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Technical Memorandum

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Subject: Focused Technical Review and Feasibility Assessment of the Proposed Veterans Cemetery Gypsum Canyon Site, Anaheim, California

This memorandum presents a focused technical review and feasibility assessment of the Gypsum Canyon Site, located in Anaheim, California, as a potential location for the development of a proposed Veterans Cemetery (the Project). Geosyntec Consultants (Geosyntec) prepared this draft memorandum for the City of Irvine (City). This memorandum pertains to the review of documents listed in the References Section.

BACKGROUND

Geosyntec understands that the State of California (State) is planning to develop a Southern California Veterans Cemetery (SCVC) in Orange County, and the Department of General Services (DGS) is assisting the state with the location selection for the SCVC. DGS is considering developing the SCVC cemetery on a 153-acre site within a 283-acre [GMU, 2023a] undeveloped property known as Gypsum Canyon (Site) in the City of Anaheim, California. The Site is currently owned by the Orange County Cemetery District (OCCD). The Site is located near State Routes 91 and 241 and can be accessed from the intersection of Gypsum Canyon Road and Santa Ana Canyon Road.

Based on the review of public documents, a portion of the Site was used as a testing facility for rocket fuel by McDonnell Douglas/Astropower between 1961 and 1991 [City of Anaheim, 2005]. In the 1950s and until 1992, the Site was used as a mine facility for sand and gravel source that was extracted by surface mining operations by Robertson's Ready Mix [GMU, 2023a]. Approximately 40 years after the surface mine was established, the southeasterly area of the site was used as an asphalt batch plant by All American Asphalt Company.

Surface mining and batch plant operations significantly altered the natural topography of the site. Prior to the surface mining operations, the site consisted of a series north-northwesterly trending ridgelines. These ridgelines previously reached elevations of 900 to 940 feet above mean sea level (msl; USGS, 1954). Today, the area of this previous topographic high has an approximate elevation of 600 to 640 feet above msl, indicating an approximately 300-foot vertical reduction. Topographic reduction of a lesser scale occurred throughout portions of the site [GMU, 2023a].

Based on conceptual design plans [Huitt Zollars and Rhaa, 2023], development of the SCVC will include: overall site preparation; remedial and mass grading (including stabilization of an existing large landslide); utilities installation; construction of access roads; full perimeter walls; stormwater treatment and detention facilities; administration and maintenance buildings; ceremonial entrance; cortege assembly area; committal service shelter; flag and assembly area; memorial walkway; in-ground cremains plots and columbaria niches; and other ancillary infrastructure.

Based on the review of the Project Cost Summary prepared by DGS [2023], the total project cost for Phase 1 of the SCVC development is estimated to be $126,031,800, as summarized in Table 1 below:

Table 1. Project Cost Summary for Phase 1 of the SCVC prepared by DGS [2023]

Element	Estimated Cost
Construction/Hard Costs	$73,071,500
Escalation	$14,731,200
Contingency at 5%	$4,390,100
Subtotal	***$92,192,800***
Soft Costs	$33,839,000
Total Cost	**$126,031,800**
Note: Detailed breakdown of the above costs by DGS or description of how DGS calculated the above costs was not provided to Geosyntec.	

Geosyntec also reviewed the Final Concept Plan Cost Estimate prepared by Huitt-Zollars [2023] for the SCVC Phase 1 development, a summary of which is provided in Table 2 below:

Table 2. Project Cost Summary for Phase 1 of the SCVC prepared by Huitt-Zollars [2023]

Element	Estimated Cost
Construction Costs:	
01. Site Work	$59,769,038
02. Administration and Public Restroom Buildings	$2,437,948
03. Maintenance Building	$3,429,131
Total Construction Cost	*$66,175,208*
Total OCCD Costs for Possible State Participation	*$46,546,400*
Total Add Alternatives Cost (Section 23-Crypts, Memorial Wall, Carillion Tower)	*$7,058,578*
Total Other Costs (Operations Equipment)	*$45,668*
Total Cost	**$119,825,854**

Notes:

1. The above cost estimate by Huitt-Zollars [2023] is based on the OCCD proceeding to develop their Site first which will include the development of Site infrastructure such as access road, bridges over Gypsum Creek, storm drain, offsite waterline extension, and electrical communication systems. An estimate of total OCCD costs for possible state participation is included assuming that OCCD may request that the State participate financially in these improvements which are mutually beneficial to both OCCD and the State.
2. The above cost estimate by Huitt-Zollars [2023] does not include soft costs (i.e., design and engineering fees), environmental assessment/hazardous material abatement fees, building permits and fees, inspection and testing fees, construction contingency, and project cost escalation fees.

Note that while the total estimated costs by DGS [2023] and Huitt-Zollars [2023] are close, there is some discrepancy, the cause of which is unknown at this time since a detailed breakdown of the DGS [2023] estimated costs was not readily available to Geosyntec.

To assist with the technical feasibility of the Site for the proposed SCVC, Geosyntec reviewed the project documents listed in the References Section and offers the comments described in the following sections.

GENERAL CIVIL COMMENTS

The Site is currently vacant, and following the cessation of mining activities, has been left as unimproved open space. Based on our review of the referenced documents, the Site has no established water, sewer, or gas connections. Also, construction of a permanent vehicular access across Gypsum Creek (i.e. a bridge), paved roads, and other basic infrastructure will be needed. The costs associated with utilities connection and the necessary civil improvements (not including the costs for site grading/earthwork) are estimated by Huitt-Zollars [2023] to be in the order of $60,923,000, itemized into different categories as summarized in Table 3 below.

Table 3. Estimated cost for Civil Improvements for Phase 1 of the SCVC based on Huitt-Zollars [2023].

Key Project Element	Estimated Cost
Site Preparation and Clearing	$1,899,000
Site Improvements (Roads, Parking, Landscaping)	$24,923,000
Wet Utility Site Improvements	$14,080,000
Dry Utility Site Improvements	$590,000
Structural Buildings (Admin and Public Restroom, Maintenance, and Committal Shelter)	$6,406,000
Total OCCD Costs for Possible State Participation	$13,025,000
Total	**$60,923,000**

Note:

1. The above estimated costs do not include site grading/earthwork costs (separately discussed later under comments related to geologic hazards).

Although the site consists mostly of open land, a segment of the Questar natural gas pipeline transects the southern region of the site. The Questar pipeline is reported as 16 inches in diameter and has a general east to west alignment [GMU, 2023a]. This segment of the Questar pipeline will require relocation prior to proposed grading activities associated with the project. This is a major

utility line, and cost and schedule impacts associated with the relocation of the pipeline do not appear to have been reflected in the project's cost estimate reviewed by Geosyntec. Geosyntec estimated that an additional Rough Order of Magnitude (ROM) cost range of $135,000 to $260,000 estimated at approximately $95 to $185 per linear foot for an approximate pipe length of 1,400 feet will be required to relocate the pipeline. This ROM does not include design, permitting, construction management and connection costs.

GEOTECHNICAL COMMENTS

The reviewed geotechnical reports [GMU, 2023a,b], prepared for the State of California Department of General Services and California Department of Veteran Affairs, generally follow a methodology consistent with the local standard of practice for similar projects. The key elements of the reports include:

- Reviewing past geotechnical information;
- Assessing geologic risk;
- Performing a geotechnical field investigation;
- Performing a geotechnical laboratory testing program;
- Developing geotechnical parameters for Site geologic materials;
- Conducting slope stability analyses; and
- Providing geotechnical recommendations for the design in a report documenting the above steps.

While the above steps are described in the geotechnical design reports, the following sections provide our selected review comments.

COMMENTS RELATED TO SEISMICITY

The geotechnical report [GMU, 2023b] states on page 10: "*The site is not within a designated Alquist-Priolo Earthquake Fault Zone and no active faults are known to exist within the site. However, localized folding and faulting of strata are present on the eastern margin of the site that is associated with the mapped shear zone shown on the Geotechnical Map – Plate 2.0. Adjacent to the eastern margin of the site is the Elsinore Fault zone and the Chino Fault zone is located about 4 miles from the site.*"

The geotechnical report [GMU, 2023b] does not mention that the active Glen Ivy Section of the Elsinore Fault has been mapped by the California Geologic Survey approximately 2 miles east of the site and is trending towards the site, which due to this fault Right-Lateral sense of movement, creates a concern for the Site, as focused seismic energy can be directed towards the Site and

amplified by the liquefiable soils associated with the Santa Ana River alluvial plain mapped under areas of the Site. Due to the Site's proximity to a major active fault, additional seismic analyses to assess seismic ground motions (in addition to using the Caltrans basic ARS Online tool utilized by the consultant) are warranted, including comparing records of existing strong motions with the calculated seismic parameters for the Site and performing a site-specific seismic site-response analysis.

The geotechnical report [GMU, 2023a] recommends a spread-footing foundation type for the proposed bridge to provide vehicular access across Gypsum Creek, and other cemetery ancillary structures. In Geosyntec's experience, pile foundations or tie-downs are generally necessary to prevent foundation uplift due to Site seismicity and associated ground motions. While the GMU [2023a] report recommends spread footings for the proposed bridge, review of the final concept plan prepared by Hutt-Zollars and Rhaa [2023] indicates that OCCD's design team is currently proposing deep foundations systems (i.e., caissons or piles) for the bridge and the Huitt-Zollars [2023] cost estimate included deep (pile) foundations provided under the OCCD costs for possible state participation.

However, additional costs associated with the development of site-specific seismic response analysis generally required for the bridge and other cemetery structures in similar seismic settings do not appear to have been included in the final concept plan cost estimate for the project.

COMMENTS RELATED TO GEOLOGIC HAZARDS

The Site presents several geologic hazards such as a large landslide re-activated by mining operations and generally unfavorable bedrock bedding conditions. These hazards require mitigation consisting of landslide headscarp removal and reconstruction with an engineered buttress, and construction of a large toe buttress key. The costs for landslide and unsuitable soils mitigation have been included under site earthwork and is estimated at $51,798,000 [Huitt-Zollars, 2023].

In addition to landslide mitigation and unfavorable bedrock conditions, other geologic hazards such as liquefaction potential, seismic-induced settlement, lateral spreading, and unsuitable soils requiring remedial measures exist at the Site.

While the large landslide mitigation costs are included in the mass grading, additional costs associated with liquefaction and seismic settlement mitigation generally required for the type of proposed structural improvements do not appear to have been included in the final concept plan cost estimate for the project. Based on our experience with similar projects/sites, we estimate that

an additional remedial ROM cost of $8,000,000[1] will be needed for potential liquefaction and seismic settlement mitigation.

Furthermore, portion of the site is underlined by artificial untested fill that generally consists of clay and silt with varying amounts of gravel, cobbles, and boulders. This artificial fill also contains varying amounts of man-made debris (concrete wash-out deposits, rebar, metal, and concrete piping, etc.). The variation of the characteristics of the soil and rock materials underlying the site (i.e., materials ranging from gravely sands to silty clays and man-made construction debris) can have adverse impacts on settlement and infiltration rates, potentially affecting adjacent slopes and/or improvements.

Additional costs, schedule delays, and difficulties associated with the removal and disposal of the unsuitable oversize material and construction debris do not appear to have been included in the final concept plan cost estimate for the project. While this additional cost for removal and disposal of unsuitable oversize material and construction debris is difficult to be quantified at this time, it should be noted that this cost can be significant cost to the project.

ENVIRONMENTAL COMMENTS

The latest Phase 1 Environmental Site Assessment (ESA) [Aptim, 2023] done for the Site contains several inconsistencies, the major ones are:

On Page 4-3 of the Phase 1 ESA, it is reported: "*No pits, ponds or lagoons utilized for waste disposal purposes were observed in the exterior area of the subject property*." This is inaccurate, as ponds used for mining purposes are still present and are visible within the Site and were described in the same document.

The historical McDonnell Douglas/Astropower facility used for rocket fuel testing between 1961 and 1991 at the Site, which is mentioned in Appendix J of the 2005 EIR No. 331 for the previously proposed Mountain Park Development Site, is not mentioned in the 2023 Phase 1 ESA. The center of the rocket fuel testing was located approximately 1 mile south of the mouth of Gypsum Canyon. The 2023 Phase 1 ESA concludes that no Recognized Environmental Conditions (RECs), no Historical RECs (HRECs), no Controlled RECs (CRECs), nor petroleum products were encountered within the Site. The historical McDonnell Douglas/Astropower facility should be considered an HREC, at a minimum.

[1] Limited liquefaction mitigation for administration and public restroom buildings, maintenance buildings, committal shelter and bridge.

The Phase 1 ESA [Aptim, 2023] concludes that a Phase 2 ESA is not warranted. This is questionable, since it is still unclear if historical impacts from Site past industrial use have been fully mitigated to today's regulatory requirements (see Geosyntec 2005 reports in Appendix J of the 2005 EIR).

Furthermore, regulatory requirements have changed since the 2005 EIR, probably resulting in more analyses, regulatory negotiations, and potentially costly environmental remediation if the Site is developed.

Additional costs associated with the potential extensive environmental remediation work and additional required analysis necessary to meet current regulatory requirements for the type of proposed site improvements do not appear to have been included in the final concept plan cost estimate for the project. While these costs are dependent on several factors such as the extent and nature of remediation as informed by additional testing and analyses and are difficult to be quantified at this time, it should be noted that these might add significant costs to the project.

CONCLUSIONS

The sections above present geotechnical and environmental remediation considerations whose estimated costs for the Site do not appear to have been included in the final concept plan cost estimate prepared by Huitt-Zollars [2023] for the project.

A summary of these additional items/considerations and our estimated ROM costs is provided in Table 4 below.

Table 4. Additional Cost Items and Estimated ROM Costs

Additional Cost Items	Estimated ROM Cost
1. Engineering, design and permitting	$12,000,000[1]
2. Questar pipeline relocation and associated permitting	$135,000 to $260,000
3. Liquefaction, settlement, lateral spreading mitigation	$8,000,000
4. Unsuitable soils/untested fill/man-made debris mitigation	Unknown at this time but significant added cost to the project
5. Potential environmental legacy contamination/regulatory negotiation	Unknown at this time but significant added cost to the project (could be in the order of several million dollars)
Total Additional Costs	**costs upwards of $20,260,000**

Note:

1. Engineering, design, and permitting costs assumed as 10% of the total project construction costs.

Based on the above, it would be advantageous to find an alternate site that does not require such extensive civil/geotechnical improvements due to its geologic setting or has a potential for further environmental remediation due to its past site use. For comparison purposes, Table 5 compares the estimated costs for Phase 1 for the Gypsum Canyon Site against the estimated costs for Phase 1 of the alternate ARDA Site.

Table 5. Comparison of Estimated Costs for Phase 1 of SCVC at Gypsum Canyon versus ARDA Site

Elements	Estimated Costs for Phase 1 SCVC	
	Gypsum Canyon[1]	**ARDA[2]**
Construction/Hard Costs	$73,071,500	$25,347,000
Escalation	$14,731,200	$1,277,500
Contingency at 5%	$4,390,100	$1,331,300
Subtotal	***$92,192,800***	***$27,955,800***
Soft Costs	$33,839,000	$14,566,500
Total Cost	**$126,031,800**	**$42,522,300**
Additional Cost Items (Geosyntec Estimate)	**costs upwards of $20,260,000[3]**	**--**

Note:

1. Cost estimate from DGS (2023).
2. Cost estimate provided by the City of Irvine and based on the DGS estimate dated May 2018 updated to account for inflation to 11/2023 using Consumer Price Index (CPI) and current site conditions (i.e., building demolition and disposal is complete, site demolition and disposal and Hazardous waste remediation/removal is ongoing/substantially complete, and site utility development is ongoing, with City of Irvine bearing the costs for these items).
3. See Table 4 above.

As summarized in Table 5 above, the costs for development of Phase 1 of the SCVC at the ARDA site will be cheaper in the order of $100,000,000 than at the Gypsum Canyon.

Furthermore, construction of Phase 1 at the ARDA site is estimated to be able to be performed within 36 to 48 months, per verbal information provided by the City of Irvine. In comparison, Phase 1 construction of the SCVC at Gypsum Canyon is estimated to take 10 years, based on the 100-year total duration for the 10-phase masterplan. This extended construction period of the Phase 1 construction for the SCVC at Gypsum Canyon is likely to result in additional costs, which will increase the chance of encountering potential change of conditions and regulations during the construction phase. This timing factor should be taken into account as part of the overall SCVC project at Gypsum Canyon.

REFERENCES

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