bae urban economics

# Aggregate Mining Economic Analysis

Prepared for Yolo County

June 30, 2021

bae urban economics

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Elisa Sabatini, Manager of Natural Resources
County of Yolo
625 Court Street, Room 202
Woodland, California 95695

Dear Elisa:

We are pleased to submit this analysis entitled Aggregate Mining Economic Analysis for Yolo County. This analysis estimates the industry's total contribution to Yolo County economic activity in 2019, including jobs and wages, taxes and fees, and indirect and induced impacts, among others. This analysis also examines effects from mining on adjacent property values based on a review of available literature, and property value analysis.

We would like to thank Yolo County staff for assistance with gathering the necessary information for this study.

Sincerely,

Matt Kowta
Managing Principal

Matt Fairris
Senior Associate

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# EXECUTIVE SUMMARY

To better understand the economic contribution of the aggregate mining industry[1] within Yolo County, the County of Yolo contracted with BAE Urban Economics inc., an urban economics consulting firm with an office in Yolo County, to conduct this assessment of the industry's current contribution to the local economy. This analysis includes the total number of direct aggregate mining industry employees and associated wages, taxes, and fees paid to the County; indirect and induced jobs and output within the County related to the direct mining activity, as well as other unquantifiable contributions. This study compares these economic contribution amounts with estimates from a 1996 study that provided an initial estimate of the likely ongoing economic contributions of the Yolo County aggregate mining program. In addition to the contributions to local economic activity, BAE also assessed the potential effects on nearby residential and agricultural property values.

## County Economic Contribution

Based on this analysis, summarized in Table ES-1 below, BAE estimates that the aggregate gravel mining operations had the following economic contributions to Yolo County within 2019:

**Jobs and Wages** – According to the California Employment Development Department (EDD), the aggregate mining industry had 49 employees within Yolo County, with an average wage of $123,084 per year.

**Property Taxes** – Based on assessed property values, including any equipment and personal property used by the gravel mining operators, the Yolo County aggregate mining operations paid approximately $766,580 in total property taxes to the County in 2019 to support countywide services, including Yolo County services, schools, and fire services.

**Sales Tax** – Aggregate gravel sold directly to consumers is subject to retail sales tax. According to Yolo County sales tax data, Yolo County operators generated roughly $172,580 in sales tax to the County in 2019.

**Gravel Mining Fees** – Unique to Yolo County, mining operators pay a fee on every ton of gravel sold in a calendar year. In 2019, that fee was nearly $0.60 per ton sold, generating nearly $2.1 million in total gravel mining fee revenue. This revenue is restricted to four uses: CCRMP implementation (which focuses on creek stabilization and restoration); contributions to the Cache Creek Conservancy (intended to focus on habitat restoration at all sites along the creek); maintenance and remediation (which is available for unanticipated environmental conditions and may later [post-2047] be used for restoration and recreation); and OCMP implementation (which focuses on administration of the program including regulation).

[1] Defined as the North American Industry Classification System (NAICS) code 212321: Construction Sand and Gravel Mining.

**Indirect and Induced Economic Contributions** – Based on the IMPLAN input-output model, which quantifies the indirect and induced contributions of specific industries within specific geographic areas, the aggregate mining industry spurs an estimated 29 additional jobs within Yolo County, generating an additional $5.7 million of annual countywide economic activity.

**Other Economic Contributions** – While not necessarily quantifiable, the aggregate mining industry contributes to Yolo County in other ways, including roadway maintenance for aggregate trucking routes, foundation and community involvement, reduced environmental externalities from importation of aggregate from non-local sources, reduced cost of local and regional projects that utilize aggregate material, and both direct and indirect benefits from the emerging Cache Creek Parkway.

**Table ES-1: Aggregate Mining Industry Economic Contribution, Yolo County, 2019**

| Jobs | 2019 Economic Contribution |
|---|---|
| Direct Employees | 49 |
| *Annual Wage/Employee* | *$123,084* |
| *Total Annual Wages* | *$6,031,110* |
| | |
| **Tax/Fees** | |
| Property Tax | $766,582 |
| Sales Tax | $172,579 |
| Gravel Mining Fees | $1,600,562 |
| **Total Direct Taxes/Fees** | **$2,539,723** |
| | |
| **Indirect and Induced** (Yolo County) | |
| Jobs | 29 |
| Output | $5,733,912 |
| | |
| **Other Contributions** | |
| Trucking Jobs | |
| Maintenance of Trucking Routes | |
| Foundations and Community Involvement | |
| Reduced Environmental Externalities | |
| Reduced Cost of Local Projects | |
| Cache Creek Parkway Benefits | |

Sources: Yolo County; California Employment Development Department; IMPLAN; BAE, 2021.

The above results generally align with the original estimates from the 1996 study, titled *Economic Analysis of the Cache Creek Off-Channel Mining Plan: Aggregate Mining and Agricultural Industry Comparison*. This includes a comparable number of jobs with slightly higher average wages than originally anticipated, as well as similar property tax revenue generation. Sales tax revenue is somewhat lower than originally anticipated, likely driven by the percent of gravel product that is sold to wholesale customers and therefore not generating local sales tax. Nevertheless, the current $172,580 in annual sales tax revenue to the County is still a significant contribution to the County Budget. In addition to categories of economic

benefits originally projected for the Cache Creek mining program in the 1996 study, the County also receives approximately $2.1million in annual gravel mining fees to support creek maintenance, habitat restoration, remediation of unanticipated environmental conditions, and program administration, as well as offer current and future outdoor recreational amenities on reclaimed mining sites as part of the Cache Creek Parkway.

## Effects on Nearby Property

Several research studies have attempted to quantify the potential effects of aggregate mining activities on nearby property values. Early studies indicated a potential negative effect on property values for nearby parcels zoned for residential use. More modern studies, however, refute these initial findings and conclude that properties in close proximity to gravel mining operations are generally unaffected by the operations.

Because the literature provides mixed findings on property value effects, and the setting in Yolo County is somewhat unique in that gravel mining was in operation prior to the development of nearby housing, BAE conducted additional research into sales trends for housing units within close proximity to Cache Creek gravel mining operations. This assessment focused on sales in the Wild Wings subdivision, as this is the only residential development that is located within one-half mile of mining operations within Yolo.

It is relevant to the conclusions of this analysis that the County's agreement to permit the Wild Wings subdivision was conditioned upon incorporating a specific Declaration of Covenants, Conditions, and Restrictions (CC&Rs) to accompany property sales within the subdivision. Within the CC&Rs associated with the Wild Wings subdivision is the following statement, in section 4.19, titled "Sand and Gravel Mining":

> *"A. Notice Regarding Sand and Gravel Mining - It is the policy of the County of Yolo to protect lands in the vicinity of sand and gravel mining operations that may lead to safety or nuisance hazards near sand and gravel operations and conversely uses that may imperil the continued operation of the sand and gravel mining. Owners within the Wild Wings Development shall recognize the rights of the sand and gravel industry to conduct mining operations and practices in compliance with the sand and gravel overlay zone and their approved state and county permits.*

Given the long-standing presence of gravel mining operators prior to the approval of the Wild Wings development, plus the clear interest of the County to preserve and support the ongoing operation of mining companies according to their approved long-term, off-channel, mining and reclamation permits, the initial sale prices of homes within the Wild Wings subdivision would have accounted for this proximity and potential effect on the desirability of the Wild Wings subdivision. Based on an analysis of the 21 home sales within the Wild Wings subdivision that had multiple sales between 2010 and 2020, all but one unit experienced an increase in

property value. Publicly available information does not indicate the reason for the single outlier unit's decline in value; however, it could have been caused by any of multiple factors, such as lack of proper maintenance, damage due to natural or human-caused hazards, circumstances causing a distressed sale, etc., that do not relate to gravel mining operations. Within the group of sales, the average sale price increase was roughly 33 percent over the prior home sale price. All of this indicates that the proximity of the Yolo County gravel mining operations to the residentially-designated property has not negatively impacted the home values.

A similar analysis of parcels zoned for agricultural use found that land values for parcels near the Sand and Gravel Overlay (SGO) and Sand and Gravel Reserve Overlay (SGRO) zones, discussed in more detail below, are unaffected by the proximity to gravel mining operations. In fact, agricultural parcels which are located within the SGRO and therefore have the potential for future mining extraction, experience higher assessed values per acre than sites outside of the overlay zone, likely a component of the additional value associated with the potential extraction of gravel resources from these sites. Agricultural sites outside of the sand and gravel overlay zones show no negative trend in assessed values, with the majority of agricultural parcels in closer proximity to the sand and gravel overlay zones registering assessed land values per acre that are consistent with those within a five-mile radius.

# INTRODUCTION

To better understand the economic contribution of the aggregate mining industry[2] within Yolo County, the County of Yolo contracted with BAE Urban Economics inc., an urban economics firm with a Yolo County office, to assess the industry's total economic contribution within the County. This includes an analysis of the total direct jobs, taxes, and fees, and as well the industry's indirect and induced contributions within Yolo County.

Gravel mining in Yolo County in and along Cache Creek has occurred since the late 1880's. As early as 1936, Yolo County began to regulate mining in the Cache Creek channel. The requirement for use permits for all new gravel operations was adopted in 1963. By 1979, the County adopted a Mining and Reclamation Ordinance that established excavation elevations and set a maximum production amount for operators. In 1980, the County approved the first "wet pit" mining operation along Cache Creek, which involved off-channel mining to depths below the groundwater table.

In recognition that Cache Creek needed to be managed more comprehensively, the County developed the Cache Creek Area Plan (CCAP), which views the creek as an integrated system, with an emphasis on the management of all of Cache Creek's resources, rather than a singular focus on the issue of mining. To support the development and implementation of the CCAP, the County conducted a number of special studies and technical analyses, to provide historical and baseline information and recommendations for improving the natural processes and resources of Cache Creek. One of these reports was a 1996 economic contribution study, titled *Economic Analysis of the Cache Creek Off-Channel Mining Plan: Aggregate Mining and Agricultural Industry Comparison.*[3] The analysis estimated the potential economic contribution of the aggregate mining industry on Yolo County. This included the estimated number of jobs, property tax revenue, and sales tax revenue.

This study provides an assessment of the total economic contribution of the Yolo County aggregate mining industry in 2019. The conclusions of this new assessment are compared to the original estimates of the 1996 study to better inform the County of the industry's current economic contributions.

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[2] Defined as the North American Industry Classification System (NAICS) code 212321: Construction Sand and Gravel Mining.

[3] The original 1996 study can be found at: https://www.yolocounty.org/home/showdocument?id=18690

# ECONOMIC CONTRIBUTIONS OF YOLO COUNTY AGGREGATE MINING INDUSTRY

The following section of the report summarizes the current activity and economic contributions of the aggregate mining industry to the Yolo County economy. This includes an assessment of direct economic contributions, including job generation, property tax and sales tax revenue, and mining fee payments, as well as indirect and induced impacts from additional spending by the operations and employees. This section also summarizes a range of additional local contributions from the operators that are not necessarily quantifiable, however they factor into the industry's local economic contribution.

## Current Mining Activity Overview

Located along the Cache Creek between the unincorporated community of Capay and the community of Yolo, Yolo County has issued seven mining permits to **four aggregate mining operators**, including Teichert Aggregates, CEMEX Construction Materials Pacific, LLC, Granite Construction Company, and Syar Industries. To designate the areas along Cache Creek where mining activities are permitted for current or future use, the County approved two overlay zones, including the Sand and Gravely Overlay zone (SGO) and the Sand and Gravel Reserve Overlay zone (SGRO). As contained in Section 8-2.906(g) of the County Zoning Ordinance, these overlay zones designate the following:

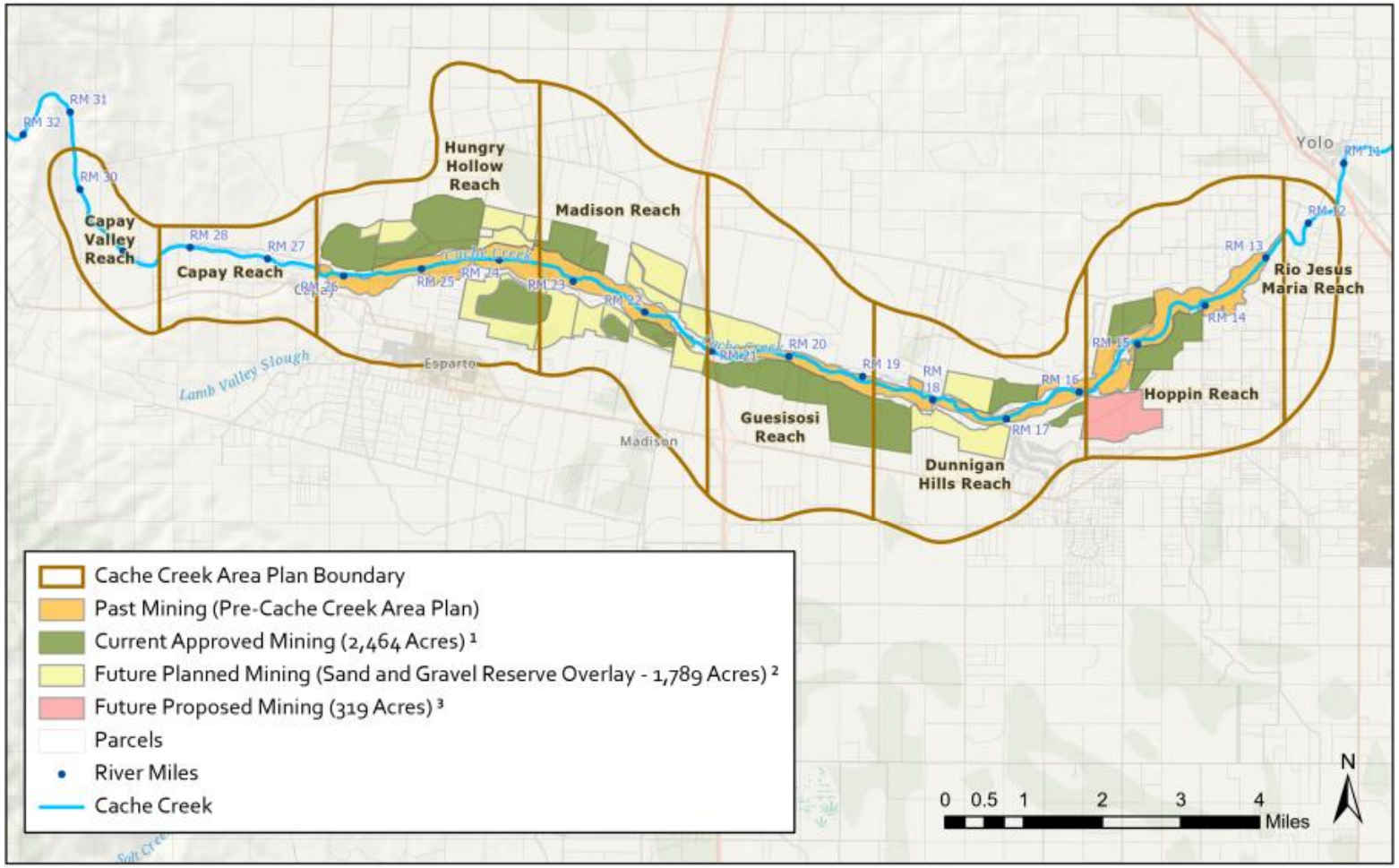
> *(1) **The Sand and Gravel Overlay zone (SGO)** is intended to be combined with the A-N and A-X zones within the boundaries of the Cache Creek Off-Channel Mining Plan, as defined by Chapter 4 of Title 10 of this Code, so as to indicate land areas in which surface mining operations may be conducted.*
>
> *(2) **The Sand and Gravel Reserve Overlay zone (SGRO)** is intended to be combined with the A-N and A-X Zones located within the boundaries of the Off-Channel Mining Plan as defined by Chapter 4 of Title 10 of this Code, so as to indicate land areas in which future surface mining operations shall be considered after 2026. The SGR Overlay is an indication to surrounding property owners and lead agencies of areas that are targeted by the County for future extraction after 2026. No commercial surface mining operations shall be conducted on lands classified with the SGR Zone. Commercial surface mining operations shall only be permitted in accordance with the requirements of Chapter 4 of Title 10 of this Code.*

As depicted below in Figure 1, the County has approved current mining activities through the SGO zone designation on a total of 2,464 acres of land (shown in Figure 1 in green). Of the 2,464 acres of land, only 1,900 acres are approved for actual aggregate excavation; the remainder is approved for other related activities such as processing and stockpiling. Through the SGRO zone, the County has designated another 1,789 acres of land for future mining activities which will require County permits (shown below in yellow). Finally, the County has an

additional 319 acres of land that are planned for mining and currently seeking permits from the County (shown in Figure 1 in red). Of the 319 additional acres for proposed mining activities, approximately 277 acres are proposed for actual excavation.

According to data provided by Yolo County, Yolo County aggregate mining operators sold a total of **3.25 million tons** of aggregate in 2019. While the total sales value of this tonnage is not available, the County receives sales tax and gravel mining fee revenue based on the aggregate sold, discussed in more detail below. According to conversations with select mining operators, demand for aggregate is expected to increase steadily over the next ten years which will drive continued demand for Yolo County aggregate production.

## Figure 1: Yolo County Past, Current, and Future Aggregate Mining Operations




1 Due to minor inaccuracies in the database and polygon boundaries, this total may be overstated by +/- 5 acres.
2 Prior to adoption of the CCAP Update in December 2019, total SGRO zoned acreage was 1,001 acres. With adoption of the CCAP Update, the SGRO was added to an additional 788 acres, for a total of 1,789 acres.
3 This reflects the actual proposed mining acreage in the Teichert Shifler application. An additional +/- 81 acres assumed for rezoning as a part of the CCAP Update represented portions of the Shifler property not ultimately included in the Teichert Shifler application.

Folder: I:\GIS\Projects\Natural Resources\Large Scale Cache Creek Maps\

OCMP Figure 5

Sources: Yolo County, 2020.

## Job Generation

According to the California Employment Development Department (EDD), the Yolo County aggregate mining industry[4] employed an average of **49 direct wage and salary employees** in 2019. According to additional discussions with the operators, this figure may not fully reflect all jobs at the sites, due to the seasonality of aggregate extraction and labor agreements. Other data provided by IMPLAN, discussed later, suggest that Yolo County has 58 employees within the aggregate mining industry, which differs from the EDD estimates as it includes non-wage and salary workers (e.g. proprietors and other self-employed individuals). The remainder of this analysis utilizes the EDD employment estimate. According to the EDD data, the average annual wage of all Yolo County aggregate mining employees was roughly **$123,000** in 2019. This estimated wage is more than **double the average wage**[5] in the Sacramento Region, encompassing Yolo County.

In addition to employees of the aggregate mining operators, summarized above, the industry also drives demand for **trucking services**. According to local mining operators interviewed for this study, customers purchasing gravel from the local operations arrange for the trucks that pick up gravel from the mining sites and deliver the gravel to the customers' sites. Although data were unavailable for the exact number of trucking jobs supported by the aggregate mining industry in Yolo County, based on feedback from the mining operators, the 2019 tonnage sold likely generated demand for 130,000 total truck trips, or 360 truck trips per day, assuming an average year-round delivery schedule. According to mining operators, aggregate product does not generally get trucked further than 70 miles from the production site. Assuming one truck can make at most two trips per day based on this maximum per-trip mileage, trucking the aggregate product likely supports up to 150 additional annual trucking jobs, though the majority of these trucking jobs may not be based in Yolo County according to the IMPLAN data below and conversations with local gravel mining operators

## Property Tax

The assessed value of all properties within the SGO, SGRO, and the site currently seeking permits amounts to roughly $73 million. Based on the property tax rates for each parcel, Yolo County gravel mining operators pay approximately **$766,580 in annual property taxes**. The vast majority of these payments (95 percent), are allocated to Yolo County agencies, including various school districts, fire districts, and the County General Fund, County Road Fund, and County Accumulated Capital Outlay Fund. The remaining tax payments are levied on properties to support bond payments for the Woodland Joint Unified School District, Esparto Unified School District, and Yuba Community College District.

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[4] Defined as the North American Industry Classification System (NAICS) code 212321: Construction Sand and Gravel Mining.

[5] According to the Occupational Employment Statistics Survey, First Quarter 2019.

## Sales Tax

According to Yolo County business-level sales tax generation, Yolo County's gravel mining operators generated roughly **$172,580 in sales tax** in fiscal year 2018/19. According to mining operators, the annual sales tax generated in Yolo County tends to fluctuate based on the percent of sales to retail (taxable) versus wholesale (non-taxable) customers, as well as overall demand for aggregate production from public and private construction projects.

## Mining Fee Revenue

As mandated in Section 10 Chapter 11 of the Yolo County Code of Ordinances[6], all gravel mining operators are subject to a local gravel mining fee. This required fee was established in 1996 and first collected in 1997. In 2007 the fees were adjusted, with additional amendments in 2013 and 2014. The fees are currently set by ordinance through the end of 2026 at which point the program requires they be reevaluated. Currently, mining operators are subject to a fee of $0.643 per ton for gravel sold in 2021, which will be collected by the County in 2022. This fee increases by four percent per year through 2026. The largest share of the gravel mining fees, or 55.6 percent, support implementation of the Cache Creek Resources Management Plan, including creek stabilization. Another 22.2 percent of the fees are allocated to the Cache Creek Conservancy to support maintenance of the Cache Creek Nature Preserve and other Cache Creek habitat restoration and management. Another 17.8 percent of fees support the off-channel mining plan which monitors and regulates the mining industry, while the remaining 4.4 percent are allocated to general maintenance and remediation. As established under the fee ordinance, this fund resides in an interest bearing account and may not be accessed until January 2027 at which time it becomes available to remediate unanticipated environmental conditions should they occur. After January 2047 this fund is available for habitat restoration and open space recreation.

In 2019, aggregate mining operators paid a total of **$2.1 million** in gravel mining fees to Yolo County or directly to the Cache Creek Conservancy, supporting implementation of the Cache Creek plan and various habitat preservation and maintenance activities. Since 2009, the total gravel mining fee revenue has ranged from $782,000 to $2.1 million, with an average annual payment amount of roughly $1.3 million.

## Other Contributions

In addition to the direct jobs supported and tax/fee payments discussed above, the gravel mining operators also make other contributions that are not quantifiable with publicly available information. These include:

**Maintenance of Trucking Route Roadways** – According to County staff, the Yolo County gravel mining operators maintain the roadway pavement of the designated aggregate truck routes used throughout the County. This includes roughly 8.8 miles of Yolo County

[6] Available at: https://www.yolocounty.org/government/board-of-supervisors/county-code

roadways. Based on the County's existing average roadway maintenance cost of $17,000 per year per mile, the operator's ongoing maintenance of these roads saves the County an average of $150,000 per year.

**Foundations and Community Involvement –** Several of the gravel mining operators have official foundations or community involvement policies that provide support for local causes. Recent grants and donations to local organizations include the Yolo Food Bank, Yolo Community Foundation, Yolo Basin Foundation, Yolo Crisis Nursery, Woodland Opera House, Western Yolo Recreation Center Association, and support to youth sports programs within the county, among others.

**Reduced Environmental Externalities** – Due to the proximity of the gravel mining operations to construction projects throughout the County that require aggregate product, the presence of Yolo County operators reduces the environmental externalities that would have been caused by importing non-local sources of aggregate. This reduces potential includes impacts on air quality, greenhouse gas emissions, and other trucking-related externalities.

**Reduced Materials Costs for Local Construction Projects –** A major component of the cost of aggregate materials used in construction projects is the cost of transportation. Due to the proximity of the Yolo County aggregate mining operators to local development project sites, costs for residential and non-residential developments (e.g. apartment projects, industrial development, offices, etc.) as well as public infrastructure projects (e.g. roads, bridges, overpasses, etc.) are reduced, therefore lessening the required investment in these projects.

**Direct and Indirect Benefits from the Emerging Cache Creek Parkway** – Gravel mining fees and negotiated land dedications from the aggregate producers are contributing over time to an extensive parkway along both sides of Cache Creek, within the CCAP area. This is documented in the *Cache Creek Parkway Plan -- Open Space Inventory and Baseline Improvements* document issued in December 2018, and the *Cache Creek Parkway Plan – Draft Master Plan and Parkway Vision* document released in February 2020. As the Parkway is assembled over time and opened to public use additional new direct, indirect, and induced economic benefits will result from expenditures of parkway visitors. The positive effects of this tourism will circulate locally in the form of user fees, hotel stays, concessionaire fees and taxes, and other associated local jobs, spending, and revenue.

## Indirect and Induced Contributions in Yolo County

In addition to the direct jobs and other direct contributions by the aggregate mine operations in Yolo County, those operations make additional indirect and induced contributions to the local economy. The indirect contributions are linked to purchases of goods and services in the County to support the mining operations. These purchases, in turn, support additional indirect

jobs in an iterative fashion within the County from the expenditures that continue to circulate locally. The induced contributions are those linked to the expenditures by worker households within Yolo County, for the workers employed both directly and indirectly by the aggregate mining industry, as well as the induced worker expenditures, again in an iterative fashion. These indirect and induced contributions are estimated here using IMPLAN, an input-output model designed to estimate the flow of dollars through the Yolo County economy. For more information on the IMPLAN model, please see Appendix B.

Based on output from the IMPLAN model, the indirect contributions of the Yolo County aggregate mining operations create an additional **16 jobs and $3.5 million in output** (value of production) throughout Yolo County. The induced impacts from the mining operators include **13 jobs and $2.2 million** in annual output.[7] In total, in addition to the direct contributions summarized above, the aggregate mining industry supports 29 jobs and output of almost $5.7 million in annual economic activity in Yolo County through indirect and induced contributions.

## Summary of Economic Contributions in Yolo County

As seen in the summary table below, the Yolo County aggregate mining operators contributed roughly $2.5 million in tax and fee revenue directly to Yolo County, while also directly employing 49 employees at nearly double the regional average wage. Based on the IMPLAN data, these operators indirectly support 29 additional jobs, which create an additional $5.7 million of annual economic output in the Yolo County economy. This indirect and induced output likely supports additional taxes and fees countywide.

The mining operators contribute to the Yolo County community and economy in other ways, not necessarily quantifiable. These additional contributions include maintenance of the roughly 8.8 miles of Yolo County roadways along the gravel trucking routes, charitable contributions and community involvement, as well as reduced environmental impacts and reduced cost of local construction projects due to the proximity of these mining operations.

[7] These jobs are by place of work, not place of worker residence.

**Table 1: Aggregate Mining Industry Economic Contribution, Yolo County, 2019**

| Jobs | 2019 Economic Contribution |
|---|---|
| Direct Employees | 49 |
| *Annual Wage/Employee* | *$123,084* |
| *Total Annual Wages* | *$6,031,110* |
| | |
| **Tax/Fees** | |
| Property Tax | $766,582 |
| Sales Tax | $172,579 |
| Gravel Mining Fees | $1,600,562 |
| **Total Direct Taxes/Fees** | **$2,539,723** |
| | |
| **Indirect and Induced** (Yolo County) | |
| Jobs | 29 |
| Output | $5,733,912 |
| | |
| **Other Contributions** | |
| Trucking Jobs | |
| Maintenance of Trucking Routes | |
| Foundations and Community Involvement | |
| Reduced Environmental Externalities | |
| Reduced Cost of Local Projects | |
| Cache Creek Parkway Benefits | |

Sources: Yolo County; California Employment Development Department; IMPLAN; BAE, 2021.

### *Comparison to 1996 Study*

As noted in the introduction, the baseline analysis estimating the economic contribution of the aggregate gravel mining industry in Yolo County was conducted in 1996. This study estimated the economic contribution of various extraction scenarios, including a low- and high-extraction scenario. The low-extraction scenario assumed 2.6 million tons of gravel extracted and sold annually, while the high-extraction scenario assumed 6.2 million tons of annual gravel extraction and sales in Yolo County. During 2019, the amount of gravel sold amounted to 3.2 million tons, more in line with the low-extraction scenario estimates.

As seen in the table below, the economic contributions estimated in the 1996 study are generally representative of the 2019 conditions. First, the 1996 study estimated between 32 and 76 gravel mining employees, depending on extraction amount. The 2019 data estimate an annual average of 49 employees, or approximately the average of the two employment estimates presented in the 1996 study. Given the 1996 study assumed wages in 1996 dollars, that study's wage estimates are understandably lower than the current wage estimates. Accounting for inflation, the $57,500 estimate annual wage in 1996 would be nearly $99,000 in annual wages in 2019. As reported previously, the California Employment Development Department reported the average annual wage for gravel mining employees in 2019 was roughly $123,080, or 20 percent more than the inflation-adjusted estimate from the original report.

In terms of property tax and sales tax, the current 2019 findings are generally in line with the original estimates from 1996. More specifically, the original study estimated between $303,700 and $724,300 in annual property taxes to all county departments, in 1996 dollars. Assuming a 2.0 percent average annual increase in assessed property value, these estimates would range from $480,000 to $1.1 million in 2019 dollars. The actual amount of property tax associated with Yolo County gravel mining operations in 2019 was $766,580, or roughly the average of the two inflation-adjusted extraction scenarios from the 1996 study. In terms of sales tax, the original study estimated that gravel mining activity would generate between $137,00 and $326,600 in annual sales tax for the County. This assumed that all gravel sold was subject to retail sales tax, but that only half of the gravel sold by the Yolo County operators would register Yolo County as the point of sale. Currently, four of the five operations that are currently selling aggregate material identify Yolo County as the point of sale, but not all gravel sold is subject to sales tax, as operators sell a portion of their products to wholesale customers. While the percentage of gravel sales that are subject to sales tax in Yolo County in 2019 is not available, it is evident that the original 1996 estimates slightly overestimated the actual sales tax generation in the County, due to the difference in the amount of sales that are subject to sales tax and the assumed percentage of these sales that use Yolo County as point of sale, therefore generating local sales tax revenue. More specifically, the 2019 sales tax generation amounted to approximately $172,580, which is somewhat below the 1996 sales tax estimates, which would range from $235,000 to $560,275 in annual sales tax if adjusted for inflation. Lastly, as noted in the table below, the original 1996 study did not assume any Gravel Mining Fee revenue, which adds roughly $2.1 million in annual revenue to undertake creek maintenance activities, habitat restoration, remediation of unanticipated environmental conditions, and program administration, as well as offer current and future outdoor recreational amenities on reclaimed mining sites as part of the Cache Creek Parkway.

**Table 2: Economic Contribution Comparison, 2019 Activity and 1996 Study Estimates**

| | 2019 Economic | 1996 Report Estimates (a) | |
|---|---|---|---|
| **Jobs** | **Contribution** | Low-Extraction | High-Extraction |
| Direct Employees | 49 | 32 | 76 |
| *Annual Wage/Employee* | *$123,084* | *$57,500* | *$57,500* |
| *Total Annual Wages* | *$6,031,110* | *$1,832,481* | *$4,370,000* |
| | | | |
| **Tax/Fees** | | | |
| Property Tax | $766,582 | $303,738 | $724,298 |
| Sales Tax | $172,579 | $136,966 | $326,612 |
| Gravel Mining Fees | $1,600,562 | n.a. | n.a. |
| **Total Direct Taxes/Fees** | **$2,539,723** | **$440,704** | **$1,050,910** |

Note:
(a) Represents nominal values in 1996 dollars.

Sources: Yolo County; California Employment Development Department; IMPLAN; BAE, 2021.

# MINING EFFECTS ON NEARBY PROPERTY VALUES

## Residential Property

There is limited residentially zoned land within close proximity to the mining operators along Cache Creek. More specifically, there is only one area where residentially zoned land lies within one-half mile of the SGA Overlay - the 340-unit Wild Wings subdivision located four miles west of the City of Woodland. In order to better understand any positive or negative effects of nearby gravel mining on residential property values, BAE conducted a literature review of comparable gravel mining operations, as well as an analysis of recent home sales within residentially-zoned areas along Cache Creek.

Available research studies generally assess the impacts of new gravel mining operations on existing property within a certain radius of the site. This does not reflect the situation in Yolo County, where gravel mining operations were in existence before the development of nearby residential units. The approval of the Wild Wings development by the County included a specific reference to the County's support of ongoing gravel mining operations. The County mandated that the Wild Wings development include specific references to the nearby gravel mining activities in the subdivision's Covenants, Codes, and Restrictions (CC&Rs) document. Real Estate disclosure laws mandate that these CC&Rs be disclosed and provided in full to every home buyer in the Wild Wings development, indicating that buyers of homes in Wild Wings were aware of existing and future gravel mining operations when they purchased their units. Section 4.19 of the Wild Wings CC&Rs, titled "Sand and Gravel Mining," reads as follows:

> "***A. Notice Regarding Sand and Gravel Mining*** *- It is the policy of the County of Yolo to protect lands in the vicinity of sand and gravel mining operations that may lead to safety or nuisance hazards near sand and gravel operations and conversely uses that may imperil the continued operation of the sand and gravel mining. Owners within the Wild Wings Development shall recognize the rights of the sand and gravel industry to conduct mining operations and practices in compliance with the sand and gravel overlay zone and their approved state and county permits."*

### *Gravel Mining Literature Review*

The results of the literature review varied. BAE identified six studies that were most frequently cited documenting effects of gravel mining on nearby property values. These include:

- Hite, D. (2006). Summary Analysis: Impact of Operational Gravel Pit on House Values, Delaware County, Ohio,
- Erickcek, G. (2006). An assessment of the economic impact of the proposed Stoneco Gravel Mine operation on Richland Township.
- Centre for Spatial Economics. (2009). The Potential Financial Impacts of the Proposed Rockfort Quarry

- Grant, A. (2017). Estimating the Marginal Effect of Pits and Quarries on Rural Residential Property Values in Wellington County, Ontario: A Hedonic Approach.
- Ford, G. S., & Seals, A. (2018). Quarry Operations and Property Values: Revisiting Old and Investigating New Empirical Evidence.
- Bureau of Land Management (2019). Environmental Assessment of Andrada Marble Quarry

The three older studies concluded that nearby gravel mining had negative impacts on property values and three more recent studies refuted these findings, suggesting proximity to mining has no noticeable impact on property values. A summary of each research paper can be found in Appendix A.

The two studies that found negative property value impacts on nearby residential properties were conducted to inform the siting of new gravel mining operations in close proximity to existing homes. Unlike Yolo County, those homeowners had little to no prior information regarding the gravel mining operations, suggesting initial property values did not account for the potential nearby use. In contrast, in Yolo County, the gravel mining operations were in existence before the Wild Wings subdivision built out, and buyers of homes in the Wild Wings subdivision were informed of the County's SGO and SGRO zones that would support current and future mining activities on nearby properties, through California's real estate disclosure law and the Wild Wings covenants, conditions, and restrictions (CC&R) document.

*Yolo County Sales Data*

Because the literature review yields contrasting conclusions regarding the impact of gravel mining operations on nearby residential home values, and do not accurately reflect the localized setting in Yolo County where residential units were constructed after the mining activities were approved and in operation, BAE conducted additional analysis of home sales trends for residential units within a one half-mile radius of existing mining operations along Cache Creek, which only includes homes within the Wild Wings subdivision. To assess the sale price trends in this area, BAE summarized all residential units with multiple sales within the past decade. As shown in Table 3 below, all units sold between 2018 and 2020 experienced a price increase relative to their prior sale date in 2010 or later, with the exception of one unit that was likely subject to unusual circumstances. Publicly available information does not indicate the reason for the single outlier unit's decline in value; however, it could have been caused by any of multiple factors, such as lack of proper maintenance, damage due to natural or human-caused hazards, circumstances causing a distressed sale, etc., that do not relate to gravel mining operations. For all of the other units, the increase in value ranged from a modest $15,000 increase, to a more significant $391,500 sale price increase over the past decade. Also shown in Table 3 below, the median sale price of units sold between 2018 and 2020 in the Wild Wings subdivision was roughly $575,000, or $188 per square foot. This is roughly 30 percent higher than the median Yolo County sales price in this time frame, which hovered around $440,000. Given that gravel mining operations have been underway before

development of Wild Wings, during development of the subdivision, and continuously since completion of the subdivision, and 95 percent of all homes sold in the Wild Wings subdivision experienced price appreciation, plus had a median sale price well above the countywide median, this information indicates that there is no evidence that the mining operations' proximity to the Wild Wings subdivision has had any adverse effect on the value of homes in the subdivision since 2010.

## Table 3: Recent Home Sale Price Trends, Wild Wings Subdivision, 2010 to 2020

| | Wild Wings Community | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Last Market Sale | | | | Prior Market Sale | | | | |
| Property Address | RBA (Sq. Ft.) | Last Market Sale Date | Last Market Sale Price | Last Market Price per Sq. Ft. | Prior Market Sale Date | Prior Market Sale Price | Prior Market Price per Sq. Ft. | Change in Sale Price Number | Change in Sale Price Percent |
| 33503 Canvas Back St | 3,153 | 09/26/2018 | $500,000 | $159 | 05/13/2010 | $379,000 | $120 | $121,000 | 31.9% |
| 34150 Canvas Back St | 2,844 | 09/23/2019 | $535,000 | $188 | 08/24/2011 | $329,000 | $116 | $206,000 | 62.6% |
| 34400 Canvas Back St | 2,093 | 10/10/2019 | $550,000 | $263 | 11/29/2011 | $325,000 | $155 | $225,000 | 69.2% |
| 33501 Wildwing Dr | 2,571 | 11/09/2018 | $500,000 | $194 | 02/23/2012 | $280,000 | $109 | $220,000 | 78.6% |
| 33292 Pintail St | 2,691 | 10/02/2019 | $676,500 | $251 | 10/24/2012 | $285,000 | $106 | $391,500 | 137.4% |
| 34750 Mallard St | 3,779 | 04/25/2018 | $360,000 | $95 | 03/19/2013 | $390,000 | $103 | ($30,000) | -7.7% |
| 18041 Blue Winged Ct | 2,093 | 07/02/2018 | $575,000 | $275 | 06/28/2013 | $435,000 | $208 | $140,000 | 32.2% |
| 33547 Wildwing Dr | 2,844 | 03/18/2019 | $600,000 | $211 | 10/16/2013 | $465,000 | $164 | $135,000 | 29.0% |
| 33388 Pintail St | 3,705 | 03/12/2020 | $625,000 | $169 | 01/29/2015 | $552,500 | $149 | $72,500 | 13.1% |
| 18247 Mandarin St | 3,705 | 04/23/2019 | $698,000 | $188 | 05/04/2015 | $525,000 | $142 | $173,000 | 33.0% |
| 18213 Mandarin St | 3,469 | 07/28/2019 | $720,000 | $208 | 05/04/2015 | $525,000 | $151 | $195,000 | 37.1% |
| 18372 Mandarin St | 3,059 | 08/21/2019 | $565,000 | $185 | 11/19/2015 | $535,000 | $175 | $30,000 | 5.6% |
| 18207 Harlequin Ct | 3,705 | 03/02/2020 | $649,000 | $175 | 12/08/2015 | $535,000 | $144 | $114,000 | 21.3% |
| 34004 Pintail St | 3,019 | 12/14/2018 | $555,000 | $184 | 01/05/2016 | $437,500 | $145 | $117,500 | 26.9% |
| 34510 Canvas Back St | 3,153 | 05/15/2018 | $575,000 | $182 | 08/24/2016 | $500,000 | $159 | $75,000 | 15.0% |
| 33565 Wildwing Dr | 3,153 | 12/12/2018 | $590,000 | $187 | 09/27/2016 | $575,000 | $182 | $15,000 | 2.6% |
| 18234 Mallard St | 2,803 | 07/13/2018 | $618,000 | $220 | 11/04/2016 | $520,000 | $186 | $98,000 | 18.8% |
| 33381 Pintail St | 3,705 | 08/15/2018 | $661,000 | $178 | 11/21/2016 | $619,000 | $167 | $42,000 | 6.8% |
| 33482 Wildwing Dr | 2,571 | 01/25/2019 | $515,000 | $200 | 12/04/2017 | $490,000 | $191 | $25,000 | 5.1% |
| **Median** | **3,059** | | **$575,000** | **$188** | | **$490,000** | **$151** | | |

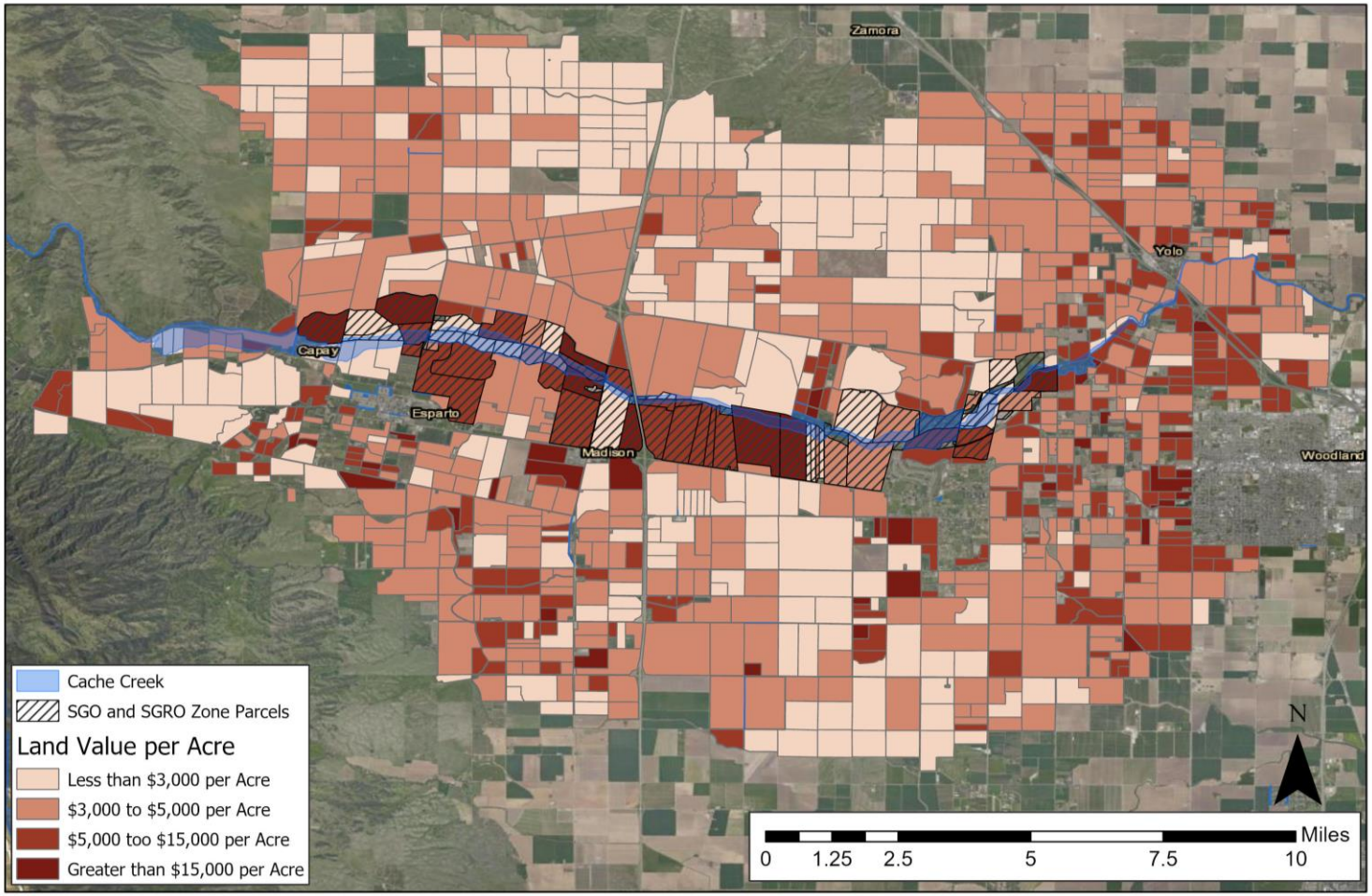
Sources: Core Logic ListSource, 2020; BAE, 2021.

## Agricultural Property

The available literature regarding aggregate mining effects on property values primarily focus on residential properties. However, in Yolo County, the majority of land surrounding the aggregate mining operations is designated for agricultural uses. BAE attempted to identify literature documenting the impact of mining specifically on agricultural land values and agricultural production expectations, but found no such analysis. However, BAE did review recent agricultural land sales within a one-mile radius of the Cache Creek aggregate mining operations, as well as assessed land values for parcels at varying distances from the aggregate mining operations. Based on sales of agricultural parcels greater than 20 acres between 2018 and 2020, the average sale price amounted to nearly $40,000 per acre. The sales values ranged from a low of roughly $5,000 to a nearly $80,000 per acre. Interestingly, the sale prices have little association with proximity to gravel mining operations, and appear to be tied to the existing use of the site. For example, of the four most expensive land sales, aerial images show existing orchards or row crops, whereas some of the less expensive land sales show little to no existing agricultural production.

In additional to land sales, BAE also analyzed the assessed land values for large parcels (greater than 20 acres) designated for agricultural use within a five-mile radius of the sand and gravel overlay zone. As seen below in Figure 2, parcels within the SGO and SGRO have higher assessed land values per acre than nearby agricultural parcels. This is likely driven by the additional value associated with the presence of gravel within these parcels and the current of future potential to extract the gravel. Outside of the sand and gravel overlay zones, including both the SGO and SGRO, assessed land values for agricultural parcels tend to be highest on the outskirts of unincorporated communities and outside the existing Woodland city limits. Although these parcels are currently designated for agricultural uses, the land may be deemed valuable due to the proximity to urban areas, use as mitigation land, and/or the potential for future urban uses, especially on the periphery of Woodland. Outside of these areas, there appears to be little connection between proximity to sand and gravel extraction sites and agricultural land values. In fact, the majority of agricultural sites that share a boundary with sand and gravel sites have assessed land values between $3,000 and $5,000 per acre, or roughly equal to the average assessed land value of all agricultural properties within a five-mile radius. Parcels farther away from the Cache Creek mining operations fluctuate in their assessed land values, with parcels in closer proximity to transportation networks (Interstate 5 and Interstate 505) generally showing higher assessed land values. This research indicates that the aggregate mining operations have no adverse effect on agricultural land values, and appear to drive higher land values for sites within the sand and gravel overlay zones that may be used for future gravel mining.

**Figure 2: Agriculture Parcel Assessed Land Value per Acre, 5-Mile Radius from Sites Designated for Current or Future Mining**




Note:
Some of the Aggregate Mining Sites shown have portions of their parcel that are located outside of the Sand and Gravel overlay zone.

Sources: Yolo County Assessor's Office; BAE, 2021

# REPORT CONCLUSIONS

Based on the preceding analysis, the aggregate mining industry contributes to the Yolo County economy with well-paying jobs, taxes, fees, and indirect and induced economic contributions. This includes 49 total jobs with average annual wages of $123,000, as well as roughly $2.5 million in annual revenue to the County from property tax, sales tax, and gravel mining fees. In addition to jobs and revenue associated directly with the aggregate mining operations, the industry also supports an additional 29 jobs and $5.7 million of output in the county through indirect and induced economic activities that are dependent on the mining activity.

The foundation of the potential economic contributions from the aggregate mining industry is included in the 1996 study, titled *Economic Analysis of the Cache Creek Off-Channel Mining Plan: Aggregate Mining and Agricultural Industry Comparison.* The above analysis indicates that current economic contributions from the gravel mining industry generally align with the initial 1996 study estimates. This includes a comparable number of jobs with slightly higher average wages than originally anticipated, as well as level of property tax revenue generation that is similar to what the 1996 study projected. Sales tax revenue is somewhat lower than originally anticipated, likely driven by the percent of gravel product that is sold to wholesale customers and therefore not generating sales tax. Nevertheless, the current $172,580 in annual sales tax revenue that the Yolo County gravel mining operations generate for the County is still a significant contribution to the Yolo County General Fund. In addition to the original categories of economic contributions projected in the 1996 study, the County also receives approximately $2.1 million in annual gravel mining fees to support maintenance of the Cache Creek area and offer current and future outdoor recreation amenities on reclaimed mining sites supported by the ongoing gravel mining fee revenues.

In addition to the positive economic contributions, there is no evidence that Yolo County gravel mining operations have negative or adverse effects on nearby residential or agricultural property values. In terms of residential parcels, there are 340 sites with residential zoning within 0.5 miles or less of the SGO or SGRO zones, all within the Wild Wings subdivision. The subdivision developed since the gravel program was adopted in 1996, or since commercial mining started in late 1800's. Buyers of housing units within Wild Wings were notified of the sand and gravel overlay zones, which allowed current and future mining activities. This indicates that initial home values in the Wild Wings subdivision would have already reflected any effect from nearby activities, including the gravel mining operations. Further, there is no evidence that gravel mining operations have had a negative effect on home values in the Wild Wings subdivision since those homes were originally developed and priced for sale. In terms of potential impacts on agricultural land within Yolo County, there is no evidence that mining operations adversely affect the value of agricultural land in terms of sale prices and County assessed values of agricultural sites within close proximity to the operations, and in fact, the evidence demonstrates that the values of these properties are benefitted by the economic expectation of aggregate mining as an additional income stream for the property.

# APPENDIX A: GRAVEL MINING EFFECT ON PROPERTY VALUE LITERATURE REVIEW

| Name of Study / Year Published | Author(s) / Study Sponsor | Location / Mining Type (Quarry/Alluvial) | Summary | Conclusion of Study | Relevance for Yolo County |
|---|---|---|---|---|---|
| An Assessment of the Economic Impact of the Proposed Stoneco Gravel Mine Operation on Richland Township<br><br>Published 2006 | Author: George A. Erickcek<br><br>Sponsored by: W.E. Upjohn Institute for Employment Research | Richland Township, Michigan<br><br>Alluvial Mining | This study found that gravel mining activities in the Richland Township had a significant negative impact on housing values in the area. Using the "hedonic pricing model," which "estimated the impact of one factor on the value of a house while holding all other factors impacting the house's value constant", the Upjohn Institute simulated the effects of gravel mining on residential property values based on the distance from the gravel site. Erickcek found that more than 1,400 homes were negatively impacted by the gravel mine site in Richland Township, with an estimated loss in value of approximately $31.5 million. | Gravel mining activities had a significant negative impact on housing values. | Not Relevant: Focused on impacts to residential property as preceding use |
| The Potential Financial Impacts of the Proposed Rockfort Quarry<br><br>Published 2009 | Authored by: Centre for Spatial Economics (C4SE)<br><br>Sponsored by: Town of Caledon, Canada | Town of Caledon, Canada<br><br>Quarry Mining | The report analyzed the potential financial impacts on a proposed quarry site within the Town of Caledon. The authors cited the study from Professor Diane Hite and applied it proportionally to the impact of Rockfort Quarry on the study area property values. Based on the average property value of the study area, estimated at $526,000, the applied hedonic model suggested that, in the presence of a quarry site, the average | New gravel mining operation would have a negative impact on existing property values; however, the basis of this conclusion has since been | Not Relevant: Focused on impacts of rock quarry on residential property as preceding use |

| Name of Study / Year Published | Author(s) / Study Sponsor | Location / Mining Type (Quarry/Alluvial) | Summary | Conclusion of Study | Relevance for Yolo County |
|---|---|---|---|---|---|
| | | | value of properties within two kilometers (1.2 miles) of the site would fall by 19 percent, or approximately $100,000 per property, and within five kilometers of the site would be reduced by eight percent. | refuted by the 2018 study by Phoenix Center for Advanced Legal and Economic Policy Studies *(below)* | |
| Estimating the Marginal Effect of Pits and Quarries on Rural Residential Property Values in Wellington County, Ontario: A Hedonic Approach<br><br>Published 2017 | Authored by: Alison Grant<br><br>Sponsored by: University of Guelph (Doctoral Dissertation) | Wellington County, Ontario<br><br>Alluvial and Quarry Mining | The report analyzed the effects of all gravel mining activities in Wellington County, Ontario on residential property values. The study included variables that were shortcomings in the Hite report, such as the measure of mining activity for each site to confirm that the sites were indeed active, accounting for nearby major urban areas and highways, and the inclusion all mining sites, from sand and gravel pits, to bedrock quarries. Based on a hedonic pricing model, the author found that gravel pits and quarries have no effect on nearby property values. Additionally, the author found that within close proximity (0.3 miles) to aggregate sites there is a significant positive price effect. The author also found no significant effects within the subsample of high activity of aggregate sites. | No negative impact found | Not Relevant: Focused on impacts of rock quarry on residential property as preceding use |

| Name of Study / Year Published | Author(s) / Study Sponsor | Location / Mining Type (Quarry/Alluvial) | Summary | Conclusion of Study | Relevance for Yolo County |
|---|---|---|---|---|---|
| Quarry Operations and Property Values: Revisiting Old and Investigating New Empirical Evidence<br><br>Published 2018 | Authored by: George S. Ford, R. Alan Seals<br><br>Sponsored by: Phoenix Center for Advanced Legal and Economic Policy Studies | Gurley, Alabama and Madera County, California<br><br>Quarry Mining | This paper revisited previous empirical methods used to investigate the causal relationship between property values and property distance from quarries, mainly refuting the study performed by Professor Diane Hite. The paper replicated the location and methods used in the Hite report and found, contrary to what was reported in the Hite report, a reduction in property prices as the distance from the quarry increased. This paper also delved further into estimating timing and placement of a mine site by using a difference-in-difference estimation strategy. The paper analyzed two quarry operations in 1) Gurley, Alabama to observe before and after operations impact and 2) Madera County, California to observe before and after local debate (anticipatory effect) of a quarry on property values. Neither exercise yielded evidence of negative impact on home values. However, the paper included discussion of the involved process of identification of the effect of quarries on property values due to the lack of home price data available. Observing that quarries are, by design, away from residential density and lack of sales data is an issue, among other conceptual and practical issues. | No negative impact found | Not Relevant: Focused on impacts of rock quarry on residential property as preceding use |

| Name of Study / Year Published | Author(s) / Study Sponsor | Location / Mining Type (Quarry/Alluvial) | Summary | Conclusion of Study | Relevance for Yolo County |
|---|---|---|---|---|---|
| Environmental Assessment of Andrada Marble Quarry<br><br>Published 2019 | Authored by: Bureau of Land Management Gila District Tucson Field Office<br><br>Sponsored by: Bureau of Land Management | Red Mountain Mine, AZ<br><br>Quarry Mining | The BLM assessment was prepared as part of a review of an application by Andrada LLC to expand an existing quarry site. The study evaluated project alternatives and potential impacts. Section 3.7 of the assessment evaluated the potential relationship between proximity to the mine site and property value. Based on the assessment's proprietary literature review, BLM assumed three points: 1) the effect of home values is a function of distance to the mine operation, 2) the mine operation began before residential development, thus any effect on the value of homes have been embedded to current home values, and 3) expansion of the mine could negatively affect property values, as it would bring the operation and properties closer together.<br><br>BLM assessed these variables on the fair market value of homes near Red Mountain Mine, AZ, an active quarry in nearby Maricopa County, as compared to those in the vicinity but not located near the mine. The analysis also incorporated the effect of proximity to other amenities, including a golf course, on home values as a means to assess the relative effect of the mining operation. Researchers found that units closest to the golf course in the residential area were valued at $232 per square foot, | No negative impact found | Relevant: Focused on impacts of rock quarry that was in operation prior to delivery of residential units |

| Name of Study / Year Published | Author(s) / Study Sponsor | Location / Mining Type (Quarry/Alluvial) | Summary | Conclusion of Study | Relevance for Yolo County |
|---|---|---|---|---|---|
| | | | while units along the golf course but in close proximity to the mine were valued at $220 per square foot (possibly indicating that there already may be a discount for homes nearest the mine). Homes at the center of the residential area, with no particular proximity to the golf course or the mine, had an average fair market value of $183 per square foot. Based on the finding that distance from the golf course had a greater negative effect on value than proximity to the mine, the research team concluded proximity to the mine had a limited effect on home value, and factors other than mine proximity were more important in determining value of homes within the development. | | |

# APPENDIX B: IMPLAN MODEL DESCRIPTION

To estimate the anticipated economic impacts of deed restrictions, this study uses IMPLAN, a widely used economic modeling software package. Core to the model is an input-output dollar flow table. For a specified region, the input-output table accounts for all dollar flows between different sectors of the economy. Using this information, IMPLAN models the way income is spent and re-spent in other sectors of the economy, generating waves of economic activity and job creation, or so-called "economic multiplier" effects. Once the economic events have been entered into the model, IMPLAN reports the following types of impacts:

- **Direct Impacts.** Direct impacts refer to the set of producer or consumer expenditures applied to the predictive model for impact analysis. It is the amount of spending available to flow through the local economy. IMPLAN then displays how the local economy will then responds to these initial changes. The direct impacts may equal the mount of spending input into the model, depending on a variety of factors. *Note, for the purposes of the above study, BAE excluded the IMPLAN Direct Impact estimate, as better data were available from the County and State to estimate the actual direct impact.*
- **Indirect Impacts.** The indirect impacts refer to the impact of local industries buying goods and services from other local industries. The cycle of spending works its way backward through the supply chain until all money leaks from the local economy, either through imports or by payments to income and taxes.
- **Induced Impacts.** The induced impacts refer to an economy's response to an initial change (direct impact) that occurs through re-spending of income according to household spending patterns. When households earn income, they spend part of that income on goods and services, such as food and healthcare. IMPLAN models households' disposable income spending and distributes it through the local economy.