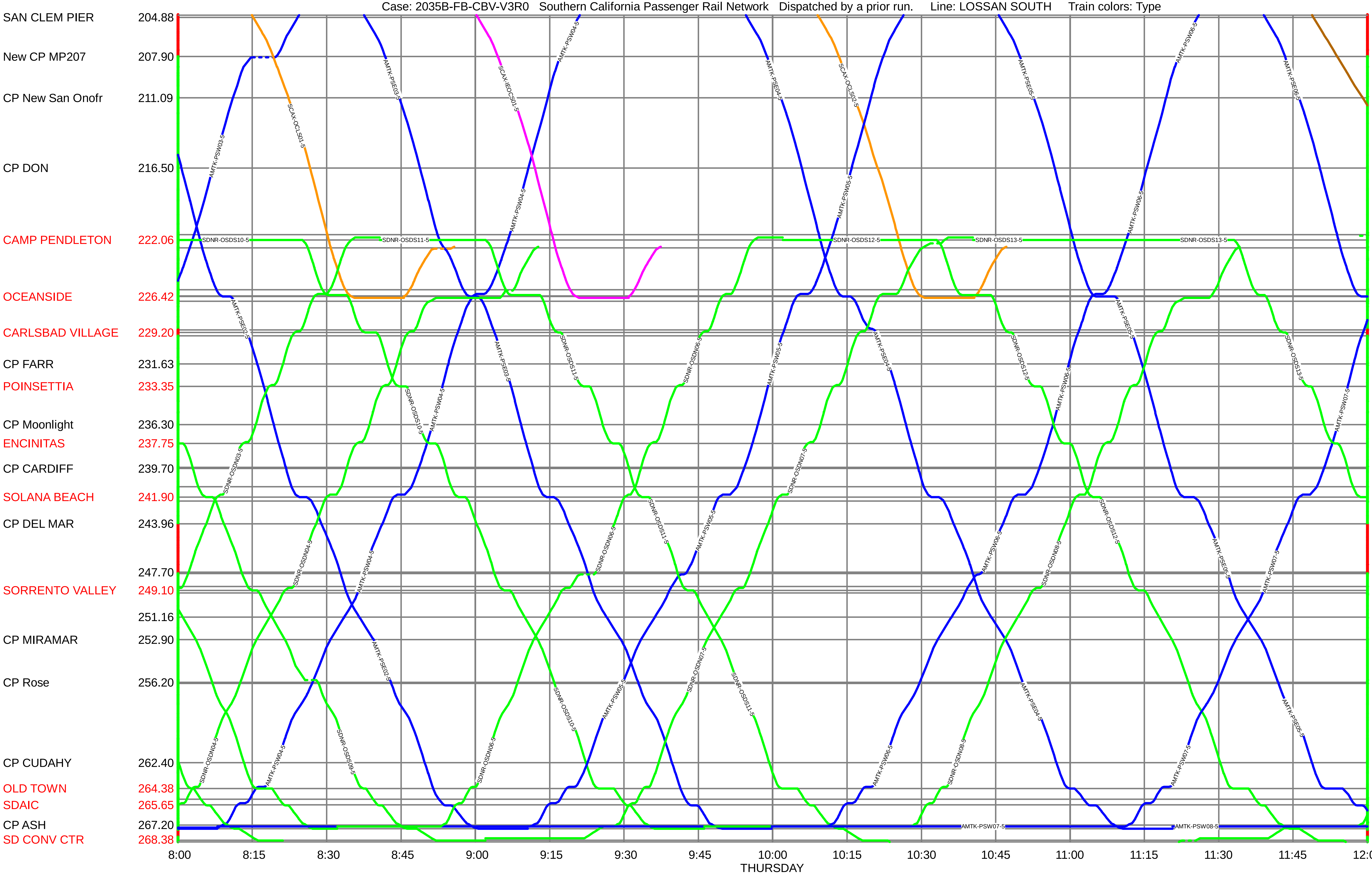
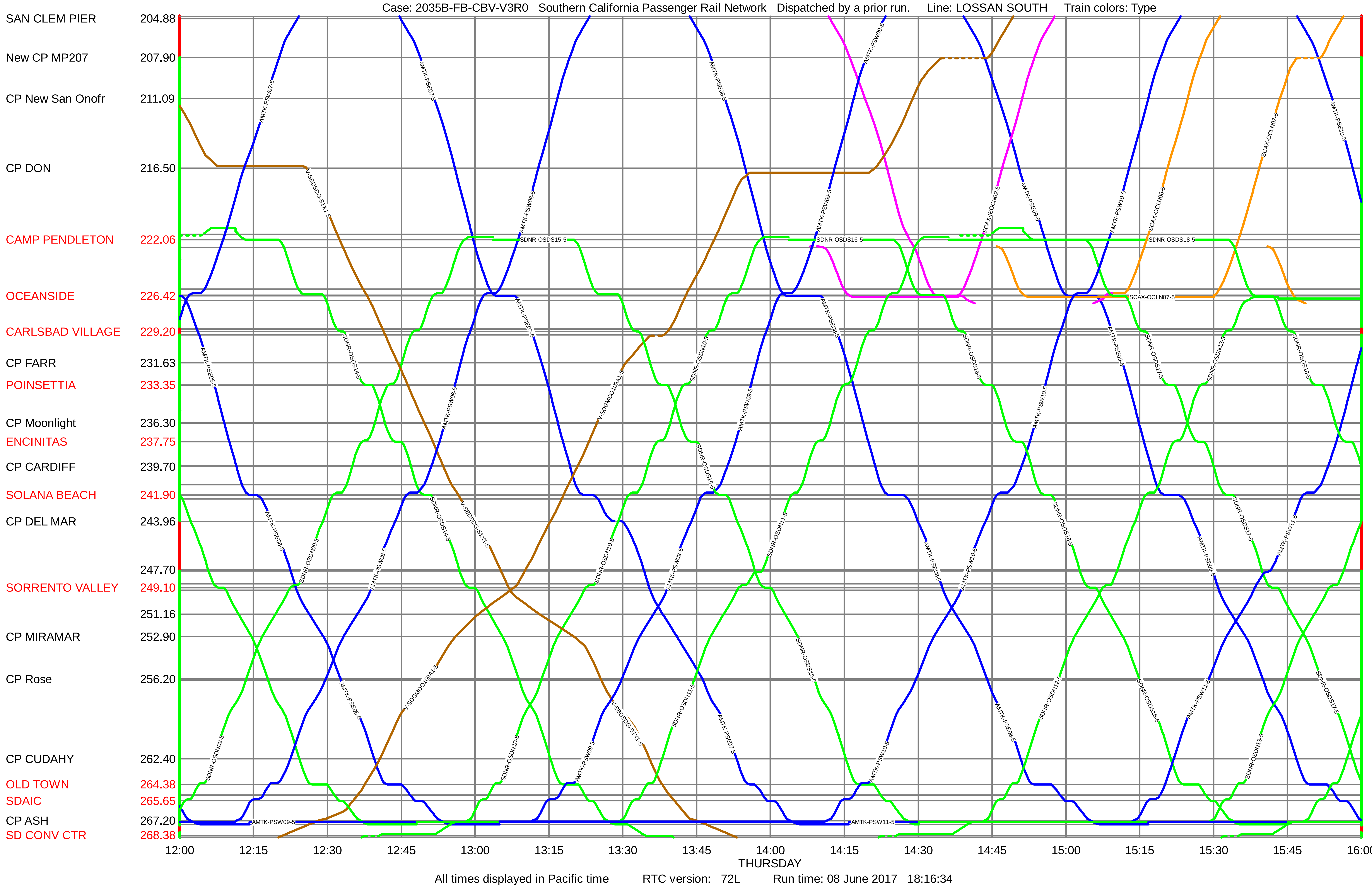
8:00
THURSDAY
All times displayed in Pacific time RTC version: 72L Run time: 08 June 2017 18:06:14

Case: 2035B-FB-CBV-V3R0 Southern California Passenger Rail Network Dispatched by a prior run. Line: LOSSAN SOUTH Train colors: Type




All times displayed in Pacific time RTC version: 72L Run time: 08 June 2017 18:07:27



Case: 2035B-FB-CBV-V3R0 Southern California Passenger Rail Network Dispatched by a prior run. Line: LOSSAN SOUTH Train colors: Type
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New CP MP207 207.90
CP New San Onofr 211.09
CP DON 216.50
CAMP PENDLETON 222.06
OCEANSIDE 226.42
CARLSBAD VILLAGE 229.20
CP FARR 231.63
POINSETTIA 233.35
CP Moonlight 236.30
ENCINITAS 237.75
CP CARDIFF 239.70
SOLANA BEACH 241.90
CP DEL MAR 243.96
247.70
SORRENTO VALLEY 249.10
251.16
CP MIRAMAR 252.90
CP Rose 256.20
CP CUDAHY 262.40
OLD TOWN 264.38
SDAIC 265.65
CP ASH 267.20
SD CONV CTR 268.38
12:00
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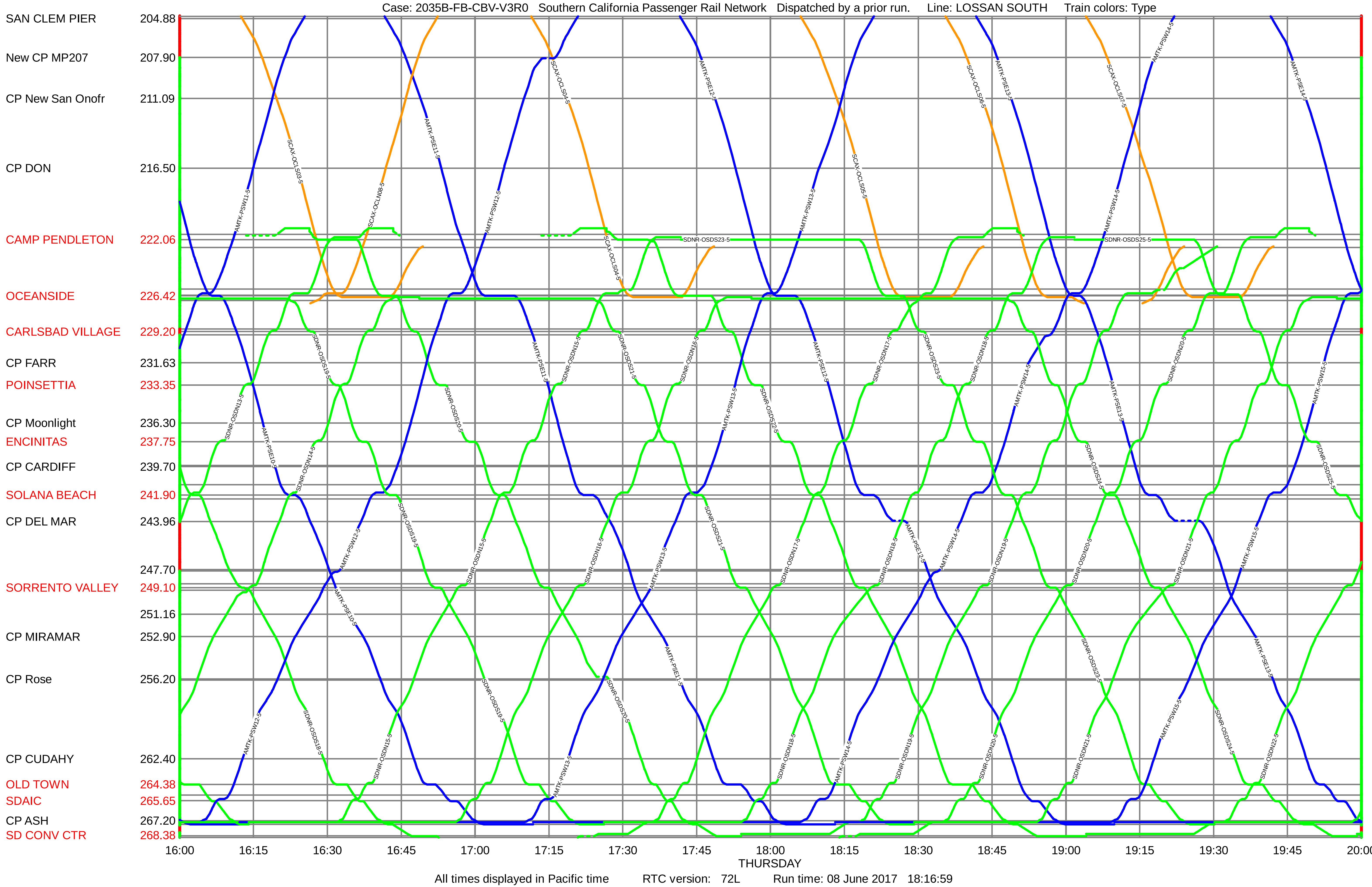
15:45
16:00
THURSDAY
All times displayed in Pacific time
RTC version: 72L
Run time: 08 June 2017 18:16:34



Case: 2035B-FB-CBV-V3R0 Southern California Passenger Rail Network Dispatched by a prior run. Line: LOSSAN SOUTH Train colors: Type
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CP New San Onofr 211.09
CP DON 216.50
CAMP PENDLETON 222.06
OCEANSIDE 226.42
CARLSBAD VILLAGE 229.20
CP FARR 231.63
POINSETTIA 233.35
CP Moonlight 236.30
ENCINITAS 237.75
CP CARDIFF 239.70
SOLANA BEACH 241.90
CP DEL MAR 243.96
247.70
SORRENTO VALLEY 249.10
251.16
CP MIRAMAR 252.90
CP Rose 256.20
CP CUDAHY 262.40
OLD TOWN 264.38
SDAIC 265.65
CP ASH 267.20
SD CONV CTR 268.38
16:00
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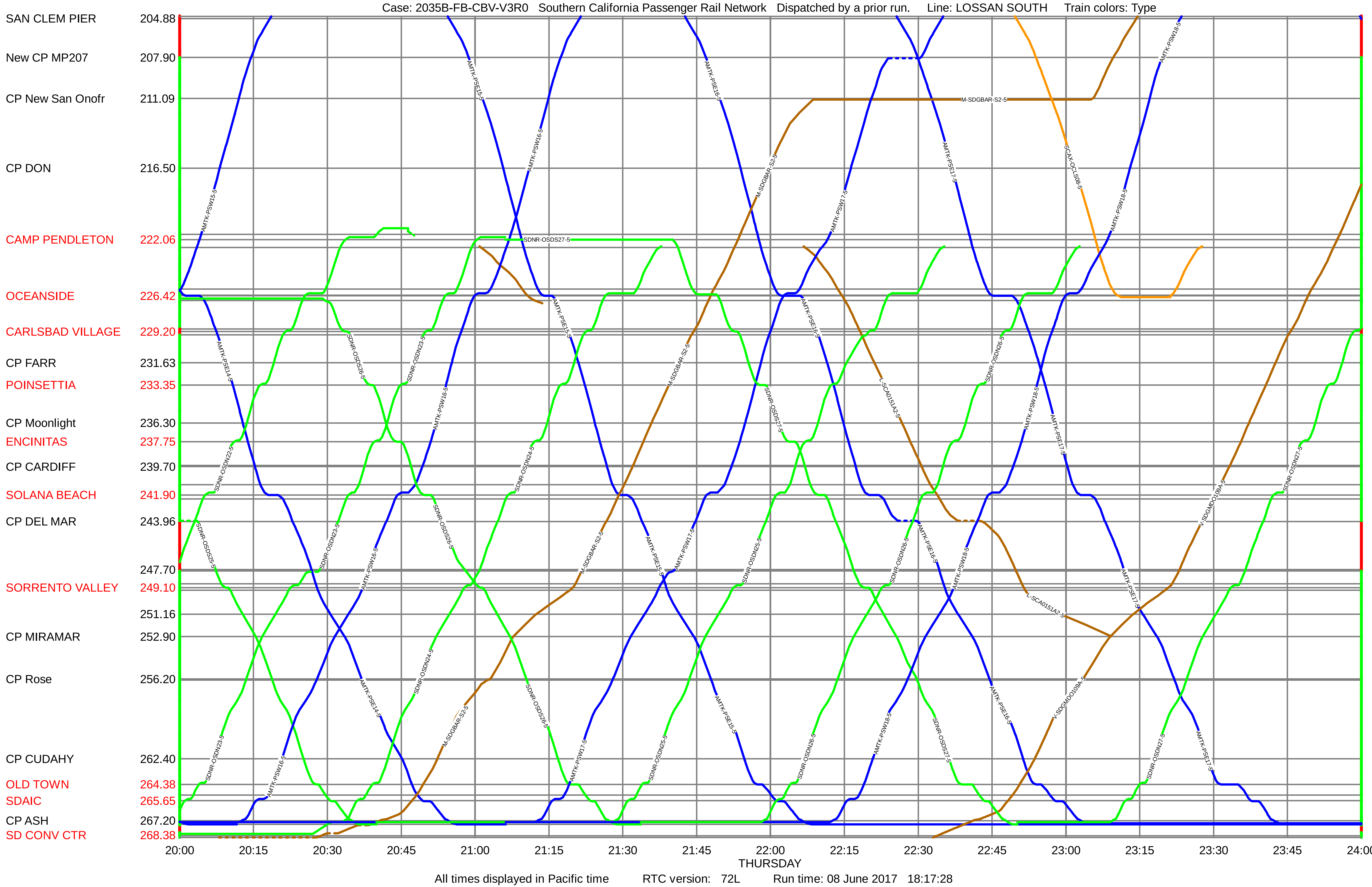
THURSDAY
All times displayed in Pacific time RTC version: 72L Run time: 08 June 2017 18:16:59


Case: 2035B-FB-CBV-V3R0 Southern California Passenger Rail Network Dispatched by a prior run. Line: LOSSAN SOUTH Train colors: Type
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CP New San Onofr 211.09
CP DON 216.50
CAMP PENDLETON 222.06
OCEANSIDE 226.42
CARLSBAD VILLAGE 229.20
CP FARR 231.63
POINSETTIA 233.35
CP Moonlight 236.30
ENCINITAS 237.75
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SOLANA BEACH 241.90
CP DEL MAR 243.96
247.70
SORRENTO VALLEY 249.10
251.16
CP MIRAMAR 252.90
CP Rose 256.20
CP CUDAHY 262.40
OLD TOWN 264.38
SDAIC 265.65
CP ASH 267.20
SD CONV CTR 268.38
20:00
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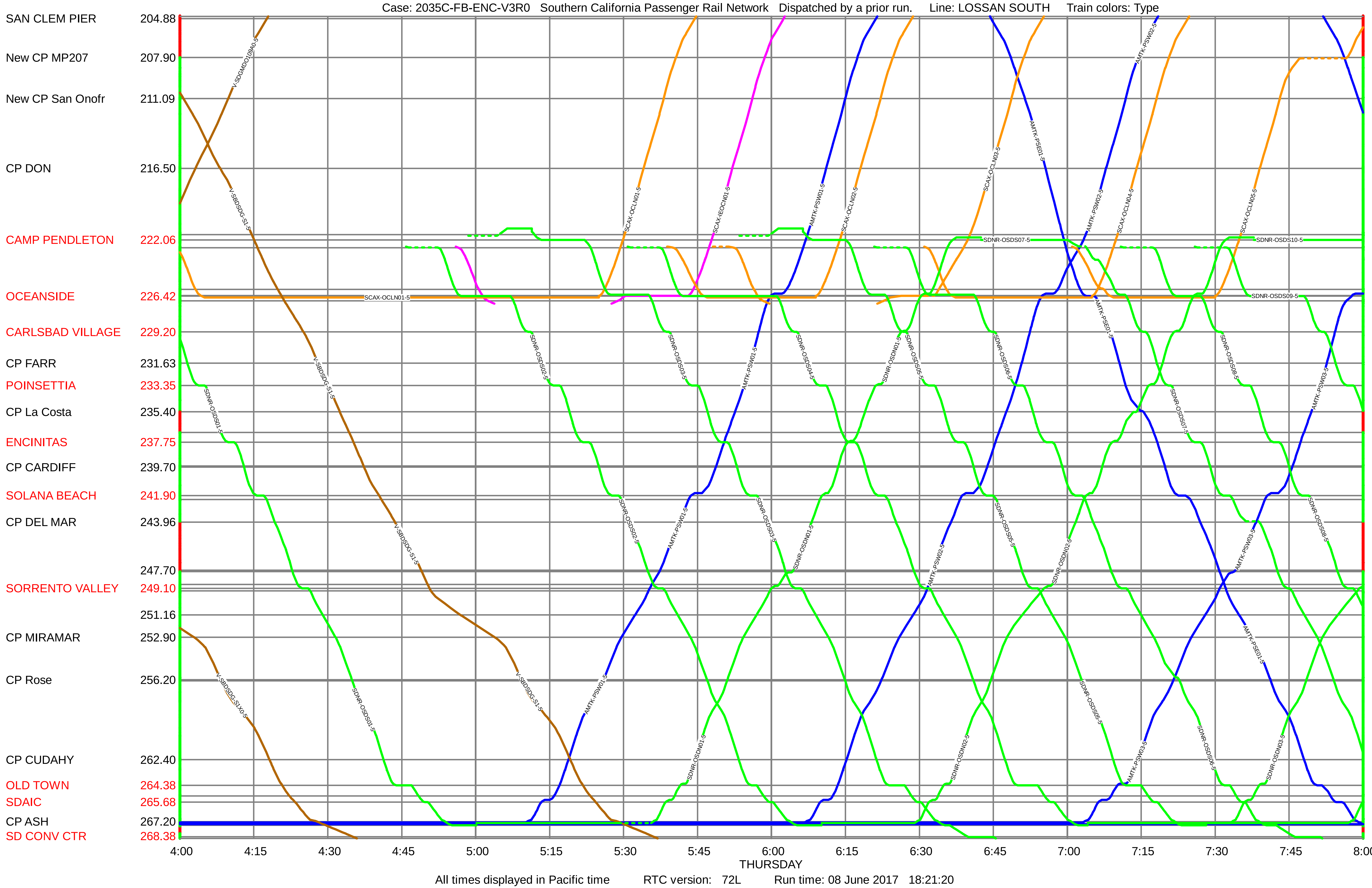
THURSDAY
All times displayed in Pacific time RTC version: 72L Run time: 08 June 2017 18:17:28


Case: 2035C-FB-ENC-V3R0 Southern California Passenger Rail Network Dispatched by a prior run. Line: LOSSAN SOUTH Train colors: Type
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New CP MP207 207.90
New CP San Onofr 211.09
CP DON 216.50
CAMP PENDLETON 222.06
OCEANSIDE 226.42
CARLSBAD VILLAGE 229.20
CP FARR 231.63
POINSETTIA 233.35
CP La Costa 235.40
ENCINITAS 237.75
CP CARDIFF 239.70
SOLANA BEACH 241.90
CP DEL MAR 243.96
247.70
SORRENTO VALLEY 249.10
251.16
CP MIRAMAR 252.90
CP Rose 256.20
CP CUDAHY 262.40
OLD TOWN 264.38
SDAIC 265.68
CP ASH 267.20
SD CONV CTR 268.38
4:00
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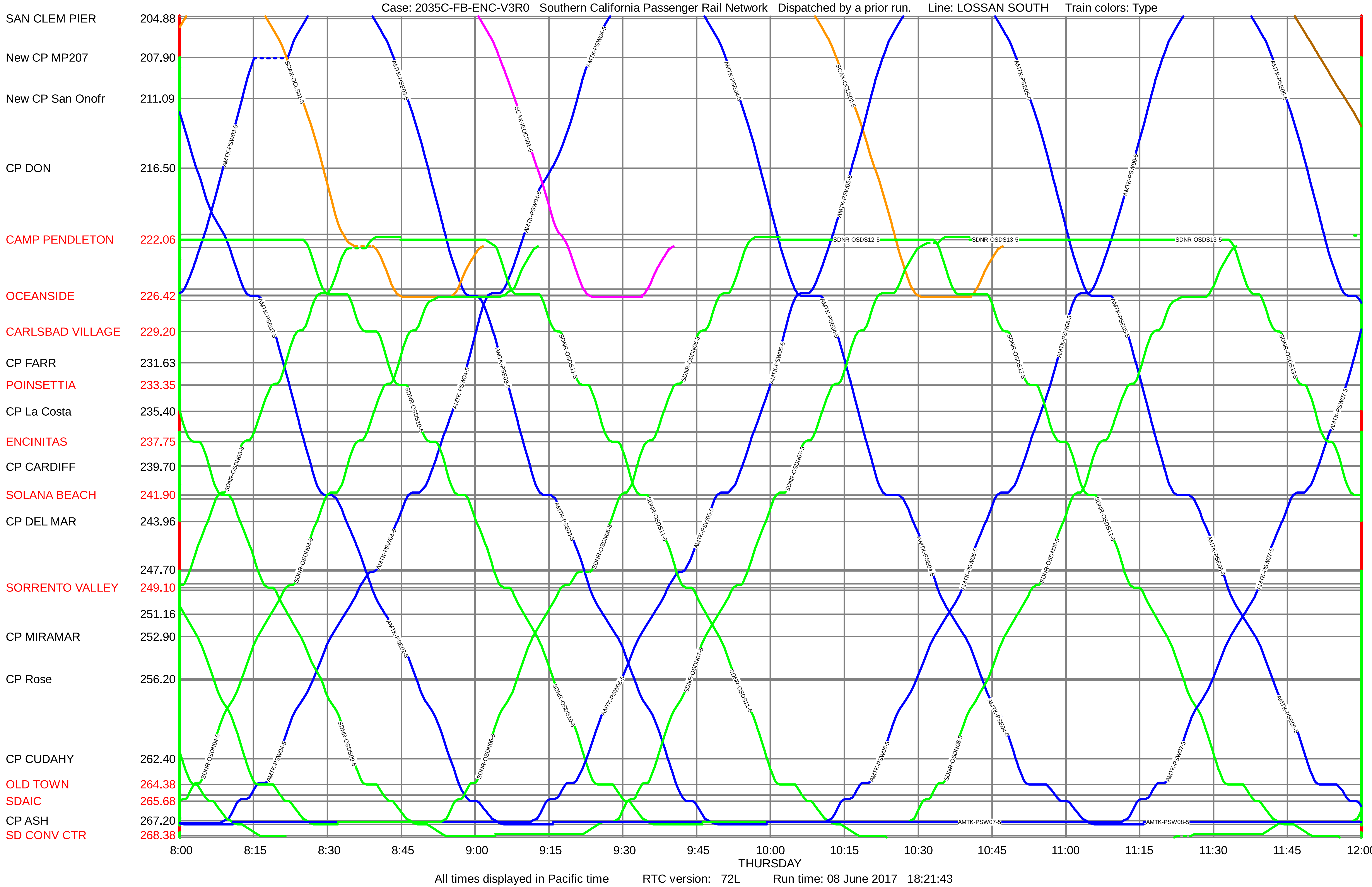
8:00
THURSDAY
All times displayed in Pacific time RTC version: 72L Run time: 08 June 2017 18:21:20


Case: 2035C-FB-ENC-V3R0 Southern California Passenger Rail Network Dispatched by a prior run. Line: LOSSAN SOUTH Train colors: Type
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New CP MP207 207.90
New CP San Onofr 211.09
CP DON 216.50
CAMP PENDLETON 222.06
OCEANSIDE 226.42
CARLSBAD VILLAGE 229.20
CP FARR 231.63
POINSETTIA 233.35
CP La Costa 235.40
ENCINITAS 237.75
CP CARDIFF 239.70
SOLANA BEACH 241.90
CP DEL MAR 243.96
247.70
SORRENTO VALLEY 249.10
251.16
CP MIRAMAR 252.90
CP Rose 256.20
CP CUDAHY 262.40
OLD TOWN 264.38
SDAIC 265.68
CP ASH 267.20
SD CONV CTR 268.38
8:00
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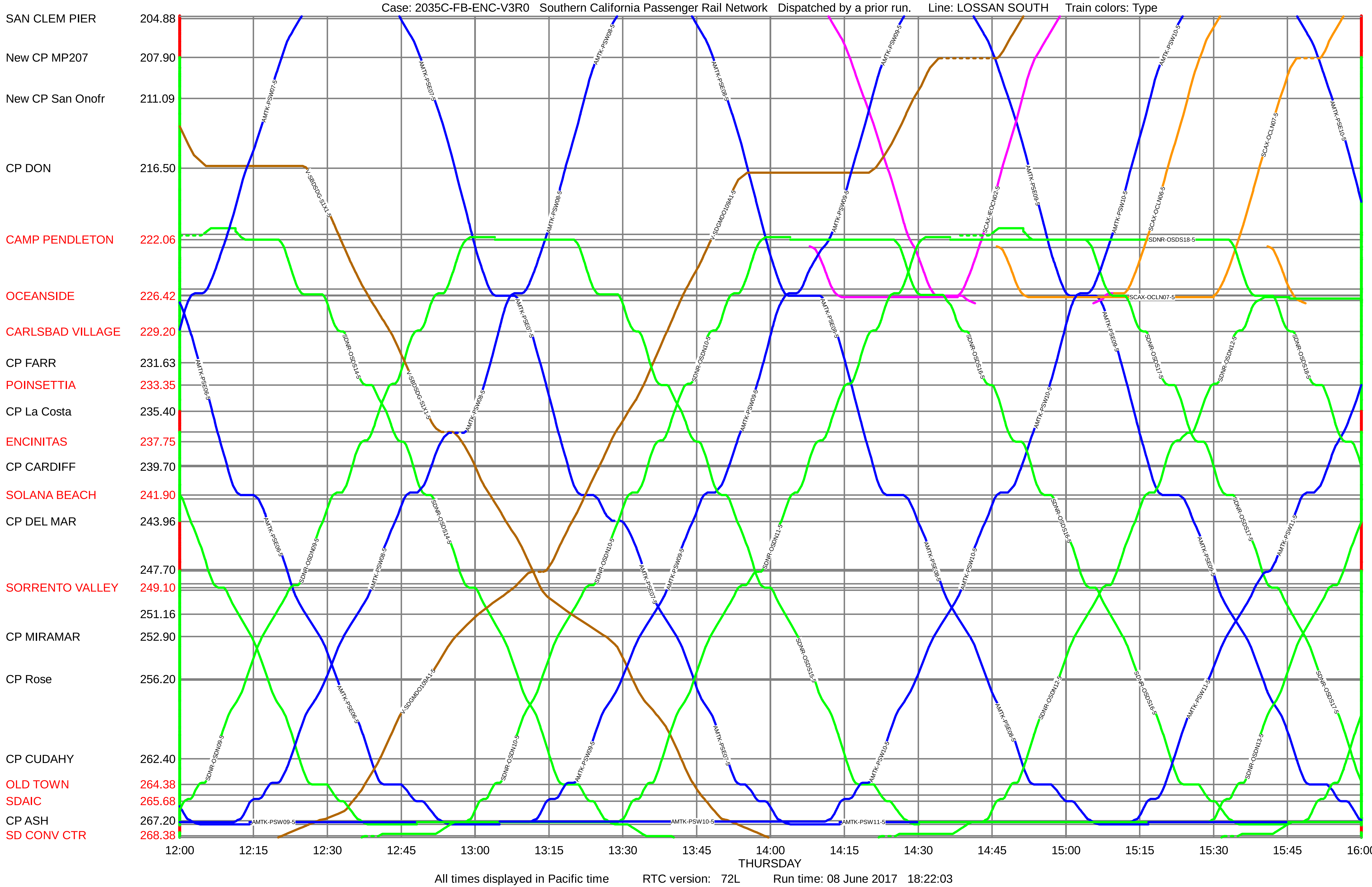
THURSDAY
All times displayed in Pacific time RTC version: 72L Run time: 08 June 2017 18:21:43



Case: 2035C-FB-ENC-V3R0 Southern California Passenger Rail Network Dispatched by a prior run. Line: LOSSAN SOUTH Train colors: Type
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New CP MP207 207.90
New CP San Onofr 211.09
CP DON 216.50
CAMP PENDLETON 222.06
OCEANSIDE 226.42
CARLSBAD VILLAGE 229.20
CP FARR 231.63
POINSETTIA 233.35
CP La Costa 235.40
ENCINITAS 237.75
CP CARDIFF 239.70
SOLANA BEACH 241.90
CP DEL MAR 243.96
247.70
SORRENTO VALLEY 249.10
251.16
CP MIRAMAR 252.90
CP Rose 256.20
CP CUDAHY 262.40
OLD TOWN 264.38
SDAIC 265.68
CP ASH 267.20
SD CONV CTR 268.38
12:00
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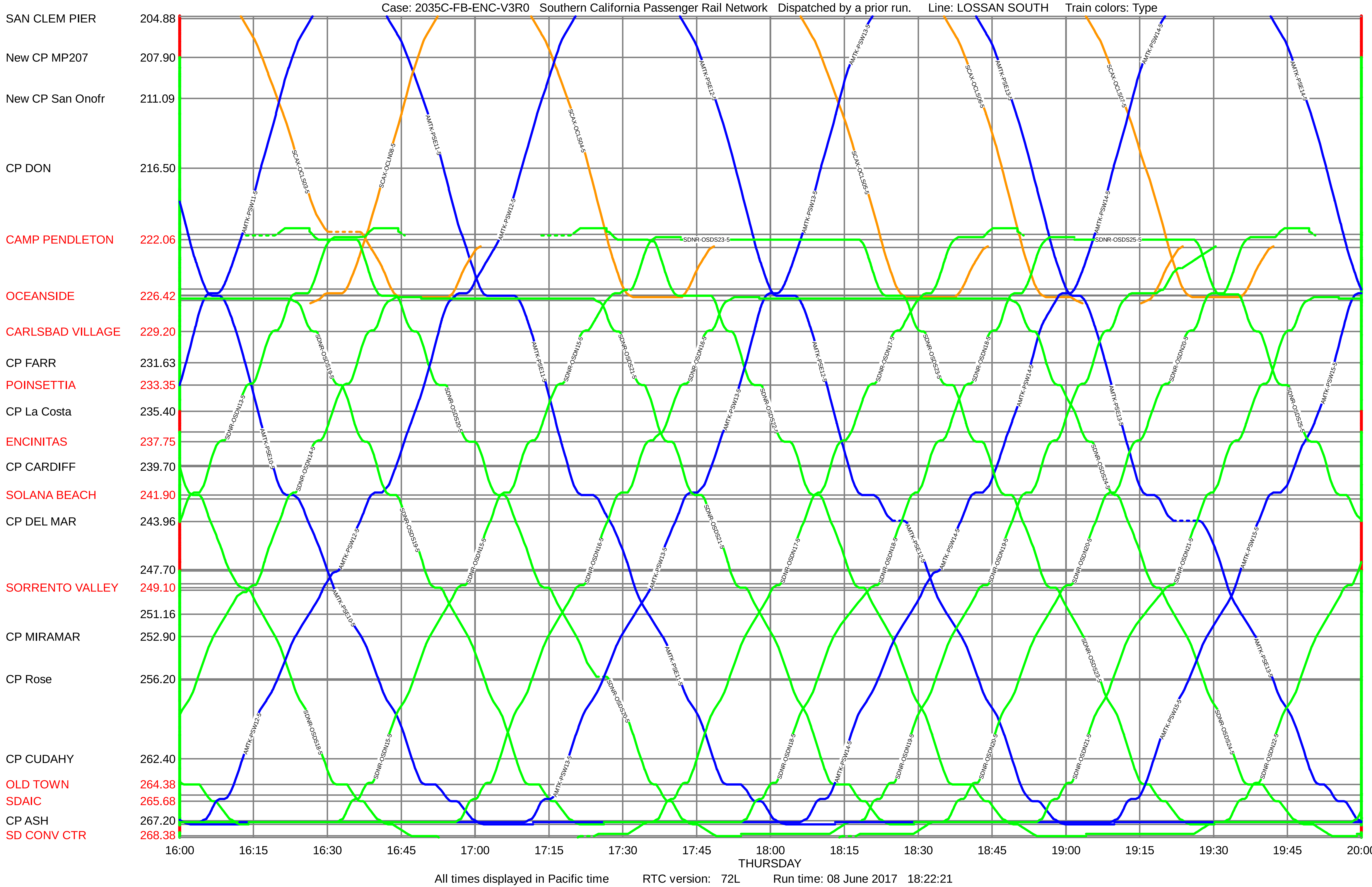
THURSDAY
All times displayed in Pacific time
RTC version: 72L
Run time: 08 June 2017 18:22:03


Case: 2035C-FB-ENC-V3R0 Southern California Passenger Rail Network Dispatched by a prior run. Line: LOSSAN SOUTH Train colors: Type
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New CP MP207 207.90
New CP San Onofr 211.09
CP DON 216.50
CAMP PENDLETON 222.06
OCEANSIDE 226.42
CARLSBAD VILLAGE 229.20
CP FARR 231.63
POINSETTIA 233.35
CP La Costa 235.40
ENCINITAS 237.75
CP CARDIFF 239.70
SOLANA BEACH 241.90
CP DEL MAR 243.96
247.70
SORRENTO VALLEY 249.10
251.16
CP MIRAMAR 252.90
CP Rose 256.20
CP CUDAHY 262.40
OLD TOWN 264.38
SDAIC 265.68
CP ASH 267.20
SD CONV CTR 268.38
16:00
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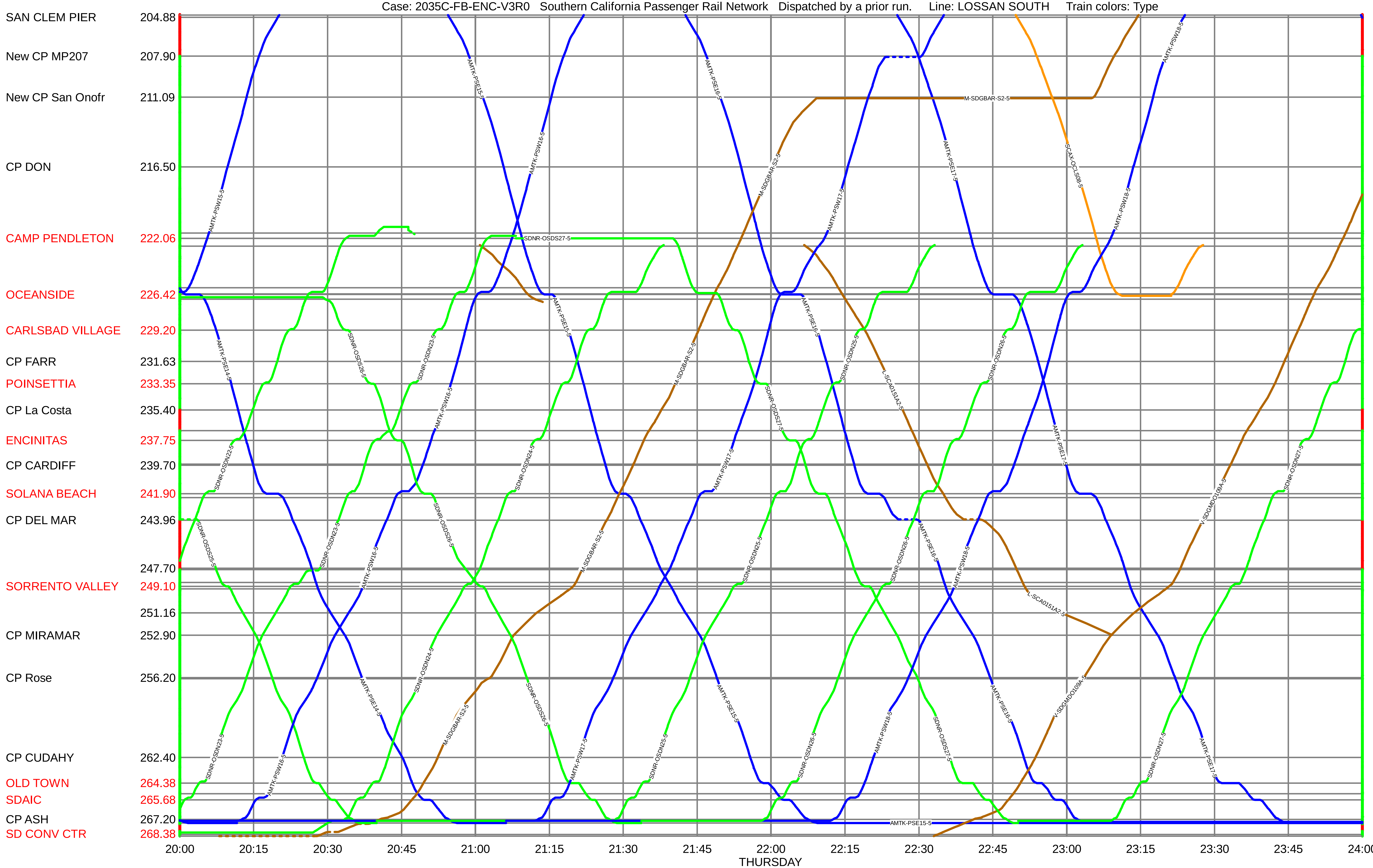
20:00
THURSDAY
All times displayed in Pacific time
RTC version: 72L
Run time: 08 June 2017 18:22:21

Case: 2035C-FB-ENC-V3R0 Southern California Passenger Rail Network Dispatched by a prior run. Line: LOSSAN SOUTH Train colors: Type

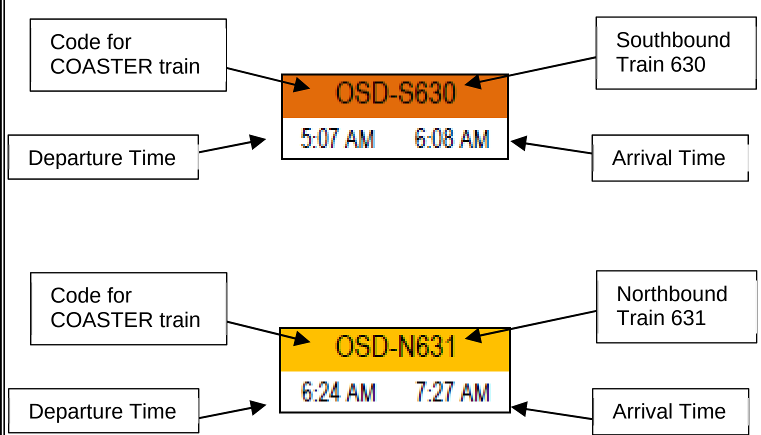



All times displayed in Pacific time RTC version: 72L Run time: 08 June 2017 18:22:41

# APPENDIX C

## EQUIPMENT CYCLE SPREADSHEETS

**Key:**




- **COASTER Train in Bold**: Train goes to Camp Pendleton Station
- <u>COASTER Train underlined</u>: Train goes to Convention Center Station

*<u>Layover Locations:</u>*

- MTS: MTS Yard
- SMMF: Stuart Mesa Maintenance Facility

**2017 Scenario**
**Equipment Turns**

| CYCLE | CARS | DEPARTURE | | | | | | | | | | | ARRIVAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| C1 | 5 | 4:37 AM | OSD-S630 | OSD-N631 | OSD-S640 | OSD-N639 | OSD-S648 | OSD-N645 | OSD-S654 | OSD-N655 | OSD-S662 | OSD-N665 | 8:48 PM |
| | | SMMF | 5:07 AM 6:08 AM | 6:24 AM 7:27 AM | 7:42 AM 8:45 AM | 9:40 AM 10:43 AM | 11:08 AM 12:14 PM | 12:51 PM 1:53 PM | 2:42 PM 3:44 PM | 4:23 PM 5:28 PM | 5:41 PM 6:45 PM | 7:15 PM 8:18 PM | SMMF |
| C2 | 5 | 5:30 AM | OSD-S634 | OSD-N635 | OSD-S644 | MTS | OSD-N661 | | | | | | 7:15 PM |
| | | SMMF | 6:00 AM 7:01 AM | 7:41 AM 8:46 AM | 9:37 AM 10:40 AM | 11:10 AM 5:10 PM | 5:40 PM 6:45 PM | | | | | | SMMF |
| C3 | 5 | 6:00 AM | OSD-S636 | MTS | OSD-N651 | OSD-S656 | OSD-N657 | | | | | | 6:28 PM |
| | | SMMF | 6:30 AM 7:38 AM | 8:08 AM 1:35 PM | 2:05 PM 3:07 PM | 3:32 PM 4:35 PM | 4:55 PM 5:58 PM | | | | | | SMMF |
| C4 | 5 | 6:43 AM | OSD-S638 | MTS | OSD-N653 | OSD-S660 | OSD-N663 | | | | | | 8:00 PM |
| | | SMMF | 7:13 AM 8:17 AM | 8:47 AM 3:08 PM | 3:38 PM 4:41 PM | 5:12 PM 6:16 PM | 6:26 PM 7:30 PM | | | | | | SMMF |

* Scheduled times are only for arrival/destination times within San Diego County

*20* *CARS*
*4* *LOCOMOTIVES*
*4* *Total Trains weekdays*
*COASTER*

**2017 Scenario**
**Mileage**

| CYCLE | CARS | DEPARTURE | | | | | | | | | | | ARRIVAL | MILES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| C1 | 5 | SMMF | OSD-S630 | OSD-N631 | OSD-S640 | OSD-N639 | OSD-S648 | OSD-N645 | OSD-S654 | OSD-N655 | OSD-S662 | OSD-N665 | SMMF | |
| | | 4.2 | 41.1 | 41.1 | 41.1 | 41.1 | 41.1 | 41.1 | 41.1 | 41.1 | 41.1 | 41.1 | 4.2 | 419 |
| C2 | 5 | SMMF | OSD-S634 | OSD-N635 | OSD-S644 | MTS | OSD-N661 | | | | | | SMMF | |
| | | 4.2 | 41.1 | 41.1 | 41.1 | 0.5 0.5 | 41.1 | | | | | | 4.2 | 174 |
| C3 | 5 | SMMF | OSD-S636 | MTS | OSD-N651 | OSD-S656 | OSD-N657 | | | | | | SMMF | |
| | | 4.2 | 41.1 | 0.5 0.5 | 41.1 | 41.1 | 41.1 | | | | | | 4.2 | 174 |
| C4 | 5 | SMMF | OSD-S638 | MTS | OSD-N653 | OSD-S660 | OSD-N663 | | | | | | SMMF | |
| | | 4.2 | 41.1 | 0.5 0.5 | 41.1 | 41.1 | 41.1 | | | | | | 4.2 | 174 |

*41.1 miles = Oceanside Transit Center to Santa Fe Depot*
*4.2 miles = Oceanside Transit Center to Stuart Mesa Maintenance Facility*
*0.5 miles = Santa Fe Depot to MTS Yard*

*TOTAL MILES* *941*
*AVG. GLS FUEL*

**2020 Scenario**
**Equipment Turns**

| CYCLE | CARS | DEPARTURE | | | | | | | | | | | ARRIVAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| C1 | 5 | 4:37 AM | OSD-S630 | OSD-N631 | OSD-S640 | OSD-N639 | OSD-S648 | OSD-N645 | OSD-S654 | OSD-N655 | OSD-S662 | OSD-N665 | 8:48 PM |
| | | SMMF | 5:07 AM 6:08 AM | 6:24 AM 7:27 AM | 7:44 AM 8:48 AM | 9:40 AM 10:43 AM | 11:08 AM 12:14 PM | 12:51 PM 1:53 PM | 2:42 PM 3:44 PM | 4:15 PM 5:20 PM | 5:41 PM 6:45 PM | 7:15 PM 8:18 PM | SMMF |
| C2 | 5 | 5:30 AM | OSD-S634 | OSD-N635 | OSD-S644 | MTS | OSD-N657 | | | | | | 6:22 PM |
| | | SMMF | 6:00 AM 7:00 AM | 7:20 AM 8:25 AM | 9:37 AM 10:40 AM | 11:10 AM 4:22 PM | 4:52 PM 5:52 PM | | | | | | SMMF |
| C3 | 5 | 5:48 AM | OSD-SX02 | OSD-NX01 | SMMF-M | OSD-SX08 | OSD-NX07 | | | | | | 7:41 PM |
| | | SMMF | 6:18 AM 7:19 AM | 7:59 AM 9:03 AM | 9:33 AM 4:05 PM | 4:35 PM 5:39 PM | 6:08 PM 7:11 PM | | | | | | SMMF |
| C4 | 5 | 6:08 AM | OSD-S636 | MTS | OSD-N651 | OSD-SX06 | OSD-N661 | | | | | | 7:15 PM |
| | | SMMF | 6:38 AM 7:43 AM | 8:13 AM 1:45 PM | 2:15 PM 3:17 PM | 4:10 PM 5:13 PM | 5:40 PM 6:45 PM | | | | | | SMMF |
| C5 | 5 | 6:35 AM | OSD-S638 | MTS | OSD-N653 | OSD-S660 | OSD-N663 | | | | | | 8:10 PM |
| | | SMMF | 7:05 AM 8:09 AM | 8:39 AM 3:08 PM | 3:38 PM 4:41 PM | 5:12 PM 6:16 PM | 6:36 PM 7:40 PM | | | | | | SMMF |
| C6 | 5 | 6:55 AM | OSD-SX04 | MTS | OSD-NX03 | | | | | | | | 6:10 PM |
| | | SMMF | 7:25 AM 8:26 AM | 8:56 AM 4:05 PM | 4:35 PM 5:40 PM | | | | | | | | SMMF |
| C7 | 5 | 3:02 PM | OSD-S656 | OSD-NX05 | | | | | | | | | 6:50 PM |
| | | SMMF | 3:32 PM 4:35 PM | 5:15 PM 6:20 PM | | | | | | | | | SMMF |

* Scheduled times are only for arrival/destination times within San Diego County

*35* *CARS*

*7* *LOCOMOTIVES*

*7* *Total Trains weekdays*

*COASTER*

# 2020 Scenario
# Mileage

| CYCLE | CARS | DEPARTURE | | | | | | | | | | | ARRIVAL | MILES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| C1 | 5 | SMMF | OSD-S630 | OSD-N631 | OSD-S640 | OSD-N639 | OSD-S648 | OSD-N645 | OSD-S654 | OSD-N655 | OSD-S662 | OSD-N665 | SMMF | |
| | | 4.2 | 41.1 | 41.1 | 41.1 | 41.1 | 41.1 | 41.1 | 41.1 | 41.1 | 41.1 | 41.1 | 4.2 | 419 |
| C2 | 5 | SMMF | OSD-S634 | OSD-N635 | OSD-S644 | MTS | OSD-N657 | | | | | | SMMF | |
| | | 4.2 | 41.1 | 41.1 | 41.1 | 0.5 0.5 | 41.1 | | | | | | 4.2 | 174 |
| C3 | 5 | SMMF | OSD-SX02 | OSD-NX01 | SMMF-M | OSD-SX08 | OSD-NX07 | | | | | | SMMF | |
| | | 4.2 | 41.1 | 41.1 | 4.4 4.4 | 41.1 | 41.1 | | | | | | 4.2 | 182 |
| C4 | 5 | SMMF | OSD-S636 | MTS | OSD-N651 | OSD-SX06 | OSD-N661 | | | | | | SMMF | |
| | | 4.2 | 41.1 | 0.5 0.5 | 41.1 | 41.1 | 41.1 | | | | | | 4.2 | 174 |
| C5 | 5 | SMMF | OSD-S638 | MTS | OSD-N653 | OSD-S660 | OSD-N663 | | | | | | SMMF | |
| | | 4.2 | 41.1 | 0.5 0.5 | 41.1 | 41.1 | 41.1 | | | | | | 4.2 | 174 |
| C6 | 5 | SMMF | OSD-SX04 | MTS | OSD-NX03 | | | | | | | | SMMF | |
| | | 4.2 | 41.1 | 0.5 0.5 | 41.1 | | | | | | | | 4.2 | 92 |
| C7 | 5 | SMMF | OSD-S656 | OSD-NX05 | | | | | | | | | SMMF | |
| | | 4.2 | 41.1 | 41.1 | | | | | | | | | 4.2 | 91 |

*41.1 miles = Oceanside Transit Center to Santa Fe Depot*
*4.2 miles = Oceanside Transit Center to Stuart Mesa Maintenance Facility*
*0.5 miles = Santa Fe Depot to MTS Yard*

*TOTAL MILES* 1305
*AVG. GLS FUEL*

**2035 Scenario**
**Equipment Turns**

| CYCLE | CARS | DEPARTURE | | | | | | | | | | | | ARRIVAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| C1 | 6 | 3:25 AM | OSD-S01 | OSD-N01 | OSD-S07 | MTS | OSD-N10 | OSD-S16 | OSD-N15 | OSD-S23 | OSD-N23 | OSD-S27 | OSD-N27 | 12:41 AM |
| | | SMMF | 3:55 AM 4:55 AM | 5:30 AM 6:37 AM | 7:02 AM 8:11 AM | 8:41 AM 12:29 PM | 12:59 PM 1:56 PM | 2:29 PM 3:35 PM | 4:32 PM 5:40 PM | 6:18 PM 7:25 PM | 7:59 PM 9:03 PM | 9:40 PM 10:49 PM | 11:09 PM 12:11 AM | SMMF |
| C2 | 6 | 4:37 AM | OSD-S02 | OSD-N02 | OSD-S10 | OSD-N08 | SMMF | OSD-S22 | OSD-N22 | | | | | 9:10 PM |
| | | SMMF | 5:07 AM 6:05 AM | 6:30 AM 7:37 AM | 8:27 AM 9:36 AM | 10:29 AM 11:25 AM | 11:55 AM 5:05 PM | 5:35 PM 6:49 PM | 7:33 PM 8:40 PM | | | | | SMMF |
| C3 | 6 | 4:54 AM | OSD-S03 | OSD-N03 | OSD-S11 | MTS | OSD-N14 | OSD-S21 | OSD-N21 | OSD-S26 | OSD-N26 | | | 11:25 PM |
| | | SMMF | 5:24 AM 6:35 AM | 7:34 AM 8:38 AM | 9:02 AM 10:13 AM | 10:43 AM 3:19 PM | 3:49 PM 4:45 PM | 5:24 PM 6:24 PM | 6:55 PM 7:51 PM | 8:29 PM 9:29 PM | 9:59 PM 10:55 PM | | | SMMF |
| C4 | 6 | 5:31 AM | OSD-S04 | MTS | OSD-N09 | OSD-S15 | OSD-N13 | | | | | | | 5:07 PM |
| | | SMMF | 6:01 AM 7:02 AM | 7:32 AM 11:29 AM | 11:59 AM 12:56 PM | 1:20 PM 2:29 PM | 3:30 PM 4:37 PM | | | | | | | SMMF |
| C5 | 6 | 5:42 AM | OSD-S05 | OSD-N04 | SMMF-M | OSD-S17 | OSD-N16 | OSD-S24 | OSD-N24 | | | | | 10:00 PM |
| | | SMMF | 6:12 AM 7:26 AM | 7:57 AM 8:54 AM | 9:24 AM 2:34 PM | 3:04 PM 4:12 PM | 4:57 PM 5:53 PM | 6:48 PM 7:49 PM | 8:34 PM 9:30 PM | | | | | SMMF |
| C6 | 6 | 6:11 AM | OSD-S06 | OSD-N05 | SMMF-M | OSD-S20 | OSD-N19 | | | | | | | 7:45 PM |
| | | SMMF | 6:41 AM 7:41 AM | 8:30 AM 9:37 AM | 10:07 AM 4:06 PM | 4:36 PM 5:44 PM | 6:19 PM 7:15 PM | | | | | | | SMMF |
| C7 | 6 | 6:57 AM | OSD-S08 | OSD-N06 | OSD-S12 | MTS | OSD-N20 | | | | | | | 8:08 PM |
| | | SMMF | 7:27 AM 8:29 AM | 8:54 AM 9:55 AM | 10:33 AM 11:44 AM | 12:14 PM 6:05 PM | 6:35 PM 7:38 PM | | | | | | | SMMF |
| C8 | 6 | 7:18 AM | OSD-S09 | OSD-N07 | OSD-S13 | OSD-N11 | OSD-S18 | OSD-N17 | | | | | | 7:08 PM |
| | | SMMF | 7:48 AM 8:48 AM | 9:29 AM 10:36 AM | 11:28 AM 12:38 PM | 1:30 PM 2:31 PM | 3:33 PM 4:42 PM | 5:34 PM 6:38 PM | | | | | | SMMF |
| C9 | 6 | 11:50 AM | OSD-S14 | OSD-N12 | OSD-S19 | OSD-N18 | OSD-S25 | OSD-N25 | | | | | | 10:55 PM |
| | | SMMF | 12:20 PM 1:29 PM | 2:44 PM 3:40 PM | 4:22 PM 5:21 PM | 5:55 PM 7:07 PM | 7:26 PM 8:35 PM | 9:29 PM 10:25 PM | | | | | | SMMF |

* Scheduled times are only for arrival/destination times within San Diego County

*54 CARS*
*9 LOCOMOTIVES*
*9 Total Trains weekdays*
*COASTER*

**2035 Scenario**
**Mileage**

| CYCLE | CARS | DEPARTURE | | | | | | | | | | | | ARRIVAL | MILES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| C1 | 6 | SMMF | OSD-S01 | OSD-N01 | OSD-S07 | MTS | OSD-N10 | OSD-S16 | OSD-N15 | OSD-S23 | OSD-N23 | OSD-S27 | OSD-N27 | SMMF | |
| | | 4.2 | 41.1 | 45.5 | 45.8 | 0.2 0.2 | 45.8 | 45.8 | 45.8 | 45.8 | 45.8 | 45.5 | 45.5 | 0.2 | 457 |
| C2 | 6 | SMMF | OSD-S02 | OSD-N02 | OSD-S10 | OSD-N08 | SMMF | OSD-S22 | OSD-N22 | | | | | SMMF | |
| | | 4.2 | 41.1 | 45.5 | 45.8 | 41.4 | 4.2 | 46.0 | 45.8 | | | | | 0.2 | 274 |
| C3 | 6 | SMMF | OSD-S03 | OSD-N03 | OSD-S11 | MTS | OSD-N14 | OSD-S21 | OSD-N21 | OSD-S26 | OSD-N26 | | | SMMF | |
| | | 4.2 | 46.0 | 46.1 | 45.8 | 0.2 0.2 | 41.4 | 41.1 | 41.1 | 41.1 | 41.1 | | | 4.2 | 353 |
| C4 | 6 | SMMF | OSD-S04 | MTS | OSD-N09 | OSD-S15 | OSD-N13 | | | | | | | SMMF | |
| | | 4.2 | 4.4 | 0.2 0.2 | 45.8 | 45.8 | 45.8 | | | | | | | 0.2 | 147 |
| C5 | 6 | SMMF | OSD-S05 | OSD-N04 | SMMF-M | OSD-S17 | OSD-N16 | OSD-S24 | OSD-N24 | | | | | SMMF | |
| | | 4.2 | 46.0 | 41.1 | 4.2 0.2 | 46.0 | 41.1 | 9:36 AM | 9:36 AM | | | | | 4.2 | 270 |
| C6 | 6 | SMMF | OSD-S06 | OSD-N05 | SMMF-M | OSD-S20 | OSD-N19 | | | | | | | SMMF | |
| | | 4.2 | 41.4 | 45.8 | 0.2 0.2 | 45.8 | 41.4 | | | | | | | 4.2 | 183 |
| C7 | 6 | SMMF | OSD-S08 | OSD-N06 | OSD-S12 | MTS | OSD-N20 | | | | | | | SMMF | |
| | | 4.2 | 41.1 | 45.5 | 45.8 | 0.2 0.2 | 45.8 | | | | | | | 4.2 | 187 |
| C8 | 6 | SMMF | OSD-S09 | OSD-N07 | OSD-S13 | OSD-N11 | OSD-S18 | OSD-N17 | | | | | | SMMF | |
| | | 4.2 | 41.4 | 45.8 | 45.8 | 45.8 | 45.8 | 45.8 | | | | | | 0.2 | 271 |
| C9 | 6 | SMMF | OSD-S14 | OSD-N12 | OSD-S19 | OSD-N18 | OSD-S25 | OSD-N25 | | | | | | SMMF | |
| | | 4.2 | 46.0 | 41.4 | 41.1 | 45.5 | 45.8 | 41.4 | | | | | | 4.2 | 265 |

*41.1 miles = Oceanside Transit Center to Santa Fe Depot*
*4.2 miles = Oceanside Transit Center to Stuart Mesa Maintenance Facility*
*0.5 miles = Santa Fe Depot to MTS Yard*
*4.4 miles = Oceanside Transit Center to Camp Pendleton*
*0.2 miles = Camp Pendleton to Stuart Mesa Maintenance Facility*
*0.3 miles = Santa Fe Depot to Convention Center Station*
*0.2 miles = Convention Center Station to MTS Yard*

*TOTAL MILES* *2407*
*AVG. GLS FUEL*

# APPENDIX 8

## San Diego Mid-Term Network Build-Out Operations Analysis Technical Memorandum

**San Diego Association of Governments**
*LOSSAN Rail Operations Modeling*

# TECHNICAL MEMORANDUM

## CONTRACT NO. 5001306 TASK ORDER 07

## SAN DIEGO MID-TERM OPERATIONS ANALYSIS


Prepared by: Ashley Walker — 07/31/2012 Date

Technical & Quality Review by: Lane Fernandes — 01/04/2013 Date

Approved & Released by: James D. Campbell — 01/08/2013 Date


| Revision | Date | Description |
|---|---|---|
| Revision 1 | 01/04/2013 | Comments from SANDAG and stakeholders incorporated and/or addressed in report. |
| | | |
| | | |
| | | |
| | | |

PARSONS BRINCKERHOFF

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January 8, 2013

# San Diego Mid-Term Network Build-Out Operations Analysis Technical Memorandum

## Background

The purpose of the memorandum is to analyze the proposed 2025 Mid-Term Build-Out of the Los Angeles-San Diego-San Luis Obispo (LOSSAN) Rail Corridor in San Diego County. This analysis is being conducted to confirm that the infrastructure improvements identified for the mid-term build out continue to be sufficient to support revised assumptions for the proposed 2025 service levels, initially identified as part of the *San Diego-LOSSAN Corridorwide Project Prioritization Analysis* prepared in 2009.

The segment of the LOSSAN Corridor that is the focus of this analysis is owned by the North County Transit District (NCTD) from the Orange County line to the southern limits of the City of Del Mar. The San Diego Metropolitan Transit System (SDMTS) owns the track in the City of San Diego from Del Mar to the Santa Fe Depot. Starting at the Orange County Line and continuing to the Santa Fe Depot in downtown San Diego, NCTD dispatches all trains operating on the corridor. The BNSF Railway (BNSF) owns the right-of-way and dispatches trains south of the Santa Fe Depot. Currently, three COASTER commuter trains each weekday operate as non-revenue trains (deadhead) on this 0.75 mile segment of the corridor between the Santa Fe Depot and the SDMTS Trolley Yard for midday layovers.

The complete vision for the LOSSAN Corridor is based on an agreed program of rail improvements between SANDAG, NCTD, California Department of Transportation (Caltrans) Rail Division, Amtrak, BNSF, Union Pacific Railroad (UPRR) and the Southern California Regional Rail Authority (Metrolink). The goal of the collective efforts of these agencies is to improve capacity, ridership, travel times, and on time performance for all services operating on the corridor.

As part of the *San Diego-LOSSAN Corridorwide Project Prioritization Analysis*, 40 projects were identified as being necessary to be implemented in order for the forecast increases in service to operate efficiently. Five of these projects (listed below in more detail) were identified as necessary (in addition to the projects identified as part of the *San Diego Near-Term Network Build-Out Operations Analysis*), to support mid-term plan for the corridor in San Diego County, many of which are currently in the planning or design stage. Again, this analysis will indicate if these projected infrastructure improvements indentified for the mid-term continue to be relevant to support revised service assumptions for the proposed 2025 service levels.

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## Methodology

The methodology for performing this analysis will rely on the results of the operational simulations conducted of the proposed service levels along the LOSSAN Corridor in a 2025 mid-term scenario (specifically in San Diego County). These results will then allow SANDAG to identify how to design and stage capital projects to most effectively support the planned increased operational levels as well as support the ultimate build out configuration of the corridor (as presented in the *San Diego Full Network Build-Out Operations Analysis* prepared in June 2012).

The simulations conducted will assist in determining overall infrastructure improvements necessary to support the service plans. Through this modeling and analysis, Parsons Brinckerhoff will identify "choke points" along the LOSSAN Rail Corridor where improvements are necessary to maintain reliable train operations under the mid-term. This will include additional track miles, crossovers and signaling improvements. Using the results of this analysis (in combination with the results of the analyses performed on the Full Network Build Out and the Near-Term Build Out) will assist in developing a priority phasing plan for the construction of these projects.

The infrastructure identified through the simulations will be guided by the need to meet service goals; however the priority in which the projects are constructed will be determined not only by their ability to support the service goals and the ultimate goals set forth in the Full Network Build-Out, but also by their ability to improve existing and near-term operations.

## Service Level Assumptions

The 2025 Mid-Term Service levels were identified by SANDAG and based on service volumes identified in the *San Diego-LOSSAN Corridor Project Prioritization Analysis* final project report prepared in May 2009. For San Diego County, the identified service levels assumed a total of 18 commuter and 32 intercity trains between the Orange County Line and Oceanside and 36 commuter trains and 32 intercity trains between Oceanside and San Diego each weekday. Tables summarizing the service level assumptions are provided below.

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***Table 1: Service Level Assumptions (Orange County Line to Oceanside)***

| Operator / Line | July 2012 Volume | 2020 Volume | 2025 Volume | Service Growth (2012-2025) | Frequency Goals (minutes)[1] |
|---|---|---|---|---|---|
| Intercity (All Stop) | 21 | 24 | 27 | 6 | 60 PK / 60-90 OP |
| Intercity (Limited Stop) | 1 | 2 | 5 | 4 | Not applicable[2] |
| Commuter | 16 | 16 | 16 | 0 | 30 PK / Existing OP |
| BNSF Freight | 4 | 8 | 8 | 2 | Not applicable |
| **TOTAL** | **44** | **50** | **56** | **12** | |

***Table 2: Service Level Assumptions (Oceanside to San Diego)***

| Operator / Line | July 2012 Volume | 2020 Volume | 2025 Volume | Service Growth (2012-2025) | Frequency Goals (minutes)[1] |
|---|---|---|---|---|---|
| Intercity | 21 | 24 | 27 | 6 | 60 PK / 60-90 OP |
| Intercity (Limited Stop) | 1 | 2 | 5 | 4 | Not applicable[2] |
| Commuter | 22 | 30 | 36 | 14 | 20 PK / Existing OP |
| BNSF Freight | 6 | 11 | 11 | 5 | Not applicable |
| **TOTAL** | **50** | **67** | **79** | **29** | |

The operational assumptions used in developing the proposed service plan for simulation purposes are consistent with the operating rules as indicated in the NCTD San Diego Subdivision Timetable. This includes speed limits, long-term speed restrictions and station hold out rules (where applicable). The infrastructure improvements planned in this mid-term scenario do not require modification to any of these rules.

## Infrastructure Assumptions

The infrastructure projects assumed for this analysis are consistent with the projects included in the San Diego 2050 Regional Transportation Plan (RTP). The projects assumed in the simulation that are in addition to those already in use or in construction are listed below.

Five of these projects have been identified as part of the mid-term plan for the corridor in San Diego County, many of which are currently in the planning or design stage. These five projects, along with the prior projects supporting the near-term service plan, were deemed necessary for the successful implementation of the proposed 2025 mid-term service levels.

These five mid-term projects are the focus of this report, but it is assumed that the projects that were found to be required to support the near-term service plan referenced in the *San Diego Near-Term*

*[1] Frequency goals are based on general guidelines identified in the SANDAG 2050 RTP and State Rail Plan for peak (PK) commute periods and off-peak (OP) non-commute periods of the day.*

*[2] The State Rail Plan currently does not distinguish frequencies between an "all stop" or "limited stop" intercity services, No specific limit stop frequency was identified and limit stop trains were considered part of the overall frequency identified for "all stop" intercity trains.*

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*Network Build-Out Operations Analysis* (and also listed below) will be completed and in operation within the mid-term time frame. A complete corridorwide track schematic for San Diego County illustrating the existing infrastructure compared against the proposed “near-term” and “mid-term” assumed infrastructure is presented as **Appendix A**.

## *Near-Term Projects*

- CP[3] San Onofre to CP Pulgas Double Track - Phase I & II (Figure 1)
- Camp Pendleton Station (Figure 1)
- Oceanside Through Track (Figure 2)
- CP Cardiff to CP Craven Double Track (Figure 3)

## *Mid-Term Projects*

- CP Eastbrook to CP Shell (Figure 2)
- Carlsbad Village Double Track (Figure 2)
- San Dieguito River Bridge Replacement and Double Track (Figure 3)
- Sorrento to Miramar Phase 2 (Figure 3)
- CP Elvira to CP Morena Double Track (Figure 3)

The Camp Pendleton Station, listed with the near-term projects, is an exception for the projects required to support the near-term service levels as presented in the 2050 RTP. This project is currently under conceptual engineering and was requested by NCTD to be included in this analysis.

The network also assumes the corridor through the City of Del Mar remains single track and does not include either of the proposed tunneling options, which are included in the 2050 RTP for implementation in the 2041-2050 phase.

[3] *Control Point (CP) is a signalized switch or crossing controlled remotely by a dispatcher in an operations control center. In this case, the San Diego portion of the LOSSAN corridor is dispatched by NCTD from their operations control center in Escondido.*

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**Figure 1 – CP Songs to CP Westbrook**

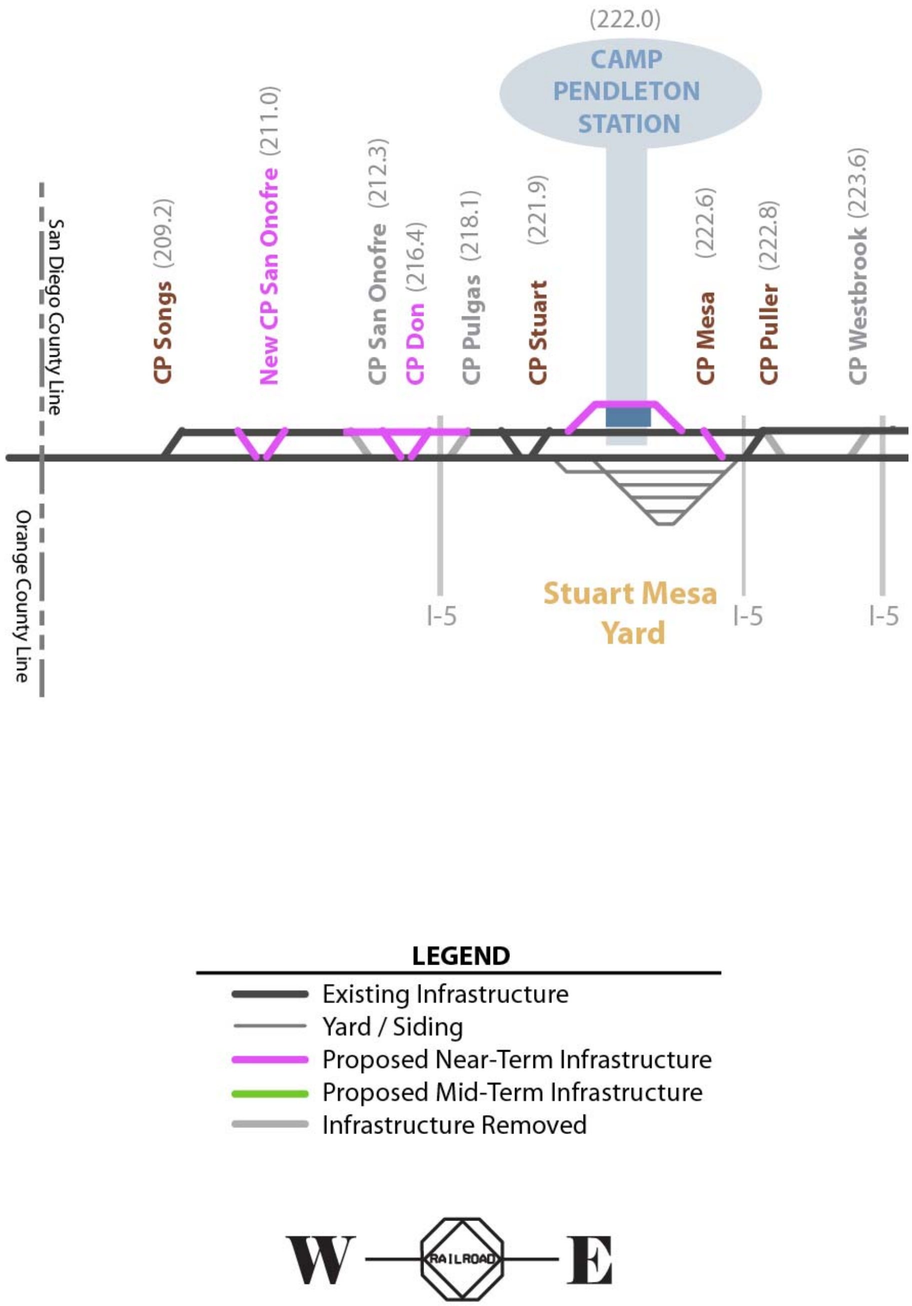

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**Figure 2 – CP Westbrook to CP Swami**

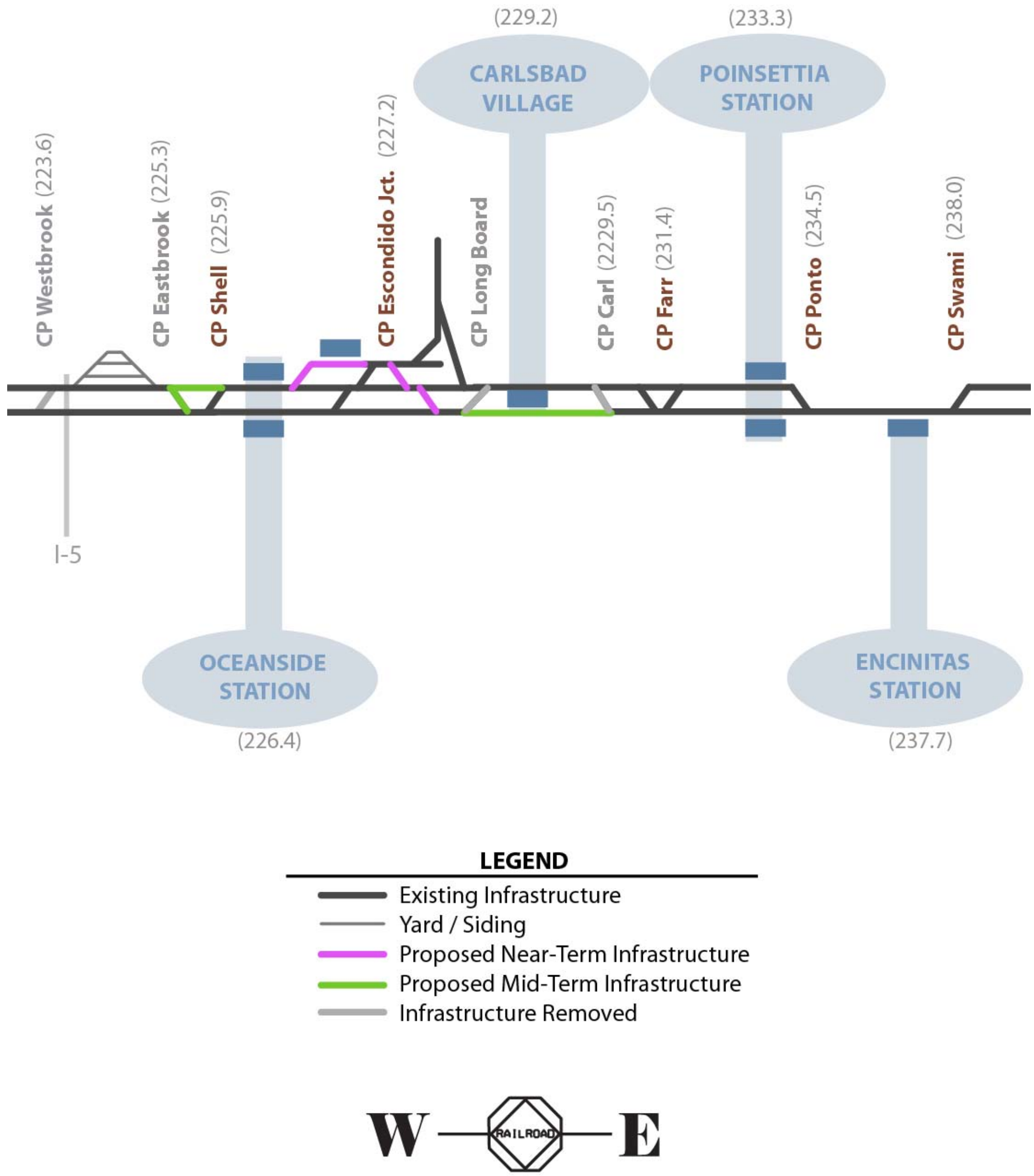

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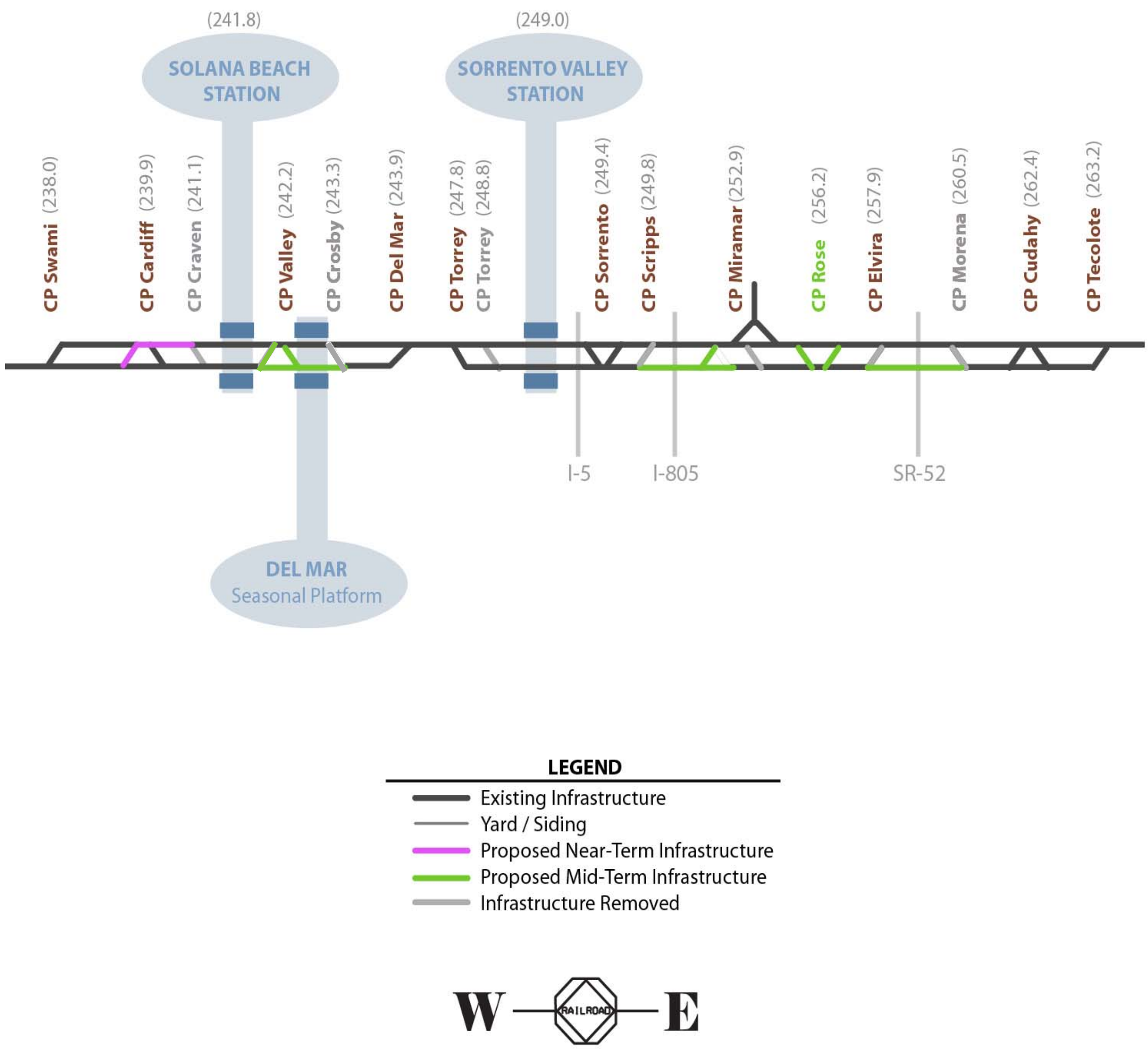
**Figure 3 – CP Swami to CP Tecolote**



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# Analysis

The following section outlines the observations made of the simulations conducted on the San Diego Mid-Term scenario infrastructure and service plan. For the purposes of these general observations, the corridor is broken down into two primary segments: Orange County Line to Oceanside and Oceanside to downtown San Diego. More specific observations associated with each project are also provided. Time-Distance diagrams (stringlines) of the simulation dispatch are provided in **Appendix B**.

## Orange County Line to Oceanside

Observations and analysis of the simulations conducted indicate that the crossover and signal spacing for the identified projects along this segment of the corridor is sufficient to support the proposed mid-term service levels identified for 2025.

Simulations did indicate, however potential conflicts between trains associated with the remaining single track between CP Serra (in south Orange County) and CP Songs (in north San Diego County). Despite additional investment in track capacity in San Diego County, the increase in assumed intercity and freight trains north of Oceanside place additional demand on this 9.3 mile single track segment.

As such, extension of the second main line track is recommended north of CP Songs towards the Orange County Line, in addition to an extension south of CP Serra towards the San Diego County Line. This would reduce the single track in this segment by approximately 2.5 miles (approximately one mile of this would be south of County Line) and help to minimize the conflict observed between trains at this location. This project is not included as part the SANDAG 2050 RTP, but was identified as "recommended" in the 2030 Long-Term Operations Analysis conducted in support of the LOSSAN Corridorwide Strategic Implementation Plan (April 2012).

The proposed Camp Pendleton station has been shown to provide no negative effects on the proposed service. Early morning startup and evening end of day commuter trains were not assumed to operate to or from this station. The decision not to originate or terminate service days at the Camp Pendleton station reduced the potential for conflicts on the corridor by removing the need for non-revenue trains to switch across the main lines while moving between the Stuart Mesa Maintenance Facility (SMMF), used to service both COASTER and Metrolink equipment north of Oceanside, and the new Camp Pendleton station. However, if NCTD chooses to implement full service (all trains) to this new station, the potential impact of these additional train moves would have to be modeled and studied.

## Oceanside to San Diego

Observations of the simulations conducted indicated that the crossover and signal spacing along this segment of the corridor was sufficient to support the proposed mid-term (2025) passenger service levels (See proposed 2025 timetable provided in **Appendix C**).

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As was also observed in the *San Diego Near-Term Network Build-Out Operations* Analysis, delays were observed between CP Ponto and CP Swami due to the remaining single track in this area. The delays occur during the morning peak hours of daily service and are associated with the proposed "new" reverse peak service from San Diego to Oceanside.

The addition of the increased "reverse" peak service created an issue in maintaining consistent 20 minute headways on COASTER trains in the peak direction and during the peak periods of 6:00 AM to 9:00 AM and 3:00 PM to 6:00 PM under the proposed mid-term service levels. To effectively support consistent 20 minute headways during the peak periods, the CP Ponto to CP Swami double track project may need to be accelerated.

The Oceanside Through Track Project, which is already identified as a "near-term" project, will also be critical for supporting the proposed service plan for 2025. The service volume increase as proposed would create a cluster of trains coming in and out of the Oceanside Transit Center station. Based on observations from the model, this cluster of trains will require the use of all available tracks at the station during peak periods.

With the proposed increase in 2025 passenger rail service, freight trains will become increasingly more difficult to slot on the corridor during midday time periods. The speed variations between freight and passenger trains and the assumed increase in the volume of passenger trains, combined with the remaining single track along the corridor, will make it more difficult to slot freight trains during daytime hours without causing impacts to the on-time performance of passenger trains. This takes on added importance due to the projected increase in freight traffic in 2025 as well as the ongoing maintenance windows and track outages at night, which often necessitate additional mid-day freights.

## *Analysis by Project*

In support of the Project Study Report (PSR) efforts underway for many of the infrastructure projects identified as part of this analysis, this section further breaks down the observations made of the simulation.

### CP Eastbrook to CP Shell

Observations of the simulation for this project identified the need for a universal crossover in proximity to the existing CP Shell. This crossover is necessary in providing flexibility for dispatchers to govern the movement of trains traveling between the Oceanside Transit Center station and the Stuart Mesa Maintenance Facility.

### Carlsbad Village Double Track

This project will add a second track between existing CP Longboard (MP 228.4) and CP Carl (MP 229.5). This project also assumes the removal of both CP Longboard and CP Carl as well as the double-tracking of the existing Carlsbad Village Station and an additional bridge over the Buena Vista Lagoon which

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separates the cities of Carlsbad and Oceanside. Observations of the simulations along this segment of the corridor suggested the proposed crossover and signal location assumptions were sufficient to support the proposed mid-term (2025) passenger service levels.

## San Dieguito River Bridge Replacement and Double Track

This project will add a second track between existing CP Valley (MP 242.2) and CP Del Mar (MP 243.9). This would include modifying CP Valley to reflect a right-hand turnout as part of the initial phase of construction for this project, which will be associated with the CP Cardiff to CP Craven double track project. This project will ultimately incorporate the construction of a seasonal platform for the Fairgrounds at Del Mar and, as part of this full build-out of this project, a universal crossover will be required at CP Valley to provide operational flexibility for both additional service and direct service to Fairgrounds seasonal platforms.

As part of this project, modifications were also assumed to address the existing clearance issues for trains operating on the siding under the Camino Del Mar overpass. This project assumes the removal of CP Crosby.

Observations of the simulation supported the design assumptions for crossover placements identified in the interim and build-out phases of this project. Additional analysis of a staging track for trains specifically serving special events at the Fairgrounds was completed and recommended that staging special event trains at the Santa Fe Depot was the preferred location at this time.

## Sorrento to Miramar (Phase 2)

This project will add a second track between the future location of CP Scripps (MP 251.2, which would then be removed) and CP Miramar (MP 252.9). CP Scripps is planned to be a temporary control point installed at the eastern limits of the Sorrento to Miramar Phase 1 project (currently under construction). This project includes curve and speed improvements along the Miramar grade, through Carroll Canyon as well as the construction of a new universal crossover at about MP 249.4 (CP Sorrento). This would include modifying CP Miramar to reflect a single left-hand crossover. Observations of the simulations along this segment of the corridor suggested the proposed crossover and signal location assumptions as presented in this technical memorandum were sufficient to support the proposed mid-term (2025) passenger service levels.

## CP Elvira to CP Morena Double Track

The final design configuration is still under consideration for this project. The design is being prepared in conjunction with the Mid-Coast Light Rail Transit (LRT) extension north from Old Town San Diego. As a result, assumptions were made for this segment that included a double track corridor along the existing alignment.

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As part of this project, a new universal crossover was assumed at CP Rose, which is geographically north (railroad west) of the existing CP Elvira by approximately 1.8 miles. It should be noted that, while crossover and signal spacing is sufficient to support rail operations during a typical day, crossover spacing is often dictated by maintenance of way plans.

Aside from creating greater operational flexibility, the construction of the proposed CP Rose (MP 256.1) would allow for quicker access to both mainline tracks for the on-track maintenance of way equipment that is often stored on the spur track adjacent to CP Miramar. The ability for this maintenance of way equipment to access both mainline tracks quickly will be especially critical when construction of the second track between CP Elvira and CP Morena is underway. For these reasons, CP Rose work must be completed prior to the removal of CP Elvira.

Observations of the simulations along this segment of the corridor suggested the proposed crossover and signal location assumptions were sufficient to support the proposed mid-term (2025) passenger service levels.

## Conclusion

In summary, the mid-term 2025 service goals and frequencies adopted in the 2050 RTP can be met in the San Diego County portion of the LOSSAN corridor. This includes 20 minute headways for commuter service (COASTER) during the weekday peak hours of operation. Further, observations and simulations indicate that the crossover and signal spacing proposed for San Diego County is sufficient to support these mid-term proposed service levels.

Also, as indicated in **Tables 1 & 2**, in addition to the increase in passenger service, there is a projected increase in freight traffic by 2025. This will continually present challenges, as these freight trains become more frequent and often increasingly greater in length. Within the 2025 infrastructure improvements, there remain limited spots on the corridor to park trains of these lengths. Even with the freight traffic prohibition during commuter peak hours, it will be increasingly challenging to keep this flow of freight traffic moving with the increase of overall traffic.

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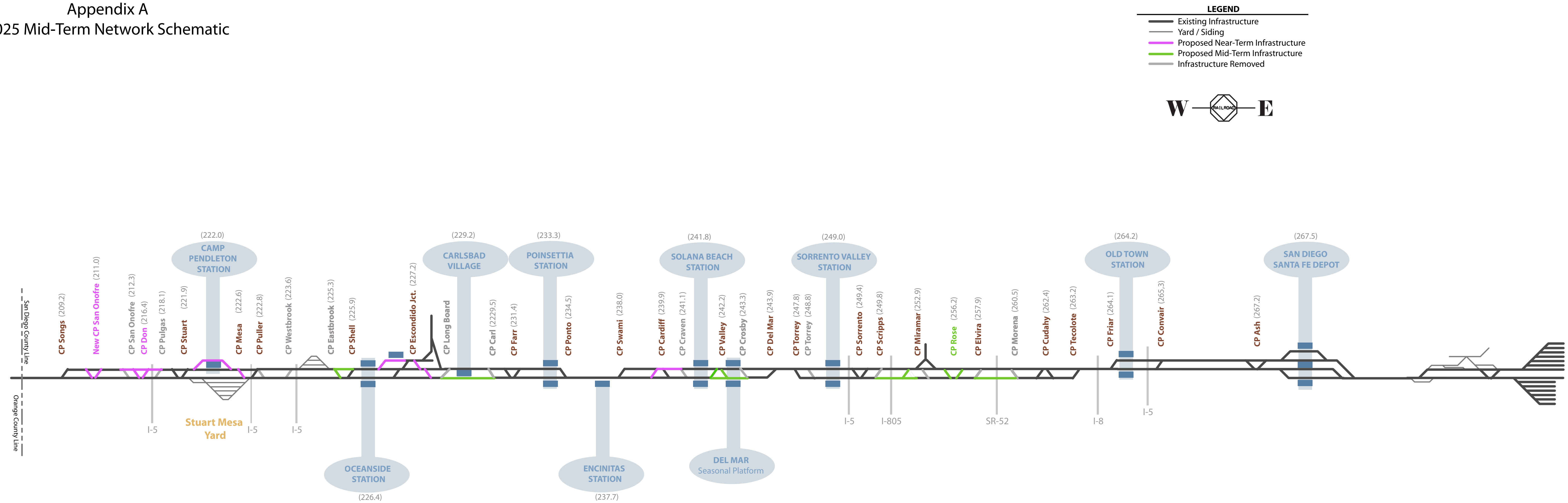
# APPENDIX A

## 2025 Network Infrastructure

Appendix A
2025 Mid-Term Network Schematic



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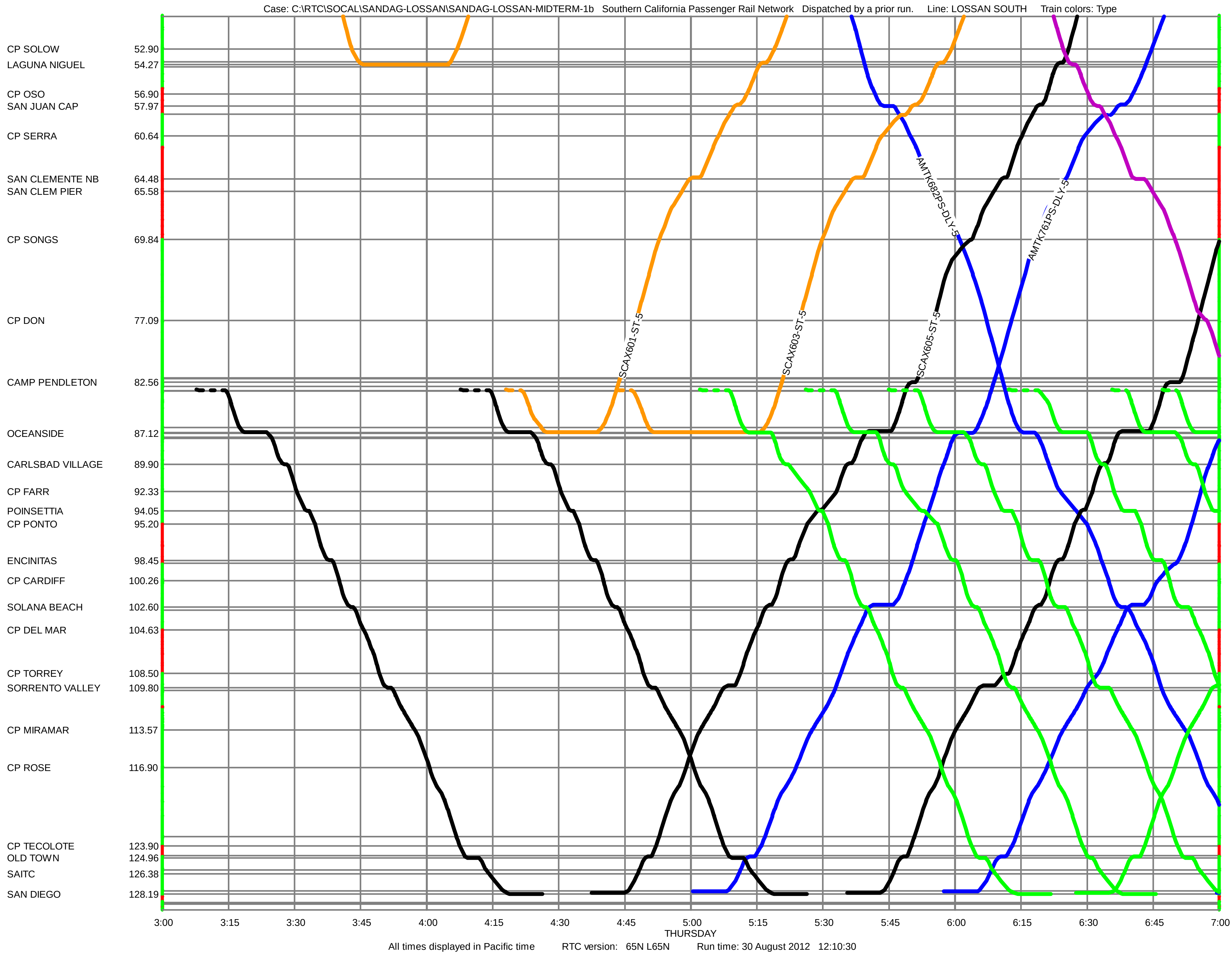
# APPENDIX B
## Time-Distance Diagrams

The time-distance diagrams presented on the following page represent the difference operators and services along the Orange and San Diego Subdivisions. Time increments are presented along the X-axis of the chart and distance or location increments are presented along the Y-axis.

Track configuration is presented along the Y-axis, with red indicating single track mainline operation and green indicating multiple track mainline operation.

A summary of the various colors used to represent each operator and service is provided below:

= Metrolink (Orange County Line)
= Metrolink (Intra-Orange County Service)
= Metrolink (Inland Empire-Orange County Line)
= Metrolink/COASTER (Los Angeles-San Diego Line)
= COASTER
= Amtrak (Pacific Surfliner)
= BNSF (Freight Service)



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CP OSO 56.90
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CP SERRA 60.64
SAN CLEMENTE NB 64.48
SAN CLEM PIER 65.58
CP SONGS 69.84
CP DON 77.09
CAMP PENDLETON 82.56
OCEANSIDE 87.12
CARLSBAD VILLAGE 89.90
CP FARR 92.33
POINSETTIA 94.05
CP PONTO 95.20
ENCINITAS 98.45
CP CARDIFF 100.26
SOLANA BEACH 102.60
CP DEL MAR 104.63
CP TORREY 108.50
SORRENTO VALLEY 109.80
CP MIRAMAR 113.57
CP ROSE 116.90
CP TECOLOTE 123.90
OLD TOWN 124.96
SAITC 126.38
SAN DIEGO 128.19
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SCAX603-ST-5
SCAX605-ST-5
AMTK682PS-DLY-5
AMTK761PS-DLY-5
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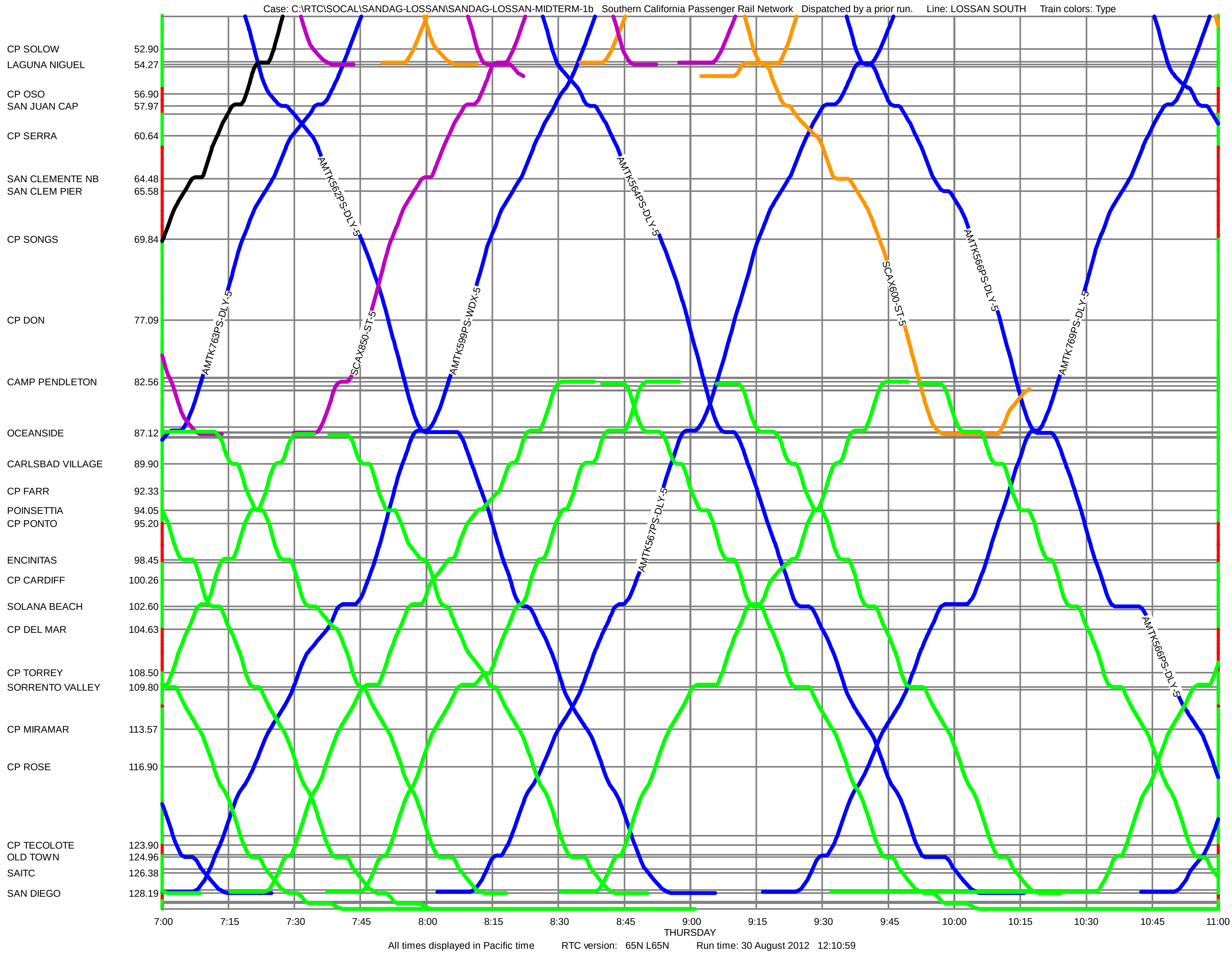
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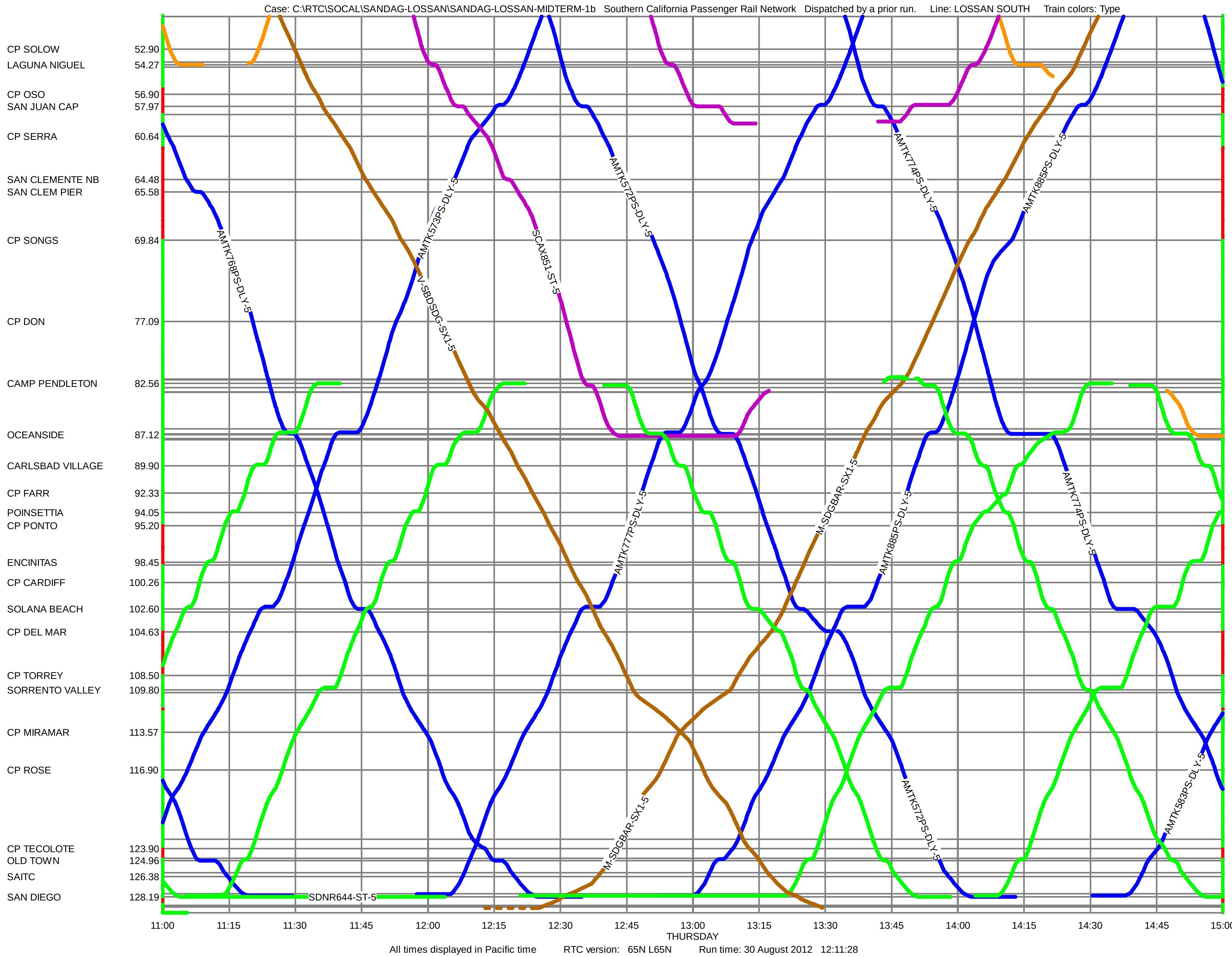

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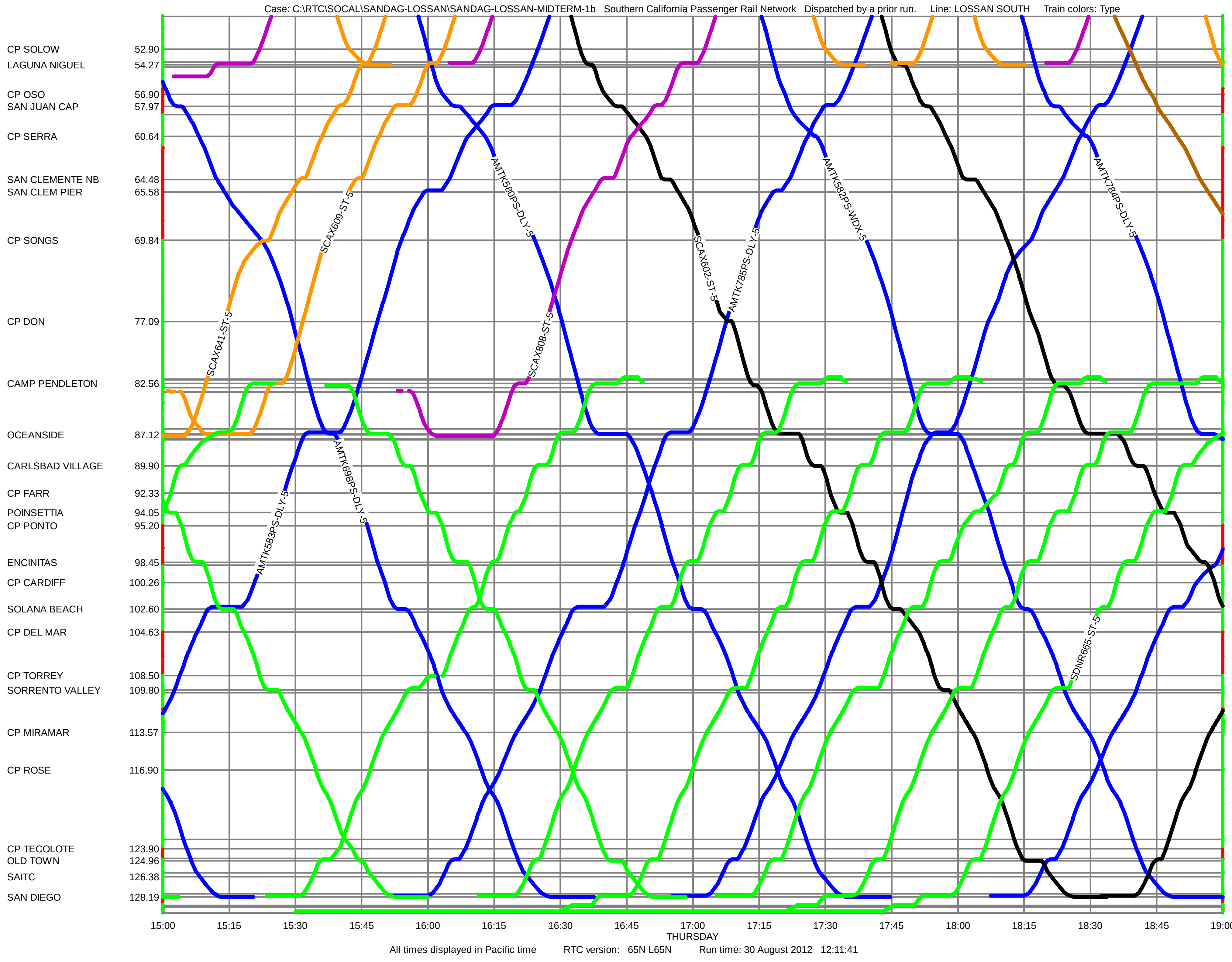

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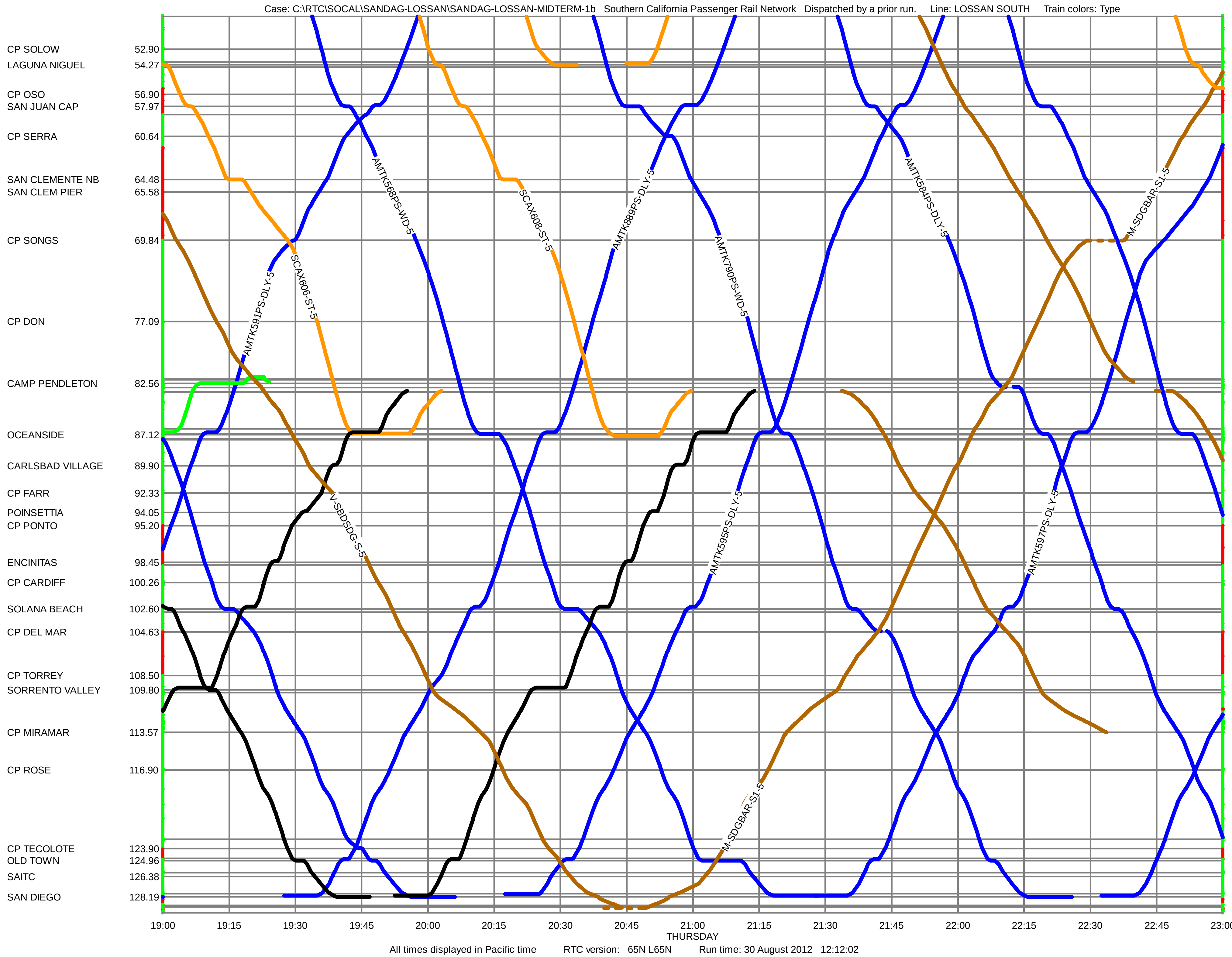
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# APPENDIX C
Proposed 2025 Timetable

# APPENDIX C
# PROPOSED 2025 TIMETABLE

**WEEKDAY SOUTHBOUND - Irvine ● Oceanside ● San Diego**

| | | Irvine | Laguna Niguel - Mission Viejo | San Juan Capistrano | San Clemente North Beach | San Clemente Pier | Camp Pendleton | Oceanside | SPRINTER Connections | | Oceanside | Carlsbad Village | Carlsbad - Poinsettia | Encinitas | Solana Beach | Sorrento Valley | Old Town San Diego | San Diego | San Diego | Convention Center |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Train Operator | No. | Dp | Dp | Dp | Dp | Dp | Dp | Ar | Ar | Dp | Dp | Dp | Dp | Dp | Dp | Dp | Dp | Ar | Dp | Ar |
| Coaster/Metrolink | C626 | --- | --- | --- | --- | --- | --- | --- | --- | --- | 3:21 AM | 3:25 AM | 3:31 AM | 3:37 AM | 3:43 AM | 3:52 AM | 4:12 AM | 4:20 AM | --- | --- |
| Coaster/Metrolink | C628 | --- | --- | --- | --- | --- | --- | --- | --- | --- | 4:21 AM | 4:25 AM | 4:31 AM | 4:37 AM | 4:43 AM | 4:52 AM | 5:12 AM | 5:20 AM | --- | --- |
| Coaster | C630 | --- | --- | --- | --- | --- | --- | --- | 4:56 AM | --- | 5:18 AM | 5:22 AM | 5:28 AM | 5:34 AM | 5:40 AM | 5:49 AM | 6:09 AM | 6:17 AM | --- | --- |
| Coaster | C672 | --- | --- | --- | --- | --- | --- | --- | 5:26 AM | --- | 5:42 AM | 5:46 AM | 5:52 AM | 5:58 AM | 6:04 AM | 6:13 AM | 6:33 AM | 6:41 AM | --- | --- |
| Coaster | C634 | --- | --- | --- | --- | --- | --- | --- | 5:56 AM | --- | 6:02 AM | 6:06 AM | 6:13 AM | 6:19 AM | 6:25 AM | 6:35 AM | 6:54 AM | 7:02 AM | --- | --- |
| Amtrak | A682 | 5:31 AM | --- | 5:46 AM | --- | --- | --- | 6:16 AM | 5:56 AM | 6:33 AM | 6:18 AM | --- | --- | --- | 6:36 AM | --- | 7:07 AM | 7:15 AM | --- | --- |
| Coaster | C646A | --- | --- | --- | --- | --- | --- | --- | 6:26 AM | --- | 6:30 AM | 6:34 AM | 6:41 AM | 6:47 AM | 6:53 AM | 7:03 AM | 7:22 AM | 7:30 AM | 7:33 AM | 7:38 AM |
| Coaster | C636 | --- | --- | --- | --- | --- | --- | --- | 6:26 AM | --- | 6:50 AM | 6:54 AM | 7:00 AM | 7:07 AM | 7:13 AM | 7:22 AM | 7:42 AM | 7:46 AM | 7:51 AM | 7:56 AM |
| Metrolink | M803 | 6:18 AM | 6:26 AM | 6:32 AM | 6:43 AM | --- | 7:02 AM | 7:10 AM | --- | 7:33 AM | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Coaster | C638 | --- | --- | --- | --- | --- | --- | --- | 6:56 AM | --- | 7:12 AM | 7:17 AM | 7:23 AM | 7:29 AM | 7:35 AM | 7:41 AM | 8:06 AM | 8:13 AM | --- | --- |
| Coaster | C640 | --- | --- | --- | --- | --- | --- | --- | 7:26 AM | --- | 7:42 AM | 7:47 AM | 7:53 AM | 7:58 AM | 8:03 AM | 8:13 AM | 8:36 AM | 8:42 AM | --- | --- |
| Metrolink | M805 | 6:53 AM | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Amtrak | A562 | 7:13 AM | --- | 7:26 AM | --- | --- | --- | 8:05 AM | 7:56 AM | 8:33 AM | 8:07 AM | --- | --- | --- | 8:22 AM | --- | --- | 8:57 AM | --- | --- |
| Metrolink | M807 | 7:26 AM | 7:40 AM | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Metrolink | M682 | 7:54 AM | 8:05 AM | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Metrolink | M815 | 8:04 AM | 8:15 AM | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Coaster | C674 | --- | --- | --- | --- | --- | 8:45 AM | 8:51 AM | 8:26 AM | 9:03 AM | 8:53 AM | 8:58 AM | 9:04 AM | 9:10 AM | 9:16 AM | 9:27 AM | 9:46 AM | 9:54 AM | 9:57 AM | 10:02 AM |
| Amtrak | A564 | 8:21 AM | --- | 8:37 AM | --- | --- | --- | 9:07 AM | 8:56 AM | 9:33 AM | 9:09 AM | --- | --- | --- | 9:27 AM | --- | 9:58 AM | 10:05 AM | --- | --- |
| Coaster | C642 | --- | --- | --- | --- | --- | 9:11 AM | 9:17 AM | 8:56 AM | 9:33 AM | 9:19 AM | 9:24 AM | 9:30 AM | 9:36 AM | 9:42 AM | 9:53 AM | 10:12 AM | 10:20 AM | --- | --- |
| Metrolink | M809 | 8:37 AM | 8:50 AM | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Metrolink | M600 | 9:08 AM | 9:16 AM | 9:22 AM | 9:36 AM | --- | --- | 10:00 AM | --- | 10:03 AM | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Coaster | C644 | --- | --- | --- | --- | --- | 9:57 AM | 10:04 AM | 9:56 AM | 10:33 AM | 10:06 AM | 10:11 AM | 10:17 AM | 10:22 AM | 10:28 AM | 10:38 AM | 10:57 AM | 11:04 AM | --- | --- |
| Amtrak | A566 | 9:30 AM | 9:40 AM | 9:46 AM | --- | 9:57 AM | --- | 10:20 AM | 9:56 AM | 10:33 AM | 10:22 AM | --- | --- | --- | 10:42 AM | --- | 11:12 AM | 11:20 AM | --- | --- |
| Amtrak | A768 | 10:40 AM | --- | 10:57 AM | --- | 11:08 AM | --- | 11:27 AM | 11:26 AM | 11:33 AM | 11:29 AM | --- | --- | --- | 11:46 AM | --- | 12:17 PM | 12:25 PM | --- | --- |
| Metrolink | M636 | 10:55 AM | 11:04 AM | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Metrolink | M851 | 11:52 AM | 12:01 PM | 12:08 PM | 12:17 PM | --- | 12:36 PM | 12:50 PM | --- | 1:03 PM | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Coaster | C676 | --- | --- | --- | --- | --- | 12:45 PM | 12:51 PM | 12:26 PM | 1:03 PM | 12:53 PM | 12:58 PM | 1:04 PM | 1:09 PM | 1:15 PM | 1:25 PM | 1:44 PM | 1:51 PM | --- | --- |
| Amtrak | A572 | 12:22 PM | --- | 12:36 PM | --- | --- | --- | 1:07 PM | 12:56 PM | 1:33 PM | 1:09 PM | --- | --- | --- | 1:25 PM | --- | --- | 2:05 PM | --- | --- |
| Metrolink | M811 | 12:45 PM | 12:53 PM | 1:03 PM | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Coaster | C652 | --- | --- | --- | --- | --- | 1:50 PM | 1:57 PM | 1:56 PM | 2:03 PM | 1:59 PM | 2:04 PM | 2:10 PM | 2:15 PM | 2:21 PM | 2:31 PM | 2:51 PM | 3:00 PM | --- | --- |
| Amtrak | A774 | 1:29 PM | --- | 1:43 PM | --- | --- | --- | 2:19 PM | 1:56 PM | 2:33 PM | 2:21 PM | --- | --- | --- | 2:40 PM | --- | --- | 3:25 PM | --- | --- |
| Metrolink | M638 | 2:05 PM | 2:14 PM | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Coaster | C654 | --- | --- | --- | --- | --- | 2:44 PM | 2:50 PM | 2:26 PM | 3:03 PM | 2:52 PM | 2:57 PM | 3:03 PM | 3:09 PM | 3:16 PM | 3:26 PM | 3:45 PM | 3:52 PM | --- | --- |
| Amtrak | A698 | 2:49 PM | --- | 3:04 PM | --- | --- | --- | 3:36 PM | 3:26 PM | 4:03 PM | 3:38 PM | --- | --- | --- | 3:55 PM | --- | --- | 4:41 PM | --- | --- |
| Coaster | C656 | --- | --- | --- | --- | --- | 3:42 PM | 3:49 PM | 3:26 PM | 4:03 PM | 3:51 PM | 3:56 PM | 4:02 PM | 4:09 PM | 4:15 PM | 4:24 PM | 4:44 PM | 4:52 PM | --- | --- |
| Metrolink | M684 | 3:34 PM | 3:45 PM | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Amtrak | A580 | 3:51 PM | --- | 4:06 PM | --- | --- | --- | 4:43 PM | 4:26 PM | 5:03 PM | 4:45 PM | --- | --- | --- | 5:02 PM | --- | --- | 5:45 PM | --- | --- |
| Coaster/Metrolink | M602 | 4:29 PM | 4:37 PM | 4:44 PM | 4:55 PM | --- | 5:13 PM | 5:19 PM | 4:56 PM | 5:33 PM | 5:24 PM | 5:29 PM | 5:35 PM | 5:41 PM | 5:47 PM | 5:58 PM | 6:19 PM | 6:25 PM | --- | --- |
| Metrolink | M813 | 4:45 PM | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Metrolink | M686 | 5:00 PM | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Amtrak | A582 | 5:07 PM | --- | 5:22 PM | --- | --- | --- | 5:54 PM | 5:26 PM | 6:03 PM | 5:56 PM | --- | --- | --- | 6:12 PM | --- | 6:55 PM | 7:03 PM | --- | --- |
| Metrolink | M640 | 5:23 PM | 5:35 PM | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Coaster/Metrolink | M604 | 5:38 PM | 5:46 PM | 5:53 PM | 6:04 PM | --- | 6:24 PM | 6:31 PM | 6:26 PM | 6:33 PM | 6:36 PM | 6:42 PM | 6:49 PM | 6:54 PM | 7:02 PM | 7:12 PM | 7:32 PM | 7:40 PM | --- | --- |
| Metrolink | M688 | 5:59 PM | 6:15 PM | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Amtrak | A784 | 6:09 PM | --- | 6:22 PM | --- | --- | --- | 6:56 PM | 6:56 PM | 7:03 PM | 6:58 PM | --- | --- | --- | 7:16 PM | --- | 7:47 PM | 7:55 PM | --- | --- |
| Metrolink | M606 | 6:51 PM | 6:59 PM | 7:06 PM | 7:18 PM | --- | --- | 7:46 PM | --- | 8:03 PM | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Amtrak | A568 | 7:27 PM | --- | 7:40 PM | --- | --- | --- | 8:14 PM | 7:56 PM | 8:33 AM | 8:16 PM | --- | --- | --- | 8:34 PM | --- | 9:11 PM | 9:16 PM | --- | --- |
| Metrolink | M608 | 7:53 PM | 8:01 PM | 8:08 PM | 8:20 PM | --- | --- | 8:45 PM | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Metrolink | M642 | 8:18 PM | 8:30 PM | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Amtrak | A790 | 8:32 PM | --- | 8:48 PM | --- | --- | --- | 9:17 PM | 8:56 PM | --- | 9:19 PM | --- | --- | --- | 9:34 PM | --- | 10:07 PM | 10:15 PM | --- | --- |
| Amtrak | A584 | 9:26 PM | --- | 9:41 PM | --- | --- | --- | 10:13 PM | 9:26 PM | --- | 10:15 PM | --- | --- | --- | 10:32 PM | --- | --- | 11:17 PM | --- | --- |
| Amtrak | A684 | 10:06 PM | --- | 10:21 PM | --- | --- | --- | 10:51 PM | --- | --- | 10:53 PM | --- | --- | --- | 11:11 PM | --- | 11:42 PM | 11:50 PM | --- | --- |
| Metrolink | M644 | 10:45 PM | 10:53 PM | 10:59 PM | 11:08 PM | --- | --- | 11:37 PM | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Amtrak | A796 | 11:08 PM | --- | 11:21 PM | --- | --- | --- | 11:50 PM | --- | --- | 11:52 PM | --- | --- | --- | 12:08 AM | --- | 12:42 AM | 12:50 AM | --- | --- |

# APPENDIX C
# PROPOSED 2025 TIMETABLE

WEEKDAY NORTHBOUND - San Diego ● Oceanside ● Irvine

| | | Convention Center | San Diego | San Diego | Old Town San Diego | Sorrento Valley | Solana Beach | Encinitas | Carlsbad - Poinsettia | Carlsbad Village | Oceanside | SPRINTER Connections | | Oceanside | Camp Pendleton | San Clemente Pier | San Clemente North Beach | San Juan Capistrano | Laguna Niguel - Mission Viejo | Irvine |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Train Operator | No. | Dp | Ar | Dp | Dp | Dp | Dp | Dp | Dp | Dp | Ar | Ar | Dp | Dp | Ar/Dp | Dp | Dp | Dp | Dp | Dp |
| Metrolink | M681 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | 4:05 AM | 4:14 AM |
| Metrolink | M601 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | 4:39 AM | --- | --- | 5:02 AM | 5:11 AM | 5:17 AM | 5:26 AM |
| Metrolink | M603 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | 4:56 AM | --- | 5:16 AM | --- | --- | 5:39 AM | 5:48 AM | 5:54 AM | 6:03 AM |
| Coaster/Metrolink | M605 | --- | --- | 4:45 AM | 4:51 AM | 5:10 AM | 5:18 AM | 5:23 AM | 5:29 AM | 5:34 AM | 5:39 AM | 5:26 AM | 6:03 AM | 5:44 AM | 5:51 AM | --- | 6:09 AM | 6:18 AM | 6:24 AM | 6:33 AM |
| Amtrak | A761 | --- | --- | 5:08 AM | 5:13 AM | --- | 5:46 AM | --- | --- | --- | 6:02 AM | 5:56 AM | 6:03 AM | 6:04 AM | --- | --- | --- | 6:37 AM | --- | 6:51 AM |
| Metrolink | M683 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | 7:05 AM |
| Coaster/Metrolink | M607 | --- | --- | 5:43 AM | 5:49 AM | 6:09 AM | 6:18 AM | 6:23 AM | 6:29 AM | 6:34 AM | 6:39 AM | 6:26 AM | 7:03 AM | 6:44 AM | 6:51 AM | --- | 7:09 AM | 7:18 AM | 7:24 AM | 7:33 AM |
| Amtrak | A763 | --- | --- | 6:05 AM | --- | --- | 6:43 AM | --- | --- | --- | 6:59 AM | 6:56 AM | 7:03 AM | 7:01 AM | --- | --- | --- | 7:34 AM | --- | 7:48 AM |
| Metrolink | M685 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | 7:55 AM | 8:04 AM |
| Coaster | C631 | --- | --- | 6:35 AM | 6:42 AM | 7:01 AM | 7:10 AM | 7:16 AM | 7:22 AM | 7:27 AM | 7:32 AM | --- | 7:33 AM | --- | --- | --- | --- | --- | --- | --- |
| Metrolink | M850 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | 7:26 AM | --- | 7:35 AM | 7:42 AM | --- | 8:01 AM | 8:11 AM | 8:18 AM | 8:26 AM |
| Amtrak | A599 | --- | --- | 7:07 AM | --- | --- | 7:44 AM | --- | --- | --- | 7:56 AM | 7:26 AM | 8:03 AM | 7:58 AM | --- | --- | --- | --- | --- | 8:40 AM |
| Metrolink | M687 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | 8:40 AM | 8:49 AM |
| Metrolink | M800 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | 9:05 AM | 9:14 AM |
| Metrolink | M637 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | 9:20 AM | 9:29 AM |
| Coaster | C635 | --- | --- | 7:25 AM | 7:30 AM | 7:53 AM | 8:05 AM | 8:10 AM | 8:16 AM | 8:22 AM | 8:30 AM | 8:26 AM | 8:33 AM | 8:32 AM | 8:39 AM | --- | --- | --- | --- | --- |
| Coaster | C673 | --- | --- | 7:45 AM | 7:50 AM | 8:11 AM | 8:21 AM | 8:26 AM | 8:32 AM | 8:38 AM | 8:43 AM | 8:26 AM | 9:03 AM | 8:45 AM | 8:52 AM | --- | --- | --- | --- | --- |
| Amtrak | A567 | --- | --- | 8:10 AM | 8:16 AM | --- | 8:45 AM | --- | --- | --- | 8:57 AM | 8:56 AM | 9:03 AM | 8:59 AM | --- | --- | --- | 9:33 AM | 9:41 AM | 9:54 AM |
| Coaster | C637 | --- | --- | 8:38 AM | 8:44 AM | 9:06 AM | 9:16 AM | 9:21 AM | 9:27 AM | 9:33 AM | 9:37 AM | 9:26 AM | 10:03 AM | 9:39 AM | 9:47 AM | --- | --- | --- | --- | --- |
| Amtrak | A769 | --- | --- | 9:24 AM | 9:30 AM | --- | 10:03 AM | --- | --- | --- | 10:15 AM | 9:56 AM | 10:33 AM | 10:17 AM | --- | --- | --- | 10:48 AM | --- | 11:03 AM |
| Metrolink | M639 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | 11:20 AM | 11:29 AM |
| Coaster | C675 | --- | --- | 10:32 AM | 10:38 AM | 10:58 AM | 11:06 AM | 11:11 AM | 11:17 AM | 11:23 AM | 11:28 AM | 11:26 AM | 11:33 AM | 11:30 AM | 11:40 AM | --- | --- | --- | --- | --- |
| Amtrak | A573 | --- | --- | 10:50 AM | --- | --- | 11:25 AM | --- | --- | --- | 11:42 AM | 11:26 AM | 12:03 PM | 11:44 AM | --- | --- | --- | 12:12 PM | --- | 12:30 PM |
| Coaster | C641 | --- | --- | 11:13 AM | 11:19 AM | 11:39 AM | 11:47 AM | 11:52 AM | 11:58 AM | 12:04 PM | 12:09 PM | 11:56 AM | 12:33 PM | 12:11 PM | 12:17 PM | --- | --- | --- | --- | --- |
| Amtrak | A777 | --- | --- | 12:05 PM | --- | --- | 12:39 PM | --- | --- | --- | 12:55 PM | 12:26 PM | 1:03 PM | 12:57 PM | --- | --- | --- | 1:27 PM | --- | 1:43 PM |
| Metrolink | M802 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | 1:58 PM | 2:04 PM | 2:13 PM |
| Amtrak | A885 | --- | --- | 1:00 PM | 1:06 PM | --- | 1:39 PM | --- | --- | --- | 1:51 PM | 1:26 PM | 2:03 PM | 1:53 PM | --- | --- | --- | 2:24 PM | --- | 2:39 PM |
| Coaster | C647 | --- | --- | 1:21 PM | 1:27 PM | 1:47 PM | 1:55 PM | 2:00 PM | 2:06 PM | 2:12 PM | 2:17 PM | 1:56 PM | 2:33 PM | 2:19 PM | 2:29 PM | --- | --- | --- | --- | --- |
| Metrolink | M812 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | 3:20 PM | 3:29 PM |
| Metrolink | M641 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | 2:56 PM | --- | 3:05 PM | --- | --- | 3:29 PM | 3:38 PM | 3:43 PM | 3:52 PM |
| Metrolink | M804 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | 4:10 PM | 4:20 PM |
| Coaster | C651 | --- | --- | 2:09 PM | 2:15 PM | 2:37 PM | 2:49 PM | 2:55 PM | 3:00 PM | 3:05 PM | 3:08 PM | 2:56 PM | 3:33 PM | 3:10 PM | 3:20 PM | --- | --- | --- | --- | --- |
| Metrolink | M609 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | 2:56 PM | --- | 3:20 PM | 3:27 PM | --- | 3:45 PM | 3:56 PM | 4:02 PM | 4:11 PM |
| Amtrak | A583 | --- | --- | 2:38 PM | --- | --- | 3:18 PM | --- | --- | --- | 3:38 PM | 3:26 PM | 4:03 PM | 3:40 PM | --- | 4:03 PM | --- | 4:19 PM | --- | 4:34 PM |
| Metrolink | M806 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | 4:55 PM |
| Metrolink | M689 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | 5:25 PM |
| Metrolink | M808 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | 3:56 PM | --- | 4:15 PM | 4:22 PM | --- | 4:42 PM | 4:53 PM | 5:01 PM | 5:12 PM |
| Coaster | C653 | --- | --- | 3:31 PM | 3:38 PM | 3:58 PM | 4:08 PM | 4:14 PM | 4:20 PM | 4:27 PM | 4:31 PM | 4:26 PM | 4:33 PM | 4:33 PM | 4:42 PM | --- | --- | --- | --- | --- |
| Amtrak | A785 | --- | --- | 4:00 PM | 4:06 PM | --- | 4:40 PM | --- | --- | --- | 4:57 PM | 4:26 PM | 5:03 PM | 4:59 PM | --- | 5:20 PM | --- | 5:32 PM | --- | 5:49 PM |
| Metrolink | M643 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | 5:50 PM | 5:59 PM |
| Coaster | C655 | --- | --- | 4:19 PM | 4:25 PM | 4:45 PM | 4:55 PM | 5:01 PM | 5:07 PM | 5:13 PM | 5:17 PM | 4:56 PM | 5:33 PM | 5:19 PM | 5:29 PM | --- | --- | --- | --- | --- |
| Metrolink | M810 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | 6:25 PM | 6:34 PM |
| Coaster | C657 | 4:37 PM | 4:42 PM | 4:45 PM | 4:52 PM | 5:12 PM | 5:21 PM | 5:27 PM | 5:34 PM | 5:40 PM | 5:46 PM | 5:26 PM | 6:03 PM | 5:48 PM | 5:58 PM | --- | --- | --- | --- | --- |
| Amtrak | A883 | --- | --- | 5:03 PM | 5:09 PM | --- | 5:40 PM | --- | --- | --- | 5:56 PM | 4:26 PM | 5:03 PM | 5:58 PM | --- | --- | --- | 6:29 PM | --- | 6:44 PM |
| Coaster | C659 | --- | --- | 5:13 PM | 5:20 PM | 5:42 PM | 5:52 PM | 5:58 PM | 6:05 PM | 6:12 PM | 6:16 PM | 5:56 PM | 6:33 PM | 6:18 PM | 6:27 PM | --- | --- | --- | --- | --- |
| Coaster | C661 | 5:28 PM | 5:33 PM | 5:36 PM | 5:43 PM | 6:03 PM | 6:12 PM | 6:18 PM | 6:25 PM | 6:31 PM | 6:37 PM | 6:26 PM | 7:03 PM | 6:39 PM | 6:49 PM | --- | --- | --- | --- | --- |
| Coaster | C665 | 5:50 PM | 5:55 PM | 5:58 PM | 6:05 PM | 6:25 PM | 6:34 PM | 6:40 PM | 6:47 PM | 6:53 PM | 6:59 PM | 6:56 PM | 7:03 PM | 7:01 PM | 7:11 PM | --- | --- | --- | --- | --- |
| Amtrak | A591 | --- | --- | 6:15 PM | 6:21 PM | --- | 6:51 PM | --- | --- | --- | 7:10 PM | 6:56 PM | 7:33 PM | 7:12 PM | --- | --- | --- | 7:47 PM | --- | 8:02 PM |
| Coaster/Metrolink | C677 | --- | --- | 6:40 PM | 6:46 PM | 7:11 PM | 7:21 PM | 7:26 PM | 7:32 PM | 7:38 PM | 7:45 PM | --- | 8:03 PM | --- | --- | --- | --- | --- | --- | --- |
| Metrolink | M645 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | 8:50 PM | 9:01 PM |
| Amtrak | A889 | --- | --- | 7:35 PM | 7:41 PM | --- | 8:11 PM | --- | --- | --- | 8:24 PM | 7:56 PM | 8:33 PM | 8:26 PM | --- | --- | --- | 9:01 PM | --- | 9:16 PM |
| Coaster/Metrolink | C667 | --- | --- | 8:00 PM | 8:07 PM | 8:31 PM | 8:41 PM | 8:46 PM | 8:52 PM | 8:58 PM | 9:05 PM | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Amtrak | A595 | --- | --- | 8:25 PM | 8:31 PM | --- | 9:00 PM | --- | --- | --- | 9:13 PM | --- | --- | 9:15 PM | --- | --- | --- | 9:44 PM | --- | 10:00 PM |
| Amtrak | A597 | --- | --- | 9:35 PM | 9:41 PM | --- | 10:10 PM | --- | --- | --- | 10:23 PM | --- | --- | 10:25 PM | --- | --- | --- | 10:54 PM | --- | 11:10 PM |
| Amtrak | A579 | --- | --- | 10:40 PM | --- | --- | 11:14 PM | --- | --- | --- | 11:29 PM | --- | --- | 11:31 PM | --- | --- | --- | 12:01 AM | --- | 12:17 AM |

PARSONS BRINCKERHOFF

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# APPENDIX D

Response to Comments

**LOSSAN RAIL OPERATIONS MODELING – SAN DIEGO PROJECT DEVELOPMENT AND COMPLETION OF CORRIDORWIDE ANALYSIS**

Comment Review Form

Submittal Title: SAN DIEGO MID-TERM OPERATIONS ANALYSIS (Draft Report)

Date: August 30, 2012

| Comment No. | Page #/Section Reference | Reviewer Agency | Comment | Date Received | Response | Comment Addressed (Y/N) |
|---|---|---|---|---|---|---|
| 1 | Overall | SANDAG | This is the first report in the series where CPs have been in ALL CAPS. | 12/3/2012 | Corrected. All CP's are now in lowercase with the exception of CP SONGS, which is an acronym. | Y |
| 2 | 2/Methodology | SANDAG | 2nd paragraph from top of page - please elaborate on how the 2025 service plan would need to support the 2030 infrastructure since we have additional projects in the 2030 plan. | 12/3/2012 | Paragraph re-written. | Y |
| 3 | 2/Service Assumptions | SANDAG | 1st sentence - there's no 2025 phase in the RTP. Please cite 2009 prioritization study instead. | 12/3/2012 | Comment addressed. | Y |
| 4 | 3/Infrastructure | SANDAG | By showing No Build, Near-Term, and Mid-Term projects all in one list, we're inconsistent between both the Near-Term (which did not show No Build projects) and the Full-Build (which showed all). Suggest listing 3 lists in this section:<br>No Build: Poinsettia, SVDT, SMP1, Tec/Wash Crossovers<br>Near-Term (and note they were analyzed in NT report): SOP1 and 2, Pendleton, Oside Thru, and Cardiff)<br>Mid-Term (subject of this analysis): EB2S, CBVDT, SDDT, SMP2, and Elvira.<br>Text in this section should be changed accordingly (e.g., focus is on 5 projects that build upon the improvements assumed in no build and near term, etc) | 12/3/2012 | Text re-written and table added. | Y |
| 5 | 3/Infrastructure | SANDAG | 1st paragraph - individual projects are not actually identified in the 2050 RTP. Use "included" in RTP. | | Comment addressed. | Y |
| 6 | 3/Infrastructure | SANDAG | Last sentence on page - DM tunnel included in RTP in 2041-2050 phase. | 12/3/2012 | Comment addressed. | Y |
| 7 | 4/Figure 1 | SANDAG | Correct Camp Pendleton Station label and change "Propose" in legend to Proposed. Latter comment applies to Figure 2. | 12/3/2012 | Spelling corrected on graphic | Y |
| 8 | 7/Figure 4 | SANDAG | Make Figure 4 same size as previous figures. | | Figure 4 deleted as no "mid-term"projects are identified for that segment of the corridor. | Y |
| 9 | 8/OC to Oside | SANDAG | 4th paragraph - change report reference to LOSSAN Corridorwide Strategic Implementation Plan (April 2012) instead of LOSSAN business case. | 12/3/2012 | Comment addressed. | Y |
| 10 | 8/OC to Oside | SANDAG | Last sentence on page - seems inconsistent with the 2nd paragraph on page 11. Was full service to Pendleton assumed in the modeling effort? | 12/3/2012 | Comment addressed. Text on page 12 changed to reflect that approximately 50% of Coaster trains service the proposed Camp Pendleton Staion in the modeling. | Y |
| 11 | 9/Oside to SD | SANDAG | Last paragraph in section - what is the span of service assumed? | 12/3/2012 | Comment addressed. Year noted. | Y |
| 12 | 9/Analysis | SANDAG | Suggest only analysis for the Mid Term projects or if the Mid Term analysis causes a change in thinking of any no build or near-term project. | 12/3/2012 | All projects listed are required to support mid-term service levels. Projects required for each Service Plan are now clearly segregated and text noted to explain which of these are also required for short-term plan as well. | Y |
| 13 | 9/SOP | SANDAG | add "…a new universal CROSSOVER will be necessary…" | 12/3/2012 | Section removed for consistency | Y |
| 14 | 11/CBVDT | SANDAG | any additional findings available for this project since it's a MidTerm project? | 12/3/2012 | Additions presented where appropriate. | Y |
| 15 | 12/SDDT | SANDAG | Suggest adding language as part of discussion on CP Valley that analysis recommends right-hand crossover in short-term as part of Cardiff to Craven and will be built as universal as part of SDDT project in order to gain operational flexibility for both additional service and direct service to Fairgrounds. | 12/3/2012 | Comment addressed. | Y |
| 16 | 12/SDDT | SANDAG | Change last sentence in that section to: Additional analysis of a staging track for trains specificially serving special events at the Fairgrounds was completed and found that staging at the Santa Fe Depot was the preferred location at this time. Original sentence sounds like the staging track would be at the Fairgrounds. | 12/3/2012 | Comment addressed. | Y |
| 17 | 12/SM | SANDAG | Consistent with comments above, change text to including specific discussion of Phase 2, including listing the extents from temporary CP Scripps (251.2) to CP Miramar (and correct spelling in two places in that paragraph) | 12/3/2012 | Separated Phase 1 and 2 and re-written. | Y |
| 18 | 12/E2M | SANDAG | Add discussion regarding CP Rose in terms of need, timing with the Elvira to Morena project, and location. | 12/20/2012 | Comment addressed. | Y |
| 19 | App B | SANDAG | Add legend | 12/3/2012 | Comment addressed | Y |
| | | | | | | |

# APPENDIX 9

## Signal Spacing and Service Enhancements Analysis Final Tech Memorandum

**San Diego Association of Governments**

*Infrastructure Development Plan for the Los Angeles-San Diego-San Luis Obispo (LOSSAN) Rail Corridor in San Diego County Update*

**FINAL**

**TECHNICAL MEMORANDUM**

**AGREEMENT NO. 15019-OS**

# Signal Spacing and Optimization Analysis

| | | |
|---|---|---|
| Prepared by: | Yu Hanakura | 1/17/2018<br>Date |
| Reviewed by: | Lauren German | 2/12/2018<br>Date |
| Approved & Released by: | Lane Fernandes | 2/12/2018<br>Date |

| Revision | Date | Description |
|---|---|---|
| 1 | 2/12/2018 | Revisions per client comments |
| | | |
| | | |
| | | |

# ON-CALL TRANSIT PLANNING SERVICES

*SAN DIEGO ASSOCIATION OF GOVERNMENTS*

# INFRASTRUCTURE DEVELOPMENT PLAN FOR THE LOSSAN RAIL CORRIDOR IN SAN DIEGO COUNTY UPDATE

# SIGNAL SPACING AND OPTIMIZATION ANALYSIS

## TECHNICAL MEMORANDUM

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**February 12, 2018**

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# 1.0 BACKGROUND

The San Diego Subdivision is part of the 351-mile Los Angeles-San Diego-San Luis Obispo (LOSSAN) Rail Corridor. The LOSSAN Rail Corridor is the second busiest intercity passenger rail corridor in the nation supporting commuter, intercity, and freight rail services. The San Diego Subdivision is the southern end of the LOSSAN Rail Corridor and is a 60-mile section from the Orange County line to the Santa Fe Depot in Downtown San Diego. Within San Diego County, the corridor is owned by the North County Transit District (NCTD) from the Orange County line to the southern limits of the City of Del Mar. The San Diego Metropolitan Transit System (SDMTS) owns the Corridor in the City of San Diego from Del Mar to the Santa Fe Depot. Starting at Control Point (CP) SONGS, just south of the Orange County line, and continuing to the Santa Fe Depot in Downtown San Diego, NCTD dispatches all trains operating on the corridor. The BNSF Railway (BNSF) owns the right-of-way south of the Santa Fe Depot, but no revenue commuter or intercity passenger trains currently operate on this segment of right-of-way.

The passenger rail services operating on the LOSSAN Rail Corridor in San Diego County include the Amtrak Pacific Surfliner (Surfliner) intercity service; Metrolink commuter service between Los Angeles, the Inland Empire, and Orange County and the Oceanside Transit Center (operated by the Southern California Regional Rail Authority); and NCTD's COASTER commuter service from the Oceanside Transit Center (OTC) south to the Santa Fe Depot. The 2035 full buildout of the corridor includes a station at the San Diego Convention Center, which extends the COASTER service past the Santa Fe Depot, to approximately the location of the San Diego Metropolitan Transit System (MTS) Trolley Yard at Milepost (MP) 268.9.

This study will evaluate the overall performance of the existing signal system along the San Diego Subdivision, identify locations of lower throughput, and provide recommendations for improving the overall operations of the corridor for both existing conditions and the 2035 full buildout of the corridor based on the *Operational Analysis of Future Scenarios Technical Memorandum*:

- Base Case: This reflects infrastructure projects open or funded through construction as of January 2017 and current levels of service.
- 2035A Scenario: This reflects infrastructure projects to be open or funded through construction as of 2035 and service levels assumed for each operator for 2035.

The *Operational Analysis of Future Scenarios Technical Memorandum* modeled three options to assess not only the full buildout of the corridor in 2035, but also to assess the operational impacts assuming only part of the planned infrastructure was constructed. For this study, only the full buildout of the corridor, option 2035A, was considered.

The impacts of future service enhancements are also considered in this study, such as the impact or benefit of higher speed operations and express (skip stop) service along a corridor that is assumed to operate under Positive Train Control (PTC). Finally, this study will include a prioritized list of recommended signal improvements for the mid-term (2020) and the full buildout (2035).

# 2.0 UNDERSTANDING SIGNALS

Signaling systems are one of the most critical elements of the railroad and ensure the safe operations of trains. Similar to highway traffic signals, railroad signals control the flow of traffic to maintain safe distances between trains traveling at high speeds.

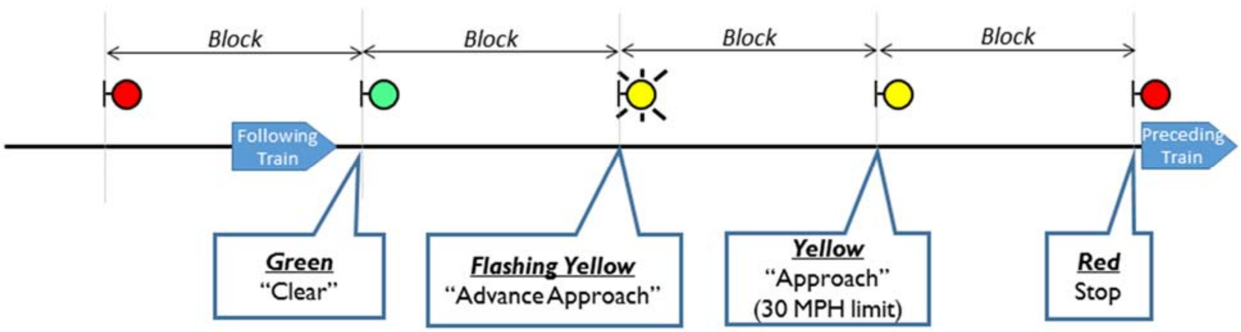
In North American railroads, including NCTD, each wayside signal has three lamps in red, yellow, and green color, and these colors can be displayed in various combinations or visual appearances. Each signal aspect (or visual appearance) is associated with a specific definition determined by each railroad. These definitions can be added to (but not changed) under a set of "Special Instructions" as defined by each railroad. The railroads operating within Southern California have adopted a typical 4-aspect system (though some older corridors still have segments of a 3-aspect system). The basic definition of each aspect in this system is listed in Table 1.

**Table 1: North American Railroad Signal Aspect – 4-Aspect System**

| Signal Aspect Indication | Name | Indication/Meaning | Status of the Preceding Train |
|---|---|---|---|
| Solid red | Stop | Stop before train passes the signal | Occupying the next block |
| Solid yellow | Approach | Proceed prepared to stop at next signal. Passenger trains exceeding 30 MPH immediately reduce to that speed. | Occupying the second block |
| Flashing Yellow | Advance Approach | Be prepared to stop at second signal. Proceed prepared to pass next signal not exceeding 30 MPH. | Occupying the third block |
| Solid green | Clear | Proceed (at the maximum speed allowed) | Not on the same track or occupying farther than the third block |

The segment between each signal is referred to as a “block”. The signals control the movement of trains into the next block. To ensure safe distance between trains, only one train on each track should be within each block at any one time. The implementation of Positive Train Control (or PTC) enforces this rule and removes the risk of a train entering to a block already occupied by another train. The basics of the 4-aspect system is summarized in Figure 1.

**Figure 1: Basics of the 4-Aspect System**




The primary purpose of a railroad signaling system is to control movements of the trains by maintaining safe distances between trains. In a high capacity passenger corridor, like the LOSSAN Rail Corridor, signal systems govern the number of trains that can operate on the corridor to address passenger demand. The more trains on a corridor, the more service can be provided to the passengers. The time separation between trains is controlled by the signal system and is referred to as “headway”. Headway is the amount of time it takes for a signal to reset to “green” or “clear” after a train passes through. A robust passenger network will require short headways between trains and a signal system where signals can reset to clear in the shortest amount of time, while still maintaining safe distances between trains.

## 2.1 SIGNAL SYSTEM FOR SAN DIEGO SUBDIVISION

The signals on the San Diego Subdivision are broken into two classifications, an absolute signal, which requires trains to stop and stay in place when Stop aspect is presented, or an intermediate signal, which is automatically controlled by the conditions of the track in that signal's block and by the condition of the following signal. Train dispatchers cannot control intermediate signals. Most control points (so named because they are points on the railroad that can be controlled by the train dispatcher) are equipped with remote control, power-operated switches. These switches may lead to a passing siding, take the form of a crossover (allowing movement to an adjacent track), or a become a "turnout" which routes a train to an alternate track (or route).

On the San Diego Subdivision, control points are locations with absolute signals and mostly at where a crossover is located and locations where single track segments split into two track segments or vice versa. However, as more second main line track is constructed on the corridor, many of these control points are being replaced with crossovers (instead of turnouts) or eliminated altogether. Generally, the signal spacing in San Diego is approximately every mile to mile and a half. While location and design of some signals that were in place before the acquisition of the right-of-way by NCTD are set by Santa Fe Railroad, the location and design of all signals added after NCTD acquired the track are set based on the minimum line of sight, safe braking distances, and other requirements specified in Chapter 17 of the NCTD Design Criteria.

Chapter 17 of the NCTD Design Criteria also requires that the signal aspect indication convention be changed at locations where the block length does not allow trains to comply with the speed, braking distance and movement authority as indicated by the signal. Examples include:

- Restricting aspect (flashing red; “Prepare to stop within a half the range of vision”) needs to be used instead of an Approach aspect where the next signal is “Stop” and is less than 3,000 feet away
- When the preceding signal is in Restricting aspect, the signal needs to indicate Approach Restricting (yellow over flashing red; “Proceed prepared to pass the next signal at restricted speed”)
- Where the distance between the second and the third signals from the signal in Stop aspect is not sufficient to allow trains to slow down to 30 MPH, additional aspects needs to be inserted so that sufficient braking distance could be offered

Historically, the goal for signal spacing along the LOSSAN Rail Corridor (between Los Angeles and San Diego) has been such as to allow for the absolute minimum following headway between passenger trains to be about 8 minutes. The system achieving the absolute minimum headway at that level can typically support two passenger trains operating in scheduled headway of 10 minutes without getting penalized by the less favorable signal aspect indication given that it provides a 15-20 percent buffer.

# 3.0 APPROACH TO ANALYSIS

## 3.1 METHODOLOGY

In this analysis, the minimum clear-to-clear signal headway for each signal block is computed using the time-distance diagram based on the pure run time of each type of the train (defined here as a Control Train) computed using the Berkeley Simulation Software Rail Traffic Controller (RTC) model to simulate railroad operations. The following information is identified on each time-distance diagram prepared for the control trains:

- The location of the head end of the Control Train
- The location of the rear end of the Control Train
- Horizontal guideline showing the location of each passenger station, Control Point (CP), and signal

For the computation of headways along the San Diego Subdivision, vertical lines are drawn on the time-distance diagram where the rear-end of the control train passes each signal. To replicate the associated latency in the signaling system (defined in this study as the time it takes for a switch to align and the time it takes for the locomotive engineer to respond to the signal aspect), vertical lines are shifted along the x-axis.

Once all information has been added to the time-distance diagram, progression of the signal aspects (e.g. red, yellow, flashing yellow, or green) is annotated on the diagram. This identifies the moment when the trailing train could receive the Clear (or green) aspect when entering the next signal block. The headway is then computed by taking the time at which the Control train receives a clear aspect at a given signal and subtracting the time at which the head end of the trailing train passes the same signal. The minimum headway presented in this report reflects absolute headway: this means that the minimum headway presented assumes that the trailing train enters a signal block at the moment the signal indication turns to a Clear aspect, without any consideration to engineer response times.

For this analysis, two alternatives were defined and evaluated for each scenario:

- Base Case Scenario
    1. COASTER Train Following Freight Train: assumes an all-stop COASTER train is trailing a freight train
    2. COASTER Train Following COASTER Train: assumes an all-stop COASTER train is trailing another all-stop COASTER train
- 2035 Scenario
    1. COASTER Train Following Freight Train: assumes an all-stop COASTER train is trailing a freight train
    2. COASTER Train Following COASTER Train: assumes an all-stop COASTER train is trailing another all-stop COASTER train

In addition to calculating minimum headways of trains operating in the same direction along the corridor, the minimum opposing headway (or the minimum time separation between two trains making opposing movements on single track segments) was also evaluated using the same methodology, but with consideration given to the time it takes for a switch to align.

## 3.2 ASSUMPTIONS

### 3.2.1 Infrastructure and Signal Locations

Assumed track layout for Base Case Scenario and 2035 Scenario are based on Base Case Scenario infrastructure and 2035A Case Scenario infrastructure assumed in *Infrastructure Development Plan for The LOSSAN Rail Corridor in San Diego County Update: Operational Analysis of Future Scenarios (2017),* respectively. In short, the following infrastructure projects are assumed to be in service in each Case:

- Base Case: completion of all infrastructure projects open or funded through construction as of January 2017 are assumed to be in service, namely:
    - Oceanside Transit Center Pass-Through Track
    - San Elijo Lagoon Double Track (Cardiff to Craven), including Chesterfield Drive Crossing Improvements
    - Elvira to Morena Double Track
    - San Diego River Bridge

- 2035 Scenario: Full build-out infrastructure projects to be open or funded through construction as of 2035 are assumed to be in service: namely, complete double tracking along corridor except for County line and through the City of Del Mar, along the bluffs, namely:
    - All new infrastructure assumed to be in service in Base Case Scenario
    - Poinsettia Station Improvements (allow removal of hold-out rule)
    - Batiquitos Lagoon Double Track
    - San Onofre Creek Double Track
    - San Onofre to Pulgas Double Track Phase 1, Stage 2
    - Camp Pendleton Station
    - Eastbrook to Shell Double Track (San Luis Rey River Bridge)
    - Carlsbad Village Double Track with inner-track fencing and other amenities that would not require the application of a hold-out rule at Carlsbad Village Station
    - La Costa to Swami Double Track with inner-track fencing and other amenities that would not require the application of a hold-out rule at Encinitas Station
    - San Dieguito Double Track and Platform
    - Sorrento to Miramar Phase 2
    - Airport Intermodal Transportation Center with inner-track fencing and other amenities that would not require the application of a hold-out rule

The locations of signals under the Base Case Scenario reflect existing signal locations (and infrastructure and signals currently under construction). The location of the signals under the 2035 Scenario were based on the locations identified in the *Infrastructure Development Plan for the LOSSAN Rail Corridor in San Diego County* (IDP) prepared in 2013.

Locations and names of the Signals assumed in both the Base Case and 2035A Scenarios are listed in Tables 2 through 5.

**Table 2: Assumed Signal Locations in Base Case: Eastbound**

| ID | MP | Type | Name |
|---|---|---|---|
| 1 | 209.14 | Absolute | CP Songs (home) |
| 2 | 211 | Intermediate | 2112/2114 |
| 3 | 213.05 | Intermediate | 2132/2134 |
| 4 | 214.8 | Intermediate | 2142/2144 |
| 5 | 216.35 | Absolute | CP Don (home) |
| 6 | 218.08 | Absolute | CP Pulgas |
| 7 | 220.1 | Intermediate | 2202/2204 |
| 8 | 221.43 | Absolute | CP Stuart (home) |
| 9 | 222.57 | Absolute | CP Mesa (home) |
| 10 | 223.61 | Intermediate | 2232/2234 |

| ID | MP | Type | Name |
|---|---|---|---|
| 11 | 225.24 | Absolute | CP Eastbrook (home) |
| 12 | 225.89 | Absolute | CP Shell (home) |
| 13 | 226.37 | Absolute | CP Pacific (home) |
| 14 | 226.69 | Absolute | CP Escondido JCT (home) |
| 15 | 228.34 | Absolute | CP Longboard (home) |
| 16 | 229.45 | Absolute | CP Carl (home) |
| 17 | 231.55 | Absolute | CP Farr (home) |
| 18 | 233.4 | Intermediate | 2332/2334 |
| 19 | 234.44 | Absolute | CP Ponto (home) |
| 20 | 236.75 | Intermediate | 2362 |
| 21 | 237.98 | Absolute | CP Swami (home) |
| 22 | 239.53 | Absolute | CP Cardiff (home) |
| 23 | 241.1 | Intermediate | N/A (a new intermediate signal to be installed at existing CP Craven) |
| 24 | 242.14 | Absolute | CP Valley (home) |
| 25 | 243.32 | Absolute | CP Crosby (home) |
| 26 | 243.9 | Absolute | CP Del Mar (home) |
| 27 | 246.08 | Intermediate | 2462 |
| 28 | 247.79 | Absolute | CP Torrey (home) |
| 29 | 249.29 | Absolute | CP Sorrento (home) |
| 30 | 249.8 | Intermediate | 2492/2494 |
| 31 | 250.9 | Absolute | CP Scripps (home) |
| 32 | 252.9 | Absolute | CP Miramar (home) |
| 33 | 254.5 | Intermediate | 2542/2544 |
| 34 | 256.04 | Absolute | CP Rose (home) |
| 35 | 257.2 | Intermediate | N/A (New signal installed as a part of Elvira to Morena Double Track) |
| 36 | 259.1 | Intermediate | 2592 |
| 37 | 260.57 | Intermediate | 2602/2604 |
| 39 | 262.27 | Absolute | CP Cudahy (home) |
| 40 | 264.3 | Absolute | CP Friar (home) |
| 41 | 265.1 | Absolute | CP Convair (home) |
| 42 | 267.13 | Absolute | CP Ash (home) |

**Table 3: Assumed Signal Locations in Base Case: Westbound**

| ID | MP | Type | Name |
|---|---|---|---|
| 1 | 267.26 | Absolute | CP Ash (home) |
| 2 | 265.22 | Absolute | CP Convair (home) |
| 3 | 264.24 | Absolute | CP Friar (home) |
| 4 | 262.52 | Absolute | CP Cudahy |
| 5 | 260.57 | Intermediate | 2601/2603 |

| ID | MP | Type | Name |
|---|---|---|---|
| 6 | 259.1 | Intermediate | 2591 |
| 7 | 257.2 | Intermediate | N/A (New signal installed as a part of Elvira to Morena Double Track) |
| 8 | 256.29 | Absolute | CP Rose (home) |
| 9 | 254.5 | Intermediate | 2541/2543 |
| 10 | 252.96 | Absolute | CP Miramar (home) |
| 11 | 251.21 | Absolute | CP Scripps (home) |
| 12 | 249.37 | Absolute | CP Sorrento (home) |
| 13 | 248.89 | Intermediate | 2481/2483 |
| 14 | 247.86 | Absolute | CP Torrey (home) |
| 15 | 246.08 | Intermediate | 2462 |
| 16 | 244 | Absolute | CP Del Mar (home) |
| 17 | 243.39 | Absolute | CP Crosby (home) |
| 18 | 242.21 | Absolute | CP Valley (home) |
| 19 | 241.1 | Intermediate | N/A (a new intermediate signal to be installed at existing CP Craven) |
| 20 | 239.71 | Absolute | CP Cardiff (home) |
| 21 | 238.07 | Absolute | CP Swami (home) |
| 22 | 236.75 | Intermediate | 2361 |
| 23 | 234.51 | Absolute | CP Ponto (home) |
| 24 | 232.85 | Intermediate | 2321/2323 |
| 25 | 231.74 | Absolute | CP Farr (home) |
| 26 | 229.53 | Absolute | CP Carl (home) |
| 27 | 228.43 | Absolute | CP Longboard (home) |
| 28 | 226.96 | Absolute | CP Escondido JCT (home) |
| 29 | 226.37 | Absolute | CP Pacific (home) |
| 30 | 225.96 | Absolute | CP Shell (home) |
| 31 | 225.32 | Absolute | CP Eastbook (home) |
| 32 | 224.27 | Intermediate | 2241/2243 |
| 33 | 222.73 | Absolute | CP Mesa (home) |
| 34 | 221.7 | Absolute | CP Stuart (home) |
| 35 | 220.1 | Intermediate | 2201/2203 |
| 36 | 218.22 | Absolute | CP Pulgas (home) |
| 37 | 216.5 | Absolute | CP Don (home) |
| 38 | 214.8 | Intermediate | 2141/2143 |
| 39 | 213.05 | Intermediate | 2131/2133 |
| 40 | 211 | Intermediate | 2111/2113 |
| 41 | 209.2 | Absolute | CP Songs (home) |
| 42 | 206.1 | Intermediate | N/A (in Orange Subdivision: included to estimate the headway near CP Songs) |
| 43 | 203.5 | Intermediate | N/A (in Orange Subdivision: included to estimate the headway near CP Songs |

**Table 4: Assumed Signal Locations in 2035A Scenario: Eastbound**

| ID | MP | Type | Name in 2013 IDP Signal System Concept |
|---|---|---|---|
| 1 | 207.89 | Absolute | New CP 207 (home) |
| 2 | 209.5 | Intermediate | 2092/2094 |
| 3 | 210.99 | Absolute | New CP San Onofre (home) |
| 4 | 213.05 | Intermediate | 2132/2134 |
| 5 | 214.8 | Intermediate | 2142/2144 |
| 6 | 216.35 | Absolute | CP Don (home) |
| 7 | 218.22 | Intermediate | 2182/2184 |
| 8 | 220.1 | Intermediate | 2202/2204 |
| 9 | 221.46 | Absolute | CP Stuart (home) |
| 10 | 222.19 | Absolute | CP Mesa (home) |
| 11 | 224.27 | Intermediate | 2242/2244 |
| 12 | 225.83 | Absolute | CP Shell (home) |
| 13 | 226.37 | Absolute | CP Pacific (home) |
| 14 | 226.37 | Absolute | CP Escondido JCT (MT1 home) |
| 15 | 228.34 | Intermediate | 2282/2284 |
| 16 | 230.1 | Intermediate | 2302/2304 |
| 17 | 231.55 | Absolute | CP Farr (home) |
| 18 | 233.03 | Absolute | CP Island (home) |
| 19 | 233.44 | Absolute | CP Breakwater (home) |
| 20 | 234.44 | Intermediate | 2342/2344 |
| 21 | 236.23 | Absolute | CP Moonlight (home) |
| 22 | 237.98 | Intermediate | 2382/2384 |
| 23 | 239.53 | Absolute | CP Cardiff (home) |
| 24 | 241.1 | Intermediate | N/A (a new intermediate signal to be installed at existing CP Craven) |
| 25 | 242.05 | Absolute | CP Valley (home) |
| 26 | 243.5 | Absolute | CP Del Mar (home) |
| 27 | 246.08 | Intermediate | 2462 |
| 28 | 247.79 | Absolute | CP Torrey (home) |
| 29 | 249.29 | Absolute | CP Sorrento (home) |
| 30 | 250.9 | Intermediate | 2502/2504 |
| 31 | 252.88 | Absolute | CP Miramar (home) |
| 32 | 254.5 | Intermediate | 2542/2544 |
| 33 | 256.02 | Absolute | CP Rose (home) |
| 34 | 257.18 | Intermediate | N/A (New signal installed as a part of Elvira Elvira to Morena Double Track) |
| 35 | 259.1 | Intermediate | 2592/2594 |
| 36 | 260.57 | Intermediate | 2602/2604 |
| 37 | 262.27 | Absolute | CP Cudahy (home) |
| 38 | 264.3 | Intermediate | 2642/2644 |

| ID | MP | Type | Name in 2013 IDP Signal System Concept |
|---|---|---|---|
| 39 | 265.1 | Absolute | CP Convair (home) |
| 40 | 267.13 | Absolute | CP Ash (home) |

**Table 5: Assumed Signal Locations in 2035A Scenario: Westbound**

| ID | MP | Type | Name in 2013 IDP Signal System Concept |
|---|---|---|---|
| 1 | 267.26 | Absolute | CP Ash (Track 3 home) |
| 2 | 265.22 | Absolute | CP Convair (home) |
| 3 | 264.24 | Intermediate | 2W/4W |
| 4 | 262.52 | Absolute | CP Cudahy (home) |
| 5 | 260.57 | Intermediate | 2601/2603 |
| 6 | 259.1 | Intermediate | 2591/2593 |
| 7 | 257.18 | Intermediate | N/A (New signal installed as a part of Elvira to Morena Double Track) |
| 8 | 256.29 | Absolute | CP Rose (home) |
| 9 | 254.5 | Intermediate | 2541/2543 |
| 10 | 252.96 | Absolute | CP Miramar (home) |
| 11 | 250.9 | Intermediate | 2501/2503 |
| 12 | 249.45 | Absolute | CP Sorrento (home) |
| 13 | 248.89 | Intermediate | 2481/2483 |
| 14 | 247.86 | Absolute | CP Torrey (home) |
| 15 | 246.08 | Intermediate | 2461 |
| 16 | 243.8 | Absolute | CP Del Mar (home) |
| 17 | 242.8 | Absolute | CP Valley (home) |
| 18 | 241.1 | Intermediate | N/A (a new intermediate signal to be installed at existing CP Craven) |
| 19 | 239.71 | Absolute | CP Cardiff (home) |
| 20 | 237.98 | Intermediate | 2371/2373 |
| 21 | 236.4 | Absolute | CP Moonlight (home) |
| 22 | 234.44 | Intermediate | 2341/2343 |
| 23 | 233.47 | Absolute | CP Breakwater (home) |
| 24 | 233.1 | Absolute | CP Island (home) |
| 25 | 232.64 | Intermediate | 2321/2323 |
| 26 | 231.74 | Absolute | CP Farr (home) |
| 27 | 230.1 | Intermediate | 2301/2303 |
| 28 | 228.34 | Intermediate | 2281/2283 |
| 29 | 226.96 | Absolute | CP Escondido JCT (home) |
| 30 | 226.37 | Absolute | CP Pacific (home) |
| 31 | 225.97 | Absolute | CP Shell |
| 32 | 224.27 | Intermediate | 2241/2243 |
| 33 | 222.73 | Absolute | CP Mesa (home) |
| 34 | 221.75 | Absolute | CP Stuart (home) |

| ID | MP | Type | Name in 2013 IDP Signal System Concept |
|---|---|---|---|
| 35 | 220.1 | Intermediate | 2201/2203 |
| 36 | 218.22 | Intermediate | 2181/2183 |
| 37 | 216.5 | Absolute | CP Don (home) |
| 38 | 214.8 | Intermediate | 2141/2143 |
| 39 | 213.05 | Intermediate | 2131/2133 |
| 40 | 211.17 | Absolute | New CP San Onofre (home) |
| 41 | 209.5 | Intermediate | 2091/2093 |
| 42 | 207.98 | Absolute | New CP 207 (home) |

### 3.2.2 Consist Characteristics

Consist configurations for Control Trains and the Following Train are as follows:

- Passenger train
  - Base Case: Five Bombardier Bi-Level Coaches hauled by one F59PHI locomotive
  - 2035A Scenario: Six Bombardier Bi-Level Coaches hauled by one Tier-4 passenger locomotive
- Freight train (for both Cases)
  - Sixty-car (all loaded), 4,200 trailing ton train hauled by three Dash-9 locomotives in distributed power formation (two in front, one in rear: 5,000 feet long including locomotives)

### 3.2.3 Signal System Characteristics

The following assumptions are made in the number of signal aspects for this analysis:

- Under the 2035A Scenario, the signal system for the entire length of San Diego Subdivision would be upgraded from the current mixture of 3-aspect and 4-aspect signal blocks to all 4-aspect signal blocks except for the end-line locations.
- For the Base Case Scenario infrastructure, all new signals and relocated signals as a part of the on-going and planned double-track projects are installed as a 4-aspect system whereas the signals currently in place as 3-aspect signals would remain as 3-aspect signals.

Latency of the signaling system are assumed to be identical to the ones for the existing system. Based on the train dispatching data provided by NCTD, signal system latency assumes:

- 10 seconds for loss of shunt (or time before a track circuit detects the wheels and axles of a train)
- Additional 23 seconds to establish routes by re-aligning railroad switch(es)

### 3.2.4 Operational Parameters

- Dwell time of the passenger trains at intermediate stations is assumed to be 30 seconds.

- Freight trains are assumed to enter and exit at maximum authorized speed (MAS) and operate without making any stops along the San Diego Subdivision.
- Ideal sight distance of the wayside signal is assumed to be 2,000 feet, as specified in the current NCTD signal design criteria.
- Response time of the locomotive engineer is assumed to be 5 seconds.

# 4.0 SIMULATION ANALYSIS RESULTS AND RECOMMENDATIONS

## 4.1 BASE CASE

### 4.1.1 Calculating Same Direction Headway

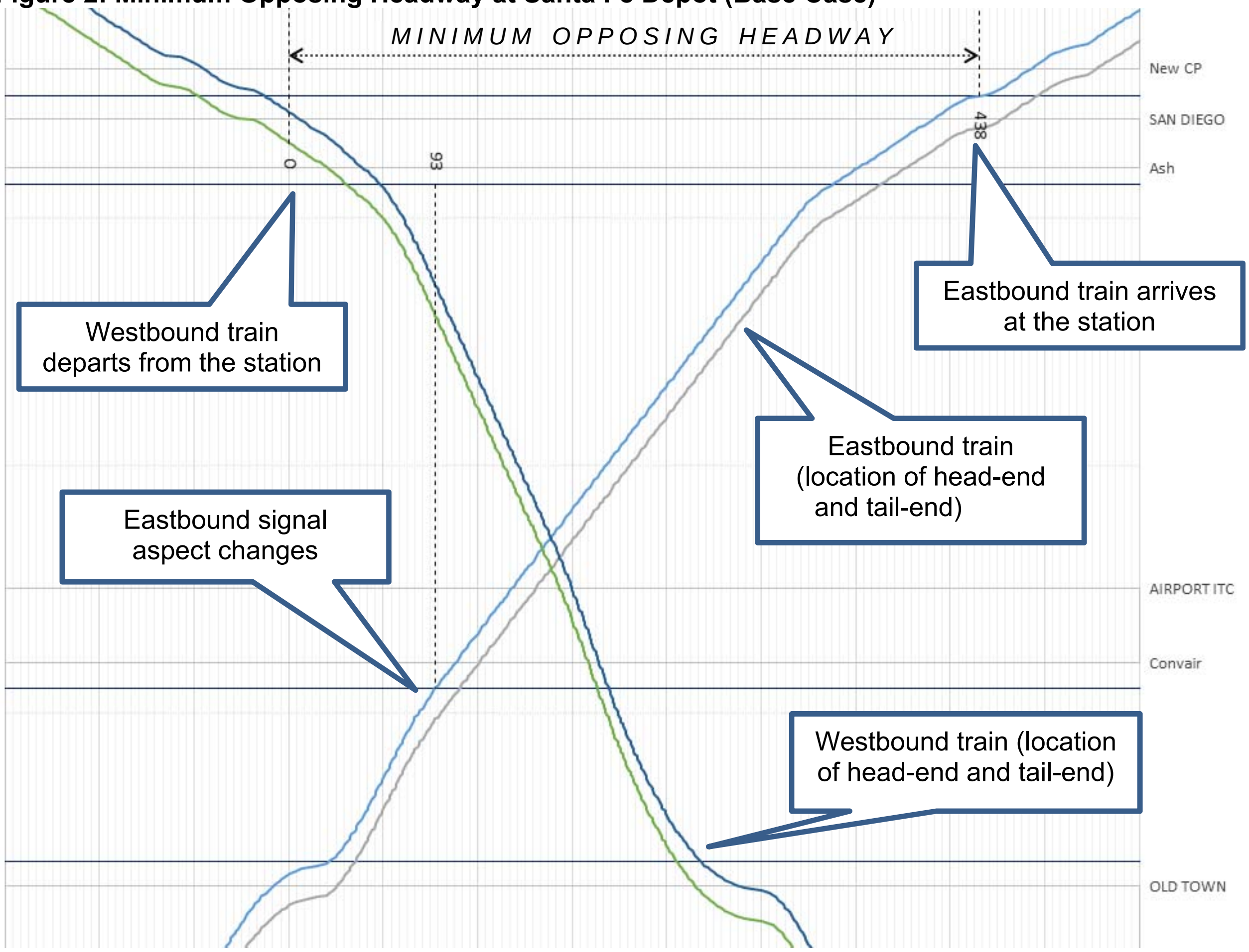
The calculation results indicate that the minimum headway under existing conditions, where a passenger train is trailing a freight train, is generally 8.5 minutes. Exceptions to this are located in the corridor segments between Solana Beach and CP Morena and near the Santa Fe Depot where headways were calculated to be as much as 18.5 minutes in the westbound direction. Additional data on the minimum headways between trains operating in the same direction for each signal location assumed for the Base Case Scenario is shown in Appendix A (in table format) and Appendix B (as a time-distance diagram).

For the alternative where a passenger train is trailing another passenger train, the analysis also identified three locations where the 8.5-minute threshold could not be met, which included CP Friar (eastbound only), between CP Sorrento and CP Miramar (eastbound only), and between CP Rose and CP Miramar (westbound only). At these locations, the minimum allowable headway was determined to be 9.5 minutes.

### 4.1.2 Opposing Direction Headway at San Diego Santa Fe Depot

The minimum headways possible of opposing movements for trains arriving to and departing from the Santa Fe Depot, as determined in this analysis, is about 6.5 minutes. Due to the slow track speed for trains arriving into the Santa Fe Depot, it takes longer for the trains to clear the controlling signals at CP Ash, increasing the clear-to-clear time for the control point (see Figure 2).

**Figure 2: Minimum Opposing Headway at Santa Fe Depot (Base Case)**




*<u>Horizontal line</u>: eastbound signal locations*

## 4.2 2035A SCENARIO

### 4.2.1 Midline Following Headway

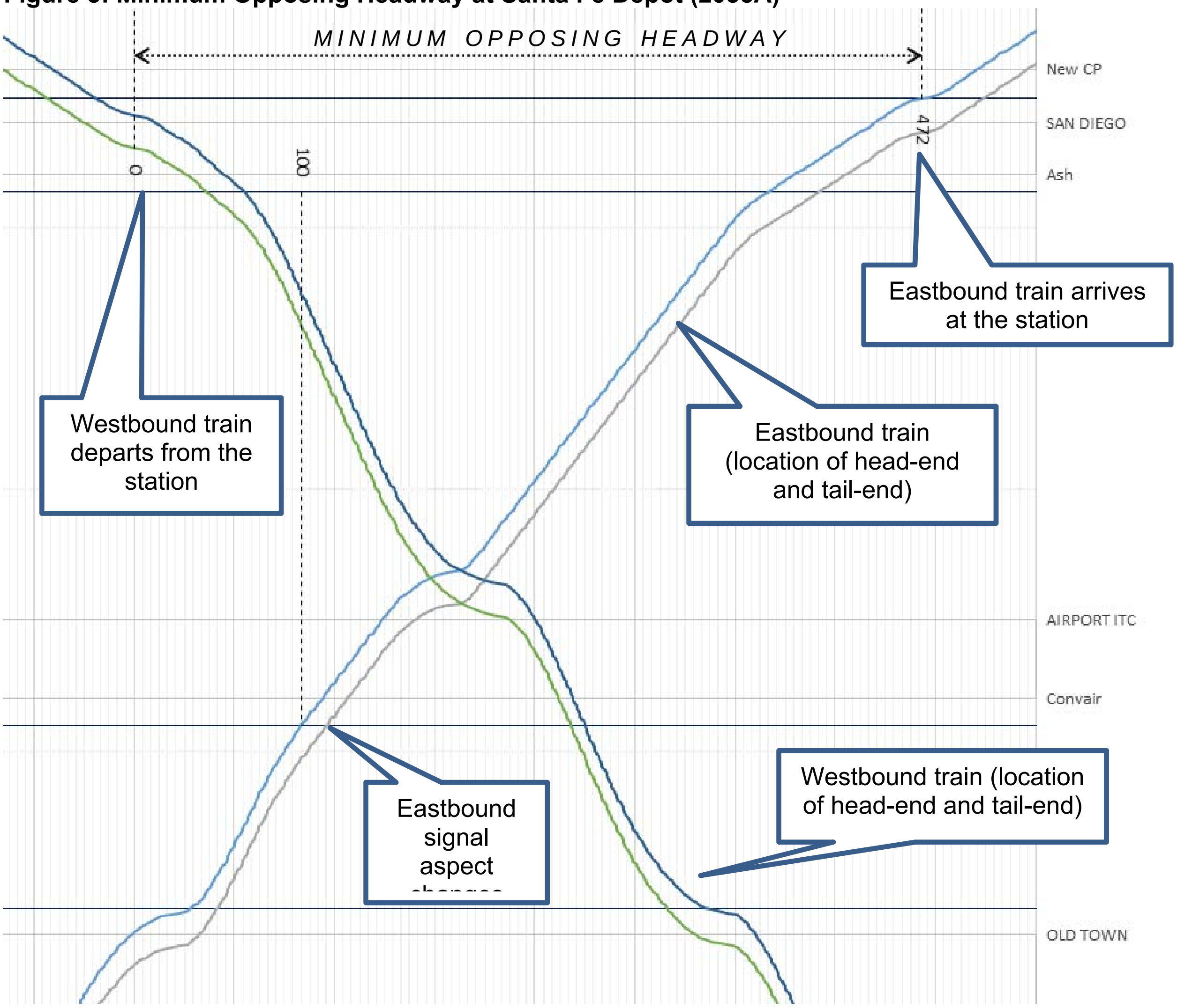
The calculation results indicate that the minimum headway under the 2035A Scenario, where a passenger train is trailing a freight train, is maintained at about 8.5 minutes north of Del Mar. South of Del Mar to the Santa Fe Depot, headways were calculated to be as much as 17 minutes in the westbound direction. Additional data on the minimum headways between trains operating in the same direction for each signal location assumed for the Base Case Scenario is shown in Appendix C (in table format) and Appendix D (as a time-distance diagram).

The increase in the headway timing south of Del Mar is due to the capital projects respacing the signals further apart, allowing only a single intermediate signal between control points, and increasing the time it takes for a train to traverse a signal block.

### 4.2.2 Opposing Headway at San Diego Santa Fe Depot

The minimum headways possible of opposing movements for trains arriving to and departing from the Santa Fe Depot, as determined in the 2035A Scenario analysis, is about 7 minutes. This is longer than was determined for the Base Case Scenario. This is due to the increase in train lengths, resulting in trains taking additional time to clear the controlling signals at CP Ash (see Figure 3).

**Figure 3: Minimum Opposing Headway at Santa Fe Depot (2035A)**




*Horizontal line: eastbound signal locations*

One observation made was that the San Diego International Airport Intermodal Transportation Center (SDAITC) will need to include a new inbound station signal since the proposed station location is identified as being between the signals of CP Convair and CP Ash with no intermediate signal in between. Without new intermediate signal(s) between these two CPs, all eastbound trains would be departing the intermodal center Delayed in Block (DIB) and operating at reduced speed to the Santa Fe Depot. This can also influence the headways of trains departing the Santa Fe Depot.

## 5.0 SUGGESTED SIGNAL OPTIMIZATION IMPROVEMENTS

The 2035A Scenario analysis identified restrictions to the achieving idea service headways south of Del Mar to the Santa Fe Depot. This section identifies options for consideration in achieving 8.5 minute headways along the entire San Diego Subdivision south of Oceanside. **It is important to note that the options presented here do not take into consideration environmental, geometric, or physical constraints to**

**proposed signal locations.** Before any final determination is made, review of the territory with NCTD signal and operating departments will be required to ensure signals are placed in appropriate locations that will allow for easy visibility, maintenance, and safe braking distance.

The options identified to reduce the minimum headway between a freight train (as the control train) and a trailing passenger train to achieve the optimum headway of 8.5 minutes are summarized below in Tables 6 and 7. The signals are placed in optimal locations. Though it is easier to install and maintain co-located signals, some signals do not end up with eastbound signal(s) and westbound signal(s) co-locations because field conditions would not allow it, such as:

- Curves
- Speed limit changes
- Speed of the tail end of the train
- Proposed location of the Airport ITC Station platform and ideal signal location to allow the train to enter to the platform while the track beyond the far end of the platform is still occupied

**Table 6: Options for Signal Optimization (Eastbound)**

| ID | MP | Type | Description of Option | Potential Capital Project for Inclusion |
|---|---|---|---|---|
| 1 | 227.8 | Intermediate | Move the intermediate currently proposed at MP 228.4 to MP 227.8. | Stand-alone project |
| 2 | 228.9 | Intermediate | Add a new intermediate signal near Carlsbad Boulevard overpass. | Carlsbad Village Double Track |
| 3 | 244.9 | Intermediate | Add a new intermediate signal between CP Del Mar and signal 2462. | San Dieguito Double Track and Platform |
| 4 | 248.6 | Intermediate | Add a new intermediate signal between CP Torrey and CP Sorrento. | Stand-alone project |
| 5 | 249.9 | Intermediate | Keep existing signals 2492/2494 (previously proposed to be removed in Sorrento-Miramar Phase II project). | N/A (Protection of existing signal) |
| 6 | 250.3 | Intermediate | Add a new intermediate signal between CP Sorrento and proposed intermediate signals 2502/2504. | Stand-alone project |
| 7 | 250.7 | Intermediate | Move proposed intermediate signals 2502/2504 (near MP 250.9) to MP 250.7. | Sorrento-Miramar Phase II |
| 8 | 251.2 | Intermediate | Restore previously-removed intermediate signal | Sorrento-Miramar Phase II |
| 9 | 251.7 | Intermediate | Add three new intermediate signals between proposed intermediate signals 2502/2504 and CP Miramar. | Sorrento-Miramar Phase II |
| 10 | 252.2 | Intermediate | | Sorrento-Miramar Phase II |
| 11 | 252.5 | Intermediate | | Sorrento-Miramar Phase II |
| 12 | 253.7 | Absolute | Add a new signal at an existing hand-thrown right-hand crossover east of CP Miramar. (Potentially powering up hand-thrown crossover). | Stand-alone project |
| 13 | TBD | Intermediate | Add a new intermediate signal near former location of CP Elvira (MP 257.9). | Stand-alone project |
| 14 | 263.5 | Intermediate | Add a new intermediate signal between CP Cudahy and CP Friar. | Stand-alone project |
| 15 | 265.7 | Intermediate | Add a new exit signal at San Diego Airport Intermodal Transportation Center | San Diego Airport Intermodal Transportation Center |

| ID | MP | Type | Description of Option | Potential Capital Project for Inclusion |
|---|---|---|---|---|
| 16 | 266.2 | Intermediate | Add three new intermediate signals between the new exit signal at San Diego Airport Intermodal Transportation Center and CP Ash. | Stand-alone project |
| 17 | 266.6 | Intermediate | | Stand-alone project |
| 18 | 266.9 | Intermediate | | Stand-alone project |

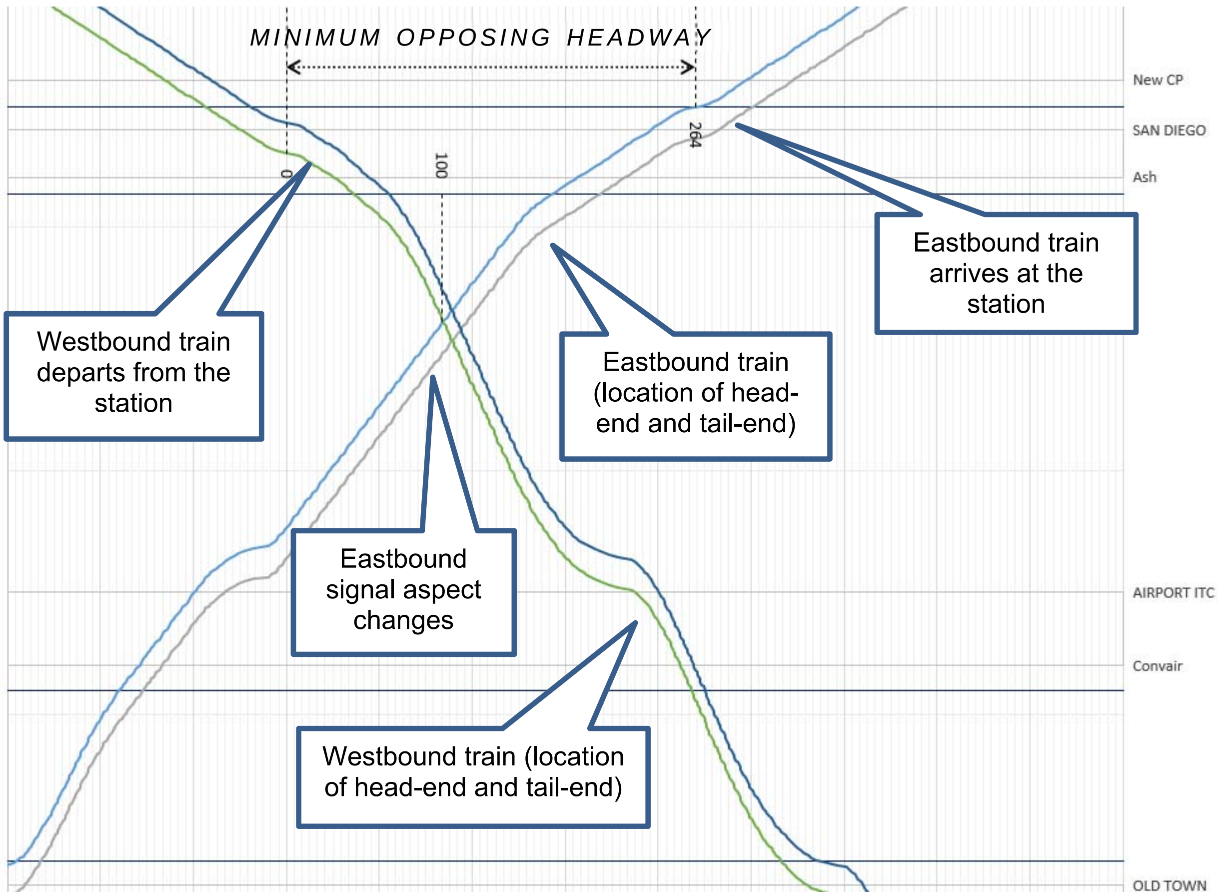
**Table 7: Options for Signal Optimization (Westbound)**

| ID | MP | Type | Description of Option | Potential Capital Project for Inclusion |
|---|---|---|---|---|
| 1 | 266.9 | Intermediate | Add three new intermediate signals between CP Ash and CP Convair. | Stand-alone project |
| 2 | 266.5 | Intermediate | | Stand-alone project |
| 3 | 266.0 | Intermediate | | Stand-alone project |
| 4 | 263.5 | Intermediate | Add a new intermediate signal between CP Friar and CP Cudahy | Stand-alone project |
| 5 | 261.7 | Intermediate | Add a new intermediate signal near Claremont Drive overpass. | Stand-alone project |
| 6 | TBD | Intermediate | Add a new intermediate signal near former location of CP Elvira (MP 257.9) | Stand-alone project |
| 7 | 255.5 | Intermediate | Add a new intermediate signal near Genesee Avenue overpass. | Rose Canyon Bridge Replacements |
| 8 | 253.8 | Absolute | Add a new signal at an existing hand-thrown right-hand crossover east of CP Miramar. (Potentially powering up hand-thrown crossover). | Stand-alone project |
| 9 | 252.1 | Intermediate | Add a new intermediate signal between CP Miramar and proposed intermediate signals 2501/2503. | Sorrento-Miramar Phase II |
| 10 | 251.6 | Intermediate | Restore previously-removed intermediate signal. | Sorrento-Miramar Phase II |
| 11 | 251.1 | Intermediate | Move the intermediate signal currently proposed at MP 250.9 to MP 251.1. | Sorrento-Miramar Phase II |
| 12 | 250.7 | Intermediate | Add three new intermediate signals between proposed intermediate signals 2501/2503 and CP Sorrento. | Sorrento-Miramar Phase II |
| 13 | 250.3 | Intermediate | | Stand-alone project |
| 14 | 249.9 | Intermediate | | Stand-alone project |
| 15 | 244.9 | Intermediate | Add a new intermediate signal between signal 2461 and CP Del Mar. | San Dieguito Double Track and Platform |
| 16 | 228.9 | Intermediate | Add a new intermediate signal near Carlsbad Boulevard overpass to make the signal “back-to-back” with the new eastbound signal. | Carlsbad Village Double Track |
| 17 | 227.8 | Intermediate | Move the intermediate currently proposed at MP 228.4 to MP 227.8 to make the signal “back-to-back” with the relocated eastbound signal. | Stand-alone project |
| 18 | 204.9 | Intermediate | Add a new intermediate signal near San Clemente Pier Station platform. **(OCTA / Metrolink territory)** | Improvement(s) need to be made to the remaining single track section of the Orange Subdivision south of CP Avery to improve the on-time performance of the trains in San Diego County |
| 19 | 202.3 | Intermediate | Add a new intermediate signal. **(OCTA / Metrolink territory)** | Improvement(s) need to be made to the remaining single track section of the Orange Subdivision south of CP Avery to improve the on-time performance of the trains in San Diego County |

The operational benefits of assuming the options defined in the tables above is summarized in Appendix C (in table format) and Appendix E (in a time-distance diagram). A schematic track diagram illustrating the respaced signal locations is presented in Appendix F.

The options identified also reduce the headway for opposing movements arriving to and departing from the Santa Fe Depot. As illustrated in Figure 4, the clearance time for a train departing the station following the arrival of another train has been reduced to about four and a half minutes. This equates to roughly 40 percent improvement in headways.

**Figure 4: Minimum Opposing Headway at Santa Fe Depot with Signal Respacing (2035A)**




*<u>Horizontal line</u>: eastbound signal locations*

## 5.1 POTENTIAL EARLY ACTION IMPROVEMENTS

The signal optimization analysis presented in this report focused on optimizing the 2035A Scenario. However, there are opportunities to implement some of these optimization options in the near-term, therefore providing benefit to existing operations. The optimization options presented in Table 8 below were identified as candidates for near-term implementation because they, 1) focused on eliminating long single blocks, and 2) would not be “throw away” projects in implementing 2035A Scenario infrastructure. These would be stand-alone projects because the mileposts are not included in near-term or mid-term capital projects.

**Table 8: Potential Early Action Improvements**

<table>
<tr><th>Direction</th><th>MP</th><th>Type</th><th>Description of Option</th></tr>
<tr><td>EB + WB</td><td>249.9</td><td>Intermediate</td><td>Keep existing signals 2492/2494 (previously proposed to be removed in Sorrento-Miramar Phase II project).</td></tr>
<tr><td>EB + WB</td><td>250.3</td><td>Intermediate</td><td>Add a new intermediate signal between CP Sorrento and proposed intermediate signals 2502/2504.</td></tr>
<tr><td>EB</td><td>250.7</td><td>Intermediate</td><td>Move proposed intermediate signals 2502/2504 (near MP 250.9) to MP 250.7.</td></tr>
<tr><td>EB</td><td>253.7</td><td>Absolute</td><td>Add a new signal at an existing hand-thrown right-hand crossover east of CP Miramar. (Potentially powering up hand-thrown crossover).</td></tr>
<tr><td>EB + WB</td><td>266.2</td><td>Intermediate</td><td rowspan="3">Add three new intermediate signals between the new exit signal at San Diego Airport Intermodal Transportation Center and CP Ash.</td></tr>
<tr><td>EB + WB</td><td>266.6</td><td>Intermediate</td></tr>
<tr><td>EB + WB</td><td>266.9</td><td>Intermediate</td></tr>
<tr><td>WB</td><td>253.8</td><td>Absolute</td><td>Add a new signal at an existing hand-thrown right-hand crossover east of CP Miramar. (Potentially powering up hand-thrown crossover).</td></tr>
</table>

## 5.2 PROJECT COSTS

The Rough order of magnitude (ROM) Cost Estimate for an intermediate signal at each location includes the base construction costs, program implementation or soft costs, and contingency.

### 5.2.1 Construction Costs

At each location, the intermediate signal would include one overhead truss with bi-directional signaling and instrument house. The construction cost per location was estimated to be roughly $1 Million in 2017 dollars. Cost estimates from similar projects, such as San Diego River Bridge Double Track Project (90% estimate), Elvira to Morena Double Track Project (65% Estimate), and Westbound signal at North End of Encinitas Station Project, were used as the basis for developing the estimated construction cost per location.

### 5.2.2 Program Implementation Costs

Per direction from SANDAG, the recently approved PSR from the San Onofre Bridge Replacements in Camp Pendleton (MP 207.6, MP 207.8, MP 208.6 and MP 209.9) Project was used as an example to estimate project implementation costs. These costs include design administration, design program management, alternative analysis, environmental analyses, design costs from preliminary to final design, independent peer reviews, construction administration, construction program management, design support during construction, construction management, as well as costs for signal and maintenance support and testing. Costs were estimated to be roughly 45% of the construction costs.

### 5.2.3 Contingency

To account for the lack of design information, the cost estimate includes a contingency of 40% of the construction costs. This includes costs for cabling, establishing power service, and PTC connection, and reconfiguration costs. Based on available information regarding site conditions, contingency was increased at certain locations to account for constructability issues, construction and maintenance access, retaining walls etc.

### 5.2.4 Total Cost

Tables 9 and 10 shows the ROM costs for the suggested signal optimization improvements. The highlighted rows are those signals identified for potential early action improvements. Total ROM cost estimate for both eastbound and westbound signals is $46,250,000.

**Table 9: Costs for Signal Optimization (Eastbound)**

| ID | MP | Type | Construction Cost | Soft Costs | Contingency | Total | Notes |
|---|---|---|---|---|---|---|---|
| 1 | 227.8 | Intermediate | $1,000,000 | $450,000 | $400,000 | $1,850,000 | Costs include both eastbound and westbound signal |
| 2 | 228.9 | Intermediate | $1,000,000 | $450,000 | $400,000 | $1,850,000 | Costs include both eastbound and westbound signal |
| 3 | 244.9 | Intermediate | $1,000,000 | $450,000 | $400,000 | $1,850,000 | Costs include both eastbound and westbound signal |
| 4 | 248.6 | Intermediate | $1,000,000 | $450,000 | $400,000 | $1,850,000 | |
| 5 | 249.9 | Intermediate | $1,000,000 | $450,000 | $400,000 | $1,850,000 | Costs include both eastbound and westbound signal |
| 6 | 250.3 | Intermediate | $1,000,000 | $450,000 | $400,000 | $1,850,000 | |
| 7 | 250.7 | Intermediate | $1,000,000 | $450,000 | $400,000 | $1,850,000 | |
| 8 | 251.2 | Intermediate | $1,000,000 | $450,000 | $400,000 | $1,850,000 | Costs include both eastbound and westbound signal |
| 9 | 251.7 | Intermediate | $1,000,000 | $450,000 | $400,000 | $1,850,000 | |
| 10 | 252.2 | Intermediate | $1,000,000 | $450,000 | $400,000 | $1,850,000 | Costs include both eastbound and westbound signal |
| 11 | 252.5 | Intermediate | $1,000,000 | $450,000 | $400,000 | $1,850,000 | |
| 12 | 253.7 | Absolute | $1,000,000 | $450,000 | $400,000 | $1,850,000 | Costs include both eastbound and westbound signal |
| 13 | TBD | Intermediate | $1,000,000 | $450,000 | $400,000 | $1,850,000 | Costs include both eastbound and westbound signal |
| 14 | 263.5 | Intermediate | $1,000,000 | $450,000 | $400,000 | $1,850,000 | Costs include both eastbound and westbound signal |
| 15 | 265.7 | Intermediate | $1,000,000 | $450,000 | $400,000 | $1,850,000 | |
| 16 | 266.2 | Intermediate | $1,000,000 | $450,000 | $400,000 | $1,850,000 | Costs include both eastbound and westbound signal |
| 17 | 266.6 | Intermediate | $1,000,000 | $450,000 | $400,000 | $1,850,000 | Costs include both eastbound and westbound signal |
| 18 | 266.9 | Intermediate | $1,000,000 | $450,000 | $400,000 | $1,850,000 | Costs include both eastbound and westbound signal |
| **EASTBOUND SIGNALS TOTAL** | | | | | | **$33,300,000** | |

**Table 10: Costs for Signal Optimization (Westbound)**

| ID | MP | Type | Construction Cost | Soft Costs | Contingency | Total | Notes |
|---|---|---|---|---|---|---|---|
| 1 | 266.9 | Intermediate | -- | -- | -- | -- | Costs included along with eastbound signal |

| ID | MP | Type | Construction Cost | Soft Costs | Contingency | Total | Notes |
|---|---|---|---|---|---|---|---|
| 2 | 266.5 | Intermediate | -- | -- | -- | -- | Costs included along with eastbound signal |
| 3 | 266.0 | Intermediate | -- | -- | -- | -- | Costs included along with eastbound signal |
| 4 | 263.5 | Intermediate | -- | -- | -- | -- | Costs included along with eastbound signal |
| 5 | 261.7 | Intermediate | $1,000,000 | $450,000 | $400,000 | $1,850,000 | |
| 6 | TBD | Intermediate | -- | -- | -- | -- | Costs included along with eastbound signal |
| 7 | 255.5 | Intermediate | $1,000,000 | $450,000 | $400,000 | $1,850,000 | |
| 8 | 253.8 | Absolute | -- | -- | -- | -- | Costs included along with eastbound signal |
| 9 | 252.1 | Intermediate | -- | -- | -- | -- | Costs included along with eastbound signal |
| 10 | 251.6 | Intermediate | $1,000,000 | $450,000 | $400,000 | $1,850,000 | |
| 11 | 251.1 | Intermediate | $1,000,000 | $450,000 | $400,000 | $1,850,000 | |
| 12 | 250.7 | Intermediate | -- | -- | -- | -- | Costs included along with eastbound signal |
| 13 | 250.3 | Intermediate | -- | -- | -- | -- | Costs included along with eastbound signal |
| 14 | 249.9 | Intermediate | -- | -- | -- | -- | Costs included along with eastbound signal |
| 15 | 244.9 | Intermediate | $1,000,000 | $450,000 | $400,000 | $1,850,000 | |
| 16 | 228.9 | Intermediate | -- | -- | -- | -- | Costs included along with eastbound signal |
| 17 | 227.8 | Intermediate | -- | -- | -- | -- | Costs included along with eastbound signal |
| 18 | 204.9 | Intermediate | $1,000,000 | $450,000 | $400,000 | $1,850,000 | **(OCTA / Metrolink territory)** |
| 19 | 202.3 | Intermediate | $1,000,000 | $450,000 | $400,000 | $1,850,000 | **(OCTA / Metrolink territory)** |
| **WESTBOUND SIGNALS TOTAL** | | | | | | **$12,950,000** | |

# APPENDIX A

## BASE CASE HEADWAY ANALYSIS: TABLE

**Estimated Absolute Minimum Headway – Base Case, Without Respacing: Eastbound**

| ID | Milepost | Absolute Minimum Headway | |
|---|---|---|---|
| | | Originally-Assumed | |
| | | Freight | Passenger |
| 1 | 209.14 | 00:08:50 | 00:04:32 |
| 2 | 211 | 00:07:43 | 00:03:58 |
| 3 | 213.05 | 00:07:11 | 00:03:42 |
| 4 | 214.8 | 00:07:28 | 00:03:53 |
| 5 | 216.35 | 00:07:14 | 00:03:43 |
| 6 | 218.08 | 00:06:32 | 00:03:19 |
| 7 | 220.1 | 00:05:27 | 00:02:47 |
| 8 | 221.43 | 00:06:07 | 00:03:18 |
| 9 | 222.57 | 00:05:40 | 00:03:18 |
| 10 | 223.61 | 00:05:06 | 00:03:50 |
| 11 | 225.24 | 00:05:25 | 00:04:20 |
| 12 | 225.89 | 00:05:45 | 00:05:50 |
| 13 | 226.37 | 00:07:27 | 00:06:17 |
| 14 | 226.69 | 00:07:01 | 00:05:44 |
| 15 | 228.34 | 00:07:07 | 00:06:59 |
| 16 | 229.45 | 00:07:01 | 00:05:54 |
| 17 | 231.55 | 00:07:22 | 00:06:05 |
| 18 | 233.4 | 00:07:12 | 00:05:48 |
| 19 | 234.44 | 00:07:47 | 00:05:51 |
| 20 | 236.75 | 00:07:11 | 00:05:13 |
| 21 | 237.98 | 00:06:55 | 00:05:03 |

| ID | Milepost | Absolute Minimum Headway | |
|---|---|---|---|
| | | Originally-Assumed | |
| | | Freight | Passenger |
| 22 | 239.42 | 00:06:07 | 00:04:51 |
| 23 | 241.1 | 00:05:03 | 00:04:09 |
| 24 | 242.14 | 00:03:42 | 00:02:05 |
| 25 | 243.32 | 00:05:05 | 00:03:13 |
| 26 | 243.9 | 00:06:25 | 00:04:08 |
| 27 | 246.08 | 00:08:34 | 00:04:59 |
| 28 | 247.79 | 00:10:20 | 00:05:06 |
| 29 | 249.29 | 00:15:01 | 00:07:13 |
| 30 | 249.8 | 00:15:54 | 00:08:17 |
| 31 | 250.9 | 00:13:56 | 00:08:10 |
| 32 | 252.9 | 00:09:14 | 00:04:36 |
| 33 | 254.5 | 00:09:09 | 00:05:33 |
| 34 | 256.02 | 00:09:09 | 00:05:28 |
| 35 | 257.2 | 00:09:39 | 00:05:49 |
| 36 | 259.1 | 00:08:53 | 00:05:40 |
| 37 | 260.57 | 00:08:11 | 00:05:47 |
| 38 | 262.27 | 00:15:34 | 00:08:52 |
| 39 | 264.26 | 00:13:05 | 00:06:47 |
| 40 | 265.1 | 00:13:51 | 00:06:37 |
| 41 | 267.13 | 00:13:11 | 00:05:03 |

**Estimated Absolute Minimum Headway – Base Case, Without Respacing: Westbound**

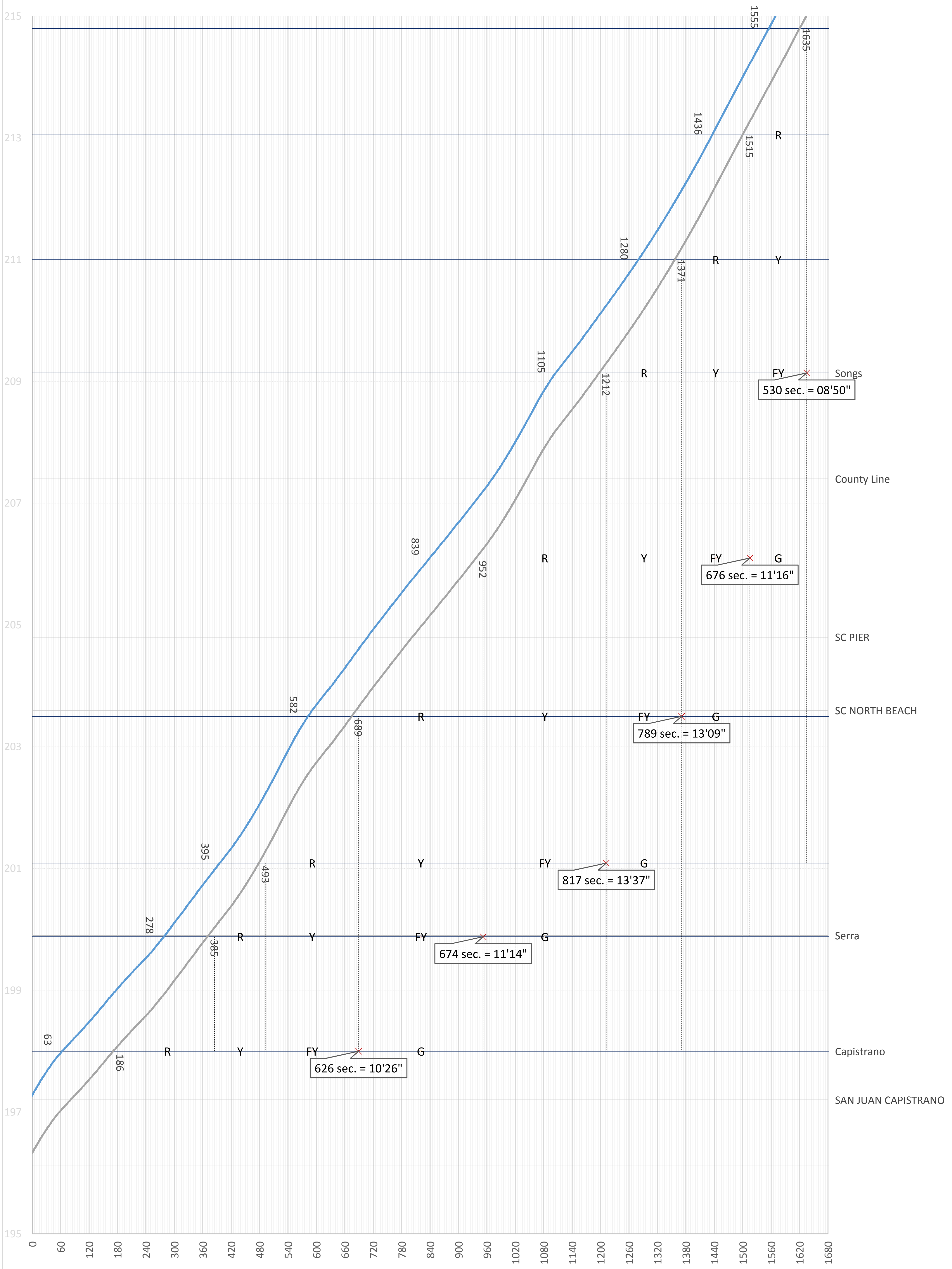
| | | Absolute Minimum Headway | |
|---|---|---|---|
| | | Originally-Assumed | |
| ID | Milepost | Freight | Passenger |
| 1 | 267.26 | 00:15:27 | 00:07:02 |
| 2 | 265.22 | 00:08:23 | 00:05:38 |
| 3 | 264.24 | 00:09:03 | 00:05:39 |
| 4 | 262.52 | 00:10:23 | 00:06:04 |
| 5 | 260.57 | 00:09:26 | 00:05:17 |
| 6 | 259.1 | 00:10:38 | 00:05:37 |
| 7 | 257.2 | 00:10:53 | 00:04:34 |
| 8 | 256.29 | 00:14:47 | 00:07:54 |
| 9 | 254.5 | 00:17:37 | 00:08:53 |
| 10 | 252.96 | 00:14:51 | 00:07:16 |
| 11 | 251.21 | 00:09:57 | 00:04:44 |
| 12 | 249.37 | 00:04:50 | 00:03:11 |
| 13 | 248.89 | 00:05:19 | 00:03:51 |
| 14 | 247.86 | 00:07:15 | 00:04:40 |
| 15 | 246.08 | 00:05:11 | 00:03:09 |
| 16 | 244 | 00:03:55 | 00:02:05 |
| 17 | 243.39 | 00:06:17 | 00:04:50 |
| 18 | 242.21 | 00:06:59 | 00:05:09 |
| 19 | 241.2 | 00:07:25 | 00:05:22 |
| 20 | 239.61 | 00:08:00 | 00:05:49 |
| 21 | 238.07 | 00:07:57 | 00:07:15 |
| 22 | 236.75 | 00:07:08 | 00:05:53 |

| | | Absolute Minimum Headway | |
|---|---|---|---|
| | | Originally-Assumed | |
| ID | Milepost | Freight | Passenger |
| 23 | 234.51 | 00:07:06 | 00:06:00 |
| 24 | 232.85 | 00:06:22 | 00:05:22 |
| 25 | 231.74 | 00:06:53 | 00:05:37 |
| 26 | 229.53 | 00:05:10 | 00:04:34 |
| 27 | 228.43 | 00:04:30 | 00:03:40 |
| 28 | 226.96 | 00:03:48 | 00:03:07 |
| 29 | 226.41 | 00:04:31 | 00:03:23 |
| 30 | 225.96 | 00:05:48 | 00:03:20 |
| 31 | 225.32 | 00:06:07 | 00:03:20 |
| 32 | 224.27 | 00:06:22 | 00:03:26 |
| 33 | 222.73 | 00:06:35 | 00:03:26 |
| 34 | 221.7 | 00:07:27 | 00:03:48 |
| 35 | 220.1 | 00:07:54 | 00:03:52 |
| 36 | 218.22 | 00:07:49 | 00:03:47 |
| 37 | 216.5 | 00:08:07 | 00:04:01 |
| 38 | 214.8 | 00:08:41 | 00:04:14 |
| 39 | 213.05 | 00:06:26 | 00:03:03 |
| 40 | 211 | 00:08:30 | 00:04:43 |
| 41 | 209.2 | 00:13:22 | 00:10:08 |
| 42 | 206.1 | 00:10:43 | 00:08:23 |
| 43 | 203.5 | 00:10:11 | 00:06:15 |
| 44 | 267.26 | 00:15:27 | 00:07:02 |

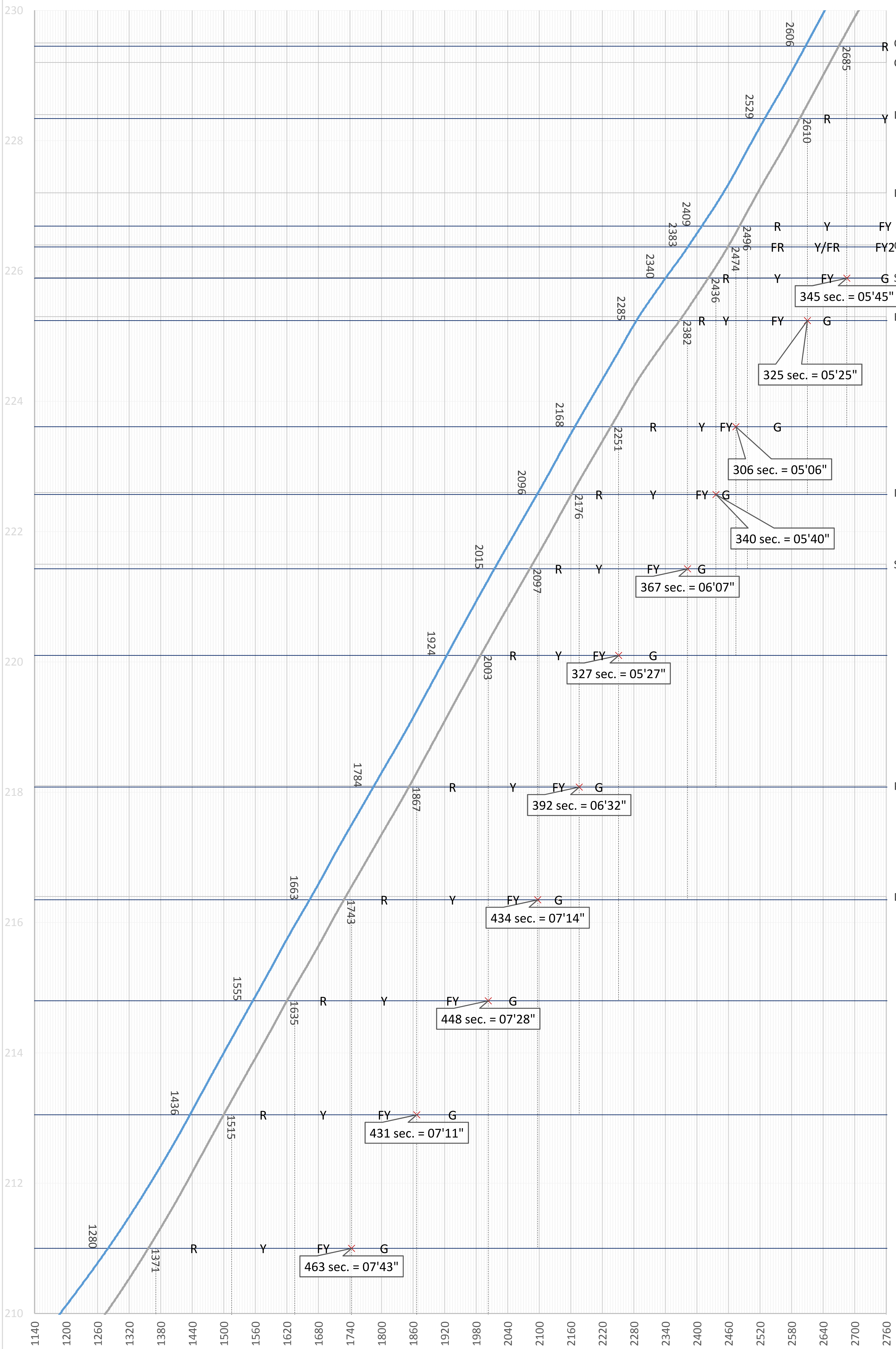
# APPENDIX B

## BASE CASE HEADWAY ANALYSIS: ANNOTATED MODIFIED STRINGLINE DIAGRAM

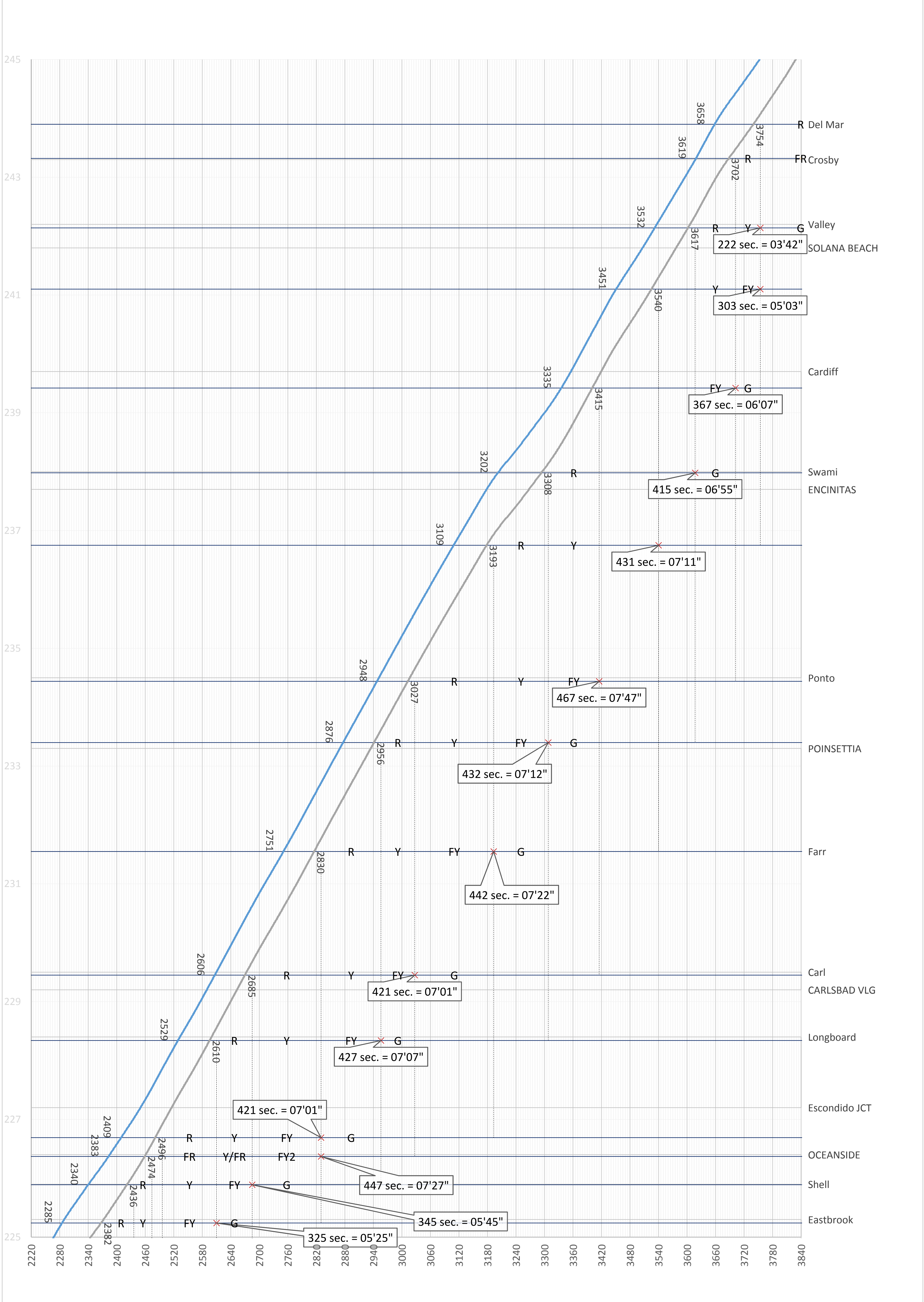
# Appendix B-1: Base Case Headway Calculation - Freight Control Train (EB)



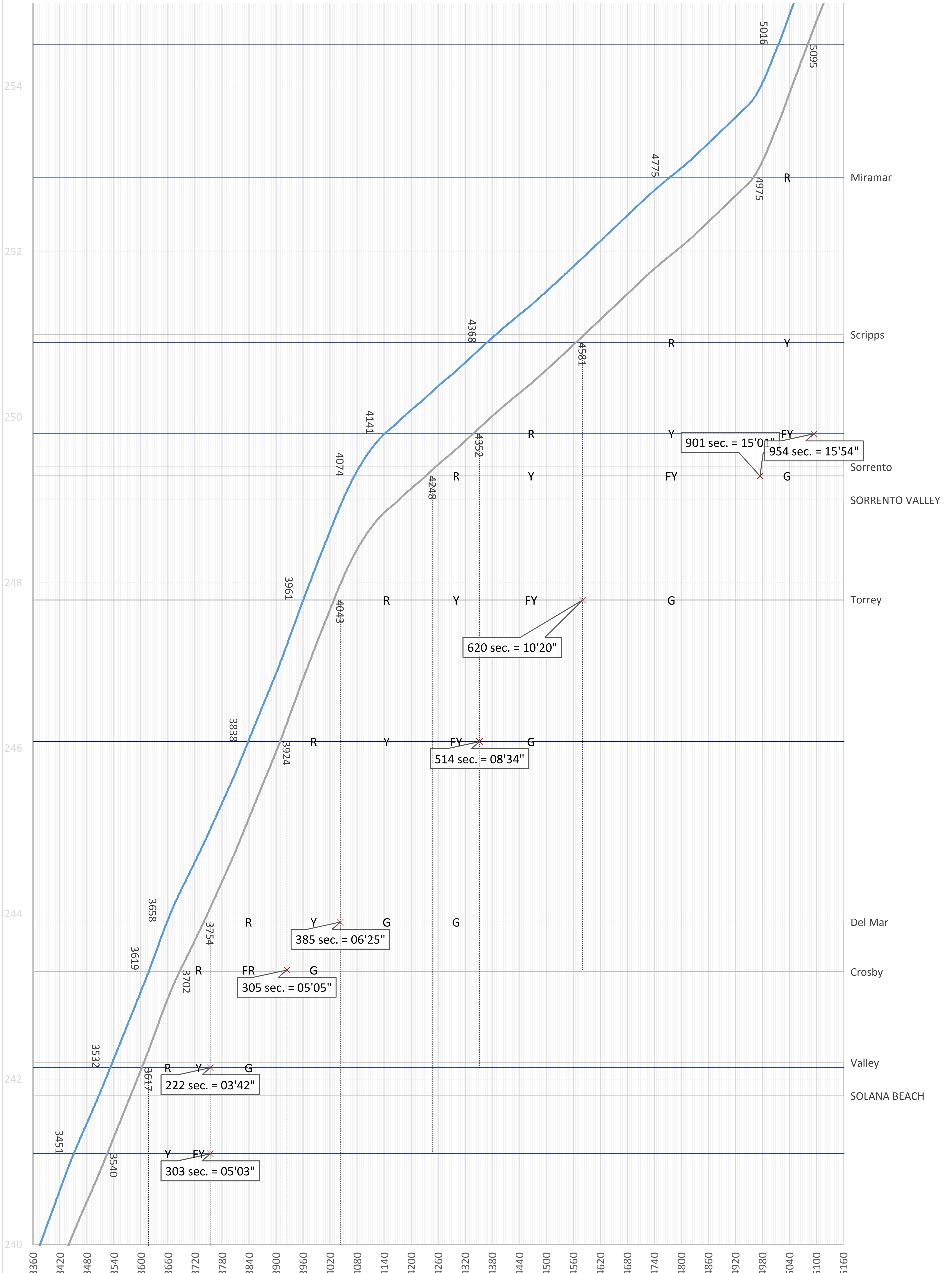
# Appendix B-1: Base Case Headway Calculation - Freight Control Train (EB)



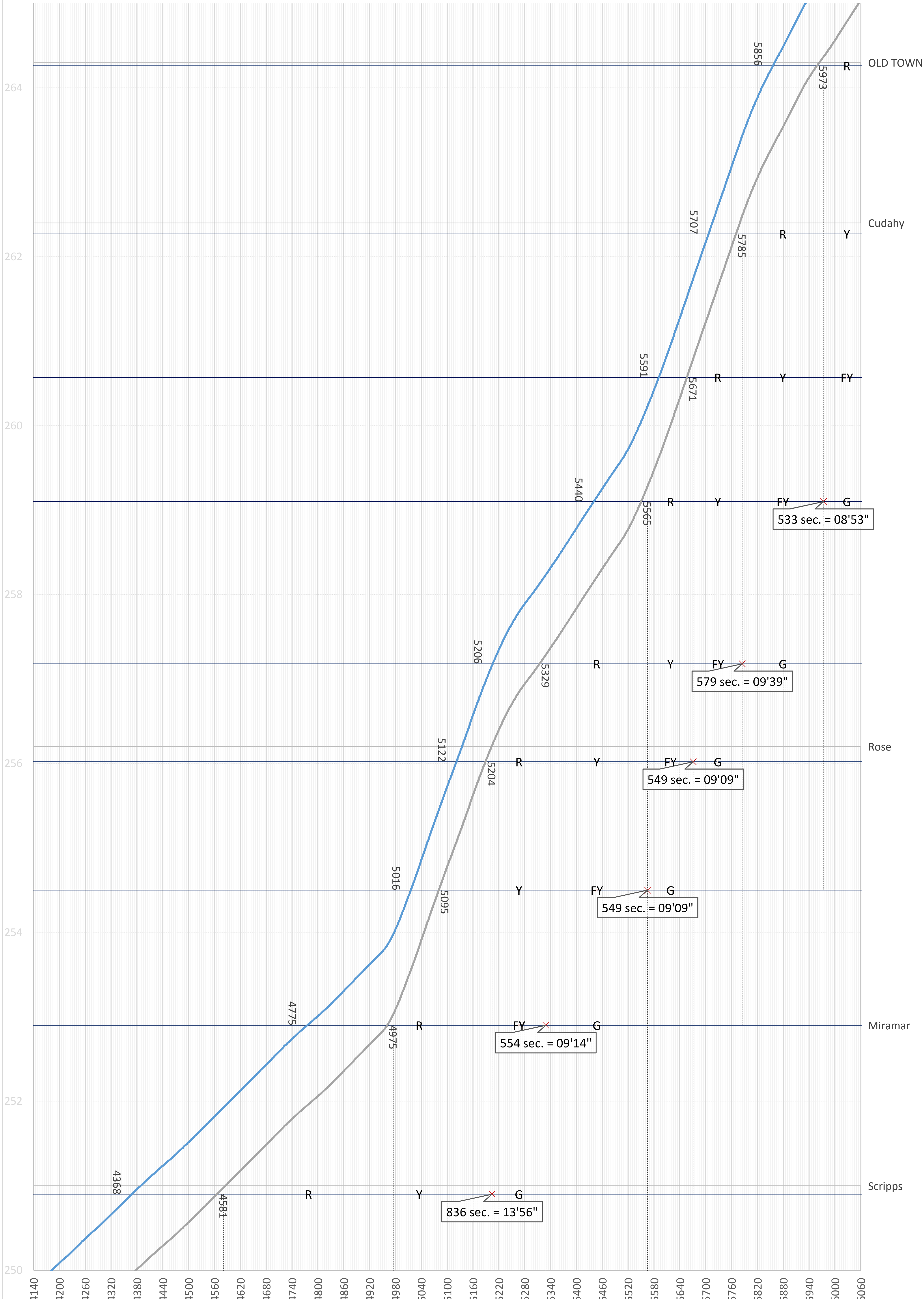
# San Diego Subdivision Headway Calculation



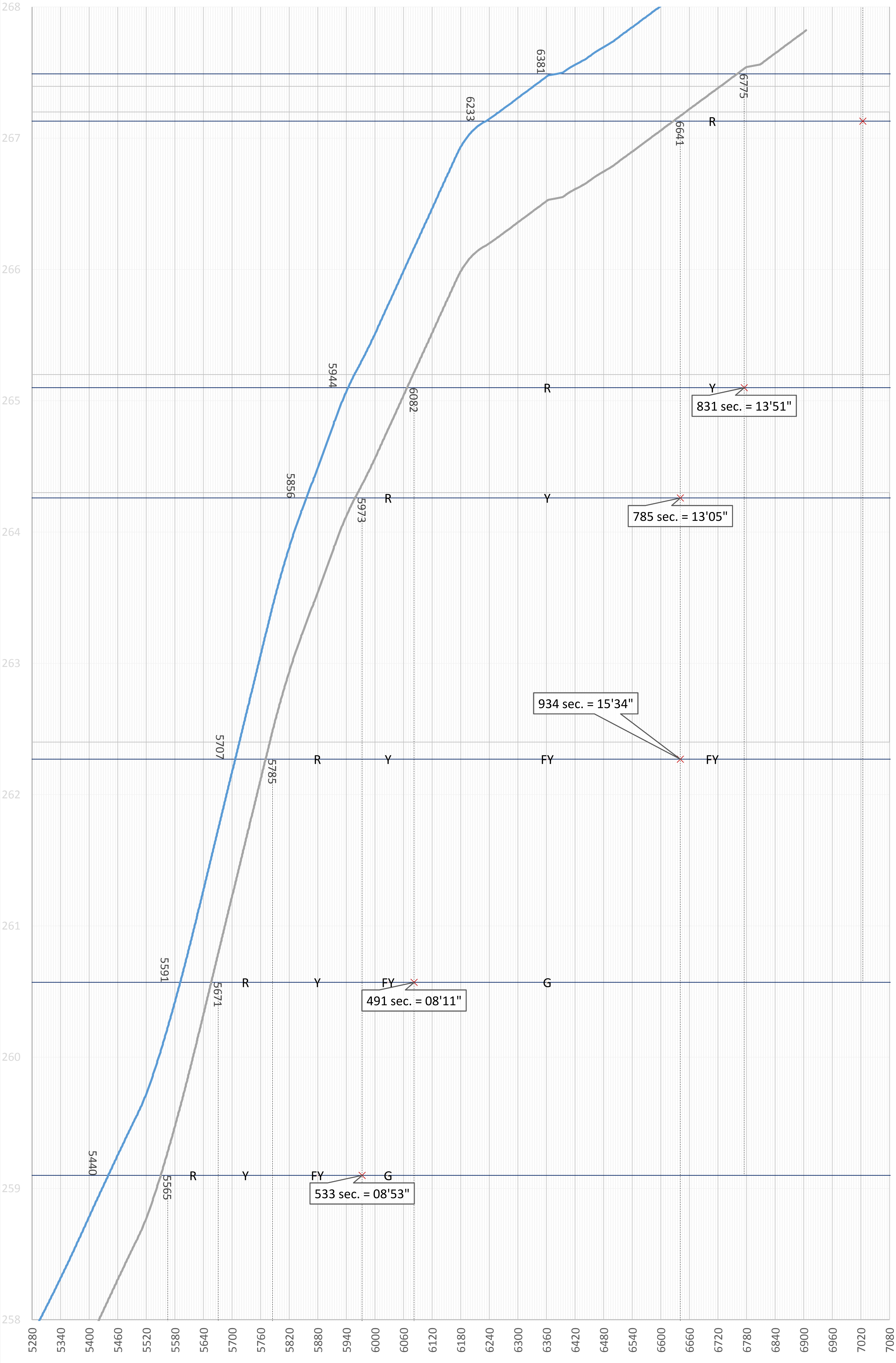
# Appendix B-1: Base Case Headway Calculation - Freight Control Train (EB)



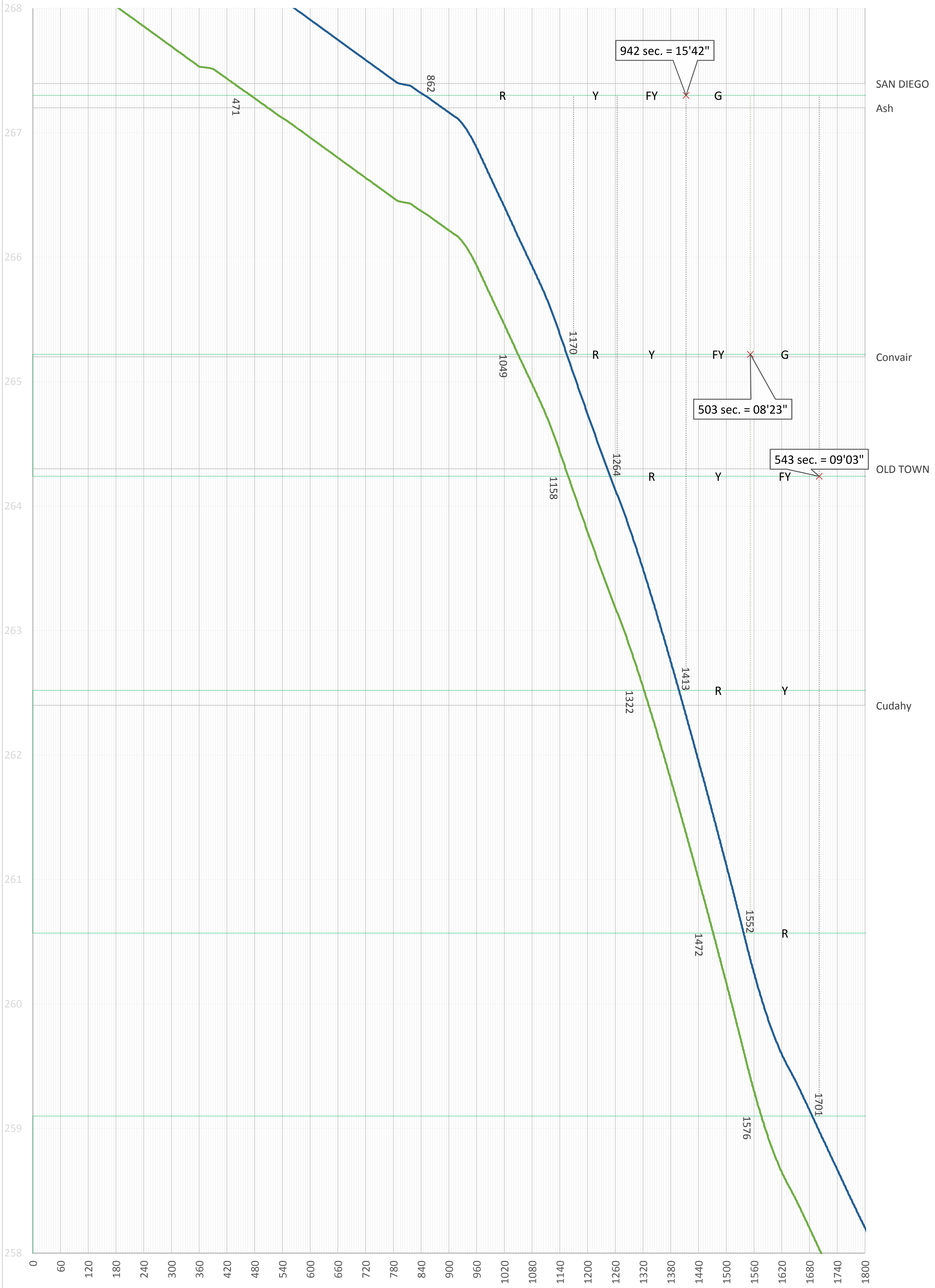
# Appendix B-1: Base Case Headway Calculation - Freight Control Train (EB)



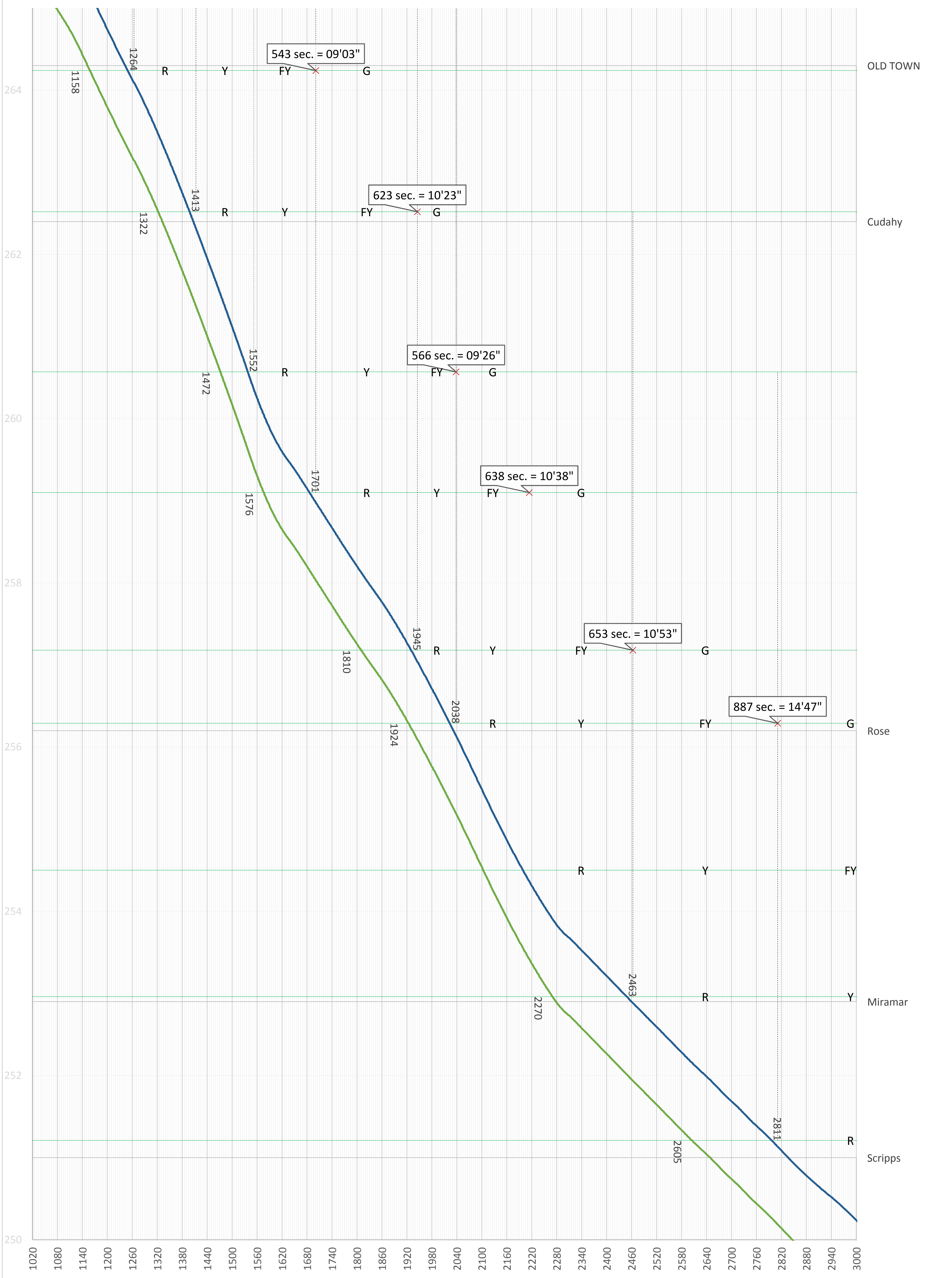
# Appendix B-1: Base Case Headway Calculation - Freight Control Train (EB)



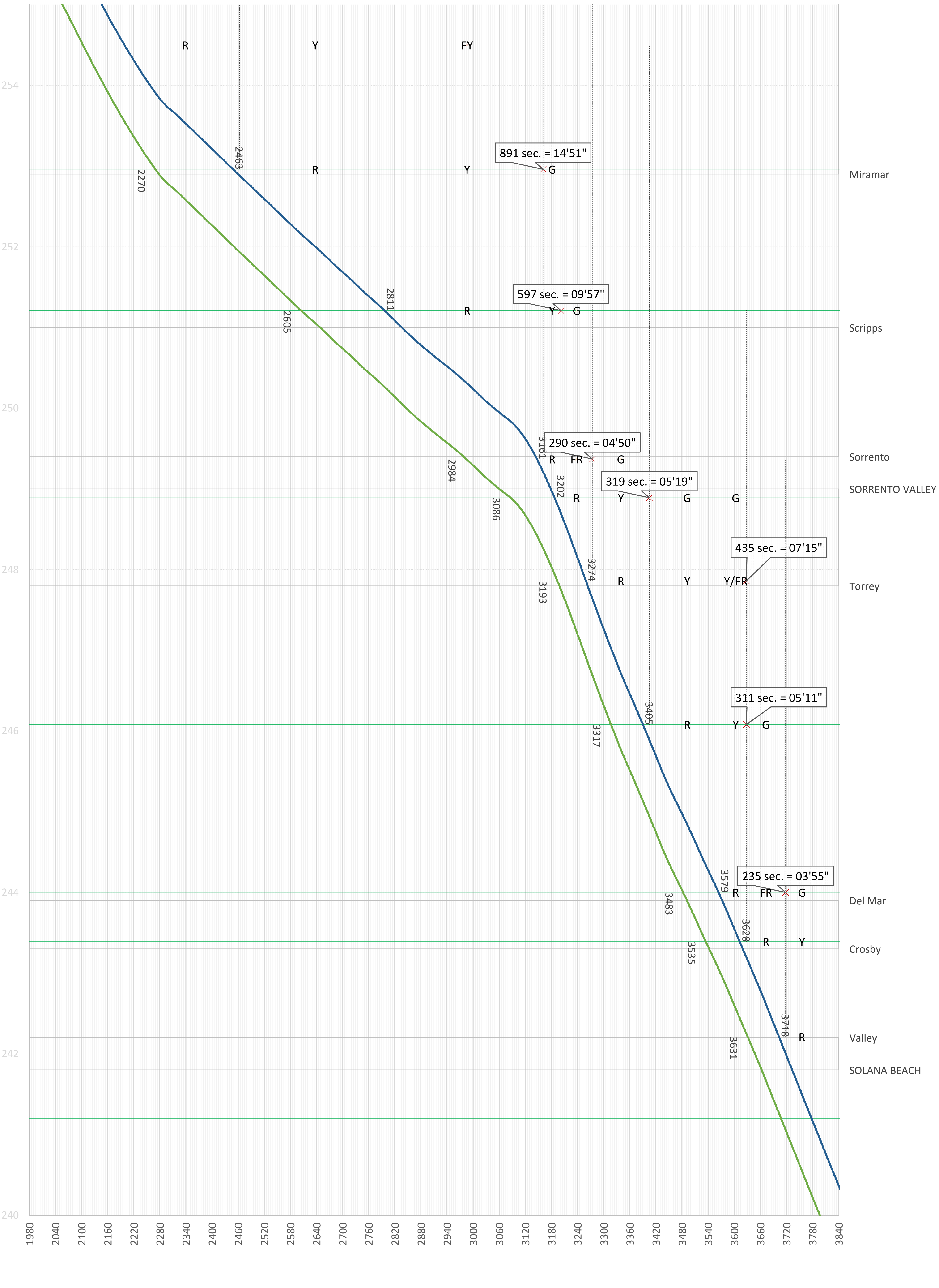
# Appendix B-2: Base Case Headway Calculation - Freight Control Train (WB)



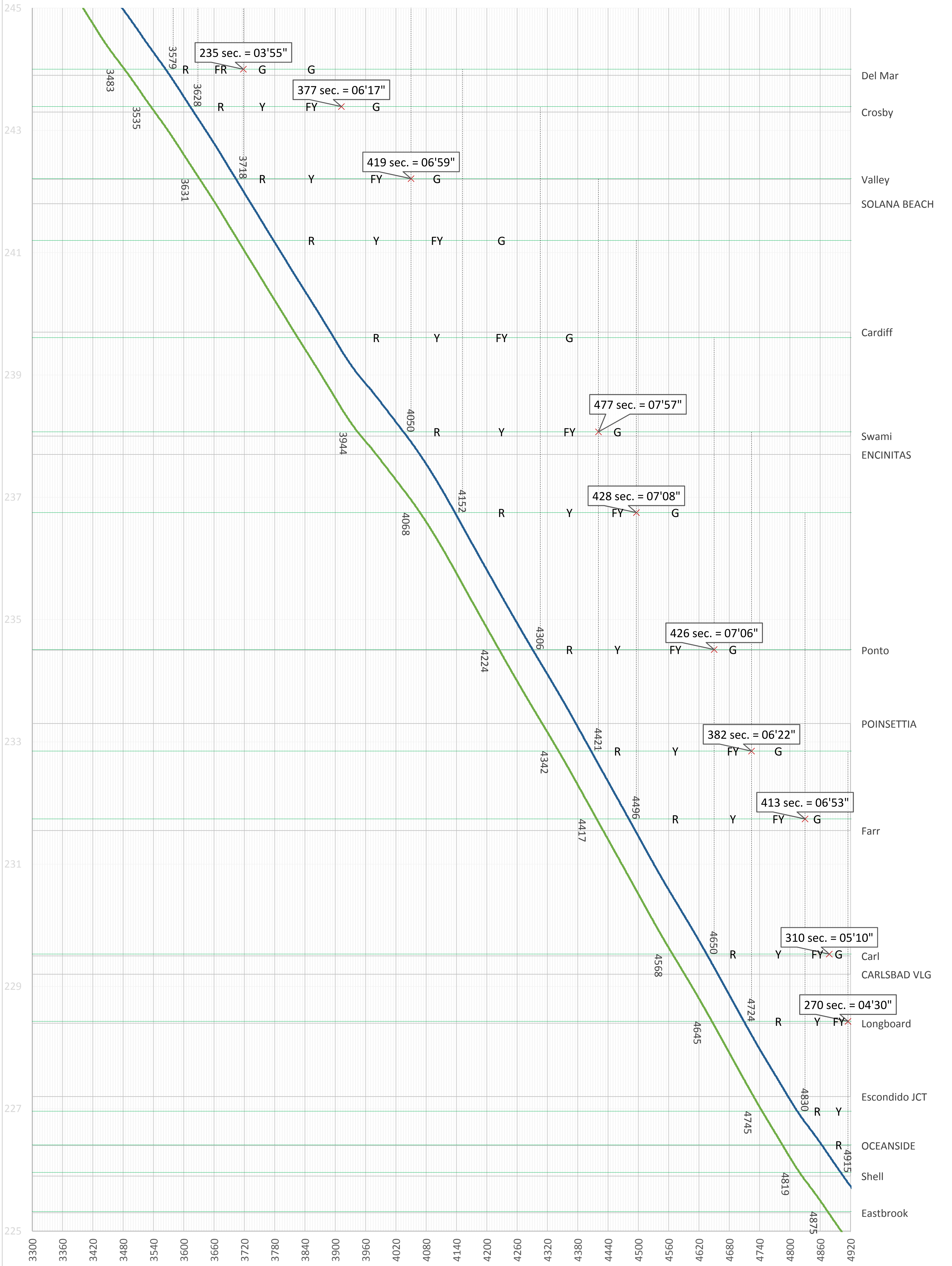
# Appendix B-2: Base Case Headway Calculation - Freight Control Train (WB)



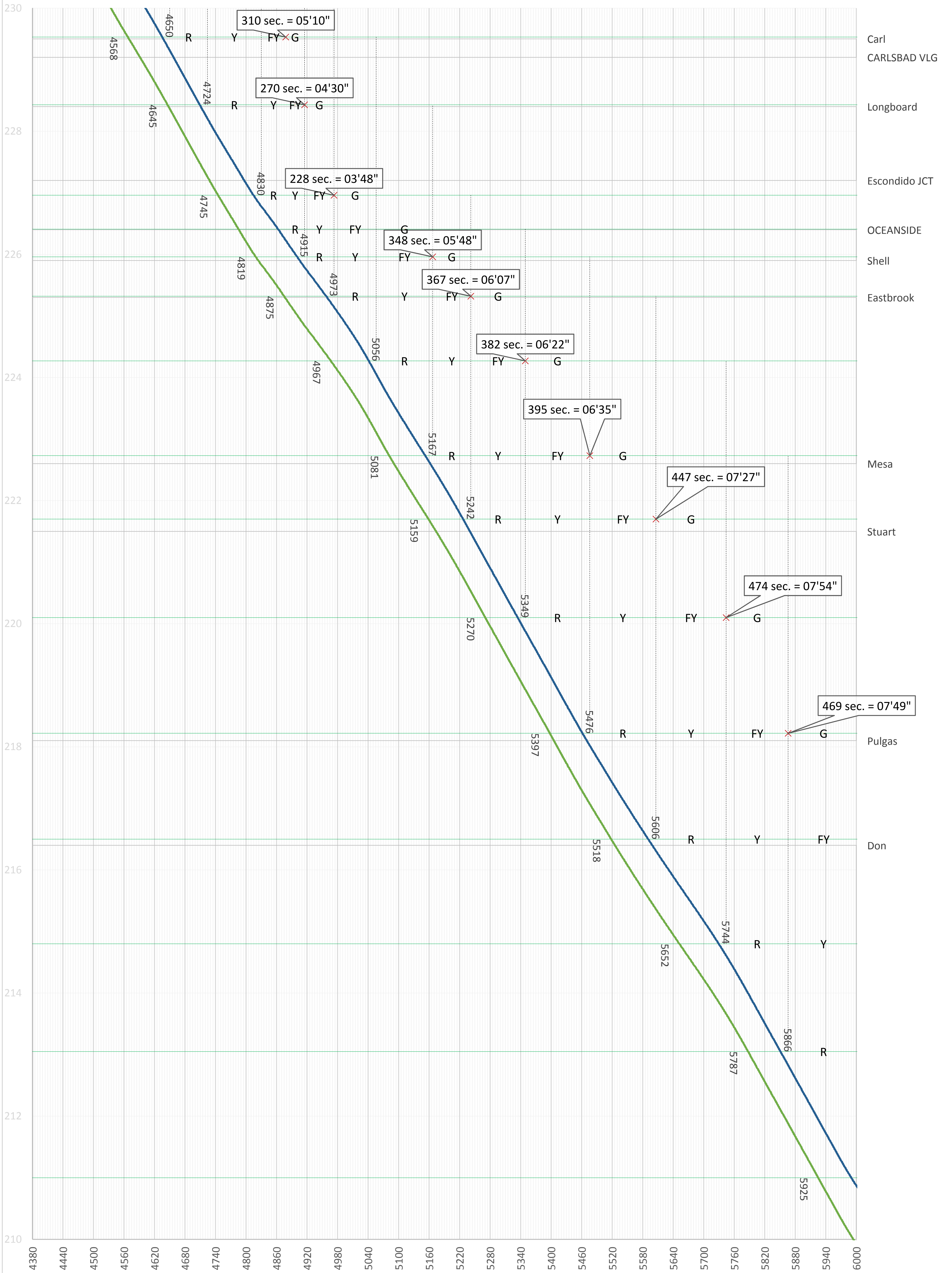
# Appendix B-2: Base Case Headway Calculation - Freight Control Train (WB)



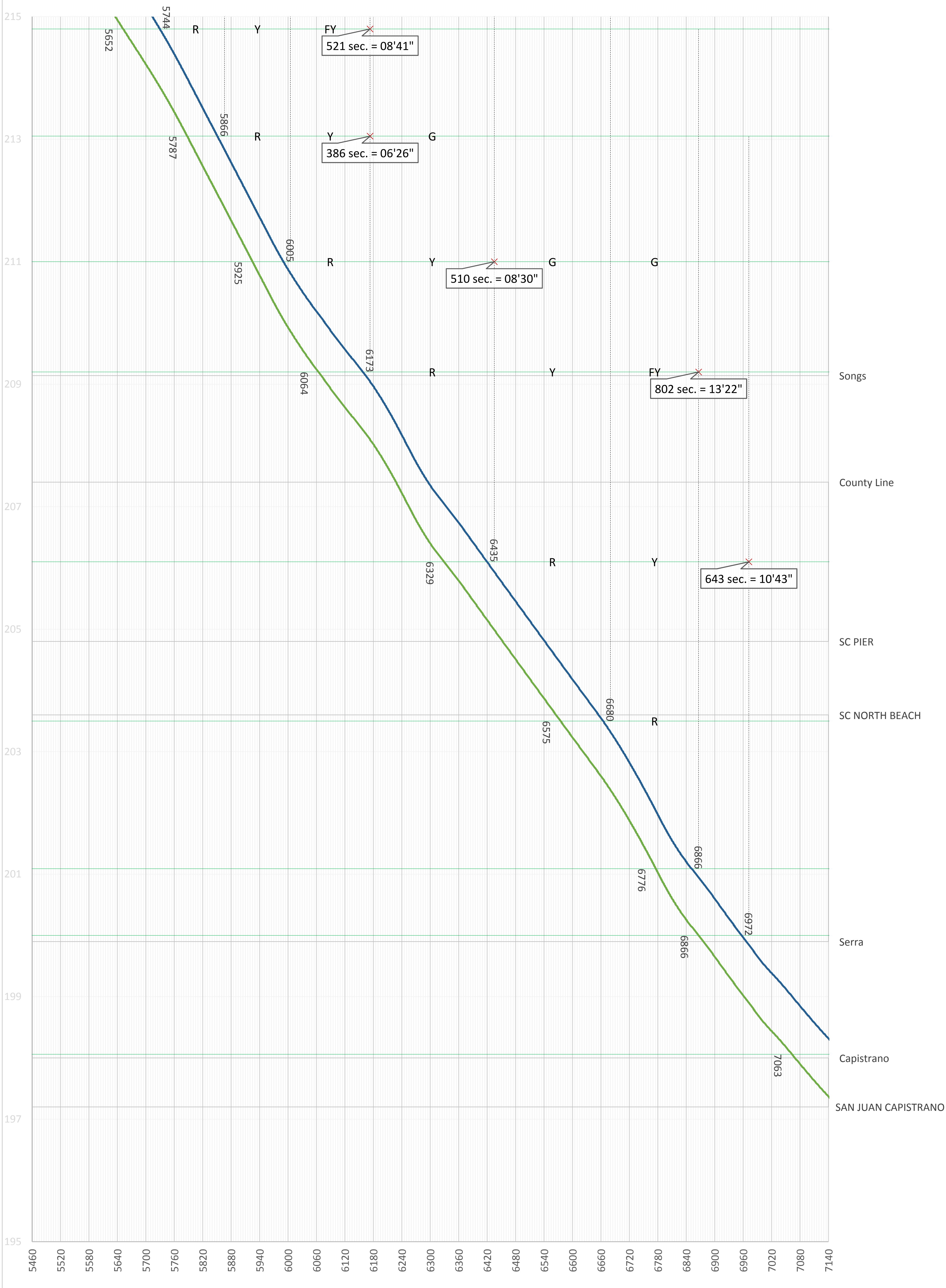
# Appendix B-2: Base Case Headway Calculation - Freight Control Train (WB)



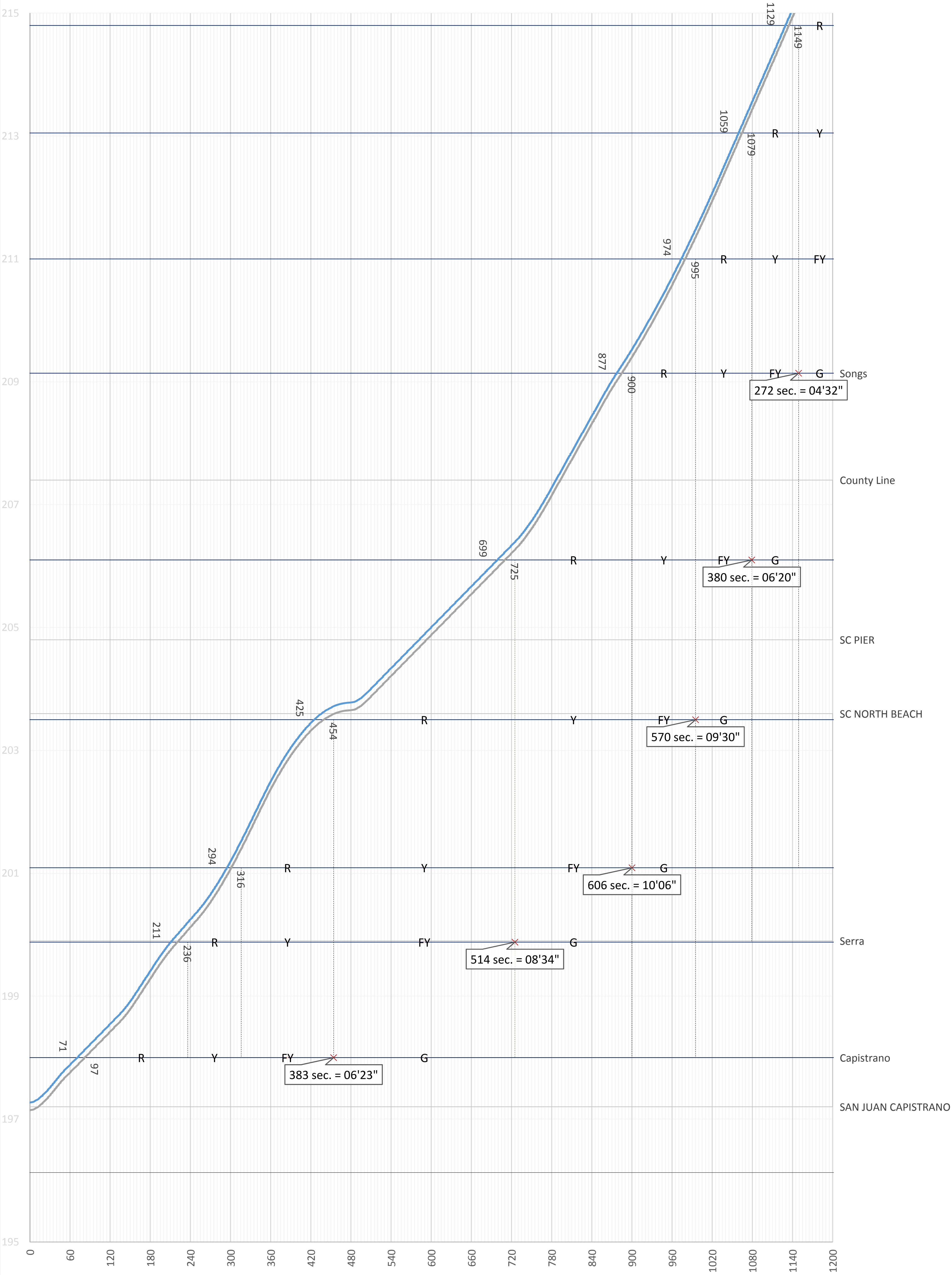
# Appendix B-2: Base Case Headway Calculation - Freight Control Train (WB)



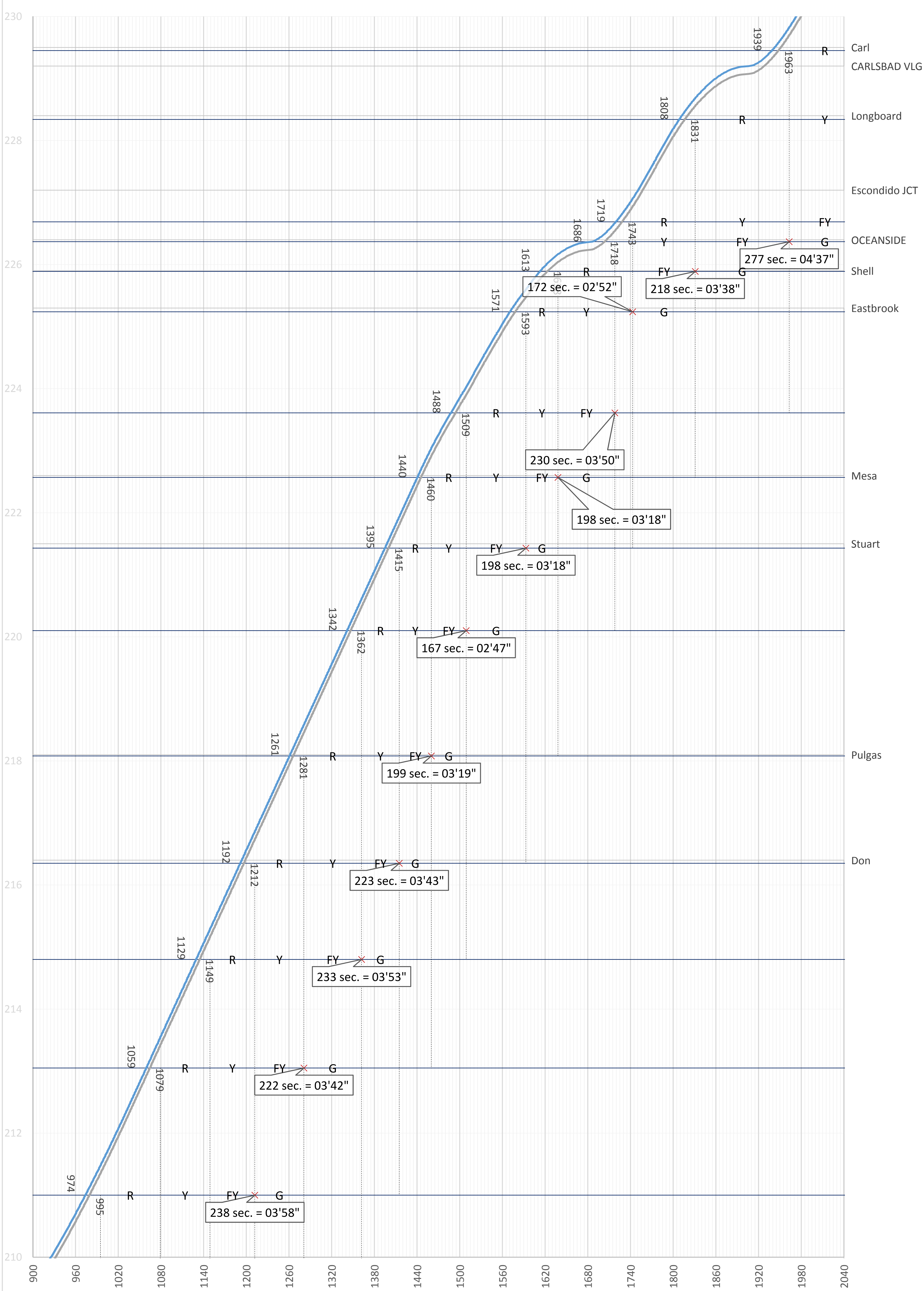
# Appendix B-2: Base Case Headway Calculation - Freight Control Train (WB)



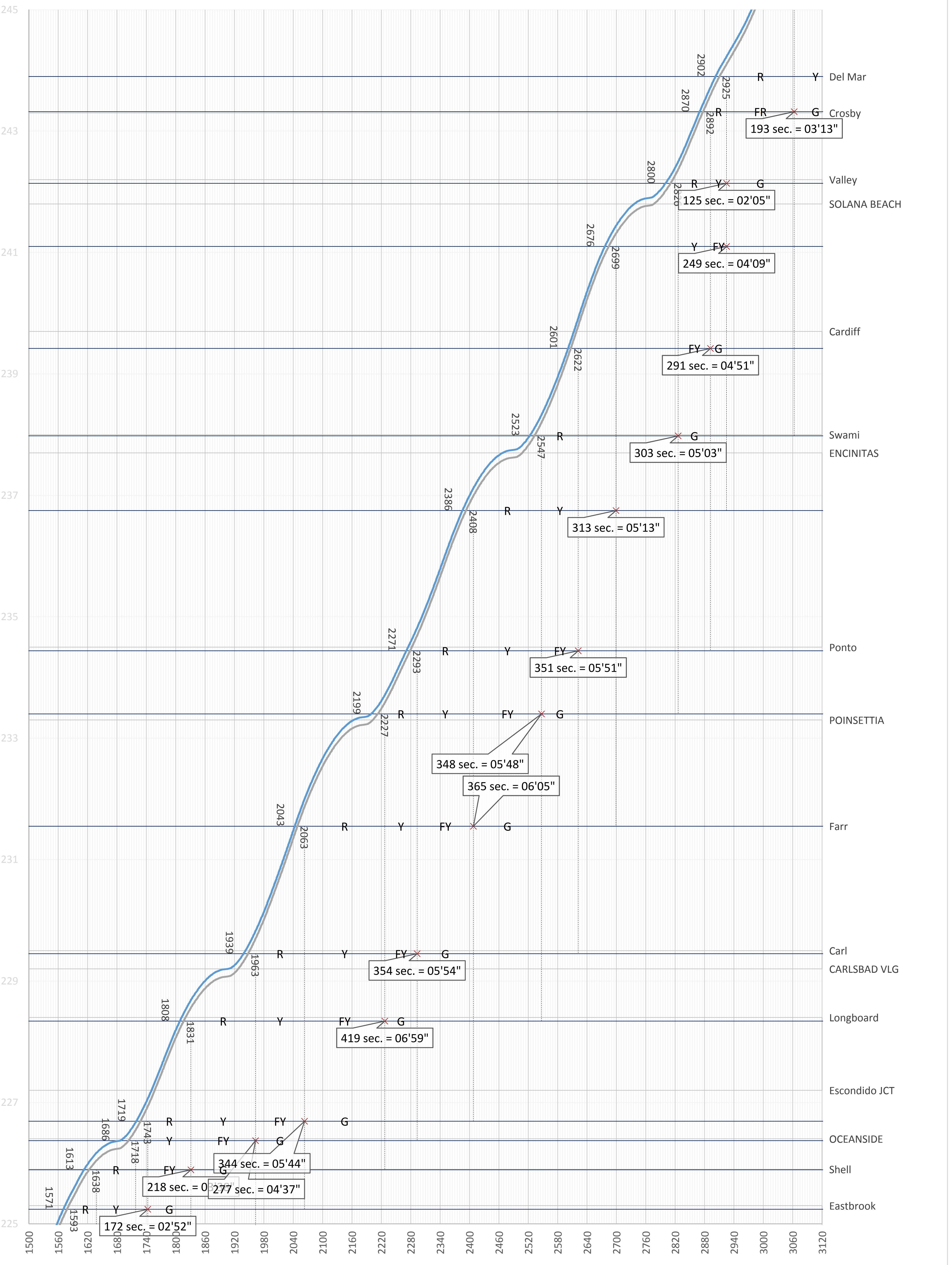
# Appendix B-3: Base Case Headway Calculation - Passenger Control Train (EB)



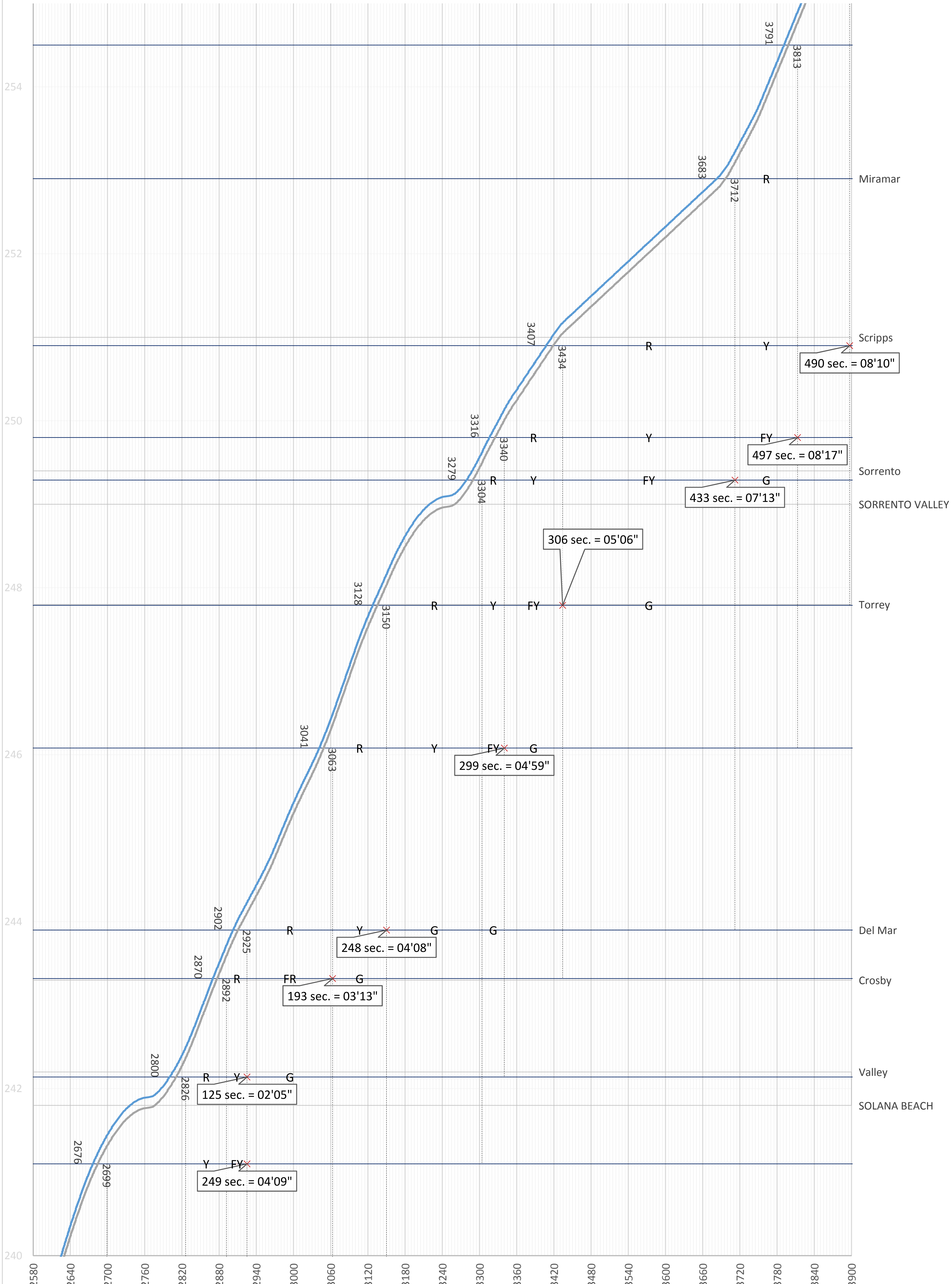
# San Diego Subdivision Headway Calculation



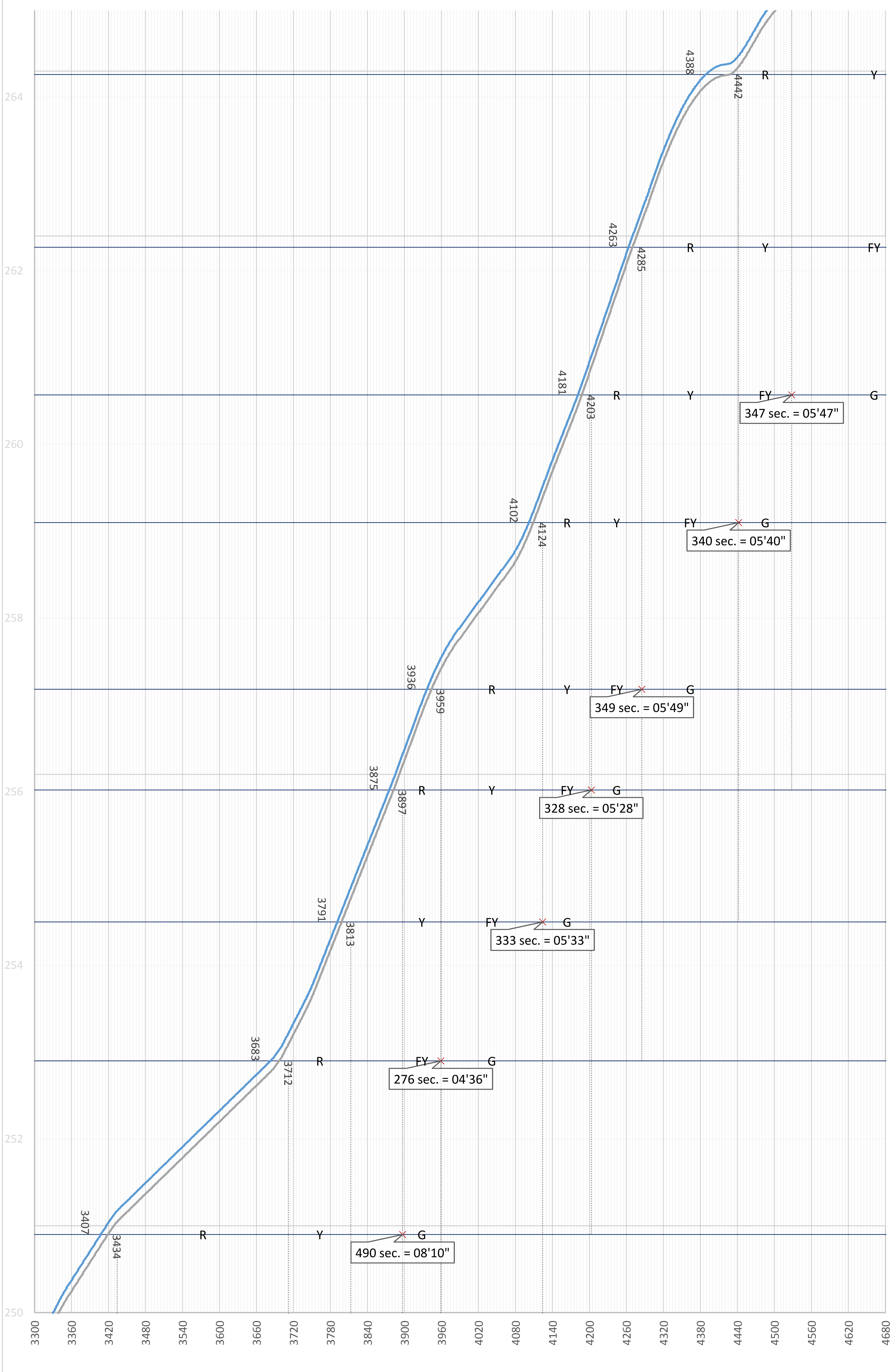
# San Diego Subdivision Headway Calculation



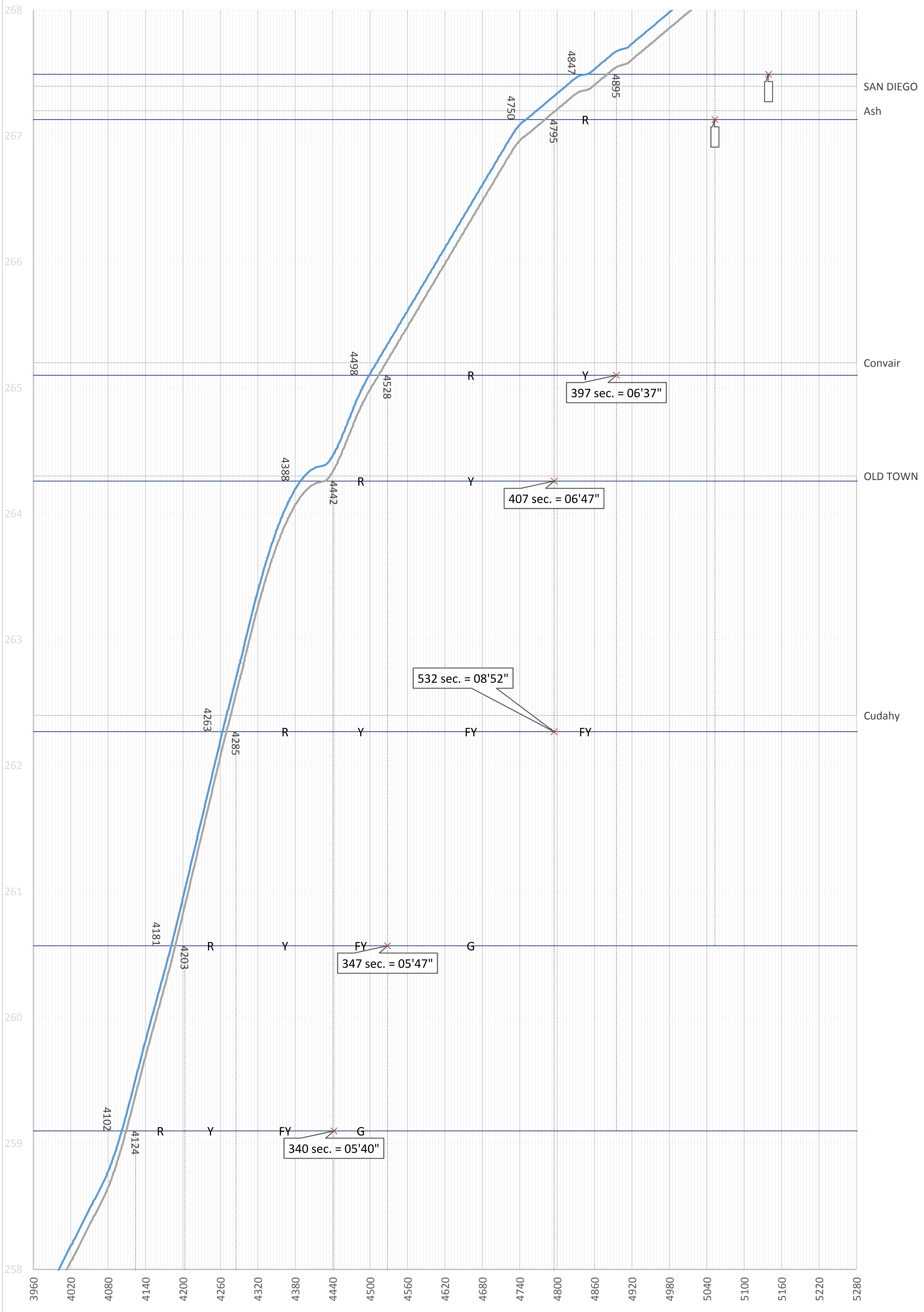
# San Diego Subdivision Headway Calculation



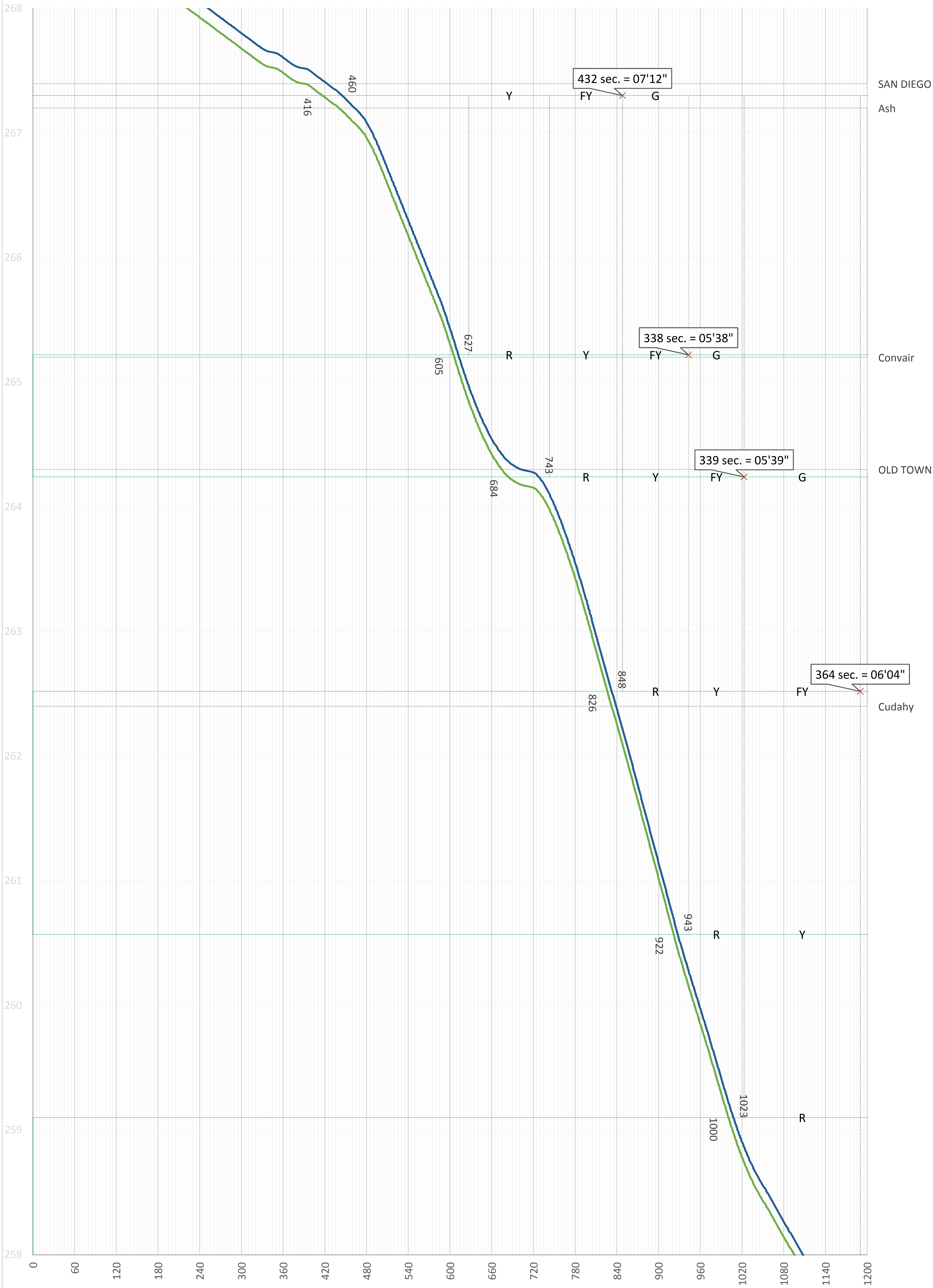
# San Diego Subdivision Headway Calculation



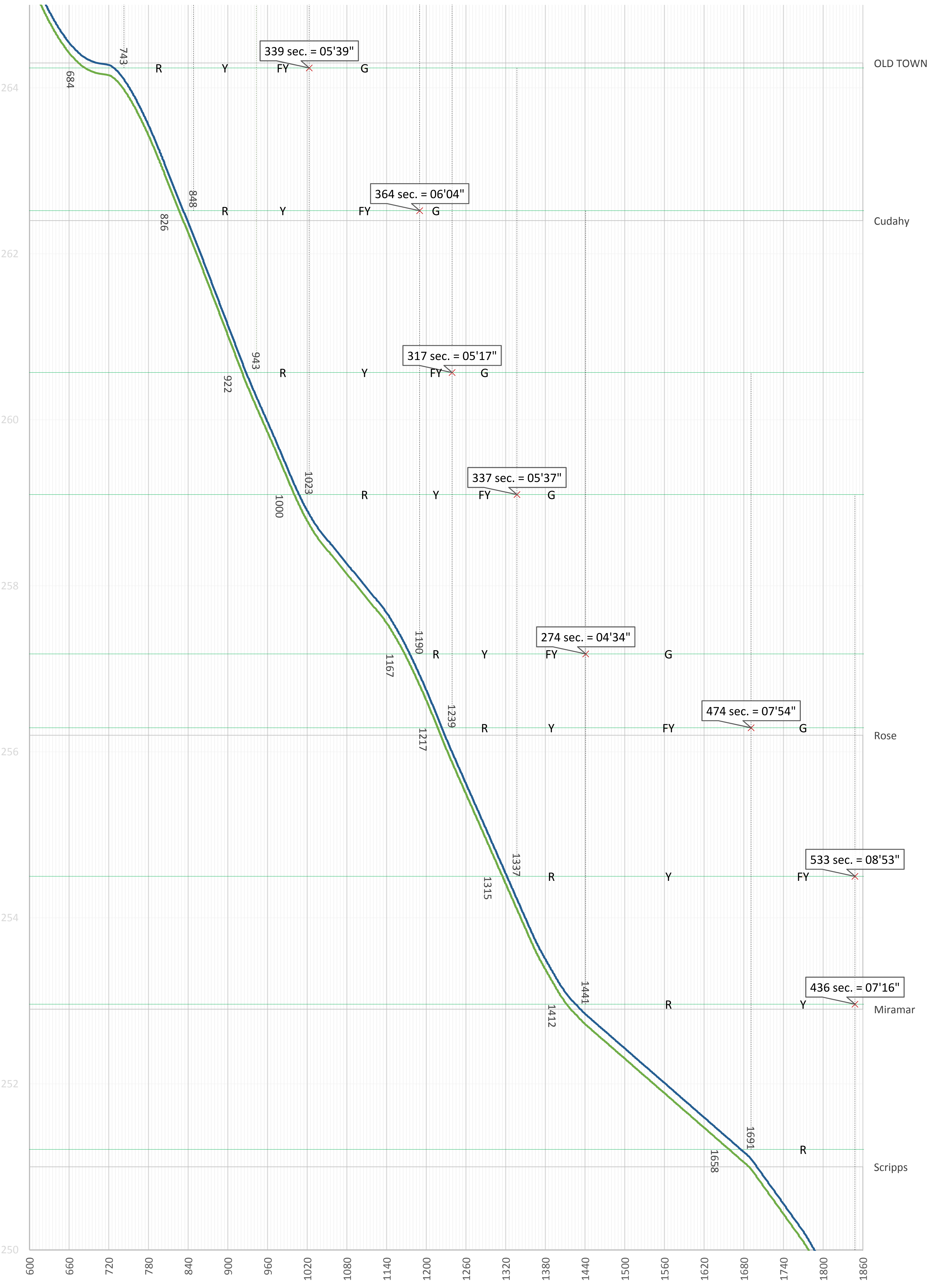
# San Diego Subdivision Headway Calculation



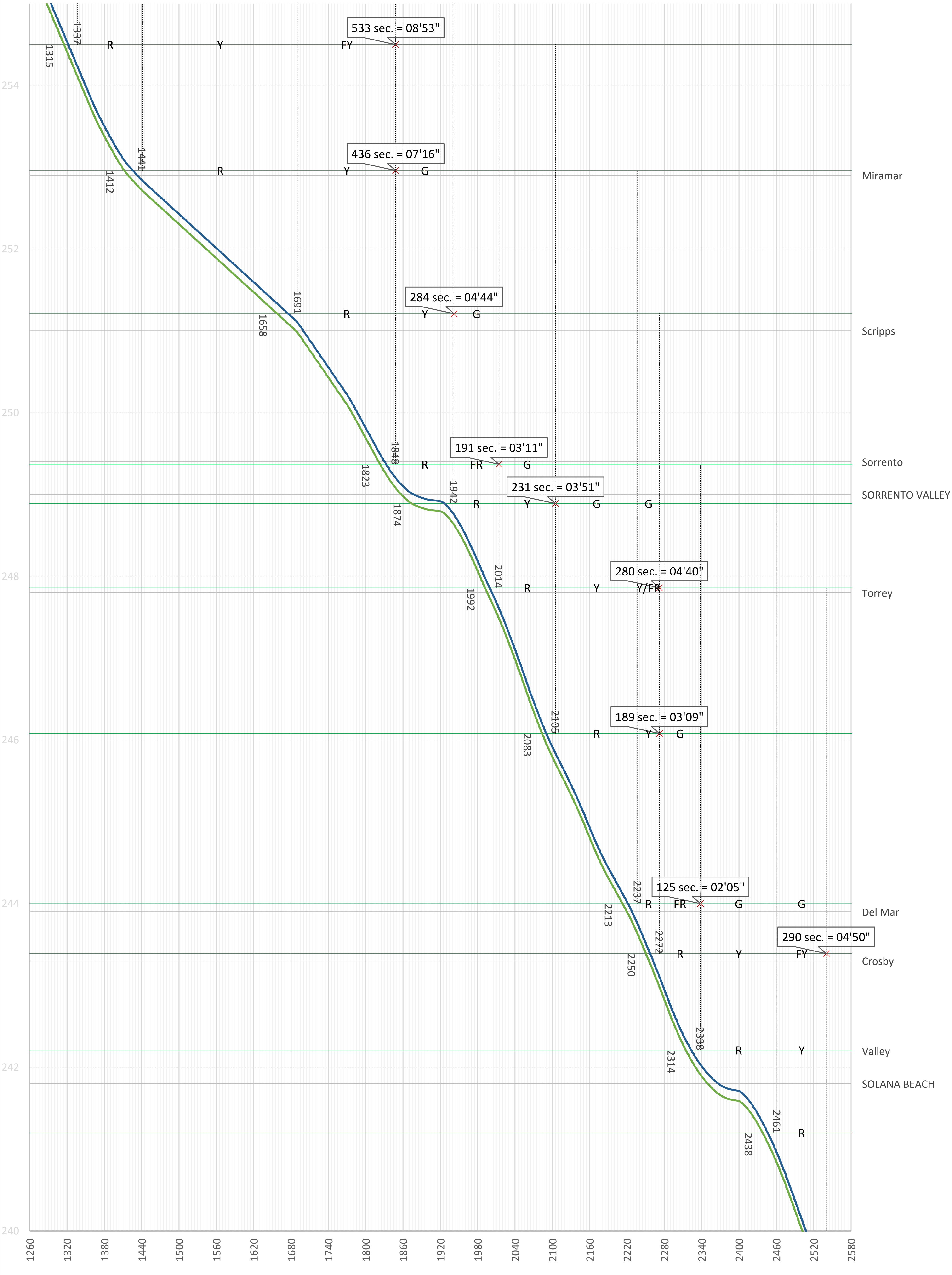
# Appendix B-4: Base Case Headway Calculation - Passenger Control Train (WB)



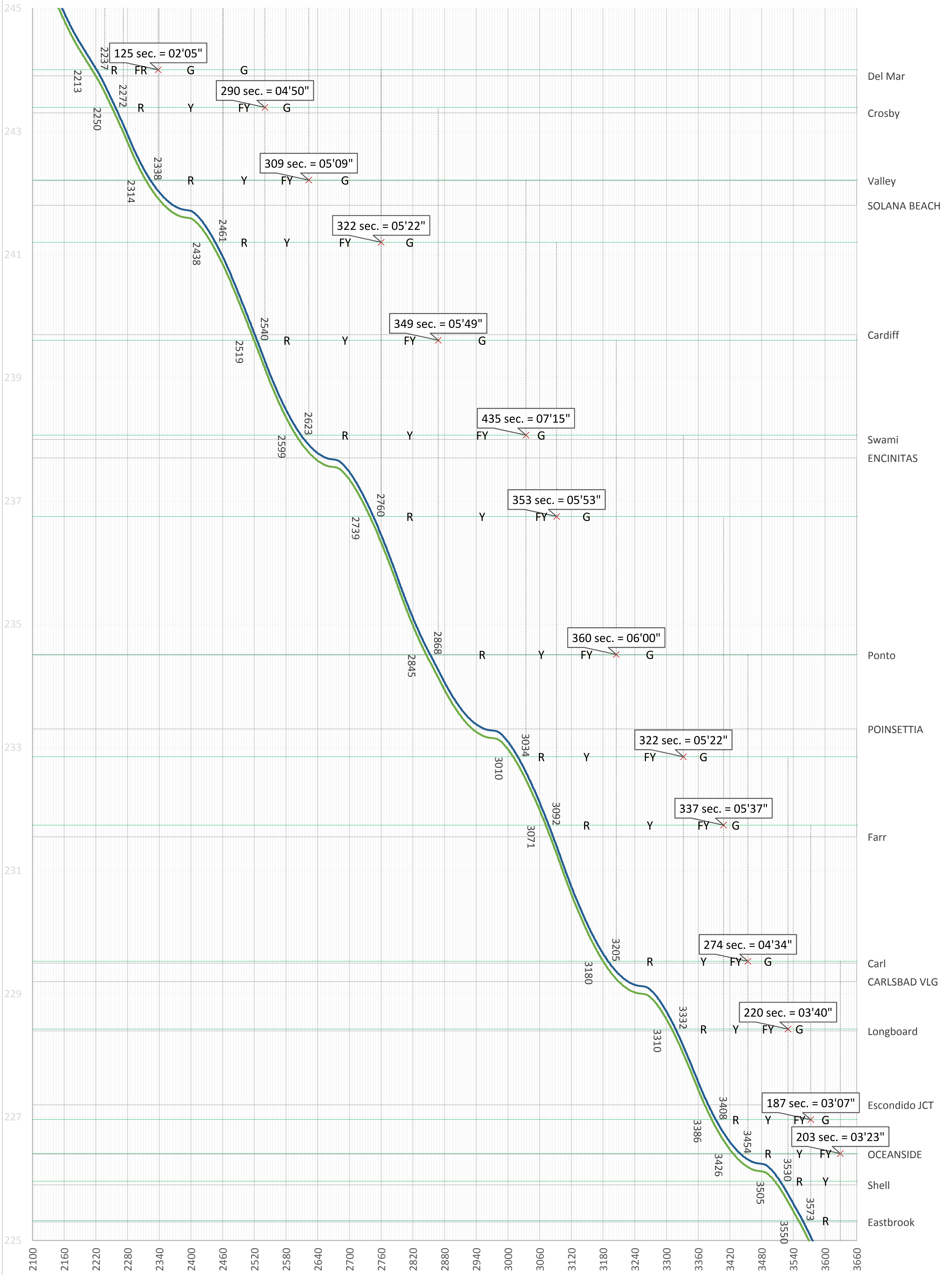
# Appendix B-4: Base Case Headway Calculation - Passenger Control Train (WB)



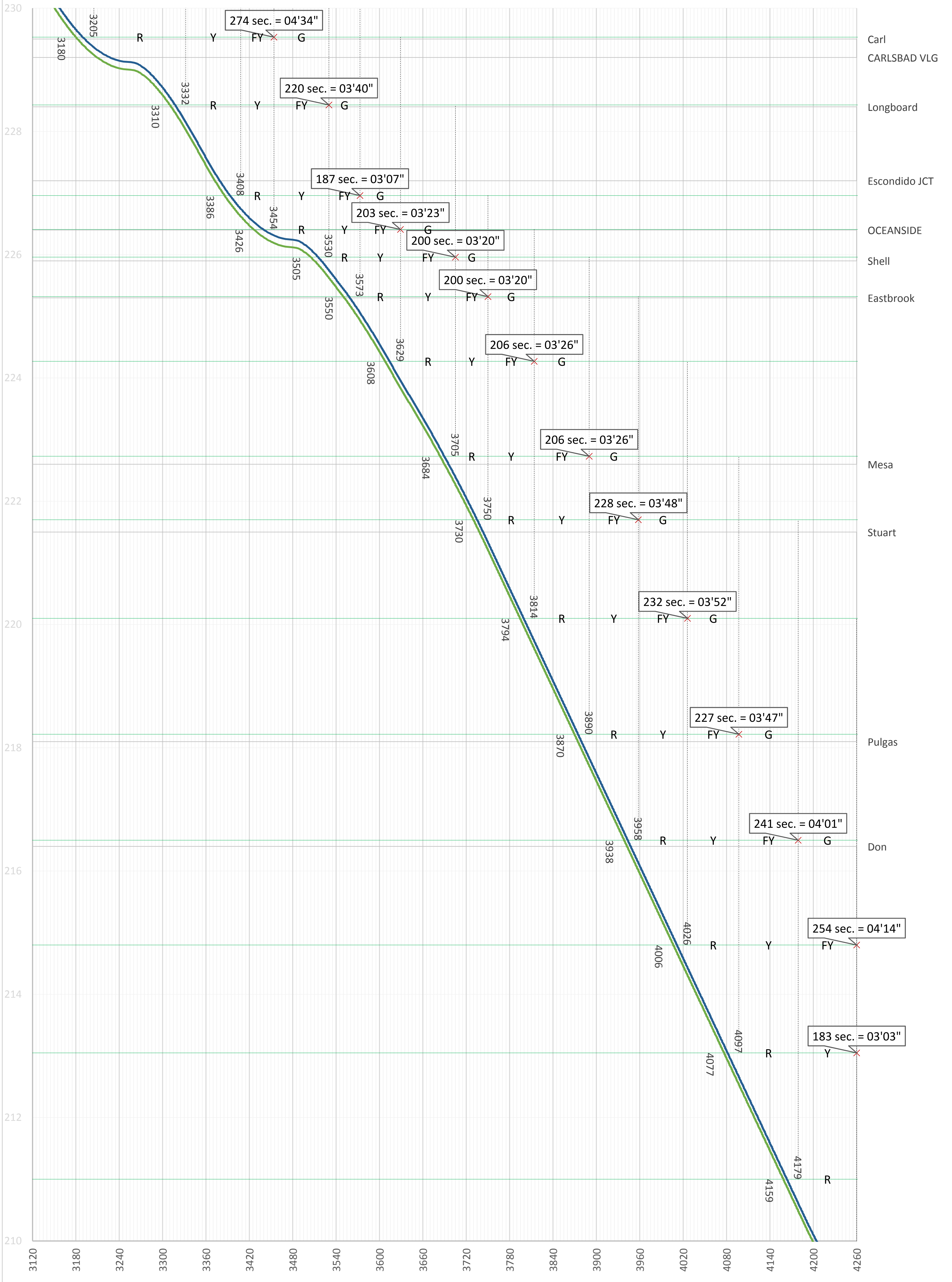
# Appendix B-4: Base Case Headway Calculation - Passenger Control Train (WB)



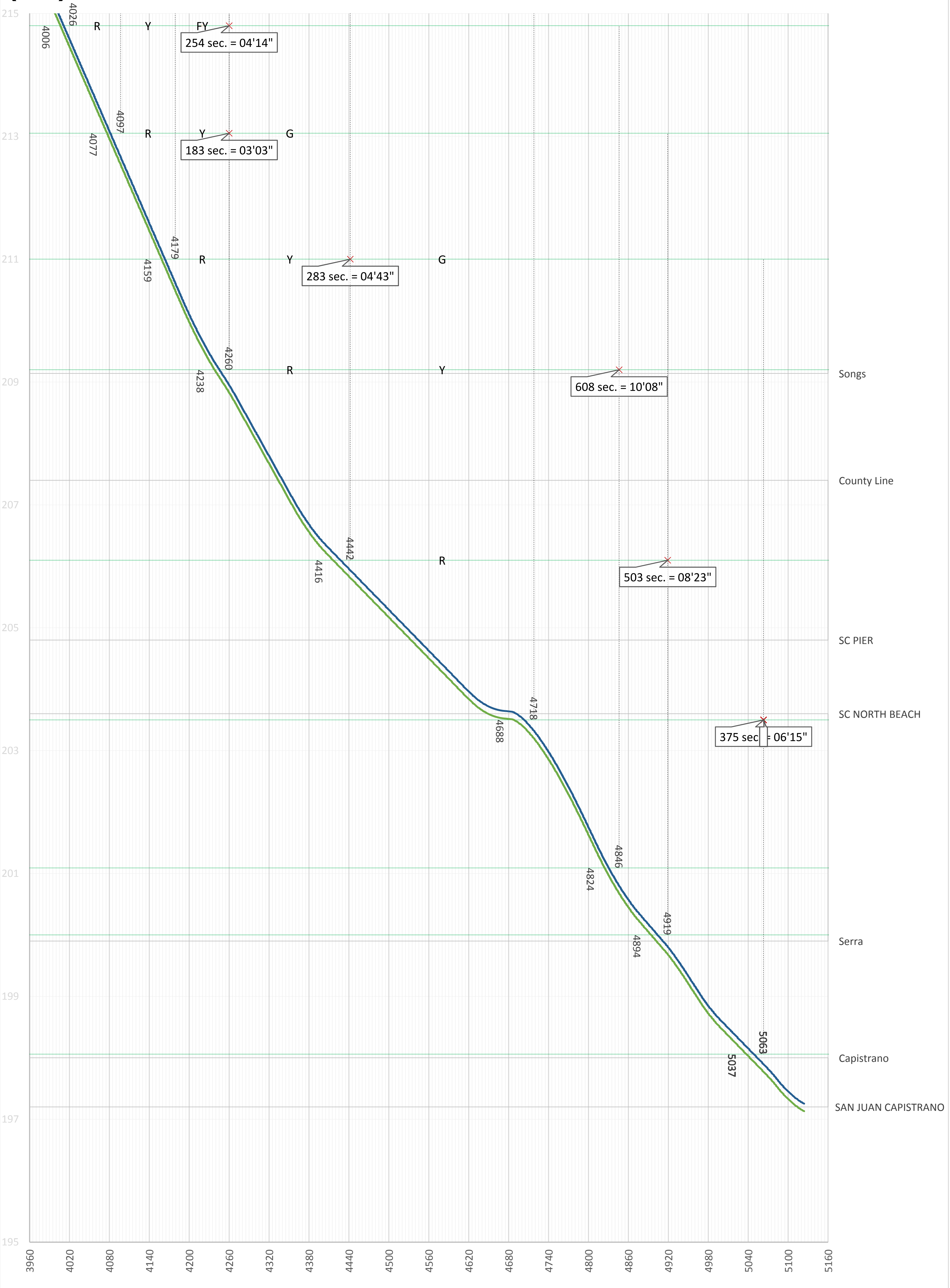
# Appendix B-4: Base Case Headway Calculation - Passenger Control Train (WB)



# Appendix B-4: Base Case Headway Calculation - Passenger Control Train (WB)



# Appendix B-4: Base Case Headway Calculation - Passenger Control Train (WB)



# APPENDIX C

## 2035A SCENARIO HEADWAY ANALYSIS: TABLE

**Estimated Absolute Minimum Headway – 2035A Scenario, With and Without Respacing (Eastbound)**

| ID | Milepost | Signal Exists? | | Absolute Minimum Headway | | | |
|---|---|---|---|---|---|---|---|
| | | | | 2013 IDP Spacing | | Respaced | |
| | | In 2013 IDP Concept | Respaced | Freight | Passenger | Freight | Passenger |
| 1 | 207.89 | Yes | Yes | 00:08:01 | 00:04:15 | 00:08:01 | 00:04:15 |
| 2 | 209.5 | Yes | Yes | 00:08:00 | 00:04:02 | 00:08:00 | 00:04:02 |
| 3 | 210.99 | Yes | Yes | 00:07:49 | 00:03:56 | 00:07:49 | 00:03:56 |
| 4 | 213.05 | Yes | Yes | 00:07:19 | 00:03:47 | 00:07:19 | 00:03:47 |
| 5 | 214.8 | Yes | Yes | 00:07:26 | 00:03:53 | 00:07:26 | 00:03:53 |
| 6 | 216.35 | Yes | Yes | 00:07:14 | 00:04:21 | 00:07:14 | 00:04:21 |
| 7 | 218.22 | Yes | Yes | 00:05:53 | 00:05:15 | 00:05:53 | 00:05:15 |
| 8 | 220.1 | Yes | Yes | 00:06:15 | 00:06:09 | 00:06:15 | 00:06:09 |
| 9 | 221.46 | Yes | Yes | 00:06:58 | 00:06:20 | 00:06:58 | 00:06:20 |
| 10 | 222.19 | Yes | Yes | 00:07:31 | 00:06:04 | 00:07:31 | 00:06:04 |
| 11 | 224.27 | Yes | Yes | 00:07:43 | 00:05:09 | 00:06:53 | 00:04:39 |
| 12 | 225.83 | Yes | Yes | 00:07:54 | 00:06:26 | 00:06:30 | 00:04:26 |
| 13 | 226.37 | Yes | Yes | 00:07:06 | 00:05:03 | 00:05:42 | 00:03:03 |
| 14 | 226.69 | Yes | Yes | 00:08:23 | 00:05:39 | 00:06:39 | 00:04:35 |
| 15 | 227.8 | No | Yes | N/A | N/A | 00:06:36 | 00:04:40 |
| 16 | 228.34 | Yes | No | 00:07:24 | 00:05:43 | N/A | N/A |
| 17 | 228.9 | No | Yes | N/A | N/A | 00:06:28 | 00:05:03 |
| 18 | 230.1 | Yes | Yes | 00:05:11 | 00:04:10 | 00:05:11 | 00:04:10 |
| 19 | 231.55 | Yes | Yes | 00:06:45 | 00:05:22 | 00:06:45 | 00:05:22 |
| 20 | 233.03 | Yes | Yes | 00:07:01 | 00:06:41 | 00:07:01 | 00:06:41 |
| 21 | 233.44 | Yes | Yes | 00:06:34 | 00:05:26 | 00:06:34 | 00:05:26 |
| 22 | 234.44 | Yes | Yes | 00:07:03 | 00:05:38 | 00:07:03 | 00:05:38 |
| 23 | 236.23 | Yes | Yes | 00:07:29 | 00:05:38 | 00:07:29 | 00:05:38 |
| 24 | 237.98 | Yes | Yes | 00:06:56 | 00:04:56 | 00:06:56 | 00:04:56 |
| 25 | 239.42 | Yes | Yes | 00:07:33 | 00:04:57 | 00:07:33 | 00:04:57 |
| 26 | 241.1 | Yes | Yes | 00:09:07 | 00:06:23 | 00:07:40 | 00:05:12 |
| 27 | 242.05 | Yes | Yes | 00:07:35 | 00:04:29 | 00:07:35 | 00:04:29 |
| 28 | 243.5 | Yes | Yes | 00:07:20 | 00:04:23 | 00:07:20 | 00:04:23 |
| 29 | 244.9 | No | Yes | N/A | N/A | 00:05:04 | 00:02:52 |
| 30 | 246.08 | Yes | Yes | 00:12:31 | 00:06:20 | 00:06:47 | 00:04:11 |
| 31 | 247.79 | Yes | Yes | 00:16:30 | 00:07:58 | 00:06:54 | 00:03:33 |
| 32 | 248.6 | No | Yes | N/A | N/A | 00:07:25 | 00:03:19 |
| 33 | 249.29 | Yes | Yes | 00:16:41 | 00:07:16 | 00:07:56 | 00:02:17 |
| 34 | 249.9 | No | Yes | N/A | N/A | 00:08:11 | 00:02:18 |
| 35 | 250.3 | No | Yes | N/A | N/A | 00:08:09 | 00:02:24 |
| 36 | 250.7 | No | Yes | N/A | N/A | 00:08:24 | 00:02:32 |
| 37 | 250.9 | Yes | No | 00:13:35 | 00:06:32 | N/A | N/A |
| 38 | 251.2 | No | Yes | N/A | N/A | 00:07:37 | 00:02:23 |
| 39 | 251.6 | No | Yes | N/A | N/A | 00:07:06 | 00:02:21 |
| 40 | 252.1 | No | Yes | N/A | N/A | 00:06:29 | 00:02:31 |
| 41 | 252.5 | No | Yes | N/A | N/A | 00:06:05 | 00:02:43 |
| 42 | 252.88 | Yes | Yes | 00:08:48 | 00:04:34 | 00:06:43 | 00:03:33 |
| 43 | 253.65 | No | Yes | N/A | N/A | 00:06:42 | 00:03:36 |
| 44 | 254.5 | Yes | Yes | 00:09:20 | 00:05:33 | 00:06:59 | 00:03:47 |
| 45 | 256.02 | Yes | Yes | 00:09:25 | 00:05:28 | 00:07:34 | 00:04:09 |
| 46 | 257.18 | Yes | Yes | 00:09:49 | 00:05:49 | 00:07:55 | 00:04:27 |
| 47 | 257.9 | No | Yes | N/A | N/A | 00:08:30 | 00:04:55 |
| 48 | 259.1 | Yes | Yes | 00:09:13 | 00:05:59 | 00:07:29 | 00:04:07 |
| 49 | 260.57 | Yes | Yes | 00:08:15 | 00:05:46 | 00:06:44 | 00:04:40 |
| 50 | 262.27 | Yes | Yes | 00:14:58 | 00:09:17 | 00:06:17 | 00:04:23 |
| 51 | 263.5 | No | Yes | N/A | N/A | 00:06:13 | 00:05:00 |
| 52 | 264.4 | Yes | Yes | 00:12:15 | 00:06:31 | 00:06:30 | 00:04:16 |
| 53 | 265.1 | Yes | Yes | 00:13:15 | 00:07:04 | 00:07:45 | 00:03:58 |
| 54 | 265.7 | No | Yes | N/A | N/A | 00:08:15 | 00:02:55 |
| 55 | 266.2 | No | Yes | N/A | N/A | 00:08:36 | 00:02:45 |
| 56 | 266.6 | No | Yes | N/A | N/A | 00:07:42 | 00:01:57 |
| 57 | 266.9 | No | Yes | N/A | N/A | 00:09:17 | 00:03:00 |
| 58 | 267.13 | Yes | Yes | 00:12:09 | 00:04:52 | 00:08:22 | 00:02:25 |

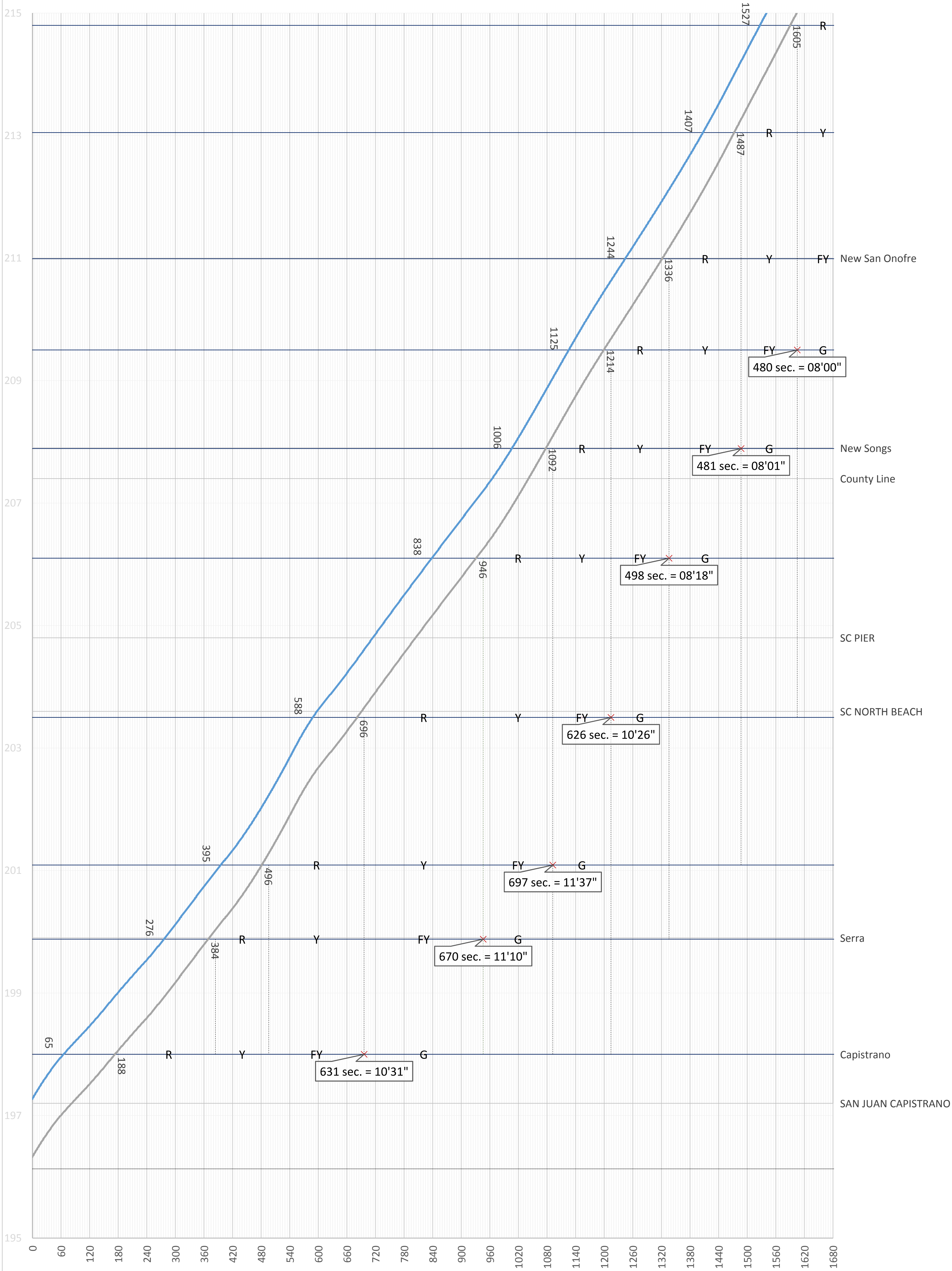
**Estimated Absolute Minimum Headway – 2035A Scenario, With and Without Respacing (Westbound)**

| | | Signal Exists? | | Absolute Minimum Headway | | | |
|---|---|---|---|---|---|---|---|
| | | | | 2013 IDP Spacing | | Respaced | |
| ID | Milepost | In 2013 IDP | Respaced | Freight | Passenger | Freight | Passenger |
| 1 | 267.3 | Yes | Yes | 00:15:23 | 00:08:11 | 00:09:43 | 00:02:42 |
| 2 | 266.9 | No | Yes | N/A | N/A | 00:08:45 | 00:03:19 |
| 3 | 266.6 | No | Yes | N/A | N/A | 00:08:27 | 00:04:51 |
| 4 | 266.1 | No | Yes | N/A | N/A | 00:06:40 | 00:05:03 |
| 5 | 265.22 | Yes | Yes | 00:08:23 | 00:05:33 | 00:06:03 | 00:03:58 |
| 6 | 264.24 | Yes | Yes | 00:09:03 | 00:05:05 | 00:05:15 | 00:02:48 |
| 7 | 263.5 | No | Yes | N/A | N/A | 00:05:25 | 00:02:46 |
| 8 | 262.52 | Yes | Yes | 00:10:23 | 00:06:08 | 00:06:19 | 00:03:19 |
| 9 | 261.7 | No | Yes | N/A | N/A | 00:07:35 | 00:04:23 |
| 10 | 260.57 | Yes | Yes | 00:09:26 | 00:05:20 | 00:07:53 | 00:04:33 |
| 11 | 259.1 | Yes | Yes | 00:10:38 | 00:05:38 | 00:07:42 | 00:03:59 |
| 12 | 258 | No | Yes | N/A | N/A | 00:06:49 | 00:03:02 |
| 13 | 257.18 | Yes | Yes | 00:10:21 | 00:04:29 | 00:06:44 | 00:02:49 |
| 14 | 256.29 | Yes | Yes | 00:14:42 | 00:06:51 | 00:06:16 | 00:02:39 |
| 15 | 255.5 | No | Yes | N/A | N/A | 00:07:04 | 00:02:58 |
| 16 | 254.5 | Yes | Yes | 00:16:26 | 00:07:16 | 00:07:44 | 00:03:21 |
| 17 | 253.8 | No | Yes | N/A | N/A | 00:08:17 | 00:03:28 |
| 18 | 252.96 | Yes | Yes | 00:13:40 | 00:05:39 | 00:08:18 | 00:03:17 |
| 19 | 252.1 | No | Yes | N/A | N/A | 00:07:27 | 00:02:38 |
| 20 | 251.6 | No | Yes | N/A | N/A | 00:07:35 | 00:02:30 |
| 21 | 251.1 | No | Yes | N/A | N/A | 00:08:01 | 00:02:22 |
| 22 | 250.9 | Yes | No | 00:08:58 | 00:03:57 | N/A | N/A |
| 23 | 250.7 | No | Yes | N/A | N/A | 00:07:25 | 00:02:11 |
| 24 | 250.3 | No | Yes | N/A | N/A | 00:06:56 | 00:03:01 |
| 25 | 249.8 | No | Yes | N/A | N/A | 00:06:48 | 00:03:24 |
| 26 | 249.45 | Yes | Yes | 00:05:30 | 00:02:59 | 00:05:30 | 00:02:59 |
| 27 | 248.89 | Yes | Yes | 00:05:52 | 00:03:08 | 00:05:52 | 00:03:08 |
| 28 | 247.86 | Yes | Yes | 00:08:38 | 00:05:14 | 00:07:12 | 00:04:18 |
| 29 | 246.08 | Yes | Yes | 00:08:03 | 00:06:21 | 00:06:05 | 00:03:43 |
| 30 | 244.9 | No | Yes | N/A | N/A | 00:06:32 | 00:05:09 |
| 31 | 243.8 | Yes | Yes | 00:06:52 | 00:05:04 | 00:06:52 | 00:05:04 |
| 32 | 242.7 | Yes | Yes | 00:07:12 | 00:05:45 | 00:07:12 | 00:05:45 |
| 33 | 241.1 | Yes | Yes | 00:06:57 | 00:05:30 | 00:06:57 | 00:05:30 |
| 34 | 239.61 | Yes | Yes | 00:07:23 | 00:05:45 | 00:07:23 | 00:05:45 |
| 35 | 237.98 | Yes | Yes | 00:06:31 | 00:05:31 | 00:06:31 | 00:05:31 |
| 36 | 236.4 | Yes | Yes | 00:05:40 | 00:04:36 | 00:05:40 | 00:04:36 |
| 37 | 234.44 | Yes | Yes | 00:04:27 | 00:03:54 | 00:04:27 | 00:03:54 |
| 38 | 233.47 | Yes | Yes | 00:05:12 | 00:04:04 | 00:05:12 | 00:04:04 |
| 39 | 233.1 | Yes | Yes | 00:06:46 | 00:05:41 | 00:06:08 | 00:05:08 |
| 40 | 232.64 | Yes | Yes | 00:06:13 | 00:05:08 | 00:05:35 | 00:04:35 |
| 41 | 231.74 | Yes | Yes | 00:06:52 | 00:05:35 | 00:05:50 | 00:04:49 |
| 42 | 230.1 | Yes | Yes | 00:06:27 | 00:06:22 | 00:05:02 | 00:04:21 |
| 43 | 228.9 | No | Yes | N/A | N/A | 00:05:01 | 00:04:11 |
| 44 | 228.34 | Yes | No | 00:06:44 | 00:05:11 | N/A | N/A |
| 45 | 227.8 | No | Yes | N/A | N/A | 00:06:08 | 00:04:44 |
| 46 | 226.96 | Yes | Yes | 00:07:01 | 00:05:20 | 00:07:01 | 00:05:20 |
| 47 | 226.41 | Yes | Yes | 00:07:32 | 00:06:34 | 00:07:32 | 00:06:34 |
| 48 | 225.97 | Yes | Yes | 00:06:59 | 00:05:19 | 00:06:59 | 00:05:19 |
| 49 | 224.27 | Yes | Yes | 00:06:22 | 00:05:06 | 00:06:22 | 00:05:06 |
| 50 | 222.73 | Yes | Yes | 00:06:34 | 00:05:03 | 00:06:34 | 00:05:03 |
| 51 | 221.75 | Yes | Yes | 00:07:31 | 00:04:18 | 00:07:31 | 00:04:18 |
| 52 | 220.1 | Yes | Yes | 00:07:54 | 00:03:53 | 00:07:54 | 00:03:53 |
| 53 | 218.22 | Yes | Yes | 00:07:49 | 00:03:47 | 00:07:49 | 00:03:47 |
| 54 | 216.5 | Yes | Yes | 00:07:54 | 00:03:53 | 00:07:54 | 00:03:53 |
| 55 | 214.8 | Yes | Yes | 00:07:33 | 00:03:54 | 00:07:33 | 00:03:54 |
| 56 | 213.05 | Yes | Yes | 00:07:38 | 00:04:04 | 00:07:38 | 00:04:04 |
| 57 | 211.17 | Yes | Yes | 00:08:30 | 00:04:51 | 00:08:30 | 00:04:51 |
| 58 | 209.5 | Yes | Yes | 00:10:43 | 00:08:15 | 00:08:31 | 00:05:31 |
| 59 | 207.98 | Yes | Yes | 00:11:56 | 00:08:58 | 00:08:49 | 00:06:56 |
| 60 | 206.1 | Yes | Yes | 00:10:43 | 00:08:16 | 00:07:23 | 00:06:05 |
| 61 | 204.9 | No | Yes | N/A | N/A | 00:07:03 | 00:05:12 |
| 62 | 203.5 | Yes | Yes | 00:10:11 | 00:06:10 | 00:06:37 | 00:03:44 |
| 63 | 202.3 | No | Yes | N/A | N/A | 00:08:20 | 00:04:58 |

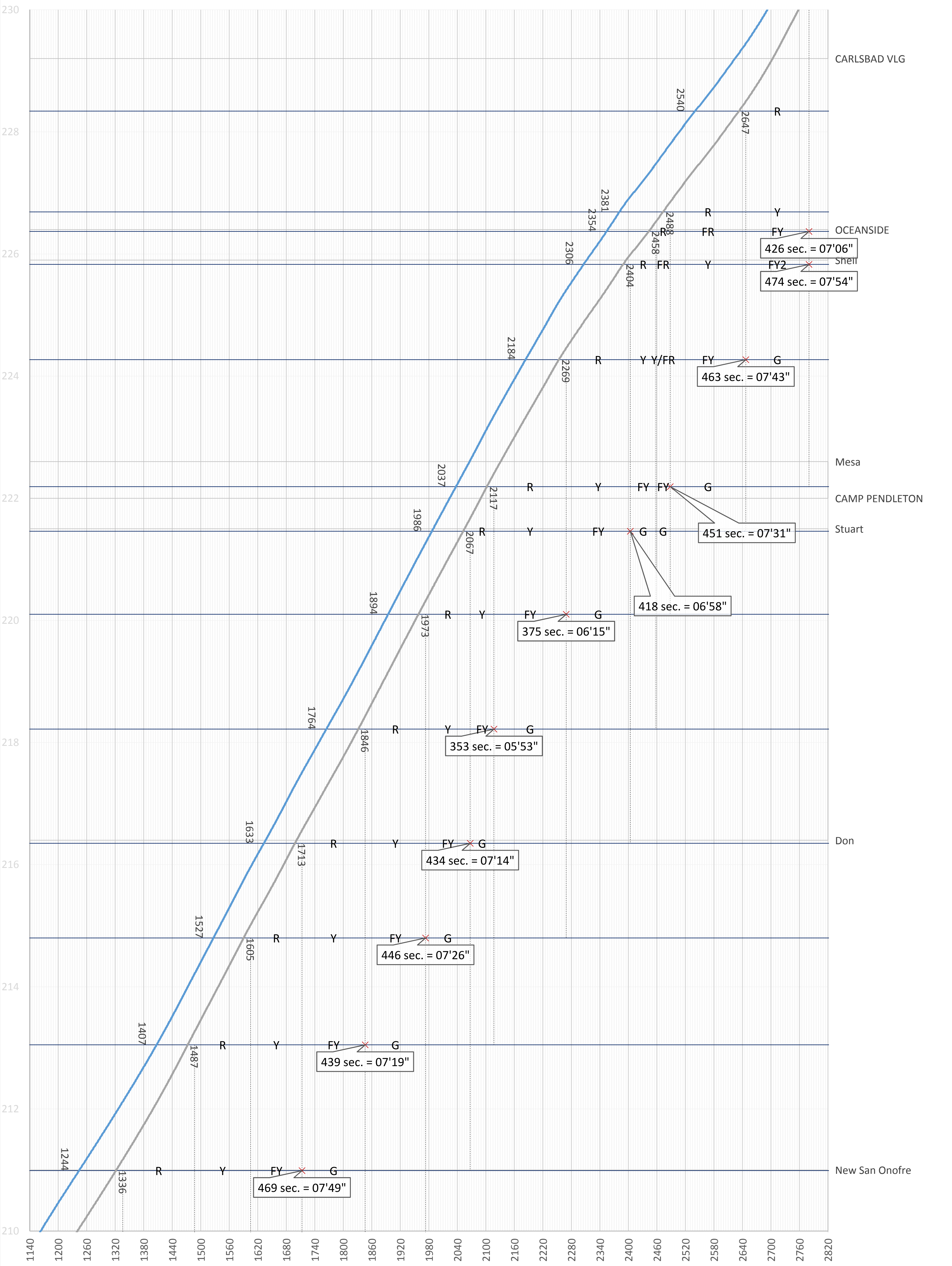
# APPENDIX D

## 2035A SCENARIO HEADWAY ANALYSIS (WITHOUT SIGNAL RESPACING OPTIONS): ANNOTATED MODIFIED STRINGLINE DIAGRAM

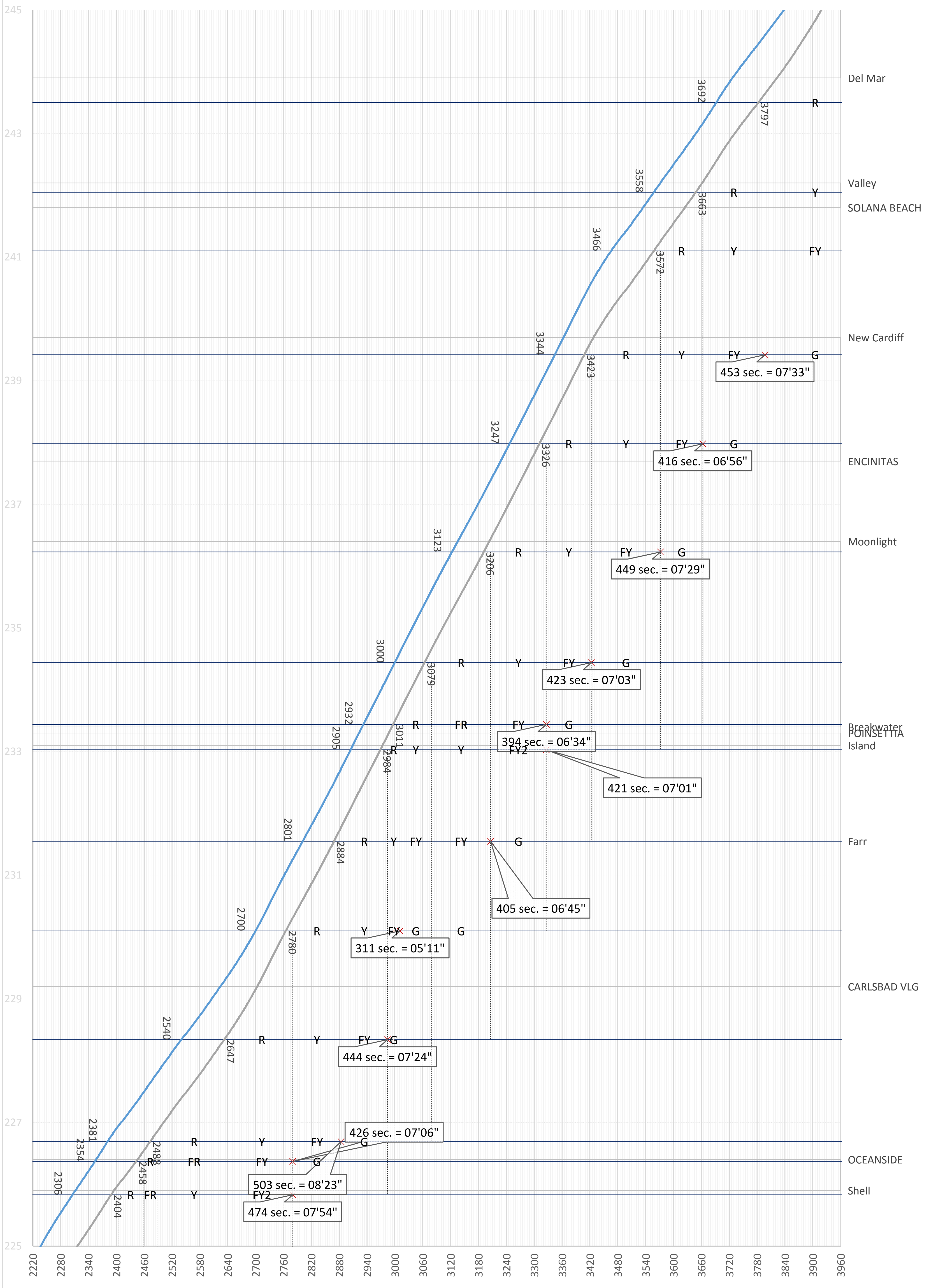
# Appendix D-1: 2035A Case Headway Calculation - Freight Control Train (EB)



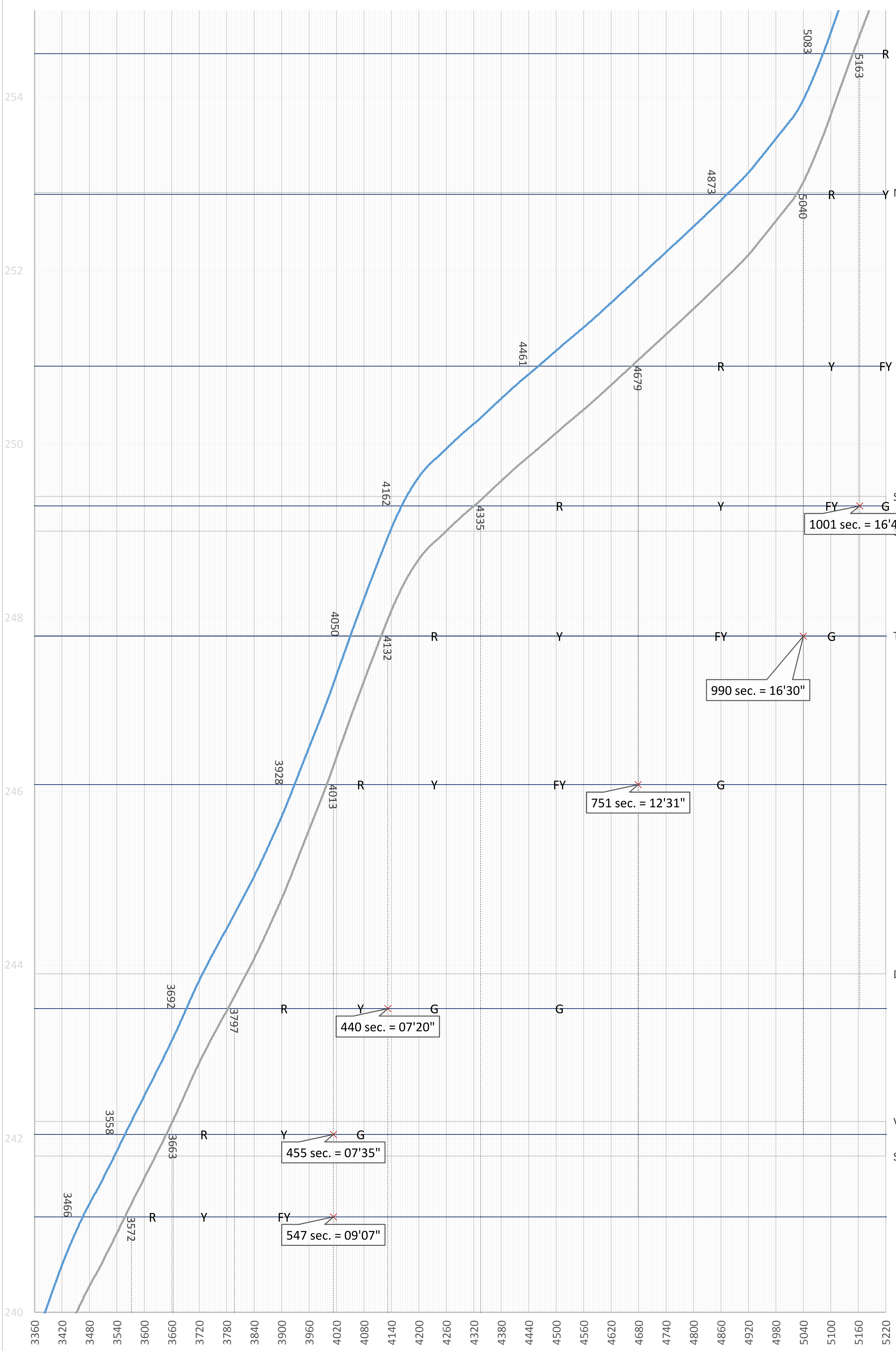
# Appendix D-1: 2035A Case Headway Calculation - Freight Control Train (EB)



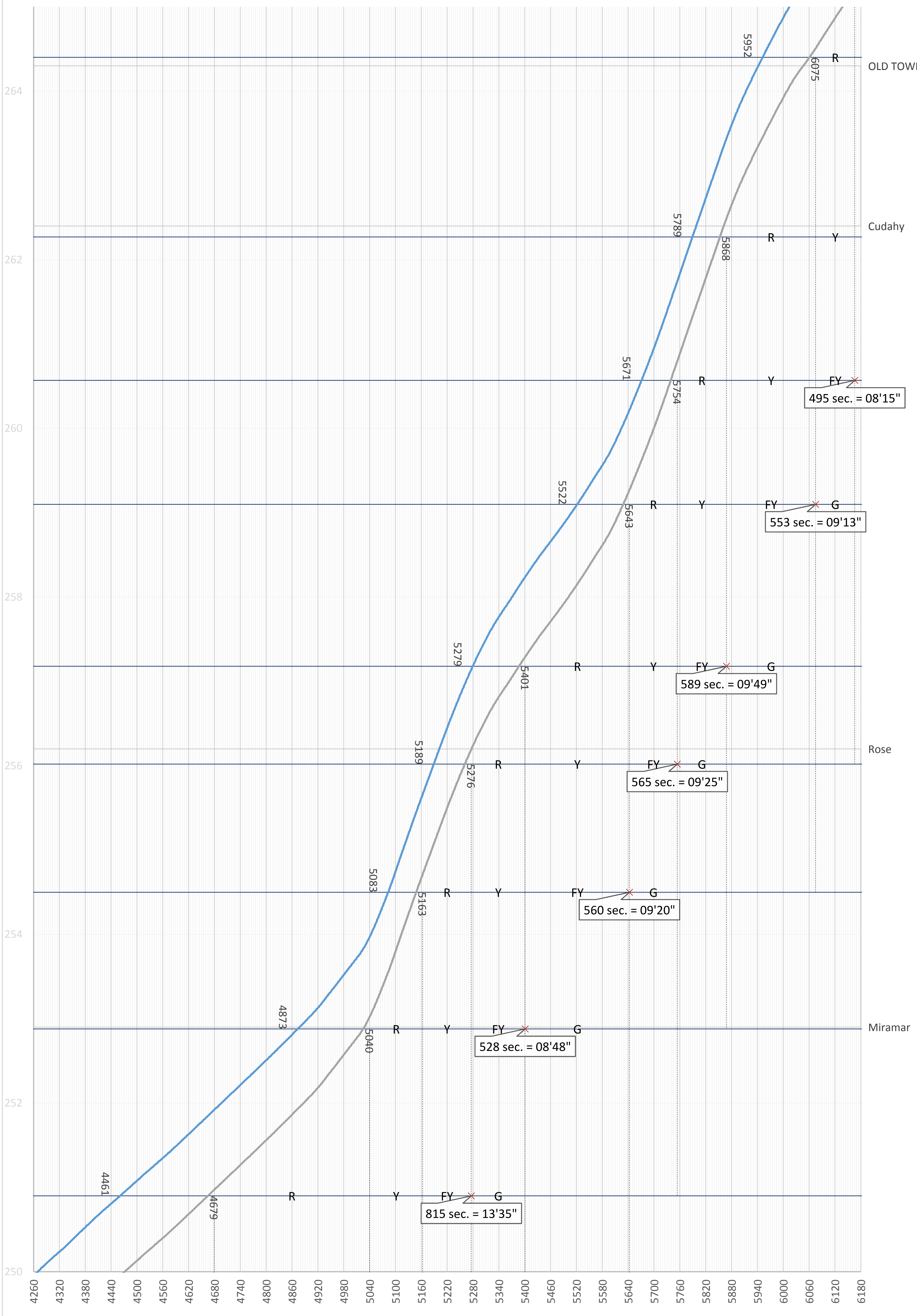
# Appendix D-1: 2035A Case Headway Calculation - Freight Control Train (EB)



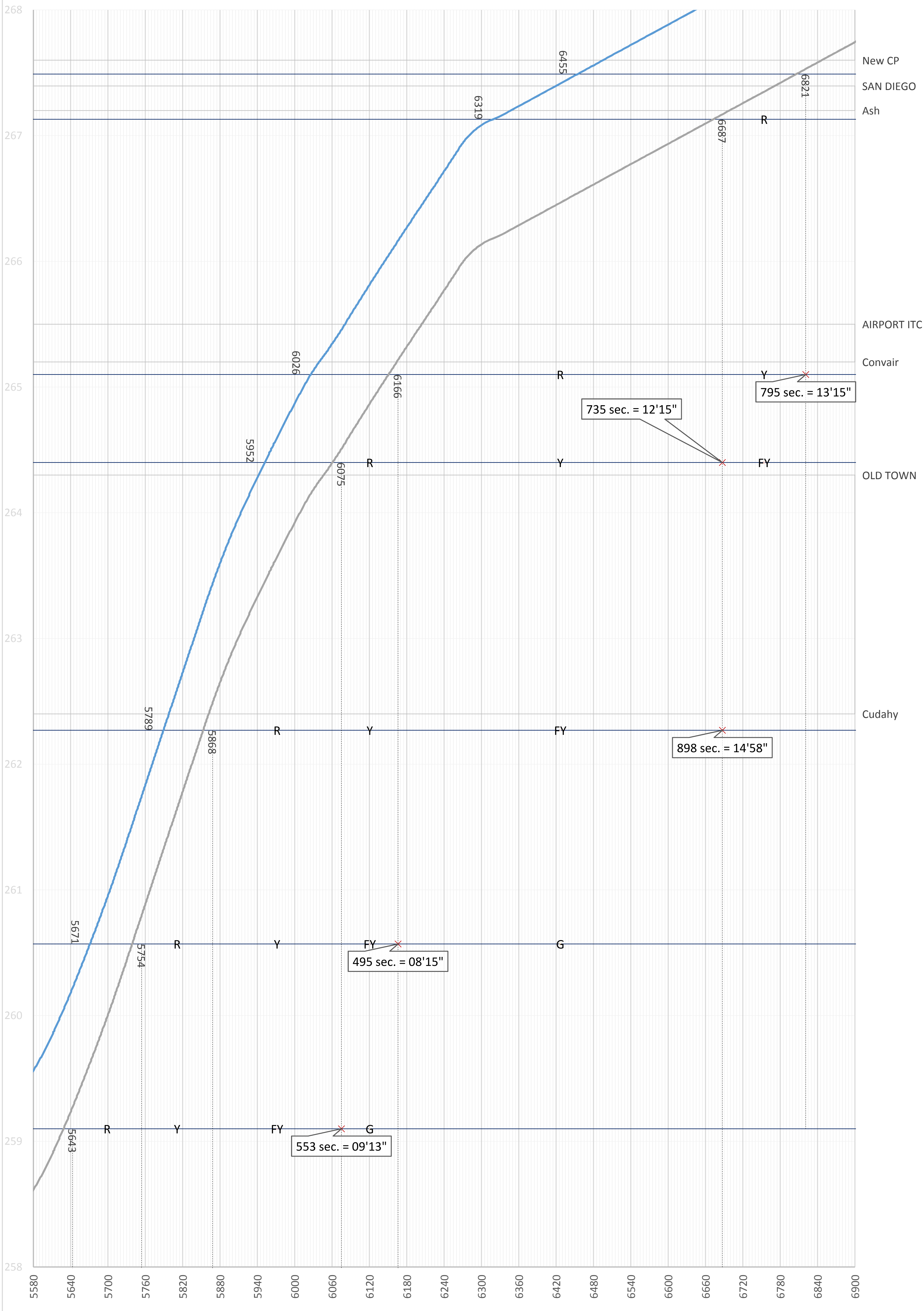
# Appendix D-1: 2035A Case Headway Calculation - Freight Control Train (EB)



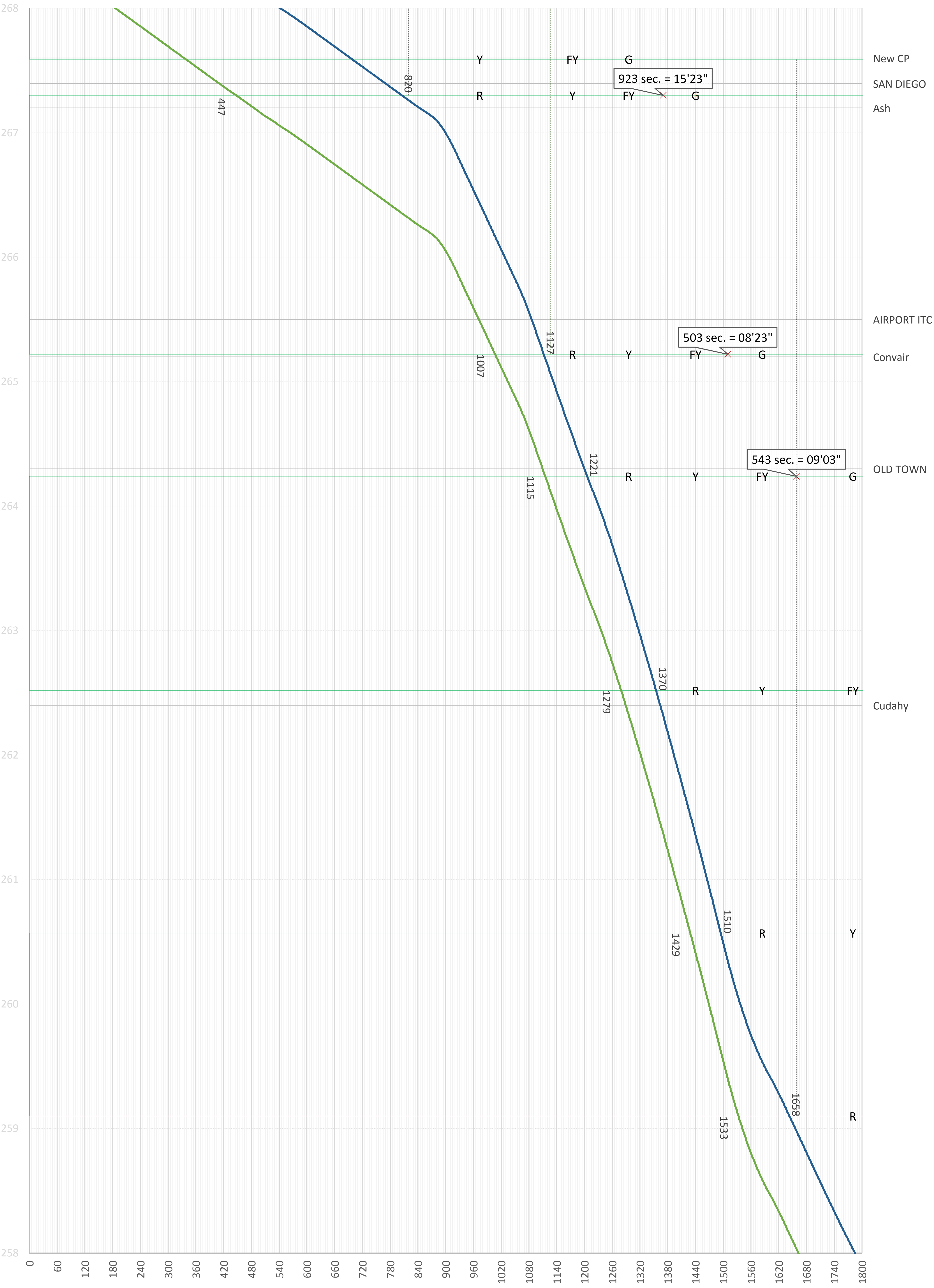
# Appendix D-1: 2035A Case Headway Calculation - Freight Control Train (EB)



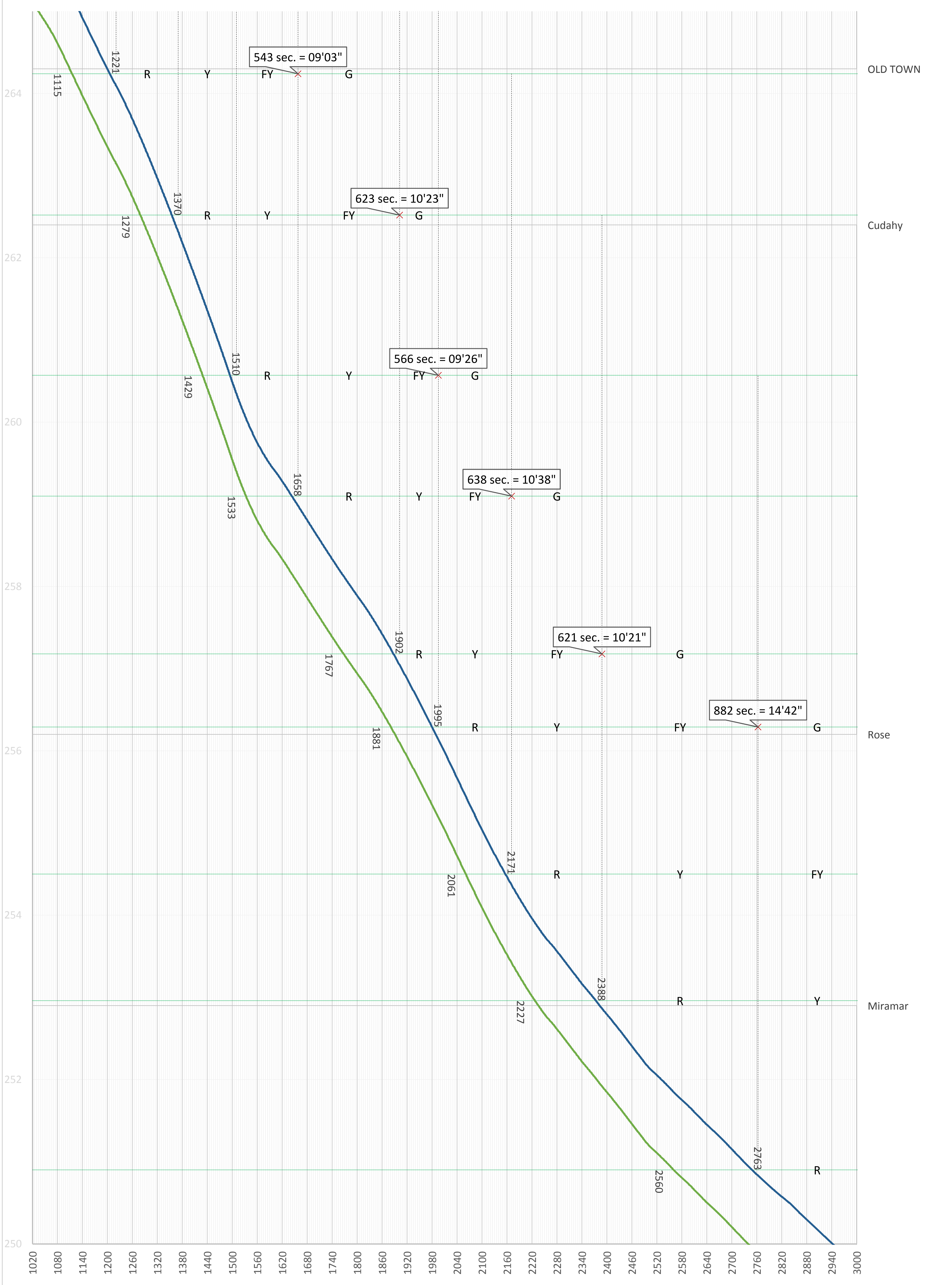
# Appendix D-1: 2035A Case Headway Calculation - Freight Control Train (EB)



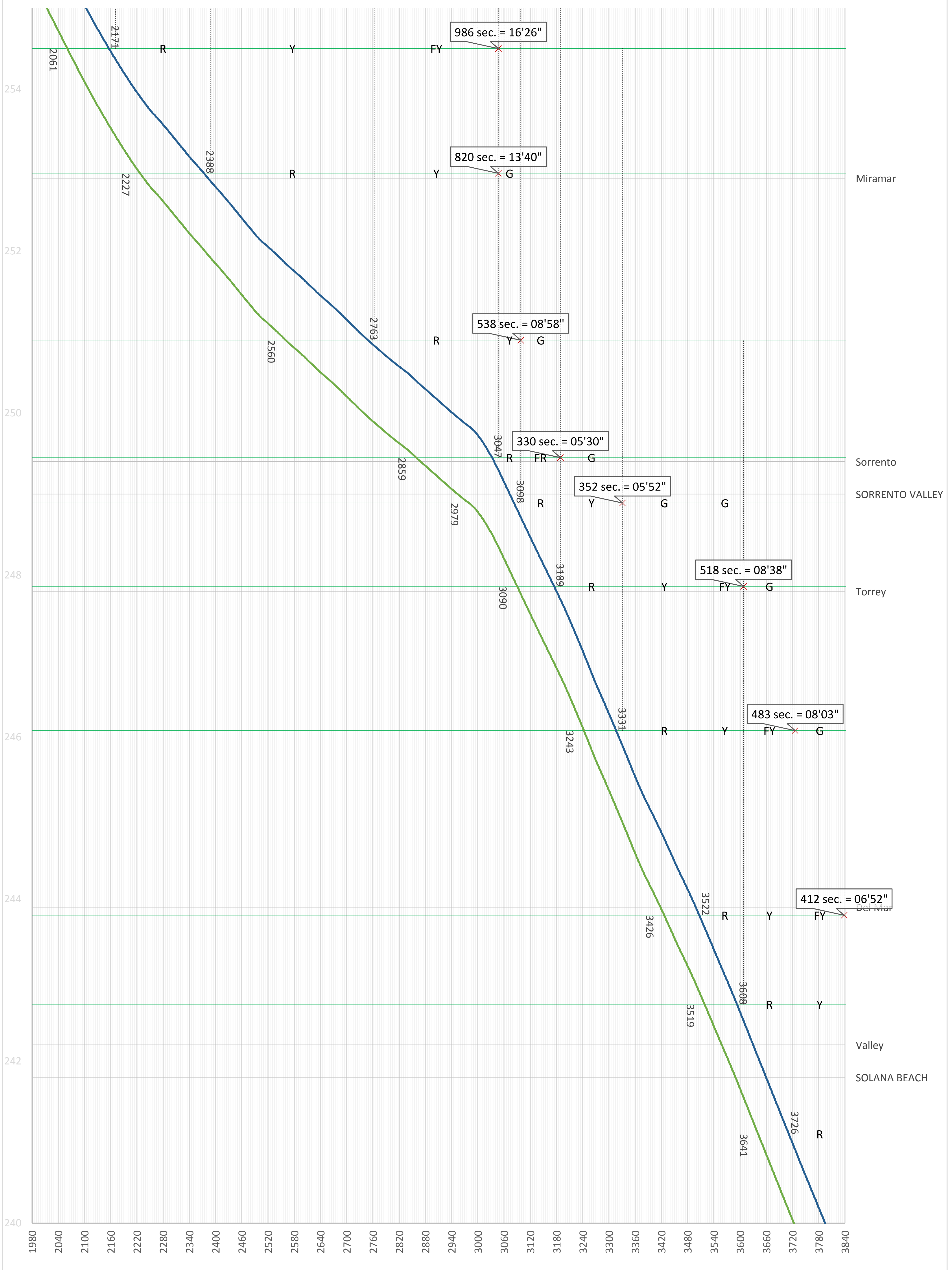
# Appendix D-2: 2035A Case Headway Calculation - Freight Control Train (WB)



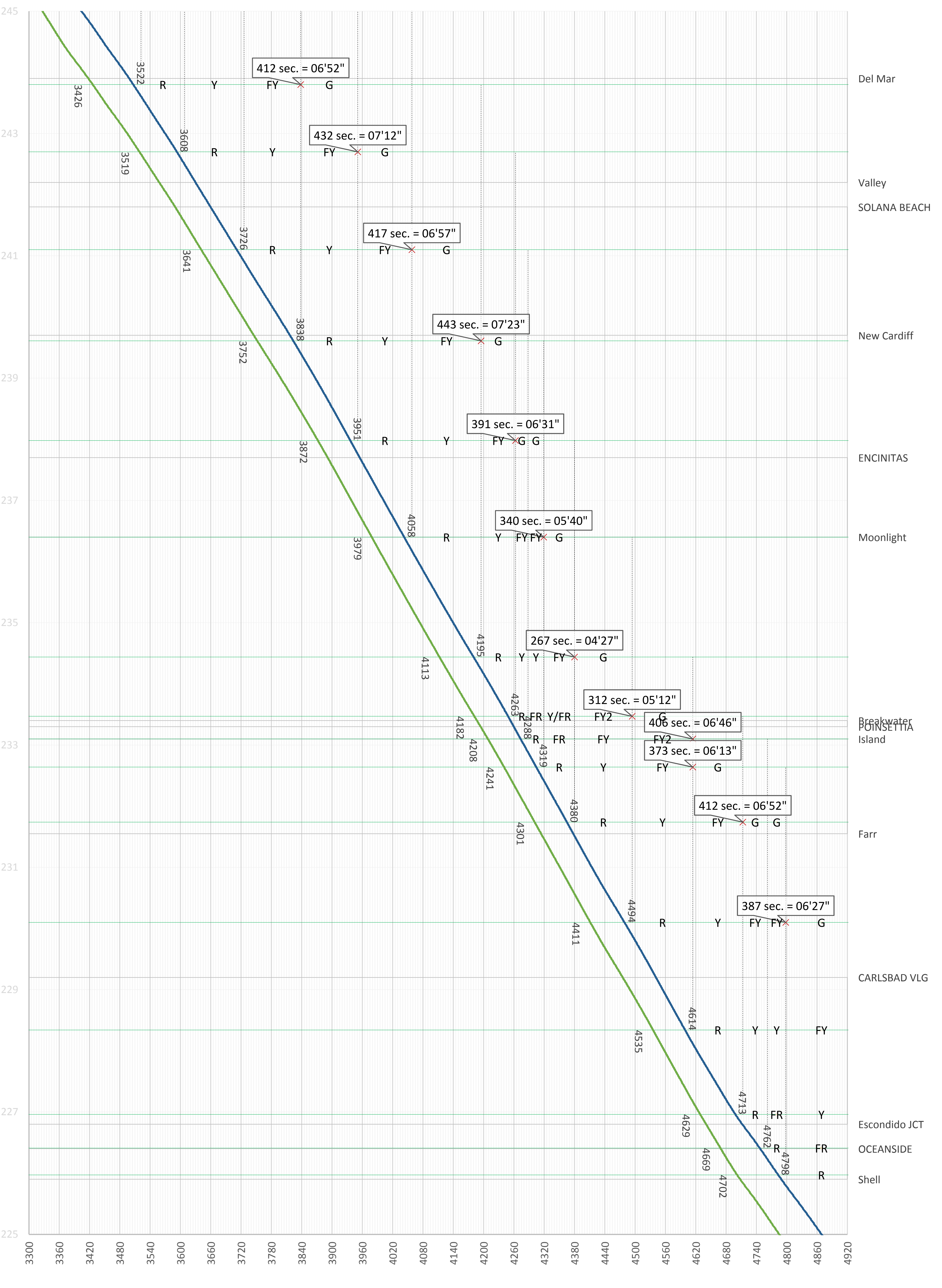
# Appendix D-2: 2035A Case Headway Calculation - Freight Control Train (WB)



# Appendix D-2: 2035A Case Headway Calculation - Freight Control Train (WB)



# Appendix D-2: 2035A Case Headway Calculation - Freight Control Train (WB)



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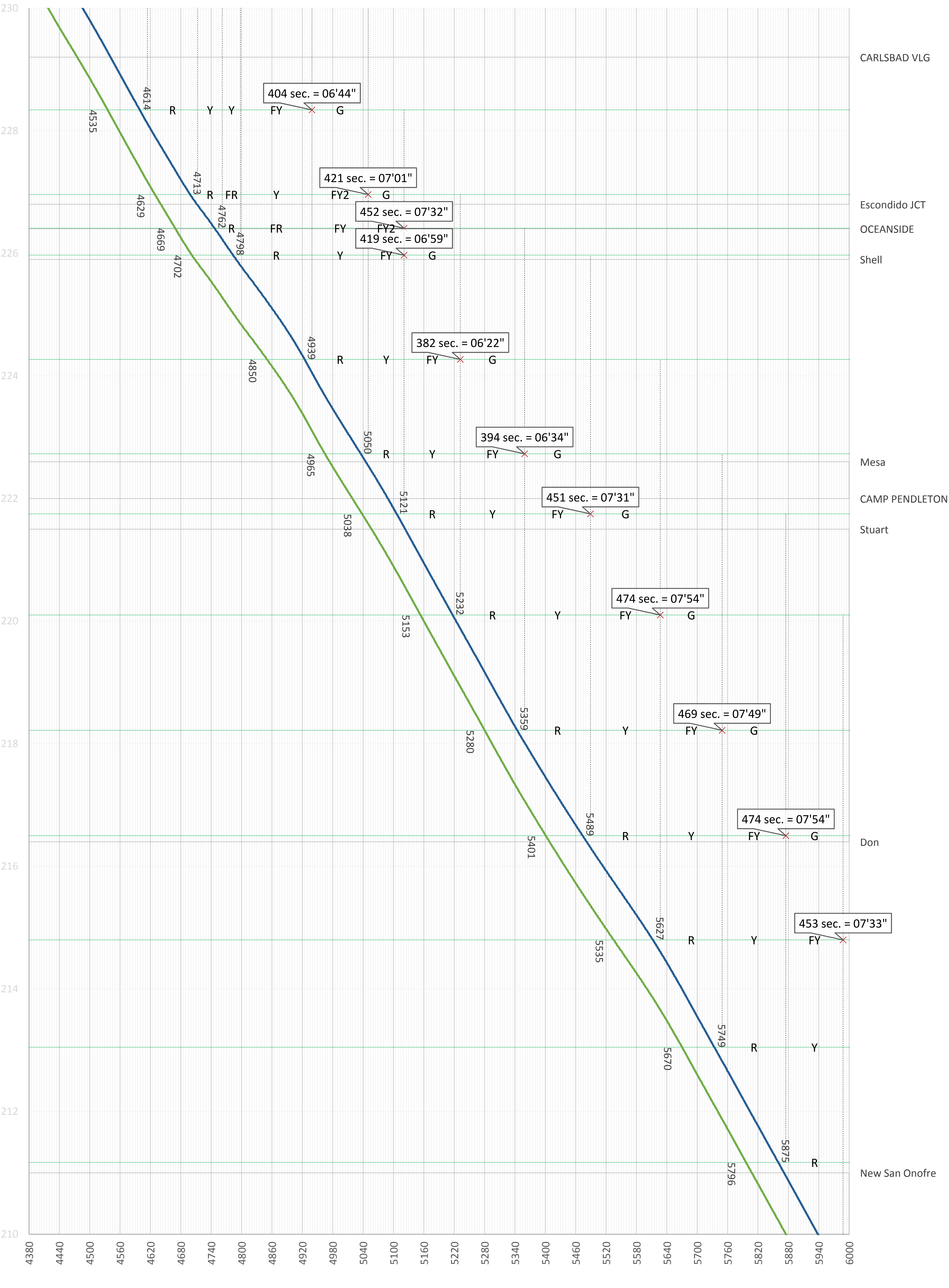

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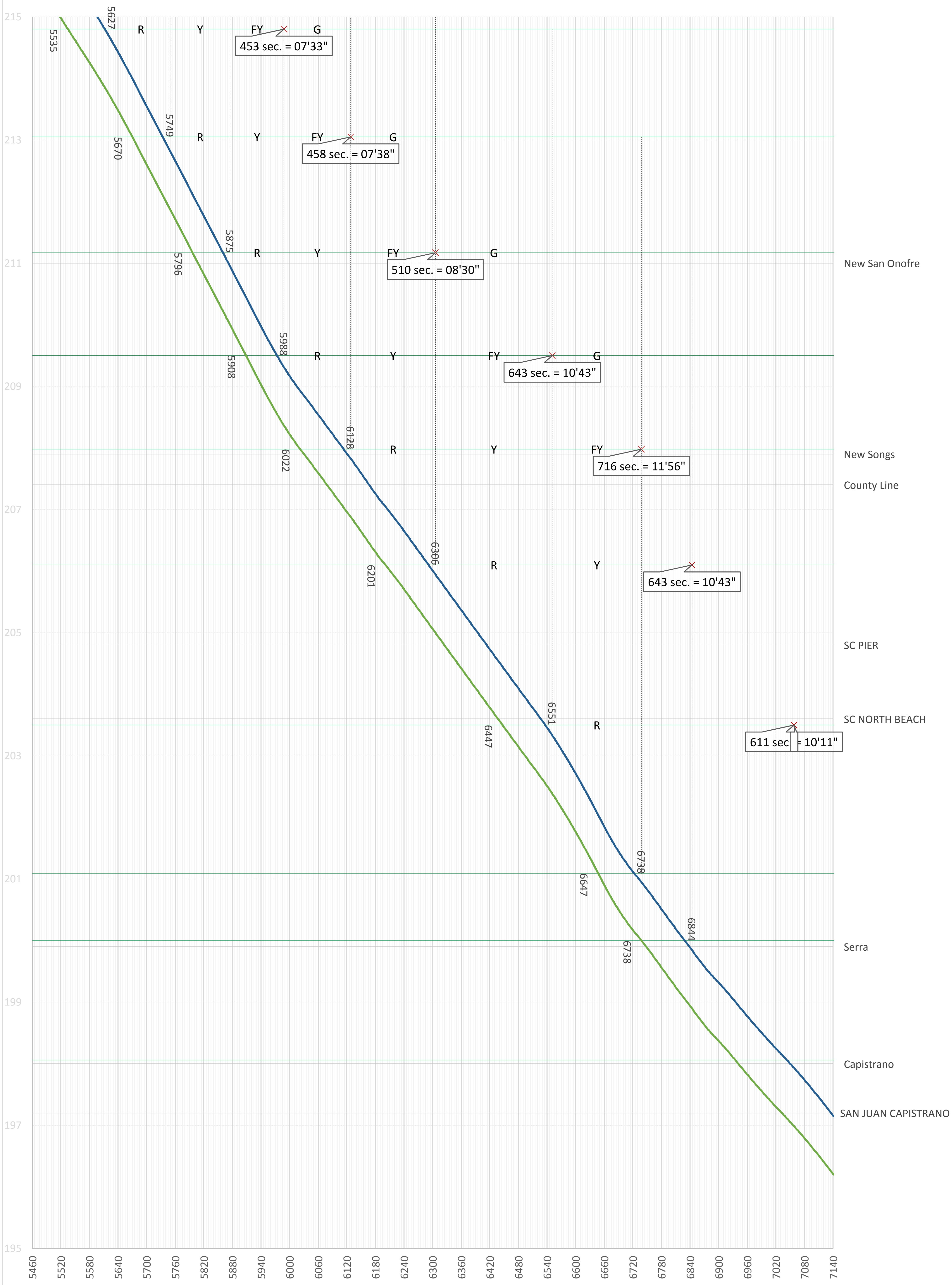
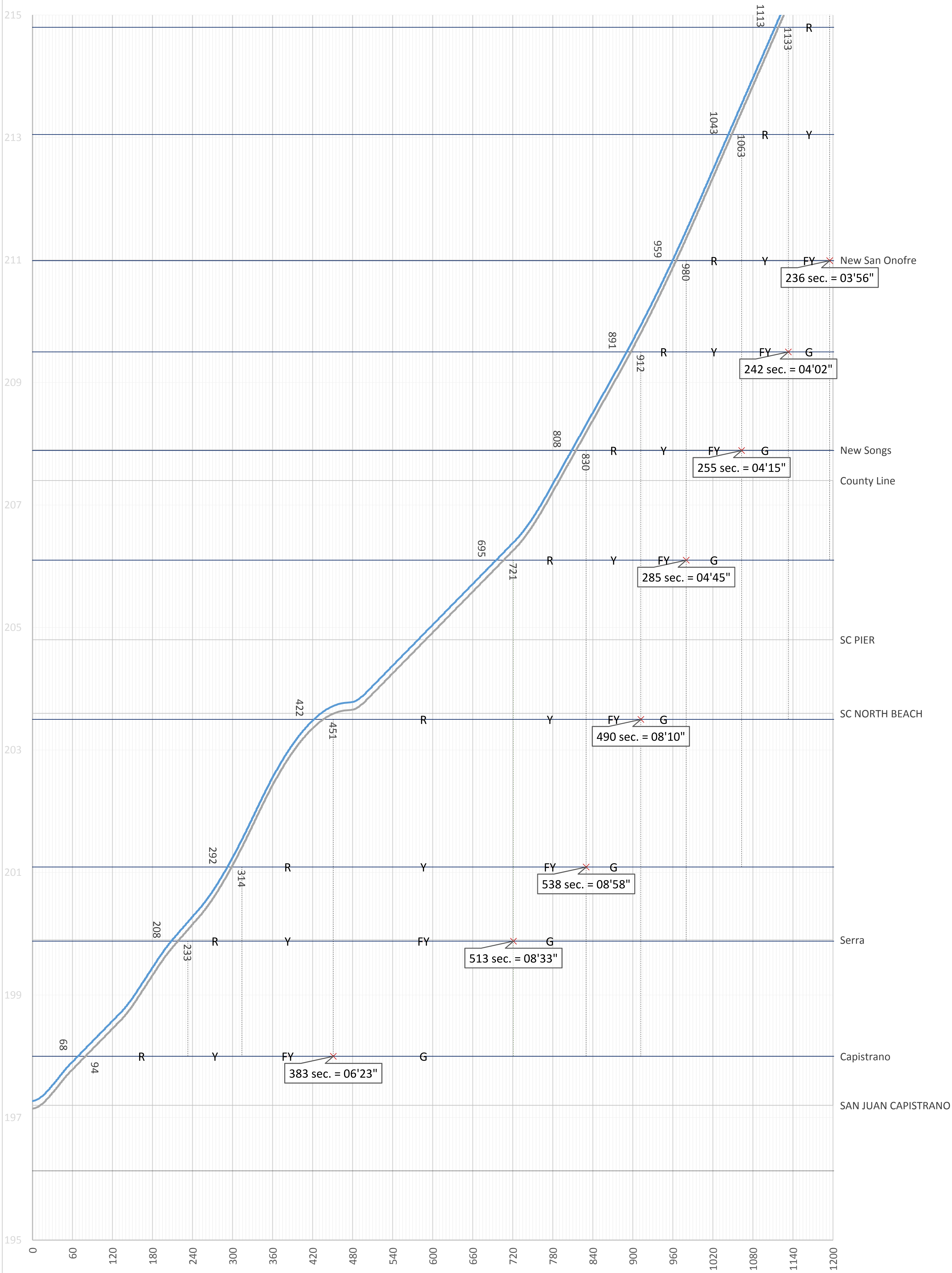


# Appendix D-3: 2035A Case Headway Calculation - Passenger Control Train (EB)



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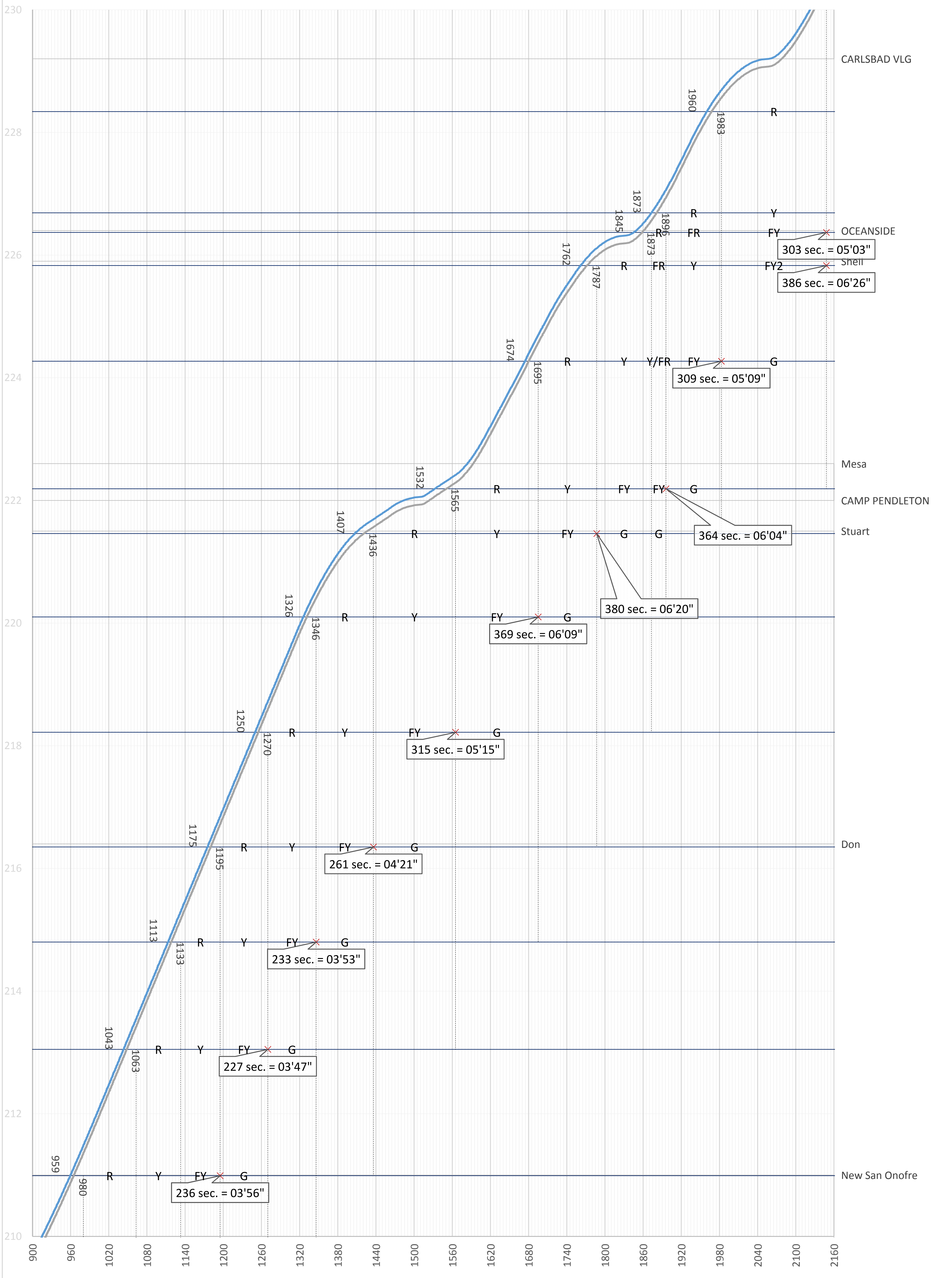

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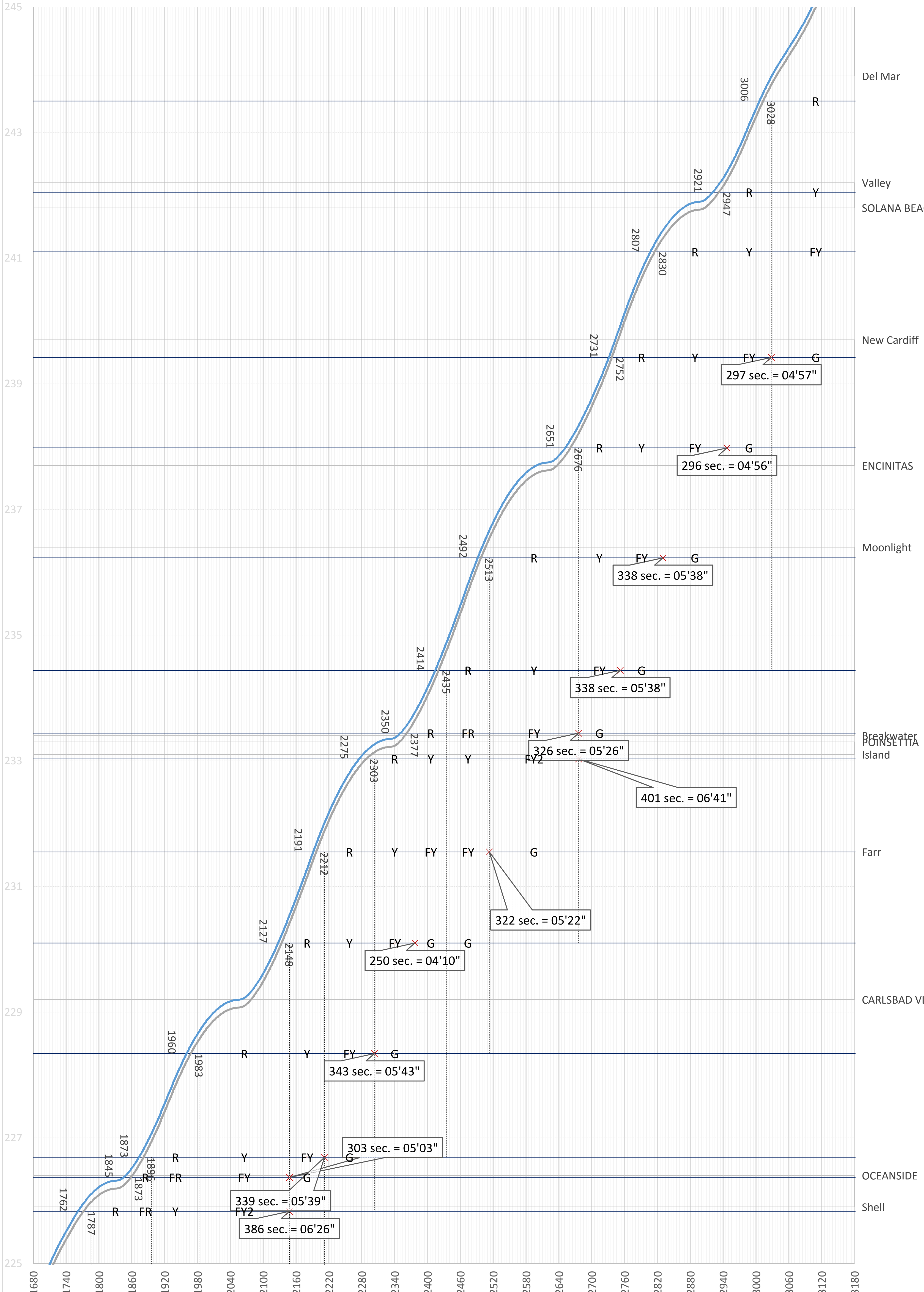

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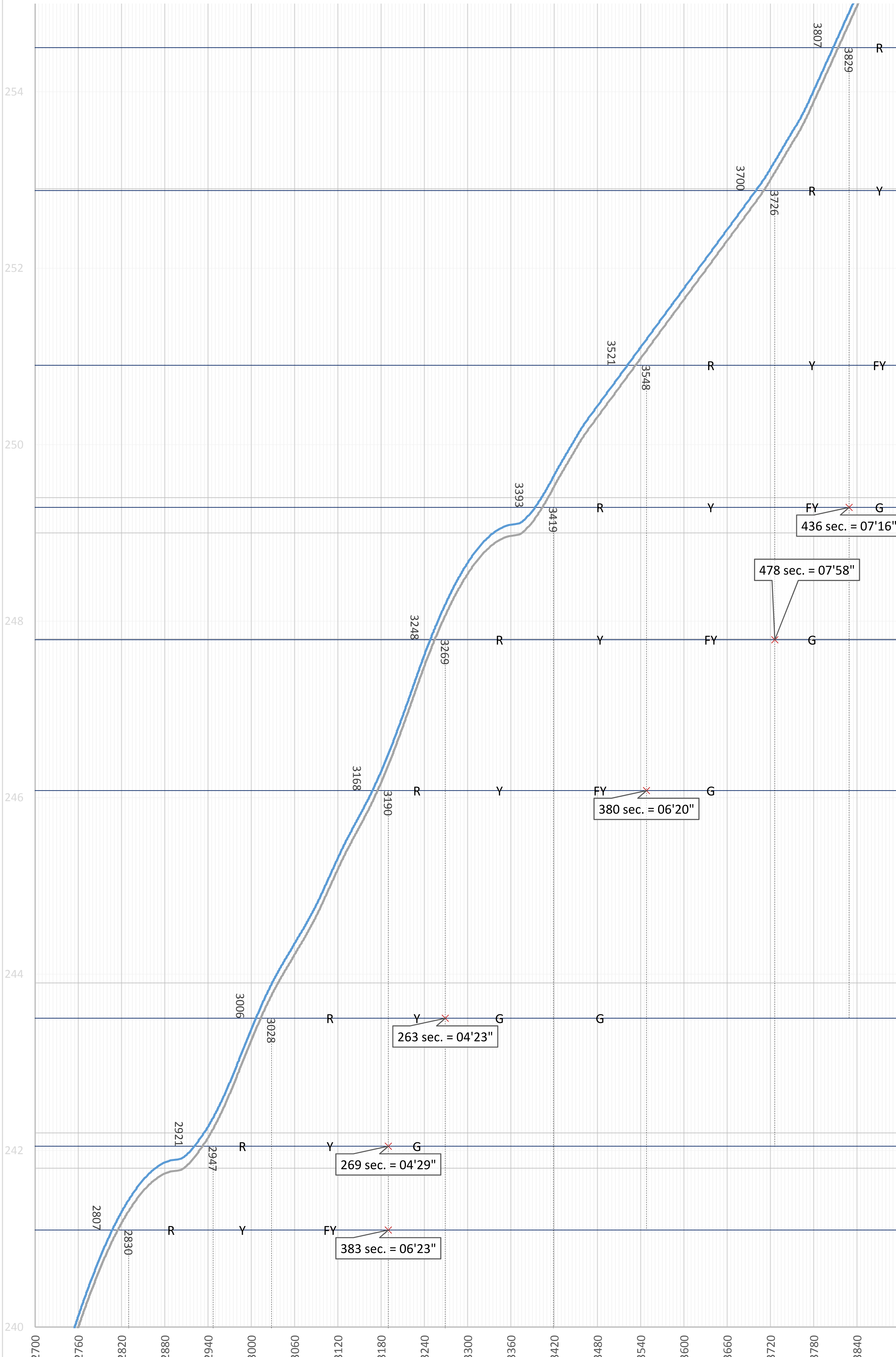

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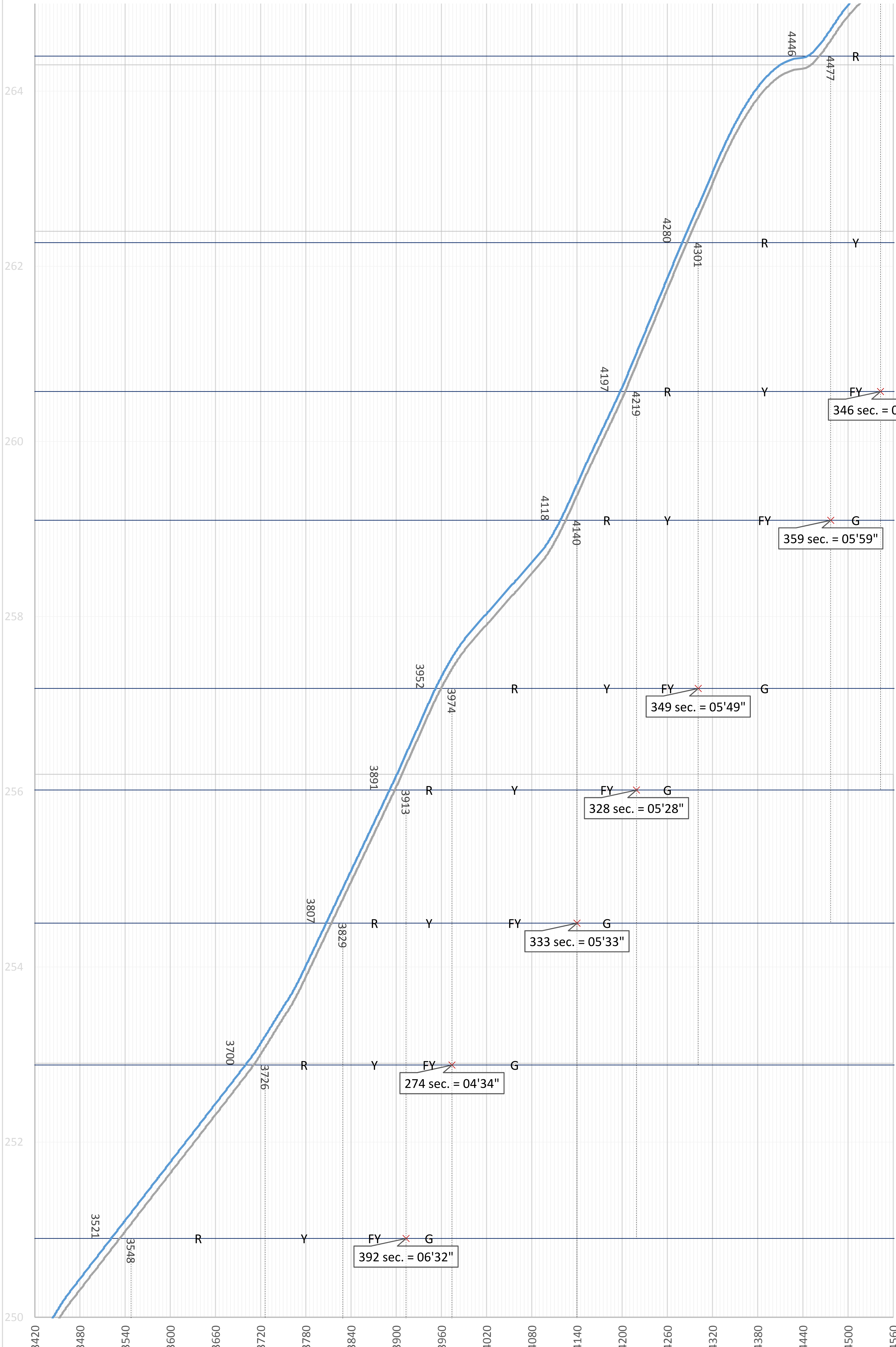

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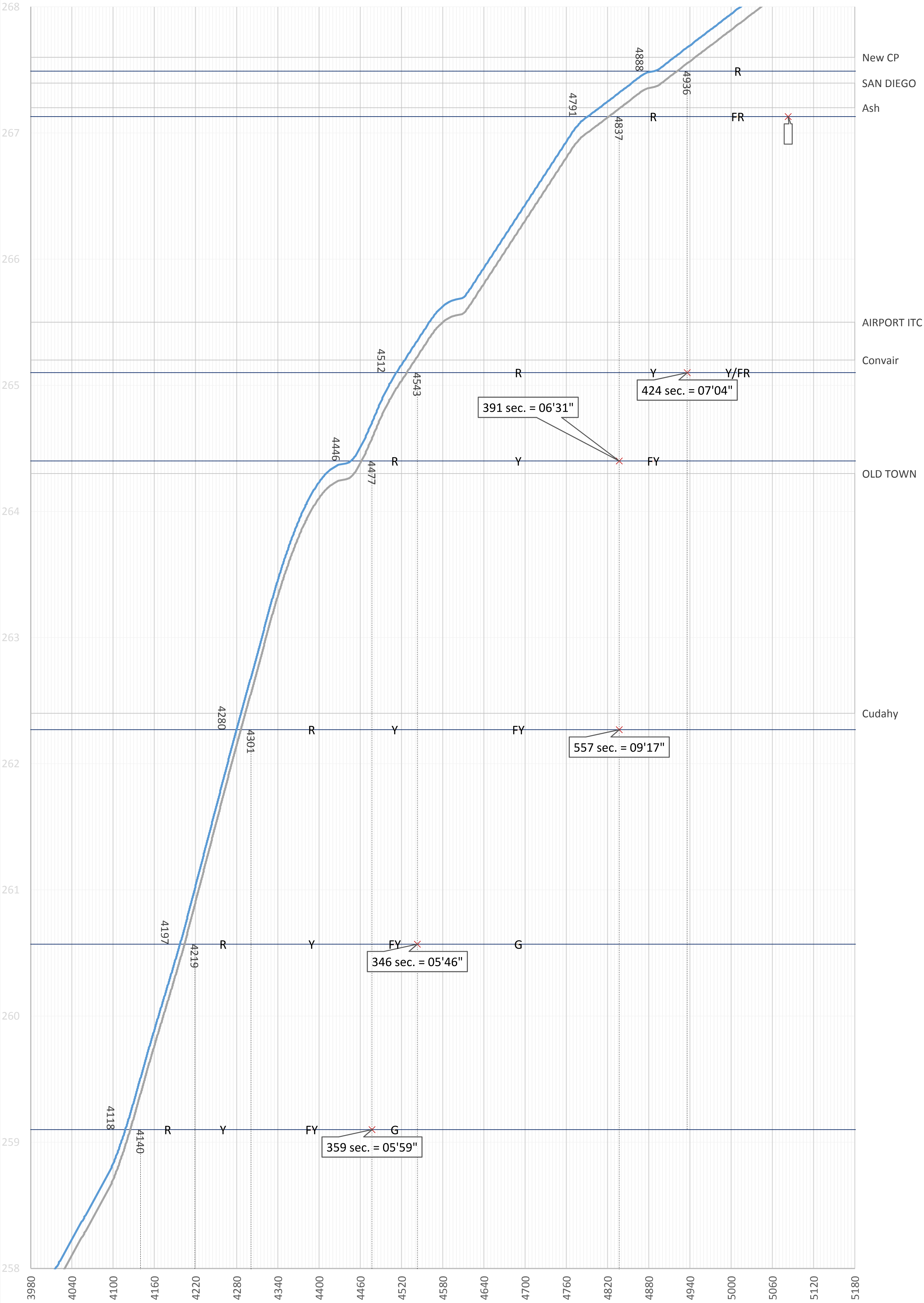

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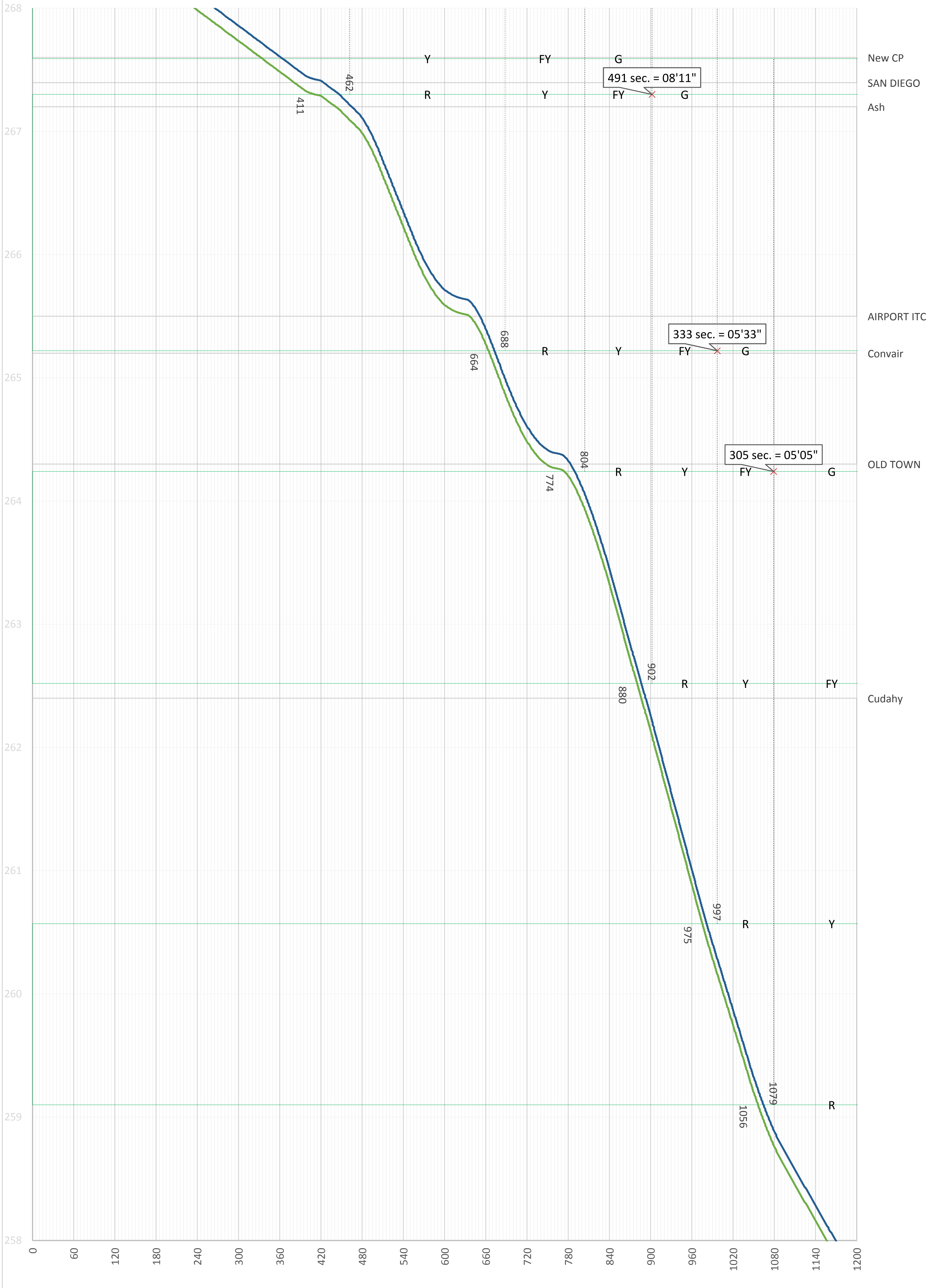

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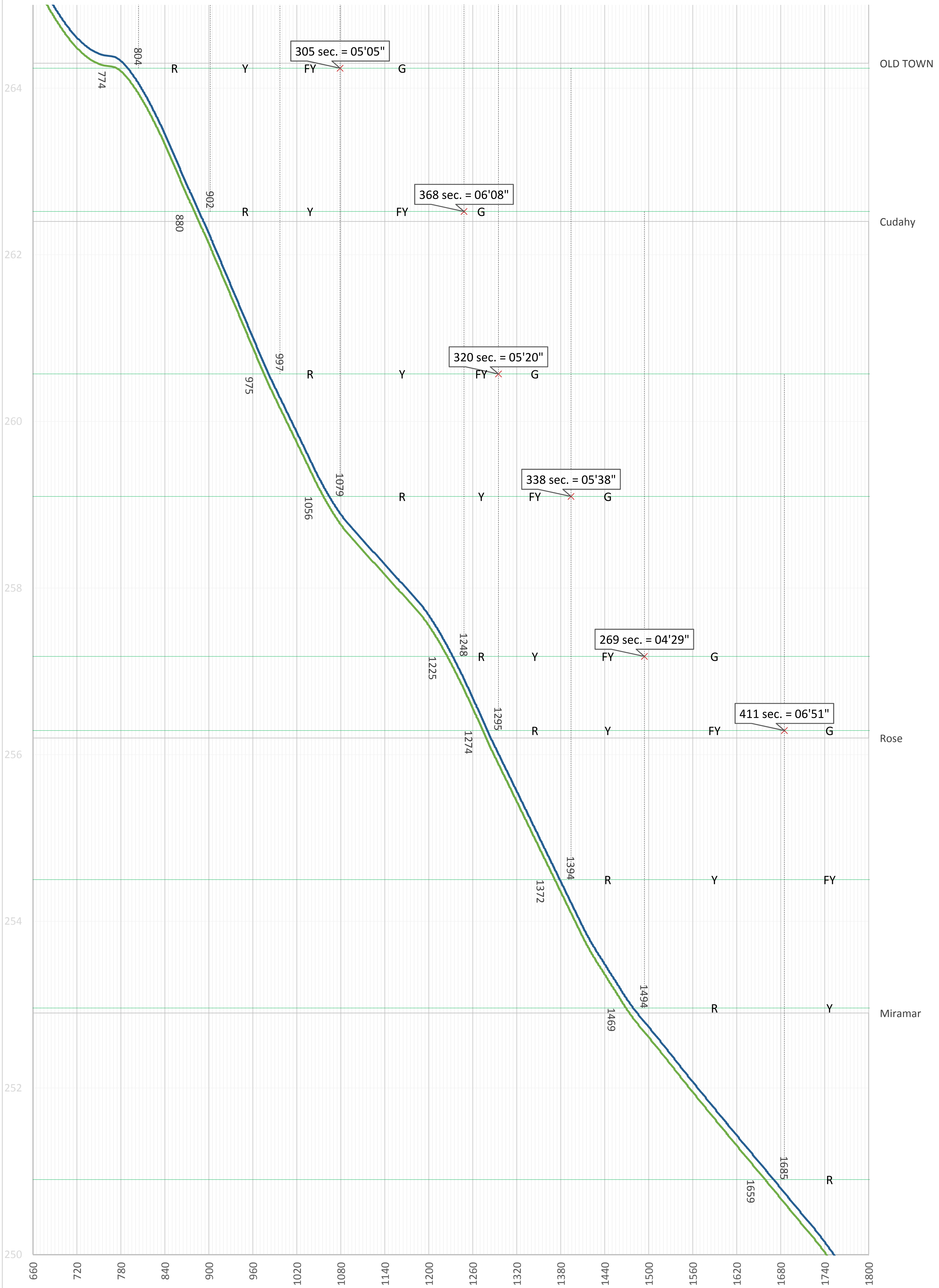

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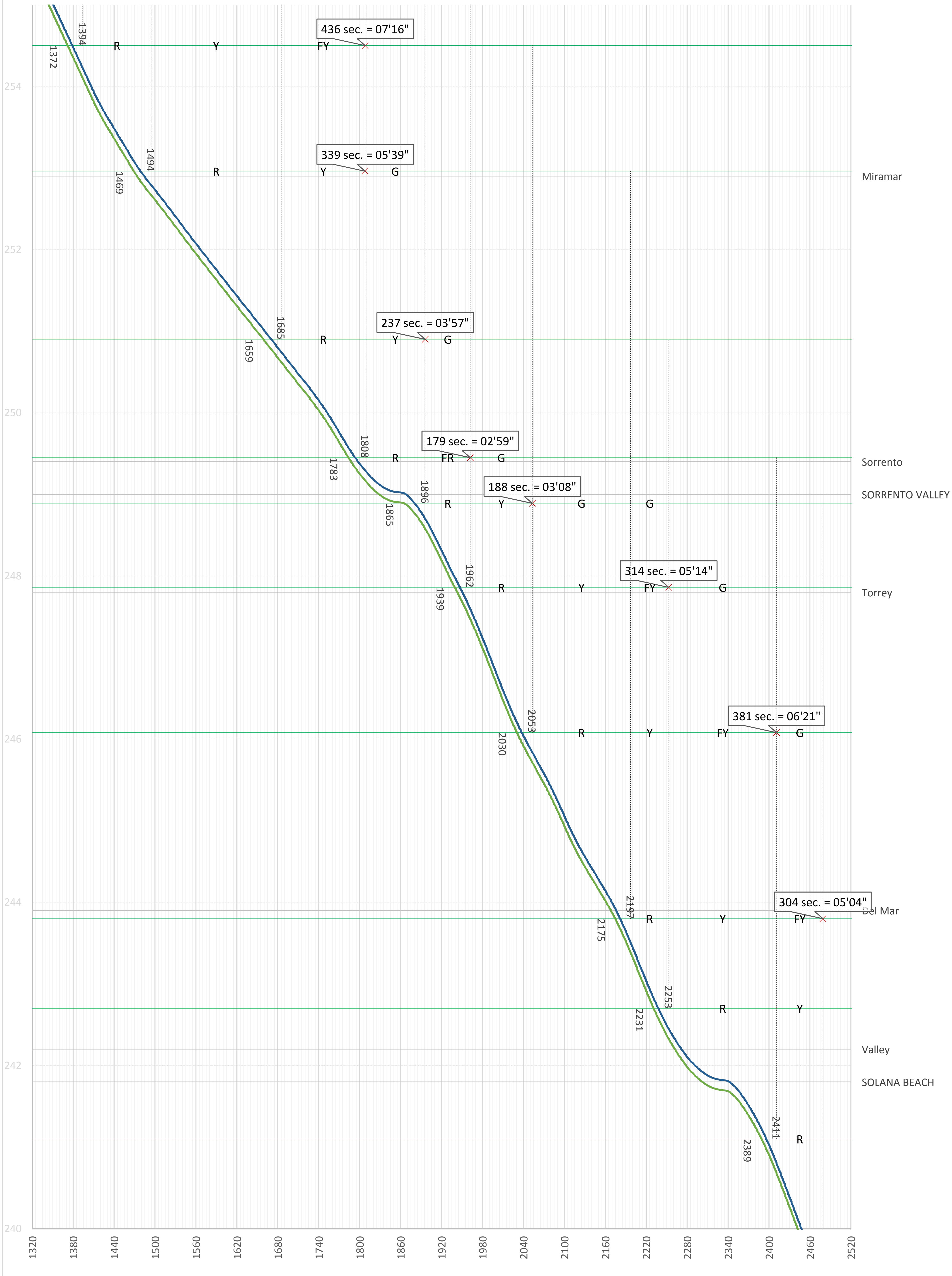

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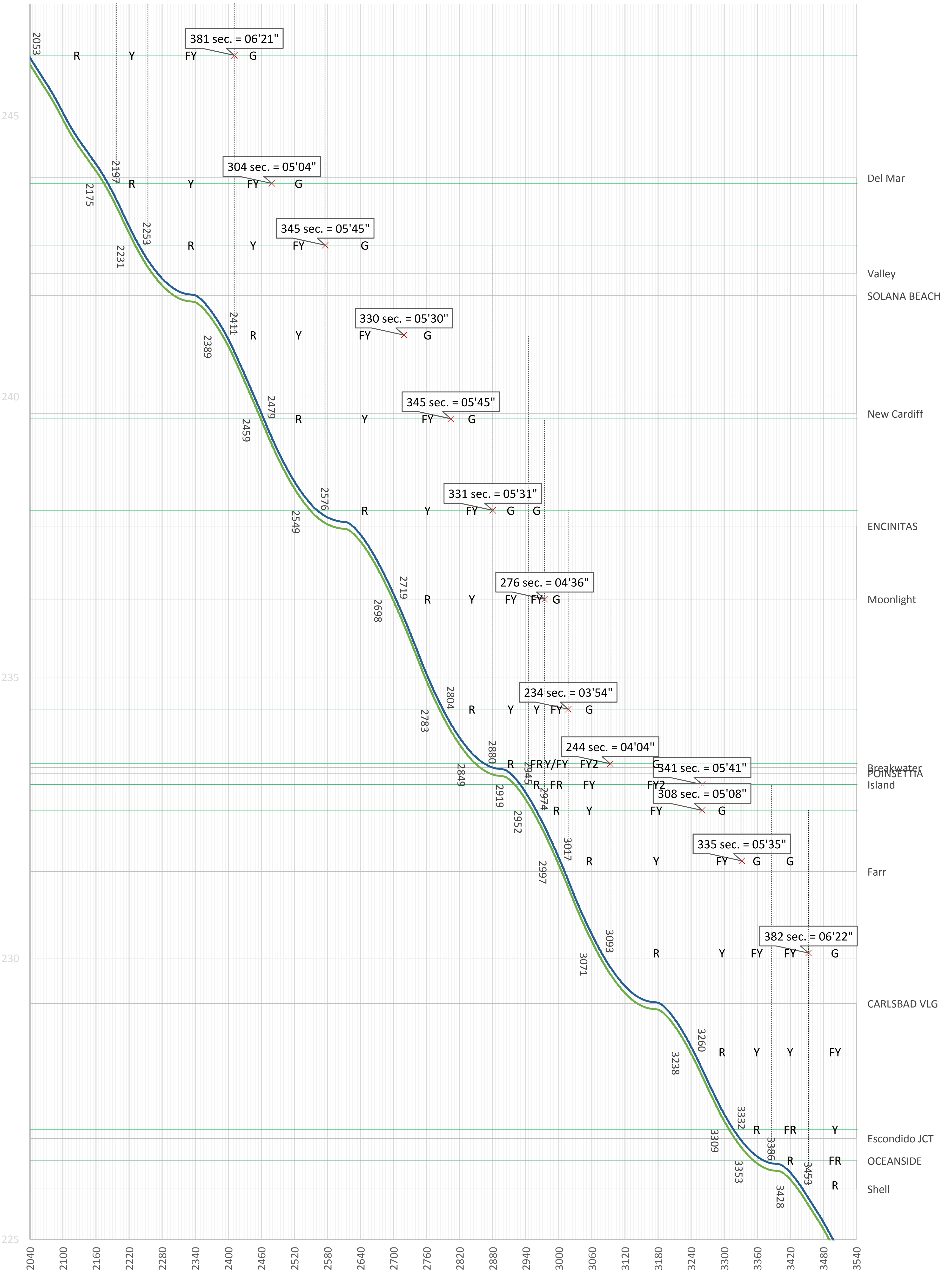

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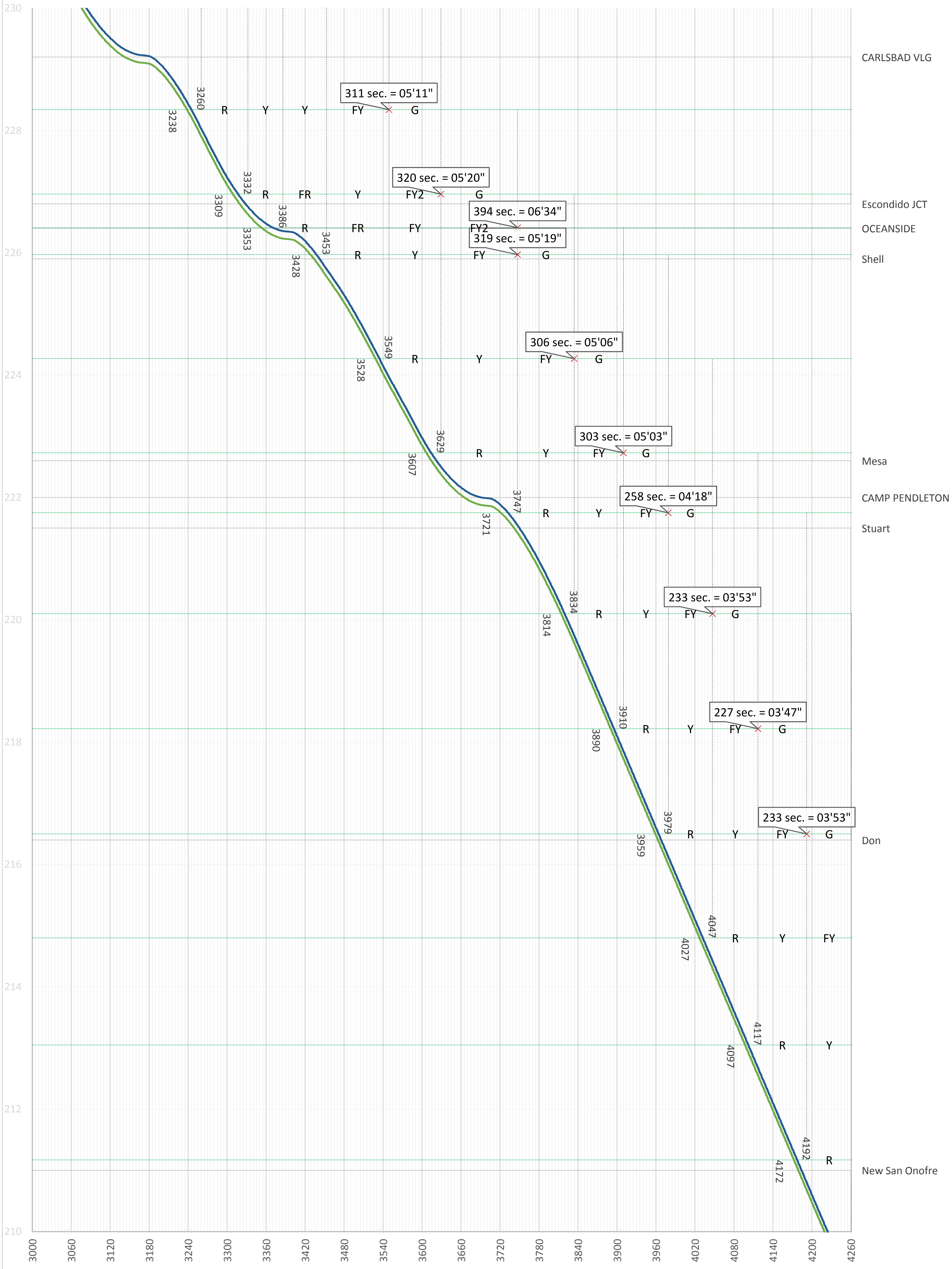

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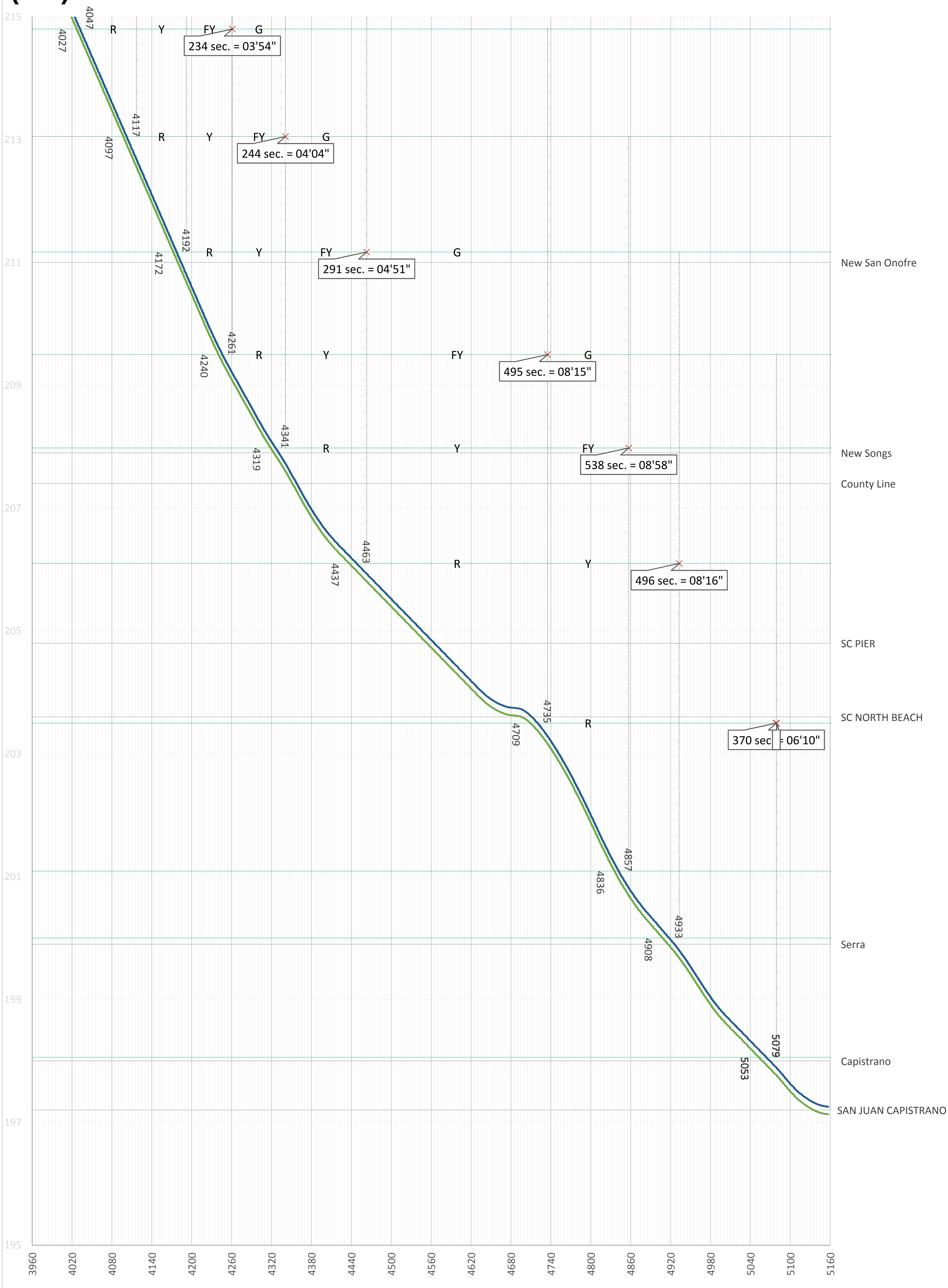
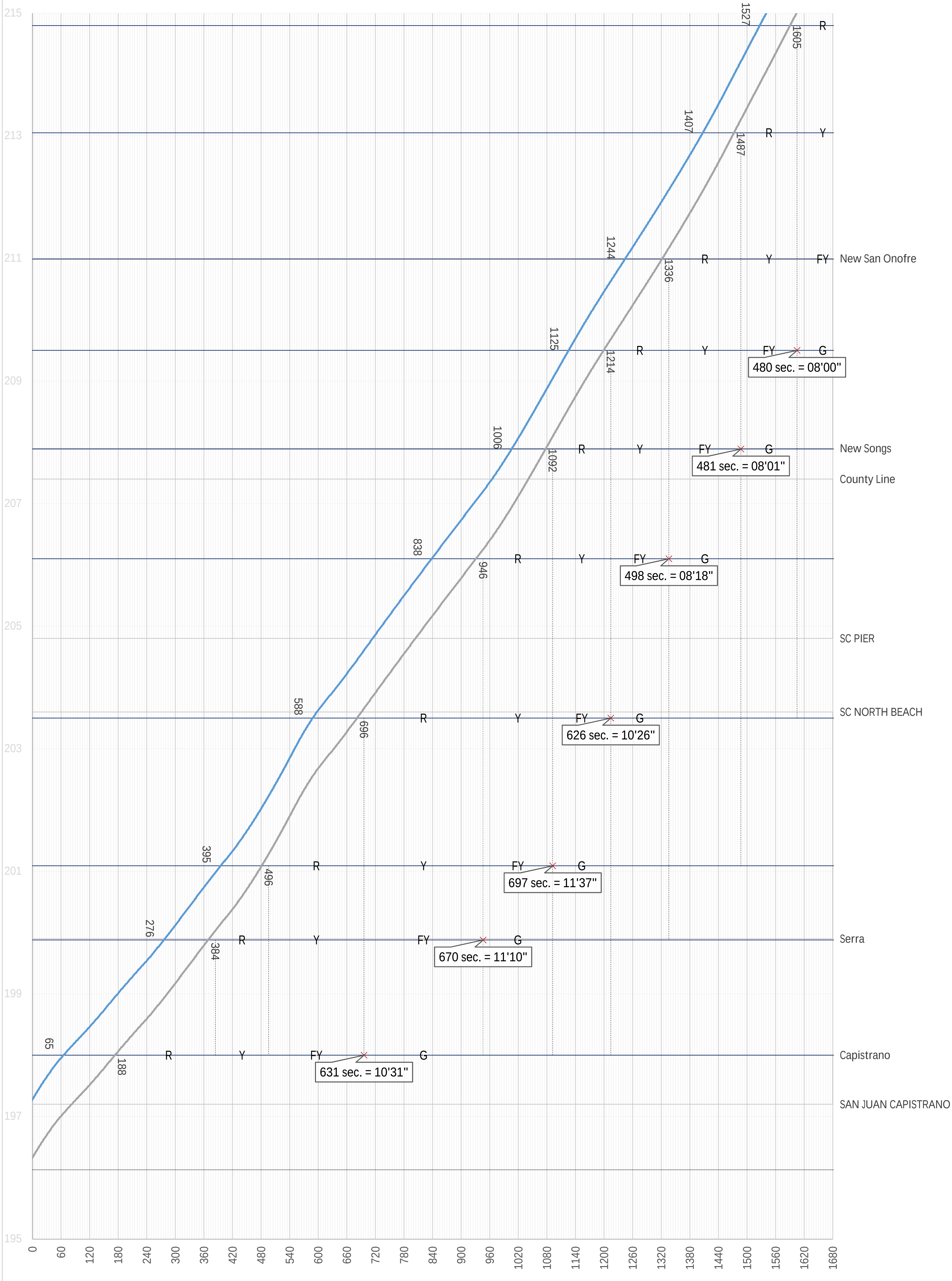


# APPENDIX E

## 2035A SCENARIO HEADWAY ANALYSIS (WITH SIGNAL RESPACING OPTIONS): ANNOTATED MODIFIED STRINGLINE DIAGRAM

# Appendix E-1: 2035A Case Headway Calculation - Freight Control Train (EB: Re-spaced)



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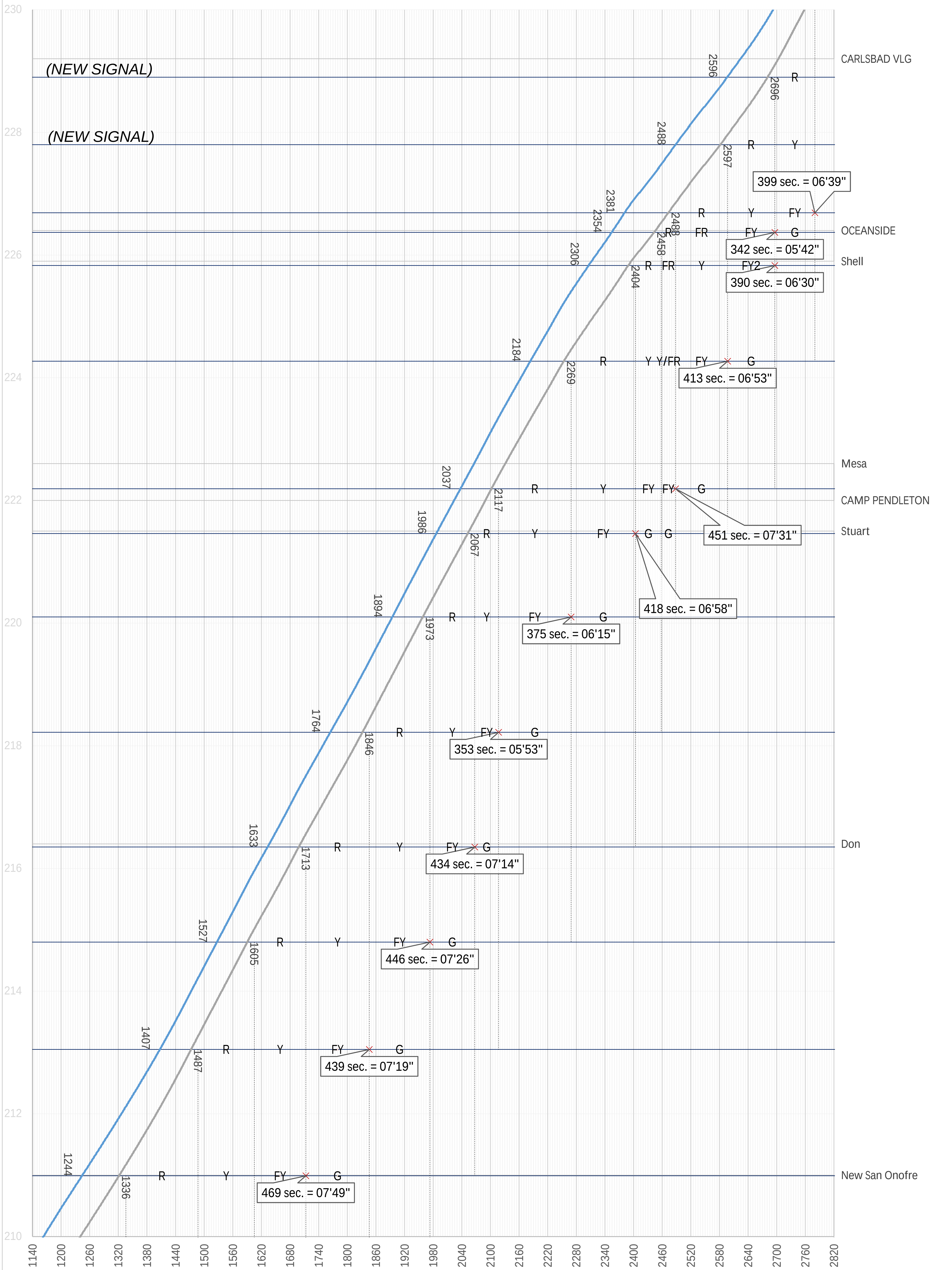

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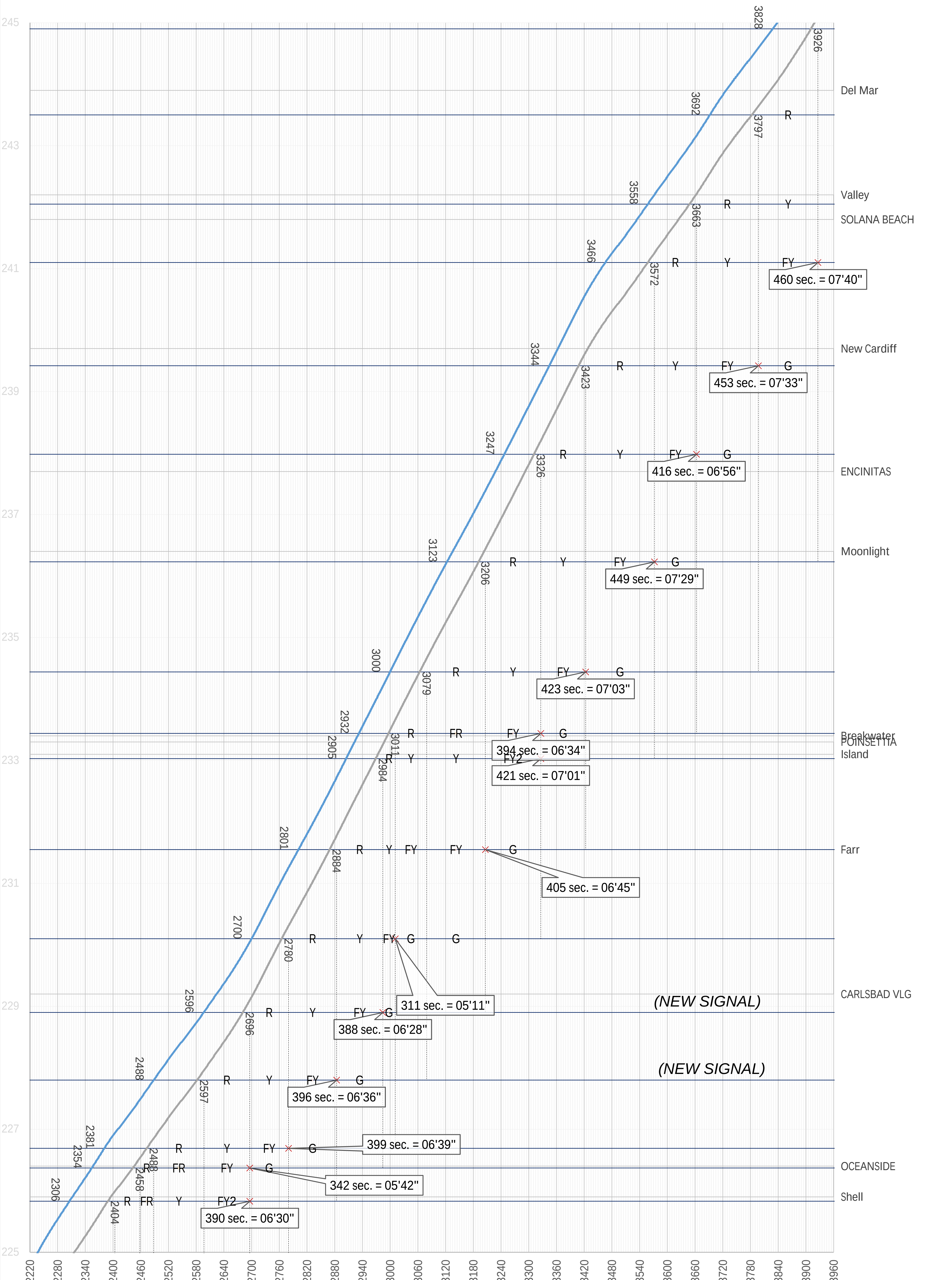

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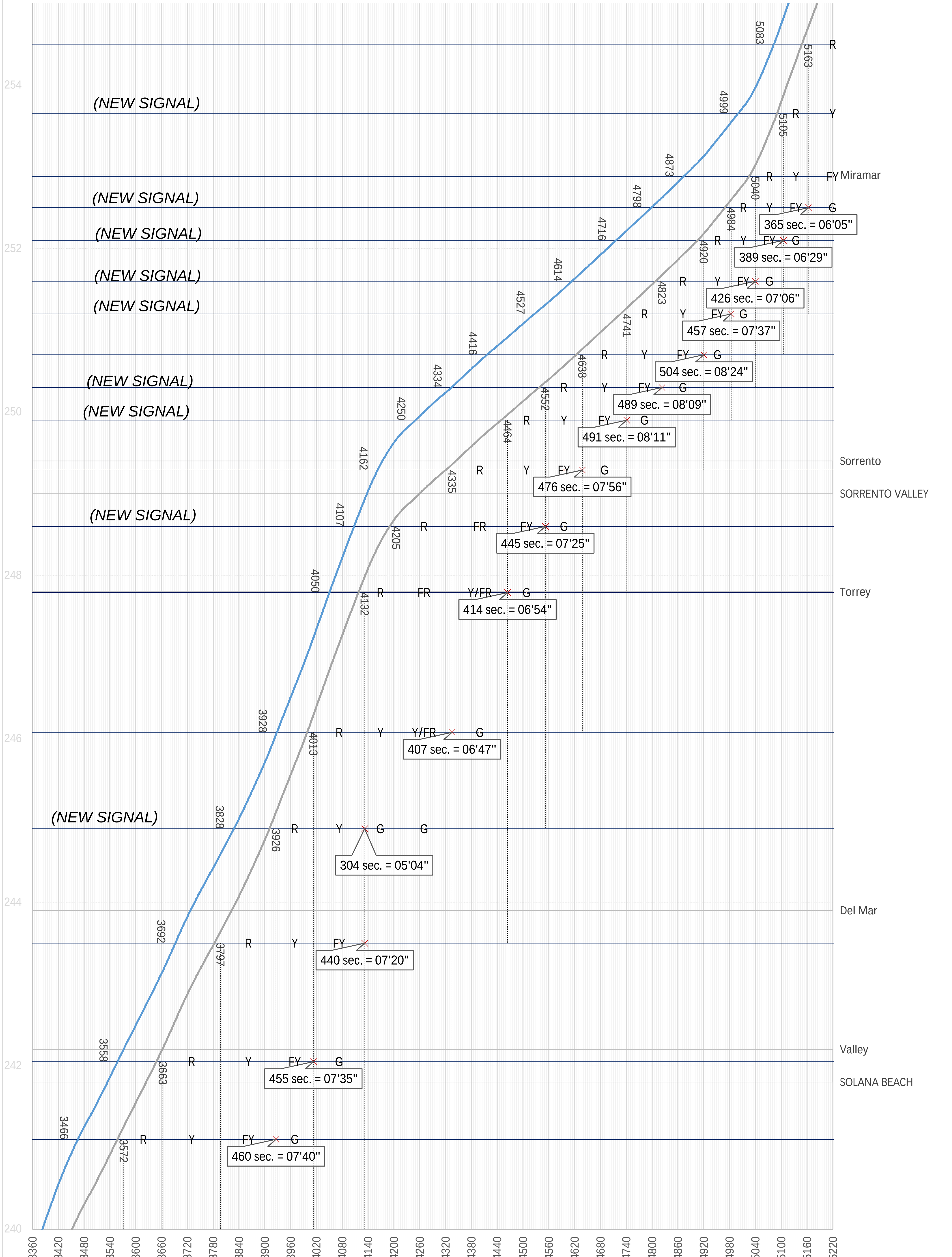

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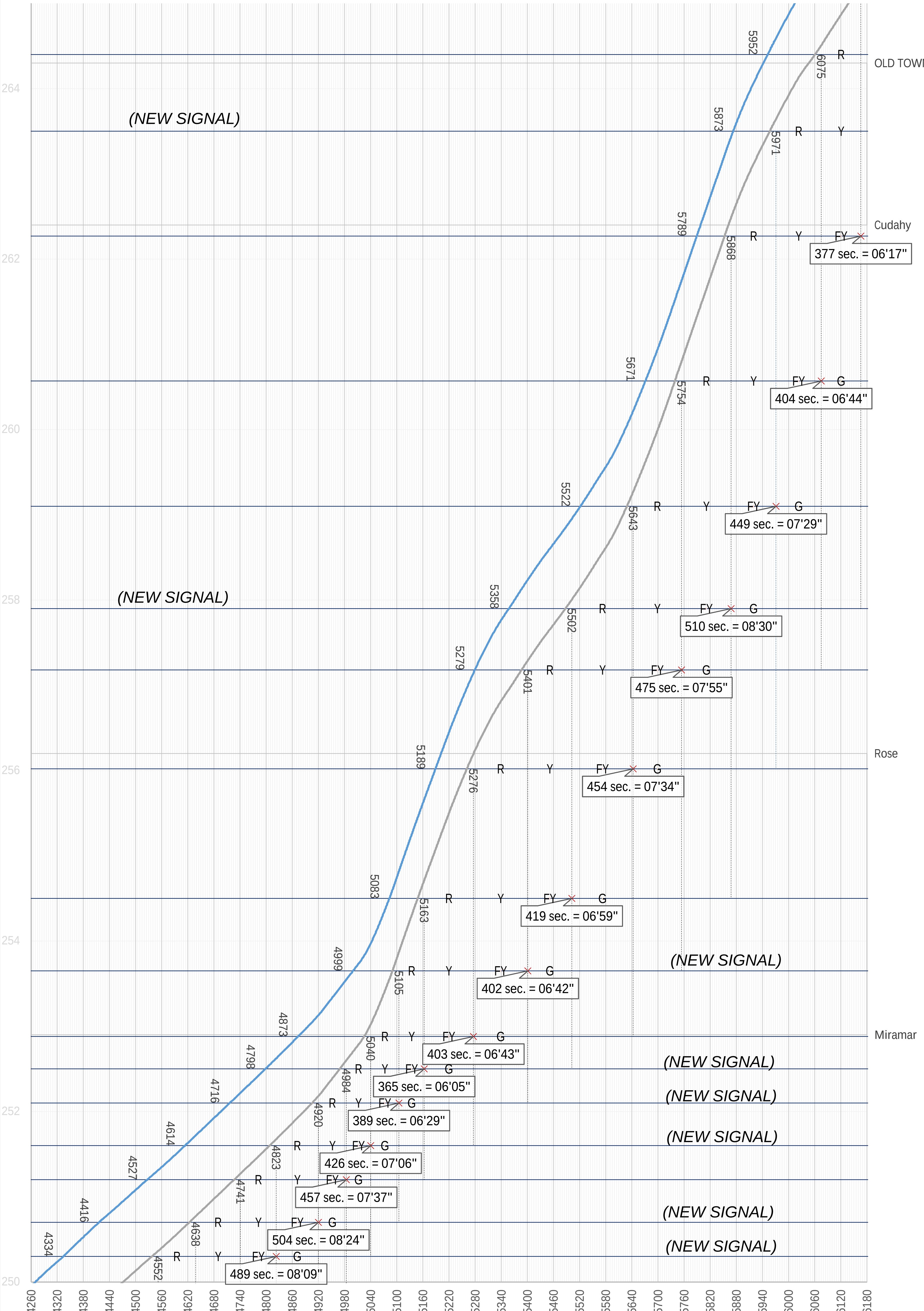

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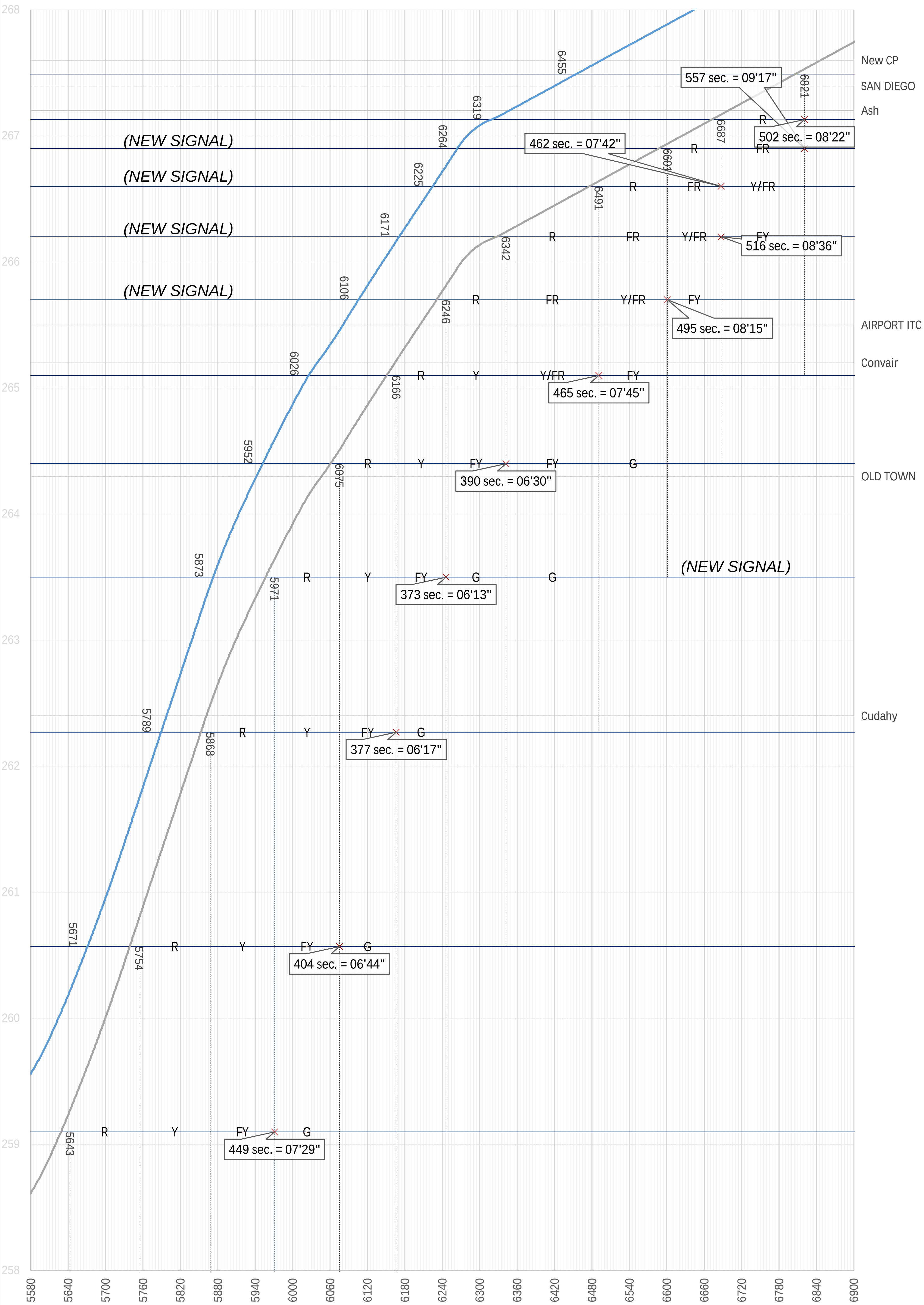

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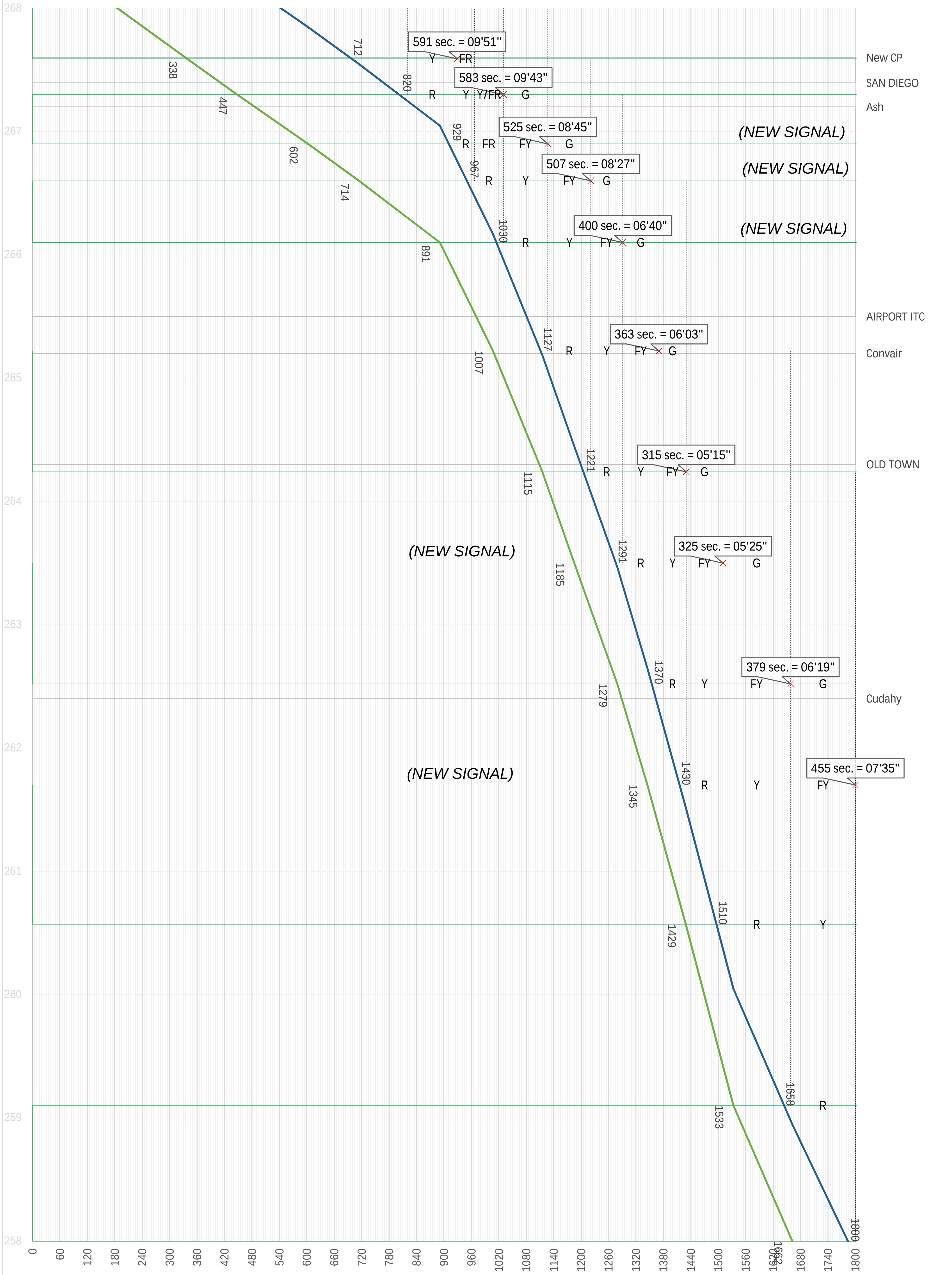

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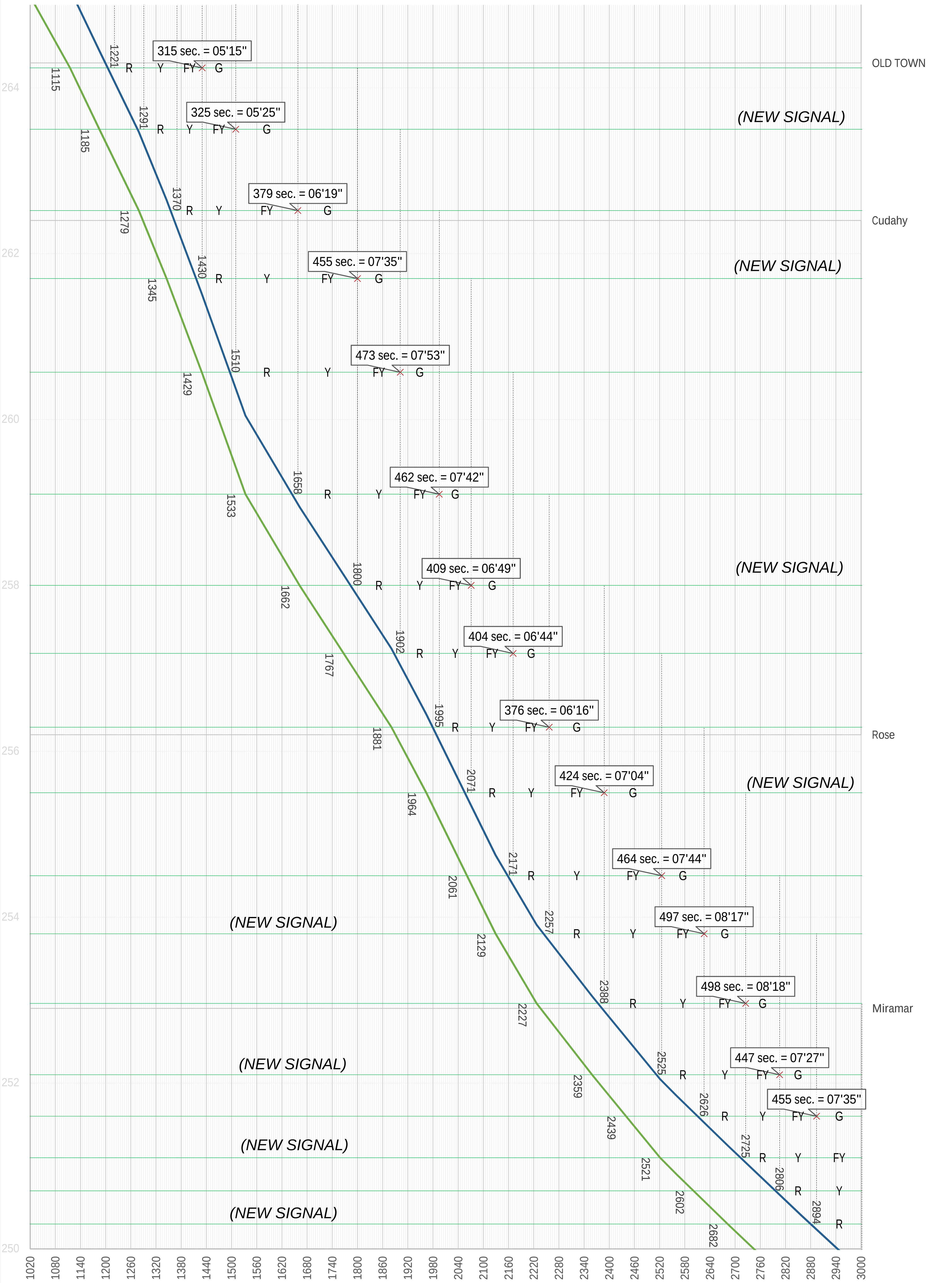

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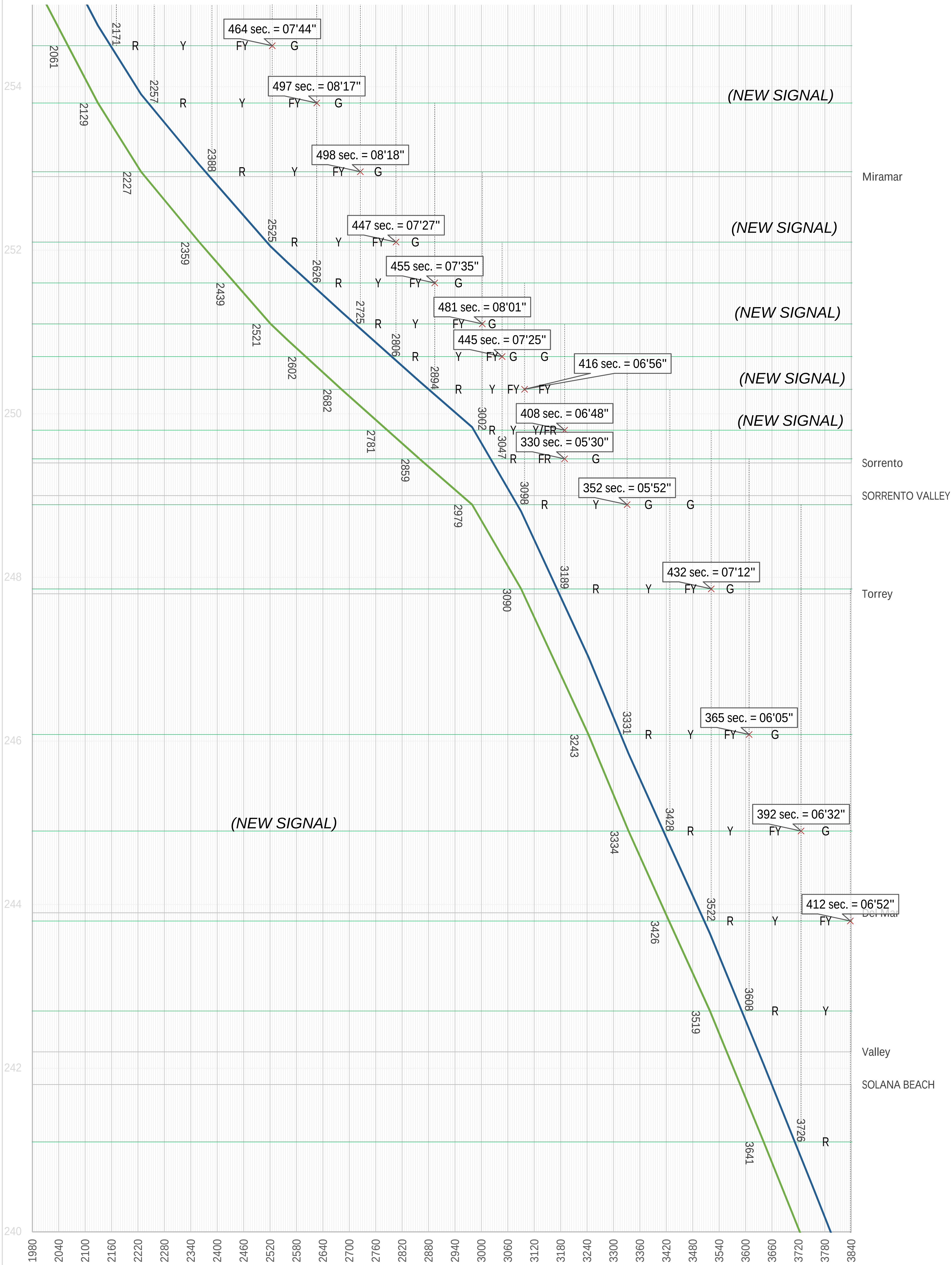

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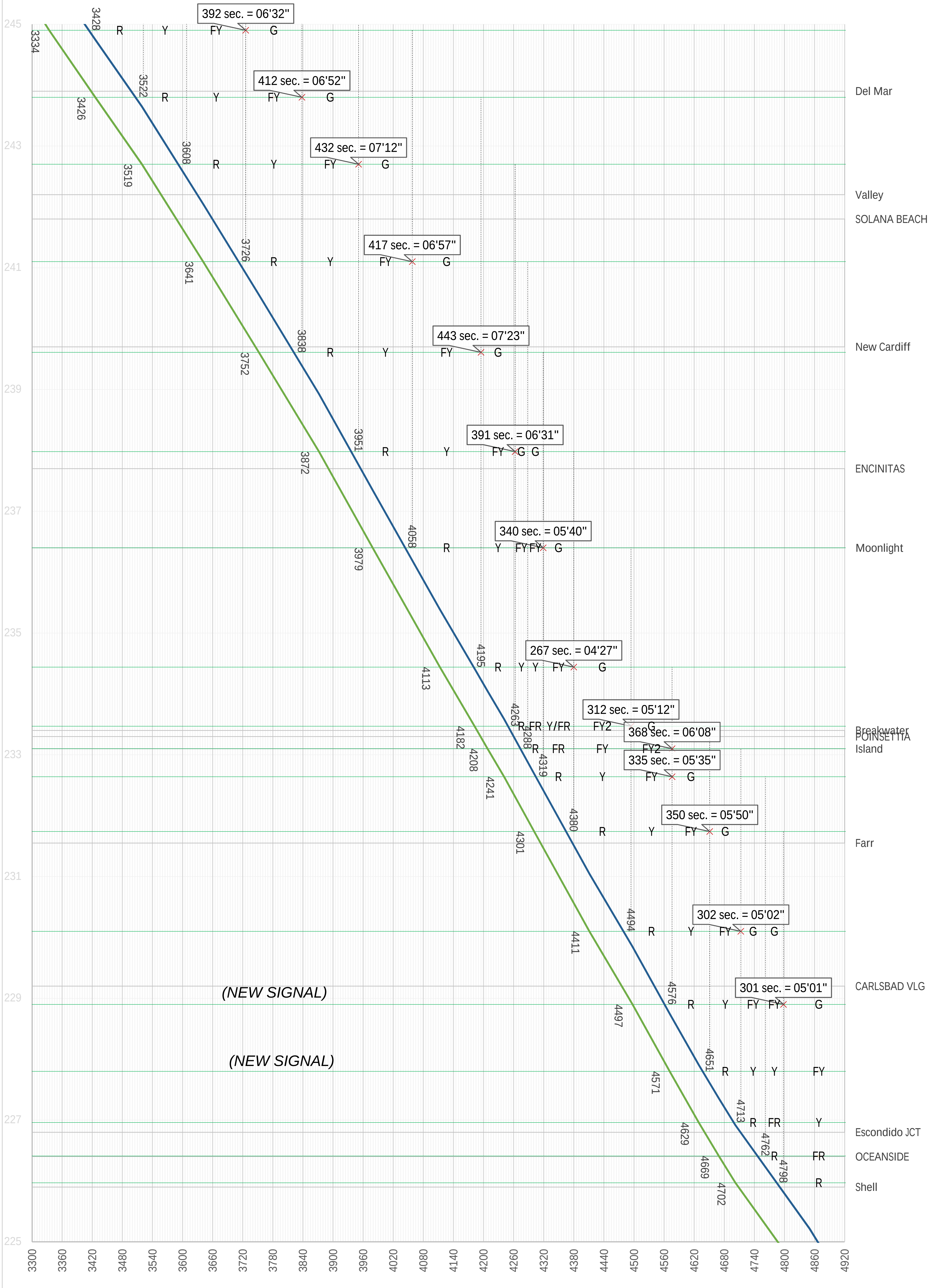

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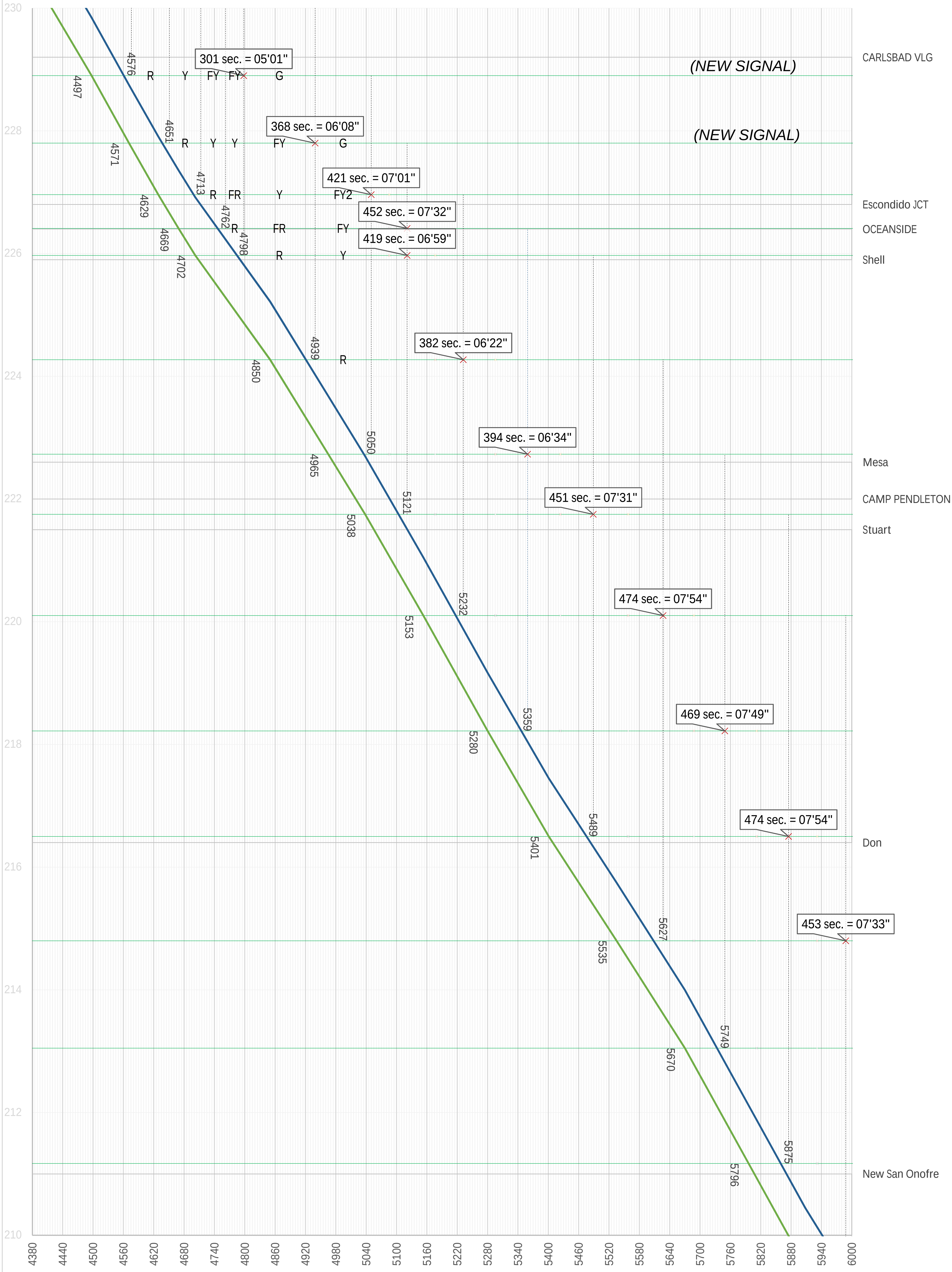

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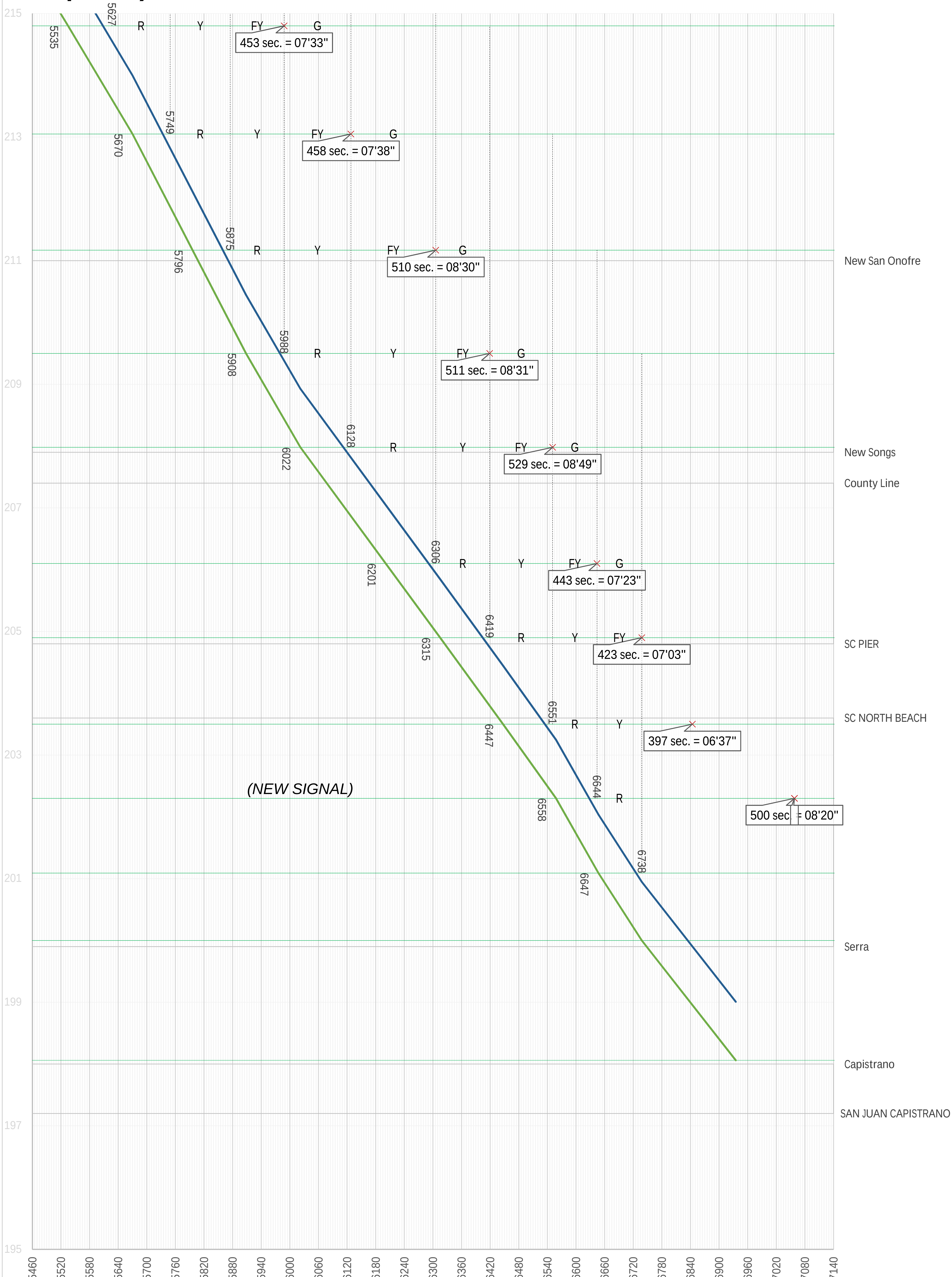

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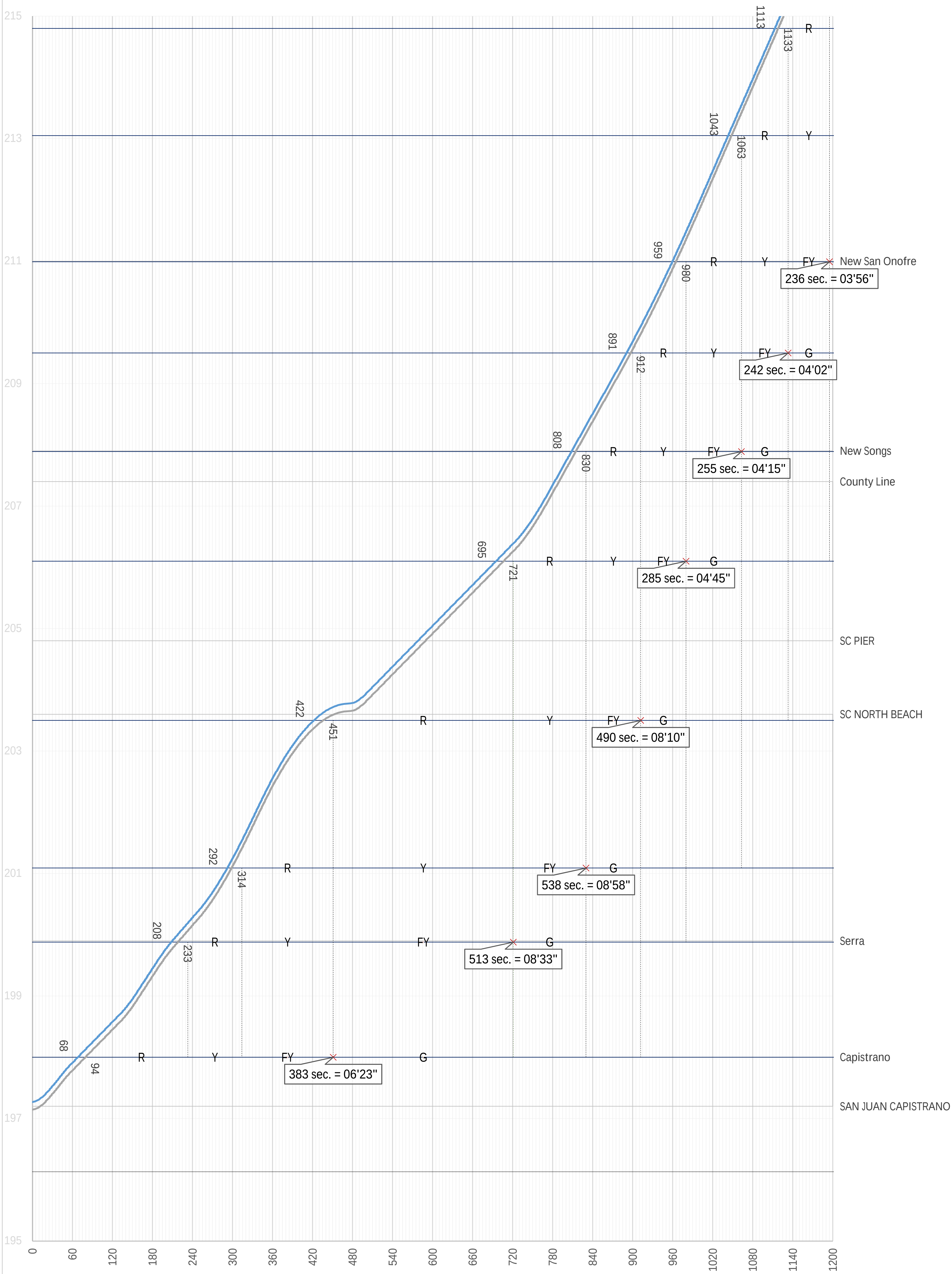

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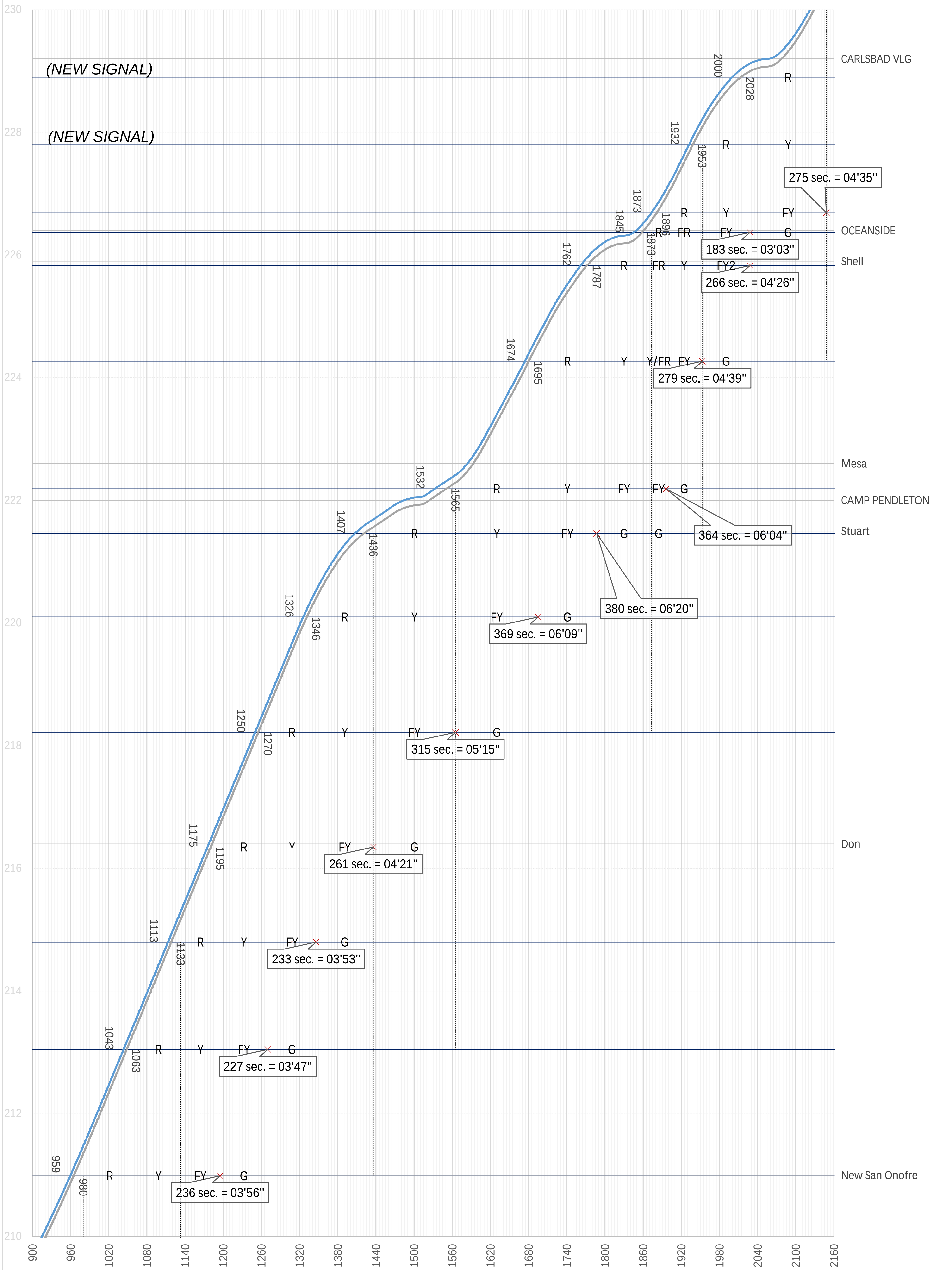

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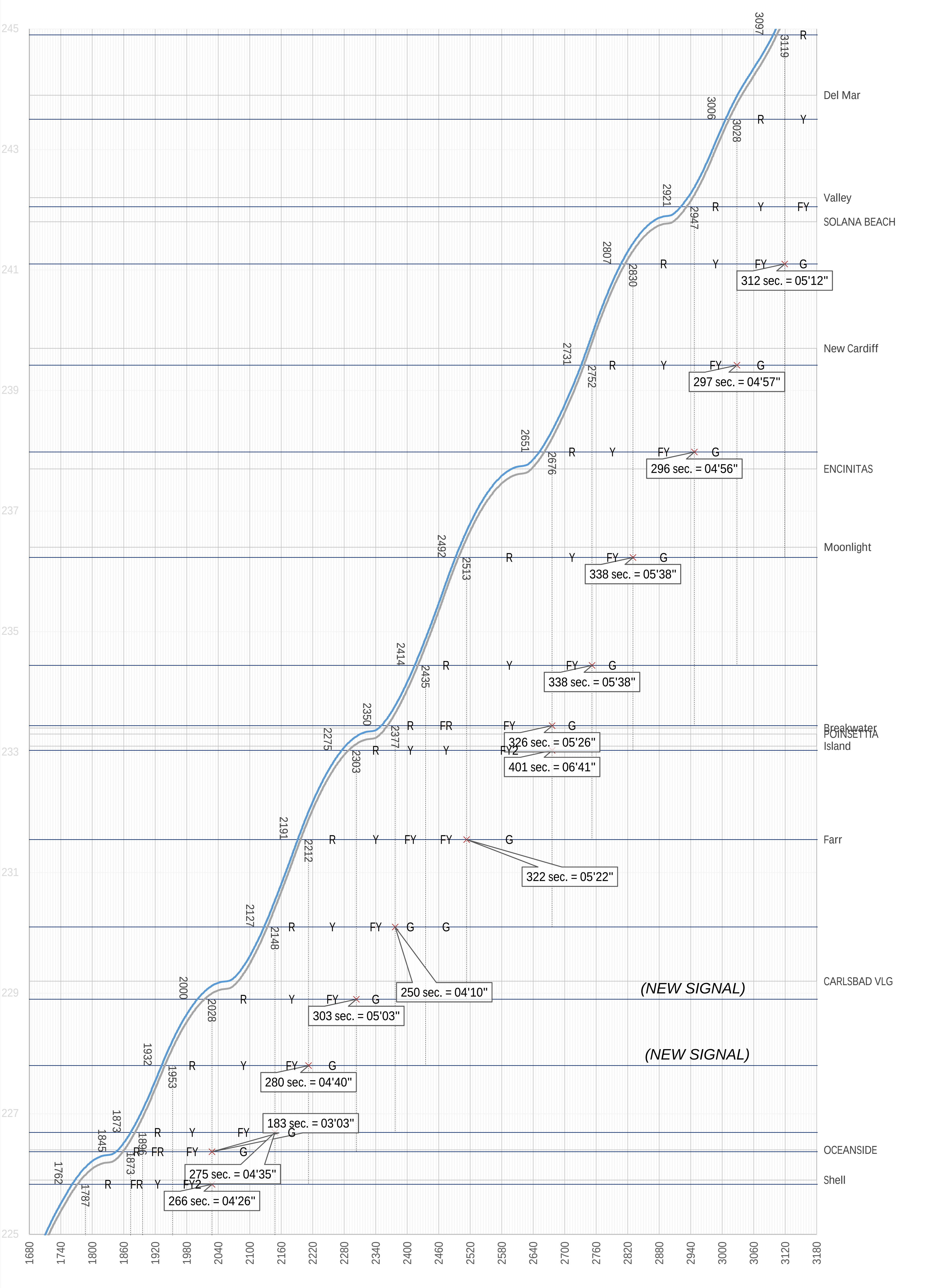

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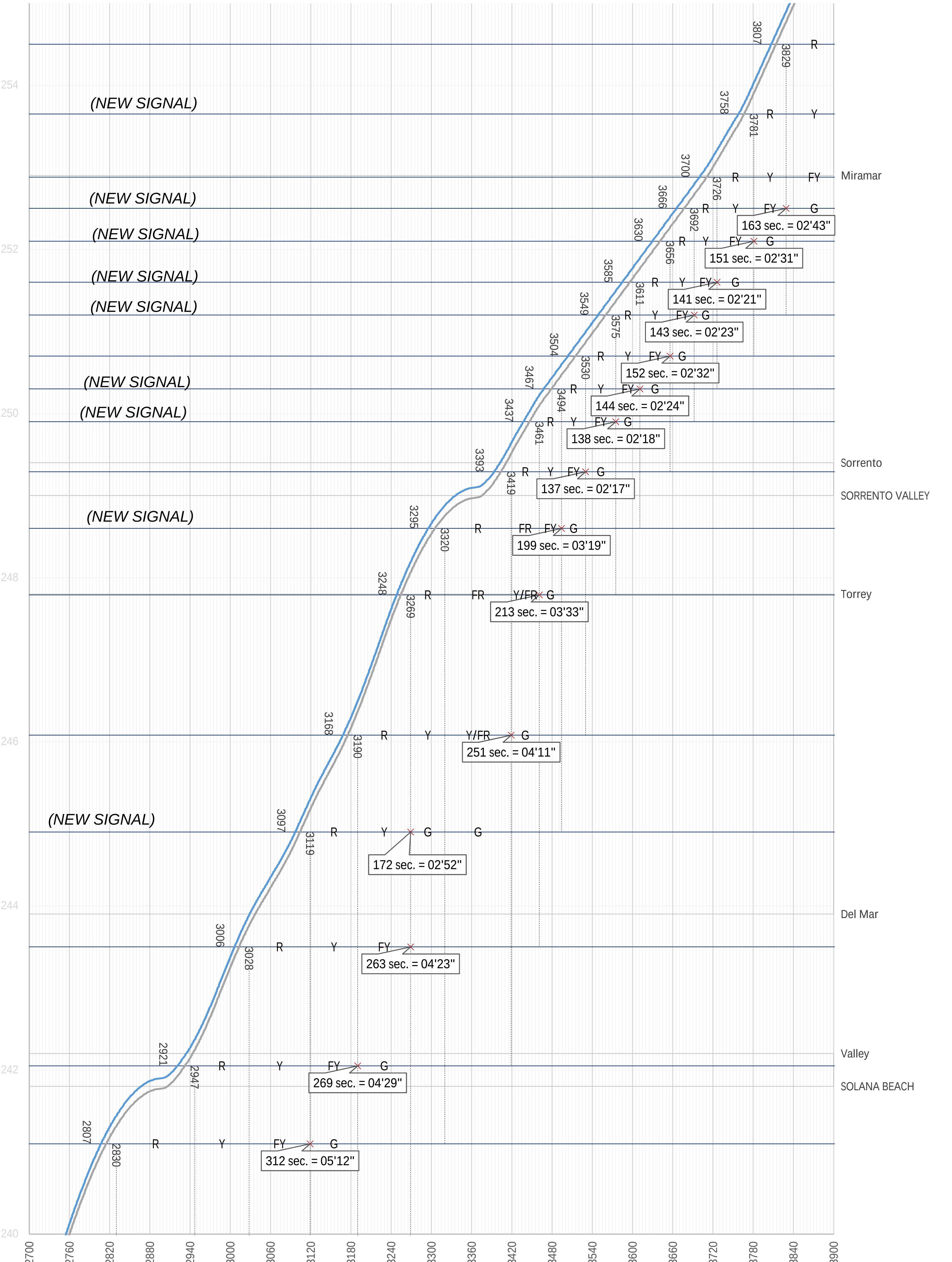

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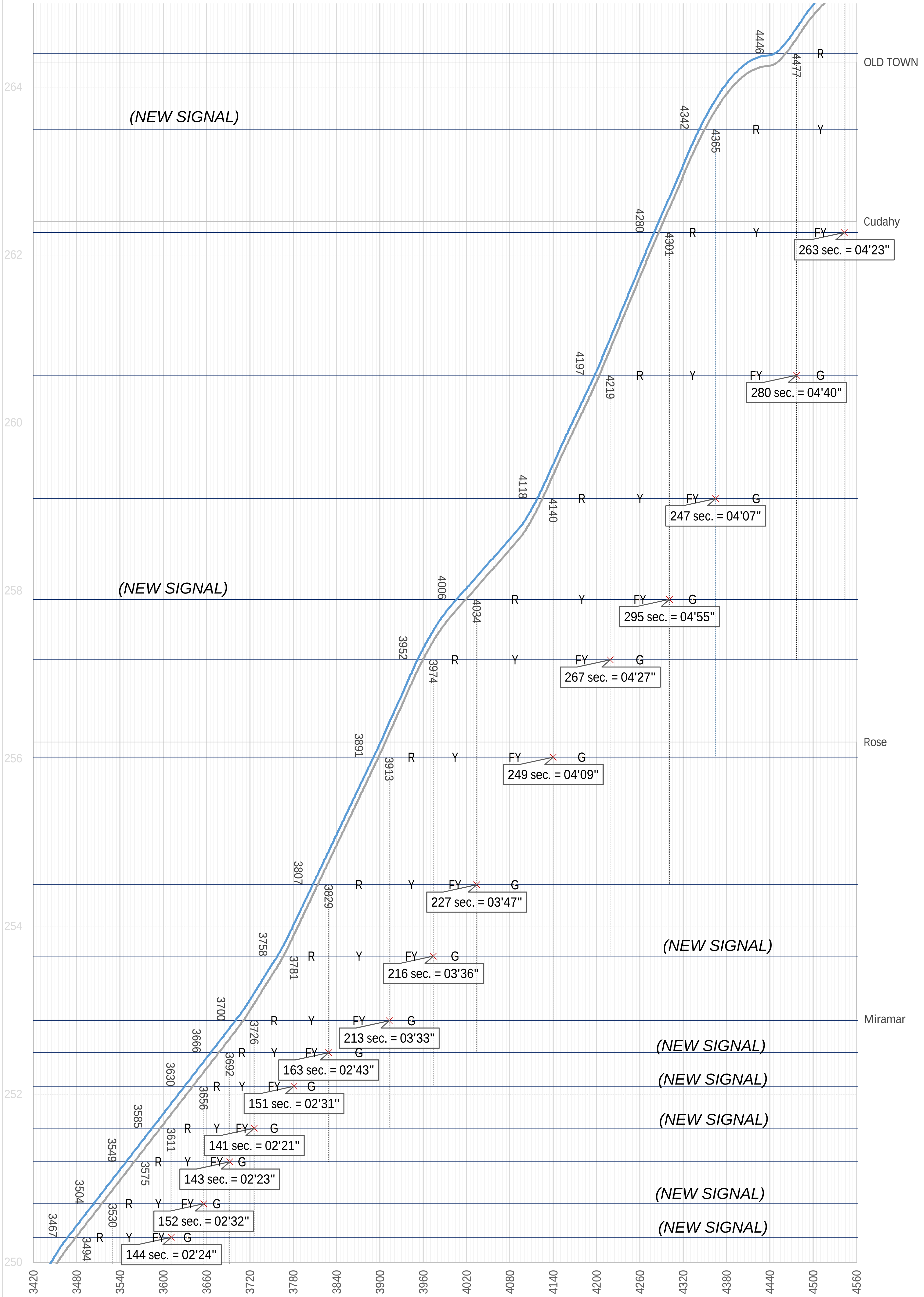

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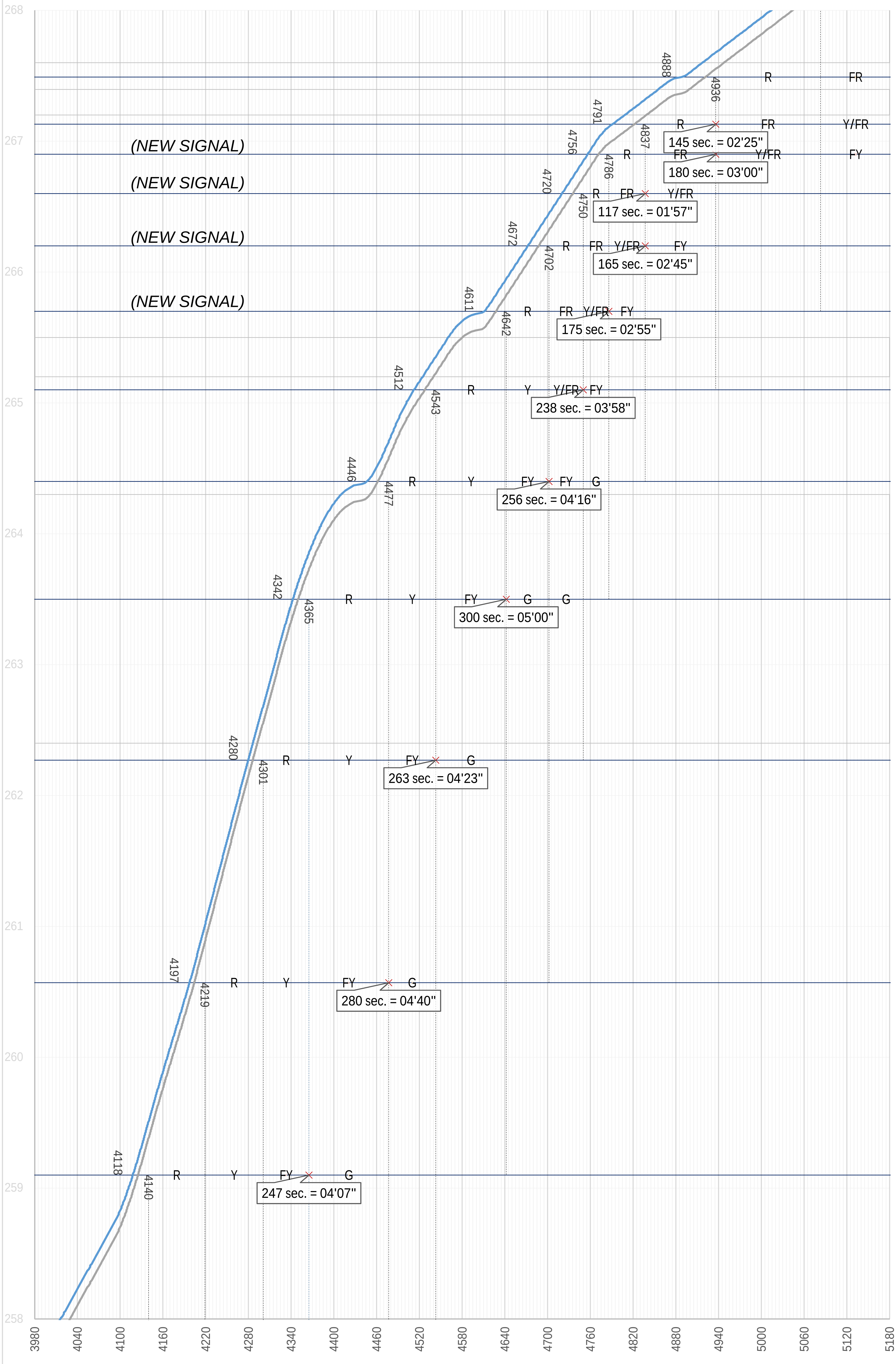

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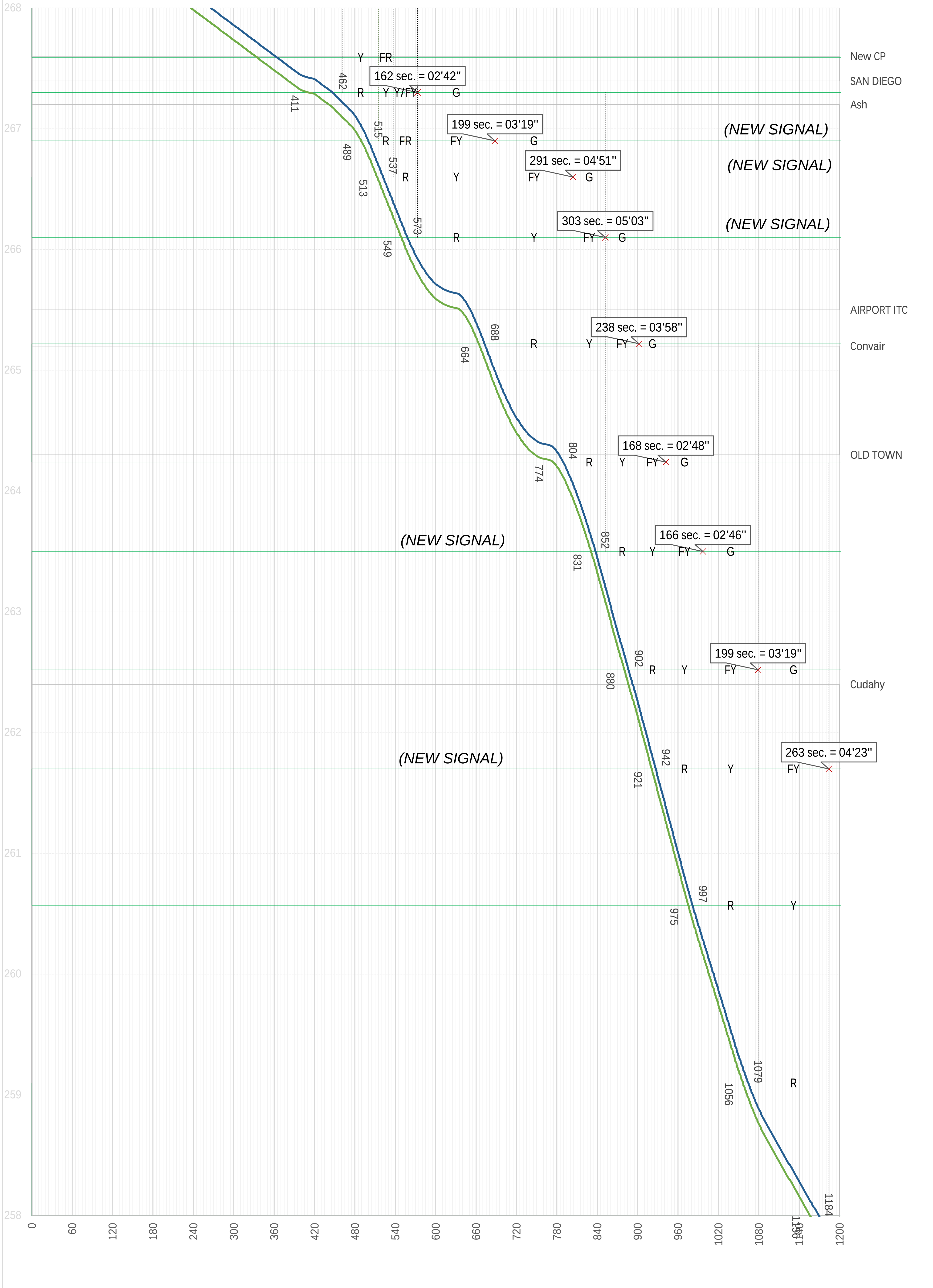

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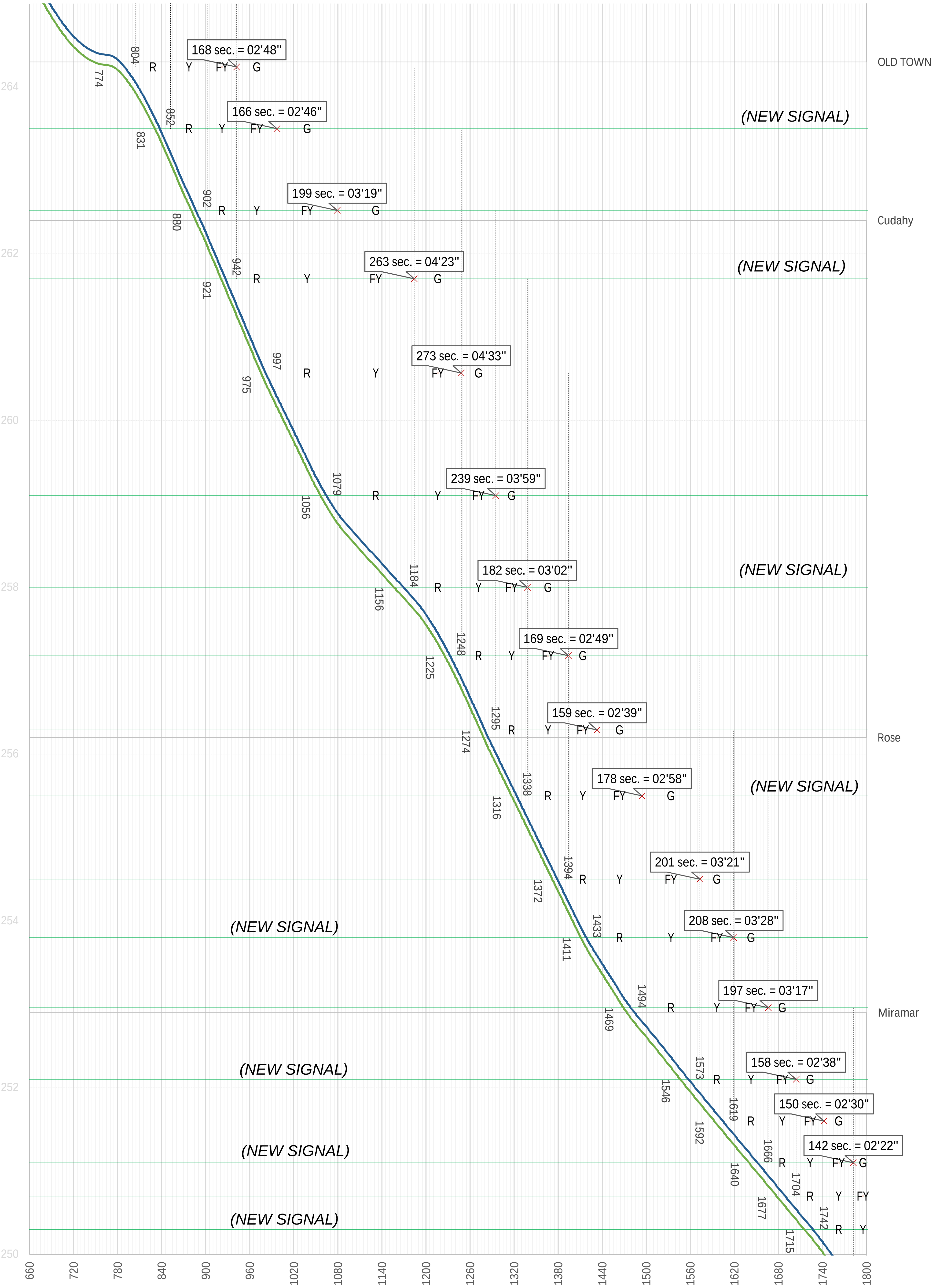

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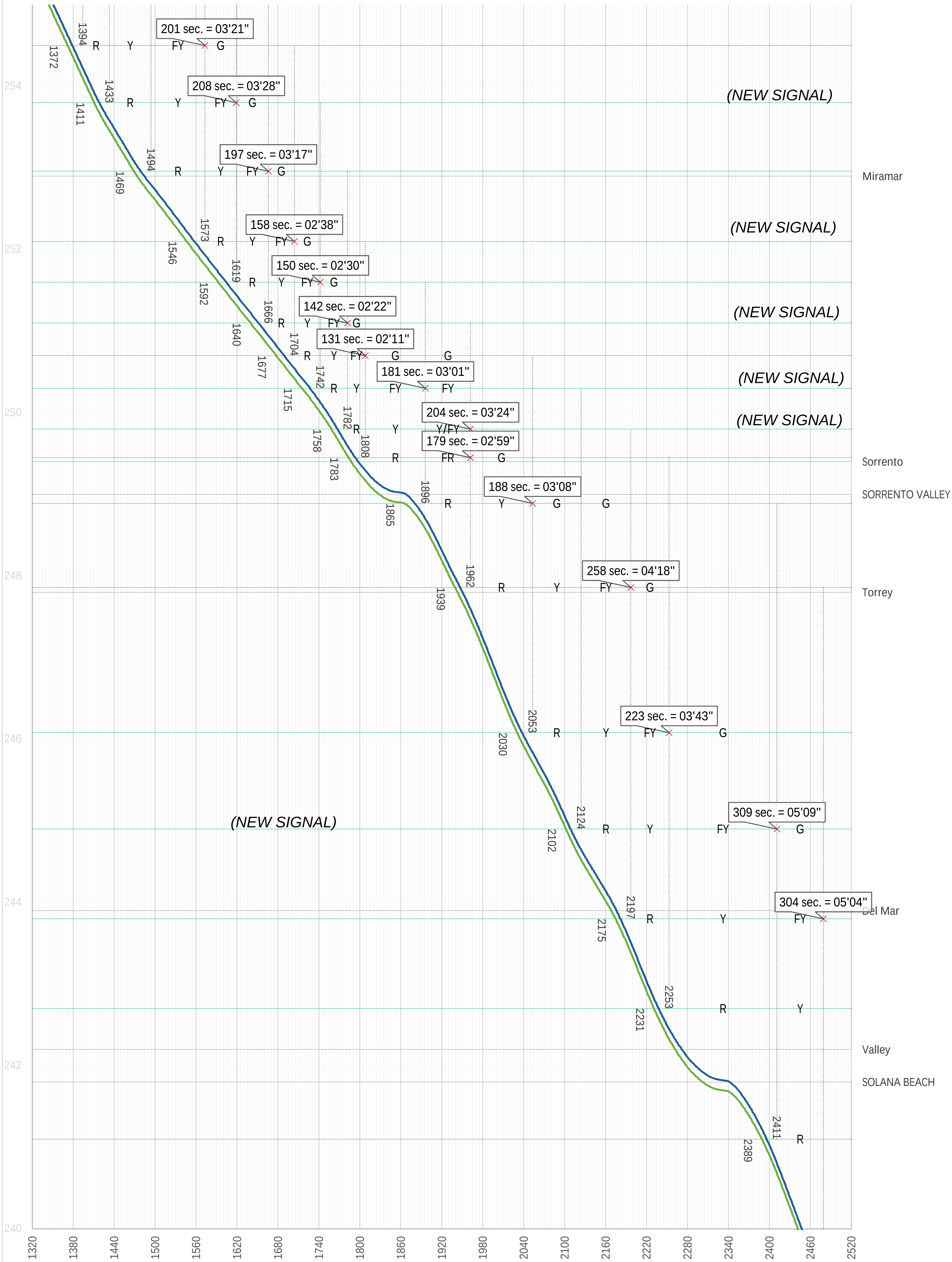

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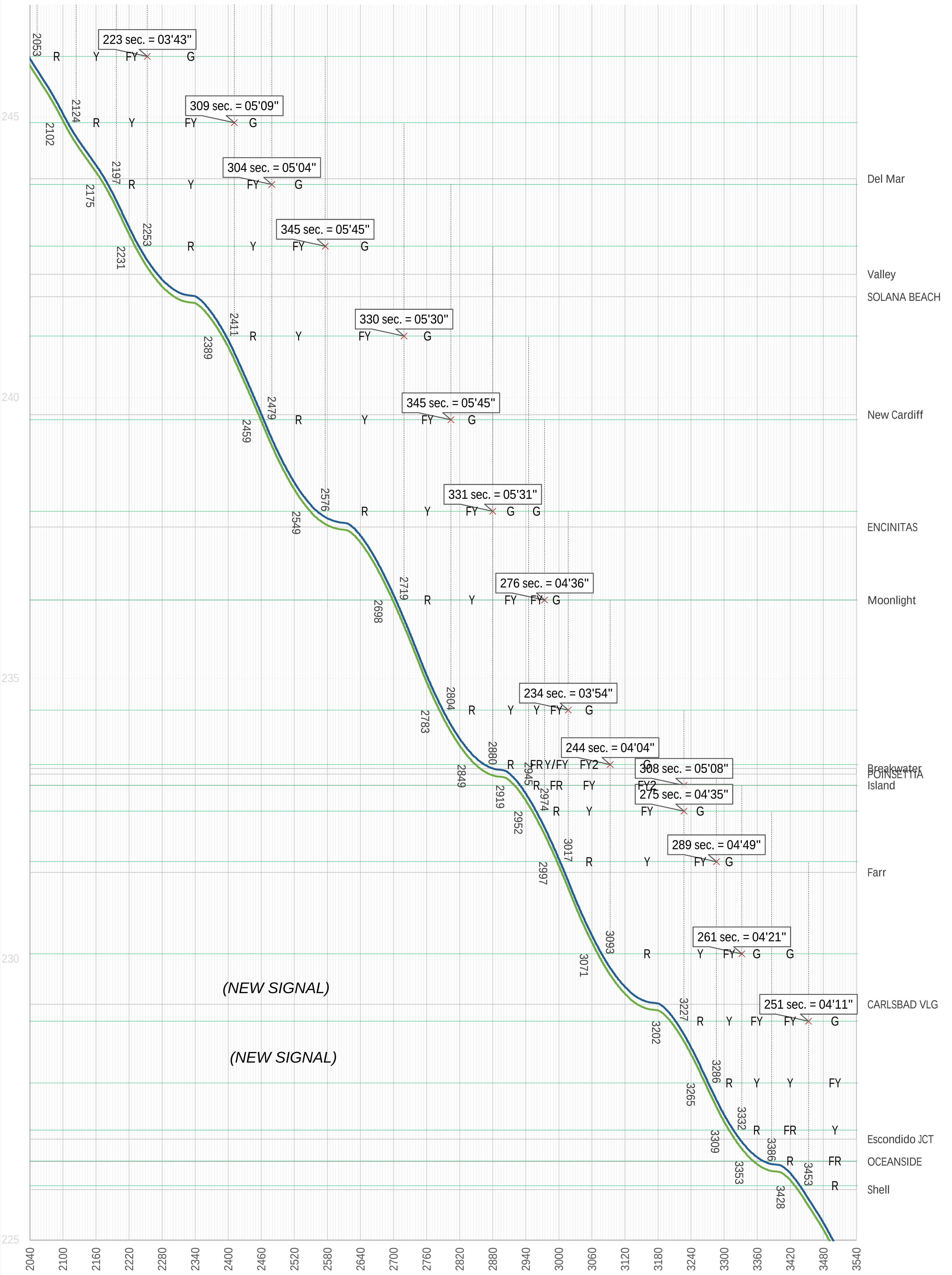

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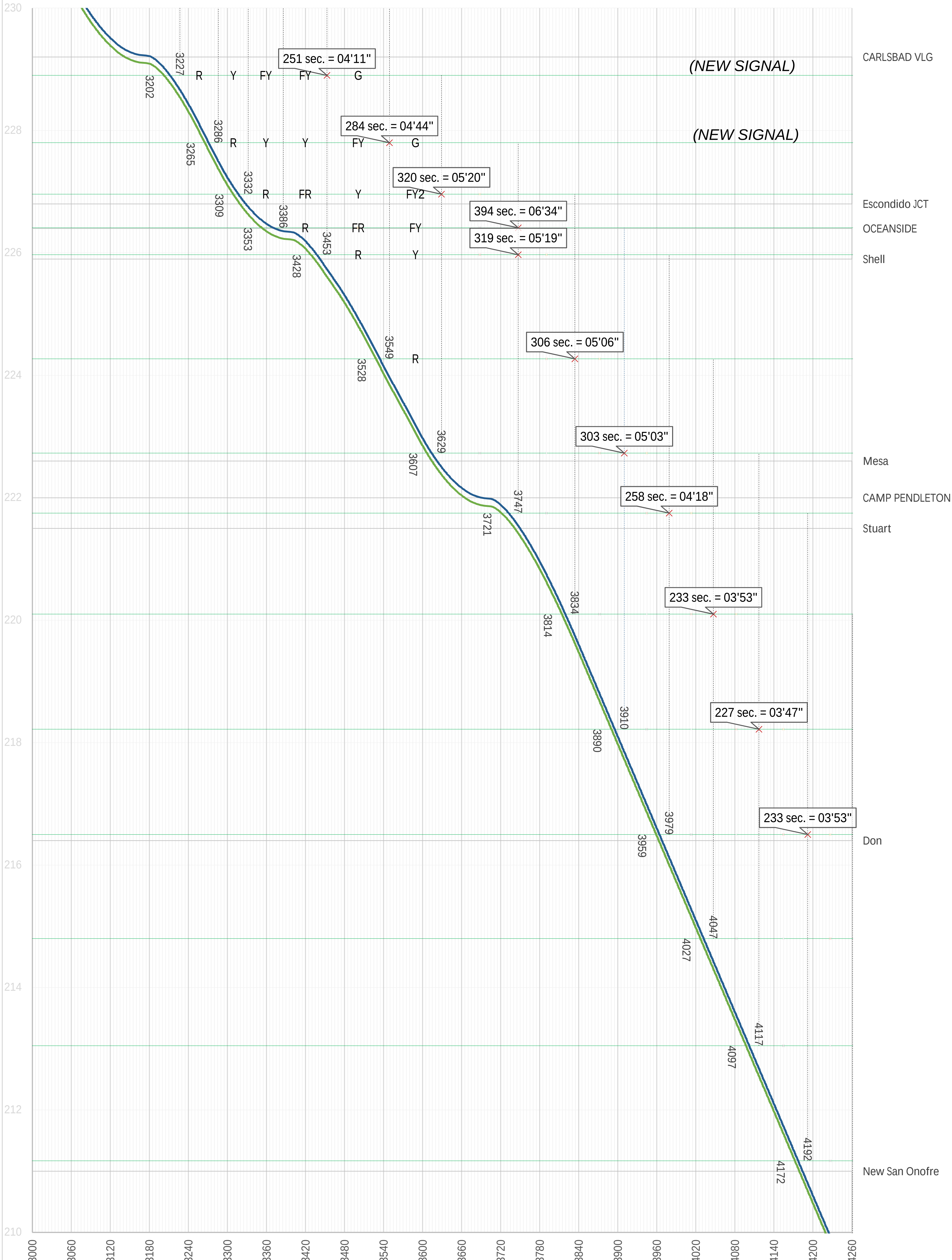

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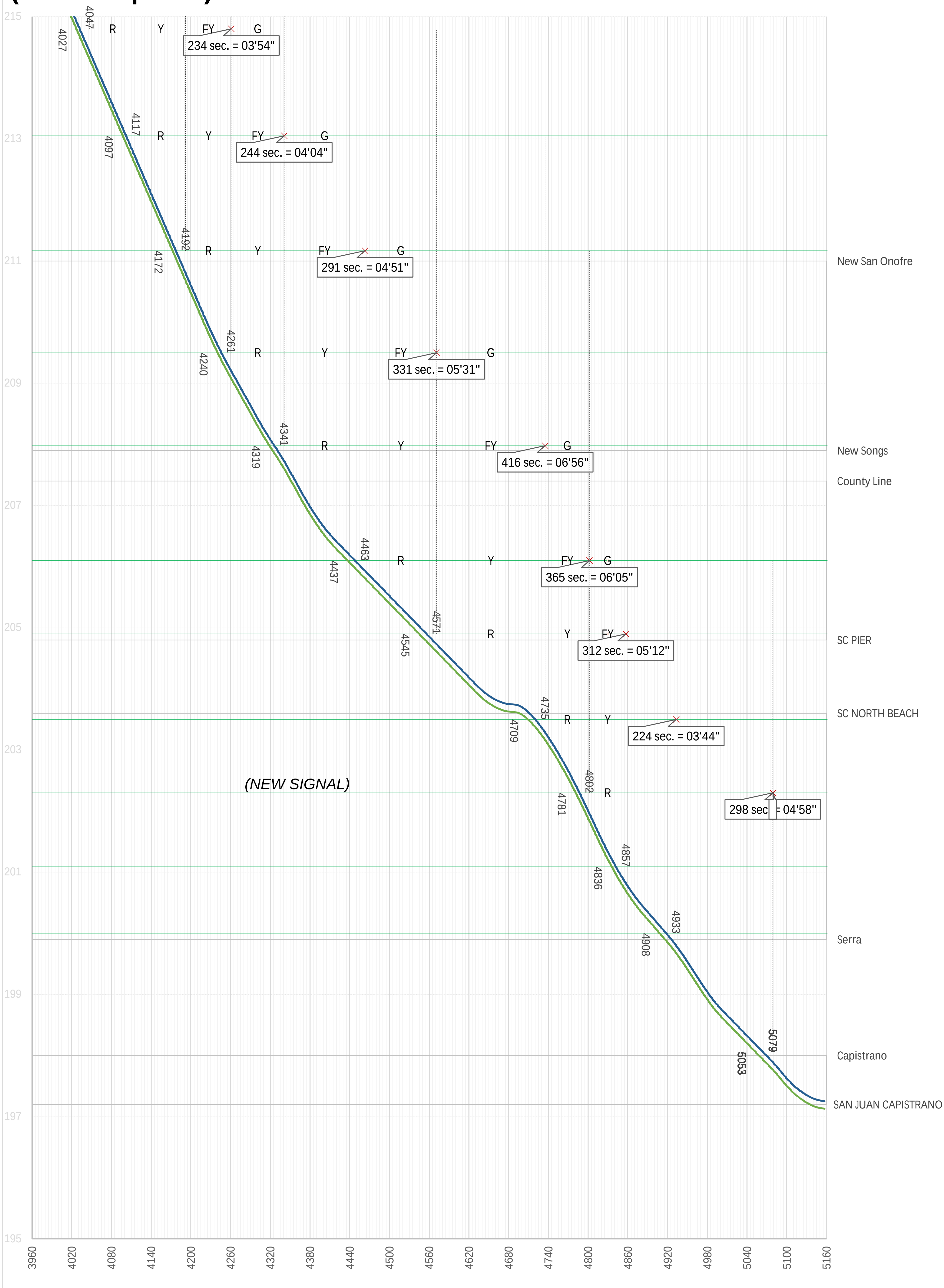
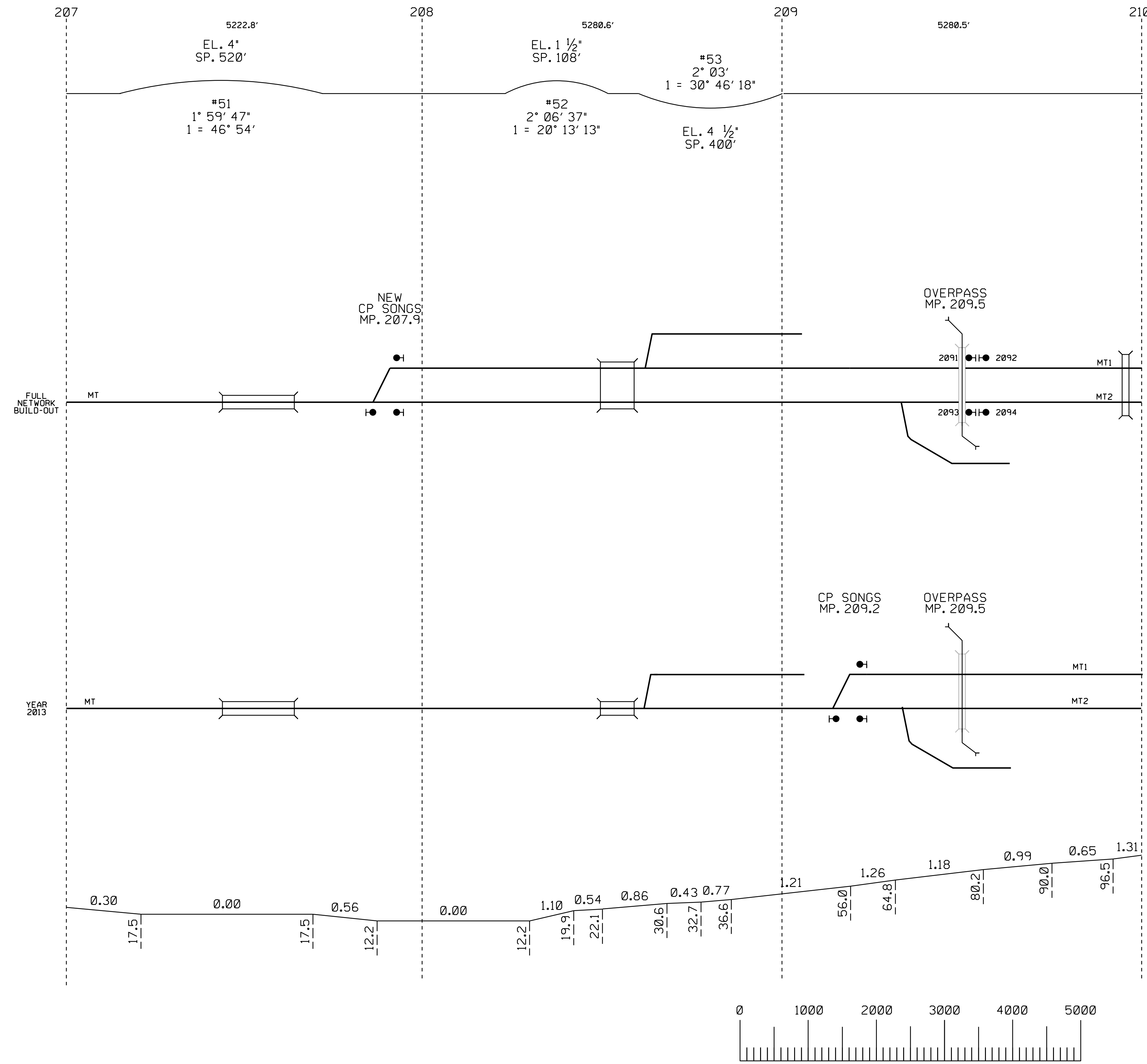


# APPENDIX F

## 2035A SCENARIO SCHEMATIC TRACK DIAGRAM WITH PROPOSED SIGNAL MODIFICATIONS

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Information confidential all plans, drawings, specifications, and or information furnished herewith shall remain the property of the San Diego North County Transit District and shall be held confidential and shall not be used for any purpose not provided for in agreements with the San Diego North County Transit District.

DESIGNED BY XX
DRAWN BY XX
CHECKED BY XX
APPROVED BY XX
DATE NOV 2012

PRE PACIFIC RAILWAY ENTERPRISES, INC.
3560 University Avenue, Suite F
Riverside, California 92501

NCTD San Diego North County Transit District

APPROVED:_______________ DATE:________

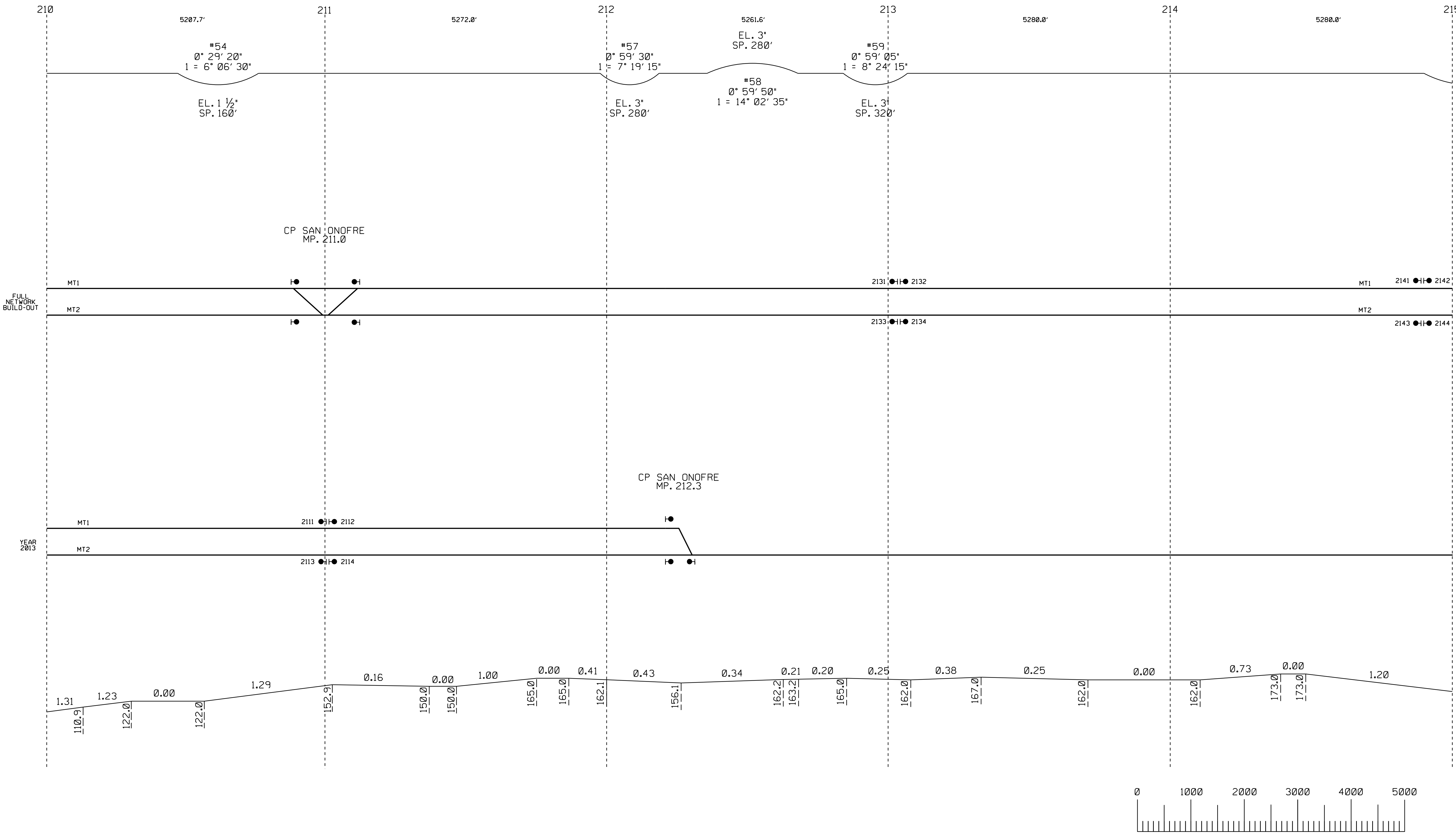
(PRIME CONSULTANT LOGO)

SANDAG San Diego's Regional Planning Agency

APPROVED:_______________ DATE:________

SAN DIEGO SUBDIVISION
FULL NETWORK BUILD-OUT
SIGNAL SYSTEM CONCEPT
MP. 207 TO MP. 210

CONTRACT NO.
DRAWING NO. SAD207_210_TC
REVISION
SHEET NO. ##
SCALE

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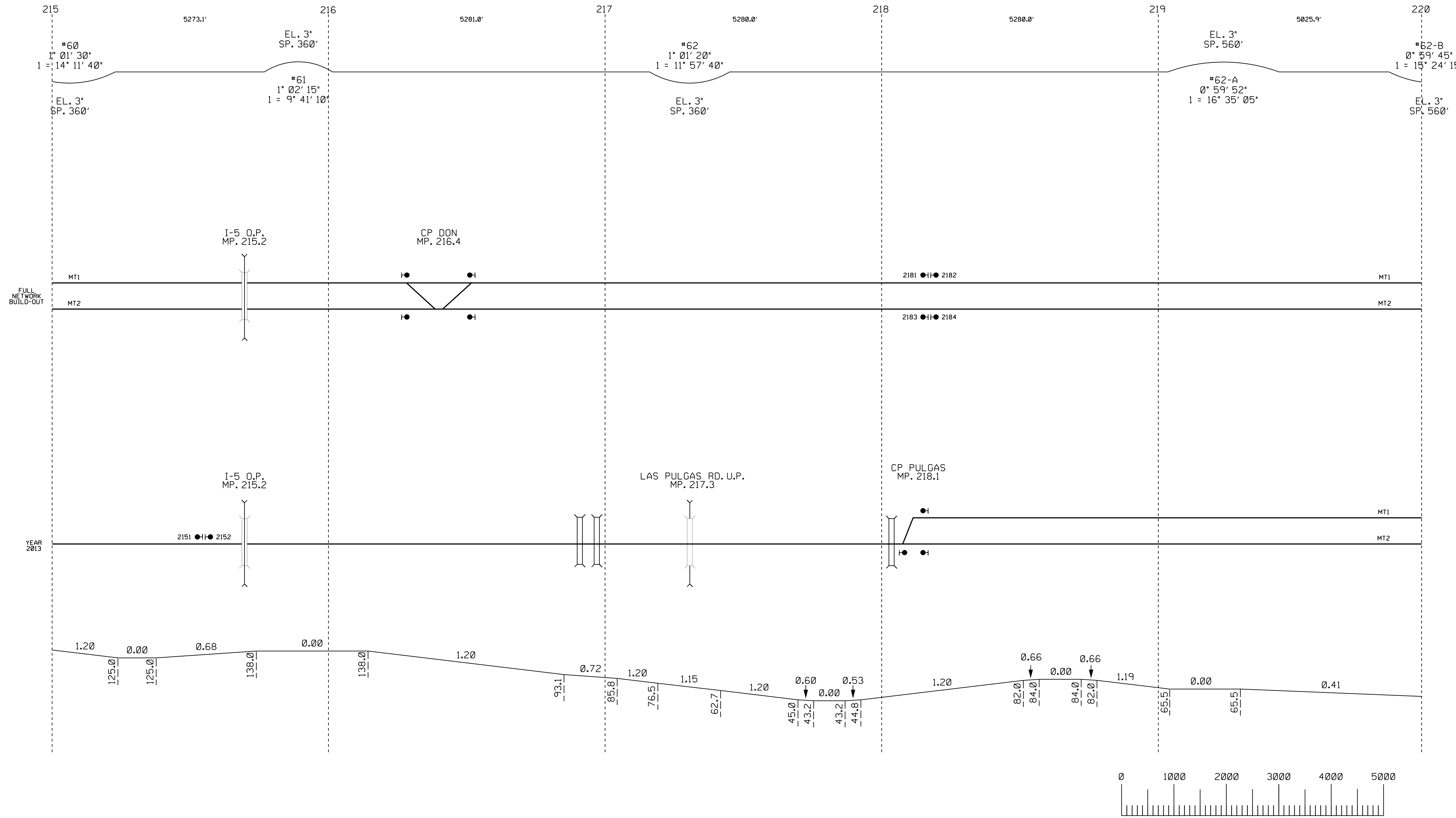
FULL NETWORK BUILD-OUT
SIGNAL SYSTEM CONCEPT
MP. 210 TO MP. 215

CONTRACT NO.
DRAWING NO. SAD210_215_TC
REVISION
SHEET NO. ##
SCALE

DRAFT 11-27-2012

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3560 University Avenue, Suite F
Riverside, California 92501

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NCTD San Diego North County Transit District

SANDAG San Diego's Regional Planning Agency

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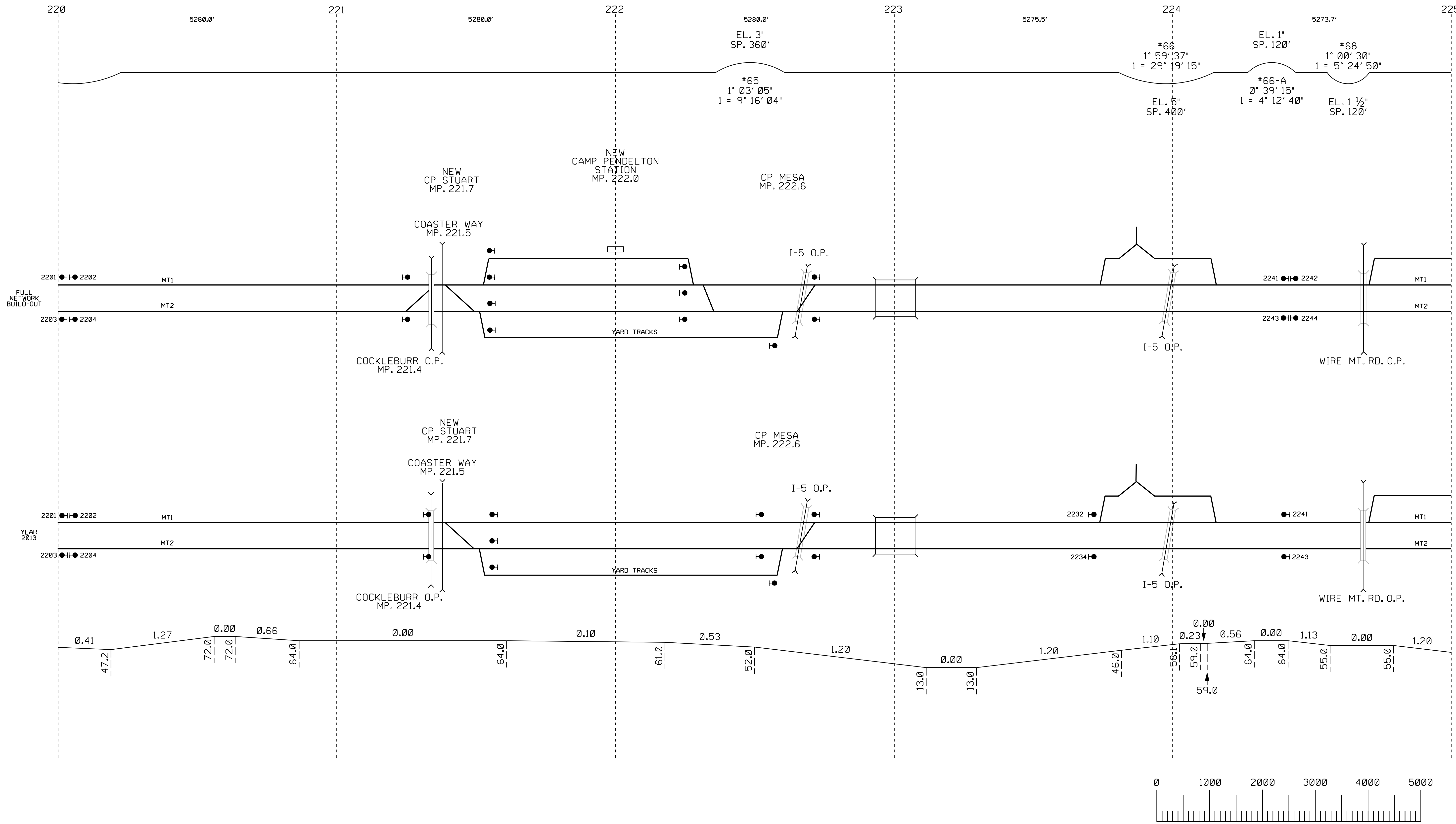
SAN DIEGO SUBDIVISION
FULL NETWORK BUILD-OUT
SIGNAL SYSTEM CONCEPT
MP. 215 TO MP. 220

CONTRACT NO.
DRAWING NO. SAD215_220_TC
REVISION
SHEET NO. ##
SCALE

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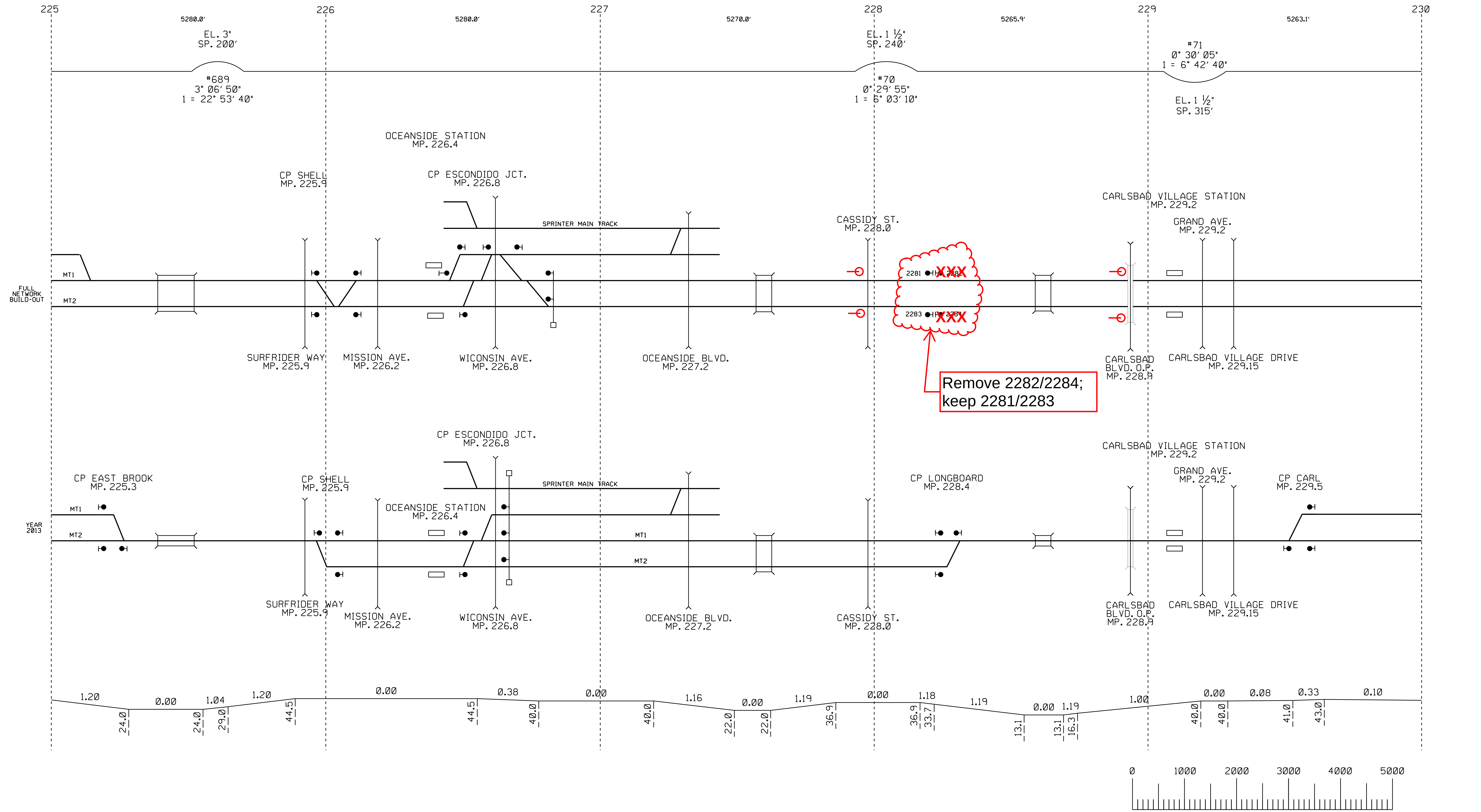
SAN DIEGO SUBDIVISION
FULL NETWORK BUILD-OUT
SIGNAL SYSTEM CONCEPT
MP. 220 TO MP. 225

CONTRACT NO.
DRAWING NO. SAD220_225_TC
REVISION
SHEET NO. ##
SCALE

DRAFT 11-27-2012

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APPROVED BY
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NOV 2012

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PACIFIC RAILWAY ENTERPRISES, INC.
3560 University Avenue, Suite F
Riverside, California 92501

(PRIME CONSULTANT LOGO)

N C T D
San Diego North County Transit District

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San Diego's Regional Planning Agency

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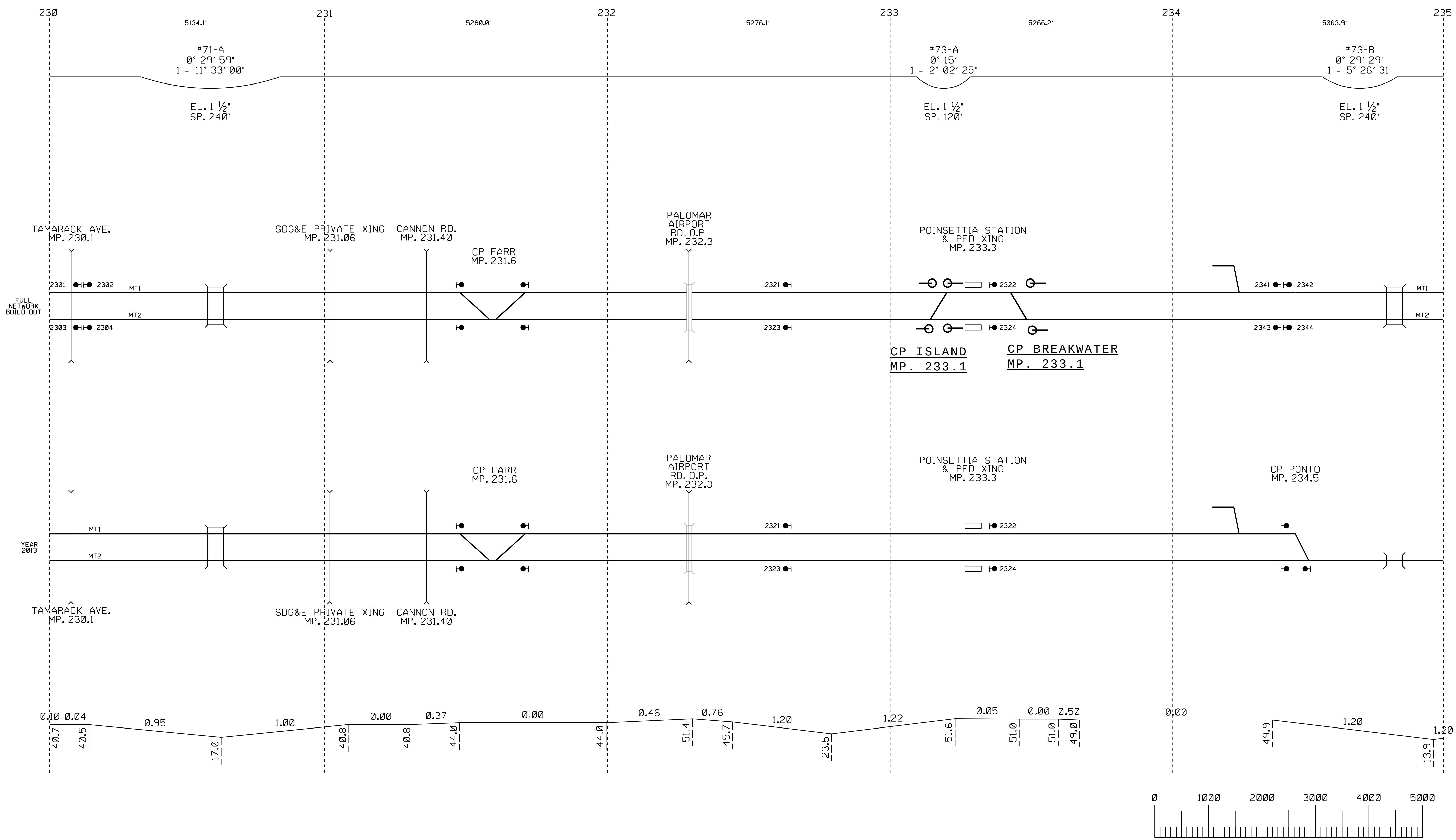
APPROVED:__________ DATE: ________

SAN DIEGO SUBDIVISION
FULL NETWORK BUILD-OUT
SIGNAL SYSTEM CONCEPT
MP. 225 TO MP. 230

CONTRACT NO.
DRAWING NO.
SAD225_230_TC
REVISION
SHEET NO.
##
SCALE

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DRAWN BY XX
CHECKED BY XX
APPROVED BY XX
DATE NOV 2012

PRE PACIFIC RAILWAY ENTERPRISES, INC.
3560 University Avenue, Suite F
Riverside, California 92501

NCTD San Diego North County Transit District

APPROVED:____________ DATE:________

(PRIME CONSULTANT LOGO)

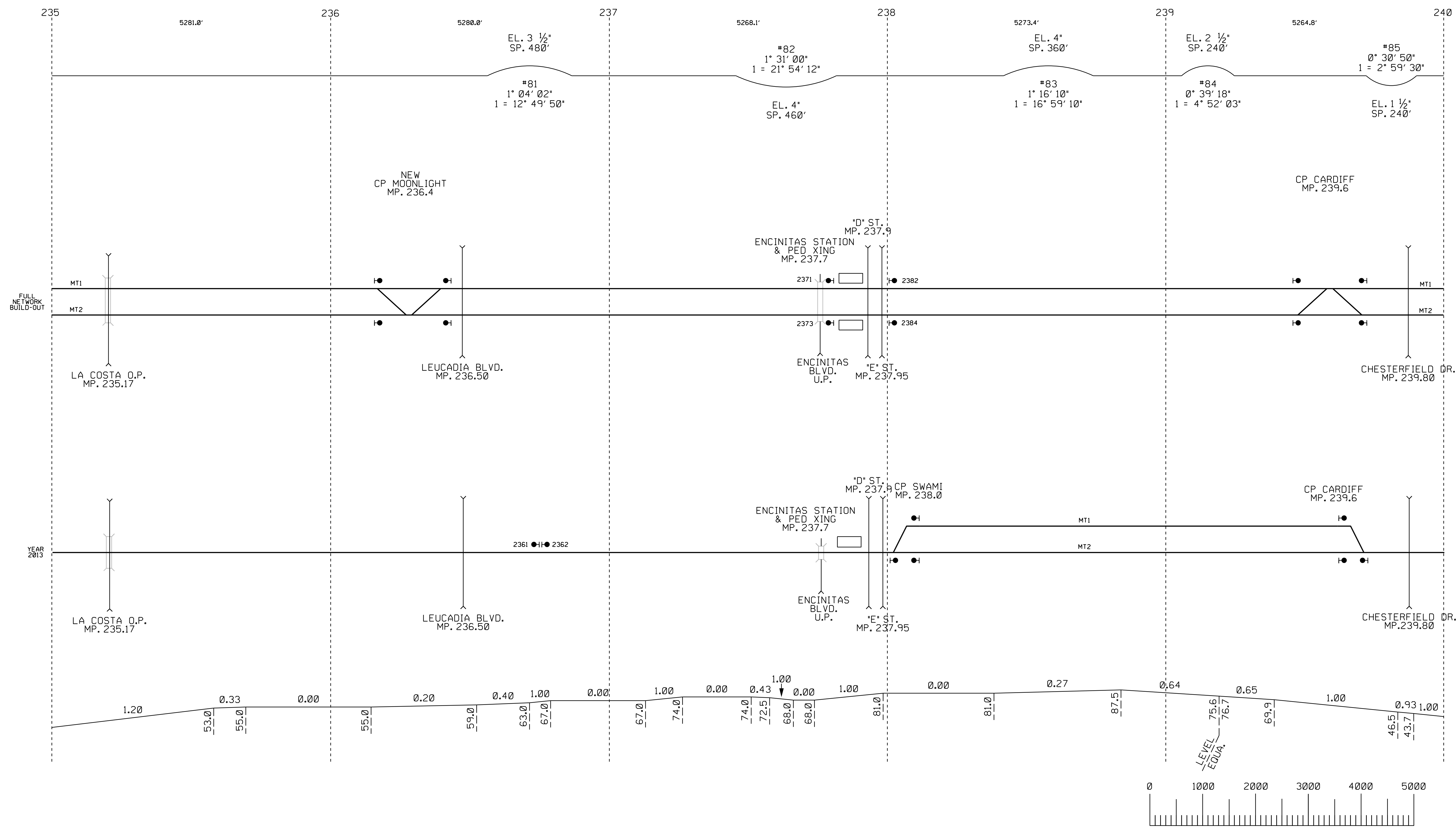
SANDAG San Diego's Regional Planning Agency

APPROVED:____________ DATE:________

SAN DIEGO SUBDIVISION
FULL NETWORK BUILD-OUT
SIGNAL SYSTEM CONCEPT
MP. 230 TO MP. 235

CONTRACT NO.
DRAWING NO. SAD230_235_TC
REVISION
SHEET NO. ##
SCALE

DRAFT 11-27-2012

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DESIGNED BY XX
DRAWN BY XX
CHECKED BY XX
APPROVED BY XX
DATE NOV 2012

PRE PACIFIC RAILWAY ENTERPRISES, INC. 3560 University Avenue, Suite F Riverside, California 92501

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SANDAG San Diego's Regional Planning Agency

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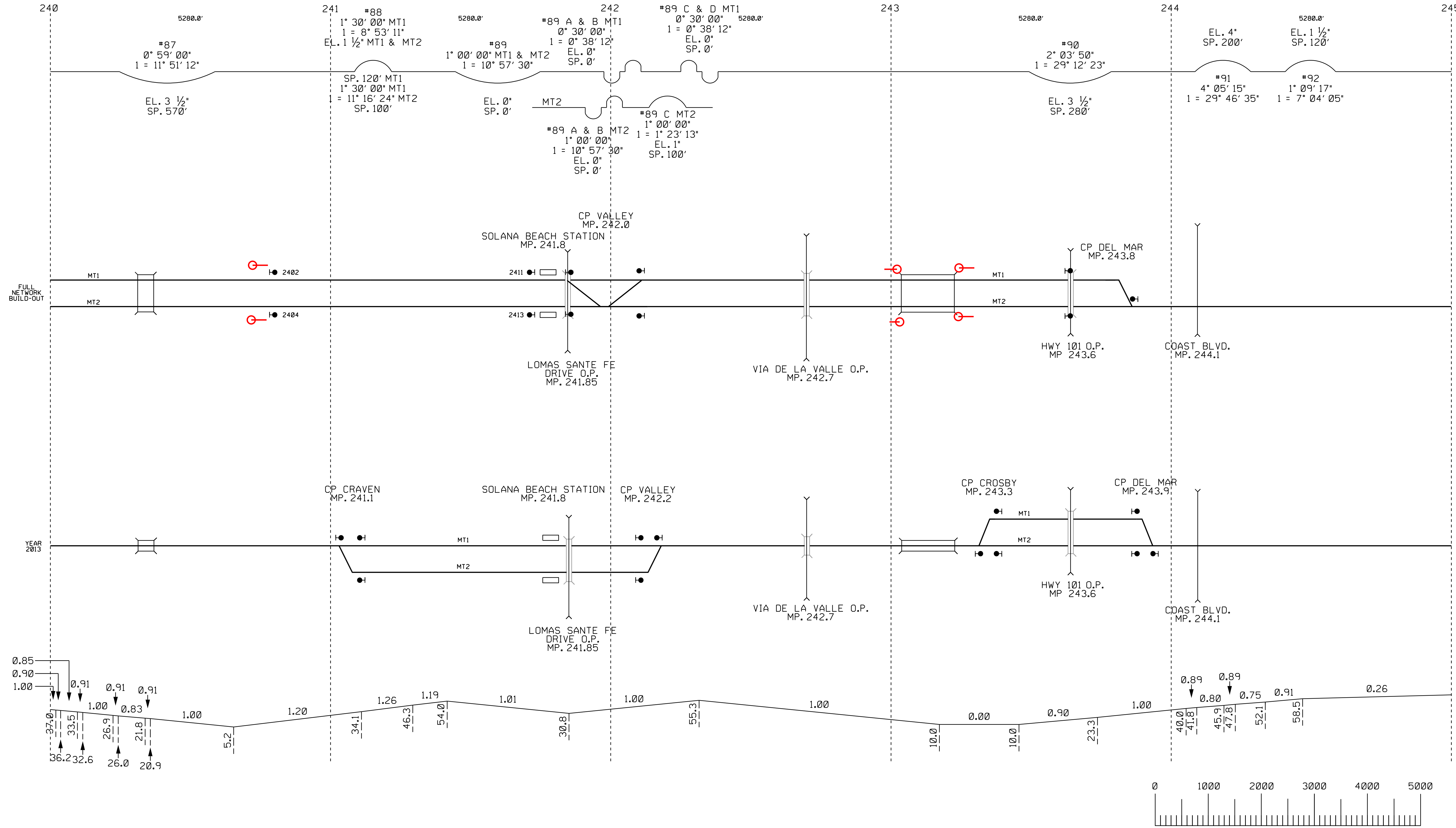
SAN DIEGO SUBDIVISION
FULL NETWORK BUILD-OUT
SIGNAL SYSTEM CONCEPT
MP. 235 TO MP. 240

CONTRACT NO.
DRAWING NO. SAD235_240_TC
REVISION
SHEET NO. ##
SCALE

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Riverside, California 92501

N C T D San Diego North County Transit District

(PRIME CONSULTANT LOGO)

San Diego's Regional Planning Agency

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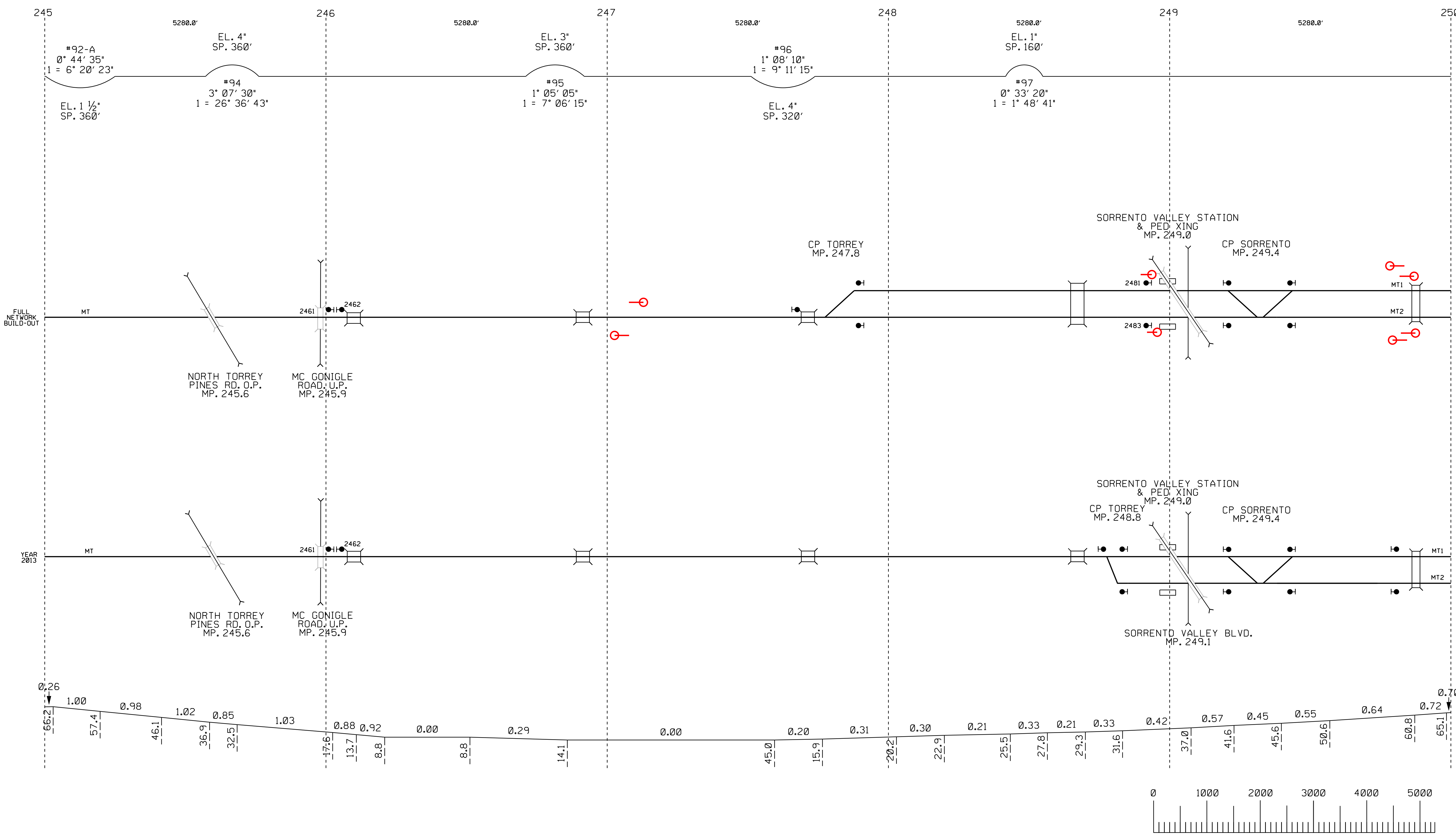
SAN DIEGO SUBDIVISION
FULL NETWORK BUILD-OUT
SIGNAL SYSTEM CONCEPT
MP. 240 TO MP. 245

CONTRACT NO.
DRAWING NO. SAD240_245_TC
REVISION
SHEET NO. ##
SCALE

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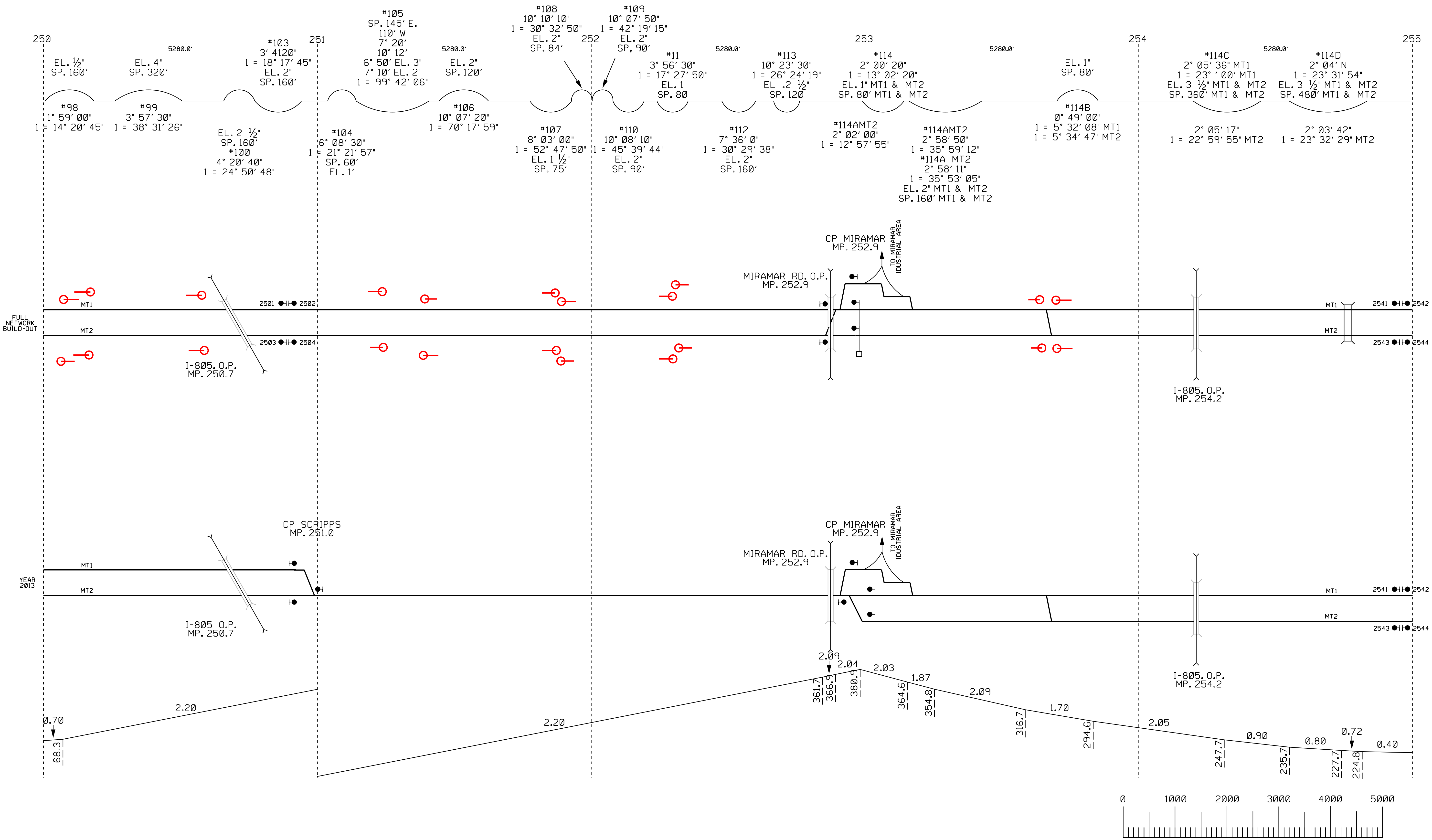
SAN DIEGO SUBDIVISION
FULL NETWORK BUILD-OUT
SIGNAL SYSTEM CONCEPT
MP. 245 TO MP. 250

CONTRACT NO.
DRAWING NO. SAD245_250_TC
REVISION
SHEET NO. ##
SCALE

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SAN DIEGO SUBDIVISION
FULL NETWORK BUILD-OUT
SIGNAL SYSTEM CONCEPT
MP. 250 TO MP. 255

CONTRACT NO.
DRAWING NO. SAD250_255_TC
REVISION
SHEET NO. ##
SCALE

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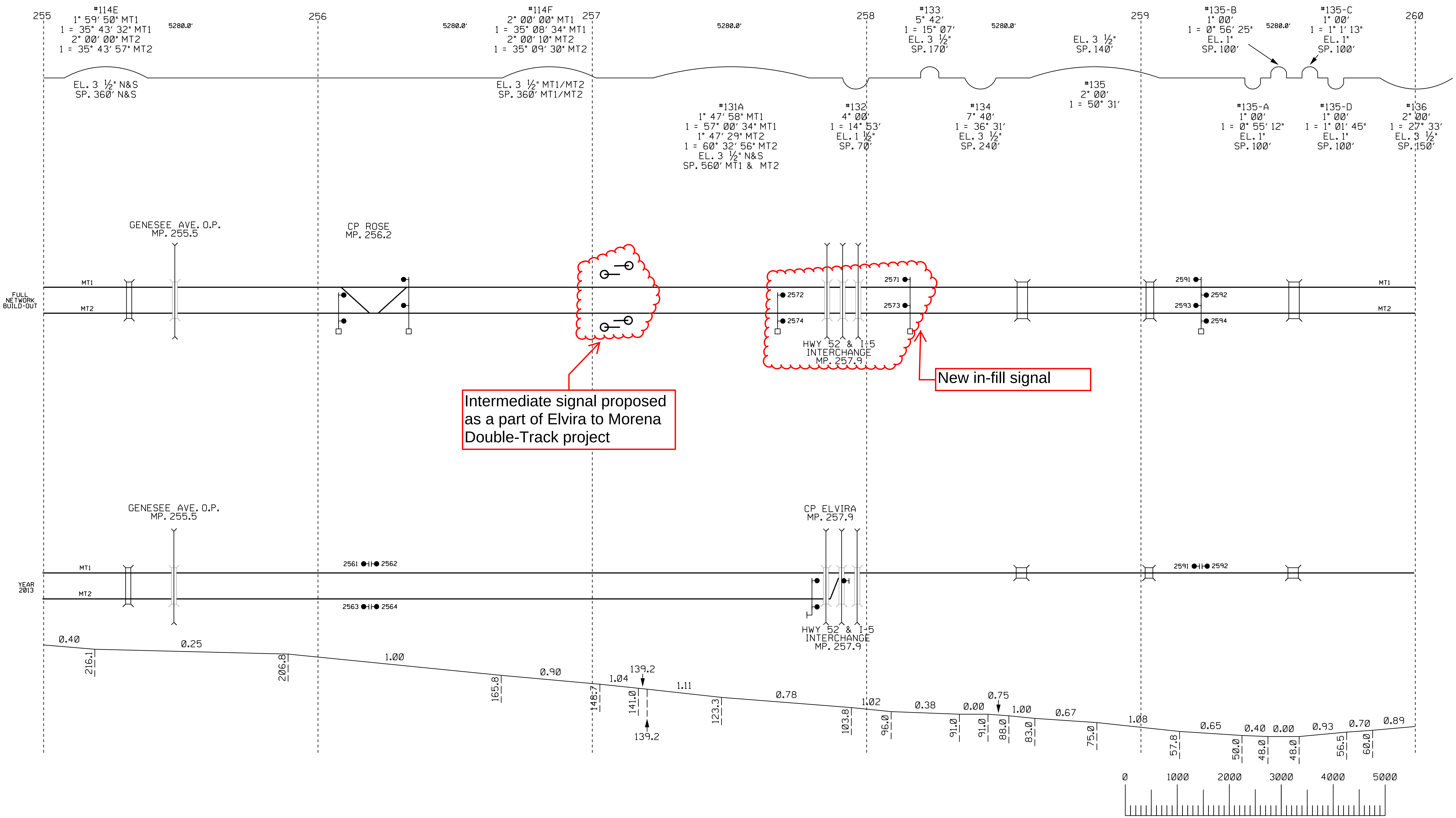


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SAN DIEGO SUBDIVISION
FULL NETWORK BUILD-OUT
SIGNAL SYSTEM CONCEPT
MP. 255 TO MP. 260

CONTRACT NO.
DRAWING NO. SAD255_260_TC
REVISION
SHEET NO. ##
SCALE

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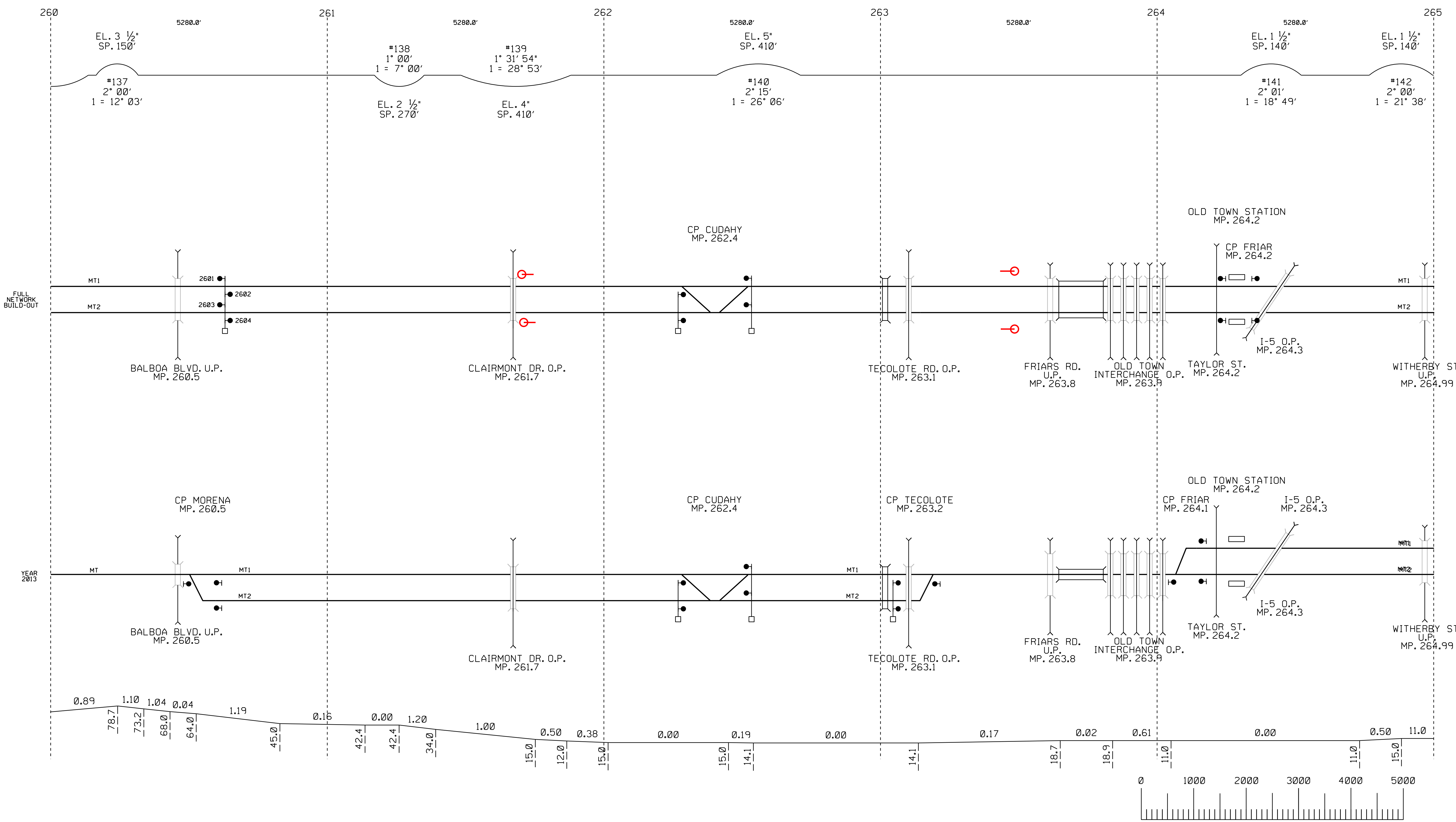


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San Diego North County Transit District

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SIGNAL SYSTEM CONCEPT
MP. 260 TO MP. 265

CONTRACT NO.

DRAWING NO.
SAD260_265_TC

REVISION

SHEET NO.
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SCALE

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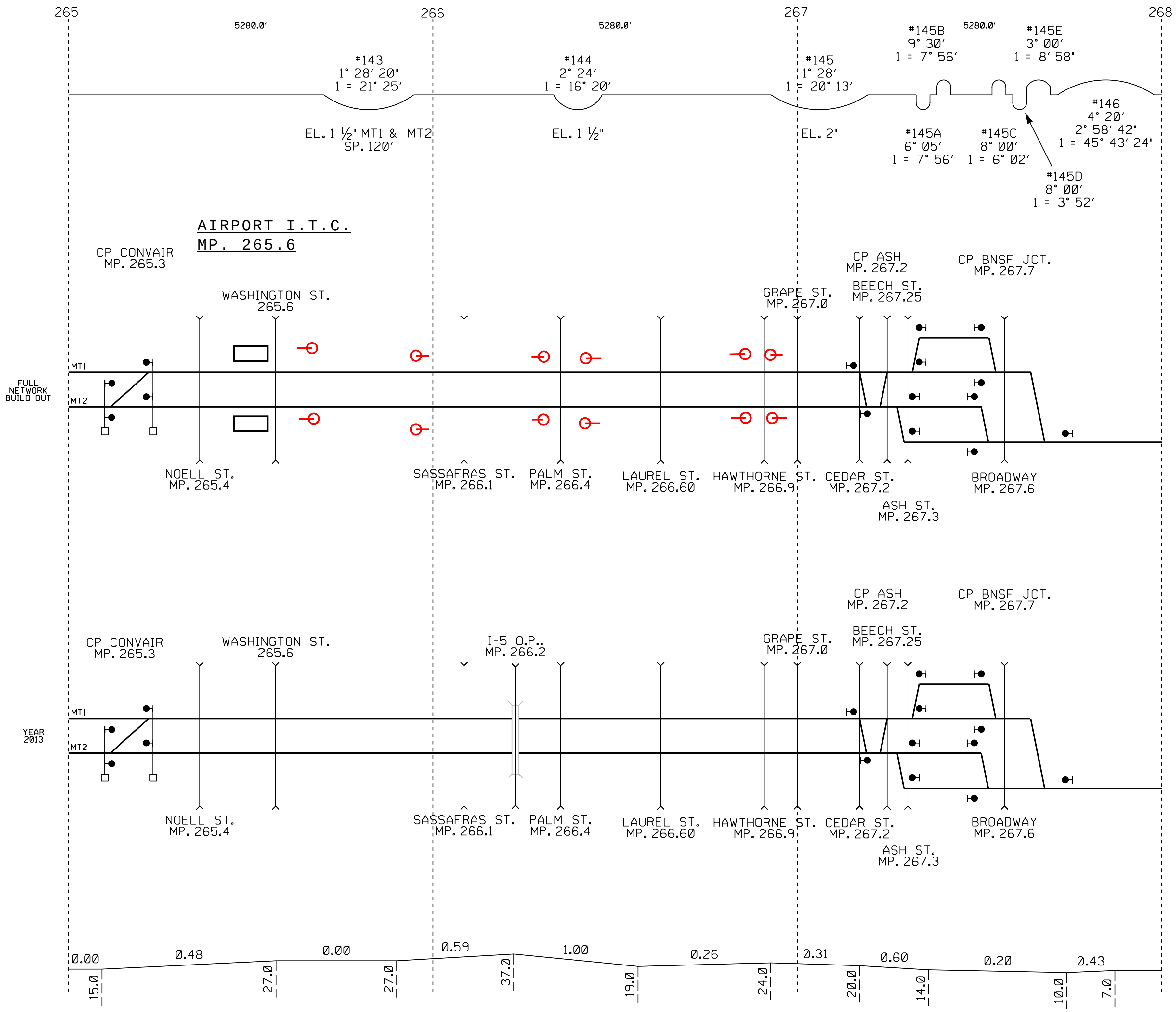


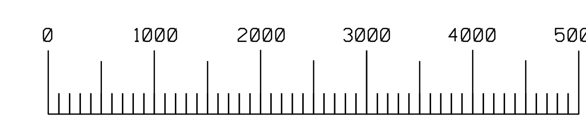


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N C T D San Diego North County Transit District

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(PRIME CONSULTANT LOGO)

SANDAG San Diego's Regional Planning Agency

APPROVED:____________ DATE:________

SAN DIEGO SUBDIVISION
FULL NETWORK BUILD-OUT
SIGNAL SYSTEM CONCEPT
MP. 265 TO MP. 268

CONTRACT NO.
DRAWING NO. SAD265_268_TC
REVISION
SHEET NO. ##
SCALE

# APPENDIX 10

## Expanded Analysis of Potential Grade Separations Technical Memorandum

**San Diego Association of Governments**

*Infrastructure Development Plan for the Los Angeles-San Diego-San Luis Obispo (LOSSAN) Rail Corridor in San Diego County Update*

FINAL DRAFT

TECHNICAL MEMORANDUM

AGREEMENT NO. 15019-OS

# Expanded Analysis of Potential Grade Separations

| | | |
|---|---|---|
| Prepared by: | Lauren German | 11/8/2017 |
| | Lauren German | Date |
| Reviewed by: | James D. Campbell | 11/8/2017 |
| | James D Campbell | Date |
| Approved & Released by: | | 11/9/2017 |
| | Lane Fernandes | Date |

| Revision | Date | Description |
|---|---|---|
| 1 | 11/8/2017 | Revision to formula to match that used for OCTA Study |
| | | |
| | | |
| | | |

# TRANSIT PLANNING SERVICES

*SAN DIEGO ASSOCIATION OF GOVERNMENTS*

# INFRASTRUCTURE DEVELOPMENT PLAN FOR THE LOSSAN RAIL CORRIDOR IN SAN DIEGO COUNTY UPDATE

# EXPANDED ANALYSIS OF POTENTIAL GRADE SEPARATIONS

## TECHNICAL MEMORANDUM

## FINAL DRAFT


***Prepared by:***

401 B Street, Suite 1650
San Diego, CA 92101

***Prepared for:***

San Diego Association of Governments
401 B Street, Suite 800
San Diego, CA 92101


**November 8, 2017**

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# TABLES



# FIGURES

# 1.0 BACKGROUND

The San Diego Subdivision is part of the 351-mile Los Angeles-San Diego-San Luis Obispo (LOSSAN) Rail Corridor. The LOSSAN Rail Corridor is the second busiest intercity passenger rail corridor in the nation supporting commuter, intercity, and freight rail services. The San Diego Subdivision is the southern end of the LOSSAN Rail Corridor and is a 60-mile section from the Orange County line to the Santa Fe Depot in Downtown San Diego. Within San Diego County, the corridor is owned by the North County Transit District (NCTD) from the Orange County line to the southern limits of the City of Del Mar. The San Diego Metropolitan Transit System (SDMTS) owns the Corridor in the City of San Diego from Del Mar to the Santa Fe Depot. Starting at Control Point (CP) SONGS, just south of the Orange County line, and continuing to the Santa Fe Depot in Downtown San Diego, NCTD dispatches all trains operating on the corridor. The BNSF Railway (BNSF) owns the right-of-way south of the Santa Fe Depot, but no revenue commuter or intercity passenger trains currently operate on this segment of right-of-way.

The passenger rail services operating on the LOSSAN Rail Corridor in San Diego County include the Amtrak Pacific Surfliner (Surfliner) intercity service; Metrolink commuter service between Los Angeles, the Inland Empire, and Orange County and the Oceanside Transit Center (operated by the Southern California Regional Rail Authority); and NCTD's COASTER commuter service from the Oceanside Transit Center (OTC) south to the Santa Fe Depot. *San Diego Forward: The Regional Plan* (Regional Plan) identifies several highway-rail at-grade crossings where rail-grade separations will help improve the safely of the rail corridor and the throughput of the highway system. By 2050, three new rail-grade separations are proposed along the LOSSAN Rail Corridor: Leucadia Boulevard and two additional grade separation projects yet to be determined.

The 2013 *Infrastructure Development Plan for the LOSSAN Rail Corridor in San Diego County* (IDP) included a map of 34 highway-rail at-grade vehicular crossings of the LOSSAN Rail Corridor in San Diego County, shown in Figure 1, but did not provide additional analysis on rail grade separations. The principle objective of this study is to evaluate and rank these 34 at-grade crossings in order to develop a prioritized list of potential grade separations along the San Diego Subdivision, which can then be used to complement the Regional Plan.

**Figure 1: LOSSAN Rail Corridor At-Grade Crossings**

# 2.0 DATA INPUT AND METHODOLOGY

This section summarizes the methodology, variables and constant factors used to calculate the vehicle delay identified for each crossing, both current and forecasted. The methodology used is based on previous at-grade crossing prioritization studies conducted along the LOSSAN Rail Corridor and will evaluate 2035 conditions.

The evaluation criteria are based on a mix of both quantitative information that includes:

- Vehicle delay at each crossing based on:
  - 2035 Traffic Volumes
  - 2035 Train Trips, Length and Train Speed
  - Planned Roadway Classification and Number of Lanes for each Arterial
  - Width of highway-rail at-grade crossing for each Arterial
  - Additional Delay due to Switching and/or Passenger Loading at Stations
  - Arrival and Departure Rates

Additional consideration could be given to improved pedestrian safety based on projected pedestrian traffic across each at-grade crossing in a future analysis.

## 1.1 2035 CONDITIONS

### 1.1.1 Train Volumes

The future service goals for the Surfliner are based on the Regional Plan and the *2018 California State Rail Plan* (SRP). In the SRP, an additional roundtrip (two daily trips) is proposed for the 2020 scenario between Los Angeles and San Diego. This increases the total number of daily trips to 26 trains. The 2035 intercity frequency goals presented in the 2018 SRP outlines hourly service for the Surfliner trains. This includes six additional daily round trips (12 daily trips) between Los Angeles and San Diego, increasing the daily service to 36 trains. This growth assumption is defined in the SRP as being broken into local and limited stop service, with 28 trains making all stops (the local) and eight limited stop trains.

Commuter service north of Oceanside is operated by Metrolink. Service goals in 2035 are based on the Scenario 1 service growth alternative presented in the *Metrolink 10-Year Strategic Plan 2015-2025* and assume 20 daily trains operating to/from Oceanside.

Commuter service from Oceanside to San Diego is assumed to increase to a total of 54 COASTER trains by 2035, with 20-minute peak frequencies and hourly off-peak frequencies based on service goals laid out in the Regional Plan. The COASTER service level at the Camp Pendleton Station and the Convention Center Station in Year 2035 is assumed to be hourly service throughout the revenue-service day with additional service during the periods when train movements from/to yards (Stuart Mesa Yard for Camp Pendleton and MTS Yard for Convention Center) are scheduled in the proposed timetable included as part of the *Infrastructure Development Plan Update* for 2017.

Freight traffic in the Corridor for the year 2035 assumes eight daily trains north of Oceanside and 11 daily trains south of Oceanside as provided by BNSF via the San Diego Association of Governments (SANDAG).

A summary of the train volume assumptions for 2035 are presented in Tables 1 and 2.

**Table 1: Service Level Assumptions – Orange County Line to Oceanside**

| Operator / Line | 2035 Plan | 2035 Frequency Goals (minutes) |
|---|---|---|
| Intercity | 36 | 60 PK / 60 OP |
| Commuter | 20 | 60 PK / 60 OP |
| Freight | 8 | Not Applicable |
| TOTAL | 64 | |

**Table 2: Service Level Assumptions – Oceanside to San Diego**

| Operator / Line | 2035 Plan | 2035 Frequency Goals (minutes) |
|---|---|---|
| Intercity | 36 | 60 PK / 60 OP |
| Commuter | 54 | 20 PK / 60 OP |
| Freight | 11 | Not Applicable |
| TOTAL | 101 | |

San Diego Trolley volumes were not included in this ranking. San Diego Trolley volumes affect grade crossings south of Taylor Street, which would skew the prioritization results in favor of the these crossings if the Trolley volumes were included.

### 1.1.2 Vehicular Traffic Volumes

Traffic volumes for 2035 were provided by SANDAG for most of the crossings, via their Transportation Forecast Information Center interactive mapping application: http://tfic.sandag.org/, using the Forecast Series 13 for forecast year 2035. This application provides forecasted average weekday traffic (AWT) volumes, as well as type of roadway, number of lanes, and posted speed.

Traffic volumes for the two private crossings and the crossings at Grand Avenue and Noell Street were not available through the Transportation Forecast Information Center interactive mapping application. The AWT volumes for the crossings at Grand Avenue and Noell Street were based on 2009-2013 traffic count data collected by the local jurisdictions and provided by SANDAG. A 1% growth factor per year was the applied to get to an estimated AWT volume for 2035.

Traffic volumes were not available for the private crossings, Stuart Mesa Access and Powerplant Access, so these crossings were not included in the delay analysis.

### 1.1.3 Additional Factors

Additional factors taken into account include variables such as potential switching movements by freight operators, the average speed of a train passing through each crossing, and the average length of a passenger and freight train that can affect the amount of time each at-grade crossing is occupied (gates down), and, therefore, the amount of delay generated at each crossing. The methodology for determining the average length of a passenger and freight train across each highway-rail at-grade crossing is described in the following section.

## 1.2 VEHICLE DELAY METHODOLOGY

The methodology used to calculate the vehicle delay focuses on the amount of daily and peak hour delay imposed on vehicles traveling through each highway-rail at-grade crossing. Methodology used in the 2005 and 2017 update to the Orange County Transportation Authority (OCTA) highway-rail at-grade crossings study is also used in this study for consistency and comparison.

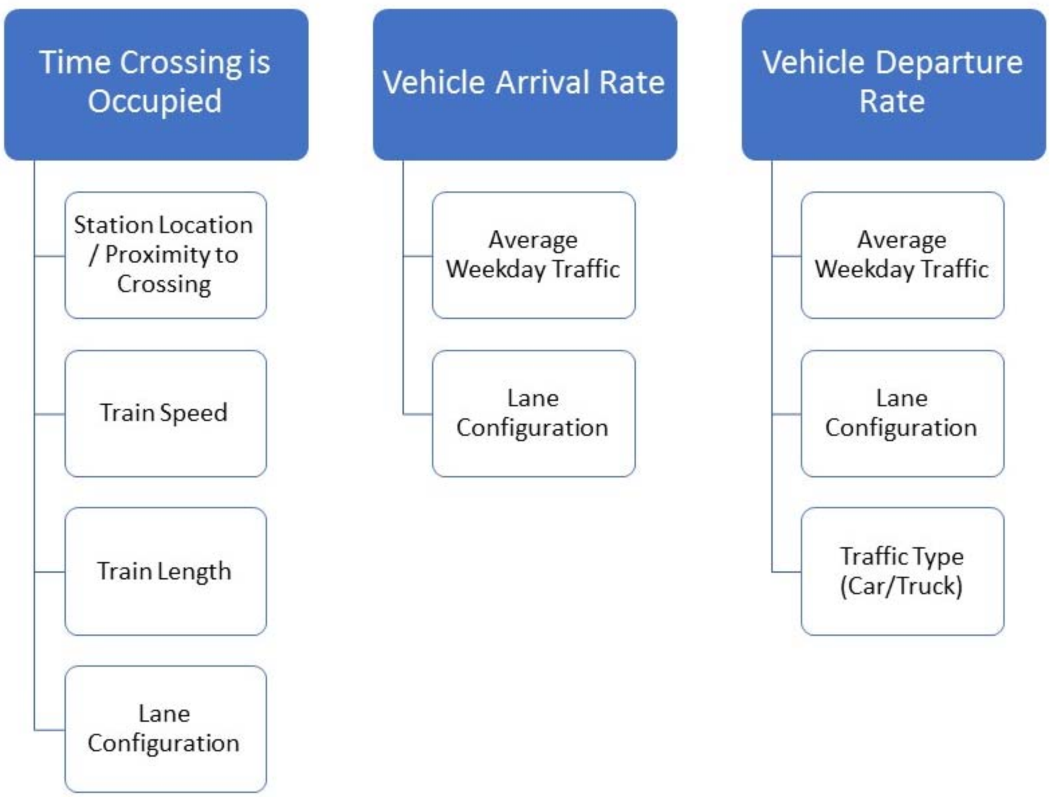
For determination of the daily and peak hour delays at each crossing, a series of formulas detailed in this section were developed and calculated based on the following factors:

- 2035 Traffic Volumes
- 2035 Projected Train Trips, Length, and Train Speed
- Future Width of Arterial at each Crossing
- Vehicle Arrival and Departure Rates
- Additional Delay due to Switching and/or Passenger Loading at Stations

### 1.2.1 Calculating the Delay

The formula used in this study has been widely used and has been accepted in additional rail analyses performed throughout Southern California and looks at the delay at an at-grade crossing as a function of the time of crossing gate down time, highway traffic volume, and the rate of vehicle queue discharge after the train has passed, as shown in Figure 2. This can be calculated on both a daily and peak hour basis.

**Figure 2: Three Primary Delay Calculation Factors**




For calculating the delay imposed at each highway-rail at-grade crossing, the same basic formula was used as was defined for the 1998 OCTA Orange-Olive Grade Crossing Study, and has been used in subsequent studies around the State. This formula considers the delay at an at-grade crossing as a function of the time the crossing is blocked, highway traffic volume, and the rate of vehicle queue, and discharge once the train has cleared the crossing. Delay can be calculated both on a daily and peak hour basis as given by the following formula:

$\text{Delay} = (T_B^2 \times Q) / 2 \times (1 - Q/D)$

Where:

- $T_B$ = the length of time the crossing is occupied by the train, determined using the $T_B$ formula below
- Q = vehicle arrival rate in vehicles per minute (vpm)
    - o This figure is calculated by converting the total forecasted AWT volumes to AM and PM vehicles per minute (vpm).
        - AM peak period volume is calculated as 30% of AWT. PM peak period volume is calculated as 35% AWT.
        - AM peak vehicles per hour is calculated as 35.66% of AM peak period. PM peak vehicles per hour is calculated as 26.62% PM peak period.
        - AM and PM peak vehicles per hour is then converted to AM and PM vehicles per minute (vpm).
- D = vehicle departure rate (vpm)
    - o The vehicle departure rate will be 1,520 vehicles per hour per lane following the passage of the trains. This is calculated as a function of the number of traffic lanes available and assumed 10-percent of the overall traffic stream during the day is comprised of trucks. This then is converted to vehicles per minute (vpm).
- Overall Delay is based on the higher value of the AM and PM peak hour delay total.

### 1.2.2 Calculating the Time a Crossing is Occupied

The primary input into the delay calculation formula is the time for which a crossing is blocked by a train. To determine this, three primary inputs need to be defined:

- The first input, which is constant, is the time associated with the time it takes for the crossing gates to close and includes the lead and lag time of the lowering/raising of the gate arms.
- The second input, which is variable, is used to account for station stop time (for the four COASTER stations located adjacent to at-grade crossings).
- The third input, which is also a variable, is equal to the span of time beginning when the front of the train enters the near side of the intersection and ending when the rear of the train clears the point beyond the intersection that signals the end of the crossing warning. This span of time is calculated by dividing the length of the train plus the length of the crossing's island circuit by the speed of the train. The length of the island circuit is the distance from approximately the near side of the intersection to the point beyond the intersection that signals the end of the crossing warning. This was determined to average about 50 feet plus the width of the grade crossing.

Once the inputs above are defined, the following formula is used to calculate the length of time (in minutes) an arterial is blocked by a train.

$T_B = 0.60 + S + ((50 + T_L + W) / V)$

Where:

- 0.60 = represents the lead and lag time of the crossing closing (a lead time of 28 seconds and a lag time of 8 seconds for a total of 0.60 minutes).

- S = represents time (mins) for station stop or switching movements
  This is a variable to account for station stop time (for stations located adjacent to arterial at-grade crossings) or switching movements of the freight operators that may require multiple passes across a single at-grade crossing during the time a gate is closed.

  - Switching movements, based on input from NCTD, have a value of 23 seconds for the switch to throw and the signal to clear, plus a 10 second loss of shunt timer for a train move, so the total value would be 33 seconds.

  - Station stop time (for stations located adjacent to arterial at-grade crossings (Grand Avenue, D Street, Sorrento Valley Boulevard, Taylor Street)) is based the dwell time in the current (value used in the model) train operations:

    - Pacific Surfliner trains: 90 seconds

    - All commuter trains: 30 seconds

    - The average dwell time, based on service level assumptions for 2035, is 72 seconds (1.2 minutes)

- 50 = represents the average distance in feet beginning where the front of the train enters the near side of the intersection and ending where the rear of the train clears the point beyond the intersection that signals the end of the crossing warning activation.
- $T_L$ = average length of the train in feet, determined using $T_L$ formula below
- W = curb-to-curb roadway width in feet, determined by taking measurements using Google Earth.
- V = train speed in feet per minute
  - Based on the averaged typical speed of a passenger train and freight train, per the raw Train Performance Calculation (TPC) run time output of the 2035A operations analysis scenario, using the Rail Traffic Controller (RTC) railroad operations simulation model developed by Berkley Simulation Software.

### 1.2.3 Calculating the Average Train Length

To calculate the average train length to be used in the delay calculation, a two-step process was defined. First, the average train length for each type of service (passenger and freight) is calculated based on the total number of trains within the segment for each type of service and their average train length. This is determined by adding the number of passenger trains multiplied by their average length to the number of freight trains multiplied by their average length, and then dividing the total by the total number of trains operating along a particular segment. For this study, passenger trains (COASTER and Amtrak Pacific Surfliner) were assumed to be an average length of 609 feet. Freight trains (BNSF & UPRR) were assumed to be an average length of 5,000 feet.

The formula for determining (average) train length is:

$T_L = ((P \times P_L) + (F \times F_L)) / (P + F)$

Where:

- P = Number of Passenger Trains Per Day, based on 2035 service level assumptions

- $P_L$ = Average Passenger Train Length in Feet

- o 609 feet (south of Oceanside), based on the average train length of the commuter and intercity service trains assumed in the 2035 service operations

- F = Number of Freight Trains Per Day, based on 2035 service level assumptions
- $F_L$ = Average Freight Train Length in Feet
  - o 5,000 feet, based on 2017 BNSF data along San Diego Subdivision

## 1.3 DELAY ANALYSIS

### 1.3.1 Summary of Results

The following Table 3 summarizes the results of the delay analysis for forecast year 2035. Table 4, at the end of this section, presents the data used to determine the delay at each at-grade crossing.

**Table 3: Forecasted Daily Total Vehicle Delay per Crossing**

| Crossing Location | City | Average Weekday Vehicle Traffic | 2035 Average Total Vehicle Delay Per Crossing (min) | Rank Based on Traffic Delay |
|---|---|---|---|---|
| Sorrento Valley Boulevard | San Diego | 39,000 | 6,385 | 1 |
| Taylor Street | San Diego | 15,200 | 716 | 2 |
| Grand Avenue | Carlsbad | 6,865 | 592 | 3 |
| Grape Street | San Diego | 30,100 | 553 | 4 |
| 5th Avenue | San Diego | 12,400 | 356 | 5 |
| Ash Street | San Diego | 7,200 | 262 | 6 |
| Hawthorne Street | San Diego | 21,900 | 253 | 7 |
| Washington Street | San Diego | 14,500 | 246 | 8 |
| Palm Street | San Diego | 12,000 | 129 | 9 |
| Market Street | San Diego | 5,900 | 107 | 10 |
| D Street | Encinitas | 1,800 | 103 | 11 |
| Carlsbad Village Drive | Carlsbad | 10,600 | 96 | 12 |
| Broadway | San Diego | 4,500 | 81 | 13 |
| Kettner Boulevard/G Street | San Diego | 4,175 | 76 | 14 |
| Laurel Street | San Diego | 9,400 | 68 | 15 |
| 1st Avenue | San Diego | 3,300 | 56 | 16 |
| Mission Avenue | Oceanside | 5,100 | 56 | 17 |
| Sassafras Street | San Diego | 7,200 | 52 | 18 |
| Cannon Road | Carlsbad | 9,900 | 50 | 19 |
| Chesterfield Drive | Encinitas | 9,600 | 47 | 20 |
| Front Street | San Diego | 2,300 | 39 | 21 |
| E Street | Encinitas | 5,000 | 38 | 22 |
| Tamarack Avenue | Carlsbad | 6,300 | 36 | 23 |
| Leucadia Boulevard | Encinitas | 6,200 | 34 | 24 |
| Noell Street | San Diego | 3,112 | 25 | 25 |
| Beech Street | San Diego | 1,400 | 24 | 26 |

| Crossing Location | City | Average Weekday Vehicle Traffic | 2035 Average Total Vehicle Delay Per Crossing (min) | Rank Based on Traffic Delay |
|---|---|---|---|---|
| Cassidy Street | Oceanside | 4,000 | 20 | 27 |
| Surfrider Way | Oceanside | 1,800 | 10 | 28 |
| Oceanside Boulevard | Oceanside | 1,600 | 8 | 29 |
| Wisconsin Avenue | Oceanside | 1,200 | 6 | 30 |
| Cedar Street | San Diego | 100 | 2 | 31 |
| Coast Boulevard | Del Mar | 100 | 1 | 32 |

As the table indicates, Sorrento Valley Blvd in San Diego is by far the crossing at which motorists are impacted by delays from gate-down time. Much of this has to do with the double track through the intersection as well as the station being adjacent to the crossing. Due to the at-grade pedestrian crossing within the station, there exists a hold-out rule, which means oncoming trains cannot enter the station until the train already in the station has left it. This affects gate-down time when the train waiting to enter is coming from the south and has yet to enter the station but may have already triggered the warning indicators on Sorrento Valley Blvd.

Overall, nine of the top ten crossings in terms of vehicle wait times are all within the City of San Diego limits with the other in Carlsbad. This is important to note because these rankings were compiled based largely on traffic volumes and wait times. This is to be expected as the density and traffic volumes of the City of San Diego largely outpaces that of a more suburban North County.

In conclusion, the Regional Plan develops a regional rail grade separation prioritized list based on 13 criteria including accident history and traffic.[1] Both light rail and heavy rail crossings are included and crossings are included based upon recommendations from local jurisdictions. This analysis is not intended to be the only prioritization but to complement this ranking in future Regional Plans by including the relevant railroad operations data for the LOSSAN crossings.

[1] See Appendix M: Transportation Project Evaluation Criteria and Rankings.

**Table 4: Data Used to Determine the Delay at Each Crossing**

| | | Delay = $(T_B^2 \times Q) / 2 \times (1 - Q/D)$ | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | $T_B = .60 + S + ((50+T_L+W) / V)$ | | | | | $T_L = ((P \times P_L) + (F \times F_L)) / (P + F)$ | | | | | Q | | D | Time for Queues to Dissipate | | Number of Vehicles Delayed Per Train Event | | Total Vehicle Minutes of Delay per Train Event | | Average Delay Per Vehicle | | No. of Trains | | Peak Hour Delay Total | |
| | | | $T_B$ | S | $T_L$ | W | V | $T_L$ | P | $P_L$ | F | $F_L$ | | | | | | | | | | | | | | | |
| | | (mins) | (mins) | (mins) | (feet) | (feet) | (ft/min) | (feet) | (Qty) | (feet) | (Qty) | (feet) | (vpm) | | (vpm) | (mins) | | | | (mins) | | (sec) | | | | (mins) | |
| | Crossing | | | | | | | | | | | | AM | PM | | AM | PM | AM | PM | AM | PM | AM | PM | AM | PM | AM | PM |
| 1 | Stuart Mesa Access (Private) MP 221.5 | No Data | 0.92 | | 1149 | | 3768.16 | 1149 | 56 | 599 | 8 | 5000 | | | | | | | | | | | | 7 | 6 | | |
| 2 | Surfrider Way | 10 | 0.90 | | 1149 | 47 | 4115.32 | 1149 | 56 | 599 | 8 | 5000 | 3 | 3 | 51 | 0.96 | 0.96 | 3 | 3 | 1.40 | 1.21 | 27 | 27 | 7 | 6 | 9.77 | 7.23 |
| 3 | Mission Avenue | 56 | 1.27 | | 1149 | 64 | 1891.56 | 1149 | 56 | 599 | 8 | 5000 | 9 | 8 | 101 | 1.39 | 1.38 | 13 | 11 | 8.03 | 6.90 | 38 | 38 | 7 | 6 | 56.21 | 41.43 |
| 4 | Wisconsin Avenue | 6 | 0.85 | | 1087 | 54 | 4810.96 | 1087 | 90 | 609 | 11 | 5000 | 2 | 2 | 51 | 0.88 | 0.88 | 2 | 2 | 0.80 | 0.69 | 25 | 25 | 8 | 8 | 6.42 | 5.56 |
| 5 | Oceanside Boulevard | 8 | 0.80 | | 1087 | 36 | 5957.16 | 1087 | 90 | 609 | 11 | 5000 | 3 | 2 | 51 | 0.84 | 0.84 | 2 | 2 | 0.96 | 0.83 | 24 | 24 | 8 | 8 | 7.68 | 6.63 |
| 6 | Cassidy Street | 20 | 0.78 | | 1087 | 36 | 6457.44 | 1087 | 90 | 609 | 11 | 5000 | 7 | 6 | 51 | 0.91 | 0.89 | 6 | 6 | 2.53 | 2.16 | 23 | 23 | 8 | 8 | 20.26 | 17.29 |
| 7 | Grand Avenue | 592 | 3.03 | 1.2 | 1087 | 63 | 975.48 | 1087 | 90 | 609 | 11 | 5000 | 12 | 11 | 51 | 3.99 | 3.83 | 49 | 41 | 73.94 | 61.87 | 91 | 91 | 8 | 8 | 591.53 | 494.99 |
| 8 | Carlsbad Village Drive | 96 | 1.02 | | 1087 | 57 | 2855.16 | 1087 | 90 | 609 | 11 | 5000 | 19 | 16 | 101 | 1.25 | 1.22 | 24 | 20 | 12.05 | 10.19 | 31 | 31 | 8 | 8 | 96.42 | 81.55 |
| 9 | Tamarack Avenue | 36 | 0.79 | | 1087 | 43 | 6062.32 | 1087 | 90 | 609 | 11 | 5000 | 11 | 10 | 51 | 1.02 | 0.98 | 11 | 10 | 4.55 | 3.82 | 24 | 24 | 8 | 8 | 36.39 | 30.57 |
| 10 | Powerplant Access (Private) MP 231.6 | No Data | 0.75 | | 1087 | 15 | 7614.64 | 1087 | 90 | 609 | 11 | 5000 | | | 51 | | | | | | | | | 8 | 8 | | |
| 11 | Cannon Road | 50 | 0.76 | | 1087 | 80 | 7558.32 | 1087 | 90 | 609 | 11 | 5000 | 18 | 15 | 101 | 0.92 | 0.90 | 16 | 14 | 6.19 | 5.25 | 23 | 23 | 8 | 8 | 49.55 | 42.01 |
| 12 | Leucadia Boulevard | 34 | 0.78 | | 1087 | 49 | 6536.2 | 1087 | 90 | 609 | 11 | 5000 | 11 | 10 | 51 | 1.00 | 0.96 | 11 | 9 | 4.31 | 3.62 | 23 | 23 | 8 | 8 | 34.48 | 28.99 |
| 13 | D Street | 103 | 2.75 | 1.2 | 1087 | 53 | 1258.4 | 1087 | 90 | 609 | 11 | 5000 | 3 | 3 | 51 | 2.93 | 2.90 | 9 | 8 | 12.91 | 11.15 | 82 | 82 | 8 | 8 | 103.28 | 89.17 |
| 14 | E Street | 38 | 0.94 | | 1087 | 50 | 3528.36 | 1087 | 90 | 609 | 11 | 5000 | 9 | 8 | 51 | 1.13 | 1.10 | 10 | 9 | 4.74 | 4.02 | 28 | 28 | 8 | 8 | 37.89 | 32.12 |
| 15 | Chesterfield Drive | 47 | 0.76 | | 1087 | 60 | 7575.04 | 1087 | 90 | 609 | 11 | 5000 | 17 | 15 | 101 | 0.91 | 0.89 | 16 | 13 | 5.92 | 5.02 | 23 | 23 | 8 | 8 | 47.37 | 40.19 |
| 16 | Coast Boulevard | 1 | 0.87 | | 1087 | 30 | 4398.24 | 1087 | 90 | 609 | 11 | 5000 | 0 | 0 | 51 | 0.87 | 0.87 | 0 | 0 | 0.07 | 0.06 | 26 | 26 | 8 | 8 | 0.54 | 0.47 |
| 17 | Sorrento Valley Boulevard | 6385 | 2.67 | | 1087 | 83 | 1395.68 | 1087 | 90 | 609 | 11 | 5000 | 70 | 61 | 101 | 8.58 | 6.68 | 597 | 404 | 798.12 | 540.80 | 80 | 80 | 8 | 8 | 6385.00 | 4326.42 |
| 18 | Taylor Street | 716 | 2.28 | 1.2 | 1087 | 92 | 2566.08 | 1087 | 90 | 609 | 11 | 5000 | 27 | 24 | 127 | 2.90 | 2.80 | 79 | 66 | 89.47 | 75.28 | 68 | 68 | 8 | 8 | 715.76 | 602.27 |
| 19 | Noell Street | 25 | 1.01 | | 1087 | 52 | 2924.68 | 1087 | 90 | 609 | 11 | 5000 | 6 | 5 | 51 | 1.13 | 1.11 | 6 | 5 | 3.15 | 2.70 | 30 | 30 | 8 | 8 | 25.23 | 21.63 |
| 20 | Washington Street | 246 | 1.33 | | 1087 | 71 | 1656.16 | 1087 | 90 | 609 | 11 | 5000 | 26 | 23 | 101 | 1.79 | 1.71 | 46 | 39 | 30.71 | 25.60 | 40 | 40 | 8 | 8 | 245.64 | 204.83 |
| 21 | Sassafras Street | 52 | 0.94 | | 1087 | 50 | 3518.24 | 1087 | 90 | 609 | 11 | 5000 | 13 | 11 | 101 | 1.07 | 1.05 | 14 | 12 | 6.46 | 5.52 | 28 | 28 | 8 | 8 | 51.69 | 44.19 |
| 22 | Palm Street | 129 | 0.94 | | 1087 | 49 | 3519.12 | 1087 | 90 | 609 | 11 | 5000 | 21 | 19 | 51 | 1.61 | 1.48 | 35 | 28 | 16.18 | 12.89 | 28 | 28 | 8 | 8 | 129.45 | 103.12 |
| 23 | Laurel Street | 68 | 0.94 | | 1087 | 49 | 3519.12 | 1087 | 90 | 609 | 11 | 5000 | 17 | 15 | 127 | 1.08 | 1.06 | 18 | 15 | 8.48 | 7.24 | 28 | 28 | 8 | 8 | 67.81 | 57.92 |
| 24 | Hawthorne Street | 253 | 1.00 | | 1087 | 49 | 2982.32 | 1087 | 90 | 609 | 11 | 5000 | 39 | 34 | 101 | 1.63 | 1.50 | 64 | 51 | 31.68 | 25.52 | 30 | 30 | 8 | 8 | 253.45 | 204.13 |
| 25 | Grape Street | 553 | 1.10 | | 1087 | 49 | 2376.44 | 1087 | 90 | 609 | 11 | 5000 | 54 | 47 | 101 | 2.35 | 2.05 | 126 | 96 | 69.17 | 52.55 | 33 | 33 | 8 | 8 | 553.34 | 420.38 |
| 26 | Cedar Street | 2 | 1.50 | | 1087 | 50 | 1318.24 | 1087 | 90 | 609 | 11 | 5000 | 0 | 0 | 51 | 1.51 | 1.51 | 0 | 0 | 0.20 | 0.18 | 45 | 45 | 8 | 8 | 1.61 | 1.40 |
| 27 | Beech Street | 24 | 1.50 | | 1087 | 50 | 1318.24 | 1087 | 90 | 609 | 11 | 5000 | 2 | 2 | 51 | 1.58 | 1.57 | 4 | 3 | 2.95 | 2.56 | 45 | 45 | 8 | 8 | 23.64 | 20.45 |
| 28 | Ash Street | 262 | 2.11 | | 1087 | 65 | 795.96 | 1087 | 90 | 609 | 11 | 5000 | 13 | 11 | 101 | 2.42 | 2.37 | 31 | 27 | 32.74 | 27.99 | 63 | 63 | 8 | 8 | 261.94 | 223.92 |
| 29 | Broadway | 81 | 1.53 | | 1087 | 84 | 1316.04 | 1087 | 90 | 609 | 11 | 5000 | 8 | 7 | 101 | 1.66 | 1.64 | 13 | 11 | 10.17 | 8.76 | 46 | 46 | 8 | 8 | 81.38 | 70.09 |
| 30 | Kettner Boulevard/G Street | 76 | 1.50 | | 1087 | 50 | 1315.6 | 1087 | 90 | 609 | 11 | 5000 | 7 | 6 | 63 | 1.70 | 1.67 | 13 | 11 | 9.53 | 8.15 | 45 | 45 | 8 | 8 | 76.20 | 65.24 |
| 31 | Market Street | 107 | 1.54 | | 1087 | 95 | 1316.92 | 1087 | 90 | 609 | 11 | 5000 | 11 | 9 | 152 | 1.65 | 1.63 | 17 | 15 | 13.32 | 11.49 | 46 | 46 | 8 | 8 | 106.59 | 91.95 |
| 32 | Front Street | 39 | 1.49 | | 1087 | 36 | 1316.92 | 1087 | 90 | 609 | 11 | 5000 | 4 | 4 | 76 | 1.58 | 1.56 | 6 | 6 | 4.82 | 4.16 | 45 | 45 | 8 | 8 | 38.53 | 33.31 |
| 33 | 1st Avenue | 56 | 1.49 | | 1087 | 36 | 1320.88 | 1087 | 90 | 609 | 11 | 5000 | 6 | 5 | 76 | 1.61 | 1.60 | 9 | 8 | 7.06 | 6.08 | 45 | 45 | 8 | 8 | 56.49 | 48.67 |
| 34 | 5th Avenue | 356 | 1.77 | | 1087 | 56 | 1017.72 | 1087 | 90 | 609 | 11 | 5000 | 22 | 19 | 101 | 2.27 | 2.19 | 50 | 42 | 44.45 | 37.36 | 53 | 53 | 8 | 8 | 355.60 | 298.89 |

# APPENDIX 11

## 2013 Station Parking Needs Assessment

LOSSAN-San Diego
Parking Expansion Project Prioritization
**EVALUATION CRITERIA**

| Category | Ref # | Criteria | Description | Source | Scoring | Weight |
|---|---|---|---|---|---|---|
| Parking | 1 | % Increase in Parking Demand (2030) | Percentage increase in total number of parking spaces needed based on mid-point between high and low ranges. | LOSSAN Station Parking Needs Assessment, 2013 | Proportional scores 0-10 with highest % receiving 10. | 6% |
| | 2 | Additional Spaces Needed (2030) | Total number of additional parking spaces needed based on mid-point between high and low ranges. | LOSSAN Station Parking Needs Assessment, 2013 | Proportional scores 0-10 with highest # receiving 10. | 19% |
| | 3 | Shared Parking Demand for Transit | Potential for parking to be used by other transit services. Greater potential = greater benefit to regional transit network. | SANDAG/NCTD Staff Analysis | High = 10, Mid = 5, Low = 0 | 4% |
| | 4 | Existing Demand | The current existing demand for additional parking at each station based on current observations and public feedback | SANDAG/NCTD Staff Analysis | High = 10, Mid = 5, Low = 0 | 4% |
| Ridership | 5 | % Increase in Ridership (2030) | Percentage increase in ridership. | LOSSAN Corridorwide Strategic Implementation Plan, 2012 | Proportional scores 0-10 with highest % receiving 10. | 34% |
| Project Delivery | 6 | Temporary Construction Impacts | Disruption to station operations during construction to existing parking, transit operations, relocation of station facilities, etc. | SANDAG Parking Structure Project Study Reports, 2012 | High = 0<br>Mid = 5<br>Low = 10 | 6% |
| | 7 | Community Support | Level of public/community support for the project. | SANDAG/NCTD Staff Analysis | High = 10, Mid = 5, Low = 0 | 10% |
| | 8 | Public Right of Way (ROW) | Project within, partially within, or outside public ROW. | SANDAG Parking Structure Project Study Reports, 2012 | Within = 10, Partially Within = 5, Outside = 0 | 7% |
| | 9 | Smart Growth Opportunity | Project located within a smart growth place type listed on SANDAG's Smart Growth Concept Map. | SANDAG Smart Growth Concept Map, 2012 | Metropolitan Center (MC) = 10<br>Urban Center (UC) = 8<br>Town Center (TC) = 6<br>Community Center (CC) = 4<br>Mixed Use Transit Center (MUTC) = 1<br>*Planned areas receive full points; potential areas receive half points. | 10% |
| | | | | | | 100% |

LOSSAN-San Diego
Parking Expansion Project Prioritization
**RESULTS**

| Category | Parking | | | | Ridership | | | Project Delivery | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Ref # | 1 | 2 | 3 | 4 | | | 5 | 6 | 7 | 8 | 9 |
| Criteria | % Increase in Parking Demand | Additional Spaces Needed | Shared Parking Demand for Transit | Existing Demand | 2014 LOSSAN Ridership | 2030 LOSSAN Ridership | % Increase in Ridership | Temporary Construction Impacts | Community Support | Public Right of Way | Smart Growth Opportunity |
| Weight | 6% | 19% | 4% | 4% | | | 34% | 6% | 10% | 7% | 10% |

| Data | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Oceanside | 71% | 351 | High | Mid | 1,523,129 | 2,043,120 | 34% | Mid | High | Within | TC, MUTC |
| Carlsbad Village | 112% | 265 | Low | Low | 489,446 | 706,567 | 44% | Mid | Mid | Within | TC |
| Carlsbad Poinsettia | 153% | 390 | Low | Mid | 412,621 | 590,241 | 43% | Mid | Mid | Partial | CC potential |
| Encinitas | 116% | 326 | Low | Mid | 438,969 | 625,590 | 43% | Low | Low | Outside | TC |
| Solana Beach | 109% | 294 | Mid | High | 868,422 | 1,408,854 | 62% | High | Low | Within | TC |
| Sorrento Valley | 233% | 162 | Low | High | 649,805 | 931,024 | 43% | Low | High | Outside | - |
| Old Town | 139% | 99 | High | High | 589,318 | 787,098 | 34% | High | High | Within | UC |
| Santa Fe Depot | 118% | 120 | High | High | 2,028,355 | 2,735,430 | 35% | Low | Mid | Outside | MC |

| Scoring (Max score 10) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Oceanside | 3.1 | 9.0 | 10 | 5 | | | 5.5 | 5 | 10 | 10 | 7 |
| Carlsbad Village | 4.8 | 6.8 | 0 | 0 | | | 7.1 | 5 | 5 | 10 | 6 |
| Carlsbad Poinsettia | 6.6 | 10.0 | 0 | 5 | | | 6.9 | 5 | 5 | 5 | 2 |
| Encinitas | 5.0 | 8.4 | 0 | 5 | | | 6.8 | 10 | 0 | 0 | 6 |
| Solana Beach | 4.7 | 7.5 | 5 | 10 | | | 10.0 | 0 | 0 | 10 | 6 |
| Sorrento Valley | 10.0 | 4.2 | 0 | 10 | | | 7.0 | 10 | 10 | 0 | 0 |
| Old Town | 6.0 | 2.5 | 10 | 10 | | | 5.4 | 0 | 10 | 10 | 8 |
| Santa Fe Depot | 5.1 | 3.1 | 10 | 10 | | | 5.6 | 10 | 5 | 0 | 10 |

LOSSAN-San Diego

Parking Expansion Project Prioritization

**RESULTS**

| Category | Parking | | | | Ridership | | | Project Delivery | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Ref # | 1 | 2 | 3 | 4 | | | 5 | 6 | 7 | 8 | 9 |
| Criteria | % Increase in Parking Demand | Additional Spaces Needed | Shared Parking Demand for Transit | Existing Demand | 2014 LOSSAN Ridership | 2030 LOSSAN Ridership | % Increase in Ridership | Temporary Construction Impacts | Community Support | Public Right of Way | Smart Growth Opportunity |
| Weight | 6% | 19% | 4% | 4% | | | 34% | 6% | 10% | 7% | 10% |

| Weighted Scoring | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Oceanside | 1.8 | 17.1 | 4 | 2 | | | 18.7 | 3 | 10 | 7.0 | 7 |
| Carlsbad Village | 2.9 | 12.9 | 0 | 0 | | | 24.2 | 3 | 5 | 7.0 | 6 |
| Carlsbad Poinsettia | 3.9 | 19.0 | 0 | 2 | | | 23.5 | 3 | 5 | 3.5 | 2 |
| Encinitas | 3.0 | 15.9 | 0 | 2 | | | 23.2 | 6 | 0 | 0.0 | 6 |
| Solana Beach | 2.8 | 14.3 | 2 | 4 | | | 34.0 | 0 | 0 | 7.0 | 6 |
| Sorrento Valley | 6.0 | 7.9 | 0 | 4 | | | 23.6 | 6 | 10 | 0.0 | 0 |
| Old Town | 3.6 | 4.8 | 4 | 4 | | | 18.3 | 0 | 10 | 7.0 | 8 |
| Santa Fe Depot | 3.0 | 5.8 | 4 | 4 | | | 19.0 | 6 | 5 | 0.0 | 10 |

| Grand Total | | |
|---|---|---|
| | Score (100) | Rank |
| Oceanside | 70.6 | 1 |
| Carlsbad Village | 61.0 | 4 |
| Carlsbad Poinsettia | 62.0 | 3 |
| Encinitas | 56.1 | 8 |
| Solana Beach | 70.1 | 2 |
| Sorrento Valley | 57.5 | 6 |
| Old Town | 59.7 | 5 |
| Santa Fe Depot | 56.9 | 7 |

# APPENDIX 12

## Station Parking Expansion Project Prioritization Evaluation

**San Diego Association of Governments**
*LOSSAN Rail Operations Modeling*

# TECHNICAL MEMORANDUM

## CONTRACT NO. 5001306 TASK ORDER 07

## STATION PARKING NEEDS ASSESSMENT

Prepared by: Christopher Wahl — 1/10/2013-4/24/2013 (Date)

Technical & Quality Review by: Mark Peterson / James Campbell — 2/12/2013-4/15/2013 (Date)

Approved & Released by: Lane Fernandes — 4/16/2013 (Date)

| Revision | Date | Description |
|---|---|---|
| Revision 1 | 2/13/2013 | Incorporated and addressed comments received from SANDAG on draft report. |
| Revision 2 | 4/16/2013 | Incorporated and addressed comments received from NCTD on revised draft report. |
| | | |
| | | |
| | | |

# SAN DIEGO ASSOCIATION OF GOVERNMENTS

# LOSSAN RAIL OPERATIONS MODELING

# STATION PARKING NEEDS ASSESSMENT

## FINAL TECHNICAL MEMORANDUM

***Prepared by:***

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**April 24, 2013**

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# TABLE OF FIGURES

# 1.0 INTRODUCTION

This memorandum summarizes the analysis conducted at the request of the San Diego Association of Governments (SANDAG) to derive parking estimates for forecast year 2030 at existing and proposed rail stations along the Los Angeles-San Diego-San Luis Obispo (LOSSAN) Rail Corridor in San Diego County, utilizing available and recent ridership forecasts for both intercity (Amtrak) and commuter (COASTER) rail passengers, station access modes splits, and other relevant information.

Ridership estimates performed as part of the LOSSAN Corridorwide Strategic Implementation Plan have indicated that passenger volumes will increase for both Amtrak and COASTER rail services along the LOSSAN Rail Corridor in San Diego County by the year 2030. To support the projected increase in ridership, additional infrastructure is being designed and constructed along the corridor to support the anticipated increase in passenger rail service levels. The service goals as stated in the Strategic Implementation Plan include:

- Provide additional through commuter service between Los Angeles and San Diego;
- Provide “new” station stops within San Diego at an Airport Intermodal Transportation Center, a seasonal platform at the Del Mar Fairgrounds, and a station at the Convention Center; and
- Operate peak period intercity trains as limited stop services

Most of the emphasis to-date has been on ensuring that the rail corridor has the capacity necessary to support the additional demand however an increase in ridership will naturally result in an increase in station parking demand. The ability to accommodate the projected increase in parking demand is equally important in that it enables passengers to utilize personal transport to bridge the gap between the station and their origin or final destination.

A range of source information focused on both intercity and commuter rail markets were utilized in performing the parking demand assessment. These sources included the following:

- 2014 and 2030 San Diego County Station Annual Ridership (AECOM, LOSSAN Corridorwide Strategic Implementation Plan, April 2012)
- FY2012 COASTER and Amtrak Annual and Daily Ridership
- San Diego LOSSAN Existing Station Access Mode Split (Survey Based, Amtrak/Metrolink/SANDAG, 2009-2012)
- 2010 and 2030 COASTER Mode of Access (SANDAG Travel Demand Model Forecast)
- AECOM Mode of Access for 2014 and 2030 Forecasts (*Summary of Ridership by Mode of Access/Egress at San Diego County Stations, based upon analysis from the LOSSAN Corridorwide Strategic Implementation Plan, April 2012*)
- Historical station parking counts (North County Transit District)

# 2.0 METHODOLOGY

This section identifies and presents the key steps used to derive parking demands at the San Diego County commuter and intercity rail stations along the LOSSAN Rail Corridor utilizing the data obtained from the sources identified in Section 1.0. In total, there were four (4) key steps taken in performing the parking needs assessment, which included:

1. Calculating Daily Boarding Estimates by Station;
2. Identifying Station Mode of Access (MOA) Splits;
3. Calculating Boarding Estimates by MOA; and
4. Estimating Parking Demand by Station and Service Type

## 2.1 DAILY BOARDING ESTIMATES BY STATION

Since parking demand is quantified on a daily basis, the initial step included deriving daily ridership estimates. The Fiscal Year (FY) 2012 (July 1, 2011 through June 30, 2012) COASTER and Amtrak daily and annual ridership numbers were used to derive daily ridership factors for the respective service types (COASTER, Metrolink, Amtrak) as follows:

- COASTER - 295
- Combined COASTER/Metrolink (Oceanside Station only) - 268
- Amtrak - 354

The 2030 AECOM annual ridership data was then divided by the above daily factors to derive 2030 daily passenger boardings by station and service type.

## 2.2 STATION MODE OF ACCESS

This step included estimating the proportion of auto access (drive alone and carpool) and non-auto (auto drop-off, transit transfer, walk, bike, other) access for each station, with the former representing the source of station parking demands. Relevant input data as indicated previously included the existing survey-based San Diego LOSSAN Station Access Mode Split data, the AECOM MOA Forecasts for 2014 and 2030, and the SANDAG travel demand model derived COASTER MOA data for both 2010 and 2030.

In general, the San Diego LOSSAN Station Access Mode Split data was identified to be more reflective of current conditions due to its derivation from recent survey data. The AECOM forecasts were also found to be aligned with the San Diego LOSSAN Station Access Mode Split data, but did not indicate any changes in mode splits between the 2014 baseline and the forecast year 2030.

Review of the SANDAG regional model MOA data indicated a reduction in the proportion of COASTER auto access trips between the years 2010 and 2030 (approximately a 7% reduction corridor wide) based upon assumptions relating to station area land use and planned transit network changes. These assumptions would over time increase the proportion of COASTER related walk/bike trips, as well as transit transfer trips, thus reducing the proportion of auto access trips to each of the COASTER stations. In discussions with SANDAG staff it was decided to calculate a range of MOA estimates (and resulting parking demand estimates) utilizing the AECOM existing survey MOA as the upper range, and estimates utilizing the projected reductions in COASTER auto access) between 2010 and 2030 as forecast by the SANDAG regional model as the lower range.

For both estimates, assumptions regarding Amtrak MOA were based upon the survey based San Diego LOSSAN Station Access Mode Split data.

The station MOAs (proportion of auto/non-auto) were then applied to the 2030 daily boardings by service type to estimate the total number of daily auto based trips (drive alone and carpool) by station and associated service type.

### 2.3 PARKING DEMAND BY STATION AND SERVICE TYPE

Using the MOA assumptions identified in Section 2.2, data on the proportion of drive alone and carpools was used to estimate average vehicle occupancy by station. This information was then applied to the projected 2030 daily auto based trips by service type to estimate daily parking demand by station. Assumptions regarding average parking duration by service type were also incorporated as follows:

- Coaster/Metrolink – single day parking only
- Amtrak – 10 percent overnight parking with average duration of 1.8 days, based on recent estimates of parking duration by Amtrak passengers as reported in the *Anaheim Regional Transportation Intermodal Center (ARTIC) Parking Demand Analysis (Parsons Brinckerhoff, 2012).*

## 3.0 STATION PARKING DEMAND ESTIMATES

Forecast 2030 annual boarding estimates were obtained from the AECOM LOSSAN ridership analysis for 2030. These estimates reflect the projected total number of passengers boarding trains at each of the respective stations along the LOSSAN Rail Corridor within San Diego County. Annual boarding numbers were converted to 2030 average daily numbers by applying the annualization factors previously noted in Section 2.1. **Table 3.1** displays both annual and daily estimated passenger boarding numbers at each of the stations.

**Table 3.1 – 2030 LOSSAN Station Passenger Boardings**

| Station | Annual Boardings[1] | Daily Boardings[2] |
|---|---|---|
| **Oceanside** | | |
| COASTER | 697,064 | 2,601 |
| Metrolink | | |
| Amtrak | 324,497 | 915 |
| **Carlsbad Village** | | |
| COASTER | 353,284 | 1,198 |
| **Poinsettia** | | |
| COASTER | 295,121 | 1,000 |
| **Encinitas** | | |
| COASTER | 312,795 | 1,060 |
| **Solana Beach** | | |
| COASTER | 347,867 | 1,179 |
| Amtrak | 356,560 | 1,006 |
| **Sorrento Valley** | | |
| COASTER | 465,512 | 1,578 |
| **Old Town San Diego** | | |
| COASTER | 393,549 | 1,334 |
| **Airport Intermodal Transportation Center (Planned)** | | |
| COASTER | 131,183 | 445 |
| Amtrak | 32,796 | 111 |
| **Santa Fe Depot** | | |
| COASTER | 725,964 | 2,461 |
| Amtrak | 641,751 | 1,810 |
| **Convention Center (Planned)** | | |
| COASTER | 43,456 | 147 |

1. *AECOM "Summary of Ridership by Mode of Access/Egress at San Diego County Stations, based upon analysis from the LOSSAN Corridorwide Strategic Implementation Plan, April 2012"*
2. *Daily Ridership derived by dividing annual ridership numbers by the following annualization factors: COASTER/Metrolink: 268; COASTER: 295; Amtrak: 354.*

Station MOA percentages were reviewed from a number of sources as shown in **Table 3.2** (on the following page), including:

- SANDAG 2010 and 2030 regional model MOA assumptions
- Existing LOSSAN survey data
- AECOM 2014/2030 estimate (*Summary of Ridership by Mode of Access/Egress at San Diego County Stations, based upon analysis from the LOSSAN Corridorwide Strategic Implementation Plan, April 2012*)

As discussed previously, two MOA estimates were developed, thereby providing a range of estimated station access assumptions and resulting parking demands. The initial MOA option assumed station access mode splits consistent with the existing LOSSAM survey data as shown in Table 3.2. The second MOA option utilized the San Diego LOSSAN survey based data as a starting point, but incorporates additional adjustments based on the SANDAG regional model projected reduction in the proportion of COASTER auto access trips between the years 2010 and 2030 (approximately 7% reduction corridorwide). These assumptions increased the proportion of COASTER related walk/bike trips, as well as transit transfer trips, and reduced the proportion of auto access trips.

**Table 3.3** (presented on page 7) displays the resulting COASTER MOA using the San Diego LOSSAN survey-based data as the base and with adjustments to reflect the SANDAG regional model assumed reduction in auto access trips between 2010 and 2030.

**Table 3.2 – Summary of Station Mode of Access by Source**

| | 2010 SANDAG Model | | | 2030 SANDAG Model | | | Amtrak/Metrolink/SANDAG Surveys | | | 2014/2030 AECOM | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Station** | **Walk/Bike** | **Auto** | **Transfer** | **Walk/Bike** | **Auto** | **Transfer** | **Walk/Bike** | **Auto** | **Transfer** | **Walk/Bike** | **Auto** | **Transfer** |
| **Oceanside** | | | | | | | | | | | | |
| COASTER | 19% | 20% | 61% | 27% | 14% | 59% | 12% | 63% | 25% | 13% | 55% | 32% |
| Metrolink | - | - | - | - | - | - | 10% | 60% | 33% | | | |
| Amtrak | - | - | - | - | - | - | 6% | 30% | 64% | 3% | 62% | 36% |
| **Carlsbad Village** | | | | | | | | | | | | |
| COASTER | 37% | 37% | 25% | 33% | 25% | 42% | 6% | 78% | 15% | 14% | 65% | 22% |
| **Poinsettia** | | | | | | | | | | | | |
| COASTER | 10% | 59% | 31% | 4% | 22% | 74% | 5% | 89% | 5% | 8% | 68% | 25% |
| **Encinitas** | | | | | | | | | | | | |
| COASTER | 25% | 36% | 39% | 34% | 40% | 26% | 24% | 64% | 12% | 9% | 65% | 26% |
| **Solana Beach** | | | | | | | | | | | | |
| COASTER | 33% | 37% | 29% | 34% | 27% | 40% | 68% | 15% | 17% | 27% | 38% | 35% |
| Amtrak | - | - | - | - | - | - | 5% | 41% | 54% | 2% | 62% | 36% |
| **Sorrento Valley** | | | | | | | | | | | | |
| COASTER | 9% | 21% | 70% | 5% | 18% | 76% | 9% | 75% | 25% | 17% | 21% | 62% |
| **Old Town San Diego** | | | | | | | | | | | | |
| COASTER | 6% | 30% | 65% | 20% | 21% | 59% | 50% | 13% | 37% | 26% | 26% | 48% |
| **Airport Intermodal Transportation Center (Planned)** | | | | | | | | | | | | |
| COASTER | - | - | - | 80% | 2% | 18% | - | - | - | 38% | 25% | 37% |
| Amtrak | - | - | - | - | - | - | - | - | - | 14% | 55% | 31% |
| **Santa Fe Depot** | | | | | | | | | | | | |
| COASTER | 35% | 1% | 64% | 33% | 0% | 67% | 28% | 0% | 72% | 60% | 3% | 37% |
| Amtrak | - | - | - | - | - | - | 13% | 9% | 78% | 22% | 26% | 52% |
| **Convention Center (Planned)** | | | | | | | | | | | | |
| COASTER | - | - | - | 100% | - | - | - | - | - | 49% | 15% | 36% |

**Table 3.3 – Adjusted 2030 COASTER Mode Splits**

| Station | Mode Splits | | | |
|---|---|---|---|---|
| | Walk/Bike | Auto | Transfer | Total |
| **Oceanside** | 18% | 53% | 28% | 100% |
| **Carlsbad Village** | 6% | 63% | 31% | 100% |
| **Poinsettia** | 5% | 68% | 27% | 100% |
| **Encinitas** | 30% | 63% | 7% | 100% |
| **Solana Beach** | 67% | 10% | 22% | 100% |
| **Sorrento Valley** | 5% | 67% | 27% | 100% |
| **Old Town San Diego** | 80% | 4% | 16% | 100% |
| **Airport Intermodal Transportation Center (Planned)** | - | - | - | - |
| **Santa Fe Depot** | 26% | 0% | 74% | 100% |
| **Convention Center (Planned)** | - | - | - | - |

Further review of the resulting MOA percentages shown in Table 3.3 identified the need for a number of additional adjustments, which are summarized below:

- *Old Town* – Due to a projected increase in non-auto access at this station, application of the SANDAG regional model MOA percentages would result in a significant reduction in the proportion of auto access (from 13% to 4%). This was identified to be excessive and the existing San Diego LOSSAN survey-based data proportion of 13% auto access was retained for this location.

- *Sorrento Valley* – Compared to the other COASTER stations, this station is somewhat unique based upon the following:

  - High boarding activity in both the AM and PM peak periods (typical commuter rail stations exhibit higher boarding activity in the AM peak period with higher alightings in the PM peak period).

  - The percentage of boardings by auto versus transit transfers varies significantly between the AM and PM peak periods. In the AM peak period a high percentage arrive at the station by auto and park at the station (75%+ as shown in the San Diego LOSSAN survey-based data). In the PM peak period, a high proportion of passengers arrive at the station by transit (62%+ as shown in the AECOM data).

  Based upon the above information, it was decided that the SANDAG 2030 rate as derived from the SANDAG regional travel demand model (18% auto access) was more reflective of overall daily station access patterns by COASTER passengers. This percentage also aligns with the AECOM 2030 forecast numbers.

- *Solana Beach* – The low MOA (10%) at this station warranted further review of the San Diego LOSSAN survey-based MOA percentages. Both the existing AECOM and SANDAG regional model derived auto access percentages are approximately 37% and the SANDAG model forecasts 27% for 2030. The latter MOAs were determined to provide a more reasonable estimate for Solana Beach (not excessively low) in the future based on the corresponding MOAs.

**Table 3.4** displays the two MOA options, including mode of access percentages by station and service type. Option A displays the Survey Adjusted MOA percentages, while Option B displays the Survey Based MOA percentages. Option A incorporates SANDAG assumptions regarding changes in station access specifically for COASTER passengers, while Option B is based on existing LOSSAN survey information.

**Table 3.4 – 2030 Mode of Access Estimates**

| Station | Option A (Survey Adjusted[1]) | | | Option B (Survey Based) | | |
|---|---|---|---|---|---|---|
| | Walk/Bike | Auto | Transfer | Walk/Bike | Auto | Transfer |
| **Oceanside** | | | | | | |
| COASTER | 18% | 53% | 28% | 12% | 63% | 25% |
| Metrolink | | | | 10% | 60% | 33% |
| Amtrak | 6% | 30% | 64% | 6% | 30% | 64% |
| **Carlsbad Village** | | | | | | |
| COASTER | 6% | 63% | 31% | 6% | 78% | 15% |
| **Poinsettia** | | | | | | |
| COASTER | 5% | 68% | 27% | 5% | 89% | 5% |
| **Encinitas** | | | | | | |
| COASTER | 30% | 63% | 7% | 24% | 64% | 12% |
| **Solana Beach** | | | | | | |
| COASTER[2] | 34% | 27% | 40% | 68% | 27% | 17% |
| Amtrak | 5% | 41% | 54% | 5% | 41% | 54% |
| **Sorrento Valley** | | | | | | |
| COASTER | 5% | 18% | 76% | 9% | 18% | 25% |
| **Old Town San Diego** | | | | | | |
| COASTER | 72% | 13% | 15% | 50% | 13% | 37% |
| **Airport Intermodal Transportation Center (Planned)** | | | | | | |
| COASTER | 38% | 18% | 44% | 38% | 18% | 44% |
| Amtrak | 14% | 29% | 57% | 14% | 29% | 57% |
| **Santa Fe Depot** | | | | | | |
| COASTER | 26% | 0% | 74% | 28% | 0% | 72% |
| Amtrak | 13% | 9% | 78% | 13% | 9% | 78% |
| **Convention Center (Planned)** | | | | | | |
| COASTER | 49% | 11% | 40% | 49% | 11% | 40% |

1. *COASTER mode splits incorporated SANDAG assumptions regarding changes in station access. Amtrak mode splits taken from LOSSAN existing surveys*

The 2030 estimated boardings were then multiplied by the respective auto MOA percentages for both MOA Options A and B. **Table 3.5** displays the resulting 2030 daily auto access boardings (drive alone and carpool) by station for MOA Options A and B.

**Table 3.5 – 2030 Auto Access Daily Boardings**

| Station | Auto Access Boardings (Option A) | Auto Access Boardings (Option B) |
|---|---|---|
| **Oceanside** | | |
| COASTER | 1,390 | 1,650 |
| Metrolink | | |
| Amtrak | 280 | 280 |
| **Carlsbad Village** | | |
| COASTER | 760 | 940 |
| **Poinsettia** | | |
| COASTER | 690 | 900 |
| **Encinitas** | | |
| COASTER | 670 | 680 |
| **Solana Beach** | | |
| COASTER | 320 | 320 |
| Amtrak | 410 | 410 |
| **Sorrento Valley** | | |
| COASTER | 290 | 290 |
| **Old Town San Diego** | | |
| COASTER | 180 | 180 |
| **Airport Intermodal Transportation Center (Planned)** | | |
| COASTER | 90 | 90 |
| Amtrak | 40 | 40 |
| **Santa Fe Depot** | | |
| COASTER | 0 | 0 |
| Amtrak | 160 | 160 |
| **Convention Center (Planned)** | | |
| COASTER | 20 | 20 |

The resulting parking demands by station were then calculated by applying an average vehicle occupancy factor (AVO) for the auto access trip to account for carpooling. Amtrak auto access boardings were also adjusted as previously discussed to account for the anticipated extent of overnight parking. The methodology used to calculate AVO factors is included in Appendix A.

**Table 3.6** presents the projected 2030 auto access boardings (Options A and B), calculated AVO, and resulting parking demand (Options A and B) at each of the stations along the LOSSAN Rail Corridor in San Diego County. As shown, Option A (Survey Adjusted MOA) results in lower parking demands than Option B (Survey Based MOA), reflecting the projected reduction in COASTER auto access at a number of the stations. Together Options A and B provide a likely range of estimated parking demand at the various LOSSAN stations.

**Table 3.6 – 2030 Parking Demand by Station**

| Station | Auto Boardings | | AVO | Parking Demand | |
|---|---|---|---|---|---|
| | Auto Access Boardings (Option A) | Auto Access Boardings (Option B) | | Parking Demand (Option A) | Parking Demand (Option B) |
| **Oceanside** | | | | | |
| COASTER<br>Metrolink | 1,390 | 1,650 | 1.09 | 1,280 | 1,520 |
| Amtrak[1] | 280 | 280 | 1.52 | 210 | 210 |
| **Total** | **1,670** | **1,930** | - | **1,490** | **1,730** |
| **Carlsbad Village** | | | | | |
| COASTER | 760 | 940 | 1.06 | 720 | 890 |
| **Poinsettia** | | | | | |
| COASTER | 690 | 900 | 1.11 | 630 | 820 |
| **Encinitas** | | | | | |
| COASTER | 670 | 680 | 1.06 | 630 | 640 |
| **Solana Beach** | | | | | |
| COASTER | 320 | 320 | 1.03 | 320 | 320 |
| Amtrak | 410 | 410 | 1.52 | 300 | 300 |
| **Total** | **730** | **730** | - | **620** | **620** |
| **Sorrento Valley** | | | | | |
| COASTER | 290 | 290 | 1.06 | 280 | 280 |
| **Old Town San Diego** | | | | | |
| COASTER | 180 | 180 | 1.09 | 170 | 170 |
| **Airport Intermodal Transportation Center (Planned)** | | | | | |
| COASTER | 90 | 90 | 1.09 | 90 | 90 |
| Amtrak | 40 | 40 | 1.52 | 30 | 30 |
| **Total** | **130** | **130** | - | **120** | **120** |
| **Santa Fe Depot** | | | | | |
| Amtrak | 160 | 160 | 1.52 | 120 | 120 |
| **Convention Center (Planned)** | | | | | |
| COASTER | 20 | 20 | 1.08 | 20 | 20 |

[1] *Amtrak parking demand increased by 10% to account for passengers who leave their cars at stations overnight.*

# 4.0 SUMMARY & REVIEW OF FINDINGS

Understanding the context of the various stations and the role they play in serving various trip types can be useful in assessing the reasonableness of the study findings. As an additional check on the reasonability of the resulting parking demands, this section also provides a comparison of the projected growth in passenger boardings relative to the estimate of 2030 parking demands at the respective LOSSAN Rail Corridor stations in San Diego County.

## 4.1 STATION CONTEXT

In general, the commuter rail stations along the LOSSAN Rail Corridor can be characterized as primarily serving either origin-based or destination-based trips, or some combination of both. Origin-based trips are typically associated with the residential side of the work commute trip, and consequently, stations serving origin-based trips tend to exhibit a higher proportion of AM peak period passenger boardings. The proportion of auto access trips also tends to be higher during this period. For the most part, origin-based auto access boardings are the source of parking demands at the respective stations. The Oceanside Transit Center, Carlsbad Village, Poinsettia, Encinitas, and Solana Beach stations typically serve a very high proportion of origin-based trips.

Destination-based trips are primarily associated with the employment side of the work commute trip, and rail stations serving such trips therefore tend to exhibit a higher proportion of passenger boarding activity in the PM peak period, with typically a higher reliance on non-auto modes for access to the stations. Destination-based trips are therefore generally not a source of parking demand. The rail stations in Sorrento Valley, Old Town San Diego and the Santa Fe Depot in downtown San Diego typically serve a high proportion of destination-based trips, the majority of which originate from the North San Diego County stations.

Future residential and employment development within the travel sheds of the respective stations will change the mix and proportion of origin- and destination-based trips served. Consequently, future parking demands at the rail stations will also change. For example, while the Sorrento Valley station currently serves a high proportion of destination-based trips, recent residential development in the Sorrento Valley area will increase the number of origin-based trips served by that station.

## 4.2 GROWTH IN BOARDINGS VERSUS PARKING DEMAND

The projected growth in station boarding activity and the associated parking demand estimates were compared as an additional measure in reviewing the reasonability of the results. **Table 4.1** displays the projected percent change in total passenger boardings and parking demands by station estimated between 2012 and 2030 (COASTER, Metrolink, and Amtrak combined).

**Table 4.1 – Boardings / Parking Demand Comparisons**

| Station | Daily Boardings | | | Parking Demand | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | 2030 Projected | | Percent Change | |
| | Existing[1] | 2030 Projected | Percent Change | Existing[2] | Option A | Option B | Option A | Option B |
| **Oceanside** | | | | | | | | |
| **Total** | **1,882** | **3,516** | 87% | 939 | 1,490 | 1,730 | 59% | 84% |
| **Carlsbad Village** | | | | | | | | |
| **Total** | **592** | **1,198** | 102% | 379 | **720** | **890** | 90% | 135% |
| **Poinsettia** | | | | | | | | |
| **Total** | **475** | **1,000** | 111% | 286 | **630** | **820** | 120% | 186% |
| **Encinitas** | | | | | | | | |
| **Total** | **492** | **1,060** | 116% | 294 | **630** | **640** | 114% | 118% |
| **Solana Beach** | | | | | | | | |
| **Total** | **980** | **2,185** | 123% | 296 | **620** | **620** | 109% | 109% |
| **Sorrento Valley** | | | | | | | | |
| **Total** | **793** | **1,578** | 99% | 84 | **280** | **280** | 234% | 234% |
| **Old Town San Diego** | | | | | | | | |
| **Total** | **670** | **1,334** | 99% | NA | **170** | **170** | NA | NA |
| **Airport Intermodal Transportation Center (Planned)** | | | | | | | | |
| **Total** | **-** | **556** | NA | NA | **120** | **120** | NA | NA |
| **Santa Fe Depot** | | | | | | | | |
| **Total** | **2,333** | **4,271** | 83% | NA | **120** | **120** | NA | NA |
| **Convention Center (Planned)** | | | | | | | | |
| **Total** | **-** | **147** | NA | NA | **20** | **20** | NA | NA |

*[1] 2012 ridership data provided by SANDAG.*

*[2] Average mid-week parking demand based on counts performed October, 2012.*

As shown above, under Option A (Survey Adjusted MOA) the percent change in passenger boardings between existing and 2030 is generally greater than the percent change in parking demands at the respective stations. Again, this is due to the projected increase in the proportion of COASTER related non-auto access to the various stations based upon assumptions relating to station area land use and assumed enhancements to the connecting transit networks. The result is an increase in the proportion of COASTER related walk/bike trips, as well as transit transfer trips.

The percent change in passenger boardings between existing and 2030 is generally equal to or less than the percent change in parking demands at the respective stations for Option B. This is due to the fact that MOA percentages remain, for the most part, unchanged from existing.

The Sorrento Valley station is a rather significant exception to the above stated observations, with a significant increase in 2030 parking demands relative to the growth in station passenger boardings. As noted previously, this station currently serves a high proportion of destination-based trips with limited parking demands. It is estimated that by 2030, new residential developments in station's travel shed will significantly increase the number of origin-based trips served by the station and hence the magnitude of parking demands at the station will increase as a result.

**Table 4.2** displays existing and projected parking demand, existing parking supply, and additional spaces required to meet the projected 2030 demand.

**Table 4.2 – Parking Supply and Demand Summary**

| Station | Existing Supply[1] | Existing Demand[2] | 2030 Projected Demand | | Additional Spaces Needed | |
|---|---|---|---|---|---|---|
| | | | Option A | Option B | Option A | Option B |
| **Oceanside** | | | | | | |
| **Total** | 1,259 | 939 | 1,490 | 1,730 | 240 | 480 |
| **Carlsbad Village** | | | | | | |
| **Total** | 540 | 379 | 720 | 890 | 180 | 350 |
| **Poinsettia** | | | | | | |
| **Total** | 335 | 286 | 630 | 820 | 300 | 490 |
| **Encinitas** | | | | | | |
| **Total** | 309 | 294 | 630 | 640 | 330 | 340 |
| **Solana Beach** | | | | | | |
| **Total** | 326 | 296 | 620 | 620 | 300 | 300 |
| **Sorrento Valley** | | | | | | |
| **Total** | 118 | 84 | 280 | 280 | 170 | 170 |
| **Old Town San Diego** | | | | | | |
| **Total** | NA | NA | 170 | 170 | TBD[3] | TBD[3] |
| **Airport Intermodal Transportation Center (Planned)** | | | | | | |
| **Total** | NA | NA | 120 | 120 | TBD[3] | TBD[3] |
| **Santa Fe Depot** | | | | | | |
| **Total** | NA | NA | 120 | 120 | TBD[3] | TBD[3] |
| **Convention Center (Planned)** | | | | | | |
| **Total** | NA | NA | 20 | 20 | TBD[3] | TBD[3] |

[1] *Provided by NCTD*
[2] *Average mid-week parking demand based on counts performed October, 2012.*
[3] *To be determined based upon further studies of existing supply utilization.*
*Note: Existing parking supply at Old Town and Santa Fe Depot not designated for rail passengers.*

# 5.0 POST 2030 PARKING DEMANDS

It is important to note that growth in rail ridership and parking demand at the rail stations along the LOSSAN corridor in San Diego County is expected to continue over the years following the year 2030, which was the timeframe and focus of this current study. With this in mind, a generalized review of forecast 2050 rail ridership – based on information taken from the *2050 Regional Transportation Plan* (SANDAG, 2011) - was undertaken to assess available data and potential long range trends within the context of the objectives of the current parking demand study.

The SANDAG travel demand model provides estimates of COASTER boardings for 2050 and these projections indicate an increase in corridor COASTER boardings for 2050 of approximately 15% over 2030 levels. Amtrak boardings are not explicitly forecast by SANDAG, however, a comparison of past growth trends of Amtrak boardings in relationship to COASTER boardings indicates that corridor Amtrak boardings can be expected to increase by a minimum of 10% over 2030 levels by 2050 as well.

As documented throughout this current study, in addition to the number of rail passenger boardings, the resulting parking demands at individual stations are and will continue to be primarily a function of station mode of access assumptions. As noted further, a number of variables have the potential to influence station mode of access, including the nature/density of adjacent land uses and changes in transit access and service levels. Further incorporation of smart growth and related policies supporting non-automobile access could have an influence as well. Quantifying these factors over the extended 2050 timeframe is difficult with any degree of confidence and therefore limits the ability to confidently forecast 2050 parking demands, especially at the individual station level.

However, given the likelihood of continued growth in parking demands over the long term, the process of increasing the parking supply to address the nearer term 2030 demands should consider the ability to accommodate the continuing increase in parking demand beyond the 2030 planning horizon. Towards this end, targeting a 10-15% increase above the 2030 parking demand estimates will provide a reasonable approach in moving forward. In addition to and integral to the expansion of parking at each rail station, appropriate measures should be incorporated to ensure flexibility in project design through phasing and identifying options to expand at a future date.

## APPENDIX A
Average Vehicle Occupancy Calculations

The average vehicle occupancy (AVO) factors were calculated in order to develop parking demand forecasts at each of the stations. AVO was calculated for “drove alone” trips and “carpool” trips at each station, and was then added together to derive an overall AVO. **Table A.1** shows the calculations for the AVO used to develop parking demand forecasts.

**Table A.1 – Average Vehicle Occupancy Calculations**

| Station | Drove Alone | Carpool | AVO - Drove Alone[1] | AVO - Carpool[2] | Overall Average Vehicle Occupancy[3] |
|---|---|---|---|---|---|
| **Oceanside** | | | | | |
| COASTER | 75% | 8% | 0.909 | 0.183 | 1.091 |
| Metrolink | | | | | |
| Amtrak | 35% | 38% | 0.476 | 1.048 | 1.524 |
| **Carlsbad Village** | | | | | |
| COASTER | 78% | 5% | 0.943 | 0.114 | 1.057 |
| **Poinsettia** | | | | | |
| COASTER | 79% | 10% | 0.889 | 0.222 | 1.111 |
| **Encinitas** | | | | | |
| COASTER | 79% | 5% | 0.936 | 0.127 | 1.064 |
| **Solana Beach** | | | | | |
| COASTER | 72% | 2% | 0.971 | 0.058 | 1.029 |
| Amtrak | 34% | 38% | 0.476 | 1.048 | 1.524 |
| **Sorrento Valley** | | | | | |
| COASTER | 78% | 5% | 0.941 | 0.119 | 1.059 |
| **Old Town San Diego** | | | | | |
| COASTER | 68% | 6% | 0.913 | 0.175 | 1.087 |
| **Airport Intermodal Transportation Center (Planned)** | | | | | |
| COASTER | 67% | 6% | 0.914 | 0.172 | 1.086 |
| Amtrak | 25% | 27% | 0.476 | 1.048 | 1.524 |
| **Santa Fe Depot** | | | | | |
| Amtrak | 25% | 27% | 0.476 | 1.048 | 1.524 |
| **Convention Center (Planned)** | | | | | |
| COASTER | 64% | 6% | 0.918 | 0.164 | 1.082 |

1. *Calculated by deriving the proportion of auto trips that drove alone, multiplied by total number of passengers per car (1) in a drove alone trip*
2. *Calculated by deriving the proportion of auto trips that carpooled, multiplied by total number of passengers per car (2) in a carpool trip*
3. *Sum of AVO for drove alone and carpool MOA*

## APPENDIX B
Response to Comments

**LOSSAN RAIL OPERATIONS MODELING – SAN DIEGO PROJECT DEVELOPMENT AND COMPLETION OF CORRIDORWIDE ANALYSIS**
Comment Review Form

Submittal Title: STATION PARKING NEEDS ASSESSMENT
Draft Technical Memorandum

Date: February 13, 2013

| Comment No. | Page #/Section Reference | Reviewer Agency | Comment | Date Received | Response | Comment Addressed (Y/N) |
|---|---|---|---|---|---|---|
| | 2/2.1 | NCTD | How was the daily ridership factor of 295 for COASTER stations derived? | 3/14/2013 | Daily ridership factor was derived by dividing the 2012 annual ridership by the 2012 average weekday ridership. 1,615,783/5,482 = 295. | |
| | 2-3/2.0 | NCTD | Daily boardings are calculated in Section 2.0 - is "daily"derived from weekend plus weekday ridership? | 3/14/2013 | Daily boardings are derived by dividing the annual weekday ridership by the average weekday ridership. These numbers represent an average weekday. | |
| | 6/Table 3.2 | NCTD | "Transfer" is listed as a MOA. Does "Transfer" capture transfers from transit, or is that captured as a walk up and therefore in the "Walk/Bike" MOA? | 3/14/2013 | "Transfer" includes all transfers from transit, taxi, and drop-off (kiss & ride) trips. | |
| | 12/4.2 | NCTD | The study cites expected significant residential growth in Sorrento Valley's travel shed. What is the area of the travel shed? What is the source of the assumption (2050 RTP?)? | 3/14/2013 | Expectation of significant residential growth in Sorrento Valley based upon general knowledge of future growth patterns. While not specifically quantified in term of the station's travel shed, growth assumptions are consistent with SANDAG Series 12/2050 RTP. | |

# APPENDIX 13

## Analysis of Service Capacity and Third Track for Access for Stuart Mesa Maintenance Facility

**San Diego Association of Governments**
*LOSSAN Rail Operations Modeling*

# TECHNICAL MEMORANDUM

## CONTRACT NO. 5001306 TASK ORDER 07

## STUART MESA MAINTENANCE FACILITY STORAGE & SERVICE CAPACITY

## THIRD TRACK FOR ACCESS TO STUART MESA MAINTENANCE FACILITY


Prepared by: Ashley Walker — 08/08/2012 (Date)

Technical & Quality Review by: Lane Fernandes — 09/04/2012-02/18/2013 (Date)

Approved & Released by: James D. Campbell — 09/07/2012-02/20/2013 (Date)


| Revision | Date | Description |
|---|---|---|
| Revision 1 | 02/20/2013 | Addressed comments provided by NCTD and SANDAG. |
| | | |
| | | |
| | | |

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February 21, 2013

# Analysis of Service Capacity and Third Track for Access for Stuart Mesa Maintenance Facility

## Background

This memorandum has been created to establish 2030 service and storage needs and access requirements for the Stuart Mesa Maintenance Facility (SMMF). The SMMF is a storage and equipment maintenance facility that is located on Camp Pendleton Marine Corp Base, north of Oceanside. It is owned by North County Transit District (NCTD) and operates on an easement through the Department of the Navy. This facility was opened in 1995 and was designed and built to maintain the rolling stock of the newly implemented COASTER commuter rail service. Metrolink Orange County Line trainsets are also currently stored overnight and have light maintenance performed at this facility.

With the exception of heavy overhauls and wheel work, all maintenance of COASTER rolling stock is performed at this facility. Currently, each weeknight, this facility services four 5-car COASTER trains and light maintenance is performed on five 6-car Metrolink trains. During the day, general and preventative maintenance is performed on the balance of the COASTER fleet and midday layover storage is provided to two Metrolink trains.

Per a March 1994 agreement between NCTD, the Southern California Regional Rail Authority (SCRRA) and the Orange County Transportation Authority (OCTA), up 43 Metrolink units (any combination of locomotives and coaches) are entitled to receive "turnaround" service and storage at the SMMF. Turnaround service consists of such things as running repairs, brake shoe change-outs and interior coach cleaning. With the planned increase in commuter service (and therefore rolling stock) proposed for the corridor in 2030, additional servicing and storage space may need to be identified.

Parsons Brinckerhoff has been tasked by the San Diego Association of Governments (SANDAG) to identify potential capacity and access improvements necessary at the SMMF to support the projected 2030 COASTER and Metrolink service levels for the San Diego Subdivision. This includes identifying the possible need for a "running" track between the Oceanside Transit Center (OTC) and the SMMF. This additional track has been identified in previous studies as being necessary to facilitate the movement of non-revenue trains between the OTC and the SMMF at either the beginning or end of each operating day and to reduce the potential for "conflicts" with revenue trains during these non-revenue movements.

## Methodology

This analysis was accomplished in part through simulations performed of the San Diego Subdivision and a specific analysis conducted of the corridor between the OTC and the SMMF. The overall analysis identified

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the estimated number of trainsets needed to support the proposed 2030 service plan and the cycling of those sets into and out of the SMMF.

To approximate the required capacity of the facility, an analysis was conducted to identify possible equipment turns and the associated increase in rolling stock required to support the assumed service plan and equipment cycles for both Metrolink and COASTER.

The results of this analysis will serve as a guide in identifying potential constraints to increasing the capacity at the SMMF. It is important to note that the conclusions reached in this analysis should not be considered definitive. The ultimate build out of the facility will be dependent upon the actual service levels achieved in the next 20 years and the service plans created and approved by the railroad operators to support those service levels. Before final augmentations to Stuart Mesa are planned, coordination will be necessary between Metrolink, SANDAG, NCTD and their contractor to develop and confirm a coordinated approach that takes into consideration not only the amount of new equipment necessary, but the maintenance methods and approach prescribed by NCTD policies.

## Service Level Assumptions

Service levels included as part of this analysis were based on the service levels identified in the 2030 Full-Build Operations Analysis previously performed in support of SANDAG. For San Diego County, the agreed to service levels assumed a total of 18 commuter and 36 intercity trains between the Orange County Line and Oceanside and 54 commuter trains and 36 intercity trains between Oceanside and San Diego. Tables summarizing the service level assumptions are provided below in Tables 1 and 2.

***Table 1: Service Level Assumptions (Orange County Line to Oceanside)***

| Operator / Line | July 2012 Volume | 2030 Volume | Service Growth (2011-2030) | 2030 Frequency Goals (minutes)[1] |
|---|---|---|---|---|
| Intercity (All Stop) | 21 | 28 | 7 | 60 PK / 60 OP |
| Intercity (Limited Stop) | 1 | 8 | 7 | Not applicable[2] |
| Commuter | 16 | 18 | 2 | 30 PK / 60-90 OP |
| BNSF Freight | 4 | 8 | 4 | Not applicable |
| **TOTAL** | **42** | **62** | **20** | |

[1] Frequency goals are based on general guidelines identified in the SANDAG 2050 RTP and State Rail Plan for peak (PK) commute periods and off-peak (OP) non-commute periods of the day.

[1] The State Rail Plan currently does not distinguish frequencies between an "all stop" or "limited stop" intercity services, No specific limited stop frequency was identified and limited stop trains were considered part of the overall frequency identified for "all stop" intercity trains.

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***Table 2: Service Level Assumptions (Oceanside to San Diego)***

| Operator / Line | July 2012 Volume | 2030 Volume | Service Growth (2011-2030) | 2030 Frequency Goals (minutes)[1] |
|---|---|---|---|---|
| Intercity (All Stop) | 21 | 28 | 7 | 60 PK / 60 OP |
| Intercity (Limited Stop) | 1 | 8 | 7 | Not applicable[2] |
| Commuter | 22 | 54 | 32 | 20 PK / 60 OP |
| BNSF Freight | 6 | 11 | 5 | Not applicable |
| **TOTAL** | **50** | **101** | **51** | |

[1] Frequency goals are based on general guidelines identified in the SANDAG 2050 RTP and State Rail Plan for peak (PK) commute periods and off-peak (OP) non-commute periods of the day.

[1] The State Rail Plan currently does not distinguish frequencies between an "all stop" or "limited stop" intercity services, No specific limited stop frequency was identified and limited stop trains were considered part of the overall frequency identified for "all stop" intercity trains.

## Existing Infrastructure and Operations

The current 2012 infrastructure at the SMMF consists of five storage tracks, three shop tracks, and two stub tracks. Each day post-revenue trains enter the yard from the south (railroad east). COASTER locomotives are positioned on the north end of the trains (railroad west). When the trains arrive in the yard the train is serviced, which includes fueling, interior cleaning and waste dumping. All four COASTER sets returning from revenue service receive daily service. Washing and sanding are also performed two to three times per week as part of their servicing. The COASTER equipment is spotted as it enters the yard and taken to the north end of the SMMF where it is serviced by mechanical before being returned to a designated storage position for the night. The interior cleaning then occurs after the trains are spotted for overnight storage.

As currently configured, the rotation of the equipment is first in and last out and thus the size of the equipment sets and their relative position in the yard will be an important consideration for equipment laying over in the yard. This is not a factor today because all COASTER trains operate as five-car sets.

The main shop tracks (storage tracks) are north of the primary maintenance building. South of the building, capacity is limited and only three cars can be stored at any one time. These spaces are typically reserved for equipment undergoing special project work, such as the installation of Positive Train Control (PTC) for cab cars or the changing out of seats, etc. There is currently no space for general equipment storage in this area.

The number 1 shop track is utilized for trains that may require use of the inspection and maintenance pit and as a result is not used to store trains. This track is also used to process out of the SMMF a train should a revenue train need to be "rescued". Therefore, the manner in which the number 1 shop track is currently utilized is not conducive to its use as a storage track.

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In addition to the inspection pit, the SMMF currently has one car washer, which is located on Track 1. In order to wash the trains, each train must run down through the same track in order to be washed and refueled. This creates pinch point in the existing capacity of the SMMF.

The locomotive fueling is also performed on Track 1 of the SMMF just north of the shop building. Fuel is stored in an above ground tank with a capacity of 20,000 gallons. With the growth in COASTER service over the past 17 years, the tank capacity is reaching its limit in being able to support the fuel demand of the daily services.

At the inception of service in 1995, the COASTER burned approximately 5,000 gallons of diesel fuel per week. With the current schedules, during the summer season, the COASTER requires over 18,000 gallons of diesel fuel per week. This does not take into account the further stress on capacity for various special event services and as fuel is dispensed/sold to Metrolink several times per month.

An additional 20,000 gallon tank is currently being considered for installation at the facility. The additional fuel capacity is especially critical when considering the potential for cross county commuter operations between Metrolink and COASTER. This new service, currently being explored, would have two early-morning Metrolink trains originate in San Diego, rather than Oceanside. It would also require Metrolink trains to be serviced and regularly fueled at the SMMF due to the increase of miles the trainsets would operate every day.

Existing standard operating procedures have all trains entering and exiting the yard from the south as they operate to or from the Oceanside Transit Center. This is currently performed on infrastructure that supports a combination of single and double track main line for the approximately four miles between the SMMF and the OTC. However, should a train need to depart from or arrive to the yard from the north, it currently must stop and activate the manual electric lock switch that govern access to the mainline, making this a lengthy and inefficient process to leave the yard. Also, the mechanical employees are not trained or allowed to access a main track, which limits their ability to shuffle equipment sets around in the yard. However, the powering of this switch on the north end of the SMMF is part of the Santa Margarita Bridge Replacement and Double Track Project currently under construction.

The BNSF Railway (BNSF) and their short-line subcontractor, Pacific Sun, also currently have access to four yard tracks available at the SMMF and reserved for their freight operations in support of the service provided to Camp Pendleton and industries along the Escondido Subdivision.

## Recommended Modifications to Infrastructure and Operations

To meet planned 2030 service levels, it is anticipated that a total of four additional trainsets may need to be stored at the SMMF. A third track between the SMMF and the OTC was not identified as necessary to support the proposed 2030 service levels (See Figure 1). This Figure presents a time-distance chart that summarizes the assumed train movements on the San Diego Subdivision in 2030. As presented, no capacity constraints were identified between the SMMF and OTC (represented in Figure 1 as "CP Mesa" and

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"Oceanside") associated with the volume of train movements. The majority of non-revenue movements between the SMMF and OTC occur during morning startup and evening shutdown time periods, where the majority of trains are operating in the same direction. Furthermore, the construction of a planned Camp Pendleton station will further reduce the need of non-revenue movements between the OTC and SMMF as a number of revenue passenger trains would then be originating and terminating at the Camp Pendleton station, which would be located adjacent to the SMMF.

In addition, as currently proposed, some of the trains may be originating or terminating at the proposed Camp Pendleton station to be located directly adjacent to the SMMF, reducing the overall number of non-revenue movements required between the SMMF and OTC. For those trains still proposed to originate and terminate at the OTC, the utilization of capacity by these non-revenue movements to and from the SMMF on the mainline was not observed to impact the ability to reliably operate the proposed 2030 service plan.

The four additional trains identified to support the 2030 service levels include three COASTER trainsets and one Metrolink. Due to the possible addition of cross county operations, the extra Metrolink train may be needed as a "spare" to support the long runs the cross county equipment will need to make daily. The assumed storage capacity requirements for 2030 are summarized in Table 3 below and compared against the existing (2012) storage capacity requirements of the SMMF.

***Table 3: Storage Capacity Increase due to Service Level Increase***

| Operator | Storage 2012 | Spare 2012 | Total 2012 | Storage 2030 | Spare 2030 | Total 2030 |
|---|---|---|---|---|---|---|
| Coaster | 4 | 1 | 5 | 7 | 1 | 8 |
| Metrolink | 5 | 0 | 5 | 5 | 1 | 6 |
| **TOTAL** | **9** | **1** | **10** | **12** | **2** | **14** |

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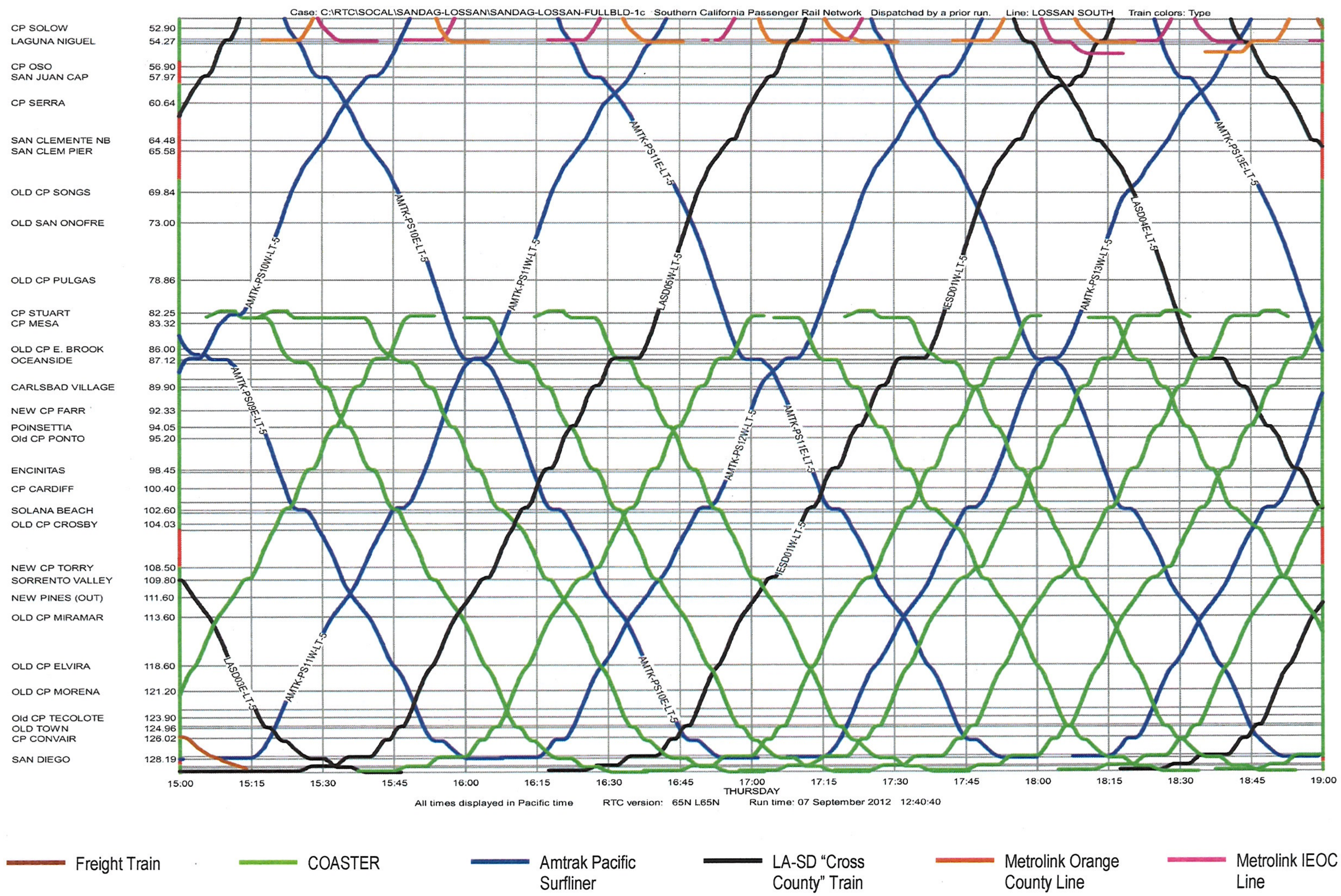
**Figure 1: Peak Morning Operations (Time-Distance Chart)**



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While it was identified to be "feasible" to physically store the estimated number of trainsets at the SMMF necessary to support the proposed 2030 service levels without increasing the storage capacity of the facility, limitations that currently exist in the processing of the equipment each day may create other capacity constraints. As mentioned above, the rotation of the equipment currently is first in and last out and thus the size of the equipment sets and their relative position in the yard are important considerations for equipment laying over in the yard. The length of each trainset will be important in determining the ultimate capacity requirements of the SMMF, since some of the storage tracks are only able to store up to 4 car trainsets.

In addition, the ability to switch trainsets between tracks without impacting main line operations is key to the efficient operations of the SMMF. As currently configured, maintenance crews cannot switch between tracks on the south end of the yard due to the limited track length before accessing the main line. This requires all switching moves to occur from the north end of the facility.

It is important to note that the ability to store trains overnight in San Diego to support the early morning northbound trains could reduce the need for additional capacity at Stuart Mesa, but would require the identification of a site to store and service the equipment overnight in the San Diego area. The San Diego MTS trolley yard, which provides this function for weekday midday layovers, would not be an option since the tracks are occupied by trolleys at night. It should be noted that, along with reducing non-revenue (deadhead) mileage, the flexibility and efficiency of having train starts out of San Diego could allow trains to run at more efficient times for making "meets" on segments of double track and allow more flexibility to the schedules of the growing reverse commute market.

Four options have been identified below to address possible capacity improvements to the yard to support the storage of more 5-6 car trainsets and for improving the efficiency of processing the equipment at the end of each operating day:

1. For improving the efficiency of how the equipment is processed at the end of each operating day, one option could be to build a track extension to the South of the yard (see Figure 2). The track will be for switching purposes and allow for maintenance crews to make equipment moves without impacting main line operations. This option would likely require modifications to the Interstate 5 overpass of the railroad, such as construction of an additional span or replacement of the overpass with a single span, to allow for the additional track to be constructed, but this can improve the daily servicing of all the trains at the yard. To address the full build-out train length identified by Metrolink, the current tracks will also need to also be extended to accommodate eight-car trainsets.

2. Store BNSF and Pacific Sun freight equipment in a place other than the SMMF. The storage of Pacific Sun freight equipment typically occupies in the neighborhood of 1,000 feet of track space at the facility. This would allow one or two additional passenger trainsets to be stored without impact. This option would require discussions with and approval of the BNSF Railway and likely require SANDAG or NCTD to identify or construct an alternate site for staging freight equipment.

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3. There is additional real estate within the existing facility property that would allow the construction of an additional storage track - a new shop track #7 between the existing shop track #6 and the freight storage track #1. This could be explored as a potential capital project, as it would be relatively straightforward project (See Figure 3).

4. Identify a location and construct a facility to service and store trainsets in San Diego. This additional capacity could reduce the future capacity requirements at the SMMF, by allowing the early morning reverse peak trains to originate out of San Diego, rather than Oceanside. It is important to note that with the 2030 operating plan, it is expected that only two COASTER trainsets will require a midday layover in the trolley yard rather than the three that currently do so. This should be taken into consideration if this option were to be further explored.

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**Figure 2: Extension of Stuart Mesa Maintenance Facility Lead Track**

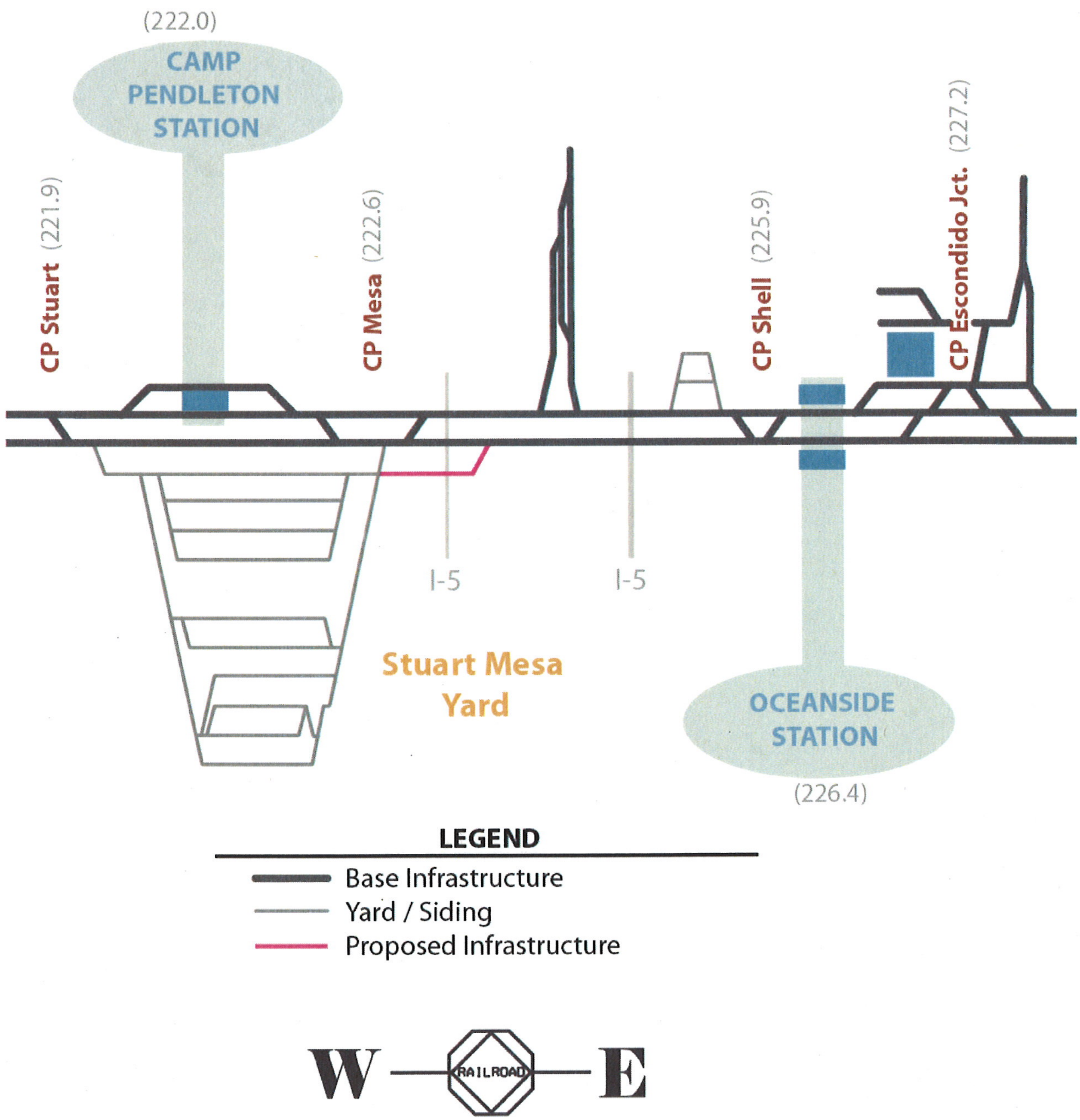

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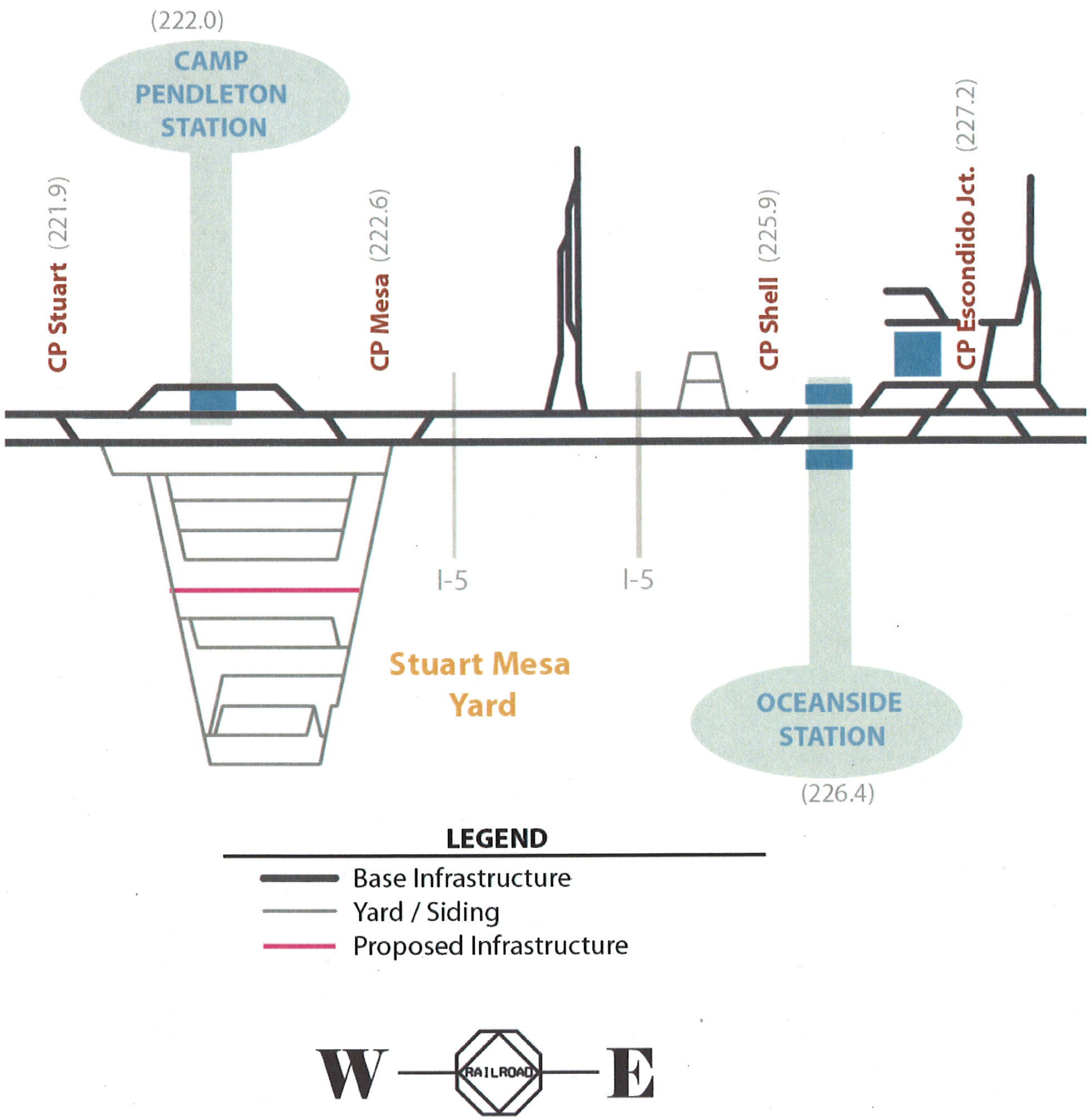
**Figure 3: Construction of Additional Storage Track**



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# APPENDIX A
## Response to Comments

| Comment No. | Page #/Section Reference | Reviewer Agency | Comment | Date Received | Response | Comment Addressed (Y/N) |
|---|---|---|---|---|---|---|
| 1 | 1 | SANDAG | change to ....Camp Pendleton Marine Corps Base ~~in~~ **north of** Oceanside. | 1/16/2013 | Comment addressed. | Y |
| 2 | 1 | SANDAG | please reorganize introduction as follows:<br>From the 3rd paragraph, take the sentence that starts w/ "Currently, short of..." and move to the end of the first paragraph.<br>Next, also from the 3rd paragraph, take the sentence that starts with "Also, short of" and move it to the first paragraph after 1. above.<br>Next, in 3rd paragraph, take sentence that starts "Under this agreement," and add to end of 2nd paragraph.<br>Last, take last sentence in 3rd paragraph that starts "With the planned" and move to beginning of 4th paragraph. | 1/16/2013 | Comment addressed. | Y |
| 3 | 1 | NCTD | Incorrect. Wheel trueing is not performed at SMMF. | 12/20/2012 | Comment addressed. | Y |
| 4 | 1 | NCTD | last paragraph in background section, change project to projected. | 12/20/2012 | Comment addressed. | Y |
| 5 | 1 | SANDAG | was third track extension to Oceanside Transit Center part of this analysis? | 1/16/2013 | Third track extension for "non revenue" movements was evaluated in previous corridorwide analyses since non-revenue movements were assumed. In addition, the establishment of a Camp Pendleton station would limit the need for non revenue movements between SMMF and OTC. Text added to clarify this point. | Y |
| 6 | 2 | NCTD | third line, change "built" to "build" | 12/20/2012 | Comment addressed. | Y |
| 7 | 2 | SANDAG | Table 1:<br>Show BN volumes at 4 for 2012 and 8 for 2030.<br>Totals are then 42 for 2012 and 62 for 2030.<br>Label frequency goals as 2030 Frequency Goals<br>Add Footnotes<br>Table 2:<br>Show BN volumes at 11 for 2030 and growth of 5<br>Show totals at 101 for 2030 and growth of 51<br>Label frequency goals as 2030 Frequency Goals<br>Isn't 32 PK frequency supposed to be 20 PK?<br>Add footnotes | 1/16/2013 | Comment addressed. | Y |
| 8 | 3 | SANDAG/ NCTD | Add track diagram of yard with the locations discussed in the text labeled (e.g., all tracks, shop tracks, inspect/maint pit, car wash, fueling) | 1/16/2013 | SANDAG to request this of NCTD. | N |
| 9 | 3 | NCTD | 5th paragraph - add track # and location of car washer | 12/20/2013 | Comment addressed. | Y |
| 10 | 3 | NCTD | 6th paragraph - add track # and location of fueling;<br>Add basis for this statement regarding fueling capacity by providing current daily usage. | 12/20/2013 | Comment addressed. | Y |
| 11 | 3 | SANDAG | 6th paragraph - add sentence on what proposed cross-county commuter operations is. | 1/16/2013 | Comment addressed. | Y |
| 12 | 4 | NCTD | 2nd line - delete "in" in ... limiting in their ability... | 12/20/2012 | Comment addressed. | Y |
| 13 | 4 | SANDAG | 2nd paragraph - add sentence or two on any impacts on passenger service, now or future. | 1/16/2013 | Passenger is planned around the BNSF usage of SMMF. Per the NCTD-BNSF Shared Use Agreement, NCTD is obligated to provide BNSF with enough freight storage to allow for "Quality Freight Rail Service", up to 7,200' of track. In order for BNSF to leave SMMF a new facility, approved by them, would have to be constructed. | Y |
| 14 | 4 | SANDAG | last paragraph, first sentence - do we need to account for spares in the 3 COASTER and 1 ML trainset assumption? | 1/16/2013 | This includes spares. These are the total sets required to support the service. | Y |
| 15 | 5 | SANDAG | Please include legend, similar to other tech memos | 1/16/2013 | Comment addressed. | Y |
| 16 | 6 | SANDAG | 4th Paragraph, use ":" at the end | 1/16/2013 | Comment addressed. | Y |
| 17 | 6 | SANDAG | bullet #1: Change sentence to This option would like require modifications to the Interstate 5 overpass of the railroad **such as construction of an additional span or replacement of the overpass with a single span**, to allow for the additional track to be construct~~ioned~~, but... | 1/16/2013 | Comment addressed. | Y |
| 18 | 6 | SANDAG/ NCTD | You haven't mentioned Pac Sun before now - perhaps briefly describe them in an earlier section. | 1/16/2013 | Comment addressed. | Y |
| 19 | 6 | SANDAG | bullet #2: is constructing an alternate site for staging freight equipment the only option for this? | 1/16/2013 | See #13. | Y |
| 20 | 7 | SANDAG | bullet #3: add at the beginning: Construction of a new shop track #7 between the existing shop track #6 and the freight storage track #1. | 1/16/2013 | Comment addressed. | Y |

| Comment No. | Page #/Section Reference | Reviewer Agency | Comment | Date Received | Response | Comment Addressed (Y/N) |
|---|---|---|---|---|---|---|
| 21 | 7 | SANDAG | bullet #4: consider adding reference to Depot findings (e.g., 2 trainsets by 2030 v. 3 today, etc). | 1/16/2013 | Comment addressed. | Y |
| 22 | 8 and 9 | SANDAG | correct Pendleton on Figures 2 and 3. | 1/16/2013 | Comment addressed. | Y |

# APPENDIX 14

## Excerpts from NCTD Integration of SPRINTER & COASTER Passenger Rail Services Study – Final Benefits and Constraints Technical Memorandum

# North County Transit District

*Integration of SPRINTER & COASTER Passenger Rail Services*

**FINAL**

**TECHNICAL MEMORANDUM**

**AGREEMENT NO. 15019-OS**

# BENEFITS AND CONSTRAINTS ANALYSIS

| | | |
|---|---|---|
| Prepared by: | Thomas Lichterman<br>Tom Lichterman | 11/3/2016<br>Date |
| Technical & Quality Review by: | Lauren German<br>Lauren German | 11/3/2016<br>Date |
| Approved & Released by: | James D. Campbell<br>James D Campbell | 11/3/2016<br>Date |

| Revision | Date | Description |
|---|---|---|
| | | |
| | | |
| | | |
| | | |

# NORTH COUNTY TRANSIT DISTRICT

# INTEGRATION OF SPRINTER & COASTER PASSENGER RAIL SERVICES

# BENEFITS AND CONSTRAINTS ANALYSIS

## FINAL TECHNICAL MEMORANDUM


***Prepared by:***

WSP | Parsons Brinckerhoff
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***Prepared for:***

North County Transit District
810 Mission Avenue
Oceanside, CA 92054



**November 3, 2016**

## 7.2 EXPANSION OF COASTER MAINTENANCE FACILITY

Two different service plans, based on different assumptions, were developed for the Integrated Service schedule. Each service plan had different requirements for the COASTER maintenance facility. As described in the Operating Cost Estimates Technical Memorandum (included in the Appendix), the first Integrated Service Plan is based on the Regional Plan and the Infrastructure Development Plan (SANDAG, 2013), with 54 COASTER trips per day and an assumption of coordination/interlining of Metrolink trainsets where possible to reduce capital requirements for the COASTER. The second Integrated Service Plan assumes 60 COASTER trips per day, with a longer peak service period, and all service operated by COASTER equipment. These two alternatives are described in succession in this section.

### 7.2.1 COASTER Maintenance Facility Expansion under Regional Plan/Infrastructure Development Plan Assumptions

In order to run 20-minute peak headways and hourly off-peak on the coastal corridor under the Regional Plan/Infrastructure Development Plan service plan, the COASTER would need five traditional bi-level commuter consists for revenue service. As a result of the coordinated service with Metrolink assumed in the Infrastructure Development Plan, three additional Metrolink bi-level commuter consists for revenue service would need to lay over at night at the COASTER maintenance facility (Stuart Mesa Maintenance Facility) to provide for early morning coordinated service. Thus, a total of eight trainsets, plus two spare sets, is assumed for storage and maintenance requirements at the Stuart Mesa Maintenance Facility. For estimating purposes, we assume that each trainset would consist of a 70’ long locomotive and four 85’ long bi-level coaches and one control cab, based on the assumptions in the Infrastructure Development Plan. As discussed earlier in the contractual review section, NCTD is currently bound to provide storage for Metrolink trains, which could limit the amount of additional storage track space that can be made available at the Stuart Mesa Maintenance Facility. Our estimate assumes continuing storage, per the existing agreement, for 30 Metrolink cars/locomotives for Metrolink’s other services.

**Table 9** provides the estimated facility requirements for the expanded fleet. **Figure 7** provides a conceptual layout for the proposed facility.

**Table 9: Comparison of Existing and Proposed Improvements at COASTER Maintenance Facility To Support 2035 Regional Plan Service Levels – Coordinated Service Plan**[1]

| EXISTING CONDITIONS | QUANTITY |
|---|---|
| COASTER Locomotive - 70' | 7 |
| COASTER Bi-Level Coach - 85' | 19 |
| COASTER Bi-Level Cab - 85' | 9 |
| **TOTAL FLEET** | 35 |
| Revenue Storage Spaces Available | 42 |
| Exterior Service Line | 1 |
| Interior Maintenance Positions (2-car trains) | 4 |
| Building Footprint (SF) | 44,600 |
| Parking Spaces | 64 |

| PROPOSED IMPROVEMENTS | QUANTITY |
|---|---|
| COASTER Locomotives - Service + Spares | 6 |
| SCRRA Locomotives - Service + Spares | 4 |
| COASTER Cab Cars - Service + Spares | 6 |
| SCRRA Cab Cars - Service + Spares | 4 |
| COASTER Coaches - 4/Consist - Service + Spares | 24 |
| SCRRA Coaches - 4/Consist - Service + Spares | 18 |
| **SUB-TOTAL COASTER SERVICE FLEET** | **62** |
| SCRRA Orange County Service | 30 |
| **GRAND TOTAL FLEET STORAGE REQUIREMENT** | **92** |
| Revenue Storage Spaces Available* | 101 |
| Interior Maintenance Positions (2-car trains) | 10 |
| Building Footprint (SF) | 90,000 |
| Parking Spaces | 64 |

*Assumes up to 6 cars stored at Camp Pendleton Station and up to 6 Cars stored at Oceanside Transit Center, if needed

The space requirements in **Table 9** and **Figure 7** were based on the following assumptions and constraints:

**Assumptions:**

- Includes 30 storage spaces provided for Metrolink cars.
- Storage of revenue vehicles to be spaced at 20’-0” on center to allow inspections and cleaning in yard. Based on existing conditions.

1 Note that building footprint (square footage) refers to all areas including maintenance bays and space in a two-story building.

- The proposed number of maintenance bays was determined by using 15% of the active fleet.

- It is assumed the Fuel, Wash, & Servicing facilities will be modified as required to meet the needs of the proposed fleet. The concept layout shows a separate Servicing track for fuel/wash/sand.

- Parking for rubber tire vehicles (employee and non-revenue vehicles) will need to be increased. There is adequate land available to increase as required.

- Support spaces of improved facility (welfare areas including offices, break room, locker rooms, etc.) could be on 2nd floor.

**Constraints:**

- These plans do not include an increase to MOW facilities at this location. In fact, additional storage tracks are proposed to be built in an area that currently provides some outdoor MOW storage. If large increases in this function are anticipated or the existing MOW storage needs to be replaced, this will require further study to incorporate.

- The area next to Interstate 5 where five two storage tracks are shown may be environmentally challenging as a possible wetland area, as discussed earlier in Section 3.4. If the site cannot be developed due to environmental restrictions, another storage location off-site may be needed due to the severe site limitations. The former BNSF freight yard about two miles south at I-5 and Harbor Drive may offer an alternative, if available for lease or purchase, but would require shuttling crews to and from trains stored there.

- Phasing of construction will take careful planning to allow the facility to remain operational as these improvements are made.

**Benefits:**

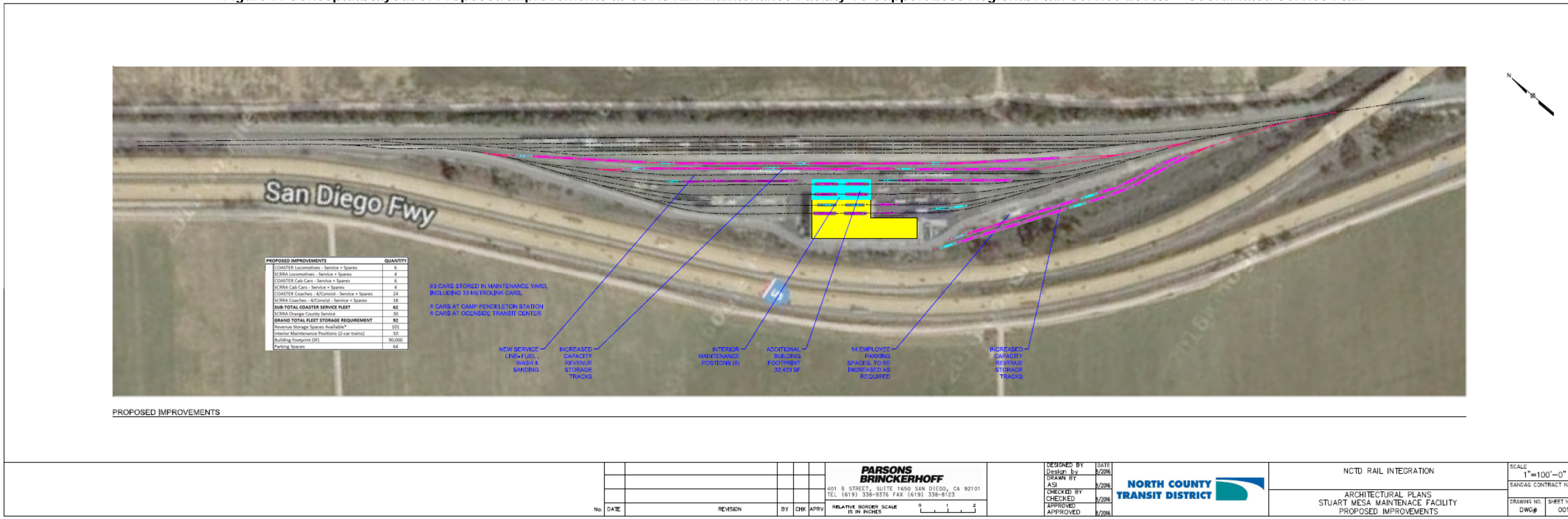
- Greatly increases service capabilities potentially without additional land acquisition for maintenance and storage functions, if the area next to I-5 can be developed as additional storage tracks.

As shown in **Table 9** and **Figure 7**, the footprint of the maintenance building would increase by 73 percent to support the expanded fleet. In addition, existing outdoor MOW storage area is lost with this proposal. A summary of the ROM capital cost estimate for this facility expansion is provided in **Table 10**. Please see the Appendix for the detailed ROM estimate.

**Table 10: ROM Capital Cost Estimate for Expansion of COASTER Maintenance Facility – Coordinated Service Plan**

| Construction Cost Element | Adj. % | Estimated Amount |
|---|---|---|
| Maintenance Facility Building Expansion | | $ 8,100,000 |
| Industrial Equipment | | $ 2,300,400 |
| Yard and Track Site/Civil | | $ 5,562,000 |
| Subtotal | | $ 15,962,400 |
| Location Factor Adjustment Percentage | 15.0% | $ 2,394,360 |
| **Subtotal** | | **$ 18,356,760** |
| | | |
| Design Contingency | 15.0% | $ 2,753,514 |
| Design Fees | 15.0% | $ 2,753,514 |
| **Subtotal** | | **$ 23,863,788** |
| | | |
| General Conditions and Mobilization | 15.0% | $ 3,579,568 |
| Contractor's Fee | 10.0% | $ 2,386,379 |
| **TOTAL CONSTRUCTION COST** | | **$ 29,829,735** |
| | | |
| Unallocated Contigency | 20.0% | $ 5,965,947 |
| **TOTAL PROJECT COST ESTIMATE** | | **$ 35,795,682** |

**Figure 7: Conceptual layout of Proposed Improvements at COASTER Maintenance Facility To Support 2035 Regional Plan Service Levels – Coordinated Service Plan**



### 7.2.2 COASTER Maintenance Facility Expansion with all COASTER Service Operated by COASTER Trainsets

In order to run 20 minute peak headways on the coastal corridor under a service plan where all COASTER service is operated by COASTER trainsets, the COASTER would need 11 commuter consists plus two spares for a total of 13 trainsets for schedule needs. For estimating purposes, we assume that each trainset would consist of a 70' long locomotive and five 85' long cars. As discussed earlier in the contractual review section, NCTD is currently bound to provide storage for SCRRA which could limit the amount of additional storage track space that can be made available at the Stuart Mesa Maintenance Facility. Our estimate assumes continuing storage for 30 Metrolink cars/locomotives.

**Table 11** provides the estimated facility requirements for the expanded fleet. **Figure 8** provides a conceptual layout for the proposed facility.

**Table 11: Comparison of Existing and Proposed Improvements at COASTER Maintenance Facility To Support 2035 Regional Plan Service Levels – All Service by COASTER Trainsets[1]**

| EXISTING CONDITIONS | QUANTITY |
|---|---|
| COASTER Locomotive - 70' | 7 |
| COASTER Bi-Level Coach - 85' | 19 |
| COASTER Bi-Level Cab - 85' | 9 |
| **TOTAL FLEET** | 35 |
| Revenue Storage Spaces Available | 42 |
| Exterior Service Line | 1 |
| Interior Maintenance Positions (2-car trains) | 4 |
| Building Footprint (SF) | 44,600 |
| Parking Spaces | 64 |

| PROPOSED IMPROVEMENTS | QUANTITY |
|---|---|
| COASTER Locomotive - 70' | 14 |
| COASTER Bi-Level Coach - 85' | 53 |
| COASTER Bi-Level Cab - 85' | 14 |
| **SUBTOTAL COASTER SERVICE FLEET** | **81** |
| SCRRA Orange County Service | 30 |
| **GRAND TOTAL FLEET STORAGE REQUIREMENT** | **111** |
| Revenue Storage Spaces Available* | 122 |
| Interior Maintenance Positions (2-car trains) | 10 |
| Building Footprint (SF) | 90,000 |
| Parking Spaces | 64 |

*Assumes 6 cars stored at Camp Pendleton Station and 6 Cars stored at Oceanside Transit Center

1 Note that building footprint (square footage) refers to all areas including maintenance bays and space in a two-story building.

The space requirements in **Table 11** and **Figure 8** were based on the following assumptions and constraints:

**Assumptions:**

- Includes 30 storage spaces provided for Metrolink cars.
- Storage of revenue vehicles to be spaced at 20'-0" on center to allow inspections and cleaning in yard. Based on existing conditions.
- The proposed number of maintenance bays was determined by using 15% of the active fleet.
- It is assumed the Fuel, Wash, and Servicing facilities will be modified as required to meet the needs of the proposed fleet.
- Parking for rubber tire vehicles (employee and non-revenue vehicles) will need to be increased. There is adequate land available to increase as required.
- Support spaces of improved facility (welfare areas including offices, break room, locker rooms, etc.) could be on 2nd floor of expanded building footprint.

**Constraints:**

- These plans do not include an increase to MOW facilities at this location. In fact, additional storage tracks are proposed to be built in an area that currently provides some outdoor MOW storage. If large increases in this function are anticipated or the existing MOW storage needs to be replaced, this will require further study to incorporate.
- The area next to Interstate 5 where five new storage tracks are shown may be environmentally challenging as a possible wetland area, as discussed earlier in Section 3.4. If the site cannot be developed due to environmental restrictions, another storage location off-site may be needed due to the severe site limitations. The former BNSF freight yard about two miles south at I-5 and Harbor Drive may offer an alternative, if available for lease or purchase, but would require shuttling crews to and from trains stored there.
- Phasing of construction will take careful planning to allow the facility to remain operational as these improvements are made.

**Benefits:**

- Greatly increases service capabilities potentially without additional land acquisition for maintenance and storage functions, if the area next to I-5 can be developed as additional storage tracks.

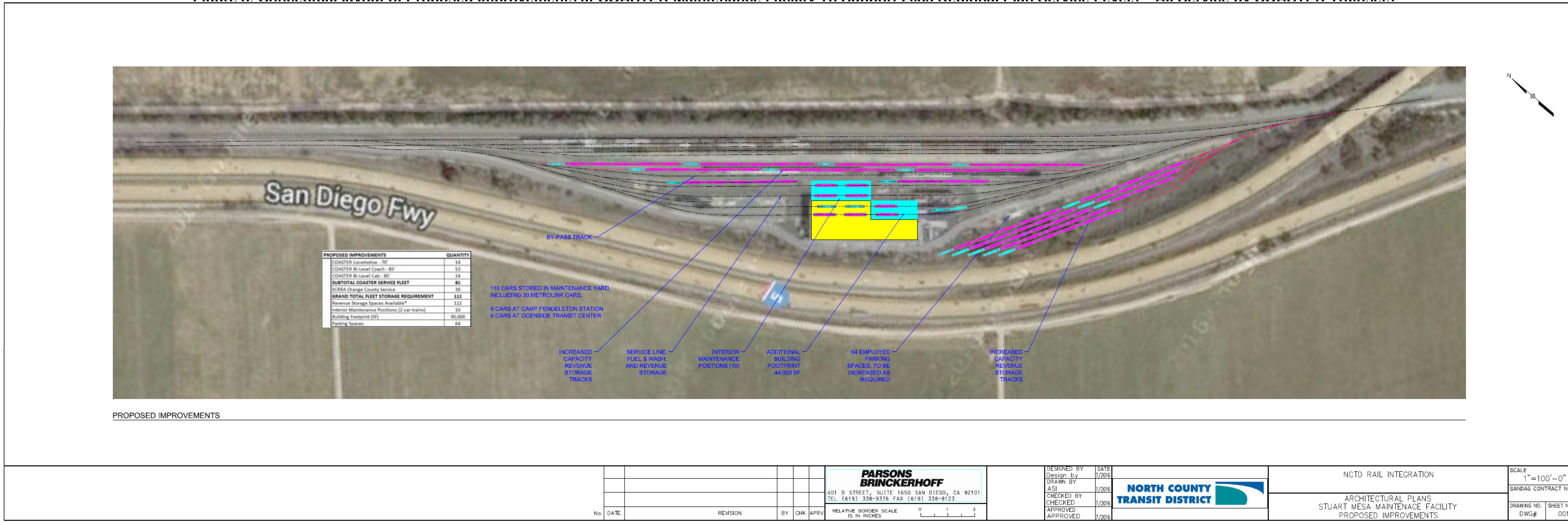
As shown in **Table 11** and **Figure 8**, the footprint of the maintenance building would double to support the expanded fleet. In addition, existing outdoor MOW storage area is lost with this proposal. A summary of the ROM capital cost estimate for this facility expansion is provided in **Table 12**. Please see the Appendix for the detailed ROM estimate.

**Table 12: ROM Capital Cost Estimate for Expansion of COASTER Maintenance Facility – All Service by COASTER Trainsets[2]**

| Construction Cost Element | Adj. % | Estimated Amount |
|---|---|---|
| Maintenance Facility Building Expansion | | $ 11,350,000 |
| Industrial Equipment | | $ 3,223,400 |
| Yard and Track Site/Civil | | $ 7,086,000 |
| Subtotal | | $ 21,659,400 |
| Location Factor Adjustment Percentage | 15.0% | $ 3,248,910 |
| **Subtotal** | | **$ 24,908,310** |
| | | |
| Design Contingency | 15.0% | $ 3,736,247 |
| Design Fees | 15.0% | $ 3,736,247 |
| **Subtotal** | | **$ 32,380,803** |
| | | |
| General Conditions and Mobilization | 15.0% | $ 4,857,120 |
| Contractor's Fee | 10.0% | $ 3,238,080 |
| **TOTAL CONSTRUCTION COST** | | **$ 40,476,004** |
| | | |
| Unallocated Contigency | 20.0% | $ 8,095,201 |
| **TOTAL PROJECT COST ESTIMATE** | | **$ 48,571,205** |

2 Note that building footprint (square footage) refers to all areas including maintenance bays and space in a two-story building.

**Figure 8: Conceptual layout of Proposed Improvements at COASTER Maintenance Facility To Support 2035 Regional Plan Service Levels – All Service by COASTER Trainsets**



# **Appendix E:**
## Detailed Cost Estimates for Track, Station, and Facility Improvements

# North County Transit District
# Coaster / Sprinter Platform and Track Upgrades

## Conceptual Cost Estimate

August 2, 2016


**Owner**

NORTH COUNTY TRANSIT DISTRICT

**Cost Estimator:**
WSP / Parsons Brinckerhoff
75 Arlington Street
Boston, MA  02116
(617) 426 7330

**NCTD Transit Corridor Project Study**
**Staurt Mesa Maintenance Facility**
**Rough Order of Magnitude Construction Cost Estimate**
August 1, 2016

| | Unit | Unit Cost | Qty. | Total |
|---|---|---|---|---|
| **30.02 Maintenance Facility** | | | | |
| **BUILDING** | | | | |
| Structural | SF | 60 | 32,400 | 1,944,000 |
| Architectural | SF | 75 | 32,400 | 2,430,000 |
| Mechanical-HVAC | SF | 35 | 32,400 | 1,134,000 |
| Mechanical-Plumbing | SF | 25 | 32,400 | 810,000 |
| Mechanical-Fire Protection | SF | 10 | 32,400 | 324,000 |
| Electrical- Lighting | SF | 15 | 32,400 | 486,000 |
| Electrical- Power | SF | 30 | 32,400 | 972,000 |
| **INDUSTRIAL EQUIPMENT** | | | | |
| Vehicle Maintenance | SF | 60 | 32,400 | 1,944,000 |
| Materials Management | SF | 6 | 32,400 | 194,400 |
| Facilities Maintenance | SF | 1 | 32,400 | 32,400 |
| MOW | SF | 4 | 32,400 | 129,600 |
| **30.05 Yard & Yard Track** | | | | |
| **SITE/CIVIL** | | | | |
| Grading/Paving | SF | 15 | 26,000 | 390,000 |
| Retaining Walls | LF | 400 | 800 | 320,000 |
| Utility - Sewer | SF | 6 | 32,400 | 194,400 |
| Utility - Water | SF | 5 | 32,400 | 162,000 |
| Utility - Drainage | SF | 5 | 32,400 | 162,000 |
| Utility - Electrical | SF | 14 | 32,400 | 453,600 |
| Landscaping | SF | 100,000 | 1 | 100,000 |
| Trackwork | | | | |
| Turnouts | No. 8 | 140,000 | 6 | 840,000 |
| Track | TF | 220 | 7,000 | 1,540,000 |
| Signals & Comm. | TF | 200 | 7,000 | 1,400,000 |

| | | | | |
|---|---|---|---|---|
| Subtotal | | | | **15,962,400** |
| Location Factor | 1.15 | | | 2,394,360 |
| Design Contingency | 15% | | | 2,753,514 |
| Design Fees | 15% | | | 2,753,514 |
| Subtotal | | | | **23,863,788** |
| General Conditions & Mobilization | 15% | | | 3,579,568 |
| Contractor's Fee | 10% | | | 2,386,379 |
| **Total Construction Cost** | | | | **29,829,735** |

| | | | | |
|---|---|---|---|---|
| Unallocated Contingency | 20% | | | 5,965,947 |
| **Total Project Cost** | | | | **35,795,682** |

**Not Including: Escalation, Hazardous Material Removal, or TOD/JD Construction Cost**

NCTD Transit Corridor Project Study
Stuart Mesa Maintenance Facility
Rough Order of Magnitude Construction Cost Estimate
June 27, 2016

| | Unit | Unit Cost | Qty. | Total |
|---|---|---|---|---|
| **30.02 Maintenance Facility** | | | | |
| BUILDING | | | | |
| Structural | SF | 60 | 45,400 | 2,724,000 |
| Architectural | SF | 75 | 45,400 | 3,405,000 |
| Mechanical-HVAC | SF | 35 | 45,400 | 1,589,000 |
| Mechanical-Plumbing | SF | 25 | 45,400 | 1,135,000 |
| Mechanical-Fire Protection | SF | 10 | 45,400 | 454,000 |
| Electrical- Lighting | SF | 15 | 45,400 | 681,000 |
| Electrical- Power | SF | 30 | 45,400 | 1,362,000 |
| INDUSTRIAL EQUIPMENT | | | | |
| Vehicle Maintenance | SF | 60 | 45,400 | 2,724,000 |
| Materials Management | SF | 6 | 45,400 | 272,400 |
| Facilities Maintenance | SF | 1 | 45,400 | 45,400 |
| MOW | SF | 4 | 45,400 | 181,600 |
| **30.05 Yard & Yard Track** | | | | |
| SITE/CIVIL | | | | |
| Grading/Paving | SF | 15 | 26,000 | 390,000 |
| Retaining Walls | LF | 400 | 800 | 320,000 |
| Utility - Sewer | SF | 6 | 45,400 | 272,400 |
| Utility - Water | SF | 5 | 45,400 | 227,000 |
| Utility - Drainage | SF | 5 | 45,400 | 227,000 |
| Utility - Electrical | SF | 14 | 45,400 | 635,600 |
| Landscaping | SF | 100,000 | 1 | 100,000 |
| Trackwork | | | | |
| Turnouts | No. 8 | 140,000 | 9 | 1,260,000 |
| Track | TF | 220 | 8,700 | 1,914,000 |
| Signals & Comm. | TF | 200 | 8,700 | 1,740,000 |

| | | | | |
|---|---|---|---|---|
| Subtotal | | | | 21,659,400 |
| Location Factor | 1.15 | | | 3,248,910 |
| Design Contingency | 15% | | | 3,736,247 |
| Design Fees | 15% | | | 3,736,247 |
| Subtotal | | | | 32,380,803 |
| General Conditions & Mobilization | 15% | | | 4,857,120 |
| Contractor's Fee | 10% | | | 3,238,080 |
| Total Construction Cost | | | | 40,476,004 |

| | | | | |
|---|---|---|---|---|
| Unallocated Contingency | 20% | | | 8,095,201 |
| Total Project Cost | | | | 48,571,205 |

Not Including: Escalation, Hazardous Material Removal, or TOD/JD Construction Cost

# APPENDIX 15

## Operations Analysis for Additional Passenger Track at Santa Fe Depot and Layover Track at MTSTrolley Yard

# San Diego Association of Governments
*LOSSAN Rail Operations Modeling*

# TECHNICAL MEMORANDUM

## CONTRACT NO. 5001306 TASK ORDER 07

## ADDITIONAL PASSENGER TRACK AT SAN DIEGO DEPOT

## MTS YARD LAYOVER TRACKS

| | | |
|---|---|---|
| Prepared by: | Ashley Walker | 9/18/2012 – 3/10/2013<br>Date |
| Technical & Quality Review by: | Lane Fernandes | 9/27/2012 – 4/22/2013<br>Date |
| Approved & Released by: | James D. Campbell | 9/28/2012 – 4/29/2013<br>Date |

| Revision | Date | Description |
|---|---|---|
| Revision 1 | 4/29/2013 | Incorporates comments from SANDAG on draft report. |
| | | |
| | | |
| | | |

PARSONS BRINCKERHOFF

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April 29, 2013

# Final Operations Analysis for Additional Passenger Track at San Diego Santa Fe Depot and Layover Track at MTS Trolley Yard

## Introduction

This is a technical memorandum on the subject of determining the feasibility of operating 2030 planned levels of service for commuter (COASTER/Metrolink), intercity (Amtrak), and freight rail operations at the San Diego Santa Fe Depot on the existing four tracks currently available for use. This also includes an evaluation of the use of the storage tracks at the MTS layover yard for both the 2020 and 2030 service plans.

## Background

In order to support planned 2030 service levels on the LOSSAN corridor, the *San Diego LOSSAN Corridor Project Prioritization Analysis* (2009) anticipated an additional fifth track would be required at Santa Fe Depot. The recent modeling completed as part of the March 2012 LOSSAN Long Term Operations Analysis (part of the LOSSAN Strategic Implementation Plan), along with further study, has shown that the existing infrastructure, with the four tracks at the Depot, is adequate to support the commuter, intercity and freight levels currently projected for the year 2030.

Secondly, this analysis also shows that the existing conditions at the San Diego MTS Trolley Yard with the availability of three layover tracks during the midday period, is adequate to support both the 2020 and 2030 planned service levels.

In addition to assumptions on the future level of service, this technical analysis assumes a number of planned infrastructure that will be funded or in-place by 2030. The level of service and infrastructure assumptions in this study are consistent with the business casefor new service detailed in the *LOSSAN Corridorwide Strategic Implementation Plan* (2012).

## Ownership and Operating Rights

The section of the LOSSAN Corridor in San Diego County from Del Mar north is owned by the North County Transit District (NCTD). NCTD, with Herzog Technologies as its contractor, also dispatches the corridor from just inside the Orange County Line (CP SONGS) to Santa Fe Depot in San Diego. With this dispatching comes the key decision making in the track assignments and determining the day to day effectiveness of how the Depot is utilized.

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The San Diego Metropolitan Transit Systems (SDMTS) owns the segment of the corridor within the City of San Diego Limits, which begins just south of the City of Del Mar (MP 245.7) and extends just south (200' south of the Broadway at-grade crossing) of Santa Fe Depot in downtown. In addition to dispatching control, NCTD is also responsible for right-of-way and track maintenance along this segment of the corridor per agreements in place with SDMTS.

South of the Santa Fe Depot BNSF owns and maintains the right-of-way and tracks to National City. While this segment of the corridor is non-signalized currently, BNSF is responsible for issuing all train orders on this segment of track. As owner of this portion of the right-of-way, any additional improvements made to the corridor south of the Santa Fe Depot for passenger services are subject to the review and approval of BNSF. Under current operating conditions, three COASTER trainsets travel a one mile portion of this segment each weekday for their midday layover in the MTS trolley yard.

## 2030 Operating Service Levels and Assumptions

The passenger service level assumptions for 2030 used in this analysis are based on the 2030 service projections outlined in the *LOSSAN Corridorwide Strategic Implementation Plan* (2012) and consistent with the *2050 Regional Transportation Plan* (RTP). The volumes presented in Table 1 are compared against existing service levels as of September 2012.

Table 1: Service Volume Comparison (Oceanside to San Diego)

| Service | Existing (September 2012) | 2020 Service Assumptions | 2030 Service Assumptions |
|---|---|---|---|
| Commuter | 22 | 30 | 54 |
| Intercity | 22 | 26 | 36 |
| Freight | 4-6 | 11 | 11 |
| TOTAL | 48-50 | 67 | 101 |

As the table indicates, between September 2012 and the forecast service levels for 2030, there is a 100% increase in rail traffic into, out of, or through Santa Fe Depot.

As the Depot infrastructure is examined for its capability to support the desired service volumes for 2030, basic operational assumptions must also be considered. The following assumptions were identified in this analysis:

- Projects identified in the SANDAG RTP for the forecast year 2030 are assumed as part of the infrastructure for this analysis. For the corridor north of San Diego, the infrastructure identified in the *LOSSAN Corridorwide Strategic Implementation Plan* (2012), including those listed below, will be assumed.
- Trainset equipment cycles are based initially on existing rotations provided by Amtrak, Metrolink and NCTD (COASTER).

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- Maximum length of "work day" for one crew cannot exceed 11 hours and 59 minutes.
- Crews report "on duty" 30 minutes before the initial departure of the train.
- Minimum terminal turnaround time between two revenue-service trips is 15 minutes for commuter and 20 minutes for intercity.
- Service plan represents weekday operations only along the LOSSAN Corridor.
- BNSF and local freight movements are based on data obtained from the observations made over a 24-hour / seven day a week period in May 2007. Freight volumes are assumed to increase from 2007 to 2030 at a growth rate of 2% per year. It is also important to note that the BNSF freight trackage rights agreement restricts freight operations within the commuter rail peak hour operations.

## 2030 Corridor Infrastructure Assumptions

To maintain continuity with the ongoing operations planning effort being performed for the *LOSSAN Corridorwide Strategic Implementation Plan* (2012), the LOSSAN 2030 Long-Term network was used as the initial base for the simulation modeling of this scenario. The network used for this analysis was updated from the 2030 network used for performing the Long-Term Operations Analysis of the LOSSAN Business Case to reflect updates to the track configurations of the projects in San Diego County currently under design. Infrastructure projects identified and incorporated into the model for the LOSSAN 2030 Long-Term Operations Analysis were identified by the LOSSAN Rail Corridor Agencies as projects that could be reasonably assumed to be funded by the end of 2030. These infrastructure projects, which were in addition to the existing 2012 corridor infrastructure configuration, are summarized below for reference.

*Los Angeles County*

- Completion of Platform 7 (Tracks 13 and 14) at Los Angeles Union Station
- Completion of BNSF Third Main Track between Los Angeles and Fullerton
- Los Angeles Union Station Run-Through Tracks

*Orange County*

- Completion of Control Point (CP) Stadium crossovers and turnout
- Laguna Niguel to San Juan Capistrano Passing Siding
- Irvine 3rd Main Track Extension
- Anaheim Canyon Station Double Track

*San Diego County*

- Completion of Santa Margarita River Bridge Replacement and Double Track
- Completion of the Oceanside Through-Track
- Completion of Sorrento Valley Double Track and Sorrento to Miramar Phase 1

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- Completion of new San Diego Crossovers (CP Cudahy and CP Convair)
- CP San Onofre to CP Pulgas Double Track
- CP Eastbrook to CP Shell Double Track
- Carlsbad Village Double Track
- CP Ponto to CP Swami Double Track
- CP Cardiff to CP Craven Double Track
- San Dieguito Bridge Double Track
- Sorrento Valley Double Track and Sorrento to Miramar Phase 2CP Tecolote to CP Friar Double Track
- San Diego Airport Intermodal Transportation Center
- San Diego Convention Center Platform*

The proposed San Diego Convention Center platform was shown in the draft “2030 Downtown San Diego Terminal Analysis” prepared by Parsons Brinckerhoff for SANDAG in February 2012 as a potential alternative terminus to the Santa Fe Depot. Through the modeling process it has been shown that the existing four tracks at the Depot will support the planned 2030 service levels, with either the Depot or the Convention Center as the terminus. However, it should be noted that to allow the Convention Center to be the terminus a second platform and track would be required and the corridor south of Santa Fe Depot, which is owned by BNSF, would also have to be improved.

As part of the San Dieguito Double Track project, a separate operations analysis was conducted on providing seasonal service to a new Del Mar Racetrack platform. As part of this project, operational modeling was performed on 14 scenarios, which included a scenario to extend 10-car “special event” trains to San Diego, rather than laying them over in Del Mar. While a preferred scenario was not presented in the “Del Mar Seasonal Platform Operations Analysis” technical memorandum prepared for SANDAG in August 2012, the simulations performed indicated it was feasible for the special event train to be stored in San Diego during the desired time frame with the assumption that the depot would retain its existing four track configuration.

With the exception of a potentialDel Mar Tunnel and bluff alignment, the above list of projects does achieve a double tracked Corridor through San Diego County from just south of the Orange County Line to Santa Fe Depot in San Diego.

## Existing Infrastructure and Operations at Santa Fe Depot

Currently at San Diego Santa Fe Depot there are four tracks used by Amtrak, COASTER and freight trains. The freight is usually exclusive to Track 4 as it is primarily used as a run-through track. Typically, Tracks 1-3 are shared daily by the 11 inbound COASTER trains and the 11 inbound Amtrak trains. Currently,

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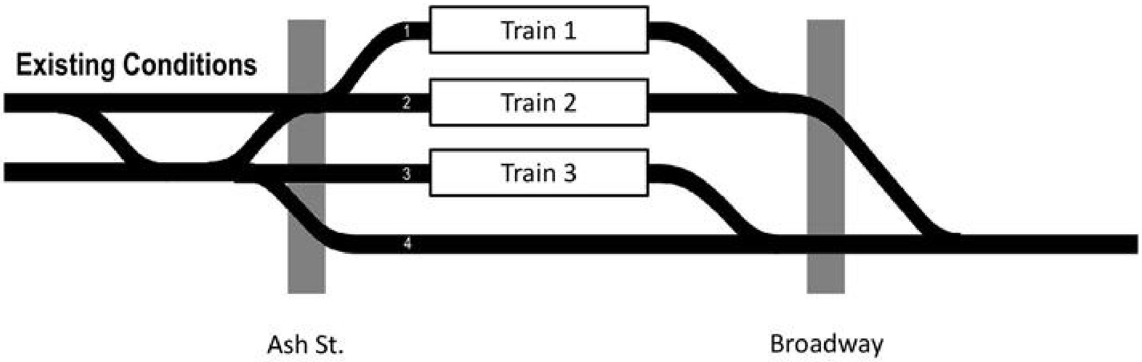
Amtrak also stores three trainsets in the Depot every night. With each occupying a separate track, 1-3 as indicated in the below diagram:




In the analysis that verified the current capacity of the Santa Fe Depot is adequate for planned 2030 levels, the following were assumed with regard to operational practices.

- Minimum of 15 minutes dwell time to "turn" commuter trains at the station and a minimum of 20 minutes of dwell time to "turn" intercity (Amtrak) trains at the station. The length of time necessary to turn the trains limits the capacity of each track to an average of two trains each hour.

- In addition to the time required to "turn" each train, the amount of time between departing and arriving trains on each track has a significant effect on terminal capacity. Time is given between departing and arriving to trains to allow for "schedule recovery" of trains that may be operating "out of slot" and subject to some level of delay. Limiting the time between departing and arriving trains impacts reliable, on-time operations at the Santa Fe Depot and results in cascading delays to both commuter and intercity trains.

## Current and Planned Layover Operations at MTS Trolley Yard

As previously mentioned, under existing operating conditions, three COASTER trainsets travel approximately one mile on the BNSF tracks to spend a midday layover at the MTS Trolley Yard. As demonstrated by the track occupancy charts in Appendix A and 2020 & 2030 time-distance diagrams in Appendices B & C respectively, only the existing three storage tracks are needed to operate the COASTER service.

Both Appendix B (2020 Near Term) and Appendix C (2030 Full Build) have the expected trainsets that will continue to the trolley yard for their midday layover marked for reference. In addition, it is

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noteworthy that with the 2030 operating plan, it is expected that only two COASTER trainsets will require a midday layover in the trolley yard. This is due to the greater service levels projected and the number of trainsets required to fulfill these service level projections.

## Conclusions

The conclusions in this report reflect the observations made to the proposed additional passenger track at San Diego Santa Fe Depot and layover track at MTS Trolley yard. The conclusions from the analysis conducted are summarized below by project.

Santa Fe Depot

- As noted in Table 1, as part of the 2030 service plan, San Diego Santa Fe Depot is anticipated to handle 90 passenger trains daily. Using the Berkeley Simulation Software Rail Traffic Controller (RTC) Model, it was shown that capacity for these 90 trains is provided on the existing Tracks 1-3 of Santa Fe Depot under optimum conditions, allowing BNSF to operate freight trains through the Depot on Track 4 during mid-day periods.

MTS Trolley Yard

- With Appendices A, B & C as reference, it can be shown through modeling that the three existing storage tracks in the trolley yard are sufficient for both the proposed 2020 and 2030 corridor service levels and will provide adequate space for the midday layover of COASTER equipment.

It is important to note that the conclusions and observations presented in this memo are based on the service plan assumptions outlined as part of the 2020 and 2030 scenarios. Changes to these service plans may change the conclusions presented in this memo and require additional operational analyses.

As mentioned, this analysis is conducted under optimum operating conditions, which basically assumes all trains operate on time with no service interruptions. However, in reality, things such as late trains, passenger service issues, mechanical delays, PTC/communication failures or other operating delays routinely occur. Given these likely occurrences, while feasible, it is noted that the San Diego Santa Fe Depot of the 2030 timeframes is at capacity and any service interruption will likely require the use of Track 4 to board and alight passengers. Depending upon the extent of the issue, any prolonged use of this track could interfere with mid-day freight movements.

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# Appendix A

## Santa Fe Depot & MTS Yard Track Occupancy Charts

| | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Track 1 | Yard | | | MTS | | | | | | | MTS | | | | | | | | | |
| | Platform | B | B | B | B | B | B | B | B | B | B | B | B | B | B | B | B | B | B | B |
| | Ar | SD01E | SD02E | IESD01E | SD05E | SD06E | SD08E | IESD02E | SD09E | SD10E | LASD02E | SD11E | LASD03E | SD13E | SD15E | SD16E | LASD04E | LASD05E | SD19E | SD20E |
| | | 4:54 AM | 5:54 AM | 7:16 AM | 7:39 AM | 8:11 AM | 8:54 AM | 10:11 AM | 11:38 AM | 12:38 PM | 1:23 PM | 2:23 PM | 3:24 PM | 4:37 PM | 5:39 PM | 6:19 PM | 7:27 PM | 8:25 PM | 9:28 PM | 10:43 PM |
| | Dp | LASD01W | LASD02W | - | SD02W | LASD03W | SD04W | SD05W | SD06W | SD07W | - | SD08W | SD09E | SD10W | SD12W | SD14W | SD16W | SD18W | SD19W | SD20W |
| | | 5:30 AM | 6:30 AM | - | 7:59 AM | 8:30 AM | 9:29 AM | 10:29 AM | 11:59 AM | 12:59 PM | - | 2:44 PM | 3:49 PM | 4:57 PM | 5:55 PM | 6:34 PM | 7:59 PM | 9:29 PM | 9:59 PM | 10:59 PM |
| Turnaround Time | | 0:36 | 0:36 | n/a | 0:20 | 0:19 | 0:35 | 0:18 | 0:21 | 0:21 | n/a | 0:21 | 0:25 | 0:20 | 0:16 | 0:15 | 0:32 | 1:04 | 0:31 | 0:16 |
| | | OK | OK | OK | OK | OK | OK | OK | OK | OK | OK | OK | OK | OK | OK | OK | OK | OK | OK | OK |
| Track 2 | Yard | | | MTS | | | MTS | MTS | MTS | | | MTS | | MTS | | | | | | |
| | Platform | A | B | B | B | B | B | B | B | B | B | B | B | B | B | B | A | | | |
| | Ar | - | - | SD03E | SD04E | SD07E | LASD01E | - | - | SD12E | SD14E | - | SD17E | - | SD18E | PS17E | PS18E | | | |
| | | - | - | 6:36 AM | 6:55 AM | 8:29 AM | 9:25 AM | - | - | 4:06 PM | 5:14 PM | - | 6:43 PM | - | 7:41 PM | 11:51 PM | 12:52 AM | | | |
| | Dp | PS01W | PS02W | - | SD01W | SD03W | - | LASD04W | LASD05W | IESD01W | SD11W | SD13W | SD15W | IESD02W | SD17W | - | - | | | |
| | | 5:14 AM | 6:07 AM | - | 7:34 AM | 8:54 AM | - | 1:30 PM | 3:30 PM | 4:34 PM | 5:34 PM | 6:17 PM | 7:04 PM | 7:33 PM | 8:34 PM | - | - | | | |
| Turnaround Time | | | n/a | n/a | 0:39 | 0:25 | n/a | n/a | n/a | 0:28 | 0:20 | 0:16 | n/a | 0:21 | n/a | 0:53 | n/a | | | |
| | | OK | OK | OK | OK | OK | OK | OK | OK | OK | OK | OK | OK | OK | OK | OK | OK | OK | OK | OK |
| Track 3 | Yard | | | | | | | | | | | | | | | | | | | |
| | Platform | B | B | B | B | B | B | B | B | B | B | B | B | B | B | B | B | B | | |
| | Ar | - | PS01E | PS02E | PS03E | PS04E | PS05E | PS06E | PS07E | PS08E | PS09E | PS10E | PS11E | PS12E | PS13E | PS14E | PS15E | PS16E | | |
| | | - | 7:49 AM | 8:39 AM | 9:41 AM | 10:52 AM | 11:52 AM | 12:52 PM | 1:52 PM | 2:53 PM | 3:54 PM | 4:52 PM | 5:50 PM | 6:49 PM | 7:49 PM | 8:40 PM | 9:52 PM | 10:52 PM | | |
| | Dp | PS03W | PS04W | PS05W | PS06W | PS07W | PS08W | PS09W | PS10W | PS11W | PS12W | PS13W | PS14W | PS15W | PS16W | PS17W | PS18W | - | | |
| | | 7:05 AM | 8:11 AM | 9:12 AM | 10:12 AM | 11:12 AM | 12:12 PM | 1:12 PM | 2:12 PM | 3:14 PM | 4:04 PM | 5:12 PM | 6:05 PM | 7:12 PM | 8:12 PM | 9:12 PM | 10:12 PM | - | | |
| Turnaround Time | | n/a | 0:22 | 0:33 | 0:31 | 0:20 | 0:20 | 0:20 | 0:20 | 0:21 | 0:10 | 0:20 | 0:15 | 0:23 | 0:23 | 0:32 | 0:20 | | | |
| | | OK | OK | OK | OK | OK | OK | OK | OK | OK | BELOW MIN | OK | BELOW MIN | OK | OK | OK | OK | OK | OK | OK |
| Track 4 | Yard | | | | | | | | | | | | | | | | | | | |
| | Platform | | | | | | | | | | | | | | | | | | | |
| | Ar | | | | | | | | | | | | | | | | | | | |
| | Dp | | | | | | | | | | | | | | | | | | | |
| Turnaround Time | | | | | | | | | | | | | | | | | | | | |
| | | | | OK | OK | OK | OK | OK | OK | OK | OK | OK | OK | OK | OK | OK | OK | OK | | |

*Intercity Min Turnaround Time = 20 Minutes*

*Commuter Min Turnaround Time = 15 Minutes*

# 2030 MTS LAYOVER YARD

***Track Assignment Matrix***

| | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Track 1 | Yard Platform | | | | | | | | | | | | | | | | | | | |
| | Ar | SD03E 6:47 AM | LASD02E 1:35 PM | | | | | | | | | | | | | | | | | |
| | Dp | LASD04W 1:10 PM | IESD02W 7:16 PM | | | | | | | | | | | | | | | | | |
| Turnaround Time | | 6:23 | 5:41 | | | | | | | | | | | | | | | | | |
| | | OK | OK | OK | OK | OK | OK | OK | OK | OK | OK | OK | OK | OK | OK | OK | OK | OK | OK | OK |
| Track 2 | Yard Platform | | | | | | | | | | | | | | | | | | | |
| | Ar | IESD01E 7:24 AM | | | | | | | | | | | | | | | | | | |
| | Dp | LASD05W 3:13 PM | | | | | | | | | | | | | | | | | | |
| Turnaround Time | | 7:49 | | | | | | | | | | | | | | | | | | |
| | | OK | OK | OK | OK | OK | OK | OK | OK | OK | OK | OK | OK | OK | OK | OK | OK | OK | OK | OK |
| Track 3 | Yard Platform | | | | | | | | | | | | | | | | | | | |
| | Ar | LASD01E 9:36 AM | | | | | | | | | | | | | | | | | | |
| | Dp | SD13W 6:00 PM | | | | | | | | | | | | | | | | | | |
| Turnaround Time | | 8:24 | | | | | | | | | | | | | | | | | | |
| | | OK | OK | OK | OK | OK | OK | OK | OK | OK | OK | OK | OK | OK | OK | OK | OK | OK | OK | OK |
| N/A | Yard Platform | | | | | | | | | | | | | | | | | | | |
| | Ar | | | | | | | | | | | | | | | | | | | |
| | Dp | | | | | | | | | | | | | | | | | | | |
| Turnaround Time | | | | | | | | | | | | | | | | | | | | |
| | | OK | OK | OK | OK | OK | OK | OK | OK | OK | OK | OK | OK | OK | OK | OK | OK | OK | OK | OK |

*Commuter Min Turnaround Time = 15 Minutes*

*Note: Two late evening commuter trains were terminated at Santa Fe Depot due to insufficient turnaround time available if extended to Convention Center station and MTS layover yard.*

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# Appendix B

## 2020 Time-Distance Diagrams

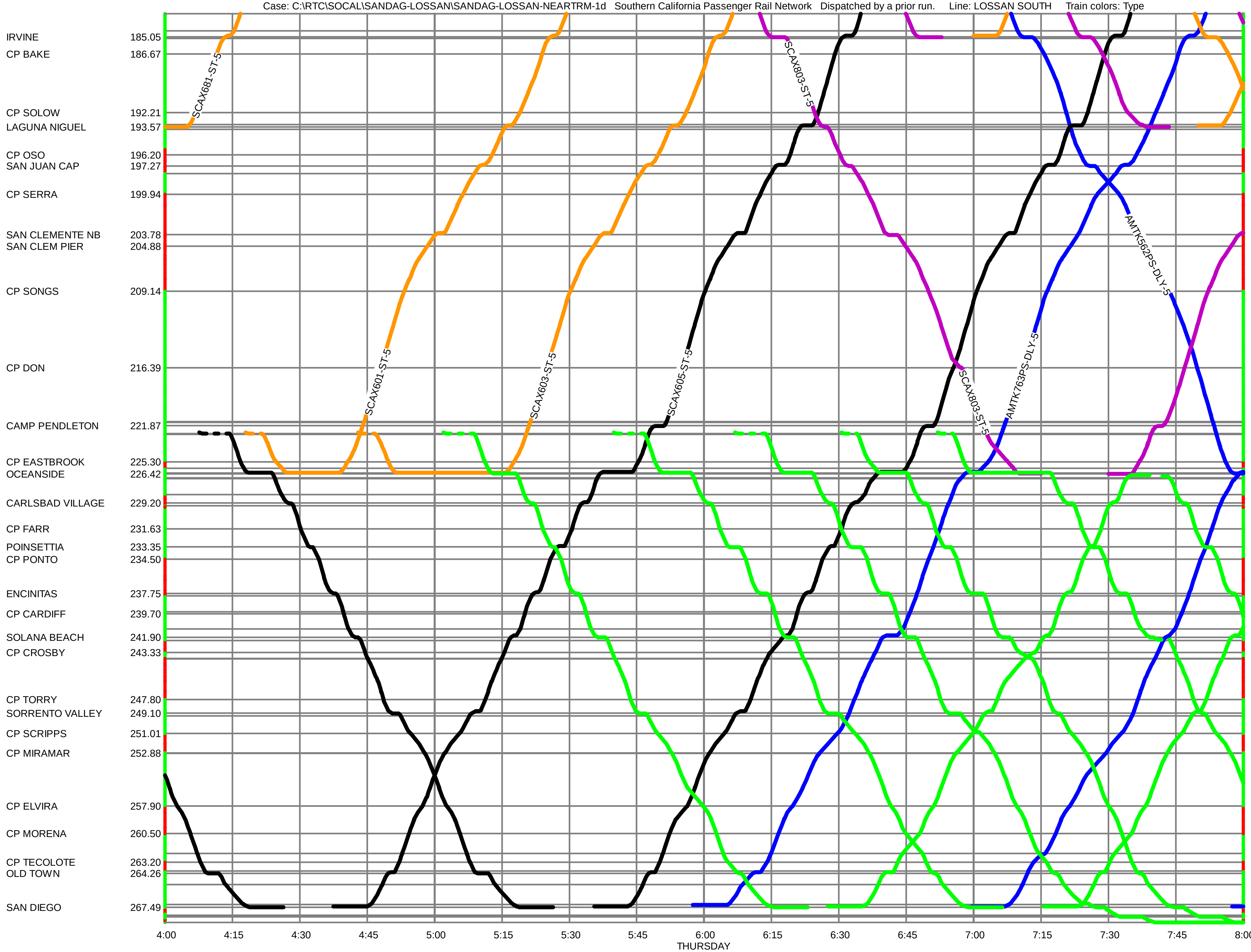
The time-distance diagrams presented on the following page represent the difference operators and services along the Orange and San Diego Subdivisions. Time increments are presented along the X-axis of the chart and distance or location increments are presented along the Y-axis.

Track configuration is presented along the Y-axis, with red indicating single track mainline operation and green indicating multiple track mainline operation.

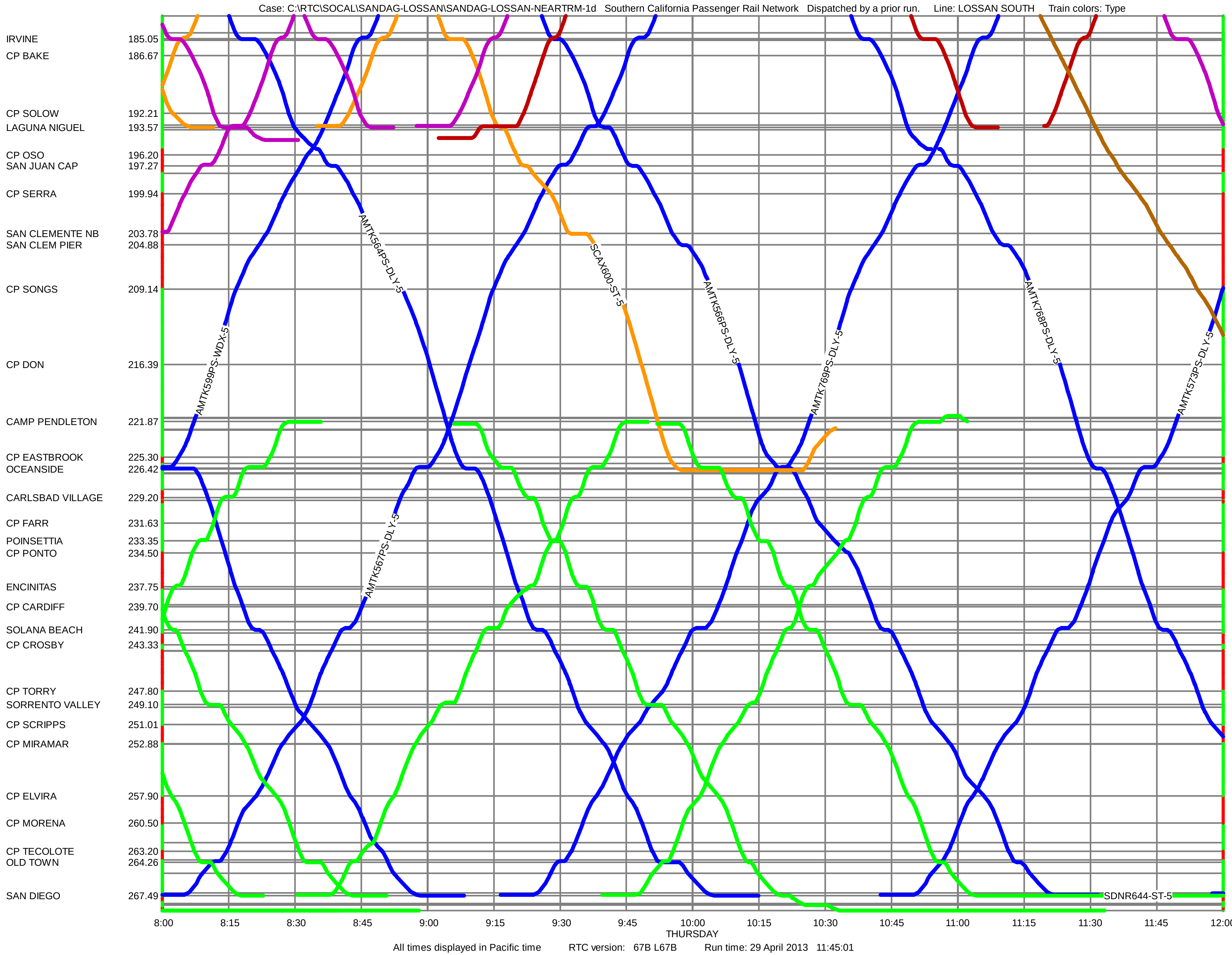
A summary of the various colors used to represent each operator and service is provided below:

= Metrolink (Orange County Line)
= Metrolink (Intra-Orange County Service)
= Metrolink (Inland Empire-Orange County Line)
= Metrolink/COASTER (Los Angeles-San Diego Line)
= COASTER
= Amtrak (Pacific Surfliner)
= BNSF (Freight Service)

Case: C:\RTC\SOCAL\SANDAG-LOSSAN\SANDAG-LOSSAN-NEARTRM-1d Southern California Passenger Rail Network Dispatched by a prior run. Line: LOSSAN SOUTH Train colors: Type

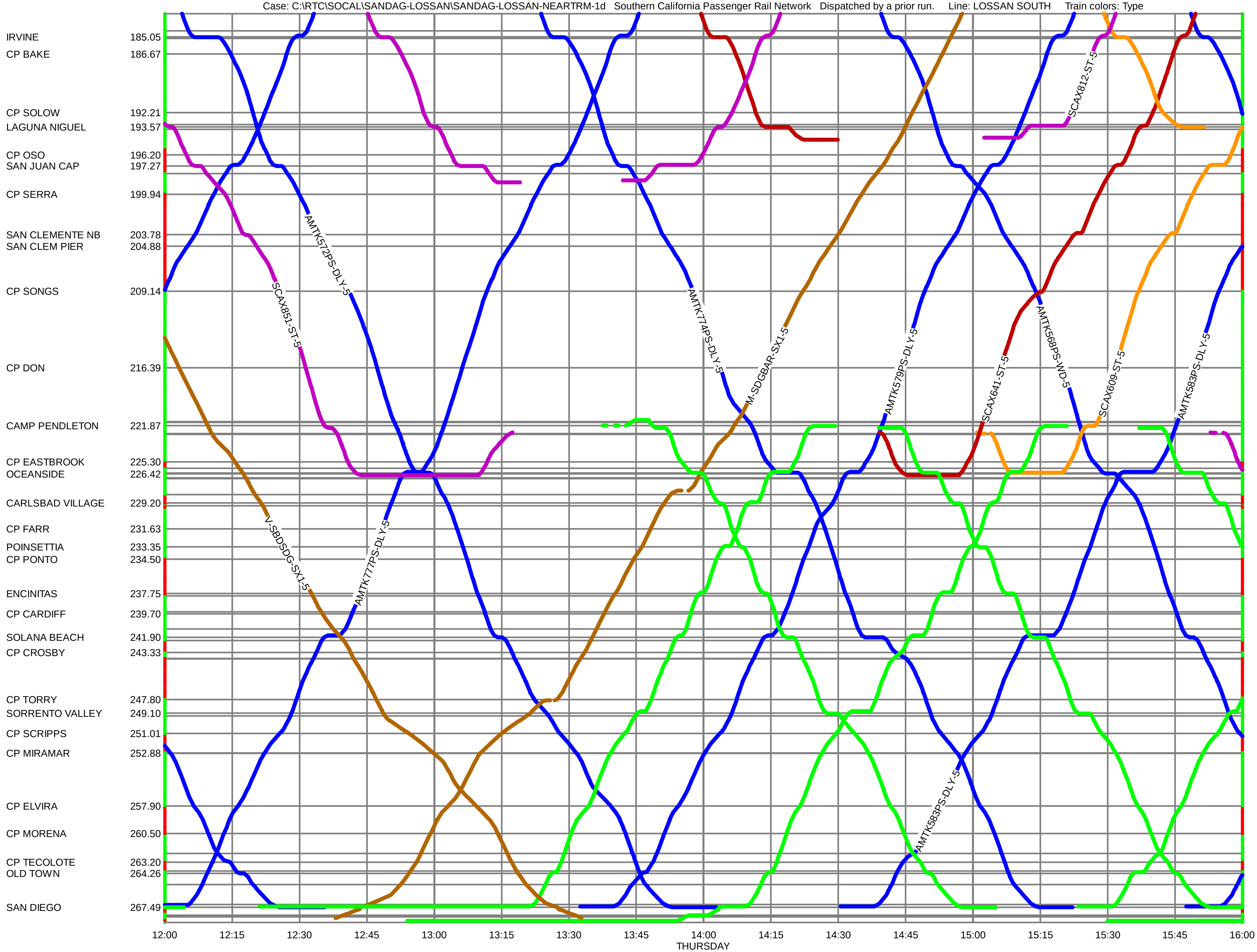



All times displayed in Pacific time RTC version: 67B L67B Run time: 29 April 2013 11:44:37

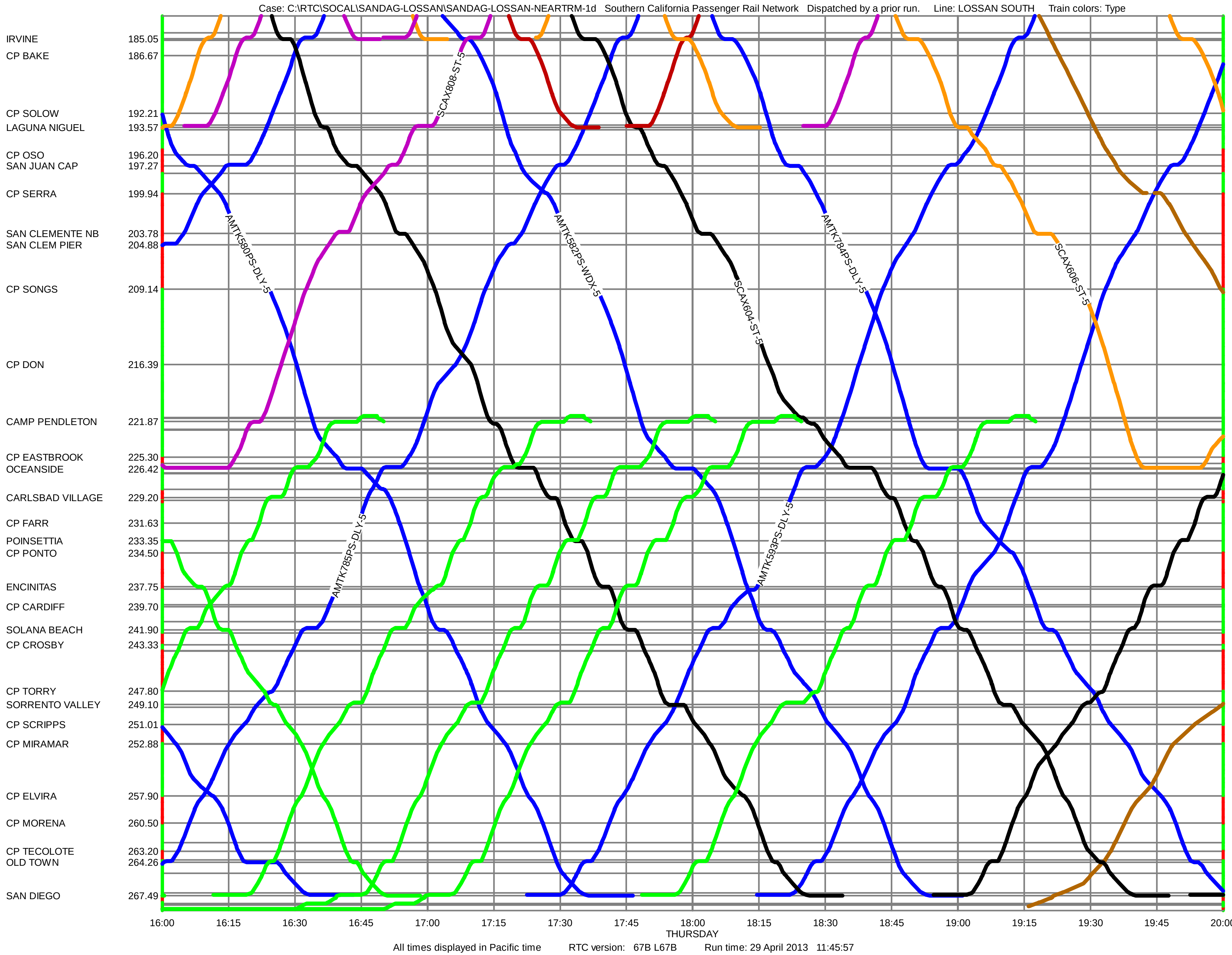


Case: C:\RTC\SOCAL\SANDAG-LOSSAN\SANDAG-LOSSAN-NEARTRM-1d Southern California Passenger Rail Network Dispatched by a prior run. Line: LOSSAN SOUTH Train colors: Type
IRVINE 185.05
CP BAKE 186.67
CP SOLOW 192.21
LAGUNA NIGUEL 193.57
CP OSO 196.20
SAN JUAN CAP 197.27
CP SERRA 199.94
SAN CLEMENTE NB 203.78
SAN CLEM PIER 204.88
CP SONGS 209.14
CP DON 216.39
CAMP PENDLETON 221.87
CP EASTBROOK 225.30
OCEANSIDE 226.42
CARLSBAD VILLAGE 229.20
CP FARR 231.63
POINSETTIA 233.35
CP PONTO 234.50
ENCINITAS 237.75
CP CARDIFF 239.70
SOLANA BEACH 241.90
CP CROSBY 243.33
CP TORRY 247.80
SORRENTO VALLEY 249.10
CP SCRIPPS 251.01
CP MIRAMAR 252.88
CP ELVIRA 257.90
CP MORENA 260.50
CP TECOLOTE 263.20
OLD TOWN 264.26
SAN DIEGO 267.49
AMTK599PS-WDX-5
AMTK564PS-DLY-5
AMTK567PS-DLY-5
SCAX600-ST-5
AMTK566PS-DLY-5
AMTK769PS-DLY-5
AMTK768PS-DLY-5
AMTK573PS-DLY-5
SDNR644-ST-5
8:00
8:15
8:30
8:45
9:00
9:15
9:30
9:45
10:00
10:15
10:30
10:45
11:00
11:15
11:30
11:45
12:00
THURSDAY
All times displayed in Pacific time RTC version: 67B L67B Run time: 29 April 2013 11:45:01

Case: C:\RTC\SOCAL\SANDAG-LOSSAN\SANDAG-LOSSAN-NEARTRM-1d Southern California Passenger Rail Network Dispatched by a prior run. Line: LOSSAN SOUTH Train colors: Type




All times displayed in Pacific time RTC version: 67B L67B Run time: 29 April 2013 11:45:29



Case: C:\RTC\SOCAL\SANDAG-LOSSAN\SANDAG-LOSSAN-NEARTRM-1d Southern California Passenger Rail Network Dispatched by a prior run. Line: LOSSAN SOUTH Train colors: Type
IRVINE 185.05
CP BAKE 186.67
CP SOLOW 192.21
LAGUNA NIGUEL 193.57
CP OSO 196.20
SAN JUAN CAP 197.27
CP SERRA 199.94
SAN CLEMENTE NB 203.78
SAN CLEM PIER 204.88
CP SONGS 209.14
CP DON 216.39
CAMP PENDLETON 221.87
CP EASTBROOK 225.30
OCEANSIDE 226.42
CARLSBAD VILLAGE 229.20
CP FARR 231.63
POINSETTIA 233.35
CP PONTO 234.50
ENCINITAS 237.75
CP CARDIFF 239.70
SOLANA BEACH 241.90
CP CROSBY 243.33
CP TORRY 247.80
SORRENTO VALLEY 249.10
CP SCRIPPS 251.01
CP MIRAMAR 252.88
CP ELVIRA 257.90
CP MORENA 260.50
CP TECOLOTE 263.20
OLD TOWN 264.26
SAN DIEGO 267.49
SCAX808-ST-5
AMTK580PS-DLY-5
AMTK582PS-WDX-5
SCAX604-ST-5
AMTK784PS-DLY-5
SCAX606-ST-5
AMTK785PS-DLY-5
AMTK593PS-DLY-5
16:00 16:15 16:30 16:45 17:00 17:15 17:30 17:45 18:00 18:15 18:30 18:45 19:00 19:15 19:30 19:45 20:00
THURSDAY
All times displayed in Pacific time RTC version: 67B L67B Run time: 29 April 2013 11:45:57

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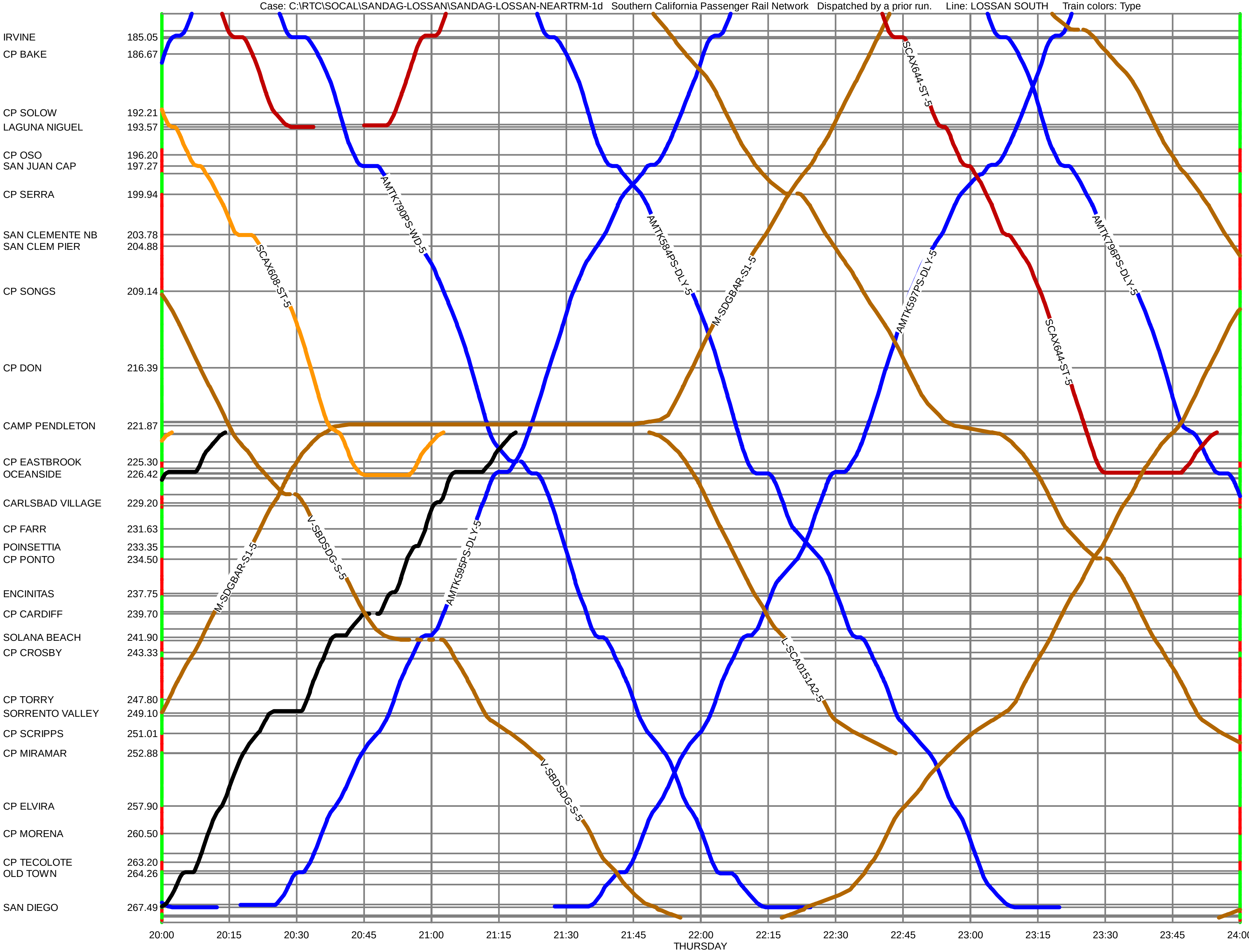


All times displayed in Pacific time RTC version: 67B L67B Run time: 29 April 2013 11:46:32

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# Appendix C

## 2030 Time-Distance Diagrams

The time-distance diagrams presented on the following page represent the difference operators and services along the Orange and San Diego Subdivisions. Time increments are presented along the X-axis of the chart and distance or location increments are presented along the Y-axis.

Track configuration is presented along the Y-axis, with red indicating single track mainline operation and green indicating multiple track mainline operation.

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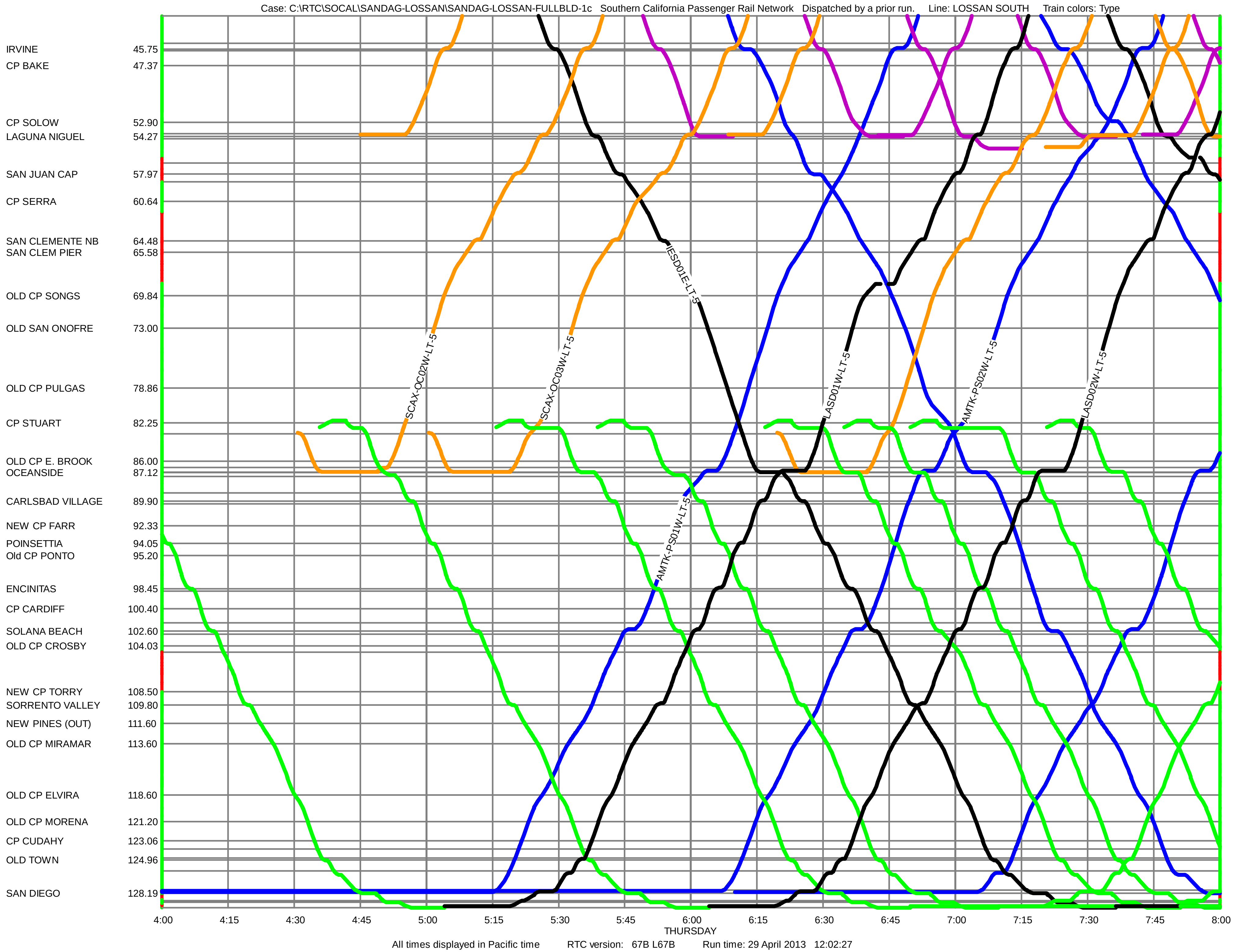
= Metrolink (Intra-Orange County Service)
= Metrolink (Inland Empire-Orange County Line)
= Metrolink/COASTER (Los Angeles-San Diego Line)
= COASTER
= Amtrak (Pacific Surfliner)
= BNSF (Freight Service)



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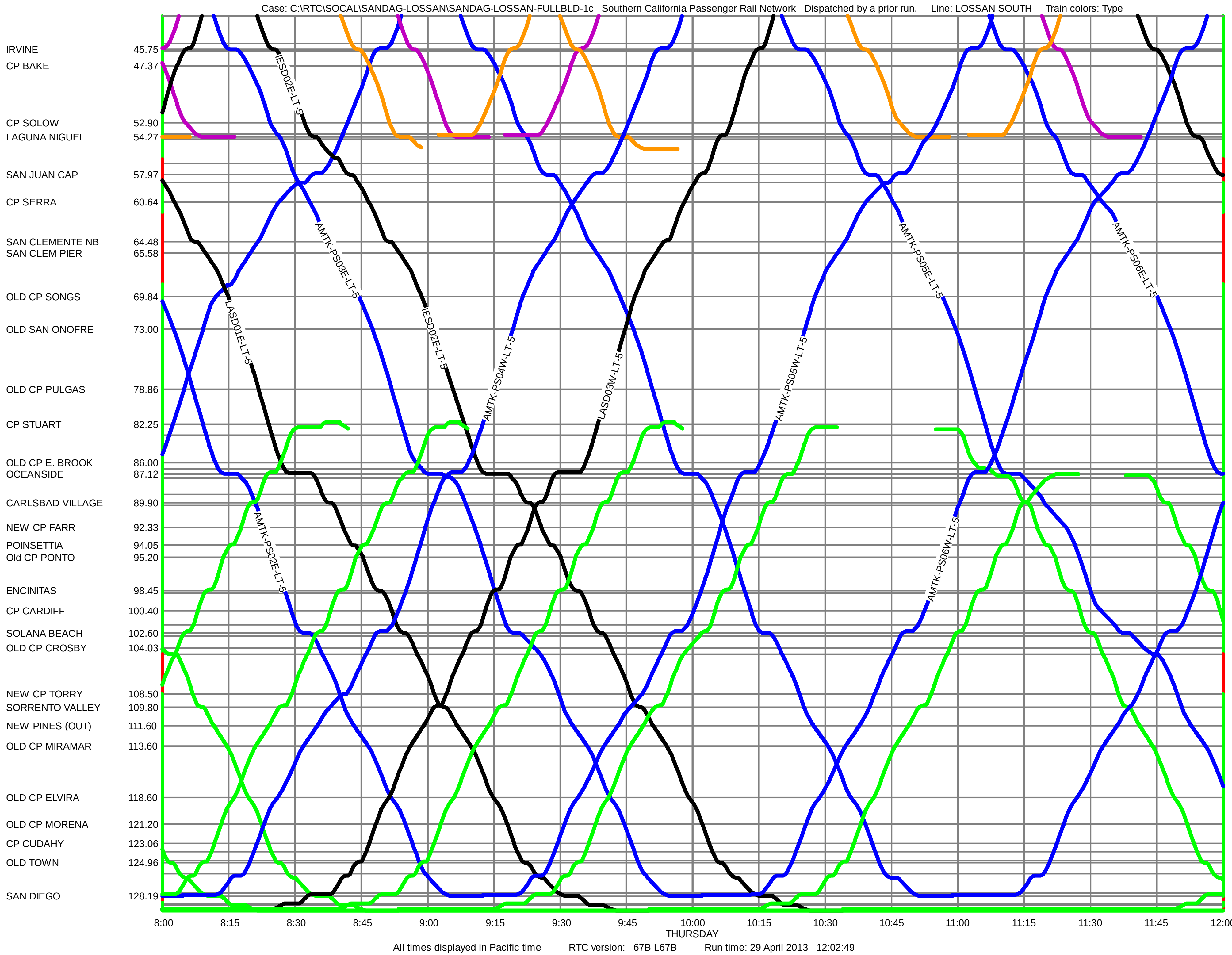
IRVINE 45.75
CP BAKE 47.37
CP SOLOW 52.90
LAGUNA NIGUEL 54.27
SAN JUAN CAP 57.97
CP SERRA 60.64
SAN CLEMENTE NB 64.48
SAN CLEM PIER 65.58
OLD CP SONGS 69.84
OLD SAN ONOFRE 73.00
OLD CP PULGAS 78.86
CP STUART 82.25
OLD CP E. BROOK 86.00
OCEANSIDE 87.12
CARLSBAD VILLAGE 89.90
NEW CP FARR 92.33
POINSETTIA 94.05
Old CP PONTO 95.20
ENCINITAS 98.45
CP CARDIFF 100.40
SOLANA BEACH 102.60
OLD CP CROSBY 104.03
NEW CP TORRY 108.50
SORRENTO VALLEY 109.80
NEW PINES (OUT) 111.60
OLD CP MIRAMAR 113.60
OLD CP ELVIRA 118.60
OLD CP MORENA 121.20
CP CUDAHY 123.06
OLD TOWN 124.96
SAN DIEGO 128.19
SCAX-OC02W-LT-5
SCAX-OC03W-LT-5
IESD01E-LT-5
LASD01W-LT-5
AMTK-PS02W-LT-5
LASD02W-LT-5
AMTK-PS01W-LT-5
4:00
4:15
4:30
4:45
5:00
5:15
5:30
5:45
6:00
6:15
6:30
6:45
7:00
7:15
7:30
7:45
8:00
THURSDAY
All times displayed in Pacific time RTC version: 67B L67B Run time: 29 April 2013 12:02:27


Case: C:\RTC\SOCAL\SANDAG-LOSSAN\SANDAG-LOSSAN-FULLBLD-1c Southern California Passenger Rail Network Dispatched by a prior run. Line: LOSSAN SOUTH Train colors: Type
IRVINE 45.75
CP BAKE 47.37
CP SOLOW 52.90
LAGUNA NIGUEL 54.27
SAN JUAN CAP 57.97
CP SERRA 60.64
SAN CLEMENTE NB 64.48
SAN CLEM PIER 65.58
OLD CP SONGS 69.84
OLD SAN ONOFRE 73.00
OLD CP PULGAS 78.86
CP STUART 82.25
OLD CP E. BROOK 86.00
OCEANSIDE 87.12
CARLSBAD VILLAGE 89.90
NEW CP FARR 92.33
POINSETTIA 94.05
Old CP PONTO 95.20
ENCINITAS 98.45
CP CARDIFF 100.40
SOLANA BEACH 102.60
OLD CP CROSBY 104.03
NEW CP TORRY 108.50
SORRENTO VALLEY 109.80
NEW PINES (OUT) 111.60
OLD CP MIRAMAR 113.60
OLD CP ELVIRA 118.60
OLD CP MORENA 121.20
CP CUDAHY 123.06
OLD TOWN 124.96
SAN DIEGO 128.19
IESD02E-LT-5
AMTK-PS03E-LT-5
LASD01E-LT-5
IESD02E-LT-5
AMTK-PS04W-LT-5
LASD03W-LT-5
AMTK-PS05W-LT-5
AMTK-PS05E-LT-5
AMTK-PS06E-LT-5
AMTK-PS02E-LT-5
AMTK-PS06W-LT-5
8:00 8:15 8:30 8:45 9:00 9:15 9:30 9:45 10:00 10:15 10:30 10:45 11:00 11:15 11:30 11:45 12:00
THURSDAY
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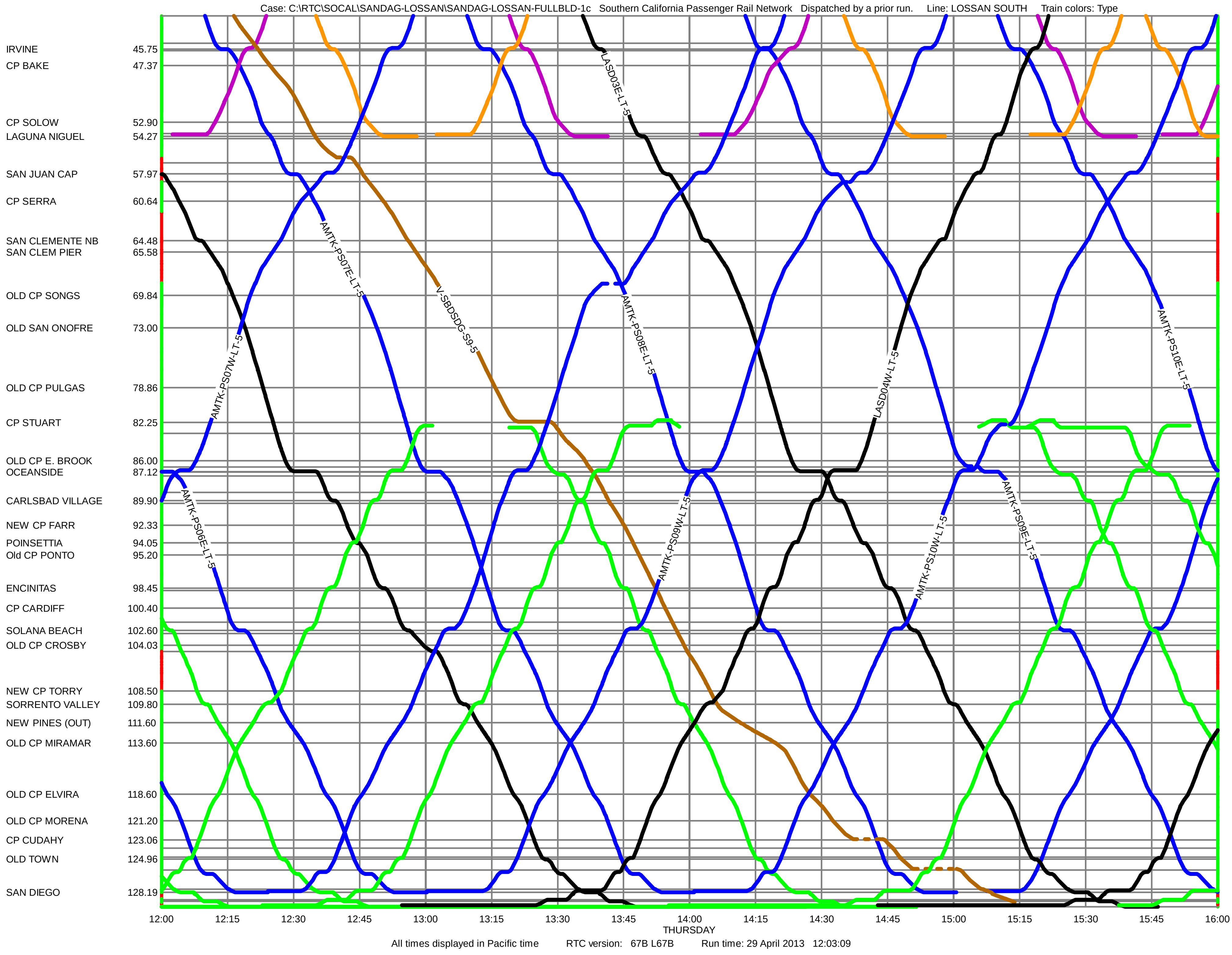
Case: C:\RTC\SOCAL\SANDAG-LOSSAN\SANDAG-LOSSAN-FULLBLD-1c Southern California Passenger Rail Network Dispatched by a prior run. Line: LOSSAN SOUTH Train colors: Type
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CP SOLOW 52.90
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SAN JUAN CAP 57.97
CP SERRA 60.64
SAN CLEMENTE NB 64.48
SAN CLEM PIER 65.58
OLD CP SONGS 69.84
OLD SAN ONOFRE 73.00
OLD CP PULGAS 78.86
CP STUART 82.25
OLD CP E. BROOK 86.00
OCEANSIDE 87.12
CARLSBAD VILLAGE 89.90
NEW CP FARR 92.33
POINSETTIA 94.05
Old CP PONTO 95.20
ENCINITAS 98.45
CP CARDIFF 100.40
SOLANA BEACH 102.60
OLD CP CROSBY 104.03
NEW CP TORRY 108.50
SORRENTO VALLEY 109.80
NEW PINES (OUT) 111.60
OLD CP MIRAMAR 113.60
OLD CP ELVIRA 118.60
OLD CP MORENA 121.20
CP CUDAHY 123.06
OLD TOWN 124.96
SAN DIEGO 128.19
AMTK-PS07W-LT-5
AMTK-PS07E-LT-5
V-SBDSDG-S9-5
LASD03E-LT-5
AMTK-PS08E-LT-5
LASD04W-LT-5
AMTK-PS10E-LT-5
AMTK-PS06E-LT-5
AMTK-PS09W-LT-5
AMTK-PS10W-LT-5
AMTK-PS09E-LT-5
12:00 12:15 12:30 12:45 13:00 13:15 13:30 13:45 14:00 14:15 14:30 14:45 15:00 15:15 15:30 15:45 16:00
THURSDAY
All times displayed in Pacific time RTC version: 67B L67B Run time: 29 April 2013 12:03:09

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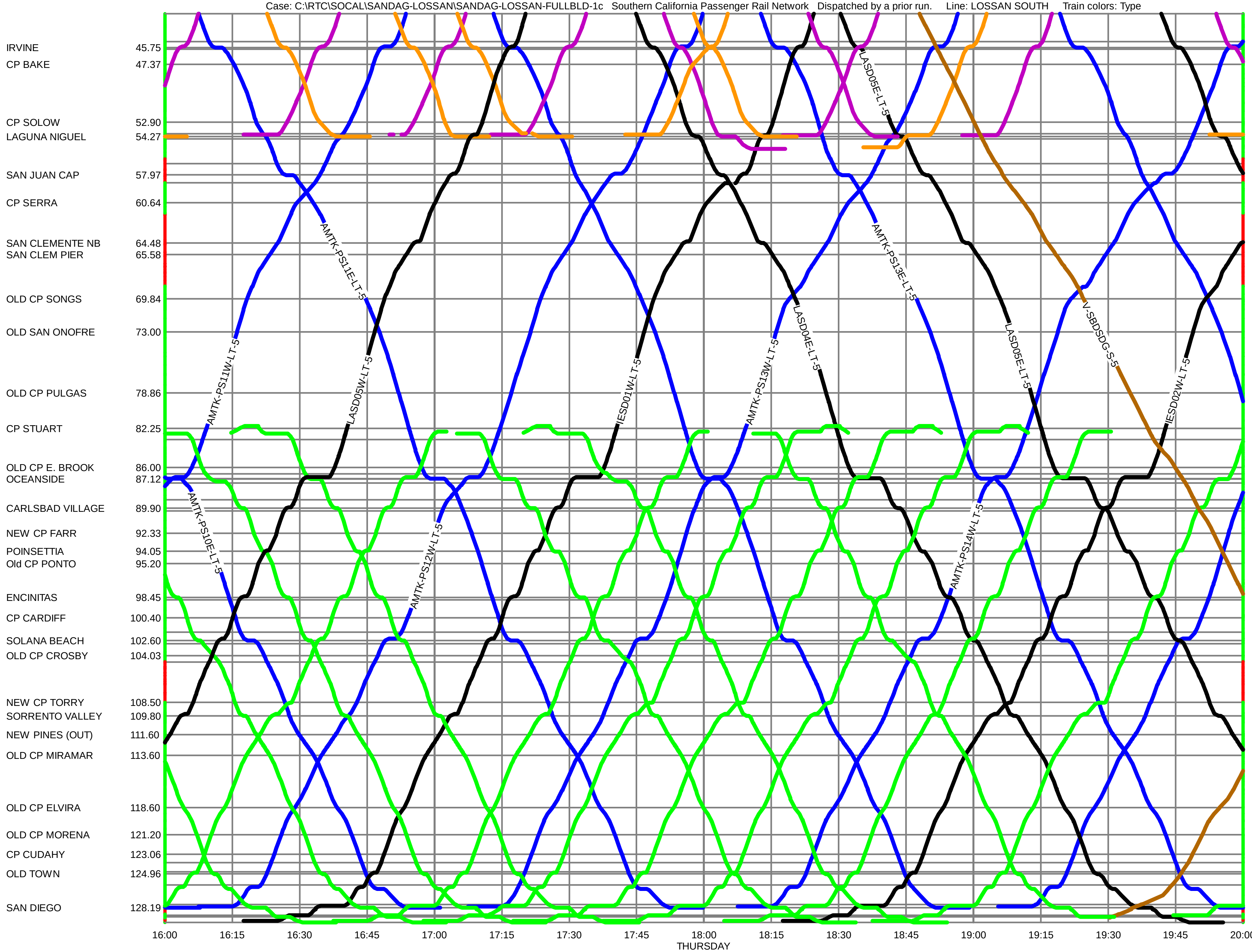


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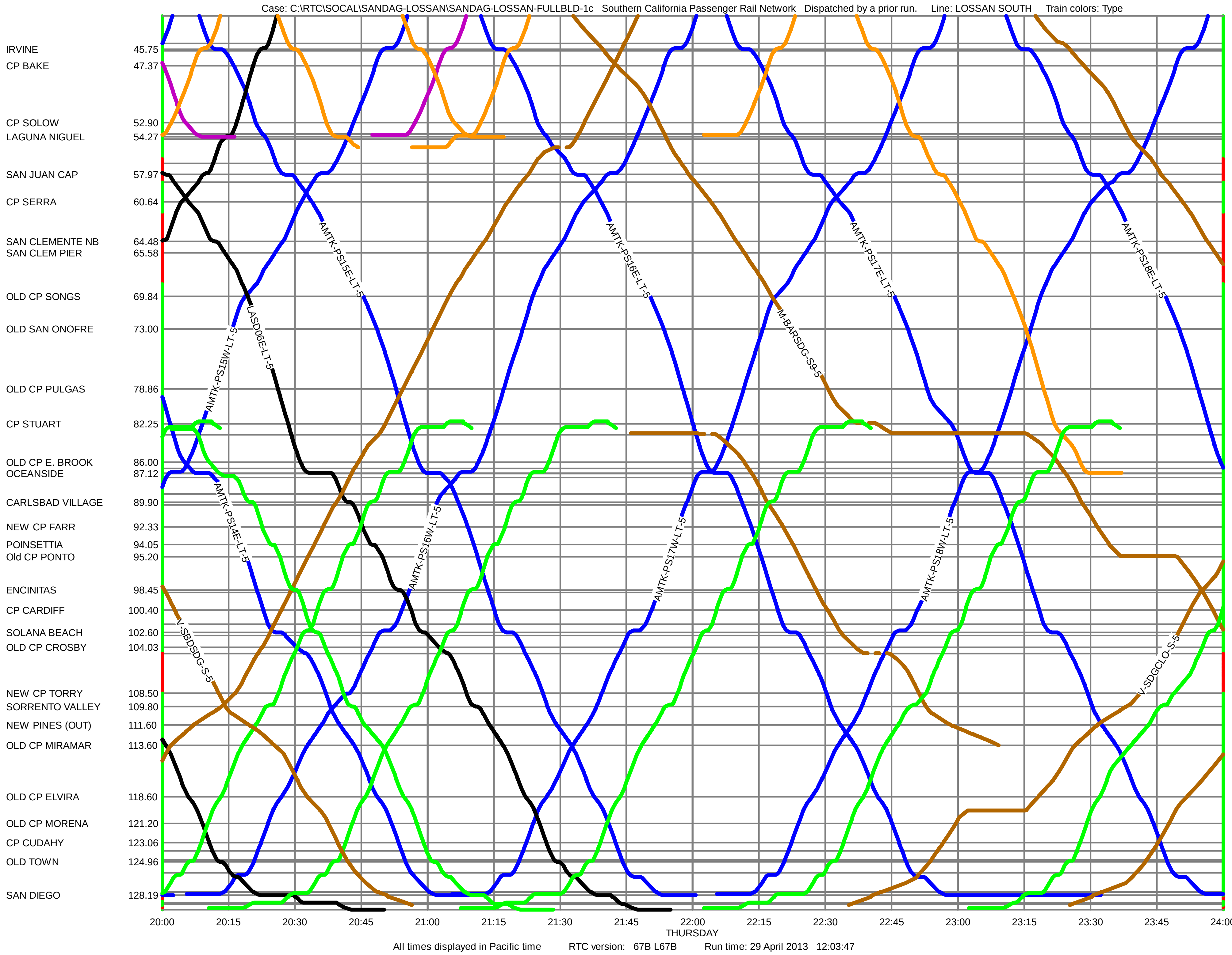

Case: C:\RTC\SOCAL\SANDAG-LOSSAN\SANDAG-LOSSAN-FULLBLD-1c Southern California Passenger Rail Network Dispatched by a prior run. Line: LOSSAN SOUTH Train colors: Type
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CP SOLOW 52.90
LAGUNA NIGUEL 54.27
SAN JUAN CAP 57.97
CP SERRA 60.64
SAN CLEMENTE NB 64.48
SAN CLEM PIER 65.58
OLD CP SONGS 69.84
OLD SAN ONOFRE 73.00
OLD CP PULGAS 78.86
CP STUART 82.25
OLD CP E. BROOK 86.00
OCEANSIDE 87.12
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NEW CP FARR 92.33
POINSETTIA 94.05
Old CP PONTO 95.20
ENCINITAS 98.45
CP CARDIFF 100.40
SOLANA BEACH 102.60
OLD CP CROSBY 104.03
NEW CP TORRY 108.50
SORRENTO VALLEY 109.80
NEW PINES (OUT) 111.60
OLD CP MIRAMAR 113.60
OLD CP ELVIRA 118.60
OLD CP MORENA 121.20
CP CUDAHY 123.06
OLD TOWN 124.96
SAN DIEGO 128.19
AMTK-PS15E-LT-5
AMTK-PS16E-LT-5
AMTK-PS17E-LT-5
AMTK-PS18E-LT-5
LASD06E-LT-5
AMTK-PS15W-LT-5
M-BARSDG-S9-5
AMTK-PS14E-LT-5
AMTK-PS16W-LT-5
AMTK-PS17W-LT-5
AMTK-PS18W-LT-5
V-SBDSDG-S-5
V-SDGCLO-S-5
20:00
20:15
20:30
20:45
21:00
21:15
21:30
21:45
22:00
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23:45
24:00
THURSDAY
All times displayed in Pacific time
RTC version: 67B L67B
Run time: 29 April 2013 12:03:47

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# Appendix D
## Response to Comments

**LOSSAN RAIL OPERATIONS MODELING – SAN DIEGO PROJECT DEVELOPMENT AND COMPLETION OF CORRIDORWIDE ANALYSIS**
Comment Review Form

Submittal Title: ADDITIONAL PASSENGER TRACK AT SAN DIEGO SANTA FE DEPOT AND MTS YARD LAYOVER TRACKS (Draft Tech Memo) Date: April 29, 2013

| Comment No. | Page #/Section Reference | Reviewer Agency | Comment | Date Received | Response | Comment Addressed (Y/N) |
|---|---|---|---|---|---|---|
| 1 | 1/Background | SANDAG | In first paragraph:<br>(1) change 2009 LOSSAN Corridor Project Prioritization Analysis to *San Diego LOSSAN Corridor Project Prioritization Analysis* (2009)<br>(2) Delete commas in "additional, fifth, track"<br>In second paragraph, change to "…analysis ~~will~~ also show**s**..."<br>In third paragraph, change LOSSAN Business Case planning effort to the "business case for new service detailed in the *LOSSAN Corridorwide Strategic Implementation Plan* (2012)". | 3/8/2013 | Comment addressed. | Y |
| 2 | 2/2030 Service… | SANDAG | First sentence should reference the service levels outlined in the LOSSAN Corridorwide Strategic Implementation Plan since the RTP does not include service assumptions for Amtrak or Metrolink service. We could say as outlined in the SIP, **consistent with the 2050 Regional Transportation Plan (RTP).** | 3/8/2013 | Comment addressed. | Y |
| 3 | 2/2030 Service… | SANDAG | Add reference to infrastructure list on page 3 in bullet #1, when it refers to project assumptions north of SD. | 3/8/2013 | Comment addressed. | Y |
| 4 | 3/2030 Corridor… | SANDAG | First paragraph:<br>(1) Change reference to business case to SIP.<br>(2) The second sentence references changes to the 2030 network - what were those? | 3/8/2013 | Comments addressed. Updates to the network were to reflect updates to track configurations for the projects in San Diego County currently under design. | Y |
| 5 | 3/2030 Corridor… | SANDAG | Change Oceanside Thru-Track to "Through Track" | 3/8/2013 | Comment addressed. | Y |
| 6 | 4 | SANDAG | Reword: "Sorrento to Miramar Double Track (Phase 2)" | 3/8/2013 | Comment addressed. | Y |
| 7 | 4 | SANDAG | Isn't Convention Center a 'platform' project, not a station? (Per BNSF/NCTD agreement, this is a special event platform only, correct? | 3/8/2013 | Comment addressed. Reworded | Y |
| 8 | 4 | SANDAG | Make the footnote regular size text.<br>Also, provide the name of the previous analysis instead of just saying "previous documents" and also reference the Del Mar Staging Track tech memo and say a couple of sentences about the findings that we can stage a 10-car Amtrak track at the Depot and how that will work under these scenarios. | 3/8/2013 | Comment addressed. Additional text also added to reference Del Mar Seasonal Platform Operations Analysis. | Y |
| 9 | 4 | SANDAG | Last paragraph in the infrastructure sections notes an already discussed Del Mar Tunnel - I don't believe we discuss that previously in this tech memo. Also, clarify that the corridor will not be double tracked north of CP Songs by 2020, correct? | 3/8/2013 | Comment addressed. Reworded | Y |
| 10 | 5/MTS | SANDAG | Text discusses occupancy charts as Appendix A and stringlines as Appendix B in first paragraph but then second paragraph discusses 2020 and 2030 stringlines as Appendix A and B. Split latter into Appendix B (2020) and new Appendix C (2030) and reference as such. | 3/8/2013 | Comment addressed. | Y |
| 11 | 5/Conclusions | SANDAG | As with previous comments (e.g., on the Del Mar Staging Track analysis), when we say it is optimum, is that realistic to assume that things are going to run on-time all the time? Consider discussion of realistic conditions. You are getting to this in the last paragarph on page 6 so perhaps consolidate the two. | 3/8/2013 | Comment addressed. | Y |
| 12 | Appendix B | SANDAG | Please add legend as in previous memos. Also split 2020 and 2030 stringlines into 2 appendices as noted in comment #10. | 3/8/2013 | Comment addressed. | Y |

# APPENDIX 16

## Operations Analysis for Proposed Del Mar Seasonal Platform

# San Diego Association of Governments
*LOSSAN Rail Operations Modeling*

# TECHNICAL MEMORANDUM

## CONTRACT NO. 5001306 TASK ORDER 07

## DEL MAR SEASONAL PLATFORM OPERATIONS ANALYSIS


| | | |
|---|---|---|
| Prepared by: | Ashley Walker | 06/29/2012<br>Date |
| Technical & Quality Review by: | Edward Pederson | 08/01/2012<br>Date |
| Approved & Released by: | James D. Campbell | 08/06/2012<br>Date |


| Revision | Date | Description |
|---|---|---|
| 1 | 07/20/2012 | Incorporated comments from SANDAG and included "new" Scenario 14 for extending trains to downtown San Diego |
| 2 | 08/06/2012 | Incorporated additional comments from SANDAG. |
| | | |
| | | |

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Orange, CA 92868
714-973-4880
Fax: 714-973-0358

August 6, 2012

## Operations Analysis of Proposed Del Mar Seasonal Platform

The Del Mar Racetrack and Fairgrounds is a commercial and tourism draw to the County of San Diego, attracting over 2 million people annually to both the Fair and horse races. To cater to this market, Amtrak operates more and longer trains during the summer months. In addition, COASTER also operates special event trains during certain days (e.g. Fourth of July). Currently train service is provided to the Solana Beach Amtrak and COASTER station, with a bus connection to/from the Race Track and Fairgrounds.

The San Diego Association of Governments (SANDAG) is moving forward with the preliminary engineering and environmental clearance of a seasonal platform for the Del Mar Race Track and Fairgrounds in coordination with the project to construct a second track between Control Point (CP) Valley and CP Crosby. As part of this process, operational modeling was performed on 13 scenarios, based on four infrastructure configurations, single versus double platforms with "staging" tracks to layover special event trains near the station, and weekday versus weekend service levels under a 2025 (mid-term) forecast year. After the draft report was completed a 14th scenario was requested, which includes extending the "special events" trains to San Diego, rather than laying them over in Del Mar. The scenarios as agreed to by the project stakeholders[1] include:

1. Weekday Service with a single platform and the Del Mar Wye rebuilt as staging track.
2. Weekday Service with a single platform and a staging track paralleling corridor south of San Dieguito River.
3. Weekday Service with a single center platform located between Track 1 and a third staging track.
4. Weekday Service with a double platform and the Del Mar Wye rebuilt as a staging track.
5. Weekday Service with a double platform and a staging track paralleling corridor south of San Dieguito crossing.
6. Weekday Service with a center platform located between Track 1 and a third staging track and a side platform located on Track 2.
7. Weekend Service with a single platform and Del Mar Wye rebuilt as a staging track.

[1] Project Stakeholders refer to SANDAG, NCTD and Amtrak.

8. Weekend Service with a single platform and a staging track paralleling corridor south of San Dieguito crossing.

9. Weekend Service with a single center platform located between Track 1 and a third staging track.

10. Weekend Service with double platform and the Del Mar Wye rebuilt as a staging track.

11. Weekend Service with a double platform and the staging track paralleling corridor south of San Dieguito crossing.

12. Weekend Service with a center platform located between Track 1 and a third staging track and a side platform located on Track 2.

13. Weekday Service with a double platform and a staging track located in Encinitas near CP Cardiff.

14. Weekday Service with a double platform and no staging track in Del Mar. Trains would be staged at the Santa Fe Depot in downtown San Diego.

## *Assumptions*

### Infrastructure

The infrastructure assumed for the rail corridor as part of this analysis was based on the projects identified as part of the Mid-Term 2025 scenario outlined by SANDAG. Additional assumptions regarding the proposed Del Mar seasonal platform were based on direction and agreement between the project stakeholders. Adjustments were made to model for each scenario to reflect the infrastructure changes between the 14 scenarios. Each scenario was simulated to determine the feasibility of each scenario to maintain system reliability while providing service to the seasonal platform(s) at Del Mar. The assumed projects identified in addition to existing 2012 conditions and the seasonal platform scenarios identified above, are listed below.

- San Onofre to Pulgas, Phase 1 & 2
- Camp Pendleton Station
- Eastbrook to Shell double track
- Oceanside Through Track
- Carlsbad Village double track
- Cardiff to Craven double track
- San Dieguito bridge double track and Del Mar Fairgrounds Platform
- Sorrento Valley double track

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- Sorrento to Miramar Phases 1 & 2 double track and track realignment
- Elvira to Morena double track
- Telecote crossover
- Washington crossover

## Service Assumptions

Weekday service levels included as part of this analysis were based on the mid-term service levels identified by SANDAG in the 2050 Regional Transportation Plan (RTP) and agreed to by the rail operators/owners. Weekend service levels for passenger services are based on agreement received from the rail operators/owners at a meeting held at the NCTD offices on April 11, 2012. The agreed to service levels assumed a total of 36 commuter and 32 intercity trains between Oceanside and San Diego during a typical weekday and 18 commuter and 32 intercity trains between Oceanside and San Diego during a typical weekend. Two additional "special event" trains were also assumed, providing service to the proposed Del Mar seasonal platform. Tables summarizing the service level assumptions are provided below. A conceptual timetable for the service levels is also provided in Appendix A.

*Table 1: Weekday Service Level Assumptions (Oceanside to San Diego)*

| Service Type | 2012 Volume Baseline | 2025 Volume Forecast | Service Growth (2011-2025) |
|---|---|---|---|
| Intercity | 22 | 32 | 10 |
| Commuter | 22 | 36 | 14 |
| Freight | 6 | 11 | 5 |
| TOTAL | 50 | 79 | 29 |

*Table 2: Weekend Service Level Assumptions (Oceanside to San Diego)*

| Service Type | 2012 Volume Baseline | 2025 Volume Forecast | Service Growth (2011-2025) |
|---|---|---|---|
| Intercity | 22 | 32 | 10 |
| Commuter | 6 | 18 | 12 |
| Freight | 6 | 11 | 5 |
| TOTAL | 34 | 61 | 27 |

# *Observations and Analysis*

## Scenario 1

Scenario 1 assumes Weekday Service and a single platform on Track 1. Train storage is provided by reconstruction of both legs of the Del Mar Wye. The additional storage track(s) associated with the wye are not assumed to cross Jimmy Durante Boulevard, to the east.

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Observations

Operations under this scenario were identified as not feasible. This scenario effectively creates a "single track" between Control Point (CP) Valley and CP Sorrento. By assuming that most, or all, trains provide service to the Del Mar platform during the summer months, additional constraints would be created under this scenario that negate the benefit of constructing a second track between the existing CP Valley and CP Crosby.

Based on observations made of the simulation using the service plan prepared for this analysis (provided in Appendix A), there was a high potential for conflicts associated with trains operating out of slot. Since trains operating in either direction would need to access the same platform, the margin of error for on-time performance (OTP) during certain times of the day (particularly peak periods) was less than 5 minutes before some level of impact was incurred by trains operating in the opposite direction. Even when service during peak periods was assumed to not stop at the Del Mar platform, conflicts remained between trains vying for access to the single platform.

Under this scenario, assuming the restoration of the Del Mar Wye is possible, two 10-car trains could be "pocketed" in support of special events. One stored on the north leg of the wye and the second on the south leg of the wye. Movement to and from the north leg of the wye was the preferred movement allowing special event trains easy access to and from the Del Mar platform. It was found to be infeasible to reconstruct the original wye in its entirety given the development that has occurred over the years, so access to and from the south leg of the wye was limited to a south facing switch. Trains accessing the south leg of the wye for storage after serving the Del Mar platform would be required to make a reverse move on the main in order to access the south leg of the wye. Since these movements are assumed to occur during non-peak times of the day, no impact was observed to regularly scheduled trains during these reverse movements.

## Scenario 2

Scenario 2 assumes Weekday Service and a single platform on Track 1. Train storage is provided by constructing a 1,700 to 1,800 foot siding south of the San Dieguito River crossing.

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Observations

Operations under this scenario were identified as not "feasible". This scenario effectively creates a "single track" between CP Valley and CP Sorrento. By assuming that most, or all, trains provide service to the Del Mar platform during the summer months, additional constraints would be created under this scenario that negate the benefit of constructing a second track between the existing CP Valley and CP Crosby.

Based on observations made of the simulation using the service plan prepared for this analysis (provided in Appendix A), there was a high potential for conflicts at this location associated with trains operating out of slot. Since trains operating in either direction would need to access the same platform, the margin of error for OTP during certain times of the day (particularly peak periods) was less than 5 minutes before some level of impact was incurred by trains operating in the opposite direction. Even when service during peak periods was assumed to not stop at the Del Mar platform, conflicts remained between trains vying for access to the single platform.

Under this scenario, construction of a siding allowed for one 10-car train and one 5-car train to be "pocketed" in support of special events. Depending on the timing of the event trains, access for either train could be from the north switch, allowing for the most direct access to and from the Del Mar platform. Trains requiring access to or from the southern switch would be required to make a reverse move on the main. Since these movements are assumed to occur during non-peak times of the day, no impact was observed to regularly scheduled trains during these reverse movements.

## Scenario 3

Scenario 3 assumes Weekday Service and that service to the platform can be provided by either main track. In addition, a third platform track at the proposed location of the seasonal platform is assumed to allow special event trains to be "stored" at the station. Since a conceptual design was not complete for this particular scenario at the time of this analysis, it was assumed that this scenario would require a center platform to be located between Track 1 and the new siding (Track 1A).

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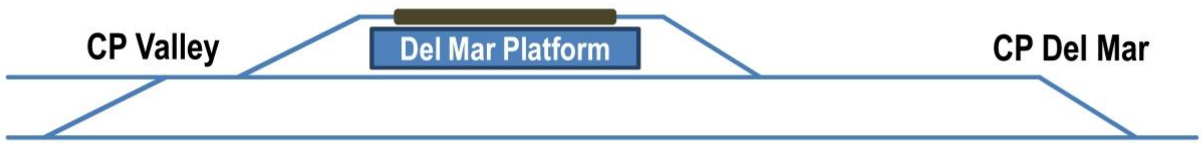


Observations

Operations under this scenario were identified as not "feasible". As with Scenarios 1 and 2, this scenario effectively creates a "single track" between CP Valley and CP Sorrento. By assuming that most, or all, trains provide service to the Del Mar platform during the summer months, additional constraints would be created under this scenario that negate the benefit of constructing a second track between the existing CP Valley and CP Crosby.

Based on observations made of the simulation using the service plan prepared for this analysis (provided in Appendix A), there was a high potential for conflicts associated with trains operating out of slot. Since trains operating in either direction would need to access the same platform, the margin of error for OTP during certain times of the day (particularly peak periods) was again less than 5 minutes before some level of impact was incurred by trains operating in the opposite direction. Even when service during peak periods was assumed to not stop at the Del Mar platform, conflicts remained between trains vying for access to the single platform.

Under this scenario, construction of the third station track allowed for one 10-car train to be "pocketed" at the station in support of special events. Operation of the special event train presented minimal impacts to regularly scheduled trains under this scenario since the special event train could simply pull into the siding and provide service to the platform. Trains operating from San Diego could also access the "pocket" track from the switch on the south end of the siding. However, due to the limited length of the siding, storage would be limited to one trainset.

## Scenario 4

Scenario 4 assumes Weekday Service and both main tracks are served by a platform. Train storage is provided by reconstructing of both legs of the Del Mar Wye. The additional storage track(s) associated with the wye are not assumed to cross Jimmy Durante Boulevard.

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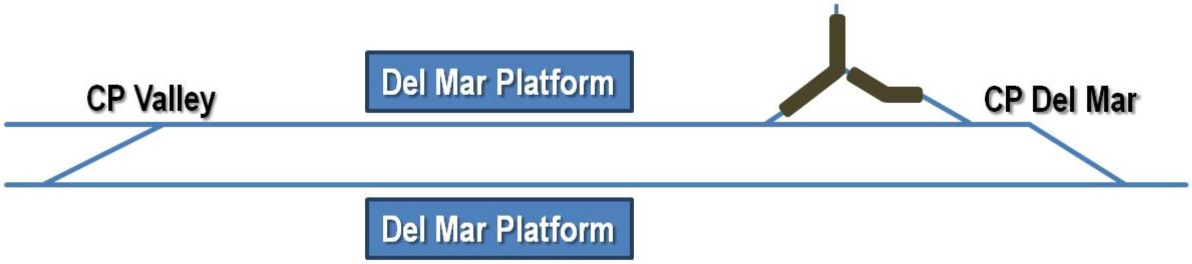


Observations

Operations under this scenario were identified to be "feasible". Daily revenue service is not altered by trains stopping at a Del Mar seasonal platform or the introduction of two "special event" trains (one in each direction). The addition of the second platform relieves the congestion identified in Scenarios 1 through 3, caused by trains vying for use of the single platform. In this scenario, northbound trains are stopping on Track 2 and southbound trains are stopping on Track 1.

Based on observations of the simulation, there are no significant conflicts identified that would adversely impact daily scheduled operations. The reduced number of conflicts (as compared to Scenarios 1 through 3) is a direct result of the ability of this scenario to support service to the seasonal platform from either Tracks 1 or 2.

Under this scenario, assuming restoration of the Del Mar Wye is possible, two 10-car trains could be "pocketed" in support of special events. One stored on the north leg of the wye and the second on the south leg of the wye. Movement to and from the north leg of the wye was the preferred movement allowing special event trains easy access to and from the Del Mar platform. It was found to be infeasible to reconstruct the original wye in its entirety given the development that has occurred over the years, so access to and from the south leg of the wye was limited to a south facing switch. Trains accessing the south leg of the wye for storage after serving the Del Mar platform would be required to make a reverse move on the main in order to access the south leg of the wye. Since these movements are assumed to occur during non-peak times of the day, no impact was observed to regularly scheduled trains during these reverse movements.

## Scenario 5

Scenario 5 assumes Weekday Service and service is provided from both main tracks to the seasonal platform(s). Train storage is provided by construction of a 1,700 to 1,800 foot siding south of the San Dieguito River crossing.

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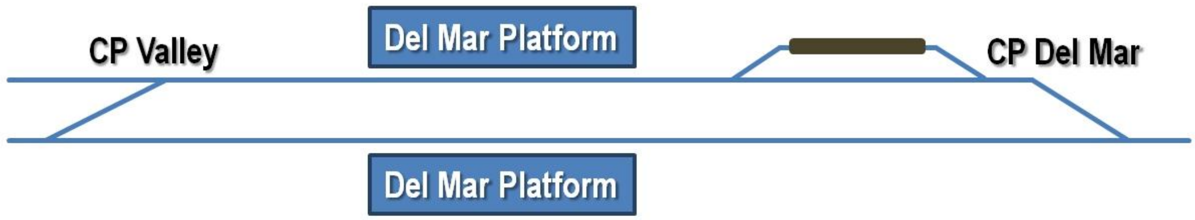


Observations

Operations under this scenario were identified to be “feasible”. Daily revenue service is not altered by trains stopping at a Del Mar seasonal platform or the introduction of two “special event” trains (one in each direction). The addition of the second platform relieves the congestion identified in Scenarios 1 through 3, caused by trains vying for use of the single platform. In this scenario, northbound trains are stopping on Track 2 and southbound trains are stopping on Track 1.

Based on observations of the simulation there are no significant conflicts identified that would adversely impact daily scheduled operations. The reduced number of conflicts (as compared to Scenarios 1 through 3) is a direct result of the ability of this scenario to support service to the seasonal platform from either Tracks 1 or 2.

Under this scenario, construction of a siding allowed for one 10-car train and one 5-car train to be “pocketed” in support of special events. Depending on the timing of the event trains, access for either train could be from the north switch, allowing for the most direct access to and from the Del Mar platform. Trains requiring access to or from the southern switch would be required to make a reverse move on the main. Since these movements are assumed to occur during non-peak times of the day, no impact was observed to regularly scheduled trains during these reverse movements.

## Scenario 6

Scenario 6 assumes Weekday Service and that service to the platform can be provided by either main track. In addition, a third platform track at the proposed location of the seasonal platform is assumed to allow special event trains to be “stored” at the station. Since a conceptual design was not complete for this particular scenario at the time of this analysis, it was assumed that this scenario would require a center platform to be located between Track 1 and the new siding (Track 1A).

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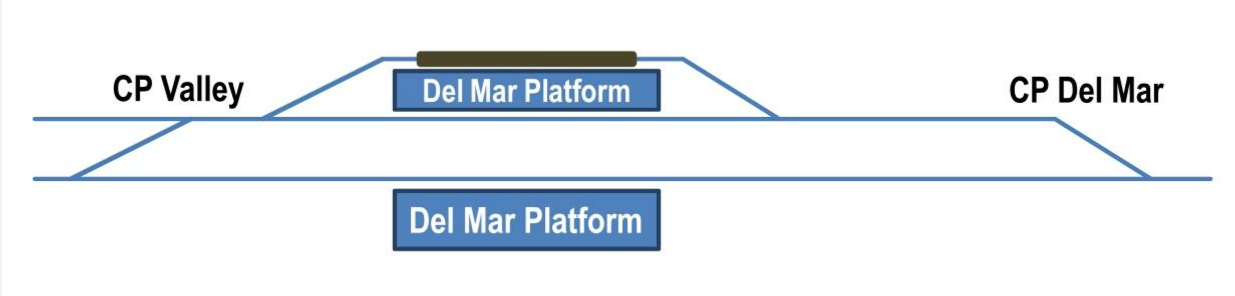


Observations

Operations under this scenario were identified to be "feasible". Daily revenue service is not altered by trains stopping at a Del Mar seasonal platform or the introduction of two "special event" trains (one in each direction). The addition of the second platform relieves the congestion issue identified in Scenarios 1 through 3, caused by trains vying for use of the single platform. In this scenario, northbound trains are stopping on Track 2 and southbound trains are stopping on Track 1.

Based on observations of the simulation there are no significant conflicts identified that would adversely impact daily scheduled operations. The reduced number of conflicts (as compared to Scenarios 1 through 3) is a direct result of the ability of this scenario to support service the seasonal platform from either Tracks 1 or 2.

Under this scenario, construction of the third station track allowed for one 10-car train to be "pocketed" at the station in support of special events. Operation of the special event train presented minimal impacts to regularly scheduled trains under this scenario since the special event train could simply pull into the siding and provide service to the platform. Trains operating from San Diego could also access the "pocket" track from the switch on the south end of the siding. However, due to the limited length of the siding, storage would be limited to one trainset.

## Scenario 7

Scenario 7 assumes Weekend Service and a single platform on Track 1. Train storage is provided by reconstruction of both legs of the Del Mar Wye. The additional storage track(s) associated with the wye are not assumed to cross Jimmy Durante Boulevard, to the east.

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### Observations

Operations under this scenario were identified to be not "feasible. This scenario effectively creates a "single track" between CP Valley and CP Sorrento. By assuming that most, or all, trains provide service to the Del Mar platform during the summer months, new constraints could be created under this scenario that negate the benefit of constructing a second track between the existing CP Valley and CP Crosby.

Based on observations of the simulation there was a high potential for conflicts associated with trains operating out of slot, despite the reduced level of service typically offered during weekends. Since trains operating in either direction would need to access the same platform, the margin of error for OTP during certain times of the day was less than 5 minutes before some level of impact was incurred by trains operating in the opposite direction. It may be feasible to reduce the potential for conflicts in this scenario by developing a separate weekend timetable for both intercity and commuter operations. However, given previous changes to intercity schedules to support a consistent seven day per week timetable, this option is not perceived as practical at this time.

Under this scenario, assuming the restoration of the Del Mar Wye is possible, two 10-car trains could be "pocketed" in support of special events. One stored on the north leg of the wye and the second on the south leg of the wye. Movement to and from the north leg of the wye was the preferred movement allowing special event trains easy access to and from the Del Mar platform. It was found to be infeasible to reconstruct the original wye in its entirety given the development that has occurred over the years, so access to and from the south leg of the wye was limited to a south facing switch. Trains accessing the south leg of the wye for storage after serving the Del Mar platform would be required to make a reverse move on the main in order to access the south leg of the wye. Since these movements are assumed to occur during non-peak times of the day, no impact was observed to regularly scheduled trains during these reverse movements.

## Scenario 8

Scenario 8 assumes Weekend Service and a single platform on Track 1. Train storage is provided by constructing a 1,700 to 1,800 foot siding south of the San Dieguito River crossing.

Observations

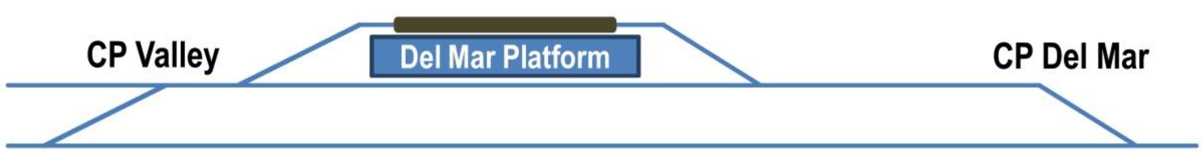
Operations under this scenario were identified to be not “feasible”. This scenario effectively creates a “single track” between CP Valley and CP Sorrento. By assuming that most, or all, trains provide service to the Del Mar platform during the summer months, new constraints could be created under this scenario that negate the benefit of constructing a second track between the existing CP Valley and CP Crosby.

Based on observations of the simulation there was a high potential for conflicts at this location associated with trains operating out of slot, despite the reduced level of service typically offered during weekends. Since trains operating in either direction would need to access the same platform, the margin of error for OTP during certain times of the day was less than 5 minutes before some level of impact was incurred by trains operating in the opposite direction. It may be feasible to reduce the potential for conflicts in this scenario by developing a separate weekend timetable for both intercity and commuter operations. However, given previous changes to intercity schedules to support a consistent seven day per week timetable, this option is not perceived as practical at this time.

Under this scenario, construction of a siding allowed for one 10-car train and one 5-car train to be “pocketed” in support of special events. Depending on the timing of the event trains, access for either train could be from the north switch, allowing for the most direct access to and from the Del Mar platform. Trains requiring access to or from the southern switch would be required to make a reverse move on the main. Since these movements are assumed to occur during non-peak times of the day, no impact was observed to regularly scheduled trains during these reverse movements.

## Scenario 9

Scenario 9 assumes Weekend Service and that service to the platform can be provided by either main track. In addition, a third platform track at the proposed location of the seasonal platform is assumed to allow special event trains to be “stored” at the station. Since a conceptual design was not complete for this particular scenario at the time of this analysis, it was assumed that this scenario would require a center platform to be located between Track 1 and the new siding (Track 1A).




Observations

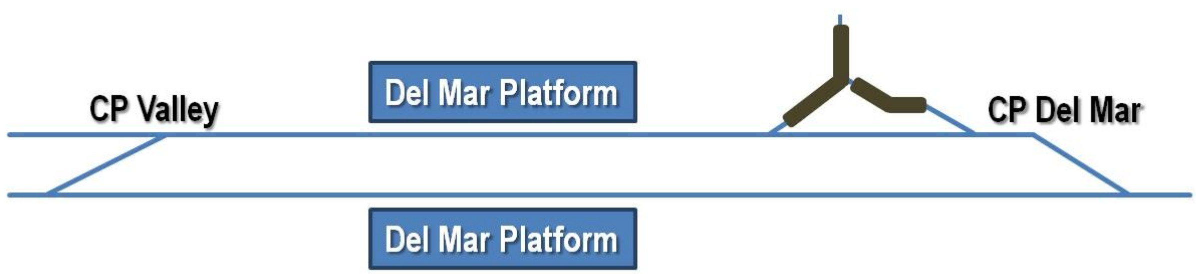
Operations under this scenario were identified to be not “feasible”. This scenario effectively creates a “single track” between CP Valley and CP Sorrento. By assuming that most, or all, trains provide service to the Del Mar platform during the summer months, new constraints could be created under this scenario that negate the benefit of constructing a second track between the existing CP Valley and CP Crosby.

Based on observations of the simulation there was a high potential for conflicts at this location associated with trains operating out of slot, despite the reduced level of service typically offered during weekends. Since trains operating in either direction would need to access the same platform, the margin of error for OTP during certain times of the day was less than 5 minutes before some level of impact was incurred by trains operating in the opposite direction. It may be feasible to reduce the potential for conflicts in this scenario by developing a separate weekend timetable for both intercity and commuter operations. However, given previous changes to intercity schedules to support a consistent seven day per week timetable, this option is not perceived as practical at this time.

Under this scenario, construction of the third station track allowed for one 10-car train to be "pocketed" at the station in support of special events. Operation of the special event train presented minimal impacts to regularly scheduled trains under this scenario since the special event train could simply pull into the siding and provide service to the platform. Trains operating from San Diego could also access the "pocket" track from the switch on the south end of the siding. However, due to the limited length of the siding, storage would be limited to one trainset.

## Scenario 10

Scenario 10 assumes Weekend Service and both main tracks are served by a platform. Train storage is provided by reconstructing of both legs of the Del Mar Wye. The additional storage track(s) associated with the wye are not assumed to cross Jimmy Durante Boulevard.




### Observations

Operations under this scenario were identified to be "feasible". Daily revenue service is not altered by trains stopping at a Del Mar seasonal platform or the introduction of two "special event" trains (one in each direction). The addition of the second platform relieves the congestion identified in Scenarios 7 through 9 caused by trains vying for use of the single platform. In this scenario, northbound trains are stopping on Track 2 and southbound trains are stopping on Track 1.

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Based on observations of the simulation there are no significant conflicts identified that would adversely impact daily scheduled operations. The reduced number of conflicts (as compared to Scenarios 7 through 9) is a direct result of the ability of this scenario to support service to the seasonal platform from either Tracks 1 or 2.

Under this scenario, assuming restoration of the Del Mar Wye is possible, two 10-car trains could be "pocketed" in support of special events. One stored on the north leg of the wye and the second on the south leg of the wye. Movement to and from the north leg of the wye was the preferred movement allowing special event trains easy access to and from the Del Mar platform. It was found to be infeasible to reconstruct the original wye in its entirety given the development that has occurred over the years, so access to and from the south leg of the wye was limited to a south facing switch. Trains accessing the south leg of the wye for storage after serving the Del Mar platform would be required to make a reverse move on the main in order to access the south leg of the wye. Since these movements are assumed to occur during non-peak times of the day, no impact was observed to regularly scheduled trains during these reverse movements.

## Scenario 11

Scenario 11 assumes Weekend Service and service is provided from both main tracks to the seasonal platform(s). Train storage is provided by constructing a 1,700 to 1,800 foot siding south of the San Dieguito River crossing.


### Observations

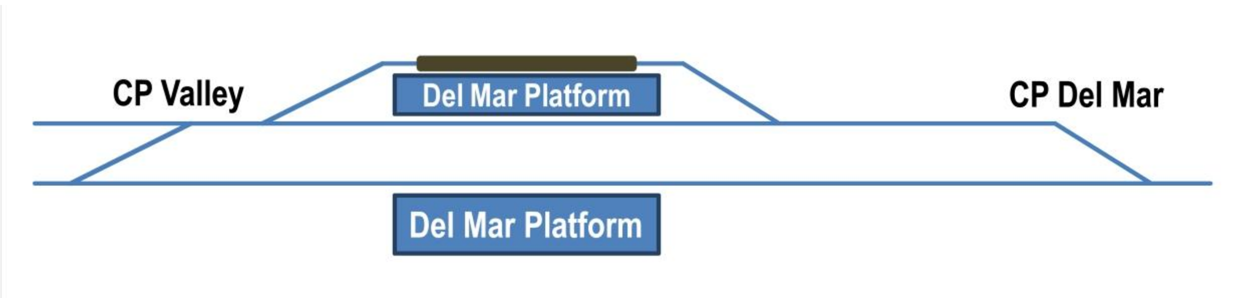
Operations under this scenario were identified to be "feasible". Daily revenue service is not altered by trains stopping at a Del Mar seasonal platform or the introduction of two "special event" trains (one in each direction). The addition of the second platform relieves the congestion identified in Scenarios 7 through 9, caused by trains vying for use of the single platform. In this scenario, northbound trains are stopping on Track 2 and southbound trains are stopping on Track 1.

Based on observations of the simulation there are no significant conflicts identified that would adversely impact daily scheduled operations. The reduced number of conflicts (as compared to Scenarios 7 through 9) is a direct result of the ability of this scenario to support service to the seasonal platform from either Tracks 1 or 2.

Under this scenario, construction of a siding allowed for one 10-car train and one 5-car train to be "pocketed" in support of special events. Depending on the timing of the event trains, access for either train could be from the north switch, allowing for the most direct access to and from the Del Mar platform. Trains requiring access to or from the southern switch would be required to make a reverse move on the main. Since these movements are assumed to occur during non-peak times of the day, no impact was observed to regularly scheduled trains during these reverse movements.

## Scenario 12

Scenario 12 assumes Weekend Service and that service to the platform can be provided by either main track. In addition, a third platform track at the proposed location of the seasonal platform is assumed to allow special event trains to be "stored" at the station. Since a conceptual design was not complete for this particular scenario at the time of this analysis, it was assumed that this scenario would require a center platform to be located between Track 1 and the new siding (Track 1A).




### Observations

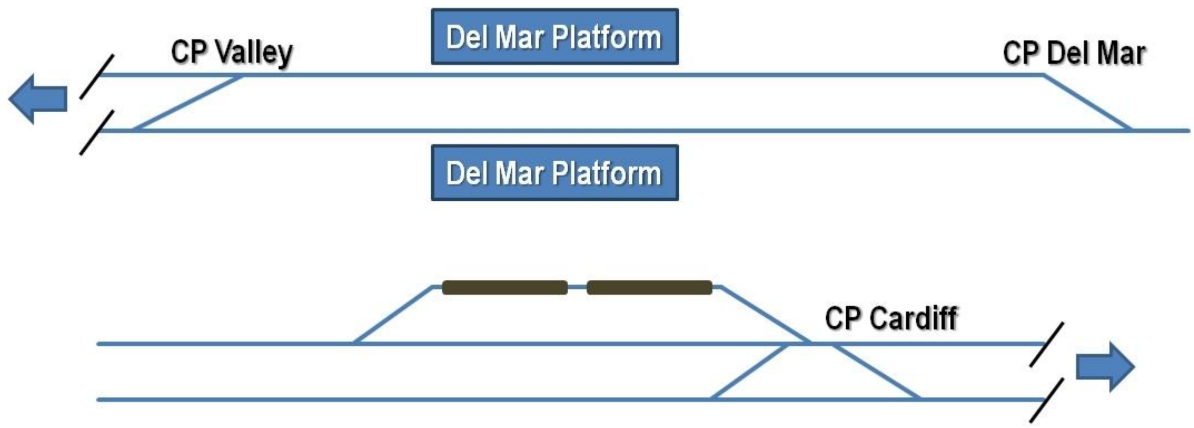
Operations under this scenario were identified to be "feasible". Daily revenue service is not altered by trains stopping at a Del Mar seasonal platform or the introduction of two "special event" trains (one in each direction). The addition of the second platform relieves the congestion identified in Scenarios 7 through 9caused by trains vying for use of the single platform. In this scenario, northbound trains are stopping on Track 2 and southbound trains are stopping on Track 1.

Based on observations of the simulation there are no significant conflicts identified that would adversely impact daily scheduled operations. The reduced number of conflicts is a direct result of the ability of this scenario to support service to the seasonal platform from either Tracks 1 or 2.

Under this scenario, construction of the third station track allowed for one 10-car train to be "pocketed" at the station in support of special events. Operation of the special event train presented minimal impacts to regularly scheduled trains under this scenario since the special event train could simply pull into the siding and provide service to the platform. Trains operating from San Diego could also access the "pocket" track from the switch on the south end of the siding. However, due to the limited length of the siding, storage would be limited to one trainset.

## Scenario 13

Scenario 13 assumes Weekday Service and that service to the platform can be provided by either main track. Different from the other scenarios identified above, this scenario assumes the "pocket" (or storage) track for special event trains would be located on a siding in Encinitas. This scenario would have the potential for storing up to two 10-car trains and was included at the request of NCTD staff in order to identify its operational feasibility.




### Observations

Operations under this scenario were identified to be not "feasible".

Based on observations of the simulation there is potential for conflicts identified that would could adversely impact daily scheduled operations. The potential for impacts occur during the non-revenue movements to and from the "storage" track in Encinitas. As proposed, the special event trains would be required to "turn" on the main track at the Del Mar seasonal platform. Turning refers the to the change in direction a train makes once it reaches its destination. Typical turning times assumed by passenger operators in their schedules can range between 10 and 20 minutes. Due to the length of time, turning a train on a main track at the Del Mar seasonal platform increases the potential for conflicts with "scheduled" trains. As a result, the departure time for the special event train in this scenario needed to be pushed back by approximately two hours from the assumed scheduled simulated in Scenarios 1 through 12 in order to minimize impacts to the regularly scheduled trains.

Under this scenario, assuming the construction of a storage siding in Encinitas, two 10-car trains could be "pocketed" to support special events. Operations of the special event train presented some impact to regularly scheduled trains under this scenario. By proposing a storage location north of the seasonal platform, two additional slots in the timetable were required to operate non-revenue movements from the seasonal platform to the storage track and return. As a result, timetables needed to be adjusted for each revenue train operating during the particular times of day in which the special event train was operating.

### Scenario 14 – Extending Train Operations to San Diego

At the request of SANDAG and NCTD, one additional scenario was added after the submittal of the draft report. This scenario identified the feasibility of extending the special events train to downtown San Diego after unloading passengers at the Del Mar seasonal platform. The train would then be stored at the Santa Fe Depot in downtown San Diego.

The feasibility of available storage capacity in the afternoon at the Santa Fe Depot for the special event train was the underlining focus of this particular scenario. To help in identifying the potential capacity in downtown San Diego conceptual equipment turns at both the Santa Fe Depot and MTS Layover Yard were reviewed.

#### Observations

Operations under this scenario were identified to be "feasible". Event trains were simulated on the same schedule as previously modeled for Scenarios 1 through 12. The trains were subsequently extended to the San Diego Depot. Simulations performed on this scenario revealed that the extension of the train to San Diego could feasibly operate with no additional impact to the proposed 2025 service levels. The train operating southbound from Los Angeles operates during non-peak hours, minimizing possible conflicts to meets with trains operating in the opposing direction. The same was observed for the northbound train in the evening, which departs San Diego at the end of the evening peak period.

#### Train storage in San Diego

The simulations performed indicated it was feasible for the special event train to be stored at the San Diego Depot during the desired time frame. However, some "creative dispatching" may be required to address the storage needs and continue to facilitate regularly scheduled train movements, in particular, midday freight operations. One suggestion, verified through manipulations of the simulation model, would be to store the special event train on Track 3 upon its arrival into San Diego. By storing the special event train on Track 3, it allows for BNSF to continue to provide midday freight operations through the depot on Track 4 (as is currently done today). An option could then be to position the special event train onto Track 4 during the peak periods, allowing for the regularly scheduled peak period trains to continue using Tracks 1 through 3.

## Conclusions

Overall reviews of the simulations conducted on each of the scenarios identified the need to consider platform access from both mainline tracks. Acknowledging requests that have been received by SANDAG from the Del Mar Fairgrounds, consideration should be given for the ability to service more than one train in each direction as the design for the seasonal platform moves forward. Simulations performed on each of the scenarios indicated an inability to reliably operate service through this segment of the rail corridor assuming a single platform and multiple trains servicing the platform in each direction, particularly during afternoon peak period operations. Additional simulations are recommended as designs are progressed and service plans are further refined to ensure a final design adequately supports the desired function of the seasonal platform.

Reviews of the simulations conducted also identified the importance of considering storage locations for the special event trains that are geographically south of the proposed seasonal platform. As verified in the simulations conducted on Scenario 13, a storage location north of the platform requires additional slots for non-revenue movements on an already congested corridor. This increases the potential for conflicts with scheduled revenue trains already proposed to be operating on the corridor. Based on the simulations conducted as part of this analysis, it is therefore recommended that consideration be given only to storage locations geographically south (railroad east) of the season platform as this project moves forward.

# Appendix A
# Proposed Mid-Term 2025 Timetables

# DEL MAR TIMETABLE

| Southbound to San Diego | READ DOWN | SCENARIOS 1 - 6 MONDAY-FRIDAY | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| STATIONS | | 628 | 630 | 634 | 636 | 638 | 640 | A615 | 642 | A720 | 646 | A830 | 648 | A940 | A1010 | 650 | A1110 |
| Oceanside | ↓ | 4:11 AM | 5:16 AM | 5:50 AM | 6:44 AM | 7:23 AM | 7:42 AM | 8:07 AM | 8:45 AM | 9:12 AM | 10:03 AM | 10:22 AM | 11:02 AM | 11:32 AM | 12:03 PM | 12:30 PM | 1:02 PM |
| Carlsbad Village | | 4:15 AM | 5:20 AM | 5:54 AM | 6:48 AM | 7:28 AM | 7:47 AM | - | 8:50 AM | - | 10:08 AM | - | 11:07 AM | - | - | 12:35 PM | - |
| Carlsbad Poinsettia | | 4:21 AM | 5:26 AM | 6:01 AM | 6:54 AM | 7:33 AM | 7:53 AM | - | 8:56 AM | - | 10:14 AM | - | 11:13 AM | - | - | 12:41 PM | - |
| Encinitas | | 4:27 AM | 5:32 AM | 6:07 AM | 7:00 AM | 7:40 AM | 7:58 AM | - | 9:01 AM | - | 10:19 AM | - | 11:20 AM | - | - | 12:46 PM | - |
| Solana Beach | | 4:33 AM | 5:38 AM | 6:13 AM | 7:06 AM | 7:46 AM | 8:03 AM | 8:22 AM | 9:07 AM | 9:27 AM | 10:25 AM | 10:37 AM | 11:25 AM | 11:47 AM | 12:19 PM | 12:52 PM | 1:17 PM |
| Del Mar | | 4:35 AM | 5:40 AM | 6:15 AM | 7:08 AM | 7:48 AM | 8:05 AM | 8:25 AM | 9:09 AM | 9:30 AM | 10:28 AM | 10:40 AM | 11:27 AM | 11:50 AM | 12:55 PM | 12:54 PM | 1:20 PM |
| Sorrento Valley | | 4:42 AM | 5:47 AM | 6:23 AM | 7:16 AM | 7:57 AM | 8:13 AM | - | 9:17 AM | - | 10:36 AM | - | 11:36 AM | - | Del Mar | 1:02 PM | - |
| San Diego-Old Town | | 5:02 AM | 6:07 AM | 6:42 AM | 7:36 AM | 8:17 AM | 8:33 AM | - | 9:38 AM | - | 10:55 AM | - | 11:56 AM | - | Event | 1:23 PM | - |
| San Diego-SF Depot | ↓ | 5:10 AM | 6:15 AM | 6:50 AM | 7:42 AM | 8:25 AM | 8:40 AM | 8:59 AM | 9:48 AM | 10:04 AM | 11:03 AM | 11:14 AM | 12:03 PM | 12:24 PM | Train | 1:30 PM | 1:54 PM |

| STATIONS | 658 | A1145 | 652 | A1230 | 654 | A1345 | 656 | 660 | A1500 | 662 | A1610 | 664 | A1710 | 666 | A1820 | A1942 | A2020 | A2115 | A2210 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Oceanside | 1:15 PM | 1:37 PM | 2:00 PM | 2:22 PM | 2:50 PM | 3:35 PM | 3:40 PM | 4:21 PM | 4:52 PM | 5:34 PM | 6:01 PM | 6:34 PM | 7:02 PM | 7:30 PM | 8:09 PM | 9:34 PM | 10:09 PM | 11:04 PM | 12:02 AM |
| Carlsbad Village | 1:20 PM | - | 2:05 PM | - | 2:55 PM | - | 3:45 PM | 4:26 PM | - | 5:39 PM | - | 7:39 PM | - | 7:35 PM | - | - | - | - | - |
| Carlsbad Poinsettia | 1:26 PM | - | 2:11 PM | - | 3:01 PM | - | 3:50 PM | 4:33 PM | - | 5:45 PM | - | 6:45 PM | - | 7:41 PM | - | - | - | - | - |
| Encinitas | 1:32 PM | - | 2:16 PM | - | 3:07 PM | - | 3:56 PM | 4:38 PM | - | 5:51 PM | - | 6:50 PM | - | 7:46 PM | - | - | - | - | - |
| Solana Beach | 1:37 PM | 1:53 PM | 2:22 PM | 2:37 PM | 3:12 PM | 3:49 PM | 4:02 PM | 4:46 PM | 5:07 PM | 5:57 PM | 6:16 PM | 6:56 PM | 7:17 PM | 7:52 PM | 8:24 PM | 9:49 PM | 10:23 PM | 11:18 PM | 12:17 AM |
| Del Mar | 1:39 PM | 1:56 PM | 2:24 PM | 2:40 PM | 3:14 PM | 3:52 PM | 4:04 PM | 4:48 PM | 5:10 PM | 5:59 PM | 6:20 PM | 6:58 PM | 7:20 PM | 7:54 PM | 8:27 PM | 9:51 PM | 10:26 PM | 11:21 PM | 12:20 AM |
| Sorrento Valley | 1:47 PM | - | 2:32 PM | - | 3:24 PM | - | 4:11 PM | 4:56 PM | - | 6:08 PM | - | 7:06 PM | - | 8:02 PM | - | - | - | - | - |
| San Diego-Old Town | 2:08 PM | - | 2:53 PM | - | 3:44 PM | - | 4:30 PM | 5:16 PM | - | 6:29 PM | - | 7:27 PM | - | 8:23 PM | - | - | - | - | - |
| San Diego-SF Depot | 2:15 PM | 2:29 PM | 3:00 PM | 3:14 PM | 3:51 PM | 4:26 PM | 4:39 PM | 5:33 PM | 5:44 PM | 6:35 PM | 6:53 PM | 7:34 PM | 7:54 PM | 8:30 PM | 9:01 PM | 10:26 PM | 11:01 PM | 11:56 PM | 12:54 AM |

| Northbound to Oceanside | READ DOWN | SCENARIOS 1 - 6 MONDAY-FRIDAY | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| STATIONS | | A605 | 631 | 633 | A705 | 635 | A810 | A920 | 639 | A1050 | A1205 | 645 | A1303 | 647 | 651 | A1440 | A1515 |
| San Diego-SF Depot | ↓ | 6:05 AM | 6:25 AM | 6:48 AM | 7:10 AM | 7:25 AM | 8:10 AM | 9:20 AM | 9:44 AM | 10:50 AM | 12:05 PM | 12:35 PM | 1:03 PM | 1:19 PM | 2:05 PM | 2:40 PM | 3:15 PM |
| San Diego-Old Town | | - | 6:30 AM | 6:53 AM | - | 7:30 AM | - | - | 9:49 AM | - | - | 12:40 PM | - | 1:24 PM | 2:10 PM | - | - |
| Sorrento Valley | | - | 6:52 AM | 7:15 AM | - | 7:53 AM | - | - | 10:10 AM | - | - | 1:01 PM | - | 1:48 PM | 2:31 PM | - | - |
| Del Mar | | 6:38 AM | 6:58 AM | 7:21 AM | 7:43 AM | 8:03 AM | 8:43 AM | 9:53 AM | 10:16 AM | 11:23 AM | 12:38 PM | 1:09 PM | 1:36 PM | 1:54 PM | 2:38 PM | 3:13 PM | 3:48 PM |
| Solana Beach | | 6:43 AM | 7:00 AM | 7:23 AM | 7:48 AM | 8:05 AM | 8:48 AM | 9:58 AM | 10:18 AM | 11:28 AM | 12:43 PM | 1:11 PM | 1:41 PM | 1:56 PM | 2:40 PM | 3:18 PM | 3:53 PM |
| Encinitas | | - | 7:05 AM | 7:28 AM | - | 8:10 AM | - | - | 10:23 AM | - | - | 1:18 PM | - | 2:01 PM | 2:46 PM | - | - |
| Carlsbad Poinsettia | | - | 7:10 AM | 7:33 AM | - | 8:16 AM | - | - | 10:29 AM | - | - | 1:24 PM | - | 2:07 PM | 2:52 PM | - | - |
| Carlsbad Village | | - | 7:16 AM | 7:39 AM | - | 8:22 AM | - | - | 10:35 AM | - | - | 1:30 PM | - | 2:13 PM | 2:59 PM | - | - |
| Oceanside | ↓ | 6:59 AM | 7:23 AM | 7:46 AM | 8:01 AM | 8:30 AM | 9:04 AM | 10:14 AM | 10:42 AM | 11:44 AM | 12:59 PM | 1:36 PM | 1:57 PM | 2:20 PM | 3:05 PM | 3:34 PM | 4:09 PM |

| STATIONS | 653 | A1600 | 655 | 657 | A1715 | 661 | 663 | 665 | A1841 | 667 | A1906 | 669 | A1939 | 671 | 673 | A2030 | 675 | A2145 | A2245 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| San Diego-SF Depot | 3:45 PM | 4:00 PM | 4:25 PM | 4:54 PM | 5:15 PM | 5:37 PM | 6:00 PM | 6:18 PM | 6:41 PM | 6:48 PM | Del Mar | 7:18 PM | 7:39 PM | 7:50 PM | 8:15 PM | 8:30 PM | 9:00 PM | 9:45 PM | 10:45 PM |
| San Diego-Old Town | 3:50 PM | - | 4:30 PM | 4:59 PM | - | 5:42 PM | 6:05 PM | 6:23 PM | - | 6:53 PM | Event | 7:23 PM | - | 7:55 PM | 8:20 PM | - | 9:05 PM | - | - |
| Sorrento Valley | 4:10 PM | - | 4:52 PM | 5:20 PM | - | 6:04 PM | 6:27 PM | 6:45 PM | - | 7:15 PM | Train | 7:45 PM | - | 8:05 PM | 8:40 PM | - | 9:25 PM | - | - |
| Del Mar | 4:18 PM | 4:33 PM | 4:58 PM | 5:27 PM | 5:48 PM | 6:11 PM | 6:36 PM | 6:54 PM | 7:14 PM | 7:24 PM | 7:45 PM | 7:54 PM | 8:12 PM | 8:23 PM | 8:48 PM | 9:03 PM | 9:33 PM | 10:18 PM | 11:18 PM |
| Solana Beach | 4:20 PM | 4:38 PM | 5:00 PM | 5:29 PM | 5:53 PM | 6:13 PM | 6:38 PM | 6:56 PM | 7:19 PM | 7:26 PM | 7:50 PM | 7:56 PM | 8:17 PM | 8:25 PM | 8:50 PM | 9:08 PM | 9:35 PM | 10:23 PM | 11:23 PM |
| Encinitas | 4:26 PM | - | 5:06 PM | 5:35 PM | - | 6:19 PM | 6:43 PM | 7:01 PM | - | 7:31 PM | - | 8:01 PM | - | 8:32 PM | 8:57 PM | - | 9:42 PM | - | - |
| Carlsbad Poinsettia | 4:32 PM | - | 5:12 PM | 5:42 PM | - | 6:29 PM | 6:49 PM | 7:07 PM | - | 7:37 PM | - | 8:07 PM | - | 8:38 PM | 9:02 PM | - | 9:47 PM | - | - |
| Carlsbad Village | 4:38 PM | - | 5:18 PM | 5:48 PM | - | 6:31 PM | 6:55 PM | 7:13 PM | - | 7:43 PM | - | 8:13 PM | - | 8:43 PM | 9:09 PM | - | 9:54 PM | - | - |
| Oceanside | 4:45 PM | 4:54 PM | 5:24 PM | 5:56 PM | 6:09 PM | 6:39 PM | 7:02 PM | 7:20 PM | 7:35 PM | 7:50 PM | 8:08 PM | 8:20 PM | 8:35 PM | 8:52 PM | 9:17 PM | 9:24 PM | 10:02 PM | 10:41 PM | 11:41 PM |

*Amtrak*

*Coaster*

# DEL MAR TIMETABLE

**Southbound to San Diego** (READ DOWN)

SCENARIOS 7 - 12
SATURDAY-SUNDAY

| STATIONS | 1640 | A615 | 1642 | A720 | 1646 | A830 | A940 | A1010 | 1650 | A1110 | A1145 | 1652 | A1230 | A1345 | 1656 | A1500 | 1662 | A1610 | A1710 | 1666 | A1820 | 1670 | A1942 | A2020 | A2115 | A2210 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Oceanside | 7:42 AM | 8:07 AM | 8:45 AM | 9:12 AM | 10:03 AM | 10:22 AM | 11:32 AM | 12:03 PM | 12:30 PM | 1:02 PM | 1:37 PM | 2:00 PM | 2:22 PM | 3:35 PM | 3:40 PM | 4:52 PM | 5:29 PM | 6:01 PM | 7:02 PM | 7:30 PM | 8:09 PM | 8:50 PM | 9:34 PM | 10:09 PM | 11:04 PM | 12:02 AM |
| Carlsbad Village | 7:47 AM | - | 8:50 AM | - | 10:08 AM | - | - | - | 12:35 PM | - | - | 2:05 PM | - | - | 3:45 PM | - | 5:34 PM | - | - | 7:35 PM | - | 8:55 PM | - | - | - | - |
| Carlsbad Poinsettia | 7:53 AM | - | 8:56 AM | - | 10:14 AM | - | - | - | 12:41 PM | - | - | 2:11 PM | - | - | 3:50 PM | - | 5:40 PM | - | - | 7:41 PM | - | 9:01 PM | - | - | - | - |
| Encinitas | 7:58 AM | - | 9:01 AM | - | 10:19 AM | - | - | - | 12:46 PM | - | - | 2:16 PM | - | - | 3:56 PM | - | 5:45 PM | - | - | 7:46 PM | - | 9:06 PM | - | - | - | - |
| Solana Beach | 8:03 AM | 8:22 AM | 9:07 AM | 9:27 AM | 10:25 AM | 10:37 AM | 11:47 AM | 12:19 PM | 12:52 PM | 1:17 PM | 1:53 PM | 2:22 PM | 2:37 PM | 3:49 PM | 4:02 PM | 5:07 PM | 5:51 PM | 6:16 PM | 7:17 PM | 7:52 PM | 8:24 PM | 9:12 PM | 9:49 PM | 10:23 PM | 11:18 PM | 12:17 AM |
| Del Mar | 8:05 AM | 8:25 AM | 9:09 AM | 9:30 AM | 10:28 AM | 10:40 AM | 11:50 AM | 12:55 PM | 12:54 PM | 1:20 PM | 1:56 PM | 2:24 PM | 2:40 PM | 3:52 PM | 4:04 PM | 5:10 PM | 5:53 PM | 6:20 PM | 7:20 PM | 7:54 PM | 8:27 PM | 9:14 PM | 9:51 PM | 10:26 PM | 11:21 PM | 12:20 AM |
| Sorrento Valley | 8:13 AM | - | 9:17 AM | - | 10:36 AM | - | - | Del Mar | 1:02 PM | - | - | 2:32 PM | - | - | 4:11 PM | - | 6:01 PM | - | - | 8:02 PM | - | 9:22 PM | - | - | - | - |
| San Diego-Old Town | 8:33 AM | - | 9:38 AM | - | 10:55 AM | - | - | Event | 1:23 PM | - | - | 2:53 PM | - | - | 4:30 PM | - | 6:22 PM | - | - | 8:23 PM | - | 9:43 PM | - | - | - | - |
| San Diego-SF Depot | 8:40 AM | 8:59 AM | 9:48 AM | 10:04 AM | 11:03 AM | 11:14 AM | 12:24 PM | Train | 1:30 PM | 1:54 PM | 2:29 PM | 3:00 PM | 3:14 PM | 4:26 PM | 4:39 PM | 5:44 PM | 6:29 PM | 6:53 PM | 7:54 PM | 8:30 PM | 9:01 PM | 9:50 PM | 10:26 PM | 11:01 PM | 11:56 PM | 12:54 AM |

**Northbound to Oceanside** (READ DOWN)

SCENARIOS 7 - 12
SATURDAY-SUNDAY

| STATIONS | A605 | A705 | A810 | A920 | 1639 | 1641 | A1050 | 1645 | A1205 | A1303 | 1651 | A1440 | A1515 | 1653 | A1600 | 1657 | A1715 | A1841 | 1667 | A1906 | A1939 | A2030 | 1675 | A2145 | 1677 | A2245 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| San Diego-SF Depot | 6:05 AM | 7:10 AM | 8:10 AM | 9:20 AM | 9:44 AM | 10:25 AM | 10:50 AM | 11:35 AM | 12:05 PM | 1:03 PM | 2:05 PM | 2:40 PM | 3:15 PM | 3:45 PM | 4:00 PM | 4:54 PM | 5:15 PM | 6:41 PM | 6:48 PM | Del Mar | 7:39 PM | 8:30 PM | 9:00 PM | 9:45 PM | 10:15 PM | 10:45 PM |
| San Diego-Old Town | - | - | - | - | 9:49 AM | 10:30 AM | - | 11:40 AM | - | - | 2:10 PM | - | - | 3:50 PM | - | 4:59 PM | - | - | 6:53 PM | Event | - | - | 9:05 PM | - | 10:20 PM | - |
| Sorrento Valley | - | - | - | - | 10:10 AM | 10:51 AM | - | 12:01 PM | - | - | 2:31 PM | - | - | 4:10 PM | - | 5:20 PM | - | - | 7:15 PM | Train | - | - | 9:25 PM | - | 10:40 PM | - |
| Del Mar | 6:38 AM | 7:43 AM | 8:43 AM | 9:53 AM | 10:16 AM | 10:57 AM | 11:23 AM | 12:07 PM | 12:38 PM | 1:36 PM | 2:38 PM | 3:13 PM | 3:48 PM | 4:18 PM | 4:33 PM | 5:27 PM | 5:48 PM | 7:14 PM | 7:24 PM | 7:45 PM | 8:12 PM | 9:03 PM | 9:33 PM | 10:18 PM | 10:48 PM | 11:18 PM |
| Solana Beach | 6:43 AM | 7:48 AM | 8:48 AM | 9:58 AM | 10:18 AM | 10:59 AM | 11:28 AM | 12:09 PM | 12:43 PM | 1:41 PM | 2:40 PM | 3:18 PM | 3:53 PM | 4:20 PM | 4:38 PM | 5:29 PM | 5:53 PM | 7:19 PM | 7:26 PM | 7:50 PM | 8:17 PM | 9:08 PM | 9:35 PM | 10:23 PM | 10:50 PM | 11:23 PM |
| Encinitas | - | - | - | - | 10:23 AM | 11:04 AM | - | 12:14 PM | - | - | 2:46 PM | - | - | 4:26 PM | - | 5:35 PM | - | - | 7:31 PM | - | - | - | 9:42 PM | - | 10:57 PM | - |
| Carlsbad Poinsettia | - | - | - | - | 10:29 AM | 11:10 AM | - | 12:20 PM | - | - | 2:52 PM | - | - | 4:32 PM | - | 5:42 PM | - | - | 7:37 PM | - | - | - | 9:47 PM | - | 11:02 PM | - |
| Carlsbad Village | - | - | - | - | 10:35 AM | 11:16 AM | - | 12:26 PM | - | - | 2:59 PM | - | - | 4:38 PM | - | 5:48 PM | - | - | 7:43 PM | - | - | - | 9:54 PM | - | 11:09 PM | - |
| Oceanside | 6:59 AM | 8:01 AM | 9:04 AM | 10:14 AM | 10:42 AM | 11:23 AM | 11:44 AM | 12:33 PM | 12:59 PM | 1:57 PM | 3:05 PM | 3:34 PM | 4:09 PM | 4:45 PM | 4:54 PM | 5:56 PM | 6:09 PM | 7:35 PM | 7:50 PM | 8:08 PM | 8:35 PM | 9:24 PM | 10:02 PM | 10:41 PM | 11:17 PM | 11:41 PM |

*Amtrak*
*Coaster*

# DEL MAR TIMETABLE

## Southbound to San Diego

READ DOWN

SCENARIO 13
MONDAY-FRIDAY

| STATIONS | 628 | 630 | 634 | 636 | 638 | 640 | A615 | 642 | A720 | 646 | A830 | 648 | A940 | A1010 | 650 | A1110 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Oceanside | 4:11 AM | 5:16 AM | 5:50 AM | 6:44 AM | 7:23 AM | 7:42 AM | 8:07 AM | 8:45 AM | 9:12 AM | 10:03 AM | 10:22 AM | 11:02 AM | 11:32 AM | 12:03 PM | 12:30 PM | 1:02 PM |
| Carlsbad Village | 4:15 AM | 5:20 AM | 5:54 AM | 6:48 AM | 7:28 AM | 7:47 AM | - | 8:50 AM | - | 10:08 AM | - | 11:07 AM | - | - | 12:35 PM | - |
| Carlsbad Poinsettia | 4:21 AM | 5:26 AM | 6:01 AM | 6:54 AM | 7:33 AM | 7:53 AM | - | 8:56 AM | - | 10:14 AM | - | 11:13 AM | - | - | 12:41 PM | - |
| Encinitas | 4:27 AM | 5:32 AM | 6:07 AM | 7:00 AM | 7:40 AM | 7:58 AM | - | 9:01 AM | - | 10:19 AM | - | 11:20 AM | - | - | 12:46 PM | - |
| Solana Beach | 4:33 AM | 5:38 AM | 6:13 AM | 7:06 AM | 7:46 AM | 8:03 AM | 8:22 AM | 9:07 AM | 9:27 AM | 10:25 AM | 10:37 AM | 11:25 AM | 11:47 AM | 12:19 PM | 12:52 PM | 1:17 PM |
| Del Mar | 4:35 AM | 5:40 AM | 6:15 AM | 7:08 AM | 7:48 AM | 8:05 AM | 8:25 AM | 9:09 AM | 9:30 AM | 10:28 AM | 10:40 AM | 11:27 AM | 11:50 AM | 12:55 PM | 12:54 PM | 1:20 PM |
| Sorrento Valley | 4:42 AM | 5:47 AM | 6:23 AM | 7:16 AM | 7:57 AM | 8:13 AM | - | 9:17 AM | - | 10:36 AM | - | 11:36 AM | - | Del Mar | 1:02 PM | - |
| San Diego-Old Town | 5:02 AM | 6:07 AM | 6:42 AM | 7:36 AM | 8:17 AM | 8:33 AM | - | 9:38 AM | - | 10:55 AM | - | 11:56 AM | - | Event | 1:23 PM | - |
| San Diego-SF Depot | 5:10 AM | 6:15 AM | 6:50 AM | 7:42 AM | 8:25 AM | 8:40 AM | 8:59 AM | 9:48 AM | 10:04 AM | 11:03 AM | 11:14 AM | 12:03 PM | 12:24 PM | Train | 1:30 PM | 1:54 PM |

| STATIONS | 658 | A1145 | 652 | A1230 | 654 | A1345 | 656 | 660 | A1500 | 662 | A1610 | 664 | A1710 | 666 | A1820 | A1942 | A2020 | A2115 | A2210 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Oceanside | 1:15 PM | 1:37 PM | 2:00 PM | 2:22 PM | 2:50 PM | 3:35 PM | 3:40 PM | 4:21 PM | 4:52 PM | 5:34 PM | 6:01 PM | 6:34 PM | 7:02 PM | 7:30 PM | 8:09 PM | 9:34 PM | 10:09 PM | 11:04 PM | 12:02 AM |
| Carlsbad Village | 1:20 PM | - | 2:05 PM | - | 2:55 PM | - | 3:45 PM | 4:26 PM | - | 5:39 PM | - | 7:39 PM | - | 7:35 PM | - | - | - | - | - |
| Carlsbad Poinsettia | 1:26 PM | - | 2:11 PM | - | 3:01 PM | - | 3:50 PM | 4:33 PM | - | 5:45 PM | - | 6:45 PM | - | 7:41 PM | - | - | - | - | - |
| Encinitas | 1:32 PM | - | 2:16 PM | - | 3:07 PM | - | 3:56 PM | 4:38 PM | - | 5:51 PM | - | 6:50 PM | - | 7:46 PM | - | - | - | - | - |
| Solana Beach | 1:37 PM | 1:53 PM | 2:22 PM | 2:37 PM | 3:12 PM | 3:49 PM | 4:02 PM | 4:46 PM | 5:07 PM | 5:57 PM | 6:16 PM | 6:56 PM | 7:17 PM | 7:52 PM | 8:24 PM | 9:49 PM | 10:23 PM | 11:18 PM | 12:17 AM |
| Del Mar | 1:39 PM | 1:56 PM | 2:24 PM | 2:40 PM | 3:14 PM | 3:52 PM | 4:04 PM | 4:48 PM | 5:10 PM | 5:59 PM | 6:20 PM | 6:58 PM | 7:20 PM | 7:54 PM | 8:27 PM | 9:51 PM | 10:26 PM | 11:21 PM | 12:20 AM |
| Sorrento Valley | 1:47 PM | - | 2:32 PM | - | 3:24 PM | - | 4:11 PM | 4:56 PM | - | 6:08 PM | - | 7:06 PM | - | 8:02 PM | - | - | - | - | - |
| San Diego-Old Town | 2:08 PM | - | 2:53 PM | - | 3:44 PM | - | 4:30 PM | 5:16 PM | - | 6:29 PM | - | 7:27 PM | - | 8:23 PM | - | - | - | - | - |
| San Diego-SF Depot | 2:15 PM | 2:29 PM | 3:00 PM | 3:14 PM | 3:51 PM | 4:26 PM | 4:39 PM | 5:33 PM | 5:44 PM | 6:35 PM | 6:53 PM | 7:34 PM | 7:54 PM | 8:30 PM | 9:01 PM | 10:26 PM | 11:01 PM | 11:56 PM | 12:54 AM |

## Northbound to Oceanside

READ DOWN

SCENARIO 13
MONDAY-FRIDAY

| STATIONS | A605 | 631 | 633 | A705 | 635 | A810 | A920 | 639 | A1050 | A1205 | 645 | A1303 | 647 | 651 | A1440 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| San Diego-SF Depot | 6:05 AM | 6:25 AM | 6:48 AM | 7:10 AM | 7:25 AM | 8:10 AM | 9:20 AM | 9:44 AM | 10:50 AM | 12:05 PM | 12:35 PM | 1:03 PM | 1:19 PM | 2:05 PM | 2:40 PM |
| San Diego-Old Town | - | 6:30 AM | 6:53 AM | - | 7:30 AM | - | - | 9:49 AM | - | - | 12:40 PM | - | 1:24 PM | 2:10 PM | - |
| Sorrento Valley | - | 6:52 AM | 7:15 AM | - | 7:53 AM | - | - | 10:10 AM | - | - | 1:01 PM | - | 1:48 PM | 2:31 PM | - |
| Del Mar | 6:38 AM | 6:58 AM | 7:21 AM | | 8:03 AM | 8:43 AM | 9:53 AM | 10:16 AM | 11:23 AM | 12:38 PM | 1:09 PM | 1:36 PM | 1:54 PM | 2:38 PM | 3:13 PM |
| Solana Beach | 6:43 AM | 7:00 AM | 7:23 AM | | 8:05 AM | 8:48 AM | 9:58 AM | 10:18 AM | 11:28 AM | 12:43 PM | 1:11 PM | 1:41 PM | 1:56 PM | 2:40 PM | 3:18 PM |
| Encinitas | - | 7:05 AM | 7:28 AM | - | 8:10 AM | - | - | 10:23 AM | - | - | 1:18 PM | - | 2:01 PM | 2:46 PM | - |
| Carlsbad Poinsettia | - | 7:10 AM | 7:33 AM | - | 8:16 AM | - | - | 10:29 AM | - | - | 1:24 PM | - | 2:07 PM | 2:52 PM | - |
| Carlsbad Village | - | 7:16 AM | 7:39 AM | - | 8:22 AM | - | - | 10:35 AM | - | - | 1:30 PM | - | 2:13 PM | 2:59 PM | - |
| Oceanside | 6:59 AM | 7:23 AM | 7:46 AM | 7:59 AM | 8:30 AM | 9:04 AM | 10:14 AM | 10:42 AM | 11:44 AM | 12:59 PM | 1:36 PM | 1:57 PM | 2:20 PM | 3:05 PM | 3:34 PM |

| STATIONS | A1515 | 653 | A1600 | 655 | 657 | A1715 | 661 | 663 | 665 | A1841 | 667 | 669 | A1939 | 671 | 673 | A2030 | A2051 | 675 | A2145 | A2245 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| San Diego-SF Depot | 3:15 PM | 3:45 PM | 4:00 PM | 4:25 PM | 4:54 PM | 5:15 PM | 5:37 PM | 6:00 PM | 6:18 PM | 6:41 PM | 6:48 PM | 7:18 PM | 7:39 PM | 7:50 PM | 8:15 PM | 8:30 PM | Del Mar | 9:00 PM | 9:45 PM | 10:45 PM |
| San Diego-Old Town | - | 3:50 PM | - | 4:30 PM | 4:59 PM | - | 5:42 PM | 6:05 PM | 6:23 PM | - | 6:53 PM | 7:23 PM | - | 7:55 PM | 8:20 PM | - | Event | 9:05 PM | - | - |
| Sorrento Valley | - | 4:10 PM | - | 4:52 PM | 5:20 PM | - | 6:04 PM | 6:27 PM | 6:45 PM | - | 7:15 PM | 7:45 PM | - | 8:05 PM | 8:40 PM | - | Train | 9:25 PM | - | - |
| Del Mar | 3:48 PM | 4:18 PM | 4:33 PM | 4:58 PM | 5:27 PM | 5:48 PM | 6:11 PM | 6:36 PM | 6:54 PM | 7:14 PM | 7:24 PM | 7:54 PM | 8:12 PM | 8:23 PM | 8:48 PM | 9:03 PM | 9:24 PM | 9:33 PM | 10:18 PM | 11:18 PM |
| Solana Beach | 3:53 PM | 4:20 PM | 4:38 PM | 5:00 PM | 5:29 PM | 5:53 PM | 6:13 PM | 6:38 PM | 6:56 PM | 7:19 PM | 7:26 PM | 7:56 PM | 8:17 PM | 8:25 PM | 8:50 PM | 9:08 PM | 9:29 PM | 9:35 PM | 10:23 PM | 11:23 PM |
| Encinitas | - | 4:26 PM | - | 5:06 PM | 5:35 PM | - | 6:19 PM | 6:43 PM | 7:01 PM | - | 7:31 PM | 8:01 PM | - | 8:32 PM | 8:57 PM | - | - | 9:42 PM | - | - |
| Carlsbad Poinsettia | - | 4:32 PM | - | 5:12 PM | 5:42 PM | - | 6:29 PM | 6:49 PM | 7:07 PM | - | 7:37 PM | 8:07 PM | - | 8:38 PM | 9:02 PM | - | - | 9:47 PM | - | - |
| Carlsbad Village | - | 4:38 PM | - | 5:18 PM | 5:48 PM | - | 6:31 PM | 6:55 PM | 7:13 PM | - | 7:43 PM | 8:13 PM | - | 8:43 PM | 9:09 PM | - | - | 9:54 PM | - | - |
| Oceanside | 4:09 PM | 4:45 PM | 4:54 PM | 5:24 PM | 5:56 PM | 6:09 PM | 6:39 PM | 7:02 PM | 7:20 PM | 7:35 PM | 7:50 PM | 8:20 PM | 8:35 PM | 8:52 PM | 9:17 PM | 9:24 PM | 9:47 PM | 10:02 PM | 10:41 PM | 11:41 PM |

*Amtrak*
*Coaster*

# DEL MAR TIMETABLE

**Southbound to San Diego** — READ DOWN

SCENARIO 14
MONDAY-FRIDAY

| STATIONS | 626 | 628 | 630 | 672 | 634 | A682 | 646 | 636 | 638 | 640 | A562 | 674 | A690 | A564 | 642 | 644 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Oceanside | 3:21 AM | 4:21 AM | 5:16 AM | 5:36 AM | 5:57 AM | 6:18 AM | 6:24 AM | 6:44 AM | 7:17 AM | 7:42 AM | 8:07 AM | 8:53 AM | 9:07 AM | 9:12 AM | 9:19 AM | 10:06 AM |
| Carlsbad Village | 3:25 AM | 4:25 AM | 5:20 AM | 5:40 AM | 6:01 AM | - | 6:28 AM | 6:48 AM | 7:22 AM | 7:47 AM | - | 8:58 AM | - | - | 9:24 AM | 10:11 AM |
| Carlsbad Poinsettia | 3:31 AM | 4:31 AM | 5:26 AM | 5:46 AM | 6:08 AM | - | 6:35 AM | 6:54 AM | 7:28 AM | 7:53 AM | - | 9:04 AM | - | - | 9:30 AM | 10:17 AM |
| Encinitas | 3:37 AM | 4:37 AM | 5:32 AM | 5:52 AM | 6:14 AM | - | 6:41 AM | 7:00 AM | 7:34 AM | 7:58 AM | - | 9:10 AM | - | - | 9:36 AM | 10:22 AM |
| Solana Beach | 3:43 AM | 4:43 AM | 5:38 AM | 5:58 AM | 6:22 AM | 6:36 AM | 6:47 AM | 7:06 AM | 7:40 AM | 8:03 AM | 8:22 AM | 9:16 AM | 9:22 AM | 9:27 AM | 9:42 AM | 10:28 AM |
| Del Mar | 3:45 AM | 4:45 AM | 5:40 AM | 6:00 AM | 6:24 AM | 6:38 AM | 6:49 AM | 7:08 AM | 7:42 AM | 8:05 AM | 8:24 AM | 9:18 AM | 9:24 AM | 9:29 AM | 9:44 AM | 10:30 AM |
| Sorrento Valley | 3:52 AM | 4:52 AM | 5:47 AM | 6:07 AM | 6:30 AM | - | 6:57 AM | 7:16 AM | 7:51 AM | 8:13 AM | - | 9:27 AM | - | - | 9:53 AM | 10:38 AM |
| San Diego-Old Town | 4:12 AM | 5:12 AM | 6:07 AM | 6:27 AM | 6:49 AM | - | 7:16 AM | 7:36 AM | 8:11 AM | 8:33 AM | - | 9:46 AM | - | - | 10:12 AM | 10:57 AM |
| San Diego-SF Depot | 4:20 AM | 5:20 AM | 6:15 AM | 6:35 AM | 6:57 AM | 7:15 AM | 7:24 AM | 7:42 AM | 8:18 AM | 8:40 AM | 8:59 AM | 9:54 AM | 9:57 AM | 10:04 AM | 10:20 AM | 11:04 AM |

| STATIONS | A566 | A768 | A1010 | 676 | A572 | 652 | A774 | 654 | A698 | A568 | 656 | A580 | M602 | A582 | M604 | A784 | A790 | A584 | A796 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Oceanside | 10:22 AM | 11:32 AM | 12:03 PM | 12:53 PM | 1:09 PM | 2:00 PM | 2:22 PM | 2:50 PM | 3:05 PM | 3:28 PM | 3:51 PM | 4:45 PM | 5:24 PM | 6:01 PM | 6:36 PM | 6:58 PM | 9:19 PM | 10:15 PM | 11:52 PM |
| Carlsbad Village | - | - | - | 12:58 PM | - | 2:05 PM | - | 2:55 PM | - | - | 3:56 PM | - | 5:29 PM | - | 6:42 PM | - | - | - | - |
| Carlsbad Poinsettia | - | - | - | 1:04 PM | - | 2:11 PM | - | 3:01 PM | - | - | 4:02 PM | - | 5:35 PM | - | 6:49 PM | - | - | - | - |
| Encinitas | - | - | - | 1:09 PM | - | 2:16 PM | - | 3:07 PM | - | - | 4:09 PM | - | 5:41 PM | - | 6:54 PM | - | - | - | - |
| Solana Beach | 10:37 AM | 11:47 AM | 12:19 PM | 1:15 PM | 1:23 PM | 2:22 PM | 2:37 PM | 3:12 PM | 3:22 PM | 3:44 PM | 4:15 PM | 5:02 PM | 5:47 PM | 6:16 PM | 7:02 PM | 7:16 PM | 9:17 PM | 10:32 PM | 12:08 AM |
| Del Mar | 10:39 AM | 11:49 AM | 12:55 PM | 1:17 PM | 1:25 PM | 2:24 PM | 2:39 PM | 3:14 PM | 3:24 PM | 3:46 PM | 4:17 PM | 5:04 PM | 5:49 PM | 6:18 PM | 7:04 PM | 7:18 PM | 9:34 PM | 10:34 PM | 12:42 AM |
| Sorrento Valley | - | - | - | 1:25 PM | - | 2:32 PM | - | 3:24 PM | - | - | 4:24 PM | - | 5:58 PM | - | 7:12 PM | - | - | - | - |
| San Diego-Old Town | - | - | - | 1:44 PM | - | 2:53 PM | - | 3:44 PM | - | - | 4:44 PM | - | 6:19 PM | - | 7:32 PM | - | - | - | - |
| San Diego-SF Depot | 11:14 AM | 12:24 PM | 1:30 PM | 1:51 PM | 2:05 PM | 3:00 PM | 3:14 PM | 3:51 PM | 4:07 PM | 4:28 PM | 4:52 PM | 5:44 PM | 6:25 PM | 6:53 PM | 7:40 PM | 7:55 PM | 10:15 PM | 11:17 PM | 12:50 AM |

**Northbound to Oceanside** — READ DOWN

SCENARIO 14
MONDAY-FRIDAY

| STATIONS | M605 | M607 | A763 | 631 | A599 | 635 | 673 | A567 | 637 | A769 | 675 | A573 | 641 | A883 | A777 | A885 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| San Diego-SF Depot | 4:45 AM | 5:43 AM | 6:05 AM | 6:35 AM | 7:10 AM | 7:25 AM | 7:45 AM | 8:05 AM | 8:38 AM | 9:24 AM | 10:32 AM | 10:50 AM | 11:17 AM | 11:40 AM | 12:05 PM | 1:03 PM |
| San Diego-Old Town | 4:51 AM | 5:49 AM | - | 6:42 AM | - | 7:30 AM | 7:50 AM | - | 8:44 AM | - | 10:38 AM | - | 11:23 AM | - | - | - |
| Sorrento Valley | 5:10 AM | 6:09 AM | - | 7:01 AM | - | 7:53 AM | 8:11 AM | - | 9:06 AM | - | 10:58 AM | - | 11:43 AM | - | - | - |
| Del Mar | 5:16 AM | 6:16 AM | 6:38 AM | 7:03 AM | - | 7:55 AM | 8:13 AM | 8:43 AM | 9:14 AM | 10:01 AM | 11:00 AM | 11:23 AM | 11:45 AM | 12:17 PM | 12:38 PM | 1:36 PM |
| Solana Beach | 5:18 AM | 6:18 AM | 6:43 AM | 7:10 AM | 7:44 AM | 8:05 AM | 8:21 AM | 8:40 AM | 9:16 AM | 10:03 AM | 11:06 AM | 11:28 AM | 11:51 AM | 12:19 PM | 12:43 PM | 1:41 PM |
| Encinitas | 5:23 AM | 6:23 AM | - | 7:16 AM | - | 8:10 AM | 8:26 AM | - | 9:21 AM | - | 11:11 AM | - | 11:56 AM | - | - | - |
| Carlsbad Poinsettia | 5:29 AM | 6:29 AM | - | 7:22 AM | - | 8:16 AM | 8:32 AM | - | 9:27 AM | - | 11:17 AM | - | 12:08 PM | - | - | - |
| Carlsbad Village | 5:34 AM | 6:34 AM | - | 7:27 AM | - | 8:22 AM | 8:38 AM | - | 9:33 AM | - | 11:23 AM | - | 12:08 PM | - | - | - |
| Oceanside | 5:39 AM | 6:44 AM | 6:59 AM | 7:32 AM | 7:53 AM | 8:30 AM | 8:43 AM | 8:54 AM | 9:39 AM | 10:17 AM | 11:30 AM | 11:44 AM | 12:15 PM | 12:33 PM | 12:59 PM | 1:57 PM |

| STATIONS | 647 | A579 | 651 | A583 | 677 | 653 | A785 | 655 | 657 | 659 | 661 | A591 | 665 | A1912 | A889 | 667 | A595 | A597 | A684 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| San Diego-SF Depot | 1:19 PM | 1:40 PM | 2:09 PM | 2:40 PM | 3:00 PM | 3:31 PM | 4:00 PM | 4:19 PM | 4:45 PM | 5:05 PM | 5:37 PM | 6:15 PM | 7:02 PM | 7:12 PM | 7:35 PM | 8:00 PM | 8:25 PM | 9:35 PM | 10:48 PM |
| San Diego-Old Town | 1:24 PM | - | 2:15 PM | - | 3:07 PM | 3:38 PM | - | 4:25 PM | 4:52 PM | 5:12 PM | 5:42 PM | - | 7:09 PM | - | - | 8:07 PM | - | - | - |
| Sorrento Valley | 1:48 PM | - | 2:37 PM | - | 3:27 PM | 3:58 PM | - | 4:45 PM | 5:12 PM | 5:32 PM | 6:04 PM | - | 7:29 PM | - | - | 8:31 PM | - | - | - |
| Del Mar | 1:50 PM | 2:13 PM | 2:47 PM | 3:13 PM | 3:35 PM | 4:06 PM | 4:33 PM | 4:53 PM | 5:21 PM | 5:39 PM | 6:06 PM | 6:49 PM | 7:37 PM | 7:46 PM | 8:09 PM | 8:39 PM | 8:58 PM | 10:08 PM | 11:04 PM |
| Solana Beach | 1:56 PM | 2:18 PM | 2:49 PM | 3:18 PM | 3:37 PM | 4:08 PM | 4:38 PM | 4:55 PM | 5:23 PM | 5:41 PM | 6:13 PM | 6:51 PM | 7:39 PM | 7:51 PM | 8:11 PM | 8:41 PM | 9:00 PM | 10:13 PM | 11:06 PM |
| Encinitas | 2:01 PM | - | 2:55 PM | - | 3:43 PM | 4:14 PM | - | 5:01 PM | 5:27 PM | 5:47 PM | 6:19 PM | - | 7:46 PM | - | - | 8:46 PM | - | - | - |
| Carlsbad Poinsettia | 2:07 PM | - | 3:00 PM | - | 3:49 PM | 4:20 PM | - | 5:07 PM | 5:34 PM | 5:54 PM | 6:29 PM | - | 7:52 PM | - | - | 8:52 PM | - | - | - |
| Carlsbad Village | 2:13 PM | - | 3:05 PM | - | 3:56 PM | 4:27 PM | - | 5:13 PM | 5:40 PM | 6:00 PM | 6:31 PM | - | 7:58 PM | - | - | 8:58 PM | - | - | - |
| Oceanside | 2:20 PM | 2:34 PM | 3:10 PM | 3:34 PM | 4:02 PM | 4:33 PM | 4:54 PM | 5:19 PM | 5:48 PM | 6:08 PM | 6:39 PM | 7:04 PM | 8:05 PM | 8:07 PM | 8:26 PM | 9:05 PM | 9:13 PM | 10:29 PM | 11:45 PM |

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# Appendix B
# Comment Response Matrix

**LOSSAN RAIL OPERATIONS MODELING – SAN DIEGO PROJECT DEVELOPMENT AND COMPLETION OF CORRIDORWIDE ANALYSIS**
Comment Review Form

Submittal Title: DEL MAR SEASONAL PLATFORM OPERATIONS ANALYSIS (Draft Report) Date: June 6, 2012

| Comment No. | Page #/Section Reference | Reviewer Agency | Comment | Date Received | Response | Comment Addressed (Y/N) |
|---|---|---|---|---|---|---|
| 1 | Overall | SANDAG | Should we be consistent between using pocket, layover, siding, storage? If yes, let's use "staging track". | 6/25/2012 | completed | Y |
| 2 | 1 | SANDAG | Delete "At the request of the Race Track" in the 2nd paragraph. Ag District did not formally request that we study. | 6/25/2012 | completed | Y |
| 3 | 1 | SANDAG | 2nd paragraph, replace "as part of" with "in coordination with" when referring to the 2nd track project. | 6/25/2012 | completed | Y |
| 4 | 1 | SANDAG | 2nd paragraph, remove reference to "operating" stakeholders in both paragraph and footnote and refer to us as Project stakeholders. | 6/25/2012 | completed | Y |
| 5 | 1 | SANDAG | Bullet #1 - capitalize "mar"; Bullet #2 - replace "crossing" wth "River". | 6/25/2012 | completed | Y |
| 6 | 2 | SANDAG | Infrastructure section, first paragraph, remove operators from end of 2nd sentence. | 6/25/2012 | completed | Y |
| 7 | 2 | SANDAG | Infrastructure section - we should add Sorento Valley DT and Tech/Wash Crossovers. | 6/25/2012 | completed | Y |
| 8 | | SANDAG | Infrastructure - consider adding brief discussion on staging track here - assumptions for length, how many, purpose to be able to queue up after events, etc. | 6/25/2012 | completed | Y |
| 9 | 2 | SANDAG | Service assumptions - I think the stakeholders agreed to both weekend and weekday service assumptions, that weekday were not only because they were in the RTP. Consider rewording intro. | 6/25/2012 | Comment addressed. | Y |
| 10 | 2 | SANDAG | Service assumptions - consider discussion that all trips were modeled to serve the platform both weekday/weekend as the most aggressive/conservative assumption at this point in order to test the various scenarios. | 6/25/2012 | completed | Y |
| 11 | 2 | SANDAG | Include reference to schedules in the appendix. | 6/25/2012 | Comment addressed. | Y |
| 12 | 3-5 | SANDAG | For Scenarios 1-3, group discussion was to change the wording from technically "feasible", since the group did not feel like the 2 minute window was feasible. | 6/25/2012 | completed | Y |
| 13 | 3 | SANDAG | Scenario 1, change "reconstructing" to "reconstruction" and add "to the east" at then of 2nd sentence. | 6/25/2012 | completed | Y |
| 14 | 6 | SANDAG | Scenario 5, change "reconstructing" to "reconstruction". | 6/25/2012 | completed | Y |
| 15 | 8 | SANDAG | Scenario 6, increase font on graphic for easterly platform text. | 6/25/2012 | completed | Y |
| 16 | 9 | SANDAG | Scenario 7, first sentence should refer to Scenario 7, not 1. | 6/25/2012 | completed | Y |
| 17 | 10 | SANDAG | Scenario 8, first sentence should refer to Scenario 8, not 2. | 6/25/2012 | completed | Y |
| 18 | 11 | SANDAG | Scenario 9, first sentence should refer to Scenario 9, not 3. | 6/25/2012 | completed | Y |
| 19 | 11 | SANDAG | Scenario 9, increase font on graphic for easterly platform text. | 6/25/2012 | completed | Y |
| 20 | 12 | SANDAG | Scenario 10, first sentence should ref to Scenario 10, not 4. | 6/25/2012 | completed | Y |
| 21 | 15 | SANDAG | Observations, 2nd paragraph - I think there's a difference between 9:00 PM hour and 9:24 pm - perhaps list the departure time. Also, the text should mention when this train was assumed to leave under the earlier scenarios - add under Service Assumptions on page 2/3 where you discuss the special events trains. | 6/25/2012 | Specifics on time are approximate in this analysis. While the analysis is based on a "conceptual" timetable, much can and will change from these assumptions over the next 13 years. More specific descriptions of time is not seen as necessary at this level of analysis. | N |
| 22 | 15 | SANDAG | Consider adding a new section on "Stakeholder" conclusions where the group decided to pursue 1. access from both MT1 and MT2 and 2. staging track at or south of the platform only and which scenarios meet those criteria. That no additional ops modeling was requested by the group at this time, but SANDAG's engineering team will be further developing the platform and staging track alignments for future discussion with the stakeholders group. | 6/25/2012 | Conclusion section added indicating simulations identified need to consider access from both mainline tracks. | Y |
| 23 | 1 | SANDAG | Should we discuss in the Intro that we modeled 14 scenarios? 2nd Paragraph on page 1 mentions the 13. Perhaps just a sentence that a 14th was added subsequent to draft, etc.? | 7/25/2012 | Comment incorporated into the report. | Y |
| 24 | 2 | SANDAG | Also, under infrastructure on page 2, it lists 10 scenarios? Shouldn't this be 14 or am I missing something. | 7/25/2012 | Comment incorporated into the report. | Y |
| 25 | 3 | SANDAG | Period needed for the last sentence on page 3. | 7/25/2012 | Comment incorporated into the report. | Y |
| 26 | 4 | SANDAG | Space needed in "notfeasible" in first sentence on page 4. | 7/25/2012 | Comment incorporated into the report. | Y |
| 27 | 9 | SANDAG | Period needed for the last sentence on page 9. | 7/25/2012 | Comment incorporated into the report. | Y |
| 28 | 16 | SANDAG | Under scenario 14, page 16, please change Fairgrounds "station" to platform. | 7/25/2012 | Change made in the final report | Y |
| 29 | General | SANDAG | We ran this with 2025 service assumptions, correct? Should we have run this with 2030 to see worst case at the Depot? | 7/25/2012 | Additional work would have to be undertaken to complete the request that is not in the scope. | Y |
| 30 | 17 | SANDAG | Just curious in the conclusions on page 17--you added the one suggestion that we need access from both MT1 and MT2, but why not say something about needing the storage at or south of the platform? I was thinking that was also a finding from the ops analysis. | 7/25/2012 | Conclusion modified to highlight need to consider storage locations for special event trains south of seasonal platform. | Y |

SANDAG

wsp