C.4 Alternative Train Vehicles – Light Diesel Multiple Units (DMUs)

Light DMUs are described in the Project Description (Section B.2.2). This section analyzes the differences in impacts between those of the light DMU and those of the originally proposed heavy DMU that was studied in the SMART 2006 FEIR. As noted in the Project Description, SMART has not committed to the use of light DMUs or to one particular DMU manufacturer. Several sources of light DMU data and specifications were used in the analysis to provide a complete and quantitative evaluation. Using the light DMU instead of the heavy DMU would have the potential to affect several issue areas: Transportation (determined to have no impact), Air Quality, Energy, Noise, and Safety. Other issue areas would not be affected by the change in vehicles and are not further studied in the following subsections.

In summary, use of light DMUs in place of heavy DMUs would provide environmental benefits in the issue areas of air quality, energy and noise. Due to better fuel efficiency compared to heavy DMUs, light DMUs would reduce the amount of pollutants and energy used for the project. Light DMUs would further reduce greenhouse gas emissions, thus increasing the beneficial effects of the project. Noise levels would also be lower with light DMUs. Public safety may be more of a concern for the light DMUs than the heavy DMUs, but the overall public safety impacts would be less than significant, consistent with the findings in the 2006 FEIR. Despite longer car lengths, the light DMUs would not have an adverse impact on transportation.

C.4.1 TRANSPORTATION

Compared to the heavy DMU vehicle analyzed in the 2006 FEIR, light DMUs are slightly slower (75 vs. 79 mph top speed), but have better acceleration and braking characteristics. Because of this, and because trains would not reach the maximum 79 mph track limit in areas where stations are relatively close together, there is essentially no transportation impact of using the light DMU. Although these vehicles are longer (at 136 feet compared to 89 feet) than the heavy DMUs (Colorado Railcar), a two-car train can still fit comfortably within the average city block length in the critical downtown San Rafael Station area, which has a storage capability of somewhat less than 300 feet. Any increase in vehicle delay at at-grade crossings due to the longer length of the light DMUs would be negligible. The light DMUs being considered for the SMART project have a larger passenger capacity (130 compared to 90 for the heavy DMU), thus avoiding the need for three-car trains even with moderate increases in ridership. Given their capacity, single-car trains may be suitable for some of the operations. These vehicles are being used on the recently opened Oceanside-Escondido “Sprinter” line in San Diego.

C.4.2 AIR QUALITY

Use of the light DMUs would reduce emissions from the proposed SMART project. Long-term impacts that would be either beneficial or less than significant in a manner similar to those described for the SMART project analyzed in the certified 2006 FEIR include: Impact AQ-4 (consistency with applicable air quality plans); Impact AQ-5 (compliance with air quality standards); and Impact AQ-8 (odors). Other long-term impacts related to regional emissions and localized air quality impacts that are different from those described in the 2006 FEIR as a result of using the light DMUs are described here.

Impact AQ-2: The proposed project with light DMUs would not exceed any pollutant emission threshold established by the BAAQMD or NSCAPCD. *(Less than significant and lower than the proposed project)*

Compared to the emissions caused by the heavy DMUs and shown in the 2006 FEIR (Tables 3.5-5 and 3.5-6), the light DMUs would cause lower amounts of emissions of each pollutant per gallon of fuel burned. The light DMUs would also consume less fuel per mile traveled than the heavy DMUs. As such, the emissions of CO, ROG, NOx, and PM10 from the light DMUs would be less than those for the heavy DMUs, and the impact of the emissions would continue to be less than significant.

Introducing passenger rail service into Marin and Sonoma Counties with implementation of the proposed project would lead to reductions in area motor vehicle traffic emissions that are quantified in the certified SMART 2006 FEIR. Just as with heavy DMUs, this decrease in motor vehicle emissions would offset the emissions from use of the light DMUs. Tables C.4-1 and C.4-2 show the motor vehicle traffic emission reductions achieved with the proposed project with heavy DMUs and with light DMUs, in the Bay Area and North Coast Air Basins, respectively. With the use of the light DMUs, the project would achieve even greater net reductions and beneficial impacts in all pollutants except NOx, which would increase by less than significant amounts compared to the No-Project scenario. Compared to the project with heavy DMUs, use of light DMUs would reduce NOx by eight pounds per day in the Bay Area Basin and five pounds per day in the North Coast Air Basin. Implementation of environmental compliance measures (ultra-low-sulfur fuels and NOx adsorbers) incorporated into the project would further reduce the less than significant NOx impacts, but these measures are not factored into the analysis presented in the tables below.

The project, with light DMUs and addition of weekend service, would result in lower emissions than listed in Tables C.3-5 and C.3-6 (see Section C.3.2).

Table C.4-1. Net Difference in Emissions with Light DMUs (Bay Area Air Basin)
(Based on a Comparison of 2025 Light DMUs to 2025 No-Project)

Activity	CO (lb/day)	ROG (lb/day)	NOx (lb/day)	PM10 (lb/day)
Study Area Motor Vehicle Traffic	–351	–17	–50	–95
Proposed Project (Heavy DMUs)	72	6	116*	2
Total with Heavy DMUs	–279	–11	66	–93
Project Light DMUs	10	3	108*	1
Total with Light DMUs	–341	–14	58	–94
Significance Threshold	550	80	80	80

Source: SMART 2006 FEIR, Table 3.5-7, with the addition of emission estimates for light DMUs.
* NOx emissions from both the heavy and light DMUs would be less than shown, with implementation of the 2006 FEIR environmental compliance measures (control technologies such as NOx adsorbers).

Impact AQ-3: The proposed project with light DMUs would result in a decrease of greenhouse gases. *(Beneficial)*

Using light DMUs for the proposed SMART project would further reduce greenhouse gas emissions. As shown in Section C.3.2, with heavy DMUs and with or without weekend service, the project would result in a net reduction in greenhouse gas emissions compared to the future No-Project condition. Since light DMUs are more fuel efficient than heavy DMUs, the light DMUs would result in a 20 percent decrease in CO2 emissions compared to the heavy DMUs. Therefore, light DMUs would increase the beneficial greenhouse gas reduction impact of the SMART project.

Table C.4-2. Net Difference in Emissions with Light DMUs (North Coast Air Basin)
(Based on a Comparison of 2025 Light DMUs to 2025 No-Project)

Activity	CO (lb/day)	ROG (lb/day)	NOx (lb/day)	PM10 (lb/day)
Study Area Motor Vehicle Traffic	–117	–6	–17	–31
Proposed Project (Heavy DMUs)	29	2	24*	0.4
Total with Heavy DMUs	–88	–4	7	–31
Project Light DMUs	2	1	19*	0.3
Total with Light DMUs	–115	–5	2	–31
Significance Threshold	550	220	220	80

Source: SMART 2006 FEIR, Table 3.5-8, including emission estimates for light DMUs.
* NOx emissions from both the heavy and light DMUs would be less than shown, with implementation of the 2006 FEIR environmental compliance measures (control technologies such as NOx adsorbers).

Impact AQ-6: The proposed project with light DMUs would expose sensitive receptors to pollutant concentrations. *(Less than significant and lower than proposed project)*

Localized long-term impacts related to CO and diesel particulate matter emissions from light DMUs would be less than those of the heavy DMUs and therefore this project impact would continue to be less than significant with the use of light DMUs. The use of light DMUs would similarly reduce localized concentrations of this pollutant for weekend service (see Section C.3.2).

C.4.3 ENERGY

Use of light DMUs would not involve additional energy use during construction. As such, construction-related impacts (Impact E-1) would be identical to those described for the SMART project analyzed in the certified 2006 Final EIR.

Impact E-2: Operation of the light DMU would require energy use, but at a level less than that of the original proposed project. *(Less than significant and less than the proposed project)*

The light DMUs consume less fuel than the heavy DMUs, so using the light DMU would increase the proposed project's energy benefits, relative to the No-Project condition. The operational energy consumption rate for the proposed heavy DMU would be between 75,000 BTU per vehicle-mile or approximately 1.8 miles per gallon (Table 3.8-2 of the DEIR) and 95,000 BTU per mile or 1.5 miles per gallon (Air Quality Technical Study, June 2005). The light DMUs under consideration would provide even greater fuel efficiency at approximately 1.9 miles per gallon or under 73,000 BTU per mile. Thus, when compared to the proposed project analyzed in the 2006 FEIR, the project with light DMUs would consume less energy than the original SMART project and less energy than the No-Project Alternative. Adding weekend service to the project with the use of light DMUs would similarly result in less energy consumption than weekend service with heavy DMUs or the No-Project Alternative. Therefore, the project with light DMUs would not place a significant demand on the regional energy supply or result in a wasteful or unnecessary usage of energy.

C.4.4 NOISE AND VIBRATION

Use of light DMUs would not involve additional construction-related noise. As such, construction-related impacts (Impact N-1) would be identical to those described for the SMART project analyzed in the certified 2006 Final EIR. Use of light DMUs compared to heavy DMUs would slightly reduce noise impacts in the vicinity of stations (Impact N-3) and the proposed maintenance facility (Impact N-4), and those impacts would remain less than significant.

Train horn noise in the vicinity of at-grade crossings would be the same as described in Impact N-5 in the 2006 FEIR. The impact of passenger train horn noise could be eliminated at any locations that are designated Quiet Zones (under 2006 FEIR Mitigation Measure N-5, Quiet Zones). In locations along the rail line away from at-grade crossings, the long-term noise exposure would be less than the original project with heavy DMUs, as discussed below.

Impact N-2: Train operations with light DMUs would cause a permanent increase in ambient noise levels in the project vicinity, but less than the original project with heavy DMUs. *(Less than significant and less than the proposed project)*

The predicted daily noise exposure for the weekday service away from at-grade crossings was analyzed in the 2006 FEIR, and given existing day/night sound levels in the project area, the original SMART project was found not to cause a significant noise impact at any location away from at-grade crossings. Table C.4-3 shows the expected noise levels for the original heavy DMUs compared with the light DMUs. Use of the light DMUs would result in daily noise levels that would be less than those of the original project, and the noise impact would continue to be less than significant for all locations away from at-grade crossings. Light DMUs would also slightly reduce the noise impacts associated with adding weekend service to the project (see Section C.3.4).

Table C.4-3. Measured Noise Levels for Heavy DMU and Light DMU Vehicles and a Typical Locomotive[1]

Operating Condition	Heavy DMU L_{max} (dBA) at 50 feet	Light DMU L_{max} (dBA) at 50 feet	Typical Diesel Locomotive L_{max} (dBA) at 50 feet[2]
Stationary — all engines idling	72.0	70.9	80
50 mph pass-by forward in mid-throttle	78.8	78.1	88

Source: Siemens 2006 (for Light DMU) and SMART 2005 DEIR (for heavy DMU and typical diesel locomotive).

1 - Comparison is limited to those conditions for which information is available for both types of DMUs.
2 - The use of typical diesel locomotives is not proposed and is provided only for purposes of comparison.

C.4.5 PUBLIC SAFETY

Setting

The 2005 DEIR and 2006 FEIR considered use of the Colorado Railcar heavy DMU. Compared to the heavy DMU vehicle analyzed in the 2006 FEIR, light DMU vehicles have a slightly lower maximum speed (75 vs. 79 mph), but have better acceleration and braking characteristics. The light DMU has a service braking rate of 2.6 miles per hour per second (mphps), which is faster than the heavy DMU, which has a service braking rate of 1.5 mphps.

Impacts

The 2006 FEIR Impact PFS-2 (Delays in emergency vehicle response times at at-grade crossings) would not change with the substitution of light DMU vehicles for heavy DMU vehicles. The slightly longer light DMU (at 136 feet compared to 89 feet) would add a negligible amount of time to pass through a crossing (less than one second). The analysis for the proposed project in the 2005 DEIR (Section 3.12.6) determined that the potential for this impact is less than significant and this finding does not change with the use of light DMUs.

Impact PFS-4: The proposed project with light DMUs could result in the creation of hazardous conditions (e.g., pedestrian/train conflicts), with regard to safety of the public and schools. *(Less than significant)*

There are several safety tradeoffs to consider for the light DMU. The lower maximum operating speed and faster braking rate would improve the light DMU's ability to avoid unanticipated collisions with other trains, vehicles, cyclists, and pedestrians at road crossings compared to the heavy DMU. This would improve public safety for SMART passengers and pedestrians, cyclists, and motorists at at-grade crossings.

On the other hand, light DMU vehicles, due to their lightweight construction, may sustain greater damages and be more easily derailed than heavy DMUs in the case of a collision with a heavy truck at a grade crossing (TCRP 1999). However, the end structure of the light DMU is designed with crash energy management (CEM) design features to absorb crash impacts in such a way as to maintain the integrity of the passenger compartments, as well as a safe zone for the operator in the cab. No specific data are available to calculate the likelihood of derailment in comparison with heavy DMU vehicles. Rail passenger operations are among the most highly regulated with respect to safety, which is reflected in the relative safety of passenger rail compared to other modes of travel (see 2006 FEIR, Master Response P). Stringent Federal Railroad Administration (FRA) requirements, other safety regulations, and safety measures that would be implemented with the proposed project would ensure that the impact is less than significant. Overall, impacts on public safety would not substantially change and would remain less than significant for the proposed project with the substitution of light DMU vehicles for heavy DMU vehicles.

(See Section C.6.6 for a cumulative analysis of safety considerations of using light DMUs in combination with future freight operations.)