The Failure of the Rosemont Mine DEIS to Adequately Analyze the Socioeconomic Impacts of the Proposed Mine

Comments on the

Draft Environmental Impact Statement for the Rosemont Copper Project
A Proposed Mining Operation, Coronado National Forest, Pima County Arizona
United States Department of Agriculture
Forest Service
Southwestern Region
MB-R3-05-3
September 2011

Prepared for the
Mountain Empire Action Alliance
Sonoita, Arizona

by

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January 2012

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Executive Summary

The Failure of the Rosemont Mine DEIS to Adequately Analyze the Socioeconomic Impacts of the Proposed Mine

The Coronado National Forest has prepared a Draft Environmental Impact Statement for the Rosemont Copper Project (DEIS.) The proposed open pit copper mine, waste piles, and copper ore processing facilities would be located south of Tucson, Arizona, just north of the Pima- Santa Cruz County line.

This report comments of the socioeconomic section of that DEIS that, in its own words, "evaluates the social and economic effects, both positive and negative, of the construction, operation, and reclamation phases of the [Rosemont copper mining] project." (p. 702)

The primary conclusion that follows from this review of the DEIS socioeconomic analysis is that it systematically exaggerates the economic benefits while just as systematically dismissing or ignoring the economic costs of the Rosemont Mine. As a result of a series of errors in economic analysis, the DEIS describes the Rosemont proposal as having large economic benefits but no or negligible economic costs. Those economic errors include:

i. Ignoring the *economic* role that the landscape amenities of the Greater Tucson area play in supporting local economic wellbeing and vitality.

ii. Treating landscape amenities and their degradation as primarily cultural, social, or aesthetic problems with no significant *economic* implications.

iii. Ignoring or misinterpreting the empirical economic research findings of the U.S. Department of Agriculture Forest Service (USFS) researchers who have documented the important *economic* role that landscape amenities play, including, specifically, in the American desert southwest.

iv. Relying uncritically on economic impact modeling funded by Rosemont and based on Rosemont-specified assumptions and commissioned by a local economic development group. The Coronado National Forest did no economic impact modeling of its own nor did it commission and supervise any economic impact modeling for the DEIS. The USFS did not even inquire about the assumptions and methods used in that outside economic impact modeling before the DEIS embraced it as its own.

v. When during the DEIS comment period the USFS did seek additional information from Applied Economics, Rosemont, and TREO on the assumptions and methods behind the economic impact modeling on which the

DEIS relied, the USFS was not willing to share that information with the public despite repeated requests.

vi. The economic impact modeling on which the DEIS relied explicitly stated that "[t]he potential impacts of the mine on the value of public lands, the tourism industry, air and water quality, wildlife habitat, astronomical observation conditions and recreational and cultural resources are **not** addressed in this analysis."[1] As a result, that economic impact modeling adopted by the DEIS explicitly excluded all of the potential costs associated with the proposed mine while exclusively reporting on its benefits.

vii. The economic impacts of the construction phase of the Rosemont project are exaggerated by a factor of four because the annual jobs and payroll are multiplied by the four- year length of the construction period. The result is an estimate of thousands of new jobs (4,100) rather than hundreds of temporary jobs.

viii. The economic impacts of the projected 20-year period of full production were exaggerated by assuming that most of the supplies needed to operate the mine would be produced by and purchased from local business firms. This led to estimates of indirect impacts that were 3 to 5 times too large. The result was total "multiplier" impacts that were twice as large as appropriate.

ix. The DEIS explicitly assumed that "[e]mployment and output projections [for the Rosemont Mine] will not fluctuate over the life of the project." (p. 704) This is a counter-factual assumption. Throughout the history of copper mining in Arizona and the United States copper mine production and employment have fluctuated substantially over periods as short as ten years or less. This DEIS assumption explicitly assumed away one of the primary economic costs associated with metal mining, the instability and disruption it brings to local employment and payroll. The net result, again, is to exaggerate the local economic benefits by assuming they will be more stable than can reasonably be expected and, as a result, higher levels of employment and payroll over time.

x. The DEIS understated the size of the visitor economy that could be negatively impacted by degrading the landscape amenities in the Greater Tucson region by focusing primarily on:
    a. a small area in the immediate vicinity of the mine,
    b. people engaged in recreation <u>on</u> Coronado National Forest land,
    c. people engaged in active recreation as opposed to other types of visitors to the Greater Tucson area.

[1] "Economic Impacts of the Rosemont Copper Project on Pima County, Arizona," Applied Economics, June 2011, p. 1. Emphasis added. The DEIS quotes this warning statement on page 700 when listing this economic study along with other economic studies that were available but does not repeat the warning when 37 pages later it adopted the Applied Economics economic impact results as its own.

xi. The DEIS understates the impact of the Rosemont mine on the visitor economy by assuming that there are perfect substitutes in the area for any landscape values degraded by the Rosemont open pit mine, extended waste rock piles, scenic highway congested by mine haul vehicles, and general industrialization of the landscape.

xii. The DEIS dismisses the negative impacts of the mine on the visitor economy and amenity-supported economic development as "not substantial" (p. 736) or "negligible" (pp. 718 and 745). At the same time it characterizes the positive local economic impacts of the mine as "quite modest" (p. 740). The DEIS, however, never places the "quite modest" positive economic impacts in the same context as the "not substantial" negative economic impacts to determine the extent to which one might cancel out the other. The result is that the DEIS emphasizes and, in the process, exaggerates the positive economic impacts despite their small size relative to the overall economy.

xiii. The DEIS ignores the fact that the negative economic impacts of the Rosemont Mine do not have to actually reduce the employment or payroll associated with the visitor economy or amenity-supported in-migration of people and businesses. Very small reductions in the *growth* of these sources of local economic vitality because the natural landscape amenities in the Greater Tucson area have been degraded and it is not as attractive a place to live, work, and do business as it had been, can have negative economic impacts over time that are larger than the positive economic impacts associated with the proposed mine.

xiv. The DEIS characterizes the negative economic impacts of the Rosemont Mine due to its impact on the visitor economy as being "speculative…difficult to predict and quantify." (p. 744.) Alternatively it characterizes the impact on the visitor economy as having "no measurable impacts." (pp. 736, 740, 741) Yet the DEIS confidently predicts the level of copper production and its impacts on employment and payroll 23 years into the future in its positive economic impact analysis. Predicting future employment down to the job and payroll down to the dollar 23 years in the future not just for the mine itself but also for the indirect and induced impacts throughout the Pima County economy is also "speculative," to say the least, as well as "difficult to predict and quantify." Yet the DEIS is willing to speculate on the positive impacts but dismisses potential negative impacts *because* they might be "speculative" or "difficult to predict or quantify." This clearly represents a bias that emphasizes positive economic impacts while dismissing negative economic impacts.

"Difficult to predict and quantify" or "measure" is not an excuse in an environmental impact statement to ignore or dismiss impacts. Impacts, including economic impacts, can be described and evaluated in whatever terms or metrics are available rather than ignoring or trivializing them *because* they are not easily predicted, measured, or quantified.

U.S. Department of Agriculture and Forest Service economic research has demonstrated the *economic* importance of landscape amenities to local economic vitality. That research has also warned about the negative consequences on local economic vitality and wellbeing associated with commercial development that damages or degrades those landscape amenities. That knowledge developed, over the last several decades, not only by USDA and USFS but many other economists, should serve as part of the foundation for any socioeconomic impact analysis written by the U.S. Forest Service.

If the exaggerations associated with the DEIS's modeling of the economic impacts of the Rosemont Mine are eliminated and the instability in copper mining production and employment are taken into account, the positive economic impacts associated with the proposed mine would be only a quarter to a third of what the DEIS projects.

If the economic analysis of the Rosemont Mine took into account amenity-supported economic development and eliminated the bias in the DEIS socioeconomic analysis, a quite different picture of the local economic impacts of the proposed Rosemont Mine would be clear: It is highly likely that the "relatively modest" positive economic impacts of the Rosemont mine will be completely offset by equally modest negative impacts on the visitor economy and amenity supported in-migration. For that reason, it is also highly likely that the Rosemont Mine would, overall, damage the economic vitality and the economic well-being of the Greater Tucson area.

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I. The Failure of the DEIS to Accurately Describe the Existing Economy and the Socioeconomic Impacts of the Rosemont Project

1. Failure to Describe the Economic Role of the Natural Landscapes in the Greater Tucson Area

The socioeconomic section of the DEIS (pp. 699-753) provides a reasonable statement of its objective: "The analysis for socioeconomics evaluates the social and economic effects, both positive and negative, of the construction, operation, and reclamation phases of the [Rosemont] project." (p. 702) To prepare for the discussion of the Rosemont Project's social and economic effects, the DEIS first describes current social and economic conditions and the affected social and economic environment (pp. 706-735). The DEIS then discusses the social and economic environmental consequences (pp. 735-753).

Unfortunately, the DEIS provides neither an accurate description of the existing economy nor an accurate projection of the socioeconomic consequences of the Rosemont Project.

1. Failure to Describe the Economic Role of the Natural Landscapes in the Greater Tucson Area

The very last paragraph in the DEIS's discussion of existing socioeconomic conditions lays out the "existing conditions" when it comes to the natural landscape that would be irretrievably degraded by the Rosemont Mine:

> As discussed above, people are drawn to the Coronado National Forest because of the unique ecology, scenery, scenic driving, relaxing, and hiking and camping opportunities. Landscape appearance and scenery can be important public land amenities, not just as recreation opportunity settings, but also as elements of the region's identity. *Regional economic development is also increasingly dependent on the environmental and ecological amenities associated with the Coronado National Forest specifically, and public lands in general.* Factors such as clean air and water quality, scenery and natural landscape, open space, dark skies, and the number of recreation opportunities can be economic assets themselves for local economies. (p. 732, emphasis added)

Found at the very end of the description of the existing socioeconomic conditions, this is the only mention or discussion of the role that protected natural landscapes can play in supporting regional economic development. Instead of this statement being made at the beginning of the description of the existing socioeconomic conditions that the Rosemont

Mine would alter, it is made at the end after almost 30 pages that largely suggest that protected natural landscapes play little or no **economic** role. Instead natural landscapes are primarily described in cultural and aesthetic terms and linked to the economy primarily through the spending of recreationists. Even in describing *that* particular economic link between natural landscapes and the local economy, the focus is often so narrow as to suggest that this too is a relatively trivial link between the region's natural landscapes and the economy. The result is a seriously inaccurate depiction of the existing socioeconomic conditions that will be impacted by the Rosemont Mine.

This failure is not the result of the U.S. Forest Service (USFS) not having access to studies documenting the positive role that protected natural landscapes can play in supporting local economic vitality. The State of Arizona's Office of Tourism annually funds studies of the role of visitors in the Pima, Santa Cruz, and Cochise County economies.[2] More directly to the point, the USFS and its parent agency, the U.S. Department of Agriculture (USDA) have been the source of much of the economic research over the last several decades documenting the reality of "amenity-supported local economic development." In fact, the DEIS cited two recent published studies of the role of forest lands in supporting local economies in Arizona and New Mexico (p. 725). One was titled "Intra-regional amenities, wages, and home prices: The role of forests in the Southwest." The title of the other was "Forest amenities and location choice in the Southwest.[3]

These studies were carried out through one of the USFS's own research agencies, the Rocky Mountain Research Station and one of the USDA's primary economic research organizations, the Economic Research Service.

The DEIS interpreted these articles as primarily providing information on what influenced property values in the study area. The first use of these studies in the DEIS was in a section labeled "Property Value and Forest Resources" (p. 725). The second use was in a section titled "Property Value" (pp. 742-744). The DEIS treated these USFS-supported studies as if they were discussing appraisal tools for determining local property values: " …these same [forest] amenity characteristics, along with a variety of other characteristics (location, area land and housing prices, area wages, number of bedrooms, bathrooms, etc.), can also influence where people live (migration) and property values (Hand et al. 2008b)" (p. 725)

This is a gross misrepresentation of these studies and their results. Although the studies did discuss the impact of the presence of forest lands on local wages and property values, this was done to document and quantify the economic importance of the natural

[2] The DEIS cited one of these studies: DEIS p. 726 in the Recreation and Tourism section cites the Dean Runyan Associates Arizona Travel Impacts 1998-2007p study released in June of 2008. The most recent of these studies was released in June 2011, Arizona Travel Impacts 1998-2010p, http://www.azot.gov/system/files/410/original/AZ%20Tourism%20Imp10p%20FINAL.pdf?1310693693

[3] Hand, M. S., J.A. Thatcher, D.W. McCollum, and R.P. Berrens. 2008. "Intra-Regional Amenities, Wages, and Home Prices: The Role of Forest in the Southwest," ***Land Economics*** 84(4)635-651 and "Forest Amenities and Location Choice in the Southwest," ***Journal of Agricultural and Resource Economics*** 33(2):232-253.

amenities associated with the forest to residents and local economic vitality. These USFS-sponsored studies that the DEIS cites documented the fact that the forest lands and their natural amenities provided a valuable "second paycheck" to residents that supplemented residents' monetary paychecks. As one of the articles stated in its "Introduction":

> "As traditional resource extraction has become relatively less important in regional economies of the American West, the amenity value of forests and other natural features have received more attention. Instead of seeking out areas that, for example, hold the promise of a large paycheck from logging or mining jobs, migrants may seek out areas that offer a large so-called 'second paycheck' derived from the value of the natural landscape. This economic behavior can have observable effects in the markets for housing and labor." (p. 635, Intra-Regional Amenities)

That article included in its "Conclusions" the following:

> "As mentioned in the introduction, the role of forests in the regional economy can have implications for rural development policy and non-market valuation within the region. One conclusion from the results is that a portion of the wage gap between urban areas and forested rural areas is due to compensating differentials for forests. That is, the second paycheck represented by forests is offsetting a reduced first paycheck from money income in amenable locations. Economic development policies that do not recognize the role of forest amenities in the region's wage structure may not be effective, ***particularly if the policies involve development of the resources that generate the second paycheck.*** Put another way, the development or preservation of natural resources 'has less to do with the kinds of jobs that result than with the social and environmental amenities created or destroyed in the process,' (Power and Barrett 2001, 18)[4]. The results presented here appear to confirm this view of economic development policies." (p. 648, Intra-Regional Amenities, emphasis and footnote added).

Note the emphasis on the role of natural amenities on local economic development rather than on establishing the appraisal value of property. Note also the supporting citation to a book co-authored by one of the authors of the present comments on the Rosemont Project DEIS.

The connection between *local* forest and landscape amenities and *regional* economic development was emphasized in this study by Hand et al. on Regional Amenities. The study also found that forests at some distance from a person's work and residence were still valuable amenities. That is, it was not only forests adjacent to a person's residence

[4] The citation is to Thomas Michael Power and Richard N. Barrett, ***Post-Cowboy Economics: Pay and Prosperity in the New American West***, (Washington DC: Island Press), 2001.

that were economically valuable to households. The value of forest amenities had broad regional impacts on location decisions. As the study pointed out:[5]

> Schmidt and Courant (2006) found that the proximity of forest (and other "nice places") near to urban areas is associated with lower wages; people don't need forest in their backyard to accept lower wages, as long as forests are "close enough."

The "lower wages" in this quote and the higher housing costs mentioned elsewhere in the article are a measure of the sacrifice that in-migrants are willing to make to gain access to those landscape amenities. Just as it is the broad set of landscape amenities within commuting distance that attracts and holds new residents and the economic activity associated with them, damage to that broad set of landscape amenities will have negative impacts on the attractiveness of the same broad geographic area such as the Greater Tucson Area and its future economic vitality.

The other Hand et al. study from USFS and USDA researchers mentioned above and cited by the DEIS also laid out the public policy implication of the study results in its "Introduction":

> "The importance of natural characteristics to regional location decisions is policy relevant…The effects of changes in local forest characteristics on population movements, and the social and economic consequences of those movements, may be information the regional teams would want to consider. (p. 233, Forest Amenities and Location Choice)

The "Conclusions" of that other Hand et al. study included:

> "An implication of the results is that the attractiveness of forests and other natural characteristics is policy relevant. This relevance stems from the fact that forests are not uniformly distributed across the landscape, and policies affecting the supply of forest may not have a spatially uniform impact. ***For example, if a policy reduces the supply of natural amenities in one location, other locations begin to look relatively more attractive to residents (although the region as a whole would look less attractive than other areas of the country).***
>
> This raises at least two policy issues in a regional context. First, locations in the Southwest, where the supply of amenities may be upwardly bounded, may ***need to view preservation as an important economic development policy. Protecting amenities already in place may buttress a steady influx of human resources to those locations***…" (p. 251, Forest Amenities and Location Choice, emphasis added)

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[5] Ibid. p. 647. The "good enough" comes from the Schmidt and Courant study title: "Sometimes Close in Good Enough: The Value of Nearby Environmental Amenities," Schmidt, Lucie, and Paul N. Courant. 2006. **Journal of Regional Science** *46 (December): 931-51.*

These studies, cited by the DEIS in support if its socioeconomic analysis, were providing a warning that the commercial development of National Forest lands in a way that damaged the natural amenities those lands provided, could damage the local economy, leading to both lower levels of economic development and lower levels of economic well-being for residents. This perspective and warning were simply ignored by the DEIS socioeconomic analysis except for the brief assertion made at the very end of the description of the existing economy of the study area (DEIS p. 732) quoted above.

These studies underlined a very important element of any complete and accurate approach to describing the Greater Tucson Area economy and how the Rosemont Project is likely to impact that economy. Focused as these studies were on Arizona and New Mexico and coauthored by USFS and USDA researchers, it was all the more important for the DEIS to have incorporated these studies' approach to analyzing the existing economy and the impact of a large open pit copper mine on that economy. The DEIS failed to do so. This is a serious error. It means that the DEIS, instead of providing the public and public decision makers with an accurate description of the forces driving the existing local economy and the likely economic impacts of degrading the regional natural landscape amenities, at best misinterpreted those studies and provided an incomplete and misleading socioeconomic analysis

The two Hand et al. 2008 studies quoted and discussed above and cited by the DEIS were not reporting on new or unusual results and policy implications. As mentioned above, the USFS and USDA have been analyzing and quantifying the *economic* role of landscape amenities on regional economies and well-being for several decades.[6]

David A. McGranahan, a researcher with the USDA Economic Research Service, published a research report in 1999 entitled "Natural Amenities Drive Rural Population Change."[7] In that report he described a natural amenities index that he developed and demonstrated that it explained much of the county population change in the United States between 1970 and 1996. He also found that employment change was highly related to natural amenities. More recently Dr. McGranahan has authored a summary of economic research entitled "Forestland a Big Draw for Rural Living."[8] This summary of research results reinforces the conclusions of the two Hand et al. (2008) studies to which the DEIS referred but misinterpreted. Also in 2009 Dr. McGranahan published an article in ***Amber Waves***, the journal reporting USDA's Economic Research Service's findings, entitled "Scenic Landscapes Enhance Rural Growth."[9] This was a summary of

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[6] In what follows, the comments will focus on the regional economic role of landscape amenities. This is the focus because the Rosemont Mine represents a significant degradation in the quality of landscape amenities in the Greater Tucson Area. The intent is not to suggest that the *only* thing influencing that regional economy is the high quality natural landscape and the environmental services it provides. This is just one of the important economic forces supporting local economic vitality and well-being, but one threatened by the Rosemont Mine that was not dealt with in the DEIS.

[7] Agricultural Economic Report (AER) No. 781, October 1999

[8] In "An Illustrated Guide to Research Findings from USDA's Economic Research Service," EIB-46 (April 2009).

[9] June 2009. http://www.ers.usda.gov/AmberWaves/June09/Findings/ScenicLandscapes.htm

a study published in ***Landscape and Urban Planning*** entitled "Landscape Influence on Recent Rural Migration in the U.S."[10] That study found that recent nonmetropolitan migration in the U.S. was driven by landscape preferences: People have been most drawn to areas with a mix of forest and open land, water area, topographical variation, and relatively little cropland. Such landscape features influenced migration directly, not through effects on employment. Note, again, the USDA research findings documenting the role of forestland amenities in attracting in-migrants.

Twelve years ago the Economic Research Service of the U.S. Department of Agriculture published a special edition of ***Rural Development Perspectives*** on the rapid growth in population in the rural counties of the Mountain West including Arizona. That growth attracted the attention of analysts because it could not be explained by the Mountain West's traditional land-based activities of farming, ranching, forest products, and mineral extraction, all of which were in relative or absolute decline. These USDA studies were focused on the non-metropolitan West, where one might expect these traditional land-based economic activities would dominate. The titles of the studies indicated the common theme: "Amenities Increasingly Draw People to the Rural West." "Quality of Life, Nontraditional Income and Economic Growth: New Development Opportunities for the Rural West," "Wildlife Conservation and Economic Development in the West," and "Jobs Follow People in the Rocky Mountain West."[11]

Also in 1999 the USFS Rocky Mountain Research Station, the USDA, and the University of Montana School of Forestry sponsored a conference on "Wilderness Science in a Time of Change." The proceedings of that conference were edited and published as a technical report by the USFS.[12] That multi-volume report included studies of "The Impact of Wilderness and Other Wildlands on Local Economies and Regional Development Trends," "Population Growth, Economic Security, and Cultural Change in Wilderness Counties," "Wildland Economics: Theory and Practice," and "Windfalls for Wilderness: Land Protection and Land Value in the Green Mountains."[13]

The USFS has long recognized the importance of natural landscapes and scenic beauty associated with National Forest lands to residents and visitors. The USFS has devoted considerable research effort over the last forty years, seeking to quantify in some objective way the quality of the scenic landscape associated with the lands the USFS manages. Understanding that would put the USFS in a better position to understand the likely impacts of land management decisions in terms of the degree of degradation of landscape values. In 1968 the Pacific Southwest Forest and Range Experiment

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[10] 85 (2008): 228-240.

[11] See the special issue of ***Rural Development Perspectives*** on the rural West, 14(2), August 1999, USDA, Economic Research Service.

[12] Cole, David N.; McCool, Stephen F., Freimund, Wayne A., O'Loughlin, Jennifer, comps. 2000. ***Wilderness Scenic in a Time of Change Conference*** Proceedings RMRS-P-15-VOL-1 through VOL-5. Ogden, UT: S.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. http://www.wilderness.net/library/documents/science1999/index.htm

[13] See table of contents via the link in the previous footnote. The authors of the studies mentioned were Gundars Rudzitis-Rebecca Johnson, John B. Loomis, Paul A. Lorah, Pete Morton, and Spencer Phillips, respectively.

Station issued a research paper on "Forest landscape description and inventories: a Basis for Planning and Design."[14] In 1974 the Forest Service developed a "Visual Management System" to be used by all National Forests.[15] In 1976 a research paper discussed "Measuring Landscape Aesthetics: The Scenic Beauty Estimation Method."[16] Broader efforts at "Assessing Amenity Resource Values" followed[17], including efforts at "Setting Technical Standards for Visual Impact Assessment Procedures." [18] Research continued over two more decades, leading to the development of a new landscape assessment method promulgated by the USFS in 1995: ***Landscape Aesthetics: A Handbook for Scenery Management."*** [19] Clearly the USFS has a long commitment to evaluating the scenic characteristics of the lands it manages and developing tools to understand the impacts of management activities and mitigating them.

It also has not just been the USFS and USDA researchers who have recognized the importance of local amenities in determining the migration of both people and economic activity across the United States. That recognition that location choice based on site-specific qualities was an important force driving the redistribution of economic activity and the economic vitality of communities was also not something recently identified by economists. Since the mid-1950s economists have emphasized the importance of residential location decisions as a powerful economic force. They focused on the role of local environmental "amenities" such as climate and natural landscapes in the settlement of the desert Southwest (including Arizona, New Mexico, and Southern California), Florida, and the Pacific Northwest.[20] Tiebout underlined the fact that people "shop around" for the social amenities produced by different levels of local government taxation and different public spending patterns such as on schools, parks, and roads.[21] In 1964 Borts and Stein argued that in a mobile, open economy, it would be an area's ability to attract and hold a labor force without bidding up labor costs that would determine the geographic distribution of economic activity.[22] Attractive local amenities draw workers to an area allowing firms to obtain the skilled labor they need without having to bid up wages.

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[14]Litton, R.B. 1968. USDS Forest Service Research Paper DSW.49.

[15] ***National Forest Landscape Management***, Vol. 2, The Visual Management System, Agricultural Handbook 462. US Government Printing Office, Washington, DC (Chapter 1).

[16] Daniel, T.C. Boster, R.S. 1976. WSDA Forest Service Research Paper RM-167. Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO.

[17] Daniel, T.C., Zube, E.H., Driver, B. (Eds.) 1979. USDA Forest Service General Technical Report RM-68. Rocky Mountain Forest and Range Experiment Station. Fort Collins, CO.

[18] Craik, K.H., Feimer, N.R. 1979. In Elsner, G., G., Smardon, R. (Eds.), ***Proceedings of Our National Landscape," Pacific Southwest Forest and Range Experiment Station, Berkeley CA.***

[19] Agriculture Handbook No. 701, USDS Forest Service, Washington, DC, 1995.

[20] Ullman, Edward, 1954, "Amenities As a Factor in Regional Growth, ***Geographic Review***, 44(1):119-132

[21] Tiebout, Charles, 1956, "A Pure Theory of Local Expenditures, ***Journal of Political Economy***, 64(2):160-164.

[22] Borts, G.H., and J.L. Stein, 1964, ***Economic Growth in a Free Market***, New York: Columbia University Press

A 2010 review study of the explanations that have been given for the redistribution of population and economic activity across the United States since 1950 concluded:[23]

> "The results show that amenity-led growth has taken what was once the periphery that faced with extreme remoteness or extreme historical baggage into 50 years of robust growth….the American landscape was being transformed from one where economic activity was virtually the sole driver of regional dynamics to one where natural amenities would become a major determinant." (p. 532)

> "The evidence is fairly clear that since the middle of the twentieth century, there has been a massive deconcentration out of the traditional American core of the Great Lakes states and the Northeast to what was the periphery of the country in the South, Southwest, and Rocky Mountain region…growth patterns have been very consistent with amenity-led migration to places endowed with high levels of natural amenities such as nice climates, pleasant landscapes, lakes, oceans and mountains…Amenity migration has led to a fundamental transformation of American geography." (p. 533)

These economic forces that are tied to local amenities that draw new residents, new firms, and the economic activity associated with them have transformed the Arizona economy in general and the Greater Tucson Area in particular along with many other parts of the nation's economic geography. That amenity-supported local economic development helps to explain the above average economic performance of the Mountain West, including Arizona, as well as in the Southeast and the Pacific Northwest over the last two decades before the Great Recession struck.[24]

The 2006 ***Tucson Economic Blueprint*** produced for the Tucson Regional Economic Opportunities (TREO) recognized the regions landscape amenities as among the region's "highest ranking…economic development strengths." [25] After listing Tucson's two public institutions of higher education and Tucson's proximity to Mexico and the cultural diversity that results from that, the next highest ranking economic development strengths were "Tucson region's current image as a place for leisure, recreation, and entertainment," "Recreational and entertainment resources within the region," and the "Tucson region's current image as a place to live." Each of these, of course, goes beyond just the region's landscape amenities, but they clearly are included among the region's "highest ranking economic development strengths." This is one of the reasons that the Pima County Board of Supervisors, the City of Tucson, and the Tohono O'Odham Nation have actively opposed the Rosemont Mine.[26]

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[23]Mark D. Partridge, "The Dueling Models: NEG Vs Amenity Migration in Explaining US Engines of Growth" 2010, ***Papers in Regional Science,*** 89(3): 513-536.

[24] Thomas M. Power and Richard Barrett, ***Post Cowboy Economics: Pay and Prosperity in the New American*** West, Island Press, Spring 2000.

[25] Strategic Analysis Report, December 27, 2006, by the KMK Consulting, p. 29.

[26] **Pima County**: "Resolution of the Pima County Board of Supervisors Opposing the Proposed Rosemont Mine", Resolution No. 2007-15, Passed January 16, 2007.**City of Tucson**; "Memorial Relating to the City

The DEIS effectively ignores this powerful set of economic forces by discussing the landscape amenities associated with the Coronado National Forest and other public lands surrounding the Greater Tucson Area in *non-economic* terms. There *are* important non-economic, cultural, social, aesthetic, and ethical aspects to these landscape amenities. But there are also important economic aspects that should have been central to the discussion of the existing economy and the local economic effects of the proposed Rosemont Mine.

Because the Rosemont Mine would seriously and permanently degrade important landscape amenities and because those landscape amenities have been one of the most important sources of economic vitality in the Greater Tucson Area, this is a fatal economic error in the DEIS. Instead of informing the public and public decision makers of these threats to local economic vitality associated with the Rosemont Mine so that the public can comment in an informed way on the proposed Rosemont Mine, the DEIS provides an incomplete and misleading analysis of the socioeconomic environment and the likely changes in it associated with the proposed mine..

2. The DEIS's Treatment of Landscape Amenities and Quality of Life as Largely Social, Cultural, and Aesthetic in Character Rather Than Economic

The flaw in the DEIS is not that it does not mention the recreation opportunities, the scenic beauty, and the quality of life. It *does* discuss these many times, but almost never as, among other things, important aspects of the *economy.* The DEIS's discussions of these important amenities also tends to minimize their importance even from a non-economic point of view.

Typical of the DEIS's handling of the environmental amenities of the Greater Tucson Region is the section (p. 725, "Property Value and Forest Resources") in which it introduces the two economic studies by Hand et al. discussed above. In that discussion the words "economic" or "economic development" never appear. Instead the DEIS mentioned that "environmental amenities…contribute to the region's identity, as well as area quality of life….these same amenity characteristics can also influence where people live (migration) and property values (Hand et al. 2008b)" The decision as to where to live is presented in a real estate sales setting of individual choice based on things like the "number of bedrooms, bathrooms, etc."

Clearly the number of bedrooms and bathrooms in individual houses is not a force that drives local economic development. It simply affects who buys which house and what

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of Tucson's Opposition to the Proposed Rosemont Mine", Passed, Adopted, and Approved by the Mayor and Council, February 6, 2007. **Tohono O'Odham Nation**: "Resolution of the Tohono O'Odham Legislative Council Opposing the Proposed Rosemont Copper Project", Resolution No. 09-569. Passed October 22, 2009.

price is paid for different types of housing. That is an *individual* decision with few regional economic implications. As a result of shifting to this individual framework and away from the Hand et al. regional economic framework, this section of the DEIS concludes that "the existence of an open-pit copper mine could result in negative impacts on values to neighboring properties." Note that this is, again, an individual problem for what the DEIS will later suggest will be only about a dozen households. The broader issues of the regional economic damage done by permanently degrading the area's landscape amenities, is never broached even though *that* was the concern expressed by the Hand et al. studies.

The DEIS also suggests that we do not really know what it is that people value about forested landscapes: "…the specific characteristics of the forest amenities that are influential is [sic] unknown…is it open space, recreation opportunities, or wildlife habitat that is attractive to people...?" (p. 725) The answer, of course, is "all of the above." The specific answer in the context of this DEIS is that an open-pit copper mine would damage all of these. Because of that, we can draw important economic conclusions without specifically allocating those costs to particular qualities of life in the area that would be damaged.

Another example of the DEIS's handling of the issue of local quality of life as it may be affected by the proposed mine is the section on page 729 labeled "Quality of Life" but which leads off with an outline that appears to be far off the mark of what most people mean when discussing quality of life: "The analysis area has a diverse population, economy, housing, land use, and natural features that are supported by an infrastructure of facilities and services." That section then goes on to discuss "Public Facilities and Services," "Transportation and Road Maintenance" which are certainly important to discuss but it is not clear they are the lead indicators of local quality of life.

This section does get around to discussing "Community Values and Social Trends" (p. 730) and "Social Benefits of Amenities on the Coronado National Forest." (p.731) Note that *economic* trends and *economic* benefits of quality of life and landscape amenities are <u>not</u> included in the headings.

The Community Values and Social Trends section focuses on the transition in the economy from natural resources (e.g. ranching and mining) to more tourism and amenity based economies and lifestyles. The DEIS explicitly says that: "The local economy near the proposed mine and rural areas of Pima, Cochise, and Santa Cruz Counties is typical of the changing economy of the West as people move to these rural areas to live, work, and play." (p. 730) These people value "quality of life" and "environmental amenities such as clean air and water and recreation opportunities." Also: "Communities in the area, such as Sonoita and Elgin, benefit from proximity to public lands." This <u>is</u> important information about the changes in community values and social trends. What is missing is a discussion of the economic development implications of this, i.e. what does this say about the role of recreation opportunities, quality of life, and environmental amenities as sources of new jobs and income and overall economic

vitality and prosperity? This is not just a social or values trend. It is also a powerful economic force.

The next section of the DEIS focuses on the ***Social*** Benefits of Amenities on the Coronado National Forest (p. 732). Note the lack of mention of the ***economic*** benefits of those landscape amenities. This is not to suggest that social benefits should be ignored. The point is that the economic benefits should not have been ignored given the powerful role they have played in the economic development of the region.

The focus on the *social* aspects is clear:

> "Environmental amenities…contribute to the region's identity, as well as area quality of life…regional population growth has brought on significant changes in the local and regional quality of life over the past 2 decades; extensive population growth has driven changes (increases) in demand for forest resources. The region is shifting from a solely commodity based lifestyle toward a more recreation and tourism based way of life."
>
> "Communities adjacent to Coronado National Forest lands have a strong sense of place tied to the forest, specifically to the recreational opportunities of the forest. Environmental amenities that attract tourists are also appealing to area residents." (p. 732)

This focus on the social aspects of the changes taking place in the surrounding region is appropriate and important. In both of these two sections of the DEIS there is a hint of concern that the growth in population pursuing these landscape amenities may have negative consequences for both residents and the quality of the landscape amenities as population and active use of the landscape increases. These are potential costs associated with amenity-driven local economic development. But to deal with them, one has to first admit that this economic dynamic is playing an important role in transforming the local economy. The DEIS fails to do that except, as mentioned above, indirectly in the last two sentences of this DEIS discussion of the existing economic conditions (p. 732).

This exclusively "social," i.e. non-economic, characterization of quality of life concerns continues in the DEIS's discussion of the socioeconomic consequences of the Rosemont Mine (pp. 735-739). If the mine is not built (No Action Alternative): "In terms of quality of life, specifically "Community Values and Social Trends" and Social Benefits of Amenities"…there would be no change in the natural amenities and environmental quality that area residents treasure. Environmental amenities that contribute to the region's identity and area quality of life would remain untouched, and the rural landscape would be preserved (p. 736)." Note the emphasis on "regional identity" and the natural world that "residents treasure." This is appropriate and important to recognize, but in an economic analysis it is also important to recognize that quality of

life and its various components are also powerful **economic** forces, not just social, cultural, or "aesthetic" interests.

The DEIS explains how it calculated the economic effects of the Rosemont Mine in the following terms: "The economic impacts…of the project were estimated by using regional economic modeling, or more specifically, by using IMPLAN (Applied Economic 2011). These types of regional economic modeling are standard approaches…providing an estimate of the ripple effects in an economy associated with a direct stimulus or investment (p. 737)." For readers who do not recall the first citation to Applied Economics thirty-seven pages earlier, this statement might be read to suggest that the USFS hired a consulting firm to carry out IMPLAN modeling of the economic impacts under USFS supervision as it did with other sections of the DEIS. But that is not the case, as mentioned on page 700 of the DEIS, The Applied Economic IMPLAN modeling was paid for by Rosemont and commissioned by Tucson Regional Economic Opportunities, a regional economic development organization. Rosemont provided the basic inputs around which the IMPLAN modeling was carried out. The USFS did not commission, pay for, or supervise that economic modeling. When the USFS wrote the DEIS it also did not have access to the Rosemont inputs or the approach to modeling that Applied Economics took.

Even more important, where the DEIS reveals that it will rely on the Rosemont/Treo IMPLAN modeling on p. 737, it does not repeat its earlier warning about the limitations of this report and its use of this report: "The potential impacts of the mine on the value of public lands, the tourism industry, air and water quality, wildlife habitat, astronomical observation conditions, and recreation and cultural resources ***were not addressed in this report*** (p. 700, emphasis added)."

Instead, as the DEIS begins its discussion of the economic effects of the Rosemont Mine, the DEIS presents the Applied Economics IMPLAN modeling as an adequate way of estimating all of the economic effects of the mine with no qualifications. It does not repeat the warning about the potential economic effects of the mine that were left out of the Applied Economic report. In effect, the DEIS, without warning or explanation, adopted an approach to modeling the economic effects of the Rosemont Mine that focused exclusively on the economic benefits of the mine and ignored the major public concerns about the economic costs of the mine. An economic analysis that focuses only on benefits and ignores the costs is a biased and fatally flawed economic analysis.

The treatment of quality of life in the socioeconomic effects section of the DEIS is focused on the social and individual impacts. The DEIS says that any degradation in the natural landscapes surrounding the Greater Tucson Area "would have the potential to decrease the public investment value of the [public] lands as well as the sense of place that these public lands provide to residents and visitors (pp. 747-8)." There might be negative changes in the quality of life for those living close to the mine: the mine "could dramatically change community well-being and sense of place…(p. 748). "…the mine could lead to a change in the nearby communities' self-perception, from identifying with an area that is rural and moderately developed to identifying with a place shaped by

industry and mining (p. 748). Such a "shift from this [undeveloped] landscape expectation to a more industrialized landscape would negatively impact local residents who are seeking a rural residential community…a real or perceived decline in local environmental quality would likely impact community values and well being, and could also reduce the demand for living in or visiting the area (p. 749)".

Note the emphasis on individual location decisions and on sense of place, community self-perception, landscape expectations, and community values. The DEIS does not deal with the potential negative impact on the *economic vitality* of the area because it has become a less attractive place to live and operate a business. The positive economic effects of building and operating the mine are emphasized while most of the negative *economic* impacts associated with a degraded natural landscape are implicitly ignored by treating them as largely social, cultural, and personal (subjective) and not economic.

This separation of the landscape amenities and qualities of life from *economic* impacts is built into the structure of the DEIS's socioeconomic analysis. Consider the "Environmental Consequences" section (pp. 735-753). It works through changes in population and demographics, housing, employment, income characteristics, economic activity, and taxes and revenues, before getting to recreation and tourism, quality of life conditions, and the **social** benefits of amenities.

The discussion of the economic effects of the Rosemont mine on population, housing, employment, income, economic activity, and taxes and revenues are all carried out solely in terms of the positive economic impacts associated with the proposed mine. Applied Economics' modeling of Rosemont's economic effects was exclusively used by the DEIS for its economic impact analysis despite both Applied Economics and the DEIS having explicitly stated that that modeling excluded the potential economic costs associated with environmental damages associated with the mine (DEIS p. 700 and Applied Economics, p. 1). Despite this one-sided focus on benefits to the exclusion of costs, this was the modeling that the DEIS used to measure "[t]he economic impacts of…the [Rosemont] project." (p. 736)

The DEIS says that this modeling is "measuring the production and consumption linkages in an economy between households, industries, and institutions (such as government), thus providing an estimate of the ripple effects in an economy associated with a direct stimulus or investment." (DEIS p. 737) Note the emphasis on the positive side: "stimulus" and "investment." Only the *positive* economic impacts associated with the mine are to be modeled and reported. The degradation or destruction of natural capital (landscape amenities) and the depression of economic activity in other sectors was not modeled. The DEIS does not seek to use the same tools to trace the direct, indirect, and induced negative economic impacts of the mine. Its study of "employment," "income," "economic activity," and "taxes and revenues" is entirely limited to the positive impacts associated with the Rosemont Mine.

Then, after the economic analysis (employment, income, economic activity, taxes and revenue) had been carried out entirely in positive terms, the "environmental consequences" section turned to recreation and tourism, quality of life, and amenities (pp. 744-749). The DEIS does not discuss any of these in terms of employment, income, economic activity, taxes and revenues, suggesting that recreation, tourism, quality of life, and amenities are not as "economic" in character as the Rosemont Mine is. This is a fatal error. As discussed above, the landscape amenities surrounding the Greater Tucson Area have been powerful economic engines supporting the region's economic vitality. The negative impacts on those landscape amenities on the regional economy should have been treated in a parallel way in the DEIS.

The explanation the DEIS provides for this asymmetric treatment is that the impacts on recreation and tourism are unknown: "…placing a number on the amount of visitors who would choose not to come to the area as a result of the mine would be speculative." "The extent to which visitor use and associated spending…or overall tourism industry output…would be displaced by the open-pit copper mine is difficult to predict and quantify…" (DEIS p. 744)

It is also difficult, of course, to predict what the level of output, employment at the proposed mine would be 10 or 15 years from now. It is even more difficult to predict what the "ripple effects" throughout the Greater Tucson Area economy would be 5, 10 or 15 years from now. Yet the DEIS did not hesitate to accept the Rosemont-related estimates of these economic impacts twenty-three years into the future. The USFS writers of the DEIS felt confident enough to project the number of jobs and the labor income 15 or 20 years out down to the individual job and dollar of labor income. The DEIS appears to provide very precise estimates of these future economic *benefits*. It is unclear how such precise projections of future ***benefits*** of the mine are not speculative but even approximating what the economic impacts associated with the ***negative impacts*** of the Rosemont Mine might be are impossibly speculative and/or impossibly difficult to predict or quantify. Saying that something is difficult to estimate precisely in quantitative terms is not the equivalent of saying that it has zero value and can be ignored.

However, the DEIS goes further and indicates that whatever the losses associated with the damage to landscape amenities by the Rosemont Mine are likely to be, they will be quite small because: "Recreationists and area users…are not expected to stop recreating in the area altogether…Recreationists displaced from the project area could likely visit nearby areas…[N]umerous additional recreation opportunities exist in the region that tourists and recreationists are expected to visit. As a result, overall tourism industry output…is not expected to change substantially during the production phase of the mine." (DEIS, p.745)

As noted above, this assumes that the open pit mine, its waste piles, the congestion of a scenic highway, the loss of dark skies, and the industrialization of the landscape will only affect those people who are currently actively using the mine site or lands in the immediate vicinity. In addition it assumes that there are nearly perfect substitutes for the

use of the general mine site "just around the corner." The DEIS completely ignores the larger impact on the quality of the natural landscapes surrounding the urban, suburban, and exurban human settlement in the Greater Tucson Area which has been one of the major sources of the region's economic vitality.

3. The DEIS Reduces the Economic Importance of Landscape Amenities by Focusing on Active Recreation on USFS Land

Throughout the socioeconomic section of the DEIS, the primary landscape amenity that is quantified is recreation. The DEIS primarily focuses on recreation on the Coronado National Forest. This dramatically understates the value of landscape amenities and the potential damage the Rosemont Mine could do to those values. This is true because:

- Providing opportunities for outdoor recreation is only one landscape amenity value. Landscape amenities are also valuable to people who do not actively recreate on those lands. That broader set of values includes open space, scenic beauty, natural settings, and wildlife habitat that are enjoyed by residents whether or not they engage in recreation on public lands.
- Outdoor recreation on public lands is just one of the activities in which visitors drawn by the landscape amenities engage. The majority of visitors may not actively visit public lands but still come to enjoy the natural beauty of the area.
- Outdoor recreation on Coronado National Forest land represents only part of the outdoor recreation that takes place on public and private lands that may be affected by the Rosemont Mine.

The result of this narrowing of what is measured as landscape amenities is a DEIS conclusion that the outdoor recreation values are so small that the Rosemont Mine could not cause significant damage to them. That is a false conclusion based on an unreasonably narrow measure of the relevant landscape amenities.

In describing the existing economy the DEIS estimates "Recreation Related Employment" by using data on visitor use on the Coronado National Forest and a USFS model tied to IMPLAN. This is used to estimate the economic impact of expenditures associated with current levels of recreation activity **on** the Coronado National Forest (p. 714-5). This leads to an estimate that 799 jobs in the three county study area (Pima, Cochise, and Santa Cruz) are "directly related to" recreation on the Coronado National Forest. This, the DEIS calculates represented 0.15 percent of study area employment (p. 715). Although this is almost twice the size of the direct operational employment associated with the Rosemont Mine[27], this is still a tiny sliver of the overall regional economy. The problem, of course, is that despite the DEIS heading, "Recreation

[27] The direct employment at Rosemont is presented simply as a measure of relative size. Our IMPLAN modeling of the total employment impact of the Rosemont Mine in Pima County is about 1,000 total jobs, 25 percent larger than the recreation impact of the Coronado National Forest. That Power Consulting IMPLAN modeling, the IMPLAN modeling reported in the DEIS, and the more recent USFS IMPLAN modeling released late in the DEIS comment period (December 20, 2011) will be discussed in a later section of this report.

Related Employment," this is not a measure of total "Recreation Related Employment." It is just the impact of recreation on the Coronado National Forest.

This focus only on Coronado National Forest land is repeated throughout the DEIS with the same trivializing impact. The DEIS also estimates "Recreation Related Labor Income" in the same way and concludes: "In terms of recreation contributions to the area economy approximately 0.10 percent of area labor income is [Coronado National] Forest Service related." This is characterized as "not substantial." (p. 717).[28] In the discussion of Recreation and Tourism in the existing economy, the DEIS again focuses not on recreation and tourism throughout the study area but on the "visitors to the Coronado National Forest" (p. 726).

In the discussion of the economic impacts of the Rosemont mine on "Recreation and Tourism," the DEIS again begins with a focus on the role of the Coronado National Forest in providing "key environmental amenities" but goes on to make clear that these are "important contributors" to a larger "recreation and tourism identity of the analysis area" (p. 744). Note again that this is clumsily phrased in non-economic terms, "identity," with no mention of the *economic* implications. This, statement, however does momentarily shift the focus to the larger range of recreation, tourism, and visitor activities in the Greater Tucson Area rather than focusing only on recreation on USFS land.

4. Understating the Size of the Visitor Economy That Will Be Affected by the Rosemont Mine

A focus on those who actively engage in recreation *on* Coronado National Forest lands leads the DEIS to mistakenly conclude that the Rosemont mine will have insignificant impacts on the local economy. This minimization of impacts takes place in two steps.

i. First, recreationists who actually set foot on National Forest land represent a very small part of the total population of the study region.

ii. Second, those recreationists are assumed to be simply geographically displaced. They can move their recreation a relatively small distance to other National Forest land or other recreation land and proceed with their recreation with very little loss.

This is a double error. First of all, the population that will be affected by the Rosemont Mine is much larger than the part of active outdoor recreationists who visit National Forest lands. It includes all those who in their travels around the Greater Tucson area will be forced to view the damaged landscape and experience the industrial

[28] In this one sentence the DEIS makes two mistakes. It refers to employment when it should have said labor income. In addition it characterized the estimated labor income as "Forest Service related" when the Forest Service activities and the Coronado National Forest has economic impact that stretch far beyond those of recreation on the forest.

disamenities associated with the mine including dust, light, noise and the conversion of a scenic highway into a mining haul road.

Secondly, because the impact will be so broad damaging the viewscape from miles away, the dark skies, the scenic highway between the mine and the Port of Tucson, etc., residents cannot just shift their outdoor activities slightly and make the costs associated with the impact go away.

As discussed in the previous section, the impact of the mine will not just be on the "recreation" or "tourist" economy. It will also have a significant impact on the attractiveness of the Greater Tucson Area as a place to live and engage in economic activity. That is, the proposed mine does not simply damage the attractiveness of the Greater Tucson Area as a place to *visit*, it also damages its attractiveness to existing residents and potential future residents. The DEIS almost completely ignores this other ongoing economic development impact despite citing USFS and USDA studies warning of exactly those impacts.

Even when the DEIS focuses on the economic impacts of degrading forest amenities, it understates those by focusing on people actively engaged in recreation on Forest Service land instead of focusing on all of the recreation values that are likely to be affected and the entirety of the "visitor" economy.

There is not an "industry" in federal government economic statistics labeled "tourism" or "visitor sector." The reason for this is not that these sectors are inconsequential but because economic activities supporting visitors are spread throughout the economy. Visitors stay in hotels and motels, they eat at restaurants and relax in drinking establishments, they use airlines and rent cars, they attend entertainment events, go to arts and crafts galleries and museums, engage in recreation, and make purchases of goods and services at a broad variety of businesses.

The categories of economic activity most directly associated with the visitor economy are accommodations (hotels and motels), eating and drinking establishments, and "arts, entertainment, and recreation."[29] For the tri-county study area, total jobs in these sectors in 2009 totaled 54,500. Total labor earnings were just over one billion dollars. That was about 9.5 percent of all jobs and 2.6 percent of all personal income.[30] In the same year all of mining, including sand, gravel, and other local building materials, was the source of about 3,700 jobs and $181 million in labor earnings, 0.7 and 0.5 percent of jobs and personal income respectively.

This comparison, however, is incomplete since it only includes two or three sectors of the economy that are impacted by visitors. In addition, all of the spending in the sectors that were mentioned above is not visitor-related. Local residents visit eating and drinking establishments and enjoy recreation, entertainment, and the arts. To calculate

[29] U.S. Department of Commerce, Regional Economic Information System.
[30] Ibid. Pima, Cochise, and Santa Cruz Counties.

the impacts of the visitor economy, estimates need to be made of the distribution of visitor spending throughout the local economy.

Although the DEIS was aware that the Arizona visitor economy along with the visitor economies of each of Arizona's counties had been studied for the Arizona Office of Tourism by Dean Runyan Associates[31] each year for several years, the DEIS ignored the most recent version (June 2011) of that study[32] as well as the county-level analysis in the 1998-2007 version of the Dean Runyan study the DEIS did cite. Instead of referring to those studies sponsored by the State of Arizona, the DEIS attempted to carry out its own estimate of the size of the study area "tourism related sectors." It did this by relying on a 2001 paper presented at a conference. That paper, in turn, provided a table on tourism spending for the "Greater Lansing [Michigan] Region in 1998.[33] From that twelve-year-old paper, the DEIS obtained an estimate of the percentage of total spending in each sector of the national economy that was tourism-related. The DEIS applied those "national tourism impact ratios" to total spending in those sectors in the tri-county study area to estimate the total size of the study area tourist economy.[34] From this the DEIS concluded that the "industry output for tourism sectors in the three-county analysis area (in 2008) was $1.05 billion, or 1.61 percent of the region's output. This was the DEIS's estimate of the direct output to the tourism industry. No multiplier impacts were included.

If, instead, the DEIS had used the study done for the State of Arizona by Dean Runyan Associates "Arizona Travel Impacts 1998-2007p" that the DEIS itself cited, it would have concluded that travel-related spending was directly responsible for 5.2 percent of jobs and 2.8 percent of labor earnings in the tri-county study area, indicating that the travel industry was two to three times larger in relative importance than the DEIS estimated.[35]

The Arizona Travel Impacts study that the DEIS cites (1998-2007p), estimates that there were 31,000 direct travel industry jobs with direct labor earnings of about $700 million in the tri-county study area.[36] In comparison the DEIS estimates that the direct

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[31]DEIS p. 726 in the Recreation and Tourism section cites the Dean Runyan Associates Arizona Travel Impacts 1998-2007p study released in June of 2008.

[32] Arizona Travel Impacts 1998-2010p, http://www.azot.gov/system/files/410/original/AZ%20Tourism%20Imp10p%20FINAL.pdf?1310693693

[33] Table 2, no page number, PDF page number 25, D.J. Stynes, "Estimating economic impacts of tourist spending on local regions: A comparison of satellite and survey/I-O approaches." DEIS Table 190, p. 728, citing Stynes (2001).

[34] DEIS p. 728-9, Tables190 and 191.

[35] Dean Runyan Associates Arizona Travel Impacts 1998-2007p study released in June of 2008, table on page 30. Cochise, Pima, and Santa Cruz Counties combined. Neither the Runyan analysis nor the DEIS analysis included multiplier impacts. Because the DEIS uses the IMPLAN data base estimates of "output" by industry, the results are not directly comparable to the estimates of Dean Runyan Associates. Dean Runyan estimates total traveler spending and then estimates the direct employment and labor earnings associated with that. The IMPLAN data base defines the output of the service and manufacturing sectors as the value of sales ("spending"), but it defines the output of retail trade establishments as simply the margin markups, not the total customer spending.

[36]Ibid. The travel industry direct jobs and labor earnings in the 2011 Dean Runyan AZ Travel Impacts study were slightly lower due to the ongoing effects of the recession. We have used the 2008 study in these comments because that is the study cited by the DEIS.

employment associated with the Rosemont Mine would be 350 to 480 and direct labor earnings will be $19.5 to $26.2 million depending on the year.[37]

5. The Visitor Economy in the Immediate Vicinity of the Rosemont Mine

In early December of 2011, two local business owners surveyed the owners of all identified small businesses in the area surrounding the towns of Sonoita, Elgin, and Patagonia to the south of the proposed Rosemont Mine in Santa Cruz County.[38] They identified 217 businesses employing approximately 800 people. The survey asked two questions:

> What percentage of the firm's sales was derived from visitors to the area?
> What percentage of those visitors were drawn to the area by its landscape and cultural amenities?[39]

The responses indicated that about 66 percent of these firms' sales were tied to the purchases of visitors rather than residents. In addition, 78 percent of the visitors were drawn to the area by the landscape and cultural amenities as opposed to just passing through, being on business, visiting family, etc. Combined, these results indicate that the landscape and cultural amenities were responsible for 51 percent of local business sales in the area. If employment is proportional to sales, this would suggest that 386 local jobs are associated with the surrounding landscape and cultural amenities in this small town and rural area.

The industrialization of the landscape by the Rosemont Mine and the conversion of the scenic highway SR 83 into a congested mineral haul road threaten both access to these local businesses and the attractiveness of visiting this area at all. For these small businesses, which had average employment of less than four workers per firm, small changes in the number of customers and aggregate customer spending could have a devastating impact. Such firms have relatively high fixed costs associated with their commercial establishments (rent, utilities, property taxes, insurance, etc.) and have to have a certain number of workers simply to keep the business open. There is a scale of operations below which the business simply is not financially viable because it cannot cover those fixed costs. Modest losses in business that push the volume of business below that level will force the business to shut down and the jobs to be lost.

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[37] DEIS pp. 738 and.741.
[38] Mountain Empire Business Survey, prepared and administered by A. Halpert and N. McCoy, December 2011.
[39] These "amenities" were defined on the survey as hiking, biking, birding, hunting, equestrian activities, ranches, relaxation get-aways, health and wellness, historic and cultural sites, arts and artists, dining, and shopping.

II. The Potential Impact of the Rosemont Mine on the Amenity-Supported Economic Vitality in Pima County

The DEIS focused its analysis of the positive economic impacts associated with the Rosemont Mine exclusively on Pima County[40] despite asserting that a tri-county study area was appropriate.[41] So that our local economic impact analysis can be compared with those reported in the DEIS, in this section we will also focus on Pima County.

1. Potential Impacts on the Greater Tucson Area Visitor Economy

From 1998 until the Great Recession struck in 2007, travel spending adjusted for inflation ("real" spending) in Pima County grew at a compound rate of 2.1 percent, labor earnings grew at a rate of 2.0 percent, and travel related employment rose at a 2.6 percent annual rate.[42] We do not have consistent estimates for the Pima County travel industry before 1998. However, real labor earnings in the hotel and motel (accommodations) sector of the economy, which primarily serves travelers, grew at an annual rate of 7.2 percent between 1988 and 1998. Over the entire period for which we have data, 1969 through 2009, real earnings in the traveler-related accommodation's sector grew at a compound rate of 3.4 percent per year across boom years as well as recession years. [43] For the purpose of this analysis we will assume that the future rate of growth of the visitor economy will be 2.6 percent for both employment and labor earnings.

The Arizona Travel Impacts analysis done for the Office of Tourism estimated the multiplier impacts of tourist expenditures to be 1.86 for jobs and 2.06 for labor earnings.[44] IMPLAN multipliers for copper mining in Pima County are somewhat different, about 25 percent higher for jobs (2.3) and about 14 percent lower for labor earnings (1.78).[45]

If the industrialization of the natural landscapes surrounding the Greater Tucson Area due to the Rosemont Mine were to slow the annual growth of the visitor economy by less than a tenth of a percentage point, from 2.60 percent per year to 2.51 percent, the

[40] Applied Economics 2011, cited and discussed in the DEIS p. 737. However, the exclusive focus on Pima County alone of that study and modeling is never mentioned in the DEIS.
[41] Figure 105, p. 703 and p. 702. Also p. 737: "As previously discussed, Cochise, Pima, and Santa Cruz Counties were selected as the economic impact analysis area."
[42] The years 1998-2006 are included. The recession year of 2001 is included. Since the start of the Great Recession, the travel industry in Pima County has not recovered to its 2006 levels. Tables on pp.30-32, Dean Runyan Associates, "Arizona Travel Impacts 1998-2010p," June 2011, prepared for the Arizona Office of Tourism.
[43] Bureau of Economic Affairs, Regional Economic Information System, earnings by place of work, deflated using the CPI.
[44] Dean Runyan Associates, op. cit. tables on p. 16.
[45] These multipliers are calculated by dividing the estimated total economic impact by the direct economic impact and represent the IMPLAN results for Pima County when the IMPLAN coefficients describing the relationship between the copper industry and the local economy are used.

negative impact on visitor-related employment in the Pima County economy would offset about half of the projected total job gains associated with the Rosemont Mine. If the annual growth of the visitor economy slowed somewhat more, by a sixth of a percentage point, from 2.6 percent to 2.43 percent, the negative impact on the total employment associated with the visitor economy would completely offset the projected total increase in jobs associated with the Rosemont Mine.

If the impact of the mine were to slow the growth in the visitor economy by about a seventh of a percentage point, from 2.60 percent per year to 2.45 percent, the negative impact on labor income in the Pima County economy would offset 53 percent of the projected positive impact of the Rosemont Mine on labor income. If the growth of the visitor economy slowed somewhat more than that, by less than a third of a percentage point from 2.6 to 2.3 percent, the decline in total labor income associated with the visitor economy would completely offset the projected gains in labor income due to the Rosemont Mine.

Note that we are not talking about an actual decrease in employment and income from the visitor economy, simply a slight slowdown in the rate at which the visitor economy expands, a slowdown so slight it probably would not be noticed by most businesses and workers in the Greater Tucson Area.

As will be discussed later in this report, the analysis above assumes a scaled down total job impact associated with the Rosemont Mine based on running the IMPLAN model without Applied Economics' exaggerating "customization" of that model. Instead of the Applied Economics' estimate of an average of about 1,750 jobs[46] being created directly and indirectly by the mine during its 20-year period of full operations, our IMPLAN modeling indicates that a total of about an additional 1,000 jobs would be associated with the mine *if* the direct employment the that Applied Economics, reported is correct rather than the lower employment reported in the Rosemont Feasibility Study.[47] Instead of $83.5 million per year in additional labor income being generated, our IMPLAN modeling indicates $43.1million in additional labor income.[48] That is, the IMPLAN modeling on which the DEIS relies projects local economic impacts about 75 to 100 percent higher than our application of IMPLAN indicates are appropriate.[49]

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[46] Applied Economics reports on 23 years of employment, labor income, and output (Figure 8, p. 12). Three of those years are pre-production years and one is a closing year. Those three years have much lower levels of output, employment, and income. We have focused on the 20 years of full operations. This increases the average annual impacts somewhat. For instance, instead of about 1,600 total jobs as reported by the DEIS (p. 740), the average over the 20 years of full production is about 1,750 jobs.

[47] As will be discussed later, the Rosemont Feasibility Study estimated direct employment that was about half of what the DEIS and Applied Economics assumed.

[48] Again, both the Applied Economics and our IMPLAN results are stated as an average over the 20 years of full production.

[49] As will be discussed later in this report, the USFS, late in the DEIS comment period (January 20, 2011) released the results of IMPLAN modeling that a USFS economist recently carried out. It too found that the local economic impacts reported in the DEIS significantly exaggerated the likely impacts of the Rosemont Mine, implicitly using multipliers that were more than 80 percent larger than appropriate.

2. The Potential Impact of the Rosemont Mine on Population Growth in Pima County

As discussed above, one of the driving forces that has supported the economic vitality of the Greater Tucson Area has been the net in-migration of new permanent residents and the economic activity associated with them.[50] During the 1990s two-thirds of the Pima County population growth was associated with net in-migration.[51] During the 2000s, with a recession at the beginning of the decade and the Great Recession beginning in late 2007, the mobility of the American population declined, and the percentage of Pima County population growth due to net in-migration declined to 51 percent.[52] The State of Arizona projects that going forward almost all of the growth in the population of Pima County will come from in-migration.[53]

Net in-migration added about 10,000 new residents per year to Pima County during the 1990s. During the first half of the 2000s, net in-migration peaked at about 14,000 new residents per year. That led the state of Arizona to project future in-migration at about that same level. [54] The Great Recession slowed in-migration down. So the actual rate of in-migration during the 2000-2009 period was about 11,000 new residents per year, but in the first year of the Great Recession (2007-2008), net in-migration fell to about 5,000 per year.

Net in-migration, however, is the difference between out-migration and in-migration both of which are much larger than the net difference between them. So, for instance, the 5,000 person net in-migration to Pima County between 2007 and 2008 was the result of in- and out-migration that were each over ten times as large. 60,000 people moved in while 55,000 people moved out.[55] Fairly small changes in either or both of these can, over time, lead to significant cumulative impacts on total population.

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[50] A common item of "folk wisdom" is that people passively follow jobs, which have to be created before people will move to a new location. As the discussion above about amenity-supported economic vitality explained, this is not the only economic force operating within local economies. Jobs also follow people because people represent the necessary workforce and markets for businesses. Net in-migration, by itself, can drive the expansion of the economy. These two sets of economic forces are the familiar ones of labor demand and labor supply. One of those economic forces does not necessarily dominate the other.

[51] County Population Estimates and Demographic Components of Population Change: Annual Time Series, July 1, 1990 to July 1, 1999, CO-99-8, March 9, 2000.

[52] US Bureau of the Census, Population Estimates, Components of Population Change, State and County Data. Table 4. Cumulative Estimates of the Components of Resident Population Change for Counties of Arizona, CO-EST 2009-04-04, March 2010.

[53] Pima County Population Projections 2006-2055, Arizona Department of Economic Security, Research Administration, Population Statistics Unit, March 31, 2006. This increased role of net in-migration is partly due to the projected decline in the birth rate. http://www.azstats.gov/population-projections.aspx

[54] See previous three footnotes and Table 5: Annual Estimates of the Components of Population Change for Counties in Arizona: July 1, 2004 to July 1, 2005 (CO-EST 2005-05-04), Population Division, U.S. Census Bureau, March 16, 2006.

[55] Pima Association of Governments, Regional Data, Demographics,Migration: http://www.pagnet.org/documents/rdc/population/components0708.pdf

For instance, if about 500 more of the total population of Pima County (980,000) were to move out each year because of the degradation of the surrounding natural landscapes by the Rosemont Mine, over a 20 year period the population would be 10,000 lower than it otherwise would have been. That 500-person loss, of course, is a tiny sliver of the total Pima County population, one person out of every 2,000. If the degraded natural landscape amenities also discouraged 500 fewer in-migrants each year, less than a one percent decline in total in-migration in 2008 and, again, a one person in 2,000 impact on the total population, another 10,000 residents would be lost over 20 years for a total loss of 20,000. Again note that we are not saying that the population would decline. Rather, it would just grow slightly slower than it otherwise would, 0.10 percent slower. e.g. instead of 2.15 percent per year, population growth would be 2.05 percent per year.

The U.S. Bureau of Economic Analysis data indicates that during the 2001-2009 period there were 50 jobs for each 100 residents of Pima County. The 2000-2009 average rate of annual in-migration of 11,000 new residents per year would be associated with about 6,500 additional jobs.[56] Over a 20 year period, that would be a total of 130,000 new jobs. Slowing the rate of in-migration even slightly because the Greater Tucson Area was no longer considered as attractive a place to live, as the TREO *Vision* study put it, or more specifically, because the landscape amenities that the local governments in the Greater Tucson Area have sought to protect, have been degraded, could have a significant impact on total employment.

For instance the 500 person increase in the number of people moving away from Pima County and a similar 500 person decrease in the number of people moving into Pima County discussed above would offset about half (47.5 percent) of the projected $43 million annual increase in labor income our IMPLAN modeling indicates would be associated with the Rosemont Mine. In addition it would offset half of the average job gains our IMPLAN modeling indicates would be associated with the Rosemont Mine (500 of 1,010 jobs).

3. The Total Economic Impact of the Rosemont Mine on the Economic Vitality in Pima County

The DEIS asserts that proposed Rosemont Mine will have negligible negative impacts on the local economy through impacts on tourism and other landscape amenity-related economic forces: In describing the impacts on recreation and tourism the DEIS characterizes them as: “Negligible changes in regional tourist spending”, “no measureable impacts” “in associated tourism activity” (p. 736 and Table 171) or that

[56] Job growth in Pima County during the 1970s and 1980s averaged about 9,000 jobs a year. During the 1990s and 2000’s up until the Great Recession (through 2007), annual job growth was a third higher, about 12,000 jobs a year. Total job growth was clearly faster than the job growth we have estimated above to be directly related to net in-migration which in the 1990s and early 2000s would have been in the 5,000 to 7,000 jobs per year range. However, we have not assigned any multiplier impacts associated with the employment associated with net in-migration.

impacts of the degradation in the character of USFS forestlands on recreation and the economy “are not substantial” (pp. 718 and 745) .

As the critique above points out, one reason the DEIS comes to this conclusion is that the DEIS systematically understates the importance of landscape amenities to the economic vitality of the Greater Tucson Area. It does this by:

- Treating landscape amenities as primarily social, cultural, and aesthetic values while implicitly ignoring the fact that besides being all of these, landscape amenities are also powerful economic resources supporting local economic vitality.
- Focusing what discussion there is on the economic role of landscape amenities only on recreation and, even more narrowly, on recreation on National Forest lands.
- Understating the actual size and importance of the visitor economy.
- Ignoring the broad expanse of landscapes and natural amenities that will be directly or indirectly impacted by the Rosemont Mine and focusing only on the immediate area around the mine.
- Not analyzing or discussing the visitor economy and its importance in the small towns and rural areas south of the proposed mine.
- Simply dismissing known negative economic impacts associated with landscape amenity degradation as “speculative” and “difficult to predict and quantify” (p. 744).

In addition, the DEIS does not put the size of the impact of the mine on amenity supported economic vitality in the same context as the size of the impact of the proposed mine itself. The DEIS points out the fact that the impact of the Rosemont mine on the overall economy of the three-county study area will be “quite modest” and cites two previous studies, including one by Power Consulting, that pointed out that the direct jobs associated with the mine would represent a 0.07 to 0.08 percent job increase within the study area employment of (p. 740). That is between one job in 1,250 and one job in 1,500. Even after accounting for “multiplier effects” impacts of this size are appropriately described as “quite modest,” to use the DEIS’s language. Distinguishing impacts that are “not substantial,” the language the DEIS used to describe the negative economic impacts of degraded landscape amenities (pp. 718 and 745) from the “quite modest” positive economic impacts associated with the mine is difficult, to say the least. Yet the DEIS pays close attention to the positive impacts of the mine despite their “quite modest” character while not even attempting to compare them to the “not substantial” negative impacts of the mine.

The important point is that in the context of “quite modest” positive impacts from the proposed mine, it is quite possible that “not substantial” negative impacts can more than offset those positive impacts and leave the local economy worse off.

Just as important, **it does not take actual *declines* in recreation, tourist, and other visitor-related activities or an actual decline in the region’s population to have a**

significant impact of local economic vitality. The negative economic impacts of very tiny *reductions in the rate of growth of the economy* caused by the degradation of the landscape amenities surrounding the Greater Tucson Area can accumulate over time and have a significant impact. These impacts of slower rates of growth can then be compared to more reasonable estimates of the likely positive economic impacts associated with the operation of the proposed Rosemont Mine to evaluate whether the mine represents a net positive impact on the economy or not.

To demonstrate this we have calculated the *smallest* negative impacts the mine would have to have on the growth of the visitor economy and on the ability of the area to hold and attract permanent residents because of its attractive characteristics to offset the positive impact of the mine. The point of this calculation is to show that **"negligible" or "insignificant" or "not substantial" changes in the rate of growth of the visitor economy or the rate of growth of population could completely offset the projected positive impacts of the Rosemont Mine** on employment and labor income. The same would be true of local government tax revenues.

This is *not* to suggest that the degradation of landscape amenities associated with the Rosemont Mine will not actually eliminate jobs because of reduced visitation to the region or reduced net in-migration into the region. It will certainly have those direct negative impacts. We are simply demonstrating that actual reductions in the number of visitors or in-migrants relative to the current number is not necessary for the Rosemont Mine to have net negative impacts on the regional economy.

If the growth of the visitor economy and the growth in population due to in- and out-migration were to decline by one-tenth of one percent, the net impacts on non-Rosemont jobs due to the Rosemont Mine would be zero. If the negative economic impacts of degrading the landscape amenities surrounding the Greater Tucson Area were greater than this, the net impact of the mine on employment opportunities would be negative.

The same is true of impacts on projected labor income. If the growth of the visitor economy were to slow by a about one-seventh of a percentage point and the decline in the attractiveness of the surrounding landscapes slightly increased the rate of out-migration by one-tenth of one percent and slowed the rate of in-migration also by one-tenth of one percent, the negative economic impacts of the mine would offset the positive impacts. See the table below.

A Complete View of the Economic Impacts of the Rosemont Mine								
Type of Amenity Impact	Reductions Due to Degraded Landscape Amenities				Increases Due to Rosemont Mine		Net Economic Impact of Rosemont Mine	
	Employment		Labor Income					
	% change*	number of jobs	% change*	amount ($millions)	Jobs	Labor Income ($millions)	Jobs	Labor Income ($millions)
Visitor Economy	-0.09%	-510	-0.15%	-$22.6				
In- and Out-Migration	-0.10%	-500	-0.10%	-$20.4				
Total Impact		-1,010		-$43.1	1,010	$43.1	0	$0.0
*For the visitor economy, the % change is the change in the annual rate of growth of the visitor economy.								
For in- and out-migration, the % change is the annual change in gross in- and out-migration.								

We **know** that the landscape amenities of the Greater Tucson Area have contributed significantly to economic vitality. That is one of the reasons why local, state, federal, and tribal governments have put so much effort and money into trying to protect those landscapes. We also **know** that seriously degrading those landscapes will have negative impacts on the attractiveness of the area to new businesses, residents, and visitors and, therefore, the overall economy. That is one of the reasons why Pima County, the City of Tucson, and the Tohono O'Odham Nation have opposed the proposed mine.

Given how small the negative economic impacts associated with the proposed mine have to be to completely offset the positive economic impacts of the mine, we can be quite certain that the overall economic impact of the mine will be negative. Local economic wellbeing will decline and the social, cultural, and aesthetic environments will be degraded.

III. Exaggerations in Rosemont Jobs and Labor Income: Misstating the Economic Impacts

As a result of the serious lingering effects of the financial collapse and the Great Recession, there is probably no more important subject of public concern than employment and wages. An economic proposal that is said to create thousands of jobs is likely to instinctively draw significant public support and appear to be a "no-brainer" to public decision makers who are asked to approve the proposal. Given the level of concern, fear, and, even, desperation about employment opportunities, it is even more important to be as accurate as possible in objectively estimating the likely employment and payroll impacts.

Unfortunately, the DEIS repeatedly overstates the number of jobs and payroll associated with the Rosemont Mine. It does this it three ways.

a. Instead of relying on an independent estimate of the jobs and income impact of the Rosemont Mine, it makes use of a study based on Rosemont assumptions and paid for by Rosemont.
b. It multiplies the number of jobs by the number of years those jobs may exist;
c. It simply assumes, despite historical evidence to the contrary, that Rosemont mine output, employment, and payroll will remain largely constant over nearly a quarter of a century.

The Failure of the Coronado National Forest to Provide the Basic Data Supporting the IMPLAN Modeling upon Which It Relied for the DEIS Socioeconomic Analysis

Power Consulting, despite extensive efforts over a three month period, was not able to obtain from the Coronado National Forest the assumptions and guidelines that TREO and Rosemont provided to Applied Economics to guide the IMPLAN economic modeling which the Coronado National Forest incorporated into its Rosemont DEIS. This prevented us from carrying out both an analysis of the plausibility of the assumptions around which that modeling was built and checking the accuracy of the modeling given those assumptions.

With the release of the Rosemont DEIS in mid-October of 2011, it became known that the DEIS relied on the TREO-Applied Economics IMPLAN modeling. On learning that this was the basis of the DEIS's local economic impact analysis, Power Consulting informed its client, Mountain Empire Action Alliance (MEAA), that Power Consulting would not be able to evaluate the IMPLAN modeling results reported in the DEIS since none of the details of that modeling were available to us or, apparently, the Coronado National Forest or most other parties seeking to comment on the DEIS.

Immediately after the official release of the DEIS in late October, Power Consulting prepared two memos to MEAA with the understanding that they would be forwarded to the Coronado National Forest. The memos were titled "The need for Additional Information on How Applied Economics Carried out Its IMPLAN Modeling" and "The Information Necessary to Evaluate the Reliability and Accuracy of the Applied Economics Application of the IMPLAN Model to the Rosemont Mine."

On October 28, 2011, Power Consulting participated in a telephone conference with the Supervisor of the Coronado National Forest, Jim Upchurch, to discuss the importance of obtaining the details of how the IMPLAN modeling reported in the DEIS was carried out. On October 31, 2011, MEAA memorialized that telephone conference in a memo to Supervisor Upchurch. Attached to that memo were Power Consulting's two memos on the additional information needed about the IMPLAN modeling on which the DEIS relied.

Partly in response to these requests, the Coronado National Forest sought the assistance of the U.S. Forest Service Region One economist in Missoula, Montana, to

evaluate the Applied Economics IMPLAN modeling, talk to Applied Economics about how it had done its modeling, and then both see if the Applied Economics results could be reproduced and also redo the IMPLAN modeling using assumptions that the Region One economist considered more appropriate.

This was done and in a telephone conference on December 14, 2011, the Principal in Power Consulting discussed the Region One Economist's approach to these issues and her results in remodeling the Rosemont economic impacts. On December 15th the Region One economist submitted a report to the Coronado National Forest on that review of the Applied Economics' IMPLAN modeling. On December 20th, Power Consulting received a copy of the Region One economist's report on the IMPLAN modeling she had carried out on the Rosemont Mine.

Power Consulting responded to that report the next day in an email to the Coronado National Forest, repeating the original request that Power Consulting and MEAA had made two months earlier: To receive a copy of the detailed assumptions that Rosemont had provided to TREO and Applied Economics that guided the IMPLAN modeling on which the DEIS relied. The Coronado National Forest had indicated two months earlier that it had received a multi-page document laying out those assumptions and guidelines for that IMPLAN modeling from TREO, Applied Economics, and/or Rosemont. That background information to the IMPLAN modeling upon which the DEIS relied was still crucial information for an informed evaluation of the socioeconomic section of the DEIS.

Despite three months of efforts, MEAA and Power Consulting did not receive that information by the time it was completing these comments to the Coronado National Forest on the DEIS. For that reason these comments could not be fully informed or complete.

1. Multiplying Multipliers: The DEIS's Use of Rosemont's Exaggerated "Indirect" Economic Impacts

The DEIS explains how it estimated the economic impacts associated with the Rosemont mine in the following way (p. 737):

> "The economic impacts of the preproduction, production, and postproduction phases of the project were estimated by using regional economic modeling, or more specifically, by using IMPLAN (Applied Economics 2011). These types of regional economic modeling are standard approaches to measuring the production and consumption linkages in an economy between households, industries, and institutions (such as government), thus providing an estimate of the ripple effects in an economy associated with a direct stimulus or investment. The multipliers of IMPLAN measure these downstream or ripple impacts."

Most readers of this description of how the DEIS would estimate the economic impacts of the Rosemont Mine would assume from this description that the USFS had contracted with Applied Economics to provide independent economic impact modeling for the DEIS. That, of course, was not the case. The economic modeling on which the USFS relied for the DEIS came from modeling paid for by Rosemont and based on assumptions that Rosemont provided. It was not the USFS with whom Applied Economics contracted but the Greater Tucson economic development agency, TREO.[57] To not identify the fact that the applicant seeking permission to develop the mine was the source of the funding for the report and of the economic impact assumptions and that the report was commissioned by a local industrial development organization is a serious error. The more serious error is that the DEIS include an independent analysis of the economic impacts of the Rosemont mine but instead directly and indirectly relied on Rosemont for that information.

All of the basic information that laid the basis for the calculation of the local economic impacts of the Rosemont Mine were provided by Rosemont itself and not independently analyzed by the Coronado National Forest for their plausibility and accuracy. Given that Rosemont has provided different estimates of the jobs associated with the mine in different settings, this failure of the USFS to critically review the basic economic data is disturbing.

The Canadian Securities Authority requires mining companies such as Augusta Resource Corporation, Rosemont's parent company, to make periodic reports on the quality, extent, and economic value of mineral deposits following a strict set of guidelines. Independent certified professionals are required to prepare these documents and sign them attesting to their accuracy. The guidelines for preparing and presenting information on mineral properties are found in the Canadian National Instrument 43-101. The purposes of these guidelines for making statements about the value of mineral properties is to ensure that misleading, erroneous or fraudulent information relating to mineral properties is not published and promoted to investors on the stock exchanges overseen by the Canadian Securities Authority.

Augusta Resource Corporation had an NI 43-101 Technical Report prepared for the Rosemont Copper Project that presented a Feasibility Study of the proposed mine and associated copper ore processing facilities.[58] That report estimated that the "peak manpower" requirements would be in years 11-15 of the mine operation and involve "45 supervisory and technical personnel, 150 workers in mine operations and 79 in mine maintenance, totaling 274 people."[59] "Mine Personnel" was discussed and a detailed

[57] A careful reader of the DEIS who referred to the bibliography to see to what "Applied Economic 2011" referred would not be told whether this was a USFS commissioned report or not. No sponsorship is mentioned. A *very* careful reader who shifted back and forth within the DEIS would have discovered that on page 700 of the DEIS the Applied Economics report was identified as "commissioned by Tucson Regional Economic Opportunities," not the USFS. The role of Rosemont in funding and providing the assumptions for the report would remain unreported.

[58] M3 Engineering & Technology Corporation. January 14, 2009, Amended March 17, 2009. Principal Author and Qualified Person: Dr. Conrad Huss, P.E.

[59] Ibid. p. 8.

annual "Mine Manpower Summary" was provided in Table 1-33, p.85. The total labor requirements during the years of mine production varied from 156 to 274. This direct employment associated with the Rosemont mine in the Feasibility Study is substantially lower than the direct employment reported in the TREO Applied Economics IMPLAN study. The direct employment estimates provided by Rosemont for that study varied from 351 to 478 during the production period, about twice as high as what was estimated in the Rosemont Feasibility study. That is a significant difference that would also directly affect the projected indirect and induced jobs, personal income, and tax revenues.[60]

IMPLAN modeling can be whatever the analyst chooses to makes of it. IMPLAN, itself, is a relatively sophisticated economic impact modeling tool that can model diverse economic changes using relatively simple input data. IMPLAN can also accept more nuanced inputs if more detail is available from outside the model about the local economy and the way the proposed project would interact with it. In that sense, IMPLAN's ability to accept user-chosen inputs to replace information built into IMPLAN allows the analyst to "fine tune" the model to more closely represent the economic change and community being studied. That also allows the IMPLAN user to "tune" the model in any direction that might be useful to the proponent of a particular industrial project. IMPLAN is readily available at a relatively modest price to anyone who is willing to pay for it.

From our review of the Applied Economics application of IMPLAN to the proposed Rosemont Mine, it appears that Applied Economics changed how the IMPLAN model described the way the Pima County economy would react to the Rosemont Mine. This could represent appropriate fine tuning of the model so that its results are more accurate. It could also represent errors, misrepresentations, or distortions. What anyone interpreting Applied Economics' (or anyone else's) IMPLAN results needs is a description of what modifications, if any, were made to the model and what customized assumptions were made about how the proposed project would interact with the local economy and what the factual basis or justification for those assumptions were.

Applied Economics in its report on the "Economic Impacts of The Rosemont Copper Project on Pima County, Arizona" appears to claim that it did not make any changes in the Pima County IMPLAN model. On page 13 Applied Economics states that: "The multipliers used in this analysis are from IMPLAN, a national vendor of economic impact software, and are specific to Pima County. Industry-specific multipliers were used for each category of vendor purchases, and income-specific household consumption multipliers were used to model employee spending.

[60] It is possible that the Rosemont Feasibility study, for some reason, did not provide a complete accounting of the direct employment required to operate the mine and its associated metal ore processing facilities along with the technical and administrative support workers. That study does, however, discuss the number of "supervisory and technical" workers required and discusses in detail the various technical aspects of the operation of the mine and the ore processing facilities.

However, when we did our initial IMPLAN runs on Pima County using the same Rosemont initial direct economic impacts that Applied Economics used, we came up with significantly different results. The IMPLAN modeling done late in the DEIS comment period by the USFS also generated significantly different results, results that were similar to Power Consulting's results.[61]

With the same assumed levels of Rosemont employment, payroll, production, and mine spending that Applied Economics used, IMPLAN generated very different local impacts from Rosemont purchases, employee spending, and other expenditures for Power Consulting and the USFS IMPLAN modeling runs. Some of the calculated impacts generated by Power Consulting's non-customized IMPLAN modeling were much smaller than Applied Economics' estimated impacts. For instance, our indirect impacts were only a fifth to a quarter of Applied Economics' estimates of the employment, labor income, and output impacts. The USFS IMPLAN modeling results produced late in the DEIS comment period also estimated indirect impacts of the mine that were much lower, a quarter to a third of what Applied Economics estimated.

The USFS IMPLAN modeling found that: "Since the two analyses [one using Applied Economics and the other the USFS sectoral assignment of Rosemont spending] use different sectors for these expenditures, and since the impact per $1million of spending is six times greater for the sectors used by Applied Economics, this has a large effect on the results of the analysis."[62] That is, the USFS analysis found that Applied Economics assigned Rosemont Mine spending to sectors of the Pima County economy in a way that significantly increased the apparent local economic impacts of that spending.

In other cases Power Consulting and the USFS IMPLAN modeling estimates of Rosemont's local economic impacts were *larger* than those estimated by Applied Economics. For example, our estimates of the induced impacts associated with employee spending were 60 to 85 percent larger than those of Applied Economics. As the USFS noted in its IMPLAN modeling of Rosemont's local economic impacts: "These differences arose from the definition of income that was used in the two analyses (whether or not employee benefits were included)." [63] Both Power Consulting and the USFS modeling included employee benefits while Applied Economics did not.

However, the exaggerated impacts associated with the mine's spending in the local economy far exceeded the Applied Economic' underestimate of the impacts of mine employee spending (the induced impacts). As a result both Power Consulting and the USFS IMPLAN modeling estimates of the *total* local economic impacts of the Rosemont Mine were only one-half to three-quarters the size of the Applied Economics' estimates.

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[61] "Comparison of economic impact results for the proposed Rosemont Copper Mine," Krista Gebert, Regional Economist, Northern Region, USFS, http://www.rosemonteis.us/files/technical-reports/20111220_usfs-economic-impact-analysis-overview.pdf . December 20, 2011. The USFS IMPLAN modeling *was* able to approximately reproduce the Applied Economics results by assigning Rosemont spending to different sectors of the Pima County economy.
[62] Ibid. Page 2.
[63] Ibid.

Put the other way around, the Applied Economics' results that were used in the DEIS estimated total impacts on labor income that were almost double our and the USFS estimates (93 and 51 percent higher than Power Consulting and the USFS respectively). The Applied Economics' total employment impacts were 73 and 85 percent higher respectively, and their total output effects were 35 percent larger than Power Consulting's. These much larger Applied Economics' total effects were due to Applied Economics estimating that the impacts of Rosemont Mine's purchases of supplies and equipment in Pima County would have four to four- and-a-half times larger impacts than the non-customized IMPLAN model and the USFS customized model would indicate. This clearly indicates that Applied Economics adjusted the model in ways that generated significantly larger local impacts from the assumed local purchases by the Rosemont Mine in Pima County.

The table below shows the results from our preliminary IMPLAN modeling of the economic impact of the Rosemont Mine. The table is an amalgamation of three different runs of the direct impact data provided by Applied Economics and reported in the DEIS.[64] The table shows the direct inputs (mine employment, payroll, and output) provided by Applied Economics and the indirect (mine spending in the local economy), induced (mine workers spending in the local economy), and total impacts. The table also shows the multipliers that IMPLAN produced for employment, labor income, and output, given Applied Economics' direct inputs (effects). The multipliers are simply the ratio of the total effect to the direct effect.

Power Consulting IMPLAN Modeling[65]

Impact Type	Employment	Labor Income	Output
Direct Effect	438.7	$24,160,000	$234,862,495
Indirect Effect	252	$10,053,993	$44,947,122
Induced Effect	319	$8,841,779	$43,812,952
Total Effect	1,010	$43,055,772	$323,622,569
Multiplier	2.30	1.78	1.38

The next table below shows comparable results contained in the USFS report "Comparison of economic impact results for the proposed Rosemont Copper Mine" that was prepared in late December 2011.

[64] We produced three different model runs with the direct inputs provided by Applied Economics. This table is not meant to represent the output of one model run by IMPLAN, but the output of three different model runs based on direct employment, direct labor income, and direct output.

[65] The direct impacts of the Rosemont Mine as reported by Applied Economics included two pre-production years and a shut-down year as well as 20 years of production for a total of 23 years. We have focused on the 20 years of full production, years 1-20. This increases somewhat the average annual impacts. E.g. the direct employment averages 438.7 jobs over the 20 years rather than the 434 that Applied Economics reported for the 23 year period, which is the average direct employment used in the USFS IMPLAN modeling. The same is true for the direct labor income and output.

Forest Service IMPLAN Modeling

Impact Type	Employment	Labor Income	Output
Direct Effect	434	$29,000,000	Not reported
Indirect Effect	265	$17,000,000	"
Induced Effect	247	$9,000,000	"
Total Effect	946	$55,000,000	"
Multiplier	2.18	1.90	"

The final table below shows comparable results presented by Applied Economics in their report "Economic Impacts of The Rosemont Copper Project on Pima County, Arizona." It was these results on which the DEIS relied.

Applied Economics IMPLAN Modeling[66]

Impact Type	Employment	Labor Income	Output
Direct Effect	438.7	$24,160,000	$234,862,500
Indirect Effect	1136.05	$52,916,000	$178,102,500
Induced Effect	172.65	$6,089,500	$26,983,500
Total Effect	1747.05	$83,147,500	$439,948,500
Multiplier	3.98	3.44	1.87

The most striking differences between these three IMPLAN modeling results are the multipliers that result from the three different applications of IMPLAN and the indirect effects. The multipliers and indirect effects from Applied Economics are much larger than those that Power Consulting and the USFS estimated. Approximately the same direct inputs (effects) were used in all three cases. This tells us that there were some significant assumptions made in Applied Economics' IMPLAN modeling to produce the much larger total economic impact effect for employment, labor income, and output.

We cannot assert that Applied Economics' customization of IMPLAN that generated these much larger economic impacts is an error or a deliberate distortion. As was pointed out above, despite much effort, Power Consulting was not provided with the assumptions that Rosemont provided to TREO/Applied Economics nor with the assumptions that Applied Economics made in its modeling.

We are simply pointing out that modeling assumptions made by Applied Economics and/or Rosemont produced much larger positive local economic impact results which were then uncritically incorporated into the DEIS by the USFS. Applied Economics in its Rosemont report did not explain what it assumed nor how it carried out its analysis, and

[66] Applied Economics, op. cit. Figure 8, p. 12. That table includes two pre-production years and a shut-down year as well as 20 years of production for a total of 23 years. We have focused on the 20 years of full production, years 1-20. This increases somewhat the average annual impacts.

the DEIS did not inquire about Applied Economics' assumptions before basing its local economic impact analysis on Applied Economics' results.

The IMPLAN model and data bases incorporate very specific detailed knowledge about the local economy and how a particular industry, such as copper mining, links into the local economy. The Pima County IMPLAN database also recognizes that there is already significant copper mining activity taking place in Pima County.[67] The analyst using IMPLAN, however, can make customized assumptions about how she expects a copper mine to interact with the local economy. Those assumptions about how the mine will relate to the local economy, however, should be made explicit, explained, and documented. Only that will allow other analysts to examine the accuracy of those assumptions and that modeling and confirm or dispute the approach taken so that the ultimate decision maker is better informed about the economic consequences of the proposed development.

The USFS in preparing the DEIS socioeconomic analysis did not do that. The Applied Economics' report did not do it either. The DEIS simply accepted the results of modeling commissioned by a local industrial development agency and paid for by Rosemont itself. The USFS in writing the DEIS did not ask Applied Economics, TREO, or Rosemont how IMPLAN had been customized to produce the results that the DEIS reported. As a result, the DEIS lent its blessing to estimated socioeconomic impacts that suggested very large ongoing economic impacts, e.g. 1,750 jobs when the mine is operating, four times the number of jobs directly associated with the copper mine and copper processing facilities themselves. As the USFS discovered late in the DEIS comment period when it asked one of its economists to use IMPLAN to model the local economic impacts of the Rosemont Mine, the employment impacts of the mine reported in the DEIS were 85 percent too high.

This uncritical acceptance by the USFS of a local industrial development agency's version of all of the good things that will come from the mine biases the comments that the general public and public decision makers are likely to make about the Rosemont proposal. The purpose of the DEIS is to provide the public with an accurate depiction of all of the impacts associated with the proposal so that informed comments can be made. The DEIS's analysis of the local economic impacts of the Rosemont Mine did not do that.

[67] Copper mining and related activities provide about 2,000 jobs in Pima County out of about 3,000 total mining jobs (excluding oil and gas industry employment). Thus IMPLAN has built into it the existing copper industry that provides almost four times as many jobs as Rosemont would provide, and the connections of that copper industry to the rest of the economy. [Bureau of Economic Analysis, Regional Economic Information System, U.S. Department of Commerce, 2009 employment and earnings by industry.]

2. Multiplying the number of jobs by the expected duration of the jobs.

The largest employment and payroll impacts that the DEIS estimates for the Rosemont Mine are those associated with the planning and construction of the mine. The DEIS reports that "approximately 4,100 jobs" would be created during project engineering and construction. 2,400 of these jobs would be directly employed in the construction of the mine and 1,800 additional jobs would result from the spending of construction companies on payroll and supplies (p. 737, also Table 171).

This huge employment number is then used to estimate the impacts on population and housing demand. For instance, the DEIS assumes that 10 percent of these 4,100 new workers are likely to relocate to the region to fill the jobs. As a result, the population is projected to increase by 410, i.e. 10 percent of 4,100 (p. 737 and Table 195).[68]

Immediately following the assertion that the Rosemont Mine will be "creating [an] estimated total of approximately 4,100 jobs," the DEIS restates this as: "Annually, the engineering and construction would result in approximately 600 jobs (assuming a 4-year construction phase)." (p. 737 and 739) There is a huge difference between saying 4,100 jobs will be created and saying that 600 jobs will be created. *The first job count is almost seven times the size of the second***.** Misstating the employment impact of a project by a factor of seven when the size of the employment impact is one of the most important social and political considerations is a major error that can only seriously confuse the public dialogue and decision making by political and business leaders.

It is unclear where the 600 jobs figure came from. The DEIS cites the IMPLAN modeling carried out by Applied Economics under contract with Tucson Regional Economic Opportunity (TERO).[69] That study simply asserted that: "The total economic impact during the three to four year construction period is estimated at $563.6 million, supporting about 4,100 direct and indirect jobs…(p. 3)." Figure 1 in that study shows the same construction impact at 4,148 jobs.

It appears that the DEIS took the direct construction jobs (2,400) and divided by the four year construction period to obtain the 600 "annual" jobs. It is unclear why one would not do the same with the 1,772 indirect and induced jobs that when added to the 2,400 direct jobs leads to the 4,148 total jobs.

The DEIS clearly believes that the "jobs" estimated by Applied Economics represent not "jobs" in the normal sense but, rather, the sum of worker-years across the entire four

[68] The DEIS misstates the population increase as "240 individuals" and then calculates a percentage increase based on that number. Table 195 indicates that actual projected population increase is 410 but then shows a percentage increases much too small to be consistent with the 410 person increase. Actually, since some of the in-migrating workers will bring their families, the actual increase in population in percentage terms associated with the 10 percent in-migration assumption will be much higher than shown in Table 195, possibly more than three times larger. It will still be a relatively small increase in population, but the string of errors in these calculations cast doubt on the other calculations in the DEIS socioeconomic analysis.

[69] Economic Impacts of the Rosemont Copper Project on Pima County, Arizona, June 2011.

year construction period. That is, Applied Economics added together the number of workers associated with the construction of the mine for each year of the construction period. If Applied Economics had applied the same approach to the operation of the mine, instead of stating that the average employment during the 21-year operation of the mine was expected to be 434 jobs, it could have multiplied this by 21 years and asserted that the employment associated with the mine would be 9,114. That would be a gross misstatement that neither Applied Economics nor the DEIS made when it came to *production jobs*. Yet when it comes to the construction period, both Applied Economics and the DEIS explicitly exaggerate the employment and income impacts by summing the impacts over the years of construction, effectively exaggerating the economic impacts by a factor of four, the number of years in the construction period.

There is standard economic language for the multi-year employment impacts that Applied Economics and the DEIS present. It is not "jobs" or "employment" but "worker-years." "Jobs" and "employment" represent employment opportunities per year. "Personal income" or "payroll" typically is reported in the same way, on a per year basis. The logic of this is straightforward. If the federal government were to open a federal court office in a major city, one might reasonably expect that office to operate indefinitely, for as long as the United States existed. If one were to multiply the number of jobs, say 100, by the expected duration of the jobs, one could claim the employment was infinite or, if one were more modest, one could use a thousand year period and say the number of jobs associated with that court office was 100,000. Clearly that would be a useless and misleading number of no practical use.

Construction jobs are *temporary* jobs. Many of the more specialized jobs last only for a few months. Others may last a year. Only a small fraction of the jobs last for the entire construction period. As the DEIS points out, because of the temporary nature of the construction jobs, construction workers tend to commute to those jobs (p. 737). Because of the temporary nature of such jobs, it is even more important not to exaggerate the contribution they can make to the local economy. Instead of recognizing this limited importance of the temporary construction jobs, Applied Economics and the DEIS do the opposite. They exaggerate the importance of those temporary jobs by suggesting that 2,400 or 4,100 construction-related workers will be working for four years until the mine is completed. This is simply an erroneous statement.

The DEIS statements about the income impacts associated with construction are also erroneous, e.g. "Total construction impacts in Pima County would precipitate a $194 million increase in payroll (p. 741)."[70] If one divides this claimed increase in payroll by the 600 annual jobs that the DEIS has estimated, each of these jobs would be paying over $323,000. Clearly this $194 million "payroll" is also the sum of the payrolls over four years. The actual *temporary* increase in average annual payroll is a quarter of this, $48.5 million. Summing annual wages over multiple years simply leads to misleading

[70] It is not clear that the $194 million is actually payroll. Applied Economics labels it "personal income" which means that it includes rent, interest, and profit associated with the construction activity in addition to labor earnings or "payroll." See p. 3, Figure 1 (p.4), p 6, and Figure 3 (p. 7). It is also true that on page 5, Applied Economics labeled the $194 million "payroll."

exaggeration. Applied Economics, for instance, shows the "total" direct payroll associated with employment at the Rosemont Mine during its operation as $515 million (Figure 4). The average employment level during the 23 years this payroll was calculated was 421. Thus the implied pay associated with these jobs is $767,000 per job. That, of course, is nonsense. The annual payroll is actually about $26 million (Figure 4) and the pay per job is about $54,000 per year. The latter is useful information (if it is accurate); the former is not; it is misleading exaggeration.

While the DEIS does mention that the "annual jobs" during the construction period would be 600, not 4,100, it drops this distinction when discussing the "[i]ndirect impacts during the construction phase of the project" which it says "would result in 1,800 jobs in Pima County (p. 740)." This is actually 1,800 "worker-years." The annual jobs would be a quarter of this, 450 jobs. Again the actual impact on employment is grossly exaggerated by the DEIS.

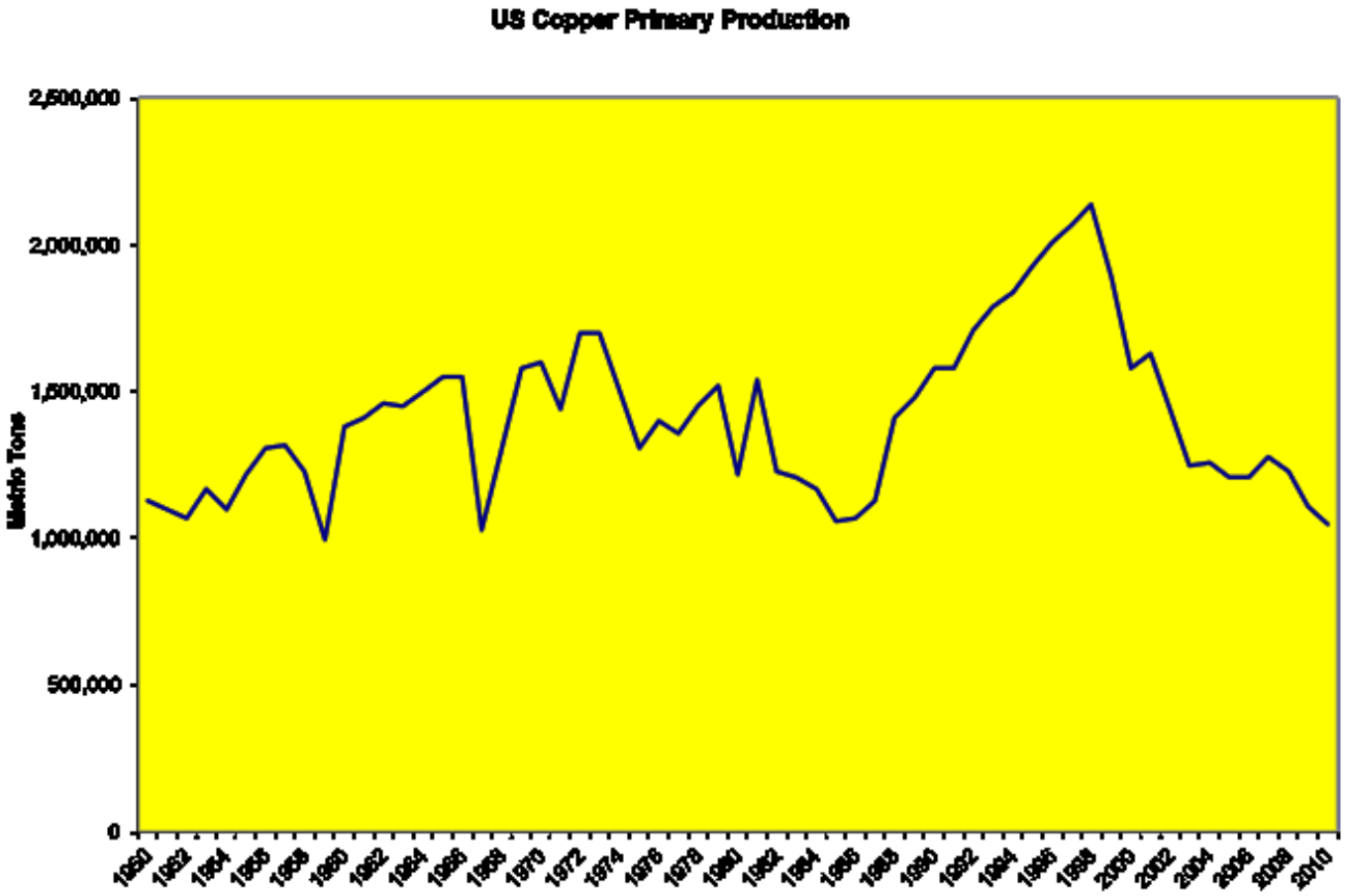
3. Ignoring the Instability of the Economic Impacts of Copper Mining

The DEIS's socioeconomic analysis is explicit in stating that its analysis assumed that: "Employment and output projections [for the Rosemont copper mine] will not fluctuate over the life of the project (p. 704)." The DEIS provides no explanation or justification for this foundational assumption. The very fact that the DEIS explicitly stated this assumption indicates that the USFS was aware of the fact that in the public discussions of the Rosemont Mine during the scoping part of the environmental impact statement process, the issue of the instability of copper mining output and employment had been raised. Instead of dealing with this important socioeconomic issue, the DEIS simply states that it will ignore it. This, in effect, assured that the DEIS's analysis would be biased towards the positive economic impacts associated with the proposed mine since the socioeconomic instability that reliance on copper mining can bring to a local economy would be purposefully ignored. In addition, the positive employment, income, and tax impacts would be exaggerated because of the assumption that the operation of the mine would never be interrupted.

One of the primary reasons that areas that are dependent on mining are rarely prosperous and typically are areas of depressed economic development and, even, persistent poverty, is the instability in mining production, employment, and payroll.[71] The instability of primary copper production in the American economy is shown in the U.S. Geological Survey data in the figure below. Over the last sixty years, 1950-2010, copper production has taken a significant downturn six times. The average time period between significant declines in production has been about eight years. Expecting a 20 to 25 year period of steady production at a copper mine is not a reasonable assumption given the

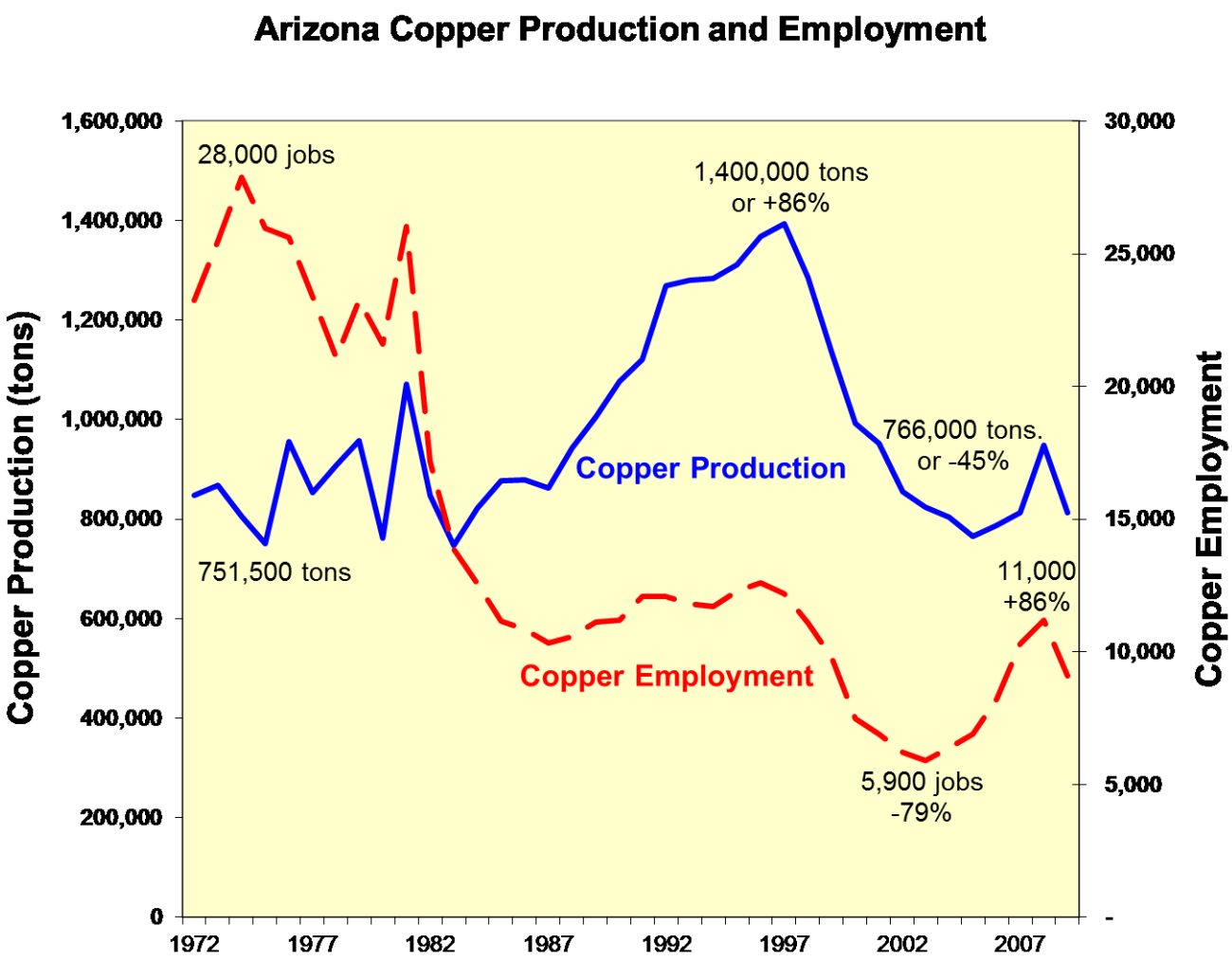
[71]"The Economic Anomaly of Mining—Great Wealth, High Wages, Declining Communities," T.M. Power, in ***Mining in New Mexico: The Environment, Water, Economics, and Sustainable Development,*** L.G. Price et al. eds., New Mexico Bureau of Geology and Mineral Resources, New Mexico Institute of Mining and Technology, 2005.

historical experience including recent experience when American copper production has declined by 50 percent over the last 12 years. See the next figure.



Source: Copper Statistics, U.S. Geological Survey, Compiled by K.E. Porter and D.L. Edelstein.

Arizona copper production and employment have also been unstable. The next figure shows Arizona copper production and employment since 1972. Arizona data also shows a dramatic decline in production, 45 percent, beginning in the late 1990s. Employment in the copper industry has declined even more dramatically, by 60 percent from the mid-1970s to 2009.



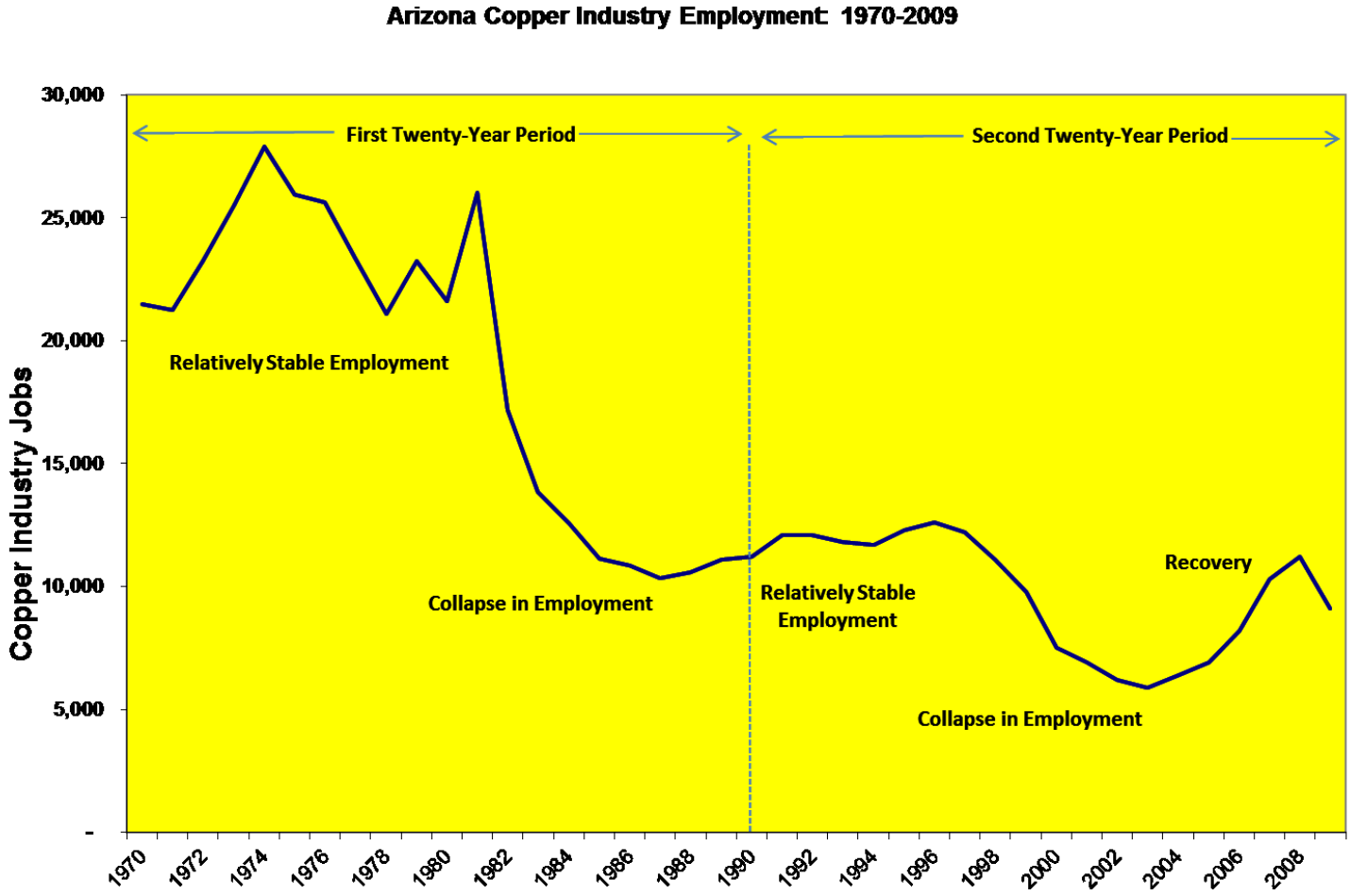
Source: Arizona Department of Mines and Mineral Resources and Western Economic Analysis Center, George F. Leaming, "The Economic Impact of the Arizona Copper Industry," various years.

One can contrast the DEIS's use of the Rosemont assumption that mine employment will be at a relatively steady level over a 20 year period with what has actually happened to Arizona copper industry employment over the last two 20-year periods: 1970-1989 and 1990 to 2009. In the first period Arizona copper industry employment was relatively stable from 1970 to 1982 and then fell by almost 60 percent to attain some stability at a very depressed level. In the second 20-year period employment remained relatively stable at the previous depressed level from 1990 to 1996 when it again plunged, this time by over half. Seven years later, beginning in 2003 it began a recovery that lasted until the down turn in 2009. That is shown in the following figure.

If the twenty-year period the Rosemont Mine is expected to operate followed the Arizona experience over the last forty years, it is likely that the Rosemont Mine would

shut down after about the first ten years. It might or might not reopen in a recovery period that follows. That could cut the expected positive local economic impacts in half. Alternatively, the mine operation could retrench along with the rest of the copper industry at an employment level less than half of its planned employment. That would eliminate about a quarter of the projected positive economic impacts.

Assuming steady production and employment at a copper mine over a 20- to 25-year period is an unreasonably optimistic assumption to make, especially without any discussion whatsoever.



IV. Other Errors in the Socioeconomic Section: A List

We list here apparent miscalculations contained in the socioeconomic section of the DEIS that should be corrected.

1. p. 708: It is said that the population of Pima County "increased…to 136,517." However, the population was already 843,746 in 2000. This no doubt was supposed to refer to the *size of the increase* in population after 2000.

2. p. 714: "State and Local government are the primary industries in Pima County…at 12.7 percent of employment." The DEIS probably means that the ***largest*** sector when industries are grouped as in Table 176 is state and local government combined. Local government was about 8 percent of total employment and state government was about 5 percent. Neither of these is the "primary industry" in Pima County.

p. 718: It is said that "recreation contributions to area economy, approximately 0.10 percent of area employment…" However, the value given is $24.1 million. This must be discussing labor income not employment or the $24.1 million does not belong in the sentence.

p. 719: "…output in Cochise County was dominated by electric power generation (3.82 percent of the county total) and computer programming services (2.76 percent). Output in Pima County was dominated by missile and space vehicle manufacturing (6.76 percent of the country total) and real estate establishments such as brokers, agents, and realtors, etc. (4.63 percent)." Again the DEIS must mean ***that among the largest industrial sectors*** in each county are the listed sectors. An industry that represents 3 or 4 percent or even 5 or 7 percent of output cannot be said to ***dominate*** a county or its economy.

p. 736: Impacts of No Action Alternative on Economic Activity: "There would be no change (increase) to economic activity and output, and in general the balance of economic activity would remain unchanged." This is almost certainly incorrect. The next impact listed stated the status quo correctly: economic activity "will increase consistent with historic trends."

p. 737 and Table 195: The percent of the expected relocating construction workforce: the 0.046 and 0.024 percent figures should be 0.0788 and 0.0418 if the relocating construction workforce is 410. Alternatively, the relocating construction workforce should be 239 and 235 to match the percentages given.

Table 195: The "total annual relocating operation workforce" is said to be 10 percent of the number of employees. The annual operational employees would be 350 to 480 (p. 738). Ten percent of that would be 35 to 48. Instead a number 21 times this is provided. The table is supposed to be quantifying the population increases. Workers will come with families. Those families should be counted too. Finally, only the direct employment at the mine is considered. The indirect and induced employment is ignored. Some percentage of them is also likely to relocate to the area.

p. 739: "…the number of workers needed for the operation of the mine and mill (average annual employment is 35 to 48 workers)..." This is incorrect. The DEIS estimates that 350 to 480 jobs are associated with operations, ten times the numbers provided here.

p. 739 and Table 195 : "…the resulting population changes (735 to 1,008 people over the life of the project (approximately 21 years)…" "Total annual relocating operation workforce: 735 to 1,008." This is totally confused: 735 and 1,008 is 2.1 times the total direct employment of 350 and 480. This would be a reasonable conversion of in-migrating *workers* to in-migrating *population*. So, if all of the direct workers were in-migrants (which the DEIS denies and says only 10 percent will be), then the population will increase by 735 to 1,008.

p. 739: "…the resulting population changes…would not be more than the number of vacant housing units…" Each person does not need a house. Each household needs a house. That would be 35 to 48 or 350 to 480 depending on which page of the DEIS one reads.

p. 739: "approximately 10 percent of the construction jobs would require specialty skills that could not be filled by the local workforce. Thus, an estimated 240 may relocate temporarily…" But the DEIS has previously pointed out that the annual construction workforce would be 600. Thus only 60, 10 percent of 600, would be in-migrants (a quarter of what was stated) in any given year. The *peak* construction workforce is likely to be above the average, but it will not be the sum of the worker-years across the entire construction period. The 240 is 10 percent of the 2,400 worker-years during the 4 year construction period. A worker-year is not a person.

p. 740: "Indirect impacts during the construction phase of the project would result in 1,800 jobs in Pima County." This is the total worker-years across all four years of the construction period. The annual number of indirect and induced jobs would be a quarter of this or 450 jobs.

p. 745: "As previously discussed, 10 percent of the construction workforce (90 employees annually) is expected to relocate to the area." This would suggest that the annual construction workforce is 900 workers, not the previous 600 estimated in the DEIS (pp. 737 and 739). The construction workforce over 4 years, the DEIS says, will be 2,400, which divided by 4 is 600 annual construction jobs times 10 percent would be 60, not 90.

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