White Paper

Defense Production Act (DPA) Title III

Expansion of Domestic Production Capability and Capacity

Funding Opportunity Announcement

Announcement Number: FA8650-19-S-5010

Topic Area(s): Sustainment of Critical Production

DeepGreen Resources Feasibility Study for Commercial Nickel-Cobalt-Copper Refinery

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Administrative Point of Contact (PoC):

Kristin Hengstebeck

Director, Business Development & Market Research for North America

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Technical Point of Contact (PoC):

Dr. Jeffrey Donald

Head of Onshore Development

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(b)(6)

Verification of Current SAM Registration and EPLS Status:

SAM number: (b)(4) | Tax ID number: (b)(4) | DUNS number: (b)(4)

The Metals Company and its subsidiaries are not listed on the Excluded Parties List System.

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Domestic Source Proof

DeepGreen Resources LLC ("DGR" or the "Applicant") is a wholly owned US subsidiary of The Metals Company (Nasdaq: TMC) ("TMC") formed in 2013 under the laws of North Carolina. TMC was formed in 2021 through the merger of DeepGreen Metals, Inc. and Sustainable Opportunities Acquisition Corporation (NYSE: SOAC). DeepGreen Metals, Inc. was incorporated under the laws of the Province of British Columbia, Canada in 2011. Nauru Ocean Resources, Inc. ("NORI"), the entity that holds the license to the metal resource to be processed through Project One, is also a wholly owned subsidiary of TMC. All TMC subsidiaries are wholly owned and thus roll up to a Canadian parent company.

The feasibility work proposed will be conducted at a site in the US that meets infrastructure, zoning, plant design, and consumables criteria for the Applicant's planned large-scale commercial processing facility ("Project One" or the "Project"). The work scope will be performed by US and Canadian firms, both of which maintain a substantial presence and resources in the US. The Applicant anticipates the majority of plant equipment can be sourced from North American suppliers a list of which can be made available; however, vendor packages will be large and may include some sub-vendors that may not necessarily be North American entities. Since 2012, DGR and its sister companies have been conducting resource definition and environmental baseline work in the area licensed by NORI, located in international waters approximately 1,500 miles west of the coast of Mexico in the Pacific Ocean. All exploration campaigns to date have operated from San Diego apart from one campaign in 2020, which operated from Hawaii. Documentation provided by the US Customs and Border Protection Office of Trade, Regulations, and Rulings in 2017 declared these campaigns to international waters and back to the US as 'voyages to nowhere,' not in violation of 46 U.S.C. § 55102 or 55103 and not requiring any clearing of customs upon return. A copy of this document can be provided.

Defense Production Act Title III Criteria

The Applicant has provided the following information to demonstrate how the Project will address DPA Title III Criteria.

(1) The industrial resource, material or critical technology item is essential to the national defense;

In his Presidential Determination No. 2022-11 of March 31, 2022, President Joseph R. Biden Jr. stated: "The United States depends on unreliable foreign sources for many of the strategic and critical materials necessary for the clean energy transition, such as lithium, **nickel**, **cobalt**, graphite, and **manganese** for large-capacity batteries. Demand for such materials is projected to increase exponentially as the world transitions to a clean energy economy. To promote the national defense, the United States must secure a reliable and sustainable supply of such strategic and critical materials. The United States shall, to the extent consistent with the promotion of the national defense, secure the supply of such materials **through environmentally responsible domestic mining and processing**."

Project One is designed to produce battery grade nickel and cobalt sulfate and copper cathode, and fertilizer-grade ammonium sulfate.[1] Nickel and cobalt are included on the US Geological Survey's (USGS) 2022 list of critical minerals. The USGS 2022 Commodity Summary notes that small volumes of nickel and cobalt that are mined in the US are exported for refining. Further, the Biden administration's 100-day supply chain review categorized Class I nickel and cobalt as specific vulnerability points in the US battery supply chain.[2] The review notes that, even more than raw materials, the US lacks processing capabilities, which Project One would remedy at scale. While not currently on the USGS critical mineral list, industry analysts project significant impending copper shortages that threaten the build out of clean energy technologies,

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[1] SEC Regulation S-K (Subpart 1300) and Canadian NI 43-101 Compliant NORI Area D CCZ Mineral Resource Estimate and associated financial model, AMC, March 2021.
[2] Biden 100-Day Supply Chain Review under Executive Order 14017, June 2021.

infrastructure, and industrial machinery[3]. Copper was also added to the U.S. Department of Energy critical material list in 2023. Adding to this problem, domestically, additive copper extraction projects have been delayed or cancelled due to environmental concerns.[4]

Project One would expand US capacity to produce these three key metals domestically at significant scales. Project One's output of refined nickel would move the US from zero production to the 7th largest global producer of nickel sulfate, with Project One being the largest single producer of nickel sulfate outside China.[7] The output of refined cobalt would move the U.S. from zero production to the 4th largest cobalt sulfate producing country globally.[5] Project One would also expand refined copper supply in the US by 5%.[6]

(2) Without Presidential action under this section, United States industry cannot reasonably be expected to provide the capability for the needed industrial resource, material or critical technology item in a timely manner; and

Without Project One, the US has limited opportunities to grow nickel and cobalt refining capacity given the competitive cost of Asian operations, which benefit from excessive government subsidization, and a lack of secure feedstock due to (1) relatively small to no domestic reserves, (2) domestic barriers to entry for new mines, and (3) lack of domestic cathode material production capacity.[3] **Figure 1** below summarizes US needs and supply compared to anticipated production from the DGR Project One facility.

Figure 1. Domestic metal demand for EVs, domestic metal production and reserves, and forecasted steady state annual metal production for DGR Project One.

Metal (contained in each product)	Required for full electrification of	U.S. production, 2021 kt[7]	U.S. reserves, 2021 kt[11]	Project One steady state production, kt[2]	EV units/steel tonnage potential, rounded[8]

[3] S&P The Future of Copper: Will the looming supply gap short-circuit the energy transition? July 2022.
[4] Impacted mining projects: Pebble, Resolution, Rosemont, Twin Metals.
[5] U.S. nickel sulfate production: Benchmark Mineral Intelligence Nickel Forecast, Q4 2021; Cobalt sulfate production: BNEF Cobalt Outlook, 2021.
[6] U.S. Geological Survey Commodity Summary 2022 – Copper refinery production 2021e.
[7] U.S. Geological Survey Commodity Summary, 2021.
[8] EV batteries: Calculated based on metal content required for 75kWh NMC811 battery cathode per AMY July 25, 2018: Table 1. Steel production: U.S.G.S. Factsheet 2014-3087.

	U.S. car sales, ktpa[3]				
Nickel[3]	1,273	14	110	64.7	1,150,000
Cobalt[3]	159.8	0.5	55	5.3	750,000
Copper[13]	1,533	1,300	48,000	48.0	565,000

The top recommendation from the Biden administration's 100-Day supply chain review – realizing a domestic nickel refinery – is unlikely to be realized without investment in Project One. The proposed facility would also serve to backfill copper production that may otherwise not reach commercial markets due to local permitting issues for domestic mines.[6]

DGR and its parent TMC have active engagement with a wide range of institutional investors, and along with its public closing in September of 2019, have raised over $400 million over the last decade to fuel its resource definition, environmental baselining, pilot collection, and processing campaigns, approximately $300 million of which has gone directly to the development of NORI. However, at this critical stage, funding the necessary feasibility work to enable investment to secure a site for a large-scale processing facility has not aligned with investment profiles. While DGR and its partners have customized a flowsheet to process nodules, resulting in near-zero waste and zero toxic tailings, the equipment required to process the secured resource is not novel; many similar facilities exist, primarily in Asia. Thus, the Project has not fit the investment profile of venture capital firms looking to fund disruptive technologies. The Project sits at the intersection of green energy, deep-sea engineering, and metallurgical processing, which has not aligned with traditional oil and gas or clean energy infrastructure investor profiles. Further, previous Federal programs were focused exclusively on R&D-level projects, pilot-scale projects, and loans for commercial-scale buildout, none of which aligned with the Applicant's need to fund a bankable feasibility study. For these reasons – and considering the additional investment from the market likely to be encouraged by DOD investment in Project One at this stage – DPA is best positioned to support the necessary feasibility work.

Further, battery raw materials projects have been underinvested in general. This is a relatively new, small sector with no majors or supermajors to rely on; there is not enough capital capacity (i.e., equity, debt, etc.) to finance the massive developments needed. Since the passing of the Inflation Reduction Act, only 1% of over $100 billion USD has gone towards raw material development.[9] As DOD is aware, companies in this sector, including DGR, are often over-leveraged before they reach the construction phase. Respected industry consultancy Battery Materials Review found that, based on capital requirements, raw materials projects require approximately 30% more funding than battery manufacturing and 70% of the required capital for EV manufacturing. However, capital capacity (funding) for raw materials projects over the past five years has been only 25% and 14% of the funding allocated to battery and EV projects, respectively, indicating an unhealthy industry pipeline and structural gap between market demand and supply, resulting in rising prices.[10] Removing Chinese capital capacity worsens this situation significantly.

(3) Purchases, purchase commitments or other action pursuant to this section are the most cost effective, expedient and practical alternative method for meeting the need.

DGR has strategically selected its feasibility partners based on their tenure of engagement with Project One, specialized expertise in the required work scope, and equipped regional resources. To this end, DGR has been working closely with (b)(4)

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[9] BNEF Zero Emissions Vehicle Factbook (Dec 2023)
[10] https://www.batterymaterialsreview.com/ourblogs/capital-capacity-vs-capital-requirement-the-misunderstanding-that-threatens-the-viability-of-the-ev-event/
[11] https://www.businesswire.com/news/home/20210924005053/en/The-Metals-Company-Processing-Pilot-Campaign-Converts-Seafloor-Nodules-into-Alloy-Containing-Critical-Battery-Metals; https://www.globenewswire.com/en/news-release/2021/10/06/2309505/0/en/The-Metals-Company-and-SGS-Group-Commence-Test-Work-Pilot-Demonstrations-to-Extract-Critical-Battery-Metals-from-Seafloor-Rocks.html

(b)(4) work and the work proposed in this white paper given its technical expertise in designing and supporting operations at complex metallurgical processing facilities, as well as battery chemical and material production plants. (b)(4) global experience, North American headquarters, and robust local resources are important given that most similar projects have been constructed outside North America, primarily in Asia. (b)(4) has advised clients on battery material projects (b)(4) across conceptual, pre-, and bankable feasibility studies; test work and process development; detailed engineering, procurement, and construction management (EPCM); and ongoing operations management. In the proposed work scope, (b)(4) will serve as the main engineering service provider conducting the site-specific plant engineering inclusive of integrated precursor cathode active material (PCAM) production and scrap and spent nickel-based battery material recycling lines. Most recently, (b)(4)
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DGR is also partnering with (b)(4)
(b)(4) to provide overall program management and integration of production chain and supporting infrastructure services for the facility's mining and processing operations. Notably, (b)(4)
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(b)(4) [13] As it relates to processing scope, (b)(4) will serve as the feasibility study program manager, overseeing day-to-day project implementation, application of project delivery standards and procedures, management of project design basis, work breakdown structure and additional DGR consultants, review of provided estimates for compliance, incorporation of capital and operating cost estimating standards, development of feasibility study

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[13] Technical Resource Summary for TOML Mineral Resource, Clarion Clipperton Zone, AMC, March 2021 (page 15).

and implementation execution plans, and compilation of final study reports. (b)(4)

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(b)(4), DGR's partners for the proposed scope, have worked successfully together on other projects, (b)(4)

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(b)(4) will have similar scope responsibilities for the proposed feasibility study. DGR will serve as the owner ultimately responsible for Project One and provide key technical and market inputs related to the metal resource, plant operations, process flowsheet, and facility buildout.

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Technical Description

1. Technical Discussion & Business Case

1.a. Technical Discussion

1.a.i. Technical Objectives

The objective of the proposed work scope is to deliver an internationally recognized bankable feasibility study inclusive of: (1) site-specific plant engineering development to support CapEx and OpEx estimates in accordance with Association for the Advancement of Cost Engineering (AACE) Class 3 guidelines, infrastructure assessment and subsequent design, execution planning and constructability, and other activities and deliverables as required by corresponding project delivery standards; (2) a technoeconomic assessment inclusive of budgetary quotes for equipment and consumables, estimated revenues incorporating previously developed market studies, terms of potential offtake agreements, and local taxes from which a decision can be reached on executing a site lease agreement with the site owner; (3) a completed Environmental and Social Impact Assessment (ESIA), including engagement with local authorities, a detailed outline of permitting requirements and process, and health and safety plans for both construction and operation phases; (4) a technoeconomic assessments of (i) an integrated precursor cathode active materials (PCAM) plant, and (ii) one or more integrated recycling lines to process scrap and spent nickel-based battery materials using the Project One facility and selected flowsheet; and (5) completion of an Operational Readiness (OR) plan inclusive of establishing the OR team, IT, and administrative systems ("Project One Feasibility Study" or the "Project").

The final study will compile the following components: (1) Executive Summary, (2) Project Objectives & Description, (3) Ownership & Legal, (4) Process Plant Feed Source, (5) Process Plant Engineering, (6) Infrastructure, (7) Environmental & Permitting, (8) Health & Safety Plan, (9) Government & Community Relations, (10) Schedule, (11) Execution Plan, (12) Operations Readiness & Planning, (13) Capital & Operating Cost Estimates, (14) Economic Evaluation, (15) Market Plan, (16) Risk Assessment, and (17) Study Conclusions & Recommendations.

1.a.ii. Technical Approach

Study parameters: DGR's approach to the feasibility study is based on decades of experience with technical studies and operation of metallurgical processing plants across its internal team and partners, which bring additive specialties in battery material processing, execution of large industrial projects, and complex program management. A US SEC S-K 1300- and Canadian NI 43-101-compliant resource definition statement for the NORI Area, which will provide feedstock for the processing facility, was completed March 17, 2021.[1] The proposed feasibility study will be conducted in accordance with AACE Class 3 guidelines (to 25% level with -15% to +20% accuracy) as the generally accepted international industry benchmark for soliciting additional investment.[17] Given DGR's parent, TMC, is publicly traded in the US, achieving SEC S-K 1300 engineering level, accuracy and contingency requirements in the future may be required. The processing methodologies and required equipment are used in various commercial operations today and have an applicable technology readiness level of 9. The feedstock itself is the only novel parameter.

(b)(4), DGR has conducted a pilot-scale processing and refining program at North American commercial facilities; the combined process involves primary pyrometallurgical processing (**Figure 2**) and secondary hydrometallurgical refining (**Figure 3**). The pyrometallurgical front end of the plant will use rotary kilns and electric furnaces (RKEFs) that calcine and smelt the nodules to form an alloy; the alloy is then sufidized to form a matte similar to mixed sulfide precipitate but containing additive copper content. The matte is converted in a Peirce-Smith converter to remove iron. The matte will be granulated and dried as per the conventional process and serves as the feedstock for the refinery facility (composition in Figure 4).

[17] https://web.aacei.org/docs/default-source/toc/toc_47r-11.pdf

The feasibility study proposed herein focuses on the secondary refining of intermediate matte, to be sourced initially from Pacific Metals Co. (PAMCO) who plans to produce the material at their existing plant in Hachinohe, Japan.[18] Following a 22-tonne pilot in 2023, PAMCO is currently conducting a 2,000-tonne demonstration to confirm commercial operating parameters. DGR parent, TMC, has also shared nodule-derived intermediate NiCuCo alloy with a firm planning a domestic nickel, cobalt and manganese refinery aiming to accept multiple types of feedstocks.

Figure 2. Pyromet Complex Calcining in Rotary Kiln at FLSmidth (PA) and smelting, sulfidation, and converting at XPS (ON).

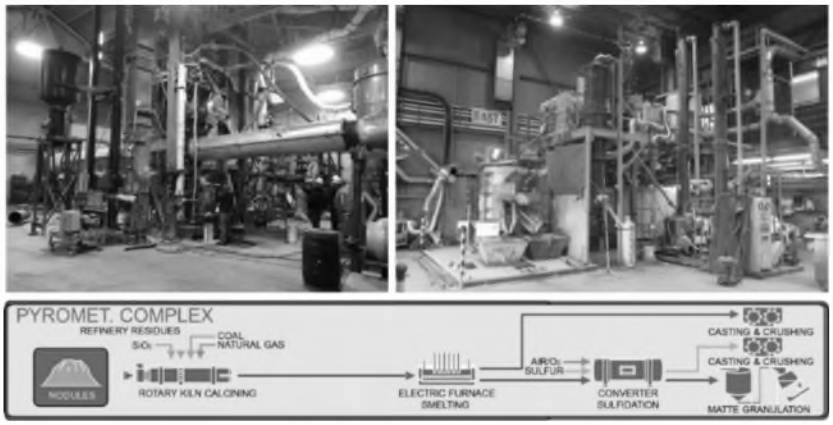
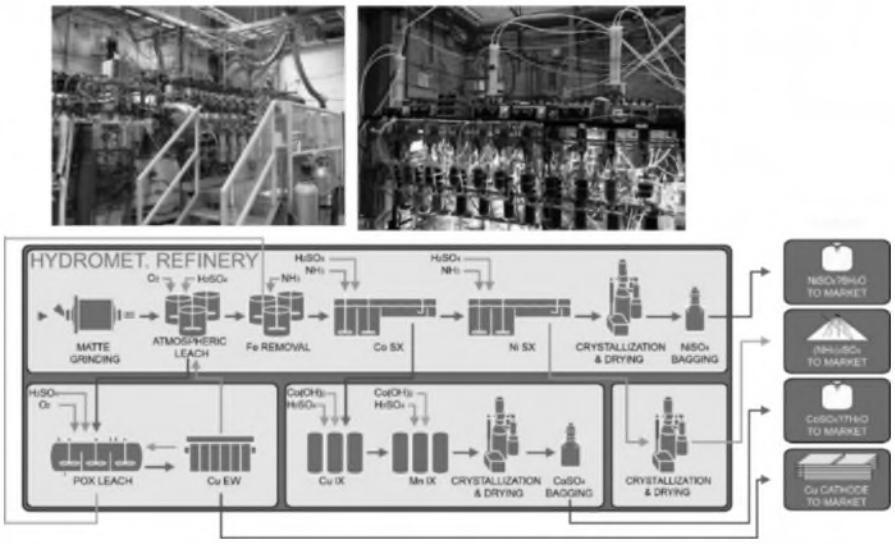


Figure 3. Hydromet Refinery Pilot Autoclave and Solvent Extraction Circuits at SGS (ON).



[18] https://investors.metals.co/news-releases/news-release-details/tmc-and-pamco-sign-binding-mou-complete-feasibility-study

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commercial scale-up; detailed plant engineering; environmental services; engineering, procurement, and construction management (EPCM); and ongoing operations management. Most recently, (b)(4) (b)(4) (b)(4) Additionally, (b)(4), is supporting TMC with program management services for the Project. Members of (b)(4) US team will serve as the feasibility study Program Management Team overseeing engineering and design advancement to support the development of an efficient construction execution. (b)(4) (b)(4) (b)(4) experience across energy, mining and metals; environmental; manufacturing; and infrastructure projects makes the company an ideal partner to transition Project One from design to construction phase. (b)(4) (b)(4) (b)(4)

The Project will be conducted in three budget periods; the first two will be 12 months in duration, per DOD guidance. The third will be six months in duration. Please refer to the Rough Order of Magnitude in **Addendum 2** for a detailed description of work to be done by budget period.

1.b. Business Case

1.b.i. Business Objective

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One from the market, offtake agreements, and provide a go/no-go decision basis on moving forward with securing the proposed site for construction of Project One. Detailed validation of discrete components of the Project budget, project engineering to the 25% level, and 15/+20% accuracy.

2.b. Manner of work

The full scope will be supported by the Project Team and appropriate local and federal authorities. The study will be managed and overseen by (b)(4) (b)(4) will conduct the detailed process engineering, manage the environmental review process specific to the metallurgical facility, and provide key market-based inputs for integrated PCAM and recycling components.

2.c. Overall Contribution to DPA Title III Topic Area Mission

Project One will support the DPA's mission to sustain critical production by producing key critical minerals – cobalt and nickel. While not currently designated a critical mineral, Project One will also produce high purity copper, for which demand is forecasted to outpace supply in the near term.[5] Nickel and cobalt sulfate and copper cathode will be refined to purity levels suitable for lithium-ion battery applications. Nickel and cobalt sulfate produced are also anticipated to meet the purity and processing location requirements to qualify for the Clean Energy Vehicle Credits per the Inflation Reduction Act.[22] Project One will provide enough battery grade nickel to support electrification of nearly half U.S. car sales[2] and sufficient cobalt to supply almost 90% of current US consumption entirely.[10] Project One enables the reshoring of critical upstream commodities supplying battery and steel industries and fills a significant midstream processing capacity gap identified by the Biden Administration as the country's biggest vulnerability and opportunity area.[2]

2.d. Deliverables

[22] https://rules.house.gov/sites/democrats.rules.house.gov/files/BILLS-117SAHR5376.pdf

DGR will deliver a final written report outlining the feasible, technical, and business key performance indicators, as well as a presentation summarizing project sub-component reports and the technoeconomic analyses. DGR will follow appropriate reporting requirements should funding be awarded. Because the deliverable proposed is a feasibility study and commencement of construction will be dependent on the findings, quarterly production and/or financial reports specific to Project One would not yet be applicable.

3. Project Viability

3.a. Merchant Supplier Orientation and Business Viability

Project One will produce the products outlined in **Figure 5**. There will be no shortage in demand for these products in the near to midterm given market demand into 2040 and beyond.[23] The facility is projected to start commercial production in 2027, just as commodity prices are rebounding and consultancies project resuming supply deficits and reach steady state levels in 2030[1]; the project timeline to be updated based on results of the proposed feasibility study. It is intended to shift to scrap and spent battery black mass as feedstock when availability and market economics warrant. The flowsheet proposed herein can recover the same nickel, cobalt and copper products enabling a circular economy.

3.b. Commitment to Being a Merchant Supplier

DGR remains open to and can accept investments and offtake agreements from both the open market as well as from U.S. Government entities. DGR operates in a fair, equitable, and responsive manner under generally accepted business principles and does not, as a matter of policy, place restrictions or limitations on which eligible customers may buy or how they may subsequently use its products. Given DGR's parent company, TMC, is a publicly listed company in the US, it must adhere to generally acceptable business practices and comply with SEC reporting requirements. Per guidance by several cathode material producers, standardized

[23] IEA *The Role of Critical Minerals in Clean Energy Transitions*, May 2021.

sulfate purity specifications will be used as the requirement for product purchase and assimilation into production processes. Purity determination via assay by third party engineering firm(s) and potentially by the customer directly will be required, the timeline for which is typically dictated by testing lab availability and not anticipated to exceed several months. Because DGR would be a new producer, there may be additional quality control measures put in place.

ADDENDUM 1: Biographical Sketches

The DGR Project Team will be led by Dr. Jeffrey Donald, Head of Onshore Development. Jeff has 20 years of experience in mining and metallurgical processing including technology commercialization and operations improvement programs at Inco, Vale, PT Vale Indonesia, SNC Lavalin and (b)(6) Jeff will be supported by both Chief Development Officer, Anthony O'Sullivan with over 30 years of mining experience including Global Exploration Manager at BHP and NORI-D Project Director Grant Linder who has recently joined TMC after delivering $26 billion in project value during his 25-yecar career at (b)(4) and BHP. Craig Shesky, CFO, will provide oversight for economic analysis and Director of Business Development, Kristin Hengstebeck, will continue to own relationships with local authorities.

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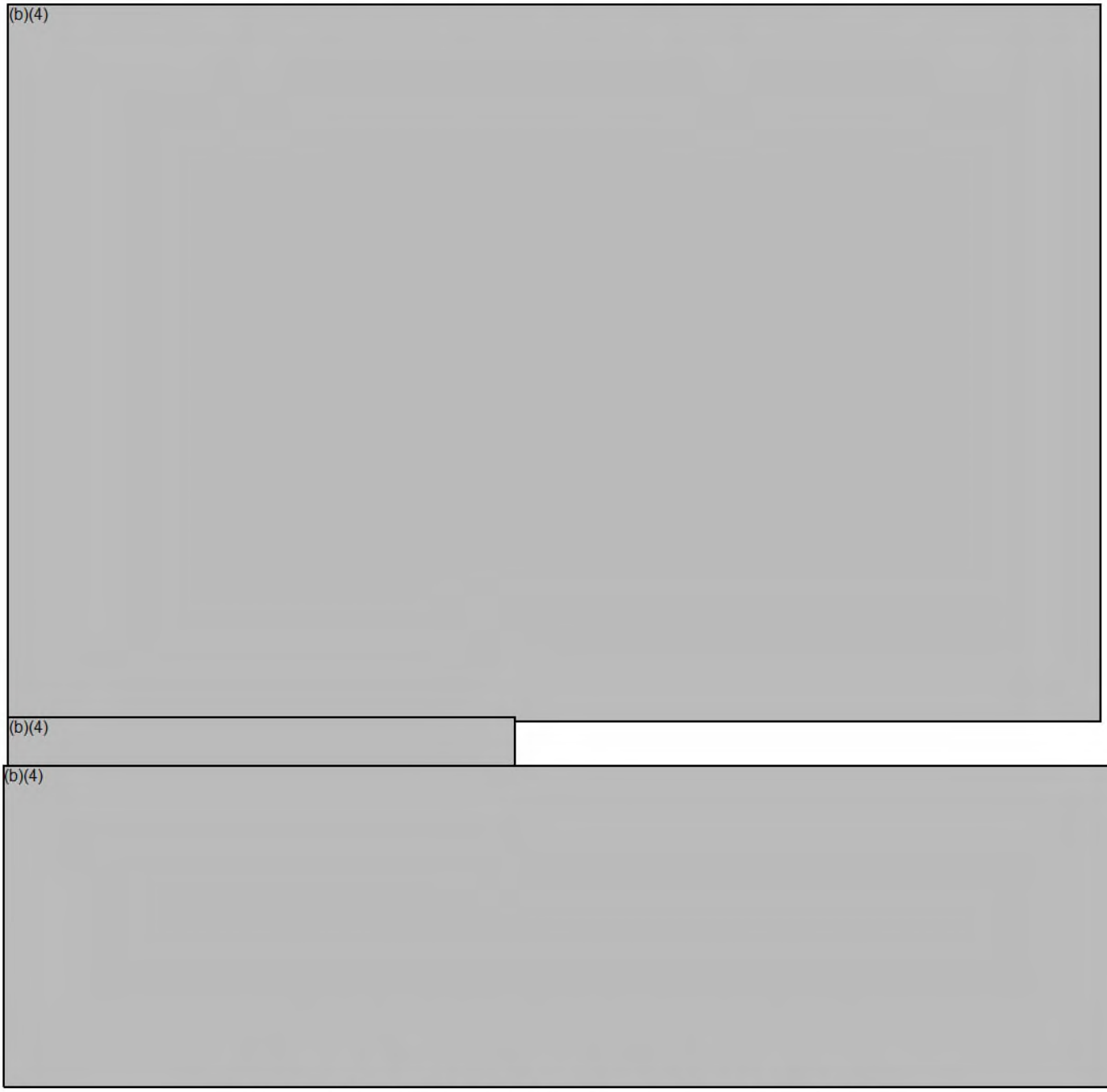

Figure 8. Cost Estimate and Labor Hours by Fiscal Year

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