DOWNTOWN MORGAN HILL PARKING STRUCTURE AND SUNSWEET MIXED USE DEVELOPMENT PROJECT RAILROAD TAC ASSESSMENT MORGAN HILL, CALIFORNIA

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Prepared for:

Akoni Danielsen
David J. Powers & Associates, Inc.
1871 The Alameda, Suite 200
San Jose, CA 95126

Prepared by:

James A. Reyff
And William Popenuck

ILLINGWORTH & RODKIN, INC.
Acoustics • Air Quality
1 Willowbrook Court, Suite 120
Petaluma, CA 94954
(707) 794-0400

Job No.: 13-240

Introduction

This report presents the results of an air quality assessment for the Downtown Morgan Hill Parking Structure and Sunsweet Mixed Use Development project. The proposed project is a plan to develop a three-story parking structure with 245 to 275 parking spaces or a three-story parking structure with underground parking and a mixed use development with up to 48 condominiums. The project would be constructed within the City of Morgan Hill (City) Downtown Specific Plan Area. The Sunsweet Site would consist of the mixed-used development including residential units, commercial/retail, and office space in addition to the proposed parking structure. The Initial Study evaluates both location options for the City's selection of the garage location and the mixed use development on the Sunsweet Site. The proposed three-story parking garage is in accordance with the Downtown Specific Plan Master EIR's plan for off-street parking facilities and would provide parking to the City's Downtown area. The mixed use development on the Sunsweet Site would be consistent with Downtown Specific Plan's residential and retail development projections.

Two locations are considered for development of the parking structure. At the City-Owned Depot Site, the parking structure would be constructed on the east side of Depot Street between East Second and East Fifth Streets in the City of Morgan Hill. The site is approximately 1.5 acres and is bounded by Caltrain/Union Pacific Railroad (UPRR) tracks to the north, Depot Street to the south, commercial and office uses to the west, and a vacant lot (under construction) to the east. The Sunsweet Site is bordered by Depot Street to the north, East Third Street to the west, East Fourth Street to the east, and commercial uses and Monterey Road to the south. The project would include the demolition of four attached warehouses and one weigh station, and older structure that was formerly used as an office building. As described above, the Sunsweet Site could include a mixed development that would include residences.

Air quality issues associated with the project are the effect of construction activities on existing sensitive receptors and the effect of existing sources of air pollution on new sensitive receptors developed as part of this plan.

Discussion of TACs

Toxic Air Contaminants (TACs) are a broad class of compounds known to cause morbidity or mortality (usually because they cause cancer or serious illness) and include, but are not limited to, criteria air pollutants. TACs are found in ambient air, especially in urban areas, and are caused by industry, agriculture, fuel combustion, and commercial operations (e.g., dry cleaners). TACs are typically found in low concentrations, even near their source (e.g., diesel particulate matter near a highway). Because chronic exposure can result in adverse health effects, TACs are regulated at the regional, state, and federal level. The identification, regulation, and monitoring of TACs is relatively new compared to that for criteria air pollutants that have established ambient air quality standards. TACs are regulated or evaluated on the basis of risk to human health rather than comparison to an ambient air quality standard or emission-based threshold.

Diesel Particulate Matter

Diesel exhaust, in the form of diesel particulate matter (DPM), is the predominant TAC in urban air with the potential to cause cancer. It is estimated to represent about two-thirds of the cancer risk from TACs (based on the statewide average). According to the California Air Resource Board (CARB), diesel exhaust is a complex mixture of gases, vapors, and fine particles. This complexity makes the evaluation of health effects of diesel exhaust a complex scientific issue. Some of the chemicals in diesel exhaust, such as benzene and formaldehyde, have been previously identified as TACs by CARB, and are listed as carcinogens either under the State's Proposition 65 or under the federal Hazardous Air Pollutants programs. California has adopted a comprehensive diesel risk reduction program. The U.S. Environmental Protection Agency (EPA) and CARB have adopted low-sulfur diesel fuel standards in 2006 that reduces diesel particulate matter substantially. CARB recently adopted new regulations requiring the retrofit and/or replacement of construction equipment, on-highway diesel trucks, and diesel buses in order to lower fine particulate matter ($PM_{2.5}$) emissions and reduce statewide cancer risk from diesel exhaust.

Fine Particulate Matter ($PM_{2.5}$)

Particulate matter in excess of state and federal standards represents another challenge for the Bay Area. Elevated concentrations of $PM_{2.5}$ are the result of both region-wide (or cumulative) emissions and localized emissions. High particulate matter levels aggravate respiratory and cardiovascular diseases, reduce lung function, increase mortality (e.g., lung cancer), and result in reduced lung function growth in children.

Sensitive Receptors

There are groups of people more affected by air pollution than others. CARB has identified the following persons who are most likely to be affected by air pollution: children under 14, the elderly over 65, athletes, and people with cardiovascular and chronic respiratory diseases. These groups are classified as sensitive receptors. Locations that may contain a high concentration of these sensitive population groups include residential areas, hospitals, daycare facilities, elder care facilities, elementary schools, and parks. For cancer risk assessments, children are the most sensitive receptors, since they are more susceptible to cancer causing TACs. Residential locations are assumed to include infants and small children. The closest sensitive receptors to the project site are existing single-family residences located along both E. 3rd and E. 4th streets.

Community Risk Thresholds of Significance

The Bay Area Air Quality Management District (BAAQMD) identified significance thresholds for exposure to TACs and $PM_{2.5}$ as part of its May 2011 *California Environmental Quality Act (CEQA) Air Quality Guidelines*[1]. This report uses the thresholds and methodologies from BAAQMD's May 2011 *CEQA Air Quality Guidelines* to determine whether there would be any project health risk impacts. This report addresses single-source (construction and operational)

[1] BAAQMD, 2011. *BAAQMD CEQA Air Quality Guidelines*. May.

impacts to nearby off-site receptors. This impact would be considered significant and mitigation would be required if:

1. An excess cancer risk level of more than 10 in 1 million, or a non-cancer (chronic or acute) hazard index greater than 1.0.
2. An incremental increase of more than 0.3 micrograms per cubic meter ($\mu g/m^3$) annual average $PM_{2.5}$.

Construction Community Risk Impacts

Construction activity would include emissions of TACs associated with diesel particulate matter or DPM. The effects to nearby sensitive receptors would be dependent on the amount of emissions, duration, proximity to construction activities, and meteorology. Specific construction plans have not been developed for the project. Therefore, it is not possible to quantify the impacts associated with the construction activities in terms of community risk, i.e., excess cancer risk, annual PM2.5 concentrations, and hazard index. Given the proximity of sensitive receptors to the project sites, there is the potential for significant community risk impacts. The level of impact could be reduced greatly through proper selection of construction equipment. Use of newer construction equipment results in much lower DPM emissions than typical equipment. To avoid significant construction impacts, Mitigation Measure AQ-1 is recommended to reduce fugitive dust emissions and Mitigation Measure AQ-2 is recommended to reduce TAC (i.e., DPM) emissions from construction equipment.

Mitigation Measure AQ-1: Include basic measures to control dust and exhaust during construction.

During any construction period ground disturbance, implement measures to control dust and exhaust. Implementation of the measures recommended by BAAQMD and listed below would reduce the air quality impacts associated with grading and new construction to a less than significant. The contractor shall implement the following Best Management Practices that are required of all projects:

1. All exposed surfaces (e.g., parking areas, staging areas, soil piles, graded areas, and unpaved access roads) shall be watered two times per day;

2. All haul trucks transporting soil, sand, or other loose material off-site shall be covered;

3. All visible mud or dirt track-out onto adjacent public roads shall be removed using wet power vacuum street sweepers at least once per day. The use of dry power sweeping is prohibited;

4. All vehicle speeds on unpaved roads shall be limited to 15 mph;

5. All roadways, driveways, and sidewalks to be paved shall be completed as soon as possible. Building pads shall be laid as soon as possible after grading unless seeding or soil binders are used;

6. Idling times shall be minimized either by shutting equipment off when not in use or reducing the maximum idling time to 5 minutes. Clear signage shall be provided for construction workers at all access points;

7. All construction equipment shall be maintained and properly tuned in accordance with manufacturer's specifications. All equipment shall be checked by a certified mechanic and determined to be running in proper condition prior to operation; and

8. Post a publicly visible sign with the telephone number and person to contact at the Lead Agency regarding dust complaints. This person shall respond and take corrective action within 48 hours. The Air District's phone number shall also be visible to ensure compliance with applicable regulations.

Mitigation Measure AQ-2: Develop a plan to select appropriate construction equipment to minimize emissions.

Prior to any construction, the project applicant shall prepare an evaluation that predicts the Community Risk impacts associated with construction following guidance provided by the BAAQMD. This analysis would be submitted to the City for review and approval. The analysis shall identify any necessary requirements to reduce community risk impacts such that significant impacts would not occur. Such equipment selection that would minimize significant impacts would include the following:

1. Develop a plan to ensure that diesel-powered equipment larger than 50 horsepower and operating on the site for more than two days consecutively shall meet U.S. EPA particulate matter emissions standards for Tier 2, 3 or 4 engines or equivalent; or the construction contractor shall use other measures to minimize construction period diesel particulate matter emissions to reduce the predicted cancer risk below the threshold. Such measures may include the use of alternative-powered equipment (e.g., LPG-powered forklifts), alternative fuels (e.g., biofuels), added exhaust devices, or a combination of measures, provided that these measures are approved by the lead agency;

2. If necessary, all generators, welders, compressors, and pumps shall be alternatively fueled or meet U.S. EPA particulate matter standards for Tier 4 engines; and

3. Minimize the number of hours that equipment will operate including the use of idling restrictions.

Railroad Community Risk Impacts

There are rail lines located approximately 190 feet northeast of the project site just north of Depot Street, with the Morgan Hill Caltrain station adjacent to these tracks. These rail lines are used by trains for passenger and freight service. Due to the proximity of the rail line to the proposed project, potential health risks to future residents at the proposed project from DPM emissions from diesel locomotive engines were evaluated.

Based on the current Caltrain schedule, there are six passenger trains during the weekdays that run along this line between 6 a.m. and 8 p.m. There are also two Amtrak-Coast Starlight daily passenger trains using this line. In addition to the passenger trains, there are up to six Union Pacific Rail Road (UPRR) freight trains that also use this rail line on a daily basis[2].

Railroad Emissions

DPM and $PM_{2.5}$ emissions from trains on the rail line were calculated using U.S. EPA emission factors for locomotives[3] and CARB adjustment factors to account for fuels used in California[4]. For this evaluation, DPM and $PM_{2.5}$ emissions were estimated for locomotives operating in 2015, 2020, and 2025.

Diesel locomotive engines for Caltrain and Amtrak passenger trains range from 3,000 to 3,600 horsepower (hp). Caltrain locomotives are, on average, currently using EPA Tier 0 or better engines. Caltrain expects that in around 2017 the locomotive engines will go through mid-level overhaul, and at that time the best engine tier level will be used[5]. These would be EPA Tier 4 engines because Tier 4 engines are required for new or remanufactured locomotives for 2015 or later. Amtrak locomotives were assumed to be similar to Caltrain's. UPRR freight trains in California range in size from about 1,500 hp to 4,000 hp, with a fleet average horsepower of about 2,000 hp[6]. For this evaluation it was conservatively assumed that the freight train locomotives use 3,600 hp engines.

The U.S. EPA establishes locomotive engine standards throughout the United States, including California. CARB established fuel standards in California, which unlike most other parts of the country, require ultra-low sulfur diesel for off-road vehicles. In 1998, EPA adopted Tier 0 (engine model years 1973-2001), Tier 1 (engine model years 2002-2004), and Tier 2 (engine model years 2005+) emissions standards applicable to newly manufactured and remanufactured railroad locomotives and locomotive engines. These standards required compliance with progressively more stringent standards for emissions of hydrocarbon (HC), CO, NOx, and DPM. In 2008, EPA adopted additional standards for locomotive diesel engines that will further reduce emissions of DPM and NOx from locomotives. The standards are designed to:

1. Tighten emissions standards for existing locomotives diesel engines when they are remanufactured;
2. Set near-term engine-out emissions standards, referred to as Tier 3 standards, for newly-built locomotive engines; and
3. Set longer-term standards, referred to as Tier 4 standards, for newly-built locomotives and marine diesel engines that reflect the application of high-efficiency after-treatment technology.

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[2] *Bay Area Regional Rail Plan, Technical Memorandum 4a, Conditions, Configuration & Traffic on Existing System*, Metropolitan Transportation Commission, November 15, 2006.
[3] *Emission Factors for Locomotives,* USEPA 2009 (EPA-420-F-09-025)
[4] *Offroad Modeling, Change Technical Memo, Changes to the Locomotive Inventory*, CARB July 2006.
[5] Personal communication with Mr. Stephen Coleman, Manager, Rail Equipment, Caltrain. March 9, 2011.
[6] Based on *2009 UPRR California Intrastate Locomotives*, Available at: http://www.arb.ca.gov/railyard/rrsubmittal/0410upinventory.pdf

The 2008 standards set more stringent emission standards for remanufactured Tier 0 – Tier 2 locomotives than the original 1998 regulations. In addition, it added Tier 3 standards for new and remanufactured engines starting in 2009 and Tier 4 standards for new and remanufactured engines beginning in 2015. The EPA estimates 90 percent reduction in DPM emissions from Tier 4 engines compared to engines meeting the current Tier 2 standards.

Passenger train locomotives were assumed to have 3,600 hp engines operating at 60% load and would be traveling at about 15 mph due to the proximity of the Morgan Hill Caltrain Station. Trains for the Caltrain system are planned to be electrified in the near future. This would eliminate DPM emissions from these trains. There would still be several diesel powered locomotives in the Caltrain system that would be used for trains traveling to and from Gilroy during the weekdays (3 northbound and 3 southbound) since the electrification of Caltrain will not extend all the way to Gilroy. This would include the trains passing through Morgan Hill. Emissions from passenger train locomotives were calculated for 2015, 2020, and 2025. Emissions were based on the use of Tier 0 or Tier 1 (Tier 0/Tier 1) locomotives in 2015, 75% Tier 0/Tier 1 and 25% Tier 4 in 2020, and all Tier 4 locomotives in 2025.

Each train was assumed to use one locomotive. Although the freight trains may have more than one locomotive, it was assumed that for this section of the rail line, which is relatively level, only one locomotive would be powering the trains. Emissions from the freight trains were calculated assuming they would use locomotives with 3,600 hp engines and would be traveling at about 30 mph with the engines operating at about 60% load. Freight train locomotives in 2015 were assumed to use 25% Tier0/Tier 1 engines and 75% pre-control engines remanufactured to meet Tier0/Tier 1 standards. For the period from 2020 through 2025, 70% of the freight train locomotives were assumed to meet Tier 0/Tier 1 remanufactured engine standards, 25% to meet Tier 3 standards, and 5% meeting Tier 4 standards. By 2025 it is expected that 75% of the locomotives will either be replaced or remanufactured to meet EPA's Tier 4 emission standards and the remaining 25% would use Tier 3 engines. Details of the emission calculations are contained in Attachment 1.

<u>Railroad Dispersion Modeling</u>

Modeling of locomotive emissions was conducted using the EPA's ISCST3 dispersion model and five years (2001-2005) of hourly meteorological data from the San Martin Airport obtained from the BAAQMD. The San Martin meteorological station is about 4 miles south-southeast of the project site. Locomotive emissions from train travel within about 1,000 feet of the project site were modeled as a line source (series of volume sources) along the track. Concentrations were calculated at receptor locations within the proposed residential area of project site with receptors spaced every 10 meters (33 feet). Receptor heights of 1.5 meters (4.9 feet) and 4.5 meters (14.8 feet) were used to represent first and second floor levels of the project housing units. The maximum modeled long-term DPM and $PM_{2.5}$ concentrations occur at the first floor level (1.5 meters) project receptors closest to Depot Street and the rail line. The portion of the rail line modeled, the project site receptor locations, and the location of maximum risk from the rail line are shown in Figure 1. Attachment 1 includes details on the assumptions used with the modeling and the DPM and $PM_{2.5}$ emission rates used.

Computed Cancer Risk

Using the maximum modeled average DPM concentration for each emissions period modeled, the maximum individual cancer risk at the project site was computed using the most recent methods recommended by BAAQMD[7]. The factors used to compute cancer risk are highly dependent on modeled concentrations, exposure period or duration, and the type of receptor. The exposure level is determined by the modeled concentration; however, it has to be averaged over a representative exposure period. The averaging period is dependent on many factors, but mostly the type of sensitive receptor that would reside at a site. This assessment conservatively assumed long-term residential exposures. BAAQMD has developed exposure assumptions for typical types of sensitive receptors. These include nearly continuous exposures over a 70-year period for residences. It should be noted that the cancer risk calculations for residential exposures reflect use of BAAQMD's most recent cancer risk calculation method adopted in January 2010. This method applies BAAQMD recommended Age Sensitivity Factors to the cancer risks for residential exposures, accounting for age sensitivity to toxic air contaminants. Age-sensitivity factors reflect the greater sensitivity of infants and children to cancer causing TACs.

The maximum increased cancer risk was computed as 6.0 in one million. This was modeled at a first floor level receptor closest to Depot Street and the rail line. The location of maximum cancer risk is shown on Figure 1. Cancer risks at other residential areas within the project site would be lower than the maximum cancer risk. This increased cancer risk is less than the BAAQMD cancer risk significance threshold of an incremental cancer risk of greater than 10.0 cases per million from a single source.

Non-Cancer Health Effects

Potential non-cancer health effects due to chronic exposure to DPM were also evaluated. The chronic inhalation reference exposure level (REL) for DPM is 5 $\mu g/m^3$. The maximum predicted annual DPM concentration from locomotives is 0.028 $\mu g/m^3$, which is much lower than the REL. Thus, the Hazard Index (HI), which is the ratio of the annual DPM concentration to the REL, would be 0.006. This HI is much lower than the BAAQMD significance criterion of a HI greater than 1.0.

$PM_{2.5}$ Concentrations

In addition to evaluating the health risks from DPM, potential impacts from $PM_{2.5}$ emissions from the locomotives were evaluated. From the rail line modeling conducted for estimating cancer risks, the maximum $PM_{2.5}$ concentration was identified. The maximum average $PM_{2.5}$ concentration of 0.028 $\mu g/m^3$ occurred at the same receptor that had the maximum cancer risk. This concentration is well below the BAAQMD $PM_{2.5}$ threshold of greater than 0.3 $\mu g/m^3$.

A summary of maximum increased cancer risks calculations and $PM_{2.5}$ concentrations is included in Attachment 1.

[7] BAAQMD, *Air Toxics NSR Program Health Risk Screening Analysis (HSRA) Guidelines*, January 2010.

Figure 1. Project Site, Receptors, Modeled Rail Line, and Location of Maximum Risk

Attachment 1

Sunsweet - Third and Depot Street, Morgan Hill, CA
DPM Modeling - Rail Line Information and DPM and PM2.5 Emission Rates

Year	Description	No. Lines	Link Width (ft)	Link Width (m)	Link Length (ft)	Link Length (miles)	Link Length (m)	Release Height (m)	No. Trains per Day	Train Travel Speed (mph)	Average Daily Emission Rate (g/mi/day)	Average Daily Emission Rate (g/day)	Link Emission Rate (g/s)	Link Emission Rate (lb/hr)
2015	Passenger								6	15	188.4	84.6	1.96E-03	1.56E-02
	Freight Trains								6	30	76.8	34.5	3.99E-04	3.17E-03
	Total	**1**	**12**	**3.7**	**2,372**	**0.45**	**723**	**5.0**	**12**	**30**	**265.2**	**119.1**	**2.36E-03**	**1.87E-02**
2020	Passenger								6	15	143.5	64.5	1.49E-03	1.18E-02
	Freight Trains								6	30	53.7	24.1	2.79E-04	2.21E-03
	Total	**1**	**12**	**3.7**	**2,372**	**0.45**	**723**	**5.0**	**12**	**30**	**197.2**	**88.6**	**1.77E-03**	**1.41E-02**
2025	Passenger								6	30	4.4	2.0	4.59E-05	3.64E-04
	Freight Trains								6	30	10.4	4.7	5.42E-05	4.31E-04
	Total	**1**	**12**	**3.7**	**2,372**	**0.45**	**723**	**5.0**	**12**	**30**	**14.8**	**6.7**	**1.54E-04**	**1.23E-03**

Notes: Emission based on Emission Factors for Locomotives, USEPA 2009 (EPA-420-F-09-025)
Fuel correction factors from Offroad Modeling Change Technical memo, Changes to the Locomotive Inventory, CARB July 2006.
DPM & PM2.5 calculated as 92% of PM emissions (CARB CEIDERS PM2.5 fractions)
Passenger trains assumed to operate for 12 hours per day
Freight trains assumed to operate for 24 hours per day

Passenger

Passenger trains - weekday =	8	
Passenger trains - weekend =	2	
Passenger trains - Sat only =	0	
Total Trains =	10	
Annual average daily trains =	6.3	
Locomotive horsepower =	3600	
Locomotives per train =	1	
Locomotive engine load =	0.6	
Freight		
Freight trains per day =	6	7 days/week
Locomotive horsepower =	3600	
Locomotives per train =	1	
Locomotive engine load =	0.6	

Emission Factors	(g/hp-hr)
Tier 0 & 1	0.32
Tier 0+ & 1+	0.20
Tier 2	0.18
Tier 2+ & 3	0.08
Tier 4	0.015
PM2.5 to PM ratio =	0.92

Engine Tier Level Distribution

	Passenger Trains			**Freight Trains**		
Engine	**2015**	**2020**	**2025**	**2015**	**2020**	**2025**
Tier 0 & 1	100%	75%		25%		
Tier 0+ & 1+				75%	70%	
Tier 2						
Tier 2+ & 3					25%	25%
Tier 4		25%	100%		5%	75%
Composite Emission Factor (g/hp-hr) =	***0.320***	***0.244***	***0.015***	***0.230***	***0.161***	***0.031***

	CARB Adj Factor	
	2010	2011+
Passenger	0.717	0.709
Freight	0.851	0.840

Sunsweet - Third and Depot Street, Morgan Hill, CA
ISCST3 Railroad DPM Risk Modeling Parameters and Project Site Maximum Residential Cancer Risk

Receptor Information

Number of Receptors	52
Receptor Spacing =	10 meters
Receptor Height =	1.5 m & 4.5 m

Meteorological Conditions

San Martin Airport Hourly Met Data	2001 - 2005
Land Use Classification	urban
Wind speed =	variable
Wind direction =	variable

Cancer Risk Calculation Method

Inhalation Dose = C_{air} x DBR x A x EF x ED x 10^{-6} / AT

Where: C_{air} = concentration in air (µg/m^3)
DBR = daily breathing rate (L/kg body weight-day)
A = Inhalation absorption factor
EF = Exposure frequency (days/year)
ED = Exposure duration (years)
AT = Averaging time period over which exposure is averaged.
10^{-6} = Conversion factor

Inhalation Dose Factors

	Value[1]							
Exposure Type	**DBR (L/kg BW-day)**	**A (-)**	**Exposure (hr/day)**	**Exposure (days/week)**	**Exposure (week/year)**	**EF (days/yr)**	**ED (Years)**	**AT (days)**
Residential (70-Year)	302	1	24	7	50	350	70	25,550

[1] Default values recommended by OEHHA& Bay Area Air Quality Management District

Cancer Risk (per million) = Inhalation Dose x CRAF x CPF x 10^6
= URF x Cair

Where: CPF = Cancer potency factor (mg/kg-day)$^{-1}$
SWFi = Sensitivity weighting factor dependent on emissions period i and duration of exposure
URF =Unit risk factor (cancer risk per µg/m^3)

Unit Risk Factors (unadjusted for age sensitivity) for DPM

Exposure Type	**CPF (mg/kg-day)$^{-1}$**	**Unit Risk DPM**
Residential (70-Yr Exposure)	1.10E+00	318.5

MEI Cancer Risk Calculations

Meteorological Data Year	**Maximum Annual DPM Concentration (µg/m^3)**		
	2015	**2020**	**2025**
2001 - 2005	0.0285	0.0209	0.0019
Cancer Risk[a]	9.07	6.65	0.61
Sensitivity Weighting Factors	0.439	0.214	1.036
Contribution to Total Cancer Risk	3.98	1.43	0.63
70-yr Total Risk[b]	***6.0***		

Notes:
Receptor Heights = 1.5 m
Maximum DPM & PM2.5 concentrations occur at recepotr along Depot St
a Cancer risk (per million) calculated assuming constant 70-year exposure to concentration for year of analysis.
b Total cancer risk (per million) calculated assuming variable exposure over a 70-year period due to decreased concentrations over time.