A Study for the Bureau of Safety and Environmental Enforcement (BSEE)

Decommissioning Cost Update for Pacific Outer Continental Shelf Region (POCSR) Facilities

Volume 1

Conducted by

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Project No. 140E0120P0007
September 2020

Decommissioning Cost Update for POCSR Facilities

BSEE Contract PO 140E0120P0007

Volume 1

Rev	Date	Reason for Issue	Prepared by	Checked by	Prepared for
0	07-09-20	Draft Submittal	Lerma, et. al.	M. Pasini	J. Dull
1	08-13-20	Final Report	Lerma, et. al.	M. Pasini J. Chaconas	J. Dull
2	9-10-20	Final Final Report	Lerma	M. Pasini	J. Dull

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ACKNOWLEDGEMENTS

InterAct would like to acknowledge and thank the following companies who provided information and data used for this study.

- Alliance Energy Services, LLC
- American Marine Corporation
- Aquatic
- Aqueous
- Aubin Group
- Beta Offshore, LLC
- Bureau of Ocean Energy Management (BOEM)
- Bureau of Safety and Environmental Enforcement
- Caley Ocean Systems
- Castagnola Fishing
- C&C Boats
- CD Lyons
- Chevron
- Claxton Engineering
- DCOR, LLC
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- Hazmat, Inc.
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- Industrial Scrap Metals, Port Fourchon, Louisiana
- InterMoor Inc.
- Menck
- Modern American Recycling Services (MARS), Gibson, Louisiana
- Pacific Maritime Group
- Pacific Tugboat Services
- Phoenix International
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- Schnitzer Steel Projects Company
- Shore Offshore Services LLC
- Stabbert Maritime
- Subsea 7
- TerraSond
- Triton Diving Services
- UTEC Survey
- Versabar

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EXECUTIVE SUMMARY

This report was prepared for the Bureau of Safety and Environmental Enforcement (BSEE) by InterAct PMTI, Inc. (InterAct) as an update to the 2016 report by TSB Offshore, Inc. (TSB), "Decommissioning Cost Update for Pacific Outer Continental Shelf Region (POCSR) Facilities". InterAct is an international project management, engineering, and environmental consulting firm focused on the energy sector. For over 25 years, the company has worked with regulatory agencies and offshore operators to assess decommissioning costs in a variety of major oil and gas hubs around the world.

BSEE is responsible for assessing and making available the cost to decommission offshore oil and gas structures in the POCSR. By utilizing a third-party to regularly reassess the decommissioning costs, BSEE can improve upon previous assessments incorporating current environmental and economic circumstances. The Bureau of Ocean and Energy Management (BOEM) then determines and secures the appropriate financial assurance. Pursuant to OCS oil and gas regulations [30 CFR 556.53 (a), (b), (c), and (d)], the Regional Director of BOEM has the authority to require additional security in the form of an additional bond, beyond the $200,000 bond amount that guarantees compliance with all the terms and conditions of the lease. The purpose of the supplemental bond assures adequate funding in the event the current operator / lessee becomes financially insolvent and unable to carry out its contractual obligations under the lease agreement. This report provides a benchmark decommissioning cost for each fixed structure (i.e. platform) and is one of the inputs BOEM uses in determining whether a supplemental bond is required. The decommissioning process includes abandonment and removal of relevant wells and platforms, and all drilling and platform sites are cleared of obstructions.

There are 23 platforms in the POCSR located off the coast of California. Seven structures (Gail, Grace, Harvest, Hermosa, Hidalgo, Hogan and Houchin) are shut-in, pending decommissioning. Well plugging operations on these platforms are underway, and decommissioning is expected to occur this decade. One additional platform in the POCSR (Habitat) is in a state of preservation. Initial platform removal applications have been received for Gail, Grace, Harvest, Hermosa and Hidalgo, but not for Hogan, Houchin or Habitat. However, for the purpose of this report, these eight platforms, as well as one active platform (Irene), are included in the first decommissioning campaign proposed in this report.

As a result of pending activity and on-going well abandonments, decommissioning campaigns differ greatly from the 2016 report. Campaigns are based on current platform status and characteristics, production history, and current oil price. Each campaign is designed to increase efficiency as well as reduce the following: cost, greenhouse emissions, safety risk and other environmental impacts.

Research was conducted to determine the most recent technologies used for platform decommissioning worldwide. There is no history of platform decommissioning in the POCSR, so this cost estimate is based on market prices and equipment availability specific to Southern

California. For services not available locally, vendors in the Gulf of Mexico (GOM) region were consulted. Recycling/scrap companies from ports in Long Beach, Los Angeles, Oakland, Portland (Oregon) and Tacoma (Washington), as well as Gulf of Mexico ports were contacted for price, suitability and availability for POCSR platform disposal.

This report estimates overall decommissioning costs for each platform as the sum of the following cost categories:

- Project Management/Engineering/Planning and Other Adjustments
- Permitting and Regulatory Compliance
- Platform Preparation
- Well Plugging and Abandonment and Conductor Removal
- Pipeline Decommissioning and Power Cable Removal
- Mobilization and Demobilization of Derrick Barges
- Platform Removal
- Platform Transportation and Disposal
- Site Clearance

This update has been prepared during the coronavirus disease 2019 (COVID-19) pandemic and is prone to variability due to the economic uncertainty caused by this global crisis. The local and global economic impact of COVID-19 cannot be fully realized at this time but suggests a significant downturn in the short-term. The long-term impact is difficult to predict, as there are many factors that could both restrict and inflate economic growth over the next 5 years.

This 2020 decommissioning estimate is 11.5% higher compared to the 2016 report as shown in Table i.1. The variance in 2020 may be in part due to the COVID-19 factors discussed above. However, the variance is also due to significant modifications in methodology, including, but not limited to the cost categories of well plugging and abandonment (P&A), larger campaigns for work execution, platform removal approach, and platform transportation and disposal. The category of well P&A was modified to incorporate the use of existing platform rigs. Adequate vessels identified in the Gulf of Mexico (GOM), capable of traveling through the Panama Canal, are specified for platform removal rather than the vessels identified in southeast Asia in the previous report. Finally, waste handling facilities in the GOM were utilized for platform disposal rather than the assumption of a waste handling facility being built in southern California, as presented in the previous report.

The results of this study estimate the cost to decommission the 23 POCSR platforms and associated wells and facilities to be $1.63 billion. Details of the 2020 cost estimate by cost category is shown in Figure i.1.

Table i.1 Decommissioning Costs by Platform

Platform Name	2016 Costs for Decommissioning $Million	2020 Costs for Decommissioning $Million	2020 vs. 2016 Change
A	$ 36.2	$ 49.6	37.1%
B	$ 32.5	$ 49.1	50.9%
C	$ 27.5	$ 39.4	43.4%
Edith	$ 30.9	$ 43.5	40.7%
Ellen	$ 42.0	$ 63.9	52.2%
Elly	$ 24.6	$ 34.4	39.9%
Eureka	$ 124.0	$ 116.9	-5.7%
Gail	$ 103.8	$ 99.6	-4.0%
Gilda	$ 59.2	$ 73.3	23.9%
Gina	$ 16.7	$ 19.2	14.8%
Grace	$ 43.2	$ 53.0	22.7%
Habitat	$ 34.5	$ 44.3	28.3%
Harmony	$ 185.7	$ 185.8	0.1%
Harvest	$ 99.7	$ 94.2	-5.5%
Henry	$ 21.6	$ 32.0	48.4%
Heritage	$ 173.6	$ 188.7	8.7%
Hermosa	$ 94.0	$ 88.8	-5.6%
Hidalgo	$ 73.9	$ 75.6	2.3%
Hillhouse	$ 31.3	$ 46.6	48.9%
Hogan	$ 38.1	$ 44.8	17.6%
Hondo	$ 100.1	$ 97.1	-3.0%
Houchin	$ 36.2	$ 40.8	12.6%
Irene	$ 37.3	$ 53.9	44.6%
Total	**$1,466.6**	**$1,634.7**	**11.5%**

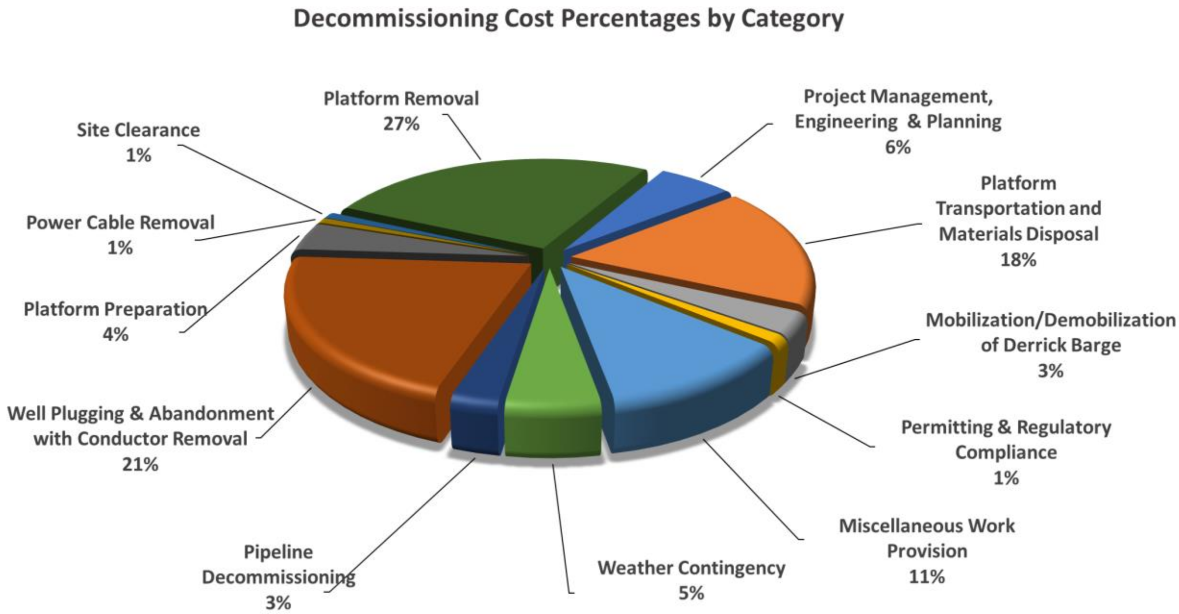

Figure i.1 Decommissioning Cost Percentages by Task

Each category has been estimated deterministically which is commensurable for this project, given the scope, level of detail available, and objective of this report. It is acknowledged that each category cost has varying certainty related to factors such as the level of information available upon which the methodology was determined, and the maturity of the technology or process specified for each category. For example, the platform removal methodology, which accounts for approximately one third of the overall estimate, is a novel concept that repurposes existing technology, with a cost based on limited specific platform data. Therefore, this category presents a risk of higher variability. Other categories, such as mobilization of the derrick barge, are based on very few variables, such as time and vessel rate, with which a high level of confidence can be attained.

Three cost categories account for approximately 65% of the overall estimate: platform removal, platform transportation and materials disposal, and well plugging and abandonment with conductor removal. All three of these categories have been calculated using different concepts than those presented in the previous study.

The overall cost estimate is only applicable to the scenario presented in this report. Key philosophies, which if changed, would have a large impact on the cost, include the following:

- Costs associated with a contract operator to manage the assets in the event an existing operator becomes financially insolvent are not included;
- Assets will be maintained in usable state per BSEE requirements (i.e., costs for major structural upgrades or equipment retrofits are not included);

- No provision is made for operating costs if a platform requires the equivalent of warm or cold stacking to facilitate the decommissioning scenario presented herein;
- Pipelines and power cables to be removed or abandoned in place as per federal and state regulations; removal costs for the federal portion only are included in this study;
- Disposition of shell mounds, where present, is not addressed in this study.

Individual report sections discuss the premise of the methodologies used for each category in greater detail.

1.0 INTRODUCTION

This study updates the previous report on the decommissioning procedures and cost for the 23 platforms in the Pacific Outer Continental Shelf (POCSR). This update utilizes similar decommissioning categories as the previous study. However, methodologies to carry out the decommissioning process vary from the previous report and are discussed briefly in this section, following an overview of the POCSR. Note that throughout both Volumes 1 and 2 of this report, footnotes that do not appear at the bottom of the page refer to References detailed in Section 13 of this report.

Overview

Decommissioning of offshore oil and gas facilities has not occurred in California for over two decades. Globally, the Gulf of Mexico (GOM) and the North Sea are both active decommissioning areas and InterAct has numerous contacts in both locations. Where local equipment and services are unavailable, these contacts were sourced to determine decommissioning best practices, required equipment and services, and finally, cost.

As of 2020, seven small structures off the coast of California have been decommissioned. Chevron's "4-H" state platforms (Hilda, Heidi, Hope, and Hazel) were decommissioned in 1996, Exxon's Offshore Storage and Treatment (OS&T) vessel with its Single Anchor Leg Mooring (SALM) system was decommissioned in 1994 (the only decommissioning that has occurred to-date on the POCSR), and state Platforms Herman and Helen were removed in 1988.

Decommissioning of the 4-H platforms was noted in the prior report as costing between $35-40 million, with a combined weight of 12,000 tons, located in water depths of 100 feet to140 feet. Although a small project when compared to some POCSR platforms, the data from this project provides insight into the challenges of bringing waste materials from the platforms to local ports.

Decommissioning campaigns were updated based on several factors. Seven POCSR platforms (Grace, Gail, Hermosa, Hidalgo, Harvest, Hogan, and Houchin) and one state water platform (Holly) are shut-in, and decommissioning for these eight platforms is anticipated within the decade. Initial platform removal applications have been received for Gail, Grace, Harvest, Hermosa and Hidalgo, but not for Hogan or Houchin. One additional platform in the POCSR (Habitat) is in a state of preservation. Platform Irene is active but is anticipated to begin decommissioning within this decade. For the purpose of this report, these nine platforms, as well as the one state platform, are included in the first decommissioning campaign. The state platform is included for cost sharing purposes only, and the decommissioning cost for this platform is not included in this report.

Well plugging operations have already begun on a few of the platforms providing useful information for developing up-to-date procedures and costs for offshore well and platform decommissioning. The list of all POCSR platforms is in Table 1.1 below with locations shown in Figure 1.1.

Table 1.1 List of POCSR Platforms

Platform	Water Depth (feet)	Estimated Removal Weight* (tons)	Year Installed **	Field Name
A	188	3,457	1968	Dos Cuadras
B	190	3,457	1968	Dos Cuadras
C	192	3,457	1977	Dos Cuadras
Edith	161	8,038	1983	Beta
Ellen	265	9,600	1980	Beta
Elly	255	12,700	1980	Beta
Eureka	700	25,700	1984	Beta
Gail	739	29,993	1987	Sockeye
Gilda	205	8,042	1981	Santa Clara
Gina	95	1,006	1980	Hueneme
Grace	318	8,390	1979	Santa Clara
Habitat	290	7,564	1981	Pitas Point
Harmony	1,198	65,089	1989	Hondo
Harvest	675	29,040	1985	Pt. Arguello
Henry	173	2,832	1979	Carpinteria
Heritage	1,075	56,196	1989	Pescado, Sacate
Hermosa	603	27,330	1985	Pt. Arguello
Hidalgo	430	21,050	1986	Pt. Arguello, Rocky Point
Hillhouse	190	3,100	1969	Dos Cuadras
Hogan	154	3,672	1967	Carpinteria
Hondo	842	23,550	1976	Hondo
Houchin	163	4,227	1968	Carpinteria
Irene	242	7,100	1985	Pt. Pedernales, Tranquillon Ridge

* Weight consists of Jacket, Deck and Pile Weight

**Year Installed Date is the jacket installation launch date

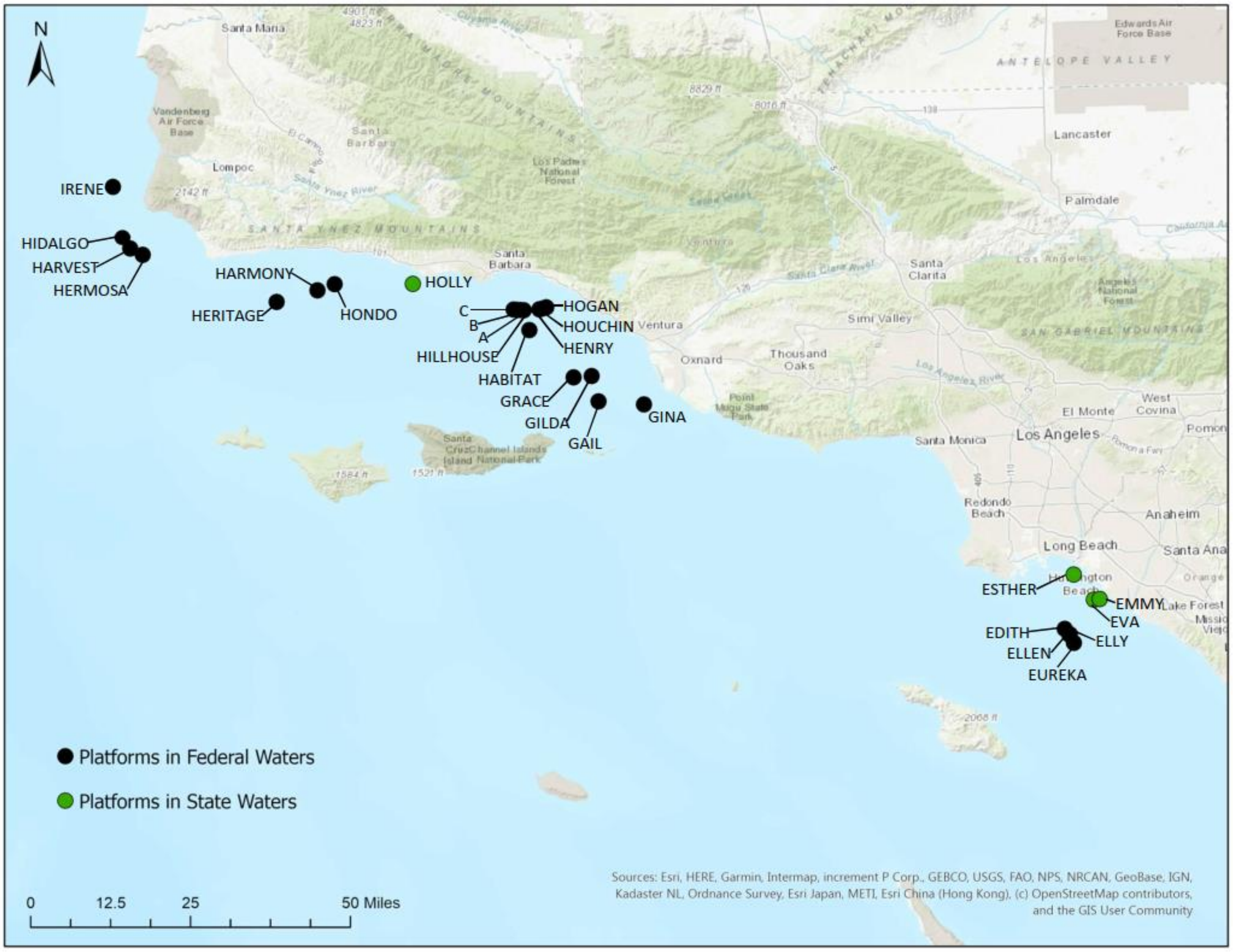

Figure 1.1 Locations of California Platforms

2020 Update

This report is updated for all aspects of decommissioning the POCSR. Certain sections of the report are straight forward and required little more than minor updates. These include:

- Platform specifications
- Methods described for platform preparation, marine growth removal, pipeline and cable removal, and the permitting process
- Contingency factors used for management/engineering, weather and work provision.

Using the same platform specifications, decommissioning cost estimates for these cost categories were updated using current market rates and making minor changes to the methodology used previously. Other aspects of the decommissioning process from the 2016 report did not represent current best practices and have been revised as appropriate, including:

- Campaign/project grouping of platforms;
- Criteria used for categorization of wells and utilization of existing platform workover rigs and CTUs to plug wells;
- Technique for conductor and platform removal;
- GOM vessel availability due to the recent (2016) construction of a wider Panama Canal route;
- Methods for platform removal and site clearance, particularly platforms in deep water;
- Consideration for local and GOM ports as well as barges to handle material waste.

Sourcing

Although the Pacific Region has not been a recently active area for decommissioning, it is an area with construction facilities and port activities. There are local dive companies, derrick and cargo barges, and waste handling providers available for a portion of the required decommissioning services. Many local construction and oil industry trades people are available for well P&A, platform preparation, dive activities, marine growth removal, and marine crane and transport services.

Teleconferences were held with local operators and vendors to validate the campaign groupings used in this report and the method anticipated for well abandonment. Operators that participated in the process provided useful asset data. Not all operators participated due to more pressing operational matters with the ongoing COVID-19 pandemic and a recent, severe decline in oil prices.

Costs were updated based on current vendor pricing, and where possible, recent historical cost data from POCSR platforms. Cost estimates derived in this study include one of the four existing platforms in California state waters but only as it pertains to shared costs for the mobilization and demobilization (mob/demob) of required decommissioning equipment. This state platform, Holly, is currently in the process of decommissioning and is assumed to share costs with other platforms in the first campaign.

Vendors provided availability and costs for west coast based derrick and cargo barges. West coast capability of waste processing facilities was also researched. Local vendors indicated the ability to handle piece small lifts (less than 50-ton) during decommissioning, but not piece large or modular lifts that will be required for full platform decommissioning.

GOM waste processing vendors reported the capability of handling piece large and modular lifts, including the ability to handle hazardous waste materials such as naturally occurring radioactive material (NORM) and asbestos. GOM vendors have historically been used in the POCSR when local vendors are unavailable. GOM and international vendors were contacted to determine the method and cost most appropriate for California platform topside and jacket removal, particularly for a platform in water depths exceeding 300 feet, as this has not yet been performed in the POCSR.

Well Plugging & Abandonment (P&A) Operations

After reviewing local services and equipment on each platform, the use of the working rig available on most POCSR platforms was determined to be the most effective method for well P&A, supplemented by the faster moving Coiled Tubing Unit (CTU) for the final steps of the well plugging process. CTU equipment is available locally. The rig would handle recovery of casing and conductor pipe after well plugging is complete. For platforms without a working rig, a hoisting system, estimated at comparable expense, would be used. All platforms have working cranes which would be used as appropriate during the P&A process. Current decommissioning activity indicates that the rig and cranes are in compliance and operational except for those on Platforms Hogan and Houchin. It is not within the scope of this study to project the condition of the cranes, and future refurbishment costs have not been included.

The well P&A process used for this study involves three phases, some best suited to rig work, and some to CTU work. The first phase involves removing equipment, resolving any milling or fishing operations and laying a completion plug. The second phase involves laying remaining internal plugs, squeezing annular cement plugs as required, and cutting shallow tubing and/or production casing utilizing a coiled tubing unit. The final phase of abandonment involves cutting and recovering the conductor, adjacent casing and cement utilizing a rig.

For wells completed with gas lift equipment, an injection string or only a kill string, Phase I would be bypassed as this equipment may be left in the hole. For wells with Electric Submersible Pumps (ESP) which have an electric cable in the well, or those with rod pump, hydraulic pump, or progressive cavity pump, the equipment must be pulled out of the well, which would be best accomplished by using the rig.

Phase II could be accomplished by a rig or CTU, but the CTU has much faster trip times (in and out of the well). Cost estimates assume the CTU would be used for this work.

Phase III would be accomplished with a rig, assuming the mast rating is sufficient to lift the required weight to do so. Where a platform rig does not have adequate strength or is unavailable, a hoisting system of comparable cost would be used. Services required for the casing cutting may not be available locally and so this equipment was assumed to be mobilized from the GOM.

Cutting Services

Due to environmental sensitivities as well as safety considerations, the use of shaped charges was considered unlikely for cutting any structures. GOM vendors with abrasive and mechanical cutting methods were quoted for cutting, as these services are not available locally. This equipment can cut through multiple casing strings and cement for well P&A and can be used by remote operated vehicles (ROV) for underwater cutting of jackets. The costs for these cutting services are included in the well P&A phase and the platform removal phase of decommissioning, respectively.

Factors Considered in Selecting Derrick Barges (DB)

The method determined for platform removal in this study is a combination of reverse installation and piece-small to piece-large removal. Reverse installation is a method whereby the platform is removed in the same manner it was installed, but in reverse. In this context, it applies to platforms of modular construction. Piece-large was used when modular construction has not been used, or larger modules need further sectioning, or to otherwise be removed in a different manner to installation. Structural integrity of such lifts requires detailed engineering. Piece-small for the purposes of this report, is defined as a lift less than 50-ton which can be disposed of locally. This method involves considerably more cutting than the other two methods.

Heavy lift vessels (HLVs) and derrick barges (DBs) found to be available from Long Beach, San Diego, Seattle and the GOM were considered. West coast vessels would be suitable for smaller lifts, while the GOM vessels would be better suited for the heavier lifts. GOM vessels would likely require engine upgrades to meet California's emission requirements, and this cost has been included into the mobilization cost of the vessels. Since the campaign groupings include numerous platforms, the cost of these upgrades was mitigated (spread out among several platforms).

For jacket removal, vessels would be equipped with a winch system. The system was used to install deep water subsea infrastructure off the coast of Australia in the North West Shelf in 2014. Discussions with the vendor indicate this system could likely be adapted to decommissioning activities as well as be compatible with GOM DB's. While the winch system may only be needed in water depths greater than 300 feet, the winch will facilitate jacket removal at all water depths.

This study is based on equipment and methods that are currently available, which conform to the premise and constraints outlined in this study. It is acknowledged that this may differ from equipment and methods of platform removal ultimately chosen for the POCSR platforms.

Dynamic Positioning Vessels

Vessels must be anchored, unless they are equipped with dynamic positioning (DP). There are DP dive vessels available on the west coast. DP vessels provide the mobility needed to decommission pipelines and power cables and were assumed to be the vessel of choice for this work.

The DB vessels specified in this report can typically be anchored in waters less than 500 feet. In deeper waters, preset anchors could be used to moor the vessels. These vessels along, with appropriate cargo barges, would be moored next to each platform during several of the decommissioning phases. No local DP HLVs were included in this study.

Platform Transportation and Material Disposal

Conductors, casings, power cables and pipelines removed during decommissioning could be disposed of on the west coast as they are anticipated to be less than 50-tons per lift. The viability of expanding current port waste processing facilities for piece-large or modular sections exceeding 50-tons was considered but is most likely uneconomic. The uncertainty of obtaining land, permits, hazardous waste handling facilities, identifying disposal sites and operating company or vendor buy in to build a west coast facility for the 23 POCSR platforms makes the viability of this option uncertain. GOM companies who recently built such facilities estimated the costs in the range of $50- $200 million.

Instead, material disposal costs for piece-large and modular lifts were estimated using derrick barges (DBs) from the GOM and local cargo barges and tugs to transport removed waste to facilities in the GOM. These facilities currently process the waste from as many as 150 GOM platforms per year and are well equipped to handle the waste, including hazardous wastes, from the POCSR. Due to the limited weight (less than 50-tons) of west coast recycling/scrap facilities, and because most of the removed POCSR equipment is in excess of 50-tons, most of the removed material would be transported to the GOM for handling.

Where piece-small lifts can be easily made, the study assumes local cranes, barges and ports would be used. For the heavier piece-large/module lifts, the GOM would play a key role.

Each decommissioning category is discussed in a separate section with a summary of cost included in each section. These cost estimates are considered rough order of magnitude numbers. Note that each section's cost is exclusive of Project Management, Engineering and Planning (PMEP) costs and exclusive of weather and general provision contingencies. These costs are included as separate cost categories as explained in Section 4. This study is not intended to replace the detailed engineering and planning work that is necessary for decommissioning execution.

2.0 DECOMMISSIONING COST INPUTS AND SCENARIOS

The decommissioning process involves the full abandonment of all wells, conductors and platforms to 15 feet below the mudline. Piping and electrical cables are to be uncovered and removed in accordance with federal and local guidelines but may be decommissioned in place with proper approval. All tangible equipment, once removed, would be recycled or disposed. While every effort was made to utilize available data, at times assumptions were required. Assumptions were based upon the reasonable judgement developed from years of staff engineering experience.

The process of assessing the cost to decommission the POCSR platforms was an integrated effort. Various engineering specialties were utilized to evaluate the abandonment and disposal requirements for the wells, conductors, facilities, pipelines, electrical equipment, and structures. Once the methodology for each phase of decommissioning was determined, the cost for each component was then applied. Finally, contingencies and adjustments were added, including those for project management, engineering and planning, miscellaneous work provision for unanticipated costs and events, and downtime due to weather.

Decommissioning Campaigns

Three decommissioning campaigns have been developed. The first campaign includes eight POCSR platforms which are currently shut-in or in a state of preservation, with decommissioning reasonably expected to occur within the decade. Because of its proximity to other shut-in platforms, another POCSR platform is also expected to be decommissioned within the decade. One state platform is currently in the process of being decommissioned and POCSR decommissioning costs assume this state platform would share some services with the nine POCSR platforms in the first campaign grouping.

Three additional POCSR platforms (ExxonMobil's Hondo, Harmony, and Heritage) are shut-in due to a third-party export pipeline leak in 2015, but these platforms have substantial remaining reserves and are expected to be the last three platforms decommissioned due to their long economic life. The remaining eleven platforms have been grouped as an intermediate decommissioning campaign.

The projected decommissioning campaigns are shown in Table 2.1. Note that the jacket weights shown do not include the weight of the piles.

Table 2.1 Platform Decommissioning Campaigns

Platform	Year Installed	Water Depth (feet)	Topside Weight (tons)	Jacket Weight (tons)
Campaign 1				
Holly*	*State Platform			
Hogan	1967	154	2,259	1,263
Houchin	1968	163	2,591	1,486
Habitat	1981	290	3,514	2,550
Irene	1985	242	2,500	3,100
Grace	1979	318	3,800	3,090
Gail	1987	739	7,693	18,300
Harvest	1985	675	9,024	16,633
Hermosa	1985	603	7,830	17,000
Hidalgo	1986	430	8,100	10,950
Campaign 2				
A	1968	188	1,357	1,500
B	1968	190	1,357	1,500
C	1977	192	1,357	1,500
Henry	1979	173	1,371	1,311
Hillhouse	1969	190	1,200	1,500
Gina	1980	95	447	434
Gilda	1981	205	3,792	3,220
Edith	1983	161	4,134	3,454
Elly	1980	255	8,000	3,300
Ellen	1980	265	5,300	3,200
Eureka	1984	700	4,700	19,000
Campaign 3				
Harmony	1989	1,198	9,839	42,900
Heritage	1989	1,075	9,826	32,420
Hondo	1976	842	8,450	12,200

Disclaimer: These are reasonable scenarios based on the current most likely grouping of decommissioning projects, used for the purposes of cost estimation. Alternative scenarios may actually occur.

Decommissioning Cost Considerations and Assumptions

The decommissioning cost for 23 different platforms in the POCSR required some assumptions to provide for details that are currently unavailable, as well as to provide for unforeseen changes in circumstances or unanticipated events. Such assumptions were based on InterAct's professional engineering judgement, experience, and research. Other assumptions were based on information collected from BSEE staff and/or precedence from prior efforts to determine POCSR decommissioning costs. Such assumptions are detailed below:

- Costs are estimated in 2020 U.S. Dollars, using price quotes obtained over the last two years. Some estimates, particularly the vessel and diving price quotes, were obtained after the COVID-19 pandemic began. All costs are currently usable for engineering cost estimations.
- Inputs based on regulations research and discussions with BSEE and BOEM POCSR staff:
    - Costs associated with a contract operator to manage the assets in the event of an existing operator becomes financially insolvent are not included;
    - Assets would be maintained in usable state per BSEE requirements;
    - Explosive use as a cutting technique was not considered as an option;
    - Platforms would be completely removed (no re-use or rigs-to-reef scenarios considered);
    - Pipelines and Power Cables would be removed or abandoned in place as per federal and state regulations; removal costs for the federal portion only are included in this study;
    - Disposition of shell mounds, where present, was not addressed in this study;
    - BSEE has contracted with BOEM to prepare a Programmatic Economic Impact Study (EIS) that will establish guidance for POCSR facility removal.
- A coordinated campaign approach was considered which would optimize decommissioning estimates by sharing equipment, services, permitting, and environmental review costs amongst multiple operators. Shared costs for the first campaign are based upon decommissioning nine POCSR platforms and one state platform (10 total) to maximize efficiency and reduce costs.
- Well P&A
    - Wells would be plugged to surface using existing platform rigs and local CTU equipment in three phases.
    - The removal of conductors and shallow casing would be completed in separate phases and is included in the well plug and abandonment cost; the

removal of empty conductors would be done concurrently and is included in the conductor removal phase of the well P&A process.

- Transportation
    - Vessels from western ports can provide 500-ton crane barges for removal of salvageable equipment removal prior to topsides and jacket removal. A 500-ton crane barge could also be utilized for piece-small removal, such as recovered well casings and conductors.
    - For lift weights exceeding 500-tons, such as those required for both reverse installation and piece-large lifts, GOM vessels would be used; one DB mob/demob cost, including the cost to retrofit the DB engine to meet California air emissions standards, was included for each of the three campaigns.
    - Cargo barges capable of carrying up to 6000-tons would be required for material disposal. Western port vessel companies confirm these vessels are available and market forces would ensure that required number of barges would be available at the time of decommissioning.
- Material Disposal
    - Waste processing ports on the west coast have 50-ton lift limits and could provide waste disposal for piece small lifts.
    - Processing fees for recyclable goods and scrap are charged to all piece-small removed material based on quotes from west coast waste processing vendors.
    - Piece-large and/or modular loads would be transported through the Panama Canal to be offloaded in Louisiana ports; time estimate for the round trip is 75 days assuming a vessel speed of seven knots per hour; canal fees were included in the disposal costs; a 5% weather contingency was applied to account for weather related delays.
    - No salvage or resale value was considered for the conductors, casings, structures, pipelines or power cables, or any other platform equipment such as rigs.
    - GOM waste handling firms do not charge a processing fee in anticipation of recycle value, thus no fees were included for piece-large/modular lifts.
    - Large loads that can be downsized to under 50-tons could be processed by an offshore cutting facility, an idle shipyard dock, and/or an international location and returned to California ports for disposal; however the costs could not be confirmed as being a more cost effective method of waste disposal, and thus were not included in this study.
- Project management, engineering and planning (PMEP), miscellaneous work provision contingency for unanticipated costs or events, and a weather downtime

contingency are included as separate cost items; they are applied to most, but not all, cost categories.

- Additional costs for potential presence of Naturally Occurring Radioactive Material (NORM) or asbestos encountered during the platform preparation phase were excluded; GOM waste processing facilities are capable of handling this hazardous waste, but some removal may be necessary during operations to separate the lifts; a safety inspection was included in the platform preparation stage to identify such hazards.

Decommissioning Common Practices and Technological Alternatives

- Topsides would be removed using piece-small/large and reverse installation techniques where possible, maximizing barge loading for disposal; while single topside and/or single lift vessels are available, no vendors were willing to share their cost estimates for day rate, mob/demob or engine retrofit costs to allow operations off the coast of California; these vessels are believed to have considerably higher day rates and fees, but may prove economical after a more rigorous engineering analysis for each specific platform, if a local waste handling facility becomes available.
- Marine growth removal on conductors would be performed as the conductors are cut and recovered as part of well P&A.
- Marine growth removal on the top 100 feet of the jacket would occur immediately prior to jacket removal as part of the platform removal phase, using a work boat as a base for the divers.
- Jackets would be removed in sections as needed to maximize barge loading for disposal, allowing for clearance through the Panama Canal.
- Jackets would be sectioned and removed using a derrick barge equipped with a winch system, to be installed on the DB for removal of these jackets.

Contingencies and Adjustments

- Some engineering and project management costs are included in the individual sections.
- Additional PMEP adjustments are included for most, but not all cost categories.
- Weather contingencies are included for some cost categories based on applicable wave and wind factors as reported from nearby buoy data as per advisement of local vessel vendors, as well as input from field experience. Weather contingencies for travel to and from the GOM are embedded in the cost for platform transportation and material disposal and for mobilization and demobilization.

- Miscellaneous work provision contingencies are included for most, but not all, cost categories to cover unanticipated costs and events.
- All contingencies and adjustments are discussed in Section 4; these costs are not included in the cost estimates shown for each phase of decommissioning, but rather, were added to the platform decommissioning estimate as a separate cost item.

Scope of Cost Analysis

Scope and costs provided in this report incorporated results from discussions with BSEE. Additionally, all costs assume operations are carried out using domestic equipment and domestic ports. Finally, any methods proposed that could not be substantiated by prior projects or where vendor quotes were unavailable, were rejected.

Costs Included:

- Project Management, Engineering and Planning and Other Adjustments
- Permitting and Regulatory Compliance
- Platform Preparation
- Well P&A, including Conductor Casing Cut and Recovery (including empty conductors)
- Mobilization and Demobilization of Derrick Barge
- Platform and Structure Removal
- Pipeline and Power Cable Decommissioning
- Platform Transportation and Disposal
- Site Clearance

The scope of work detailed under each category may differ than actual work based on any given operating company's internal requirements, such as risk review and Authorization for Expenditure (AFE) funding processes. Additionally, the cost for Environmental Impact Statement/Environmental Impact Report (EIS/EIR) mitigation measures and permit conditions may differ from those developed in this study. Finally, other unforeseen costs may exist in addition to those listed below.

Costs Not Included:

- Costs of a decommissioning agent or contract operator to manage platform during decommissioning operations in the event the current operator is not able to meet its decommissioning obligations and become insolvent;
- Non-federal water items, including one platform, pipelines and power cables which are in state waters;

- NORM removal;
- Remediation of shell mounds, where present;
- Permitting delays and/or cost of mitigation measures imposed as permit condition;
- Downtime due to equipment failures, operational delays, presence of marine mammals;
- Public relation expenses;
- Company or platform specific safety training;
- Costs for ship traffic or fishing affected by operations;
- Costs for worst case scenarios (earthquake, tsunamis, accidents, blowouts, leaks);
- Costs for handling hazardous waste during platform preparation;
- Costs for any significant structural reinforcement or equipment refurbishment required during platform preparation;
- Decommissioning costs of future wells to be drilled or equipment to be installed.

3.0 DECOMMISSIONING METHODOLOGY

The decommissioning methodology used in this study is consistent with general cost model inputs discussed in Section 2 and with BSEE decommissioning requirements (30 CFR 250, Subpart Q, Decommissioning Activities, NTL 2009-P04, NTL 2010-P05, 43 U.S. code 133, and NTL 2017-N02 Reporting Requirements for Decommissioning Expenditures on the OCS) and has been applied to each phase of decommissioning. Costs were developed using the specific constraints outlined below.

Well Plugging and Abandonment and Conductor Removal

- All unplugged wells would be permanently plugged and abandoned (P&A) consistent with BSEE requirements.
- Platforms with working rigs would use the rig to pull equipment out of the hole if required, to clean out the well and set the completion plug following equipment removal, and to cut and recover casing and conductor pipe, including conductors with no casing inside.
- Platforms without working rigs would use a hoisting system such as casing jacks to pull equipment out of the hole if required and to cut and recover casing and conductor pipe; costs were considered comparable to rig costs; a Coiled Tubing Unit (CTU) would set the isolation cement plug in such wells.
- All platforms would use CTU and other rig-less equipment to set subsequent internal and annular cement plugs.
- Abrasive cutting methods would be used to sever and remove all conductor and casing strings, including conductors with no casing.
- The conductor pipe would have the marine growth removed as it is being recovered.
- The conductor would be cut and recovered in 40 foot sections, along with other well casings using abrasive cutting methods to at least 15 feet below the original mudline. Each section would weigh 50 tons or less, loaded on a workboat to shore, and taken to local west coast scrap yards.
- The plugging of wells would be the first step in the decommissioning process for all platforms.
- No salvage or scrap value was included in cost estimates.

Platform Preparation

- Platforms and pipeline/power cable routes would be visually inspected to prepare for removal.

- Divers and/or remote operated vehicles (ROVs) would be used for underwater inspections, which would include a pre-decommissioning side-scan sonar survey (SSS) to establish a base line for the site clearance phase; the cost for the SSS is included in the site clearance phase.
- Hydrocarbons would be flushed from all equipment, which would then be cleaned and checked for gas-free conditions. Waste would be removed from the platform.
- Rigs would be demobilized from all platforms, as well as other salvageable equipment.
- Modules to be removed separately from the deck would be detached from the platform structure.
- Piping, electrical, and instrumentation connections between modules or piece-large sections would be cut.
- New pad eyes and lift supports would be installed where required and external equipment obstructing module lifts would be removed.
- No salvage or scrap value was included in cost estimates.

Mobilization and Demobilization of Vessels

- Heavy lift vessels (HLV) would be mobilized from the Gulf of Mexico (GOM) through the Panama Canal; engine retrofits required by California would be included in the cost of mobilization; mob/demob charges would be shared within each campaign.
- Dynamically positioned (DP) dive vessels would be mobilized from Seattle.
- Cargo barges, crane barges, tugboats, workboats, crew boats, and support vessels would be mobilized from west coast ports as needed.

Topsides Removal

- Topside modules would be removed (reverse installation or piece-large, with minor small piece-small techniques) and placed on cargo barges.
- The deck sections and support frames/cap trusses would be removed by cutting each into manageable lifts that would fit through the Panama Canal.
- Cargo barges would transport the modules and deck structures to GOM ports to be offloaded by dockside cranes or by skidding.
- GOM waste processing facilities are equipped to handle all anticipated waste, including hazardous waste.

Jacket Removal

- Marine growth would be removed from the top 100 feet of the jacket using vessel based equipment. Any remaining marine growth on the jacket would be removed at the offloading facility.
- GOM based derrick barge (DBs) would be used for POCSR jacket removal.
- Jackets would be sectioned in place and removed; the DB would be equipped with a winch system installed on the deck for recovery of the sections to surface.
- Main piles and any skirt piles would be severed 15 feet below the original mud-line.
- Saturation diving would be used below 200 feet water depths.
- Cargo barges would transport jacket sections and piles to GOM ports to be offloaded by dockside cranes or by skidding.
- GOM waste processing ports are equipped to handle any waste and/or remaining marine growth.

Pipeline Decommissioning

- All pipelines would be flushed and cleaned.
- The ends of the pipeline would be exposed by cutting the line approximately 100 feet from the base of the jacket and above the riser-bend.
- Pipeline segments between platforms on the POCSR would be decommissioned in place; The cost for burying the pipeline ends is included, but no concrete mat costs are included.
- POCSR pipeline segments in water depths of 200 feet or greater would be decommissioned in place.
- POCSR pipeline segments in water depths of less than 200 feet would be removed to the State Tidelands boundary (the cost of removing facilities in state waters is beyond the scope of this study).
- Pipelines removed would be cut into 40 feet segments and loaded on a local cargo barge for transport to shore, to be disposed of at local waste processing ports.

Power Cable Decommissioning

- Power cables would be removed from the POCSR and transported to shore by cargo barge.
- A local workboat would be used to pull the cable, cut and load it in sections on the barge.
- The cable would be transported to shore and disposed of at local waste processing ports.

Platform Transportation and Disposal

- West coast crane and cargo barges can load and transport recyclable and scrap material to local ports if less than 50-tons.
- All conductor, casings, cables and pipeline waste would be transported to west coast ports.
- Processing fees apply to both recyclable and scrap materials at west coast ports.
- GOM crane barges can lift POCSR platform loads up to 1000-tons, load them on local barges designed to fit through the Panama Canal.
- The Panama Canal allows for barges as large as 400 feet x 100 feet to pass.
- Travel time of 75 days round trip to GOM includes Panama Canal wait time and barge offloading time. An additional 5% contingency was added for potential weather delays.
- West coast tugs would be used to haul barges to avoid retrofit requirements for California air emissions.
- All platform and jacket waste would go to GOM ports.
- No processing fees apply to GOM waste handling facilities.
- No salvage value has been included for any recyclable or salvageable equipment.

Site Clearance

- Site clearance and verification would be compliant with BSEE 30 CFR 250.1740-1743.
- A pre-decommissioning side scan sonar survey (SSS) would be conducted.
- A post-decommissioning SSS would be conducted.
- Any identified debris in the SSS would be recovered by an ROV.
- For water depths greater than 300 feet, the ROV would also be equipped with a camera to record the verify that all obstructions have been cleared.
- For water depths less than 300 feet, test trawling would be conducted to verify that all obstructions have been cleared.

4.0 PROJECT MANAGEMENT, ENGINEERING, PLANNING & OTHER ADJUSTMENTS

This section addresses three categories of factored costs. The first category is project management, engineering and planning (PMEP) related costs. The second and third categories referred to as 'Other Adjustments', are weather and general contingency. Each of these components were calculated as a percentage applied to the applicable task.

Project Management, Engineering and Planning (PMEP)

PMEP includes the following tasks:

- Review of contract and lease removal obligations;
- Engineering analysis to determine detailed method of well P&A, topsides preparation, topsides and platform removal, pipeline flushing and pipeline and power cable decommissioning;
- Operational planning, including determination of permits required and anticipated timelines for permit acquisition and environmental review;
- Contracting for services required;
- Oversight of project execution.

The costs of a decommissioning agent (or contract operator) to manage the platform during decommissioning activities was not included as per discussions with BSEE. However, the PMEP does provide for engineering and management support during the decommissioning process.

Contract obligations include lease, joint operating agreements (if any), relevant rules and regulations regarding the POCSR decommissioning process, pipeline and production sales agreements, existing permit conditions, and any other contracts that will be affected by the decommissioning process. Some POCSR platforms are operated by a different company than the company responsible for decommissioning. Agreements for such instances must be reviewed to determine the liability of each company.

Engineering analysis for well P&A includes a detailed review of each well's history and diagramming of the wellbore. Additionally, the wellhead condition and any annular pressures must be analyzed. Once the current status of the well is determined, detailed P&A programs can be written. Engineering analysis for platform removal includes review of as-built drawings, construction reports, maintenance records and inspection reports. The pre-commissioning surveys would be reviewed to determine structure integrity of the platform and identify any modifications that must be made. Some engineering analysis costs are included in the platform removal costs, but the additional engineering costs, such as detailed cutting and lifting plans, supplement this estimate.

Once the engineering analysis is complete, detailed programs would be written and permits obtained for field procedures. The project team would then develop a project schedule which allows for all permits to be obtained prior to commencement of work. After permits are obtained, permit conditions and any required mitigation measures would be reviewed. Required changes to the detailed programs would be made.

Required services would be identified from the detailed procedures for both well and platform decommissioning activities. Once the programs are finalized, such services would be bid out to all interested vendors. The project team would then evaluate the bids and award the work as appropriate.

Decommissioning costs of 8% for PMEP was used in the last report and was deemed to be still valid. This estimate is consistent with projected costs in the United Kingdom (UK) North Sea. A detailed review of costs from 2012 to 2018[4], projects PMEP at 7.6% of total costs over the next decade (2019-2028).

The PMEP costs were calculated as 8% of the following tasks:

- Permitting and Regulatory Compliance
- Platform preparation
- Well and Conductor P&A
- Pipeline and power cable decommissioning
- Platform removal (excludes mob/demob of vessels)
- Platform Transportation and Material Disposal
- Site Clearance

The calculated costs for PMEP are shown in Table 4.1. The 2016 report excluded permitting and regulatory as well as disposal from this calculation. These tasks were included in the PMEP calculation in 2020 due to the complex nature of permitting with various state and federal agencies in and around the state of California, and due to the more complex method of platform transportation and disposal used in this report.

Other Adjustments

Contingencies have been applied to various aspects of the decommissioning process. While every effort is made to properly assess each cost component, unforeseen costs and events are inevitable. Two price adjustments were made to improve the accuracy of this cost estimate. The first is a weather contingency and the second is a general contingency.

Table 4.1 Project Management, Engineering and Planning Costs

Platform	Pre-PMEP Costs	PMEP (8%)
A	$ 37,706,600	$ 3,016,500
B	$ 37,235,800	$ 2,978,900
C	$ 29,719,400	$ 2,377,600
Edith	$ 33,013,800	$ 2,641,100
Ellen	$ 49,047,900	$ 3,923,800
Elly	$ 25,932,500	$ 2,074,600
Eureka	$ 90,825,400	$ 7,266,000
Gail	$ 75,005,200	$ 6,000,400
Gilda	$ 54,646,000	$ 4,371,700
Gina	$ 13,812,400	$ 1,105,000
Grace	$ 39,264,900	$ 3,141,200
Habitat	$ 33,533,900	$ 2,682,700
Harmony	$ 138,129,100	$ 11,050,300
Harvest	$ 69,039,700	$ 5,523,200
Henry	$ 23,945,100	$ 1,915,600
Heritage	$ 136,248,300	$ 10,899,900
Hermosa	$ 65,068,000	$ 5,205,400
Hidalgo	$ 55,347,400	$ 4,427,800
Hillhouse	$ 35,335,200	$ 2,826,800
Hogan	$ 33,980,700	$ 2,718,500
Hondo	$ 70,640,400	$ 5,651,200
Houchin	$ 30,818,400	$ 2,465,500
Irene	$ 38,849,000	$ 3,107,900
Total	**$ 1,217,145,100**	**$ 97,371,600**

<u>Weather Contingency</u>

Significant changes in weather can affect the activity of barges, cranes and rigs. Based upon input from local offshore vendors, wave heights of more than six feet and wind speeds of more than twenty-five miles per hour present a hazard to move equipment onto or off the platform. Critical lifts may have more sensitive wave and wind criteria. Buoys operated by the National Data Buoy Center provide historical data collected off the coast of California. While not all buoys collect the same information, five buoys, located between two and twenty-two miles of the POCSR platforms, contained wave heights and/or wind speeds. The percentage of time in excess of the combined thresholds over the three-year period, 2016 to 2018, was incorporated into a weather contingency factor for each platform.

The five buoys shown in Figure 4.1 were utilized to determine a portion of the weather contingency. Buoy 46253 measures wave height data but not windspeed so this datapoint is merely a validation of Buoy 46053 assessment in which thresholds were exceeded 2% of the time. Buoys PTGC1 and Buoy 46218 record windspeed and wave height, respectively. The measurements were grouped to assess percentage of time in excess of the threshold as a validation of the and then averaged with results of Buoy 46054 which contains both wave height and windspeed measurements resulting in an excess of 14% of the time.

Fog is another component of weather that may impede the decommissioning process. While modern technology may reduce fog's impact on sea-going activity, it can create challenges when visibility is required such as crane operations and helicopter activity.

In 1979, an environmental statement completed by the Department of the Interior assessed the impact of offshore oil and gas activity on the environment (Final Environmental Statement, OCS Sale No. 48 Volume 2 of 5). The California Bight region located offshore from Point Conception to San Diego, has significantly reduced visibility of less than two miles for the months of June, July and August. However, fog is defined as a condition which exists when visibility is reduced to less than 1 km or 0.6 miles. According to the Final Environmental Statement report, the visibility is reduced 2 to 12 percent of the time in the western portion of the lower California coast and 20 to 24 percent in the eastern portion. It is estimated that the remainder of the 9 months incurs reduced visibility 1 percent of the time. Because the reduced visibility in the report does not strictly adhere to the definition of fog, the percentage calculated for a twelve-month period was reduced by half and added to the wave and wind percentage for the weather contingency used in this evaluation.

The combination of the weather components yielded a downtime of 5 to 15 percent from south to north (and east to west). The southern platforms: Edith, Elly, Ellen, Eureka, Grace, Gilda, Gail, Gina, Habitat, Houchin, Hogan, Henry, Hillhouse, A, B, and C fall within the 5% weather downtime area on the map of Figure 4.1. However, based on field experience, Gail, Gilda and Grace are likely to be impacted by weather 10% of the time. The central platforms: Hondo, Harmony and Heritage fall within the 10% weather downtime area on Figure 4.1. Again, direct field experience on Heritage indicates weather downtime is closer to 15%. The northern most platforms: Hermosa, Harvest, Hidalgo and Irene have a 15% weather downtime. Figure 4.1 below illustrates the location POCSR platforms in the decommissioning study and the simplest parsing of weather contingency. Table 4.2 lists the factors applied to each platform, including increased weather downtime for Gail, Gilda, Grace and Heritage. The weather contingency for material disposal was added separately as the impact by platform is negligible compared to the total length of the transit to the GOM.

Figure 4.1 Weather Contingency Zones

Table 4.2 Weather Downtime Percent

Platform	Factor
A	5%
B	5%
C	5%
Edith	5%
Ellen	5%
Elly	5%
Eureka	5%
Gail	10%
Gilda	10%
Gina	5%
Grace	10%
Habitat	5%
Harmony	10%
Harvest	15%
Henry	5%
Heritage	15%
Hermosa	15%
Hidalgo	15%
Hillhouse	5%
Hogan	5%
Hondo	10%
Houchin	5%
Irene	15%

The weather downtime was applied to the same tasks as the PMEP, with the following exceptions: permitting and regulatory, platform transportation and material disposal, and mob/demob of vessels from GOM. Permitting and regulatory would not incur an added weather downtime. The platform transportation and material disposal, and mob/demob of the heavy lift vessels, may experience reduced speeds as a result of rough waters travelling to and from the GOM through the Panama Canal to the POCSR, but it is not expected to result in downtime. As such, a 5% added cost is embedded in these cost categories. No additional weather downtime was included in these cost categories as a separate cost.

In 2016, weather downtime was multiplied to 100% of well P&A and conductor removal costs and only 85% of other cost categories, applied only to key tasks. In this 2020 study update, weather downtime was applied to 100% of each cost category included in the calculation. Table 4.3 shows the cost basis used and the calculated weather contingency for each platform.

Table 4.3 Weather Contingency Costs for Each Platform

Platform	Pre-Weather Contingency	Weather Contingency
A	$ 31,241,000	$ 1,562,100
B	$ 31,032,500	$ 1,551,600
C	$ 23,489,700	$ 1,174,500
Edith	$ 23,297,900	$ 1,164,900
Ellen	$ 38,165,500	$ 1,908,300
Elly	$ 16,380,000	$ 819,000
Eureka	$ 70,028,300	$ 3,501,400
Gail	$ 55,404,400	$ 5,540,400
Gilda	$ 44,188,100	$ 4,418,800
Gina	$ 9,646,600	$ 482,300
Grace	$ 28,798,200	$ 2,879,800
Habitat	$ 23,450,900	$ 1,172,500
Harmony	$ 107,826,400	$ 10,782,600
Harvest	$ 49,562,800	$ 7,434,400
Henry	$ 17,838,600	$ 891,900
Heritage	$ 106,540,000	$ 15,981,000
Hermosa	$ 45,923,600	$ 6,888,500
Hidalgo	$ 38,047,900	$ 5,707,200
Hillhouse	$ 28,991,800	$ 1,449,600
Hogan	$ 23,790,200	$ 1,189,500
Hondo	$ 50,133,100	$ 5,013,300
Houchin	$ 20,646,100	$ 1,032,300
Irene	$ 28,737,500	$ 4,310,600
Total	**$ 913,161,100**	**$ 86,856,500**

Miscellaneous Work Provision

A miscellaneous work provision contingency was applied to account for any unknowns that may result in downtime and/or added costs. The 15% factor utilized in the 2016 report is a reasonable assumption to apply for unanticipated costs and events, based on engineering experience. This same factor was used in this report.

The miscellaneous work provision contingency costs were calculated as 15% of the following tasks:

- Permitting and Regulatory Compliance
- Platform preparation
- Well and Conductor P&A
- Pipeline and power cable decommissioning
- Platform removal (excludes mob/demob of vessels)
- Platform Transportation and Material Disposal
- Site Clearance

Permitting and regulatory compliance, and platform transportation and material disposal, were not incorporated in the 2016 miscellaneous work provision contingency calculation. These tasks are included in this report's calculation based upon InterAct's experience with the complex nature of permitting and regulatory activities in the state of California. Additionally, the lengthy round trips through the canal to the GOM for platform transportation and material disposal may result in unexpected events or downtime due to capacity restrictions through the Panama Canal or other docking and disposal related issues.

Table 4.4 General Contingency Costs

Platform	Pre-Misc. Work Provision	Misc.Work Provision (15%)
A	$ 37,706,600	$ 5,656,000
B	$ 37,235,800	$ 5,585,400
C	$ 29,719,400	$ 4,457,900
Edith	$ 33,013,800	$ 4,952,100
Ellen	$ 49,047,900	$ 7,357,200
Elly	$ 25,932,500	$ 3,889,900
Eureka	$ 90,825,400	$ 13,623,800
Gail	$ 75,005,200	$ 11,250,800
Gilda	$ 54,646,000	$ 8,196,900
Gina	$ 13,812,400	$ 2,071,900
Grace	$ 39,264,900	$ 5,889,700
Habitat	$ 33,533,900	$ 5,030,100
Harmony	$ 138,129,100	$ 20,719,400
Harvest	$ 69,039,700	$ 10,356,000
Henry	$ 23,945,100	$ 3,591,800
Heritage	$ 136,248,300	$ 20,437,200
Hermosa	$ 65,068,000	$ 9,760,200
Hidalgo	$ 55,347,400	$ 8,302,100
Hillhouse	$ 35,335,200	$ 5,300,300
Hogan	$ 33,980,700	$ 5,097,100
Hondo	$ 70,640,400	$ 10,596,100
Houchin	$ 30,818,400	$ 4,622,800
Irene	$ 38,849,000	$ 5,827,400
Total	**$ 1,217,145,100**	**$ 182,572,100**

The total adjustments added to the base cost of decommissioning total $355 million. This cost provides for project management, engineering and planning, downtime due to weather, and unforseen delays, costs and events. The total for each platform is listed in Table 4.5.

Table 4.5 Total Adjustments per Platform

Platform	PMEP	Weather Contingency	Misc.Work Provision	Total Contingencies
A	$ 3,016,500	$ 1,562,100	$ 5,656,000	$ 10,234,600
B	$ 2,978,900	$ 1,551,600	$ 5,585,400	$ 10,115,900
C	$ 2,377,600	$ 1,174,500	$ 4,457,900	$ 8,010,000
Edith	$ 2,641,100	$ 1,164,900	$ 4,952,100	$ 8,758,100
Ellen	$ 3,923,800	$ 1,908,300	$ 7,357,200	$ 13,189,300
Elly	$ 2,074,600	$ 819,000	$ 3,889,900	$ 6,783,500
Eureka	$ 7,266,000	$ 3,501,400	$ 13,623,800	$ 24,391,200
Gail	$ 6,000,400	$ 5,540,400	$ 11,250,800	$ 22,791,600
Gilda	$ 4,371,700	$ 4,418,800	$ 8,196,900	$ 16,987,400
Gina	$ 1,105,000	$ 482,300	$ 2,071,900	$ 3,659,200
Grace	$ 3,141,200	$ 2,879,800	$ 5,889,700	$ 11,910,700
Habitat	$ 2,682,700	$ 1,172,500	$ 5,030,100	$ 8,885,300
Harmony	$ 11,050,300	$ 10,782,600	$ 20,719,400	$ 42,552,300
Harvest	$ 5,523,200	$ 7,434,400	$ 10,356,000	$ 23,313,600
Henry	$ 1,915,600	$ 891,900	$ 3,591,800	$ 6,399,300
Heritage	$ 10,899,900	$ 15,981,000	$ 20,437,200	$ 47,318,100
Hermosa	$ 5,205,400	$ 6,888,500	$ 9,760,200	$ 21,854,100
Hidalgo	$ 4,427,800	$ 5,707,200	$ 8,302,100	$ 18,437,100
Hillhouse	$ 2,826,800	$ 1,449,600	$ 5,300,300	$ 9,576,700
Hogan	$ 2,718,500	$ 1,189,500	$ 5,097,100	$ 9,005,100
Hondo	$ 5,651,200	$ 5,013,300	$ 10,596,100	$ 21,260,600
Houchin	$ 2,465,500	$ 1,032,300	$ 4,622,800	$ 8,120,600
Irene	$ 3,107,900	$ 4,310,600	$ 5,827,400	$ 13,245,900
Total	**$ 97,371,600**	**$ 86,856,500**	**$ 182,572,100**	**$ 366,800,200**

5.0 PERMITTING AND REGULATORY COMPLIANCE

This section describes permitting and environmental review requirements and associated costs for the decommissioning of the POCSR oil and gas platforms, pipelines, and power cables. The process remains the same as that described in the 2016 report with a few updates for modified regulations. The cost estimate for permitting and regulatory compliance is based on the platforms being completely removed. Potentially controversial issues that could extend the environmental review process, such as a proposal for an artificial reef pursuant to the State of California's Rigs to Reef legislation adopted in 2010 or the fate of shell mounds (if present), were not assumed in this analysis. As noted in Section 1, BSEE instructed the study team not to include either of these factors in the cost study.

Regulatory agencies with permit authority are engaging in an Interagency Decommissioning Working Group (IDWG) to prepare for upcoming decommissioning work offshore California. The IDWG seeks to coordinate their processes and mitigation requirements so that all agency policies and regulations are met.

Permitting and regulatory compliance costs will be incurred to obtain the necessary Federal, State, and local permits required for decommissioning operations and to prepare the environmental documentation necessary to satisfy the requirements of the National Environmental Policy Act (NEPA) and the California Environmental Quality Act (CEQA). The costs to satisfy environmental mitigation measures that are typically placed on offshore projects, such as marine mammal protection measures, air emissions mitigation, commercial fishermen preclusion agreements, pre- and post- decommissioning biological surveys, were included in the cost estimates. Other costs, such as bathymetric surveys for anchor positioning and post-decommissioning seafloor surveys for to ensure there are no obstructions that could interfere with other ocean users, were included elsewhere in the report. For decommissioning projects offshore California, mitigation costs can be significant.

Regulatory Agency Jurisdiction

The decommissioning of a Federal OCS oil and gas platform(s) will involve the removal of the structure and associated offshore oil and gas pipelines and power cables that connect the platforms and onshore processing facilities and electrical grids. The project may also involve the decommissioning of an associated onshore processing facility if it is the only facility servicing those platform(s). The agencies that have primary regulatory jurisdiction over such a project are BOEM/BSEE, which regulates oil and gas activities on the Federal OCS, the California State Lands Commission (CSLC) which has authority over State Tidelands located within 3 miles from the coastline, and the County/City agency regulating the related onshore facilities. In addition, the California Coastal Commission has permit authority over all aspects of the decommissioning program within the State's recognized Coastal Zone Boundary.

In addition to BOEM and BSEE, several other Federal agencies have regulatory authority over various aspects of decommissioning projects including: National Marine Fisheries Service, U.S. Army Corps of Engineers, U.S. Fish and Wildlife Service, U.S. Environmental Protection Agency, U.S. Coast Guard, and the U.S. Pipeline and Hazardous Materials Safety Administration. Additional State and local agencies having regulatory jurisdiction over decommissioning operations in California include the California Department of Fish and Wildlife, California Geologic Energy Management Division, Regional Water Quality Management District, California State Fire Marshal, County Planning and Resource Management Departments, and regional Air Pollution Control Districts. Tables 5.1 and 5.2 list the major regulatory agencies and their permitting requirements and authority. These tables were derived from InterAct's expertise and experience permitting offshore and coastal oil and gas projects and are consistent with other BSEE matrices as well as the 2016 report.

Permitting Process

The process of obtaining the required federal, state, and local permits necessary for decommissioning is complex and typically requires two to five years to complete. Planning for decommissioning should start at least two to three years before cessation of production in order to minimize cost and avoid unnecessary delays in facility removal. Many preparatory activities can and should be conducted as part of operations in anticipation of decommissioning. The final two to three years of production and time for well P&A should provide enough time for the permitting process for structure removal. Any unforeseen problems could delay this process. Due to the numerous permits required and the complexity of the process, companies that have decommissioned offshore oil and gas facilities have historically contracted with local consulting firms that have the technical, environmental and regulatory expertise required to help them navigate through the regulatory framework.

Outer Continental Shelf Lands Act regulations administered by BSEE require that operators obtain approval of the platform removal methodology prior to removal of the platform through an application process. The first step in the process involves preparing and submission of an Initial Platform Removal application (Decommissioning Plan) two years prior to the end of production to BSEE (30 CFR 250.1726). The Decommissioning Plan provides detailed information for the various steps in the process, equipment to be used, project schedule and phasing, cutting techniques, coordination with other operators for a joint decommissioning project, transportation and salvage/disposal plans, pipeline flushing details, site restoration techniques, etc. This becomes the "project description" and basis for environmental review under CEQA. Within two years of the initial plan submission, a Final Platform Removal Plan (Decommissioning Plan) must be submitted to BSEE (30 CFR 250.1727) as well as the necessary permit application materials needed to secure permits from Federal, State and local regulatory agencies with responsibility for these facilities. Geotechnical, marine biological, marine archaeological, seafloor, and fish surveys to establish environmental conditions and resources that could be impacted during decommissioning are required as part of the project application. BSEE has the authority but could use BOEM at their discretion.

When a project involves both Federal and State permits, the agencies will often form a Joint Review Panel (JRP) to conduct an environmental review of the project pursuant to NEPA and CEQA. Impacts associated with platform decommissioning have the potential to create significant adverse environmental impacts. To coordinate the process and minimize duplication of effort, BSEE or whomever BSEE designates (as Federal Lead Agency) and the lead CEQA agency (CSLC or County Planning and Development Department depending on the work scope) generally prepare a joint Environmental Impact Statement/Environmental Impact Report (EIS/EIR) for the project. BSEE may hire a third party to prepare an EIS.

The EIS/EIR will analyze the anticipated environmental impacts of the project and identify mitigation measures to eliminate or minimize those impacts. A Draft EIS/EIR is circulated for public and agency review. Comments received require a response in the Final EIS/EIR. The final document is then brought to the decision-making bodies in a public hearing for adoption.

The California Coastal Commission (CCC) must issue a Federal Consistency Determination (consistency with the California Coastal Act) for activities in POCSR waters and Coastal Development Permit (CDP) for any activities that occur within State waters and adjacent onshore coastal zone. Following action by the CCC, BSEE and the lead CEQA agency and can proceed with approving the project by respectively issuing a Record of Decision (ROD) and Notice of Determination (NOD) for the project.

NEPA environmental reviews may be on a project-specific, as described above, or on a broader programmatic level. The analyses in a programmatic NEPA review are valuable in setting out the broad view of environmental impacts and benefits for a proposed decision such as a rulemaking, or establishing a policy, program, or plan. It can also be used for approving multiple actions such as several similar or connected projects in a region. Such is the case for the anticipated decommissioning of platforms in the POCSR. BOEM is currently working on a Programmatic EIS for the first set of POCSR platforms identified for removal.

Once completed, the Programmatic EIS could be used by BSEE to evaluate future actions to determine the need for additional analysis. If future changes to the proposed action vary from the initial analysis, it could be analyzed in a subsequent document, referred to as a “tiered” analysis. One benefit of a subsequent tiered document is that it avoids the need to repeat information already considered at the programmatic level, thereby expediting the process. Programmatic NEPA reviews are intended to produce clearer and more transparent decision-making, as well as provide a better defined and more expeditious path toward decisions on proposed actions.

Another benefit of a programmatic approach is having the flexibility to evaluate what is known and then move forward with federal projects. The consultation process with regulatory agencies such as the U.S. Fish and Wildlife Service, National Marine Fisheries Service, the State Historic Preservation Office can be markedly streamlined as well. For instance, a proposed project could have a programmatic agreement under the Endangered Species Act and have a separate, more focused and specific consultation with the U.S. Fish and Wildlife Service, for any subsequent tiered NEPA review.

BSEE notes, however, that given the complexity of the subject decommissioning projects, the broad range of environmental issues, and the fact that environmental review must meet the needs of state and local agencies, each campaign described in this study will likely still require the preparation of a project-specific EIS/EIR. Under the Permit Streamlining Executive Order signed in 2017, NEPA documents are to be no more than 150 pages, 300 pages for complex projects, and reach decision within one year from the issuance of the EIS Notice of Intent. A combined EIS/EIR, however, is expected to take 24-36 months after the application has been deemed complete by the lead agencies. The timeframe will depend on the quality of the application, the quality of the environmental analysis, and the number, nature, and complexity of comments received.

Table 5.1 Federal Permitting Requirements Applicable to Decommissioning Projects

Agency	Permit/Approval	Regulated Activity	Applicable project Components	Review Period*	Authority
Federal Agencies					
Bureau of Ocean Energy Management (BOEM)	Coordinates NEPA Analysis	Responsible for OCS lease administration (including lease adjudication), and ensuring compliance with bonding requirements and lease terms and conditions. Performs environmental analysis on behalf of BSEE.	OCS facilities including platforms, wells and pipelines.	Conducted in coordination with BSEE NEPA review	Outer Continental Shelf Lands Act, 30 CFR § 550 and 30 CFR § 556
Bureau of Safety and Environmental Enforcement (BSEE)	Approval of Initial and Final Decommissioning Application	Responsible for approving OCS decommissioning applications and enforcing safety and environmental regulations.	OCS facilities including platforms, wells and pipelines	Approximately 6 months to 3 years to complete NEPA review and project component decommissioning procedures. (Duration mainly depends on external reviews.)	Outer Continental Shelf Lands Act 30 CFR 250 Subpart Q, Decommissioning Activities NTL 2020-P02 NTL 2010-P-05 43 U.S. Code 1334
US Army Corps of Engineers (ACOE)	Section 404 permit Section 10 permit	Responsible for: (1) issuing permits for discharges of dredged or fill material in U.S. waters; (2) issuing permits for construction of any structure in or over the navigable waters of the U.S.	Marine components	6-8 months including certification of NEPA/CEQA document	Clean Water Act, Section 404 Rivers and Harbors Act, Section 10
United States Fish & Wildlife Service (USFWS)	Incidental Take Permit; Finding of No Jeopardy	Responsible for ensuring protection of threatened and endangered species (e.g., sea otters and certain bird species), pursuant to the Endangered Species Act (ESA).	Marine activities that could impact threatened or endangered species not otherwise regulated by NMFS (i.e., white abalone, seabirds)	Unspecified	Endangered Species Act 16 USCA 1513 50 CFR Section 17
Environmental Protection Agency (EPA)	National Pollution Discharge Elimination System (NPDES) Permit	Responsible for issuing National Pollution Discharge Elimination System (NPDES) permits for discharges of pollutants from point sources to surface waters.	Conductor cutting, depending on method used; Discharge of final pipeline flush waters, if fluids meet strict standards	Unspecified	Clean Water Act
United States Coast Guard (USCG)	Navigation consultation Notice to Mariners	Responsible for ensuring navigation safety, proper use of aids to navigation, and managing responses to any unauthorized discharges including oil spills.	All marine decommissioning activities; issues notices to mariners of preclusion areas during work for purposes of safety; enforces said notices	Unspecified	Ports and Waterways Safety Act Oil Pollution Act of 1990 33 CFR – Coast Guard
U.S. Department of Transportation, Pipeline and Hazardous Material Safety Administration	Pipeline abandonment applications	Responsible for ensuring pipeline safety and overseeing abandonment of pipelines for DOT jurisdictional pipelines.	Pipeline components Hazardous materials	Unspecified	Natural Gas Pipeline Safety Act Hazardous Liquid Pipeline Safety Act Hazardous Materials Transportation Act
National Marine Fisheries Service (NMFS)	ESA, Section 7 for marine species Marine Mammal Protection Act Essential Fish Habitat Assessment	Impacts to federally-listed and species proposed for listing. Protection of Marine Mammals including impacts associated with explosives use. Managed Marine Fish Resources	Marine components	Review period: 6 months to 1 year Review period: 18 months or more Review period: Similar to ESA Completed prior to NEPA completion	Endangered Species Act Marine Mammal Protection Act Magnuson-Stevens Fishery Conservation and Management Act

*The Review Period is an estimated duration. The actual time required may be longer or shorter.

Table 5.2 State and Local Permitting Requirements Applicable to Decommissioning Projects

Agency	Permit/Approval	Regulated Activity	Applicable project Components	Review Period*	Authority
State of California Agencies					
California State Lands Commission (CSLC)	Lead agency for CEQA documentation. Pipeline lease Agreement termination	Review of environmental impacts in area of jurisdiction. Removal of components in State Territorial Waters.	All decommissioning activities in state waters to mean high tide line. Review impacts of all decommissioning activities.	10-12 months for certification of CEQA document. Lease termination agreement	Public Trust Doctrine, Public Resources Code Sections 6301, 6500. California Environmental Quality Act (CEQA)
California Coastal Commission (CCC)	Coastal Development Permit/Federal Consistency	Ensures any development (including decommissioning activity) within the coastal zone complies with the CA Coastal Act and CZMA.	All decommissioning activities within the Coastal Zone	4-6 month review process, partially concurrent with CEQA review.	California Coastal Act; Coastal Zone Management Act
California Department of Fish and Wildlife (CDFW) Office of Spill Prevention & Response (CDFW OSPR)	Endangered Species Act Consultation, Finding of No Jeopardy; Section 1603 Permit; Oil Spill Contingency Plan approval	Activities affecting State Waters resources. Onshore activities affecting onshore resources including streams and wetlands. State lead for response to oil spills affecting state waters and resources.	Decommissioning activities that could impact CA fish and wildlife resources, including listed threatened or endangered species or species of special concern.	4-6 month review process, partially concurrent with CEQA review.	CA Endangered Species Act; CA Dept. of Fish & Game Code Section 1603; Senate Bill 861
Regional Water Quality Control Board (RWQCB)	Section 401 Water Quality Certification	Discharges that may affect surface and ground water quality.	Any activity that could result in a discharge to waters of the state	Concurrent with ACOE review and approval.	Clean Water Act (CWA) Porter-Cologne State Water Quality Act (1969).
State Historical Preservation Officer (SHPO)	Section 106 review and compliance	Impacts to historic and prehistoric resources.	None identified at this time.	3-6 months after certification of CEQA document.	National Historic Preservation Act 36 CFR 800
California Geologic Energy Management Division (CalGEM)	Notice of Intention (NOI)	Well Plugging and Abandonment	Platform well plugging abandonment (prior to platform decommissioning)		California Public Resources Code Section 3106
Local Agencies (Santa Barbara, Ventura and Los Angeles Counties)					
County Department of Planning and Building and Safety (County)	Conditional Use Permit; Coastal Development Permit	Removal of project components located landward of State Lease within unincorporated portions of County (beach & onshore segments).	Onshore facilities within Coastal Zone.	2-3 month review process, partially concurrent with CEQA review.	County General Plan / Coastal Plan
Air Pollution Control Board (APCD)	Air quality emissions review; Permit to Operate/ Authority to Construct (PTO/ATC) and Portable Engine Permits	Air emission outputs associated with project decommissioning activities.	All decommissioning activities with equipment require engines (i.e., derrick barge, tugs, cranes, crew and supply vessels, portable equipment, generators, trucks, etc.)	6-8 months review process, concurrent with CEQA review.	1990 Clean Air Act CEQA review

Cost Model Inputs

The cost components used to develop total cost estimates for permitting and regulatory compliance for this report are the same as those used in the previous report, with minor changes. The costs for each component were updated based on the study team's experience with California project mitigation. Total costs were then allocated to each platform based on the number of platforms in each campaign. Details of each cost component included in the overall permitting cost are explained below:

(1) *Initial and Final Platform Removal Plan (Decommissioning Plan)*: The project applicant, with assistance of a local consulting firm if necessary, would prepare a Plan that provides a detailed description of proposed project activities, the associated equipment and personnel requirements, and the schedule for completing the activities. Typically, these materials are based on detailed engineering plans developed by engineering firms and/or marine contractors with expertise in marine decommissioning operations.

(2) *Data Collection and Field Surveys:* The project applicant would contract with an environmental consulting firm that would compile existing baseline environmental information and conduct field surveys to evaluate the project site and identify the presence of any sensitive marine species and habitats that could potentially be impacted by decommissioning operations. Field surveys would include pre- and post-construction surveys. Such surveys were required by regulatory agencies for previous decommissioning projects conducted offshore California.

(3) *NEPA and CEQA Document Preparation and Review Process:* The project applicant will be required to fund the preparation of EIS/EIR. It is expected that the BOEM Programmatic EIS will be available for reference prior to the first campaign. This document will establish policy and mitigate approaches for POCSR facility decommissioning. However, project specific details will be required to fully evaluate the impacts of the proposed decommissioning activities for public review. Upon submission of an application package that is deemed complete, BSEE or whomever BSEE designates, and the lead CEQA agency will oversee the preparation of an EIS/EIR that will be conducted by a third party (consulting firm) selected by the agencies.

(4) *Agency Processing Fees and Staff Time*: The project applicant will be responsible for covering these expenses. Federal, State and local regulatory agencies in California impose fees for processing applications or require applicants to reimburse the agencies for staff time and that of their consultants to review and process permits.

(5) *Environmental Mitigation Requirements*: The project applicant will be responsible for mitigating impacts to air quality and commercial fishermen who would be precluded from fishing in the area where decommissioning operations are conducted. This mitigation involves payments to fishermen for lost catch, with evidence of fish tickets establishing typical catch quantities, and fees paid the local air pollution control

districts for technology demonstration projects and other air quality improvement programs. Regulatory agencies have also required project applicants to prepare Marine Wildlife Protection Plans and post trained protected species observers to monitor decommissioning operations to ensure protection of whales and other marine mammals. Such requirements were imposed by regulatory agencies on Exxon when they decommissioned the OS&T and SALM in federal waters in 1994 and on Chevron when they decommissioned Platforms Hope, Heidi, Hilda and Hazel in State waters in 1996. Similar conditions have been placed on other marine construction projects.

(6) *Mitigation Monitoring and Permit Compliance:* As part of the EIS/EIR, a Mitigation Monitoring Plan will be developed for ensuring compliance with the mitigation measures adopted in the environmental review document. Regulatory agencies require project applicants to develop and implement compliance plans to ensure that environmental mitigation measures and other conditions placed on the project by the approving authorities are satisfied by the project applicant. The monitoring activities are typically performed by consultants and regulatory agency personnel. Compliance reports are required documenting completion of requirements before, during, and after project work.

Table 5.3 Permitting and Regulatory Compliance Costs - Base Case

Cost Factors*	Cost Per Activity
1. Initial and Final Platform Removal Plan (Decommissioning Plan) Preparation (does not included decommissioning engineering costs)	$ 200,000
2. Data Collection and Field Surveys	$ 100,000
3. Prepare NEPA and CEQA Documents (EIS/EIR)	$1,800,000
4. Agency Processing Fees and Staff Time	
• Application Fees	$ 100,000
• Agency Staff Time	$ 120,000
• Applicant Consultant Support	$ 160,000
5. Environmental Mitigation Requirements	
• Mitigation Fees (Air and Fisheries)	$ 800,000
• Marine Mammal Monitoring	$ 100,000
6. Mitigation Monitoring and Compliance	$ 150,000
Total Cost Per Project	**$3,530,000**

*The cost factors 1, 2, 5, and 6 vary due to number of platforms. This is due to the additional locations and processes required to generate the required documentation. Table 5.4 shows the values for the factors that vary with the number of platforms

Table 5.4 Permit & Reg. Compliance Costs Variance by Number of Platforms per Campaign

		Number of Platforms in Campaign									
Cost Factors	Base Case*	2	3	4	5	6	7	8	9	10	11
1. Initial and Final Platform Removal Plan (Decommissioning Plan) Preparation (does not include decommissioning engineering costs)	$ 250,000	$ 270,000	$ 290,000	$ 310,000	$ 330,000	$ 350,000	$ 370,000	$ 390,000	$ 410,000	$ 430,000	$ 450,000
2. Data Collection and Field Surveys	$ 150,000	$ 180,000	$ 210,000	$ 240,000	$ 270,000	$ 300,000	$ 330,000	$ 360,000	$ 390,000	$ 420,000	$ 450,000
3. Prepare NEPA and CEQA Documents (EIS/EIR)	$ 2,000,000	$ 2,000,000	$ 2,000,000	$ 2,500,000	$ 2,500,000	$ 2,500,000	$ 3,000,000	$ 3,000,000	$ 3,000,000	$ 3,000,000	$ 3,000,000
4. Agency Processing Fees and Staff Time											
- Application Fees	$ 120,000	$ 120,000	$ 120,000	$ 160,000	$ 160,000	$ 160,000	$ 200,000	$ 200,000	$ 200,000	$ 200,000	$ 200,000
- Agency Staff Time	$ 150,000	$ 150,000	$ 150,000	$ 190,000	$ 190,000	$ 190,000	$ 230,000	$ 230,000	$ 230,000	$ 230,000	$ 230,000
- Application Consultant Support	$ 160,000	$ 160,000	$ 160,000	$ 200,000	$ 200,000	$ 200,000	$ 240,000	$ 240,000	$ 240,000	$ 240,000	$ 240,000
5. Environmental Mitigation Requirements											
- Mitigation Fees (Air and Fisheries)	$ 800,000	$ 920,000	$ 1,040,000	$ 1,160,000	$ 1,280,000	$ 1,400,000	$ 1,520,000	$ 1,640,000	$ 1,760,000	$ 1,880,000	$ 2,000,000
- Marine Mammal Monitoring	$ 100,000	$ 130,000	$ 150,000	$ 170,000	$ 190,000	$ 210,000	$ 230,000	$ 250,000	$ 270,000	$ 290,000	$ 310,000
6. Mitigation Monitoring and Compliance	$ 150,000	$ 170,000	$ 190,000	$ 210,000	$ 230,000	$ 250,000	$ 270,000	$ 290,000	$ 310,000	$ 330,000	$ 350,000
Total	**$ 3,880,000**	**$ 4,100,000**	**$ 4,310,000**	**$ 5,140,000**	**$ 5,350,000**	**$ 5,560,000**	**$ 6,390,000**	**$ 6,600,000**	**$ 6,810,000**	**$ 7,020,000**	**$ 7,230,000**

* For some factors, costs are expected to increase with each additional platform while other costs are expected to increase at intervals (i.e., factors 3, 4)

Total Cost of Campaign 1 (10 platforms)	$7,020,000	Cost/platform	$ 702,000
Total Cost of Campaign 2 (11 platforms)	$7,230,000	Cost/platform	$ 657,000
Total Cost of Campaign 3 (3 platforms)	$4,310,000	Cost/platform	$1,437,000

Table 5.5 Permitting and Regulatory Compliance Costs Per Campaign

Campaign	Cost Per Project	Number of Platforms
1	$ 7,020,000	10
2	$ 7,230,000	11
3	$ 4,310,000	3

Table 5.6 Permitting and Regulatory Compliance Costs Per Platform

Platform Name	Campaign	Cost Per Platform *
A	2	$ 657,000
B	2	$ 657,000
C	2	$ 657,000
Edith	2	$ 657,000
Ellen	2	$ 657,000
Elly	2	$ 657,000
Eureka	2	$ 657,000
Gail	1	$ 702,000
Gilda	2	$ 657,000
Gina	2	$ 657,000
Grace	1	$ 702,000
Habitat	1	$ 702,000
Harmony	3	$ 1,437,000
Harvest	1	$ 702,000
Henry	2	$ 657,000
Heritage	3	$ 1,437,000
Hermosa	1	$ 702,000
Hidalgo	1	$ 702,000
Hillhouse	2	$ 657,000
Hogan	1	$ 702,000
Hondo	3	$ 1,437,000
Houchin	1	$ 702,000
Irene	1	$ 702,000
Total		**$ 17,856,000**

6.0 PLATFORM PREPARATION

Platform preparation encompasses the activities associated with placing the platform in a condition where it can be safely removed. To enable safe removal, risks to people, the environment, and equipment must be mitigated to the maximum extent possible. The steps of platform preparation are as follows:

- Initial Platform Preparations Phase and underwater survey
- Platform Removal Preparations Phase

Initial Platform Preparations Phase and Underwater Survey

The initial steps to inspect and secure the platform may occur before, during, or after wells have been plugged and abandoned. The main goals of this stage are to assess the condition of the platform, make improvements and repairs to prepare the platform for removal, and then idle the platform in a manner that reduces environmental and personnel hazards.

During this phase, a Level 1 inspection will be performed on the topside which includes:

- In-service paint inspection to determine whether it is adequate for the duration of the decommissioning project;
- Overall structural assessment;
- Corrosion assessment (handrails, walkways, boat landings, etc.);
- External inspection of process equipment;
- Erosion/corrosion site identification;
- Safety inspection to identify hazardous materials and ensure planned platform cuts are safe.

The topside inspection will identify any repairs or structural modifications that must be made to the platform prior to topside removal. Equipment to be removed prior to decommissioning, such as the workover rig, would be identified. Inspection of individual modules would be used to confirm safety and structural integrity for detailed cutting and removal required to separate each module.

During this phase, steps would be taken to secure the facility prior to removal. To reduce risk to the environment, all lines and vessels would be flushed, hydrocarbon pathways would be isolated, waste and non-essential chemicals would be removed. To reduce risk to personnel, all equipment would be shut down and lockout/tagout installed on non-essential equipment. Safety systems functions would be confirmed, and the crane(s) would be inspected and repaired, as necessary. (Significant refurbishment costs were not included in this study.)

The pre-decommissioning underwater inspection would be a Level II inspection and would include:

- Identification of corrosion and/or structural member fatigue damage;
- Assessment of coating condition, cathodic protection system condition and current condition of structural members;
- Identification of design or construction deficiencies;
- Potential for unanticipated or environmental overloading;
- Scour/seafloor instability and other potential subsea hazards;
- Presence of debris or obstructions.

The underwater inspection would identify all debris, obstructions, and/or subsea structural integrity issues. All identified issues would be addressed as part of the platform preparation process.

Platform Removal Preparations Phase

After detailed removal/cutting programs have been approved, platform preparation begins. The intent of this stage is to prepare the topside sections for lift by a derrick barge. Local crane and cargo barges would be mobilized to remove workover rigs and other salvageable equipment prior to decommissioning as part of the preparation phase.

Platform removal requires cutting the facility into sections that can be safely lifted within the capabilities of the selected HLV and transported within the capacity of the selected cargo barge. A structural engineer would review each designated lift to ensure the section can withstand the lift. Structural reinforcements may be required. Detailed engineering is necessary to determine the extent of structural reinforcements needed on each platform, which is beyond the scope of this study.

Lifting pad eyes would be installed for each section where necessary. Pipes would be cut and capped to prevent fluid release. Electrical lines would be severed, and temporary lighting and power would be required. These tasks require a significant number of personnel including crane operators, inspectors for cranes and welds, electricians, scaffolding crew, engineers, project managers, catering crew, welders, crews for boats, helicopter pilots, safety representatives and other operations personnel.

Cost Model Inputs

The cost estimate presented in Table 6.1 is based on market rates for personnel, equipment rental, services, and consumables. The model is based on the premise that decommissioning operations would occur concurrently for three platforms allowing for the ability to share costs such as crew boat and shore-based facilities.

The cost for the initial platform preparation phase varies by complexity of the topsides. Complexity is driven by platform size, platform function, number of wells, platform age, and water depth. To determine costs for the 23 platforms, time and cost estimates were developed to prepare one representative platform, Platform A. These estimates were then scaled to fit each specific platform.

The cost for the platform preparation for topside removal was based on the topsides weight of the different platforms assuming the either 500-ton or 1000-ton lifts. The estimate was then further modified for specific requirements of each platform such as helicopter transport and/or presence of living quarters currently available.

The cost per platform is based on the time required for preparation of one section multiplied by the number of sections that must be prepared. Two sections would be prepared simultaneously to optimize efficiencies. Costs for a Level 1 topside inspection and Level 2 underwater inspection were based on market rates provided by vendors.

Platform inspections may occur before well P&A is complete, but for cost estimating purposes, platform preparation field work would take place after all wells have been P&A'd. Thus, the costs include time for crane operations, crew transportation and meals after the P&A work is complete. If the work is done concurrently, actual costs could be less.

Rig demobilization costs were provided by two POCSR operators. These costs are extrapolated for all POCSR platforms and are included in the Platform Preparation costs. The platform preparation cost estimate includes two additional salvageable equipment removals for the smaller platforms, and three additional removals for the larger platforms. The cost for removal of this salvageable equipment equated to the cost for rig demobilization.

The cost estimate for platform preparation activities includes costs for:

- Utility/crew boats and catering or galley operations;
- If appropriate, helicopter making three trips every three days, with a weekly supply boat;
- Platform preparation crew including welders, electricians, scaffolding, inspectors, crane operators;
- Platform preparation equipment cleaning, repair, and the structural modification crew;
- Other materials and supplies.

Table 6.1 Platform Preparation Costs

Platform	Topside Weight (tons)	Topside Preparation (days)	U/W Inspection	Topside Prep Cost	Total Cost
A	1357	22	$ 28,100	$ 1,625,400	$ 1,653,500
B	1357	22	$ 28,100	$ 1,631,700	$ 1,659,800
C	1357	20	$ 28,100	$ 1,582,100	$ 1,610,200
Edith	4134	41	$ 28,700	$ 2,584,800	$ 2,613,500
Ellen	5300	45	$ 40,900	$ 2,435,500	$ 2,476,400
Elly	8000	35	$ 40,900	$ 2,370,700	$ 2,411,600
Eureka	4700	80	$ 40,900	$ 4,644,700	$ 4,685,600
Gail	7693	60	$ 37,900	$ 3,848,000	$ 3,885,900
Gilda	3792	35	$ 43,900	$ 1,987,000	$ 2,030,900
Gina	447	10	$ 29,800	$ 675,300	$ 705,100
Grace	3800	40	$ 37,900	$ 2,872,000	$ 2,909,900
Habitat	3514	30	$ 43,900	$ 1,807,300	$ 1,851,200
Harmony	9839	78	$ 43,900	$ 5,064,800	$ 5,108,700
Harvest	9024	67	$ 37,900	$ 5,028,500	$ 5,066,400
Henry	1371	18	$ 28,100	$ 1,554,900	$ 1,583,000
Heritage	9826	78	$ 43,900	$ 5,067,600	$ 5,111,500
Hermosa	7830	58	$ 37,900	$ 4,555,300	$ 4,593,200
Hidalgo	8100	59	$ 37,900	$ 4,612,100	$ 4,650,000
Hillhouse	1200	20	$ 28,100	$ 1,544,100	$ 1,572,200
Hogan	2259	24	$ 31,900	$ 1,662,400	$ 1,694,300
Hondo	8450	66	$ 43,900	$ 4,538,500	$ 4,582,400
Houchin	2591	30	$ 31,900	$ 2,173,400	$ 2,205,300
Irene	2500	23	$ 37,900	$ 2,200,500	$ 2,238,400
Totals		**960**	**$ 832,400**	**$ 66,066,600**	**$ 66,899,000**

7.0 WELL AND SLOT PLUGGING AND ABANDONMENT

This section of the report discusses the current well and conductor slot count, the plug and abandonment (P&A) procedures, well categories and abandonment costs in compliance with BSEE Federal Regulations. Regulations for the abandonment of wells is explained in Title 30, Chapter II, Subchapter B, Part 250 Subpart Q. Regulations mandate critical placement of cement and other barriers to: (1) provide downhole isolation of hydrocarbon and sulfur zones; (2) protect freshwater aquifers; and (3) prevent migration of fluids to the sea floor in accordance with 30 CFR 250.1715. The final stage of abandonment includes cutting and recovering all pipes 15 feet below the mudline in accordance with 30 CFR 250.1716. Detailed information on well plug and abandonment (P&A) requirements is provided in Volume 2 Appendix A of this report.

Well and Conductor Slot Count

Year-over-year well counts change due to operator activity and outside influences. Over the last five years (2016 to 2020) oil price has declined by almost $34 per barrel compared with the previous five-year average. Additionally, the pipeline spill in 2015 off the coast of California forced the shut-in of eight POCSR platforms. Since 2016, several wells are now temporarily abandoned (TA) and several P&A projects are now underway. As of April 2020, 759 wells and 59 conductor slots require P&A based on information provided by BSEE and verified by operators when possible. While differences in well/slot count between the 2016 report and the current report are noted in Volume 1 Appendix E, they are not reconciled for changes due to completion status or informational errors.

P&A Procedures

Twenty-two of the twenty-three POCSR platforms include numerous wells that must be abandoned. (Platform Elly has no wells.) These wells are either production or injection wells, and some have already been partially abandoned. Those partially abandoned are referred to as “TA” wells, or temporarily abandoned with the intention of full abandonment at a later date. Individual consideration of a well’s condition would dictate specific protocols at the time of abandonment. However, wells may be categorized such that the abandonment procedure would follow the generic process outlined below in Phase I through Phase III:

- Phase I
    - Remove necessary equipment and clean out any fill or debris in the well that prevents placement of the bottom plug
    - Fish/mill if required
    - Set bottom cement plug
- Phase II

    - Isolate critical flow paths in wellbore
    - Cut and recover shallow production casing
    - Place two independent surface plugs below the mudline
- Phase III
    - Use abrasive or mechanical cutters to sever casing and conductor strings
    - Remove casings and conductor 15 feet below the mudline.

Sixteen of the POCSR platforms have working rigs. Six of the POCSR platforms containing wells do not have working rigs in place and two of these platforms have rigs identified for mobilization when needed. The cost of hoisting equipment for platforms without rigs is presumed comparable to costs used for platforms with working rigs. Two scenarios are considered in the first phase of abandonment:

1. Leaving equipment in place. This is an acceptable option for injection wells, gas lift wells, and idle wells with no pump in which the equipment would not compromise the abandonment of the wellbore.
2. Removing equipment using a rig. This is required for wells with rod pumps, progressive cavity pumps, hydraulic pumps or electric submersible pumps (ESPs) which have electrical cables from the pump to the surface. These cables could serve as conduits from the producing formation to the surface if not removed.

Cleaning out the well, particularly through the completed interval, is most easily carried out by the rig after removing equipment, especially if there is a fish in the well. Subsequent plugging operations would utilize a Coiled Tubing Unit (CTU). For platforms with no readily accessible rig, the cleanout and any required fishing and/or milling would be done by a CTU.

Figure 7.1 Claxton High-Pressure Marine Growth Removal Tool

Once all wells on the platform have been plugged with cement, well plugging equipment would be removed, and casing/conductor cutting-and-recovery equipment would be installed on the platform. The conductor and casing strings would be removed using the rig or comparable hoisting equipment. The removal process would include the following steps:

1. Cut the conductor and any shallow casing strings
2. Recover the conductor and casing strings using a rig or casing jacks while simultaneously removing marine growth (see Figure 7.1) as the conductor is pulled through the rig floor
3. Section the conductor in 40-foot lengths
4. Load the pipe on barges for disposal.

Once loaded onto a cargo barge, the material would be transported to local ports for disposal. The weight of steel and cement to be transported are shown in Table 7.1. The table assumes one well configuration per platform to streamline analysis and that previously reported data is accurate. The transport and disposal costs are included in Section 11. Figure 7.2 shows before and after abandonment wellbore diagrams. More detail on well P&A procedures is provided in Volume 2, Appendix A of this report.

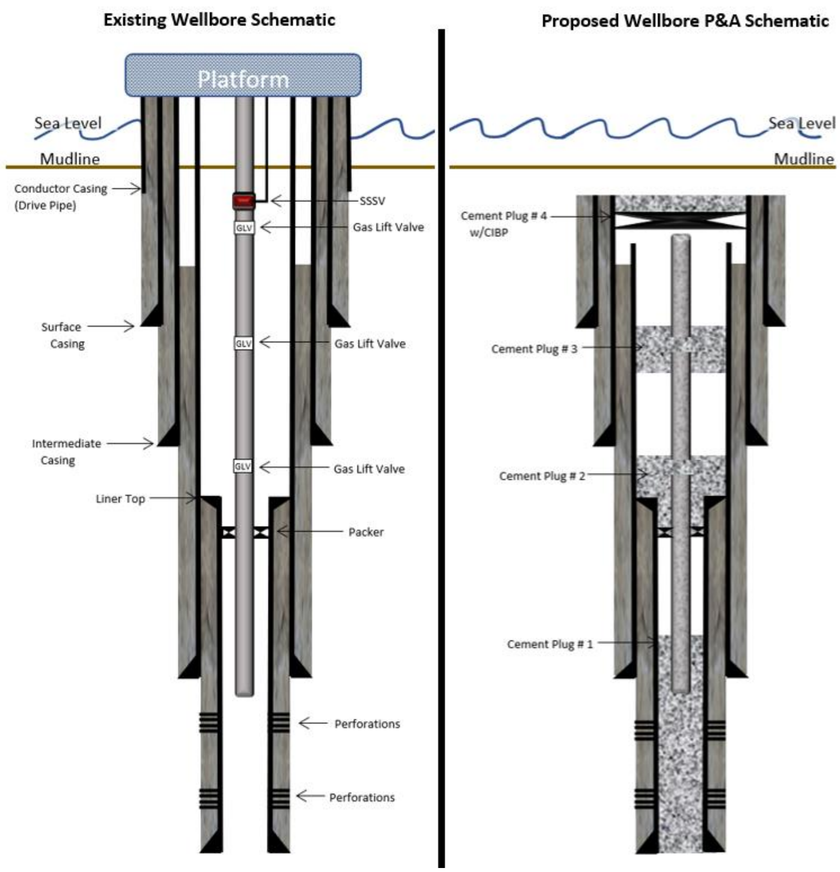

Figure 7.2 Typical Wellbore Configuration (Existing and P&A Schematics)

Table 7.1 Conductor and Casing Data

Platform	Water Depth (feet)	Wells to P&A	Slots to P&A	Conductor Length (feet)	Total Well/Slot Cond Length (feet)	Conductor OD (inches)	Conductor Weight (lbs/foot)	Casing #1 OD (inches)	Casing #1 Weight (lbs/foot)	Casing #2 OD (inches)	Casing #2 Weight (lbs/foot)	Casing #3 OD (inches)	Casing #3 Weight (lbs/foot)	Annular Cmt Weight (lbs/foot)	Total Weight per Well (tons)	Total Weight per Slot (tons)	Total Weight (tons)
A	188	50	5	268	14,740	13 3/8	68.0	9 5/8	40.0	6 5/8	24.0			61.7	26.0	9.1	1,343.1
B	190	54	3	270	15,390	13 3/8	68.0	9 5/8	40.0	6 5/8	24.0			61.7	26.1	9.2	1,439.4
C	192	35	2	272	10,064	20	106.5	13 3/8	54.5					117.4	37.9	14.5	1,354.1
Edith	161	20	9	241	6,989	13 3/8	54.5	9 5/8	36.0					42.9	16.1	6.6	380.5
Ellen	265	63	1	345	22,080	24	245.7	13 3/8	54.5	9 5/8	36.0			239.5	99.3	42.4	6,299.2
Eureka	700	50	10	780	46,800	24	245.7	13 3/8	54.5	9 5/8	36.0			239.5	224.5	95.8	12,185.0
Gail	739	29	0	819	23,751	24	201.0	18 5/8	94.5	13 3/8	69.0	9 5/8	43.5	225.2	259.3	82.3	7,519.2
Gilda[1]	205	63	0	285	17,955	20	94.0	13 3/8	54.5	9 5/8	43.5			163.3	50.6	13.4	3,189.8
Gina	95	12	0	175	2,100	20	94.0	13 3/8	54.5	9 5/8	43.5			163.3	31.1	8.2	373.1
Grace	318	28	10	398	15,124	24	201.0	18 5/8	106.0	13 3/8	72.0	9 5/8	47.0	221.2	128.8	40.0	4,006.3
Habitat[2]	290	20	1	370	7,770	24	201.0	18 5/8	87.5	13 3/8	72.0			187.0	101.3	37.2	2,063.1
Harmony	1,198	35	8	1,278	54,954	24	201.0	18 5/8	87.5	13 3/8	68.0	7.0	26.0	254.8	407.2	128.4	15,280.9
Harvest	675	19	6	755	18,875	24	201.0	18 5/8	106.0	13 3/8	68.0	9 5/8	43.5	222.3	241.9	75.9	5,051.5
Henry	173	24	0	253	6,072	20	106.5	13 3/8	54.5					117.4	35.2	13.5	845.2
Heritage	1,075	49	0	1,155	56,595	20	133.0	16	75.0	13 3/8	68.0	9 5/8	47.0	132.9	263.3	76.8	12,900.7
Hermosa	603	13	3	683	10,928	24	201.0	18 5/8	106.0	13 3/8	68.0	9 5/8	43.5	222.3	218.8	68.6	3,050.8
Hidalgo	430	14	0	510	7,140	24	201.0	18 5/8	106.0	13 3/8	72.0	9 5/8	47.0	221.2	165.0	51.3	2,310.6
Hillhouse	190	50	0	272	13,600	20	106.5	13 3/8	54.5					117.4	37.9	14.5	1,893.1
Hogan	154	39	0	234	9,126	18 5/8	87.5	10 3/4	40.5	9 5/8	47.0			134.1	36.2	10.2	1,410.5
Hondo	842	28	0	922	25,816	20	133.0	16	75.0	13 3/8	68.0	9 5/8	47.0	132.9	210.2	61.3	5,884.7
Houchin	163	36	0	243	8,748	18 5/8	87.5	10 3/4	40.5	7	23.0			162.2	38.1	10.6	1,370.1
Irene	242	28	1	322	9,338	20	133.0	13 3/8	61.0	9 5/8	47.0			153.7	63.5	21.4	1,800.7
Total		**759**	**59**		**403,955**												**91,951.5**

Well Categories

In order to determine the cost of abandonment, the condition of each well must first be considered and grouped with wells of similar condition. The well files from the BSEE database, discussion with BSEE's Regional Supervisor, and discussions with POCSR operators provide the basis for grouping the wells into one of several categories. Specifically, casing depths, directional surveys, existing cement plugs, annular pressures, completion string details and recent well operations were obtained and analyzed for a sampling of wells on each platform. Due to the ongoing maintenance of each platform, any condition that arises regarding the wellhead prior to decommissioning is expected to be addressed promptly and therefore not considered in the well categorization. Based on this data and prior experience with variables influencing well abandonment costs, the following well categories were created:

1. TA-LOW
    - Contains only a conductor OR
    - Temporarily abandoned to surface with two independent barriers placed just below the mudline, one of which is mechanical in the center of the wellbore
    - All prior abandonment plugs tested and to code per BSEE 30 CFR 250.1715.

2. LOW
    - Total depth (TD) or plugback total depth (PBTD) is 4,000 feet or less
    - Does not meet Extended Reach[1] (ER) criteria defined as the ratio of Departure to Vertical Depth greater than or equal to 2
    - Does not have sustained casing pressure defined as annuli that will not bleed to zero psi
    - Does not contain a fish
    - Does not contain a rod pump, ESP or hydraulic pump, but may contain gas lift valve system, injection string or kill string
    - Does not require any annular cement squeeze work

3. MEDIUM-LOW
    - TD or PBTD of less than 8,000 feet OR
    - Meets ER criteria greater than or equal to 2 and less than 3
    - Meets all other criteria for a low cost well

4. MEDIUM
    - TD or PBTD of less than 16,000 feet OR

[1] The Extended Reach calculation is a ratio of the horizontal departure to the true vertical depth of a well. Wells that exceed an ER of 2 increase the complexity of wellbore management and are therefore expected to increase the cost to abandon the well. InterAct calculated the departure for each well using the Haversine formula. A small sample of wells' ER was calculated with both the Haversine formula and Halliburton's software, Compass. At TD, the sample wells' ER value using Haversine was within 2% of the Compass-calculated ER. For the purposes of time-management, the Haversine formula was determined to be sufficient for categorization purposes.

- Has a rod pump, ESP or hydraulic pump or equipment that requires a rig or other lift system to remove from the well OR
- Has ER criteria greater than 3 OR
- Has sustained casing pressure (SCP) OR
- Requires annular cement OR
- Requires plugs to be drilled out
- Meets all other criteria for a medium-low cost well

5. HIGH
    - Requires fishing OR
    - Requires milling OR
    - Has significant known hole problems

Utilizing the above-mentioned criteria, 759 wells are placed into one of the five categories. Well categorizations are shown in Volume 1 Appendix E. In addition to well abandonment, twelve POCSR platforms include a total of 59 slots that have only conductors installed. These 59 slots would undergo Phase III of abandonment, removing the conductor 15 feet below the mudline.

Well/Slot Abandonment Cost

Determination of well abandonment costs began with a review of recent offshore operations. Additionally, quotes from vendors and discussions with operators regarding current pricing and procedures impacted the final estimates. Well abandonment costs were compared to actual costs obtained from Platform Hogan. Larger well P&A projects as modeled in this study are expected to have greater vendor discounts and increased operating efficiency (i.e., less Non-Productive Time or NPT). This is in part a result of the learning curve effect and a 24-hr workday (vs the 8-hr workday used for Platform Hogan P&A work).

Considerations in the determination of abandonment costs are as follows:

- Day rates for platform rigs and associated services were calculated utilizing vendor and operator provided costs or from cost analysis of recently abandoned wells. These costs are used for all POCSR platforms.
- The CTU is to be used for setting internal plugs, perforating, and setting annular plugs. The CTU unit and tools required to perform these functions are included in the CTU day rates based upon vendor pricing.
- Cementing services would be required for both rig and CTU operations at a comparable rate for all POCSR platforms and are based upon vendor pricing.
- No wireline unit would be required for perforating as this would be done by the CTU with the use of specialized tools.

- Removal costs of the conductor and the adjacent casing strings from the borehole would vary by length. The cost to cut and recover the conductor and casing strings (C&R) is sorted into one of three categories: 1) conductor length less than 300 feet, 2) conductor length greater than 300 feet but less than 500 feet, and 3) conductor length greater than 500 feet (all are less than 1300 feet). This Phase III cost is then added to the cost to plug the well in Phase I and Phase II.

Provided in Table 7.2(a) is the per well cost to P&A (including Phase III costs to cut and recover casing and conductor) based upon the well categorization. The per conductor slot cost to P&A is provided in Table 7.2(b). Detailed well P&A cost estimates are provided in Volume 2 Appendix B of this report. PMEP of 8%, a work provision contingency of 15%, and the appropriate weather factor ranging from 5-15% are applied to each well P&A estimate as a separate cost.

Table 7.2 (a) Well P&A Costs by Well Type *and* (b) Slot C&R Cost

Well Category	Number of Wells	Well P&A Cost[1]
TA-Low	20	$ 61,800
Low	84	$ 285,400
Medium-Low	110	$ 340,300
Medium	500	$ 451,100
High	45	$ 1,004,400
Average Well P&A Cost		**$ 439,200**

[1] Does not include $300,000 for Rig Mob on Gilda and Habitat.

7.2a. Typical Well P&A Cost without PMEP or Contingency.

Conductor Length	Number of Slots	Slot P&A Cost[1]
< 300'	19	$ 61,800
< 500'	13	$ 78,400
< 1,300'	27	$ 181,700
Average Slot C&R Cost		**$ 120,300**

[1] Does not include $150,000 for Rig Mob on Habitat.

7.2b. Average Slot C&R Cost without PMEP or Contingency.

Platform Well P&A Costs

The well P&A cost for each platform is provided in Table 7.3. The total cost to plug and abandon 759 wells on 23 platforms is $333.7 million. The total cost to P&A 59 empty conductor slots is $7.1 million. The cost for Platform B includes one subsea well near Platform B that does not have an API number but was identified by BSEE as a medium category well. The costs provided in Table 7.3 do not contain PMEP or contingencies, discussed in Section 4 or disposal costs, discussed in Section 11.

Table 7.3 Well and Slot P&A Costs per Platform

Platform	Wells and Slots to P&A	Average Well Depth (feet)	Well P&A Costs	Slot P&A Costs	Total P&A Costs
A	55	2,517	$18,439,400	$ 309,000	$18,748,400
B*	57	3,120	$20,466,800	$ 185,400	$20,652,200
C	37	2,840	$12,754,100	$ 123,600	$12,877,700
Edith	29	5,370	$ 7,567,100	$ 556,200	$ 8,123,300
Ellen	64	6,680	$24,665,200	$ 78,400	$24,743,600
Eureka	60	6,370	$25,225,400	$1,817,000	$27,042,400
Gail	29	8,470	$14,941,400		$14,941,400
Gilda[1]	63	7,850	$24,717,000		$24,717,000
Gina	12	6,470	$ 4,317,000		$ 4,317,000
Grace	38	3,840	$ 9,361,800	$ 784,000	$ 10,145,800
Habitat[2]	21	12,030	$ 10,352,900	$ 78,400	$ 10,431,300
Harmony	43	12,910	$21,941,500	$ 1,453,600	$23,395,100
Harvest	25	9,410	$ 9,747,900	$ 1,090,200	$ 10,838,100
Henry	24	4,140	$ 9,492,800		$ 9,492,800
Heritage	49	15,100	$33,892,500		$33,892,500
Hermosa	16	8,590	$ 6,818,500	$ 545,100	$ 7,363,600
Hidalgo	14	12,510	$ 9,775,100		$ 9,775,100
Hillhouse	50	3,430	$19,526,100		$19,526,100
Hogan	39	3,680	$11,647,500		$11,647,500
Hondo	28	13,060	$16,222,000		$16,222,000
Houchin	36	3,660	$ 9,242,700		$ 9,242,700
Irene	29	9,880	$ 12,573,800	$ 78,400	$ 12,652,200
Total	**818**		**$333,688,500**	**$7,099,300**	**$340,787,800**
Average per well		6,900			$ 416,600
Average per platform	37	7,360			$ 15,167,700

[1] Gilda has an additional $150,000 added to the P&A cost to account for Rig Mobilization.

[2] Habitat has an additional $150,000 added to the P&A cost to account for Rig Mobilization.

*Includes one subsea well with no API number categorized as Medium

$333,688,500 **$7,099,300** **$340,787,800**

8.0 MOBILIZATION AND DEMOBILIZATION

The transit time to bring a derrick barge (DB) to the coast of California and the time to return the vessel to its port of origin is covered by the Mobilization/Demobilization (Mob/Demob) cost. An additional, wider Panama Canal route was completed in 2016, after the prior 2016 report was published. As such, larger vessels now have reduced transit time to the California coast, making many Gulf of Mexico (GOM) based vessels more attractive. These mob/demob costs include the cost of engine retrofits to Tier III or better required to comply with California air regulations.

Cost Model Inputs

A mobilization cost was calculated based on the following inputs:

- Transit distance of 4,300 Nautical miles
- Transit speed of 7 knots
- Derrick barge towed using 2 tugs
- $2.0 million budget to retrofit engines for air quality compliance
- Panama Canal fee estimated to be $100,000 each way
    - 10-day delay estimated at Panama Canal awaiting passage, each way
- $9.0 million budget to configure vessel with winch for jacket removal
- Costs include fuel and crew
- 5% weather contingency potentially causing reduced vessel transit speeds
- Day rates are reduced to be 90% of the normal operating day rate due to decreased resources required while the vessel is in transit

Within each campaign, the platform removal method is based upon a topside removal phase, followed by removal of the jackets. For each project phase (topside or jackets), the vessel configuration that is required is different. Thus, there is an additional charge to reconfigure the barge attributed to each campaign.

It is recognized that transiting the Panama Canal can incur significant fees and can also be difficult to calculate for crane type vessels using a tariff structure primarily designed for quantities of containers or passengers and measured in PC/UMS (Panama Canal Universal Measurement System). Research has shown that in January 2014, the *'Left Coast Lifter'*, now operated by Tappan Zee Constructors, transited the existing Panama Canal en-route from San Francisco to New York. The *'Left Coast Lifter'* is a sheerleg floating crane which is 384 feet long and 100 feet wide which closely resembles the dimensions of the vessel proposed for this project. It was reported that the fee was $70,000 according to the Panama Canal Authority. Reservations can also be made to transit the canal for a 15% booking fee which guarantees passage within a certain time frame and would thus limit additional vessel day rate costs should a route through the Panama Canal be delayed. At this time, pre-booked passages are incurring a 10-day delay. There has also been a recently introduced Freshwater Conservation surcharge which is $10,000 for vessels over 300 feet long. An estimate was made of the derrick barge PC/UMS equivalent and the above factors were considered in determining a fee likely to be in the region of $100,000, each way.

A 5% weather contingency is applied to account for delays or extended transit times due to weather and sea-state related impacts. This is applied in this section, separate from the general weather contingency applied to other cost categories.

The total mobilization cost is split equally between the number of platforms in each campaign.

Table 8.1 Derrick Barge Mob / Demob Cost

Campaign	Number of Platforms	Cost per Platform
1	10	$ 1,834,000
2	11	$ 1,704,000
3	3	$ 5,154,000

The mob/demob cost per campaign is shown in Table 8.1 above, and the cost per platform is shown below in Table 8.2. The costs per platform are significantly reduced in the first two campaigns by the large number of platforms in each.

Table 8.2 Mob/Demob Costs per Platform

Platform	HLV Mob/Demob
A	$ 1,704,400
B	$ 1,704,400
C	$ 1,704,400
Edith	$ 1,704,400
Ellen	$ 1,704,400
Elly	$ 1,704,400
Eureka	$ 1,704,400
Gail	$ 1,833,700
Gilda	$ 1,704,400
Gina	$ 1,704,400
Grace	$ 1,833,700
Habitat	$ 1,833,700
Harmony	$ 5,153,600
Harvest	$ 1,833,700
Henry	$ 1,704,400
Heritage	$ 5,153,600
Hermosa	$ 1,833,700
Hidalgo	$ 1,833,700
Hillhouse	$ 1,704,400
Hogan	$ 1,833,700
Hondo	$ 5,153,600
Houchin	$ 1,833,700
Irene	$ 1,833,700
Total	**$ 50,712,500**

9.0 PLATFORM AND STRUCTURE REMOVAL

Decommissioning regulations for POCSR platforms are found in 30 CFR 250.1725-1731. Removal requirements for platforms and facilities are the same as those for wells, 15 feet below the mud line. Details of platform sizes, weights and specifications can be found in Appendix B and C of Volume 1 of this report.

It is important that the removal technique selected proves to be economically, technically, and politically viable. The viability of each solution is assessed based on the constraints established for this project. It is recognized that these may not ultimately reflect actual techniques used.

One of the unique challenges faced in the Pacific region is the lack of existing infrastructure and equipment suitable for such a project. This primarily includes a lack of vessels with sufficient heavy lifting capabilities, as well as a lack of disposal options that can handle the sizes and volumes involved in platform decommissioning. As such, the removal technique used would be primarily driven by the materials disposal solution.

Cost Model Inputs

The following scenario has been determined for platform removal:

- Marine growth removal would take place immediately prior to jacket removal
- Topsides removed through reverse installation for modular platforms (installed in modules)
- Topsides removed through piece-large techniques (cut into sections larger than 50-ton) for non-modular platforms
- Jacket removed using piece-large sectioning (cut into sections larger than 50-ton)
- Topside and jackets removed in phases within each campaign grouping
- Preset anchors used in for platforms in >500 feet water depth
- Once in the area (west coast), DB, tugs and cargo barges would mobilize to/from Port of Los Angeles area
- DP2 Dive Vessel would mobilize from Seattle

Marine Growth Removal

Immediately prior to jacket removal, marine growth would be removed from the top 100 feet of platform jackets. Divers and/or ROVs with cleaning tools would be utilized to clear the subsea jackets. Due to the topsides having been removed prior, a workboat would be required. The remaining marine growth on the lower sections of the jackets (estimated to be much less than the top 100 feet) would be removed at the offloading facility in the GOM, which is capable of handling such material.

Deck/Topside Removal

The platform decommissioning process begins with the removal of the topsides. Topsides in the POCSR range from 450 tons to over 9,800 tons. Between 5-20 lifts were required to install them on the jackets initially. The largest lift for the modular support structures during installation was about 2,000 tons.

Topsides can be removed in four different ways:

- As a single lift, which requires a large specialty vessel
- In groups of modules, which involves fewer lifts, but may require additional strengthening / bracing
- As small pieces, which takes longer due to the number of required cuts, but requires less lift capacity
- As large pieces, which requires detailed cutting plans to ensure structural integrity
- In reverse order of installation, which is a common decommissioning method

Reverse installation is the preferred method selected for basis of this report but is only applicable to modular platforms. Non-modular platforms will be removed in large pieces. These techniques provide a good solution and meet technical, economic and political requirements.

Given the campaign groupings, the same derrick barge is proposed for all lifts. A derrick barge such as *'DB Thor'* has a revolving lift capacity of 1,760 tons at 98-foot radius which is sufficient for the majority of installed modules, based on the data available. The towed barge can fit through the Panama Canal to transit from its GOM base and has all necessary facilities on board for this type of work including 114 persons on board (POB) accommodation. Unlike some of the larger, specialist lift vessels of which there may only be one in the world, similar specification vessels to *'DB Thor'* can be comparatively easy to find, making the selection a robust choice in the view of an appropriate vessel being available when required.

The derrick barge would be anchored in position and use preset catenary design drag embedment anchors in water depths greater than 500 feet.

Table 9.1 Topside Modules

Platform	Topside Weight (tons)	Topside Module Count	Average Module Weight (tons)
A	1,357	4	339
B	1,357	4	339
C	1,357	4	339
Edith	4,134	12	345
Ellen	5,300	12	442
Elly	8,000	10	800
Eureka	4,700	10	470
Gail	7,693	8	962
Gilda	3,792	6	632
Gina	447	2	224
Grace	3,800	6	633
Habitat	3,514	6	586
Harmony	9,839	13	757
Harvest	9,024	10	902
Henry	1,371	4	343
Heritage	9,826	13	756
Hermosa	7,830	8	979
Hidalgo	8,100	9	900
Hillhouse	1,200	4	300
Hogan	2,259	8	282
Hondo	8,450	13	650
Houchin	2,591	9	288
Irene	2,500	5	500

Topside Removal Challenges

In the POCSR region, single lift removal is unlikely to be a viable removal method. Firstly, there are no large heavy lift vessels stationed on the west coast, with the maximum lift capacity currently available found to be approximately 500-tons. With topsides up to nearly 10,000 tons, only a handful of vessels exist in the world that are capable of making such a lift. Even then, such vessels would be too large to transit through the new Panama Canal, incurring high mobilization costs.

Finally, if such a vessel was determined as the economical option, the single lift would have to be transported around Cape Horn or to Asia to a suitable waste handling facility.

Given the method of installation which has seen most POCSR platforms installed with modular construction, significant engineering would also be required to reinforce the structure in order to safely make the lift. An innovative modular system such as Versatruss from Versabar may address some of these issues, although each platform would require a unique engineered solution which may not lend itself equitably to a cost sharing campaign approach.

Assuming a single lift could be made, a more significant issue is where such a large structure can be taken for dismantling and disposal. As the materials disposal section of this report concludes, the west coast currently has no suitable disposal yards. Again, with a collaborative large campaign style approach, a disposal yard would need to be of significant capacity in order to cope with the arrival of topsides in relatively quick succession.

With the current vessels available on the west coast, the piece-small removal method may be technically viable although there may be limitations from the vessel size in terms of hook height. More so, piece-small is unlikely to be economically or politically viable due to the increased amount of time for removal and the associated emissions and other environmental impacts of a prolonged campaign.

Jacket Removal

Since the California Rigs to Reef program, as currently written, is not considered a viable option for operators, the jacket must be completely removed in line with current legislation.

Jackets in water depths of less than 200 feet are routinely removed in the GOM. However, structures in deeper waters, as many in the POCSR region are, pose different challenges. The size and weight of the jacket are typically a function of water depth. POCSR platforms are located in water depths ranging from 95 feet to 1,198 feet, and jacket weights range from 400-tons to 42,900-tons.

A major consideration of jacket removal is the consequence of marine growth. History as shown with the previous 4-H decommissioning project, that in the California climate the miasma generated from decaying marine growth shoreside is a serious consideration for stakeholders. Subsequent ordinance in this area now prohibits similar future activity. The undesirable effects of decaying marine growth can be mitigated by removing it from the jackets shortly before their removal. With the concept proposed in this project of a topside removal phase followed by a jacket removal phase, the jackets may remain in situ for some time after the topsides have been removed. Therefore, to be timely and effective it is cogent that marine growth removal would need to be vessel based, having lost the use of the topside for staging equipment. The cost of marine growth removal from the top 100 feet of the jacket is included in the jacket removal phase of the cost model. GOM waste processing facilities have indicated that they can accept any residual marine growth debris without issue.

In previous versions of this report, the jacket removal methodology has been to section them, as opposed to removal with a single lift. For the deeper water structures, TSB's solution in the 2016 decommissioning cost report was to construct a lift barge by converting a cargo barge with installation of four winches on the deck that could winch the jacket sections up, underneath the lift barge. The load would then be transferred to a derrick barge for recovery to a waiting cargo barge. This concept could not be validated based on market research. The principle of jacket removal through sectioning has been preserved as the preferred removal method in this report given the project scope. However, the manner in which the sections are retrieved has been developed to make use of proven technology.

Installation of deep water infrastructure is often achieved using winches since derrick and crane barges aren't equipped for these deep lifts. A joint project between Subsea7 and SapuraAcergy in 2013-2014 demonstrated one such system which could feasibly be re-engineered for jacket recovery, overcoming the limitations of the previous lift barge concept. Subsea7 commissioned Caley Ocean Systems to deliver a winch system which could lower up to 1047-tons to depths of over 4200 feet. The design delivered features a lowering beam with a novel connector that docks in the lowering beam, allowing the load to be transferred from the cargo barge by the HLV crane, with the connector then docking in the lowering beam on the winch system. The crane hook can is then disconnected without the crane block having entered the water, leaving the load suspended on the connector, lowered on the lowering beam by the winches.

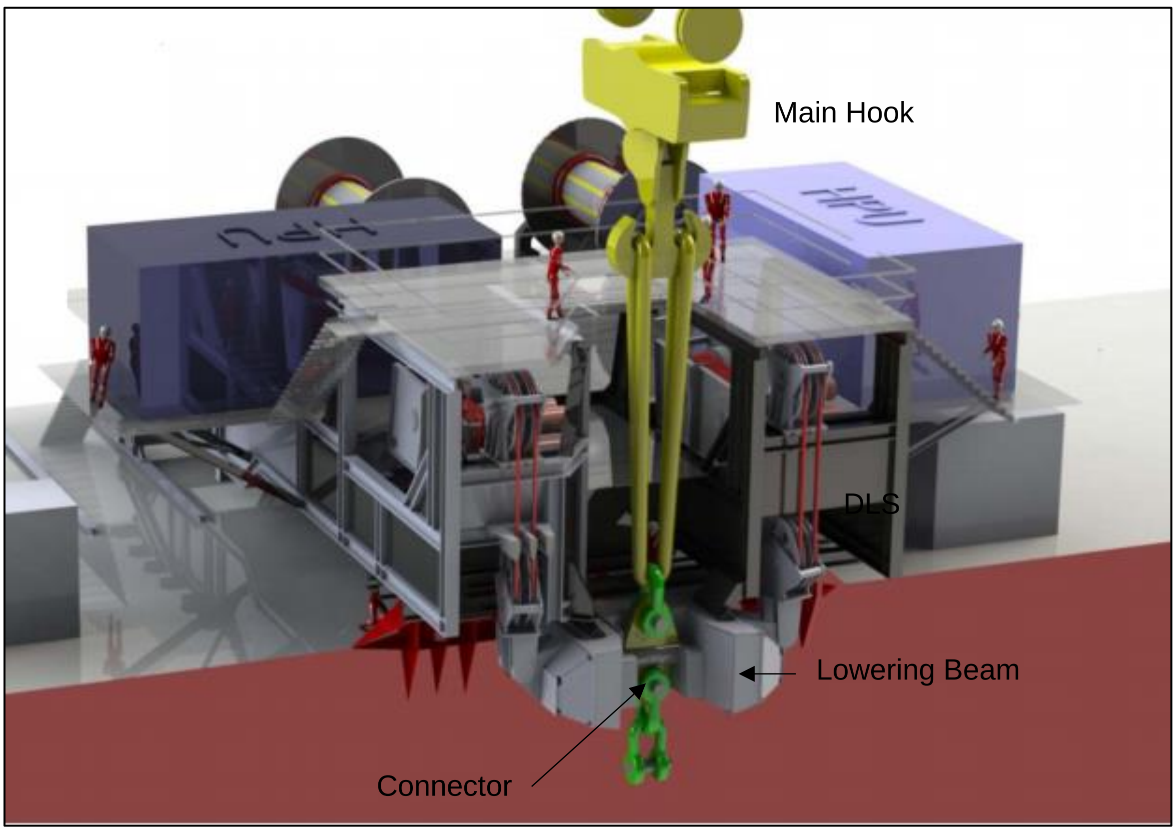

Figure 9.1 Caley Ocean Systems / Subsea 7 Deepwater Lowering System (DLS)[10]

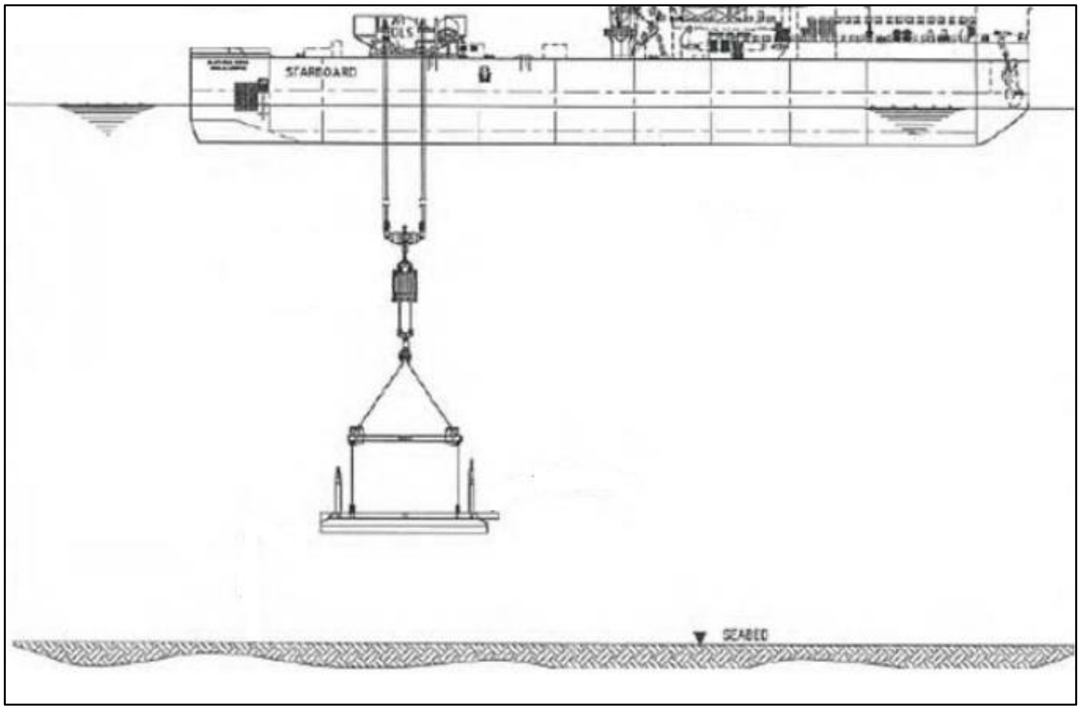

Figure 9.2 Lowering the load on DLS winches (connector docked in lowering beam)[10]

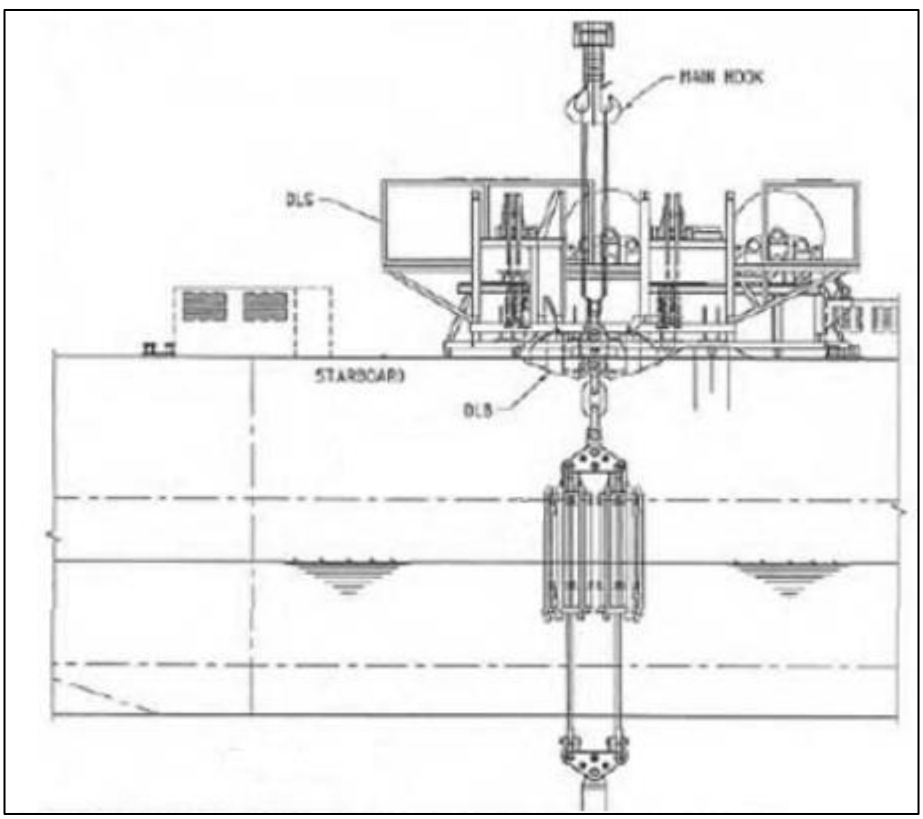

Figure 9.3 Transferring Load to Main Hook (connector pulls out of lowering beam)[10]

In this application, the system would be used in reverse. The jacket section would be connected to the winches via the connector docked in the lowering beam. The jacket section would then be winched to surface. The main hook of the crane would then be rigged up to the other end of the connector. The crane would lift the connector and load from the lowering beam. The crane can then slew round to deposit the jacket section on a cargo barge moored alongside the derrick barge.

This deep water lowering system (DLS) is still owned by Subsea7 and located in Malaysia, although it can be containerized for shipping. The DLS can be installed on any vessel via custom grillage pre-preinstalled on the deck for minimal dock time to configure the vessel to use the system.

This study assumes a custom system would be manufactured for cost estimating purposes. However, it may be more cost effective to either rent the existing unit or purchase it, if for sale, and refurbish it and reconfigure it for this application.

Cutting Method

For the removal methodology chosen, jackets would be sectioned using a combination of conventional underwater cutting technologies. The use of explosives was not deemed necessary or likely in California's offshore environment and therefore was not considered in the project scope.

Structural drawings provided by BSEE and those available online were reviewed. Since detailed drawings were not available for all platforms, all jackets have been modeled to be of a similar construction, such that the same removal methodology can be employed across the entire POCSR inventory for cost estimating purposes.

For the platforms where it has been documented, main piles appear to have been driven through the jacket legs and attached to the jacket structure through means of welding and/or grouting. It is also known for piles to become stuck in the jacket legs during installation if deformed under the driving forces. Therefore, it is feasible that the main piles can be removed with the jacket sections and would not need to be removed independently. If it can be verified that the main piles are free inside the legs, once severed below the mud line, extraction with an internal lifting tool may be necessary. This scenario has not been costed for in this project. A removal weight estimate was calculated for the piles through knowing the diameter of the piles, assessing a likely weight per foot, the number of legs on the platform and height of the jackets. This additional pile weight was added to the known jacket weights when determining the lift size for each jacket section. These simplified models of the jackets should be validated or improved as necessary for each platform during the engineering phase through review of resources such as the pile installation log. Once the topside has been removed, verification that pile damage, ovality, grout spoilage or other obstructions do not impede use of the tools would be conducted. It is assumed that the main piles retain internal access such that internal cutting and mud plug jetting tools can be conveyed and deployed without hindrance. Mud plugs inside the piles would be jetted and an internal pile cutting tool would sever the main piles. Skirt piles are also noted on many of the jackets. These are typically installed with a removable follower and then welded and/or grouted to the jacket structure. As such, these too can also be removed with the main jacket sections without need for a separate removal provision. Skirt piles would be externally dredged and cut with a diamond wire saw (DWS).

Platform legs would be externally dredged and cut with DWS. The jacket would be further sectioned using a combination of DWS for the structural legs and shears for cross members and bracing. Tool manipulation would be aided by ROV and /or diver intervention as required, and dependent on water depth.

Jacket removal is one of the costliest phases of decommissioning due to the size, complexity and costly equipment and services required. The cost estimate for sectioning the jacket developed for this project is heavily impacted by the number of members and bracing to be cut. The size of these members would also determine the appropriate cutting technology.

The information available for this project does not include such detail for all platforms, nor is it feasible to generate a detailed cutting plan for each jacket for the intended accuracy of this cost estimate. Truly, only the weight and height of each jacket are known with confidence. To overcome this, conceptual cutting plans were developed for a small simple jacket, Platform Edith, and a large complex jacket, Platform Harmony, for which more specific data was available.

These two extreme data points were modeled, and an interpolation model was developed to estimate of the number of cuts required to section the jacket for each platform. A complication factor was added for the number legs on the jacket with the notion that a 3 X 4 (12) legged platform may have more internal bracing than a 2 X 3 (6) legged platform. On top of this, a water depth factor was used because the base of a deep water platform is expected to be much stronger and more heavily braced than an equivalent platform with the same number of legs which terminate at a shallower depth. Clearly such simplified models limit the accuracy of the cost estimate achievable but provide a reasonable benchmark for this study.

Jacket Removal Alternatives Considered

Several alternative methods were considered for jacket removal in order to find a concept that best matches economic, technical and political viability. Single lift, flotation techniques, reverse installation, piece-large through to piece-small removal are all methods that have been used elsewhere to meet the challenge. Each was considered for applicability to the POCSR asset inventory.

Single lifts are deemed not viable for the Pacific Region, in the context of the constraints set out for this report owing to a lack of suitable domestic disposal destinations as well as the long transit times to any suitable disposal yard. This would limit the economic viability of conducting a campaign based project. Furthermore, it is not technically viable with current technology for several of the deep water jackets in the POCSR region. The world's largest vessel of its type that specializes in such removal techniques, is currently Allseas' '*Pioneering Spirit'*, which has a maximum jacket lifting capacity of 28,000 tons. Platforms Heritage and Harmony had jacket installation weights of over 32,000 tons and 42,000 tons respectively. It is understood an investment decision should soon be made by Allseas on an even larger vessel, '*Amazing Grace'*, which is expected to have 50% greater capacity than '*Pioneering Spirit'* which may address the technical viability in future.

Reverse installation is also not technically feasible. Jacket installation records reviewed showed that jackets were towed out on launch barges or floated out, sometimes with the aid of additional buoyancy. From this horizontal transport position, the jackets were upended by flooding the structure's legs in a controlled ballasting process. More chambers are flooded until the jacket is landed on the sea floor. Piles were then driven in through the main legs or surrounding the legs as skirt piles. The addition of grout, likely degradation of the flooding chamber seals and the inability to accurately calculate structural capacity for upending, combines to make reverse installation an uncertain prospect without significant engineering and investigative work up front.

Flotation techniques have included installation of large rigid buoyancy tanks that could be engineered to aid a single lift or reverse installation approach, as used in the salvage industry (most recognizably used on the recovery of the cruise ship '*Costa Concordia'*), This concept was successfully demonstrated in a jacket removal scenario by removing Total's Frigg DP2 jacket in 2008. The jacket was floated and towed to a suitable location for sectioning and disposal. Similarly, the Phillip's Maureen platform, a unique steel gravity based installation, was also refloated and towed to a location for disposal, in 2001, using buoyancy. Ultimately this approach is was not deemed suitable for this project since each jacket would require a custom solution which is contrary to the premise of grouping platforms for equipment and cost sharing. The significant engineering cost and complexity may also render it less cost effective than alternatives.

With rigid buoyancy tanks already discounted for single lift, using them for individual sections would only further increase the engineering design effort and complexity required. An alternative solution could be to use inflatable lift bags as also used in the salvage industry. This poses a large engineering challenge also, with the need to precisely calculate the buoyancy required for each jacket. Another technical challenge would be how to inflate the bags at the depth of the deeper structures. Safety concerns are also a big factor as the ascent of the section must be carefully controlled. This is usually achieved in the salvage industry by tethering the load to a fixed point. There must also be safeguards against a catastrophic failure of one of the lift bags. There are, however, developments within the industry which may make this a more feasible solution in future years. Aubin Group's Deepbuoy product has potential to overcome these issues, having developed a gel to fill lift bags with that creates neutral buoyancy. If neutrally buoyant, much smaller forces are required to manipulate the load. The product is currently unproven in such an application, requiring further development and testing to prove this approach.

There are also several emerging technologies which may make jacket removal more efficient. This includes the use of lasers for cutting. Efforts are underway by companies such as Deep Ocean Ltd. in making this subsea cutting technology a viable option. Cutting Underwater Technologies (CUT) Ltd. are also developing a sub bottom cutting tool which combines excavating and cutting into one operation.

Jacket sectioning from piece-small through to piece-large, as proposed here, is to section the jacket underwater and recover sections one at a time although the manner in which the sections are recovered can be achieved in different ways. Before settling on a winch based solution, several alternatives were considered. The technical challenge, with deeper water structures especially, is how to bring these sections to surface. The default option may be to simply use a large crane to recover the sections. However, water depth can become so great that practical limits of how much wire rope can be spooled on a crane vessel are quickly reached, combined with diminishing lifting capacity at depth. Table 9.2 below provides details on each platform's jacket and the anticipated number of sections for removal.

Table 9.2 Jacket Sections

Platform	Jacket Weight (tons)	Estimated Pile Removal Weight (tons)	Jacket Sections	Average Section Weight (tons)
A	1,500	584	3	695
B	1,500	590	3	697
C	1,500	597	3	699
Edith	3,454	603	5	811
Ellen	3,200	832	5	806
Elly	3,300	956	5	851
Eureka	19,000	2,198	22	964
Gail	18,300	2,320	22	937
Gilda	3,220	768	4	997
Gina	434	178	1	612
Grace	3,090	1,039	5	826
Habitat	2,550	849	4	850
Harmony	42,900	4,530	48	988
Harvest	16,633	2,120	20	938
Henry	1,311	283	2	797
Heritage	32,420	4,065	38	960
Hermosa	17,000	1,893	20	945
Hidalgo	10,950	1,340	14	879
Hillhouse	1,500	394	3	631
Hogan	1,263	429	4	423
Hondo	12,200	1,744	15	930
Houchin	1,486	407	4	473
Irene	3,100	760	4	965

Based on the chosen technique and the development of the cost model outlined above, the estimated cost per platform for the removal of the topsides and jacket is shown in Table 9.3.

Table 9.3 Platform Removal Cost by Platform

Platform	Topside Removal	Jacket Removal	TOTAL
A	$ 1,233,500	$ 5,749,600	$ 6,983,100
B	$ 1,233,500	$ 5,755,300	$ 6,988,800
C	$ 1,233,500	$ 5,760,900	$ 6,994,400
Edith	$ 2,120,100	$ 8,412,300	$ 10,532,400
Ellen	$ 2,123,800	$ 8,254,900	$ 10,378,700
Elly	$ 1,856,200	$ 9,775,000	$ 11,631,200
Eureka	$ 1,775,300	$ 30,682,300	$ 32,457,600
Gail	$ 1,683,300	$ 31,258,400	$ 32,941,700
Gilda	$ 1,456,300	$ 8,849,200	$ 10,305,500
Gina	$ 893,300	$ 2,408,700	$ 3,302,000
Grace	$ 1,465,500	$ 10,565,400	$ 12,030,900
Habitat	$ 1,483,800	$ 7,339,700	$ 8,823,500
Harmony	$ 2,479,700	$ 71,903,200	$ 74,382,900
Harvest	$ 2,154,600	$ 28,879,800	$ 31,034,400
Henry	$ 1,226,200	$ 3,897,200	$ 5,123,400
Heritage	$ 2,490,800	$ 58,598,000	$ 61,088,800
Hermosa	$ 1,882,700	$ 28,841,900	$ 30,724,600
Hidalgo	$ 2,083,400	$ 18,873,800	$ 20,957,200
Hillhouse	$ 1,231,700	$ 4,661,400	$ 5,893,100
Hogan	$ 1,741,400	$ 6,662,900	$ 8,404,300
Hondo	$ 2,468,700	$ 23,327,100	$ 25,795,800
Houchin	$ 1,870,200	$ 5,754,100	$ 7,624,300
Irene	$ 1,507,000	$ 7,702,000	$ 9,209,000
Total			**$ 433,607,600**

10.0 PIPELINE AND POWER CABLE DECOMMISSIONING

Decommissioning of platforms in the Pacific Outer Continental Shelf (POCSR) require the proper decommissioning of power cables and pipelines that service these offshore facilities by allowing the transfer of electricity, oil, water and gas as appropriate. Pipelines and cables both connect the platforms to onshore locations and also make connections between platform facilities in the POCSR.

Details of existing power cables and pipelines are provided in the Appendices C and F of Volume 2 of this report, respectively.

Requirements

BSEE requirements for pipeline and power cable decommissioning are outlined in 30 CFR 250.1750-1754. These regulations detail the criteria for whether a pipeline can be decommissioned in place or is required to be removed. The Regional Supervisor makes the final determination if a pipeline or power cable may be decommissioned in place. The determination considers if the pipeline or cable is or will become a physical or environmental hazard. If a pipeline has been decommissioned in place but is later deemed to be an obstruction, the pipeline can be required to be removed.

As noted in Section 5, during any pipeline and/or power cable decommissioning, federal and state agencies would prepare an environmental review document, considering all environmental impacts associated with the decommissioning. Operators with decommissioning projects traversing state waters would still coordinate with federal entities that have authority in state waters, including the USACE and USCG, local air pollution control districts, and with city and county planning departments.

Operators in the POCSR are required to conduct biennial ROV and cathodic detection pipeline surveys to determine the integrity of pipelines and identify any repair issues. The surveys also identify any 3rd party impacts that may compromise the integrity of pipeline segments. Determination of the integrity of each pipeline segment in more than 200 feet water depth would be a consideration as to whether such pipeline may be decommissioned in place or would be required to be removed.

Cost Model Inputs

For the purposes of this cost study, all pipelines and power cables between POCSR platforms would be decommissioned in place as would POCSR pipeline segments in water depths greater than 200 feet. Pipeline ends would be buried or otherwise secured; the cost estimate includes the cost of pipeline burial but does not include the installation of articulated concrete mat(s).

In cases where POCSR pipeline segments are in less than 200 feet of water, or in cases where power cables are routed to shore, pipeline segments and cables would be removed to the point where they cross the state tidelines boundary[2]. Workboats and barges used to remove pipelines, pipeline components, and power cables are assumed to be available locally, based on market research.

In water depths exceeding 200 feet, pipeline decommissioning requires the use of Dynamic Positioning (DP2) Dive Vessels, where environmental hazards associated with anchoring in multiple locations along the pipeline are a concern. The DP2 Dive Vessel would be mobilized from Seattle, Washington and a locally available modular SAT system would be installed to support mixed gas and saturation diving spreads. The installation and removal of the modular SAT system are included in the mobilization/demobilization costs, respectively. Local mobilization and demobilization costs are allocated between platforms in the same campaign grouping. All pipeline and cable decommissioning operations would run 24 hours per day.

Procedures - Decommissioning in Place

Once a pipeline is approved to be decommissioned in place, the pipeline would be pigged (if applicable and/or feasible) and flushed with water until the contents meet California Ocean Plan standards. It may take multiple flushes and pig runs to achieve this criterion. The pipeline would then be filled with seawater.

Once cleaned, each segment of the pipeline would be cut and plugged. Each plugged end would be buried at minimum of three feet below the seafloor. All pipeline valves and other fittings that could unduly interfere with other uses of the POCSR would be removed according to 30 CFR 250.1751.

The pipeline/cable decommissioning regulations require the following:

- Clean the line by flushing water through the pipeline and pig the line, as applicable
- Disconnect the pipeline from the platform
- Cut end to be plugged or capped
- Cut end to be buried at least three feet below the seafloor or covered with protective concrete mat
- All pipeline valves, fittings, crossings, and some of the spanned areas are to be removed
- Power cables to be cut using an ROV and then pulled onto a workboat before being placed on a barge

[2] BSEE and BOEM cannot require bonding for activities that are outside of their jurisdiction. Therefore, the cost of pipeline and/or power cable removal from state waters is not included in this estimate.

Cost Factors

A variety of factors influence the costs associated with decommissioning pipelines and power cables. Mobilization and demobilization costs of required vessels and required equipment have been allocated to each campaign grouping. Also included are onsite daily rates for vessels, labor, and equipment associated with the pipeline and cable decommissioning.

The estimated time to complete the work is based water depth and on the number of risers and pipeline sections to be cut out, rigged, and lifted to a barge. The campaign parameters most influencing the cost are water depth and the quantity of valves or other fittings that are required to be cut and removed, both due to the high day rate for vessels and fuel consumption, as well as the increased time required for diving operations. Hours for valve removal are included as part of the total hours required for pipeline decommissioning for the calculation of cost. These times required were adopted from the previous report. Only vessel and equipment rates were updated for this section of the report.

Calculated Costs

Table 10.1 presents a summary of pipeline decommissioning costs for each platform. Additional pipeline specifications and cost estimate details are provided in Volume 2, Appendix F.

Table 10.2 presents the estimated cost and length of power cable to be removed for each platform. The overall cost to decommission or remove the pipelines and cables associated with the 23 oil platforms is estimated to be significantly less than the previous estimate. While the majority of vendor rates supplied has increased from the previous report, the cost of mobilization/demobilization of the DP2 Dive Vessel from Seattle is considerably less than bringing a similar vessel from the Gulf of Mexico as assumed in the previous report.

Another factor in the lower cost estimate is the larger campaign groupings. For example, the previous cost estimate to decommission the five pipelines associated with Eureka included a mobilization/demobilization of a DP2 Dive Vessel from GOM totaling $5.8 million. Using the revised campaign basis, the mobilization/demobilization of the DP2 Dive Vessel from Seattle would be shared with ten other platforms for a total of $1.1 million. This represents a savings of more than $4.7 million in the mobilization/demobilization expenses.

Costs related to the mobilization/demobilization of a cable reel barge from GOM was considered but was determined to be an uneconomic option. Cable decommissioning with the use of ROVs to cut and pull them up onto cargo barges is the most cost-efficient method.

It should be noted however, that if all power cables are removed from the 23 POCSR platforms at the same time, the mobilization and installation of a reel carousel from the GOM should be investigated further, given such a large work scope.

Costs shown in these tables do not include PMEP or other contingencies, which are included in Section 4. Costs also exclude disposal costs, which are included in Section 11.

Table 10.1 Pipeline Decommissioning Cost

Platform	Water Depth (feet)	Total Length of OCS Pipeline (mi)	Length of Pipeline to be removed (mi)	Total Pipeline Cost
A	188	35.9	20.2	$ 3,125,100
B	200	1.5	0.0	$ 1,000,800
C	193	1.5	0.0	$ 611,200
Edith	150	7.8	0.0	$ 368,400
Ellen	265	0.0	0.0	$ -
Elly	265	15.2	4.5	$ 1,770,400
Eureka	700	4.8	0.0	$ 4,753,000
Gail	739	18.5	0.0	$ 2,858,800
Gilda	205	29.5	12.5	$ 5,474,400
Gina	90	12.0	0.6	$ 547,100
Grace	308	30.5	4.6	$ 2,935,000
Habitat	292	8.3	0.9	$ 1,082,400
Harmony	1,200	22.2	1.1	$ 3,183,100
Harvest	675	5.8	0.0	$ 1,847,300
Henry	170	7.3	0.0	$ 573,400
Heritage	1,075	13.5	0.0	$ 1,610,700
Hermosa	603	20.8	1.1	$ 2,465,600
Hidalgo	430	9.6	0.0	$ 1,889,000
Hillhouse	189	1.5	0.0	$ 815,600
Hogan	154	22.9	0.6	$ 1,151,400
Hondo	842	9.8	0.6	$ 1,928,200
Houchin	176	2.9	0.0	$ 704,900
Irene	242	30.1	4.6	$ 3,494,200
Total	-	**311.9**	**51.3**	**$ 44,190,000**
Average Cost per mile				$ 861,600

Table 10.2 Power Cable Removal Costs

Cable Origin	Cable Terminus	Length (feet)	Total Removal Costs
A	B	2,640	$ 164,100
B	C	2,640	$ 164,100
C	Shore	26,400	$ 829,400
Edith	Shore	36,960	$ 1,093,500
Ellen**			
Elly			
Eureka*	Ellen (2 cables)	15,297	$ 313,100
Gail			
Gilda	Shore	36,960	$ 1,093,500
Gina	Shore	1,584	$ 208,600
Grace			
Habitat	P/FA	19,536	$ 695,700
Harmony*	Shore (2 cables)	59,664	$ 980,000
Harvest			
Henry	Hillhouse	13,200	$ 499,200
Heritage	Harmony	39,072	$ 1,211,100
Heritage	Shore	104,544	$ 2,848,800
Hermosa			
Hidalgo			
Hillhouse	Shore	17,952	$ 618,000
Hogan	Shore	4,752	$ 325,900
Hondo*	Harmony (2	47,520	$ 828,100
Houchin	Hogan	3,800	$ 302,100
Irene	Shore	14,784	$ 576,900
Total			**$ 12,752,100**

* Data represents combined length and cost of both cables

**Connects to Elly by bridge, no subsea cable

11.0 PLATFORM TRANSPORTATION AND DISPOSAL

There are three primary methods of disposal for steel and other materials associated with dismantling a platform:

- Refurbish and reuse,
- Scrap and recycle, and
- Dispose of in designated landfills.

Opportunities for refurbishing and reusing facilities in the POCSR are very limited due to the age of the platforms, the current lack of additional oil and gas development in the POCSR, and inherent limitations associated with meeting the strict technical standards now required. Drilling/workover rigs and an estimate of two other major pieces of equipment (such as a crane and compressor) would be removed during the platform preparation phase and brought to shore to be refurbished and reused. For larger platforms, three other major pieces of equipment are estimated to be removed. The cost of removal and transportation to shore are include in platform preparation costs.

The steel and other materials removed from platforms using piece-small methods (<50-tons) would be transported to shore for scrapping/recycling/disposal in landfills at local waste processing ports. The costs for piece-small items to be recycled is estimated at $100/ton and the cost for piece-small items to be scrapped/disposed of is estimated at $200/ton based on local vendor quotes. The piece-small method would be used for well casings/conductor, pipeline sections, power cables, and possibly minor topside removals.

For this study, all topside and jacket waste is transported through the Panama Canal to Gulf of Mexico (GOM) waste handling facilities which are designed for such waste. The Panama Canal is likely the limiting factor in the size of the loads that can be transported from the west coast to the GOM. The maximum permissible sizes are conveyed as Panamax and Neopanamax dimensions for the original Panama Canal route and wider route constructed in 2016, respectively. These are summarized in Figure 11.1:

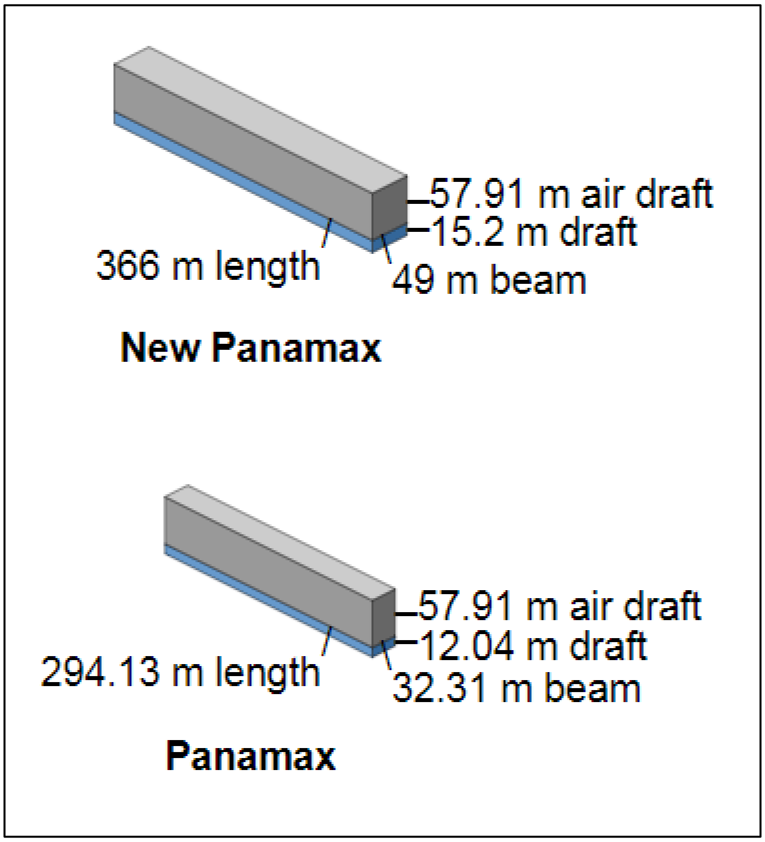

Figure 11.1 Panamax and Neopanamax dimensions[13]

For this study, the steel and other materials removed from platforms using piece-large or reverse installation methods where modular construction (>50 tons) was used, would be transported through the Panama Canal as shown in Figure 11.2. Facilities at these ports would receive the bulk of steel removed from the POCSR.

Two separate vendors contacted confirmed that these facilities do not charge a processing fee in anticipation of recycling value of the steel. These processing facilities handle up to 150 platforms per year from the GOM and are equipped to handle hazardous waste such as NORM and asbestos and other non-recyclable materials. Their no fee policy is based on decades of handling platform waste from offshore oil and gas structures.

Figure 11.2 Pathway of Disposal for Large Lifts

Cost Model Inputs

A premise of this study is that domestic US disposal will be used. However, it is recognized that viable options for international disposal do exist. Likely viable options could include disposal in Asia with many of the structures originally manufactured in Korea and Japan. It is known that space, equipment and relevant skills are readily available. An additional option could be sites such as Ensenada in Mexico. Assessing viability of these options is beyond the scope of this study. This is partly due to the increased political risk of transporting waste across international borders. This was demonstrated in the case of the Exxon Offshore Storage and Treatment (OS&T) vessel in 1994, which was towed to Ensenada, Mexico for disposal but ultimately turned around by authorities and ended up in the Port of Los Angeles, while alternative disposal or resale options were sought. In addition, disposal in Asia requires considerable transport time to reach these foreign ports. This could lead to either excessive standby time for the HLV (making the method uneconomic on a relative basis), or a lack of cargo barges and tugs to transport the structures (making the method logistically impossible). Finally, there is also an environmental risk as the traceability of waste cannot be controlled as tightly in foreign destinations as can be done in domestic destinations.

The potential of establishing new facilities specifically for recycling the platforms was also considered, as has successfully been seen in the North Sea with Able UK's Seaton Port facility and MARS in Frederikshavn, Denmark. It was assessed that there may not be the same political will on the west coast coupled with suitable sites where permitting would be granted. Furthermore, with just 23 structures in the Federal POCSR, four structures in state waters, and little prospect of further development, the economic viability of establishing a new facility may not be a sound case.

The above considerations indicate that the assumption of domestic disposal at existing facilities is prudent, although several vendors expressed an effort to develop facilities at a west coast location in the future. Finally, it is conceivable that offshore cutting facilities and/or dockside idle shipyards equipped with appropriate cranes could be used as an intermediate location to cut structures into 50-ton lifts that could be handled by waste processing facilities in local ports, but the economic viability of this option, as well as hazardous waste disposal sites for NORM or asbestos, is uncertain.

Travel time to GOM ports, including wait time through the canal, is calculated to be 75 days, based on an estimated travel speed, approximate distance and a delay for passage through the Panama Canal. This estimate was verified by vessel contractors. A Panama Canal transit fee of $200,000 per vessel round trip was also included in the cost estimate. A 5% weather contingency is applied to account for delays or extended transit times due to the impact of adverse weather and sea-states. This is applied specifically in this section, separately from the general weather contingency applied to other cost categories.

Disposal costs for all conductors with cemented casing inside, and all power cables, would be scrap, processed at a cost of $200/ton. Disposal costs for empty conductors and removed pipelines are considered as recyclable, processed at a cost of $100/ton. The costs for vessels to load and transport these piece-small items to west coast facilities are included in the disposal cost estimate. All piece-small items would be cut in 40 feet sections, allowing platform cranes and dock side cranes to be used for loading and unloading cargo barges. No salvage value is included in the cost estimates.

Disposal costs for platform topside and jacket removal include the costs for transporting loaded barges to facilities in the Gulf of Mexico. No processing fees or salvage values are included in cost estimates.

Total disposal cost estimates for each platform are shown in Table 11.1.

Table 11.1 Material Disposal Costs

Platform	Topsides and Jacket Disposal Costs	Conductor Disposal Costs	Power Cable Disposal Costs	Pipeline Disposal Costs	Total Disposal Costs
A	$ 5,181,800	$ 338,500	$ 4,900	$ 283,400	$ 5,808,600
B	$ 5,181,800	$ 359,600	$ 4,900	$ -	$ 5,546,300
C	$ 5,181,800	$ 342,300	$ 48,600	$ -	$ 5,572,700
Edith	$ 8,846,300	$ 144,600	$ 68,000	$ -	$ 9,058,900
Ellen	$ 8,846,300	$ 1,329,900	$ -	$ 49,200	$ 10,225,400
Elly	$ 8,846,300	$ -	$ -	$ 49,200	$ 8,895,500
Eureka	$ 17,692,500	$ 2,419,500	$ 28,100	$ -	$ 20,140,100
Gail	$ 17,692,500	$ 1,206,300	$ -	$ -	$ 18,898,800
Gilda	$ 8,846,300	$ 712,300	$ 68,000	$ 174,300	$ 9,800,900
Gina	$ 3,349,500	$ 149,000	$ 2,900	$ 7,400	$ 3,508,800
Grace	$ 8,846,300	$ 839,600	$ -	$ 78,800	$ 9,764,700
Habitat	$ 8,846,300	$ 483,300	$ 35,900	$ 15,500	$ 9,381,000
Harmony	$ 25,651,500	$ 3,077,000	$ 109,800	$ 27,400	$ 28,865,700
Harvest	$ 17,692,500	$ 1,082,400	$ -	$ -	$ 18,774,900
Henry	$ 5,181,800	$ 243,400	$ 24,300	$ -	$ 5,449,500
Heritage	$ 25,651,500	$ 2,355,500	$ 264,300	$ -	$ 28,271,300
Hermosa	$ 17,692,500	$ 707,200	$ -	$ 42,700	$ 18,442,400
Hidalgo	$ 16,017,800	$ 579,700	$ -	$ -	$ 16,597,500
Hillhouse	$ 5,181,800	$ 471,600	$ 33,000	$ -	$ 5,686,400
Hogan	$ 8,846,300	$ 625,200	$ 8,700	$ 8,300	$ 9,488,500
Hondo	$ 17,692,500	$ 1,280,000	$ 87,400	$ 10,400	$ 19,070,300
Houchin	$ 8,846,300	$ 617,000	$ 7,000	$ -	$ 9,470,300
Irene	$ 8,846,300	$ 451,000	$ 27,200	$ 85,000	$ 9,409,500
Total	**$ 264,658,500**	**$ 19,814,900**	**$ 823,000**	**$ 831,600**	**$ 286,128,000**

12.0 SITE CLEARANCE

Site clearance involves the inspection and verification that areas surrounding platforms within the POCSR are free of obstructions that could interfere with other ocean uses, including commercial fishing or naval operations. Site clearance operations typically consist of inspections and post-decommissioning clean-up and verification surveys. Pre-decommissioning surveys aid in the establishment of a baseline for site clearance and can identify and locate objects that should be addressed during the decommissioning process and/or features that should be protected and avoided. An important scope of the pre-survey is the identification and location of sensitive habitat, natural resources, and natural features that require mitigation planning for protection during decommissioning operations. This information is used to ensure the deployment and retrieval of any anchors deployed during decommissioning operations are completed in a safe and environmentally sound manner.

Requirements

BSEE requirements for Site Clearance Operations are found in the Code of Federal Regulations (30 CFR 250.1740-1743).

After removal:

- For a platform or other facility in water depths less than 300 feet, a trawl must be dragged over the site.
- For a Platform or other facility in water depths greater than 300 feet, either:
    - Drag a trawl over the site *or*
    - Scan across the site using sonar equipment *or*
    - Use another method approved by the Regional Supervisor

For platforms, the investigation area must include 100% of a 1320-foot radius surrounding the center of the platform location.

The regulation provides for alternative investigation methods in deeper waters if trawling is not used to verify that the site is clear. The alternative methods for site clearance verification are outlined below:

Table 12.1 Site Clearance Requirements

Alternative Methods	Parameters	Requirements
(a) Sonar	Cover 100 percent of the appropriate grid area listed in §250.1741(a)	Use a sonar signal with a frequency of at least 500 kHz.
(b) A diver	Ensure that the diver visually inspects 100 percent of the appropriate grid area listed in §250.1741(a)	Ensure that the diver uses a search pattern of concentric circles or parallel lines spaced no more than 10 feet apart.
(c) An ROV (remotely operated vehicle)	Ensure that the ROV camera records videotape over 100 percent of the appropriate grid area listed in §250.1741(a)	Ensure that the ROV uses a pattern of concentric circles or parallel lines spaced no more than 10 feet apart.

Trawling and/or survey information must be submitted to the Regional Supervisor within 30 days after the verification activities have been completed, including official verification letters with witness sign-off from both the responsible party representative and the contractor's verification. Verification letters should include date, method of verification, survey area extents, coverage and map, and results of the survey.

Cost Model Inputs

Both pre-decommissioning surveys and post-decommissioning surveys would be completed. The pre-decommissioning side scan sonar (SSS) survey is performed during the platform preparation phase. The pre-survey will detect debris targets and will locate pipelines, power cables, and other equipment to aid in planning decommissioning activities. Pre-decommissioning surveys are costed to be conducted sequentially for all platforms within a campaign, and related facilities, under one mobilization, thereby sharing these costs across each decommissioning campaign.

Post-decommissioning site clearance requirements and associated costs depend largely on water depth and specifications of debris needing removal. Estimated costs assume 1) remote operated vehicle (ROV) deployment to remove obstructions; and 2) trawling for water depths <300 feet and ROV surveying for water depths >300 feet to verify removal of debris and confirm site clearance.

Debris removal cost estimates include ROV deployment and average operational times. Debris removal operations are estimated to take an average of seven days for platforms in water depths less than 300 feet and fourteen days for platforms in greater than 300 feet water depths.

Cost estimates for diving spreads are not included as diving is not specifically required by regulations. Diving spreads were determined to be less economically viable than ROV based debris removal, particularly in deeper water settings.

Following any ROV based debris removal, test trawling is used for verification in water depths less than 300 feet. For water depths greater than 300 feet, ROV deployment, which is used for debris removal, can also conduct a visual survey by camera to concurrently verify site clearance. Combining these processes eliminates the need for additional mobilization and service costs. Site clearance verification must be conducted within 60 days of platform removal, further justifying the use of ROV surveys immediately following debris removal as the most time and cost-effective solution.

There are no mitigation costs considered or included for impacts on commercial fishing operations as a result of shell mounds. Costs related to shell mounds include a comprehensive shell mound sampling program that will cover characterization and collection of geotechnical data and biological surveys. Costs for shallow ROV sampling, vibrocore sampling and grab samples are also included. The costs are calculated from information gathered from contractors and oil and gas operators that have conducted similar operations.

Site Clearance Cost

Estimated site clearance and verification costs total $566,800 for each platform located in less than 300 feet of water. For platforms in 300 feet of water or greater, the calculated cost estimate for clearance and verification increases to $776,600 per platform. Site Clearance calculation breakdown details are shown in Table 12.2.

Table 12.2 Site Clearance Costs

Platform Water Depth (< 300 feet)		Platform Water Depth (> 300 feet)	
Pre-Decommissioning SSS (2 days x $36,000)	$ 72,000	Pre-Decommissioning SSS (2 days x $36,000)	$ 72,000
Mob/Demob	$ 33,000	Mob/Demob	$ 33,000
Data Analysis	$ 6,000	Data Analysis	$ 6,000
Subtotal	$111,000	Subtotal	$111,000
ROV Deployment Debris Removal (7 days x $20,400)	$142,800	ROV Deployment Debris Removal (14 days x $20,400)	$285,600
Site Clearance Verification Trawling (7 days x $5,000)	$ 35,000	Site Clearance Verification ROV Survey (5 days x $20,400)	$102,000
Shell Mound Survey Geotechnical & Biological	$278,000	Shell Mound Survey Geotechnical & Biological	$278,000
Total Cost	**$566,800**	**Total Cost**	**$776,600**

Site clearance costs per platform are shown in Table 12.3

Table 12.3 Site Clearance Costs per Platform

Platform	Site Clearance
A	$ 566,800
B	$ 566,800
C	$ 566,800
Edith	$ 566,800
Ellen	$ 566,800
Elly	$ 566,800
Eureka	$ 776,600
Gail	$ 776,600
Gilda	$ 566,800
Gina	$ 566,800
Grace	$ 776,600
Habitat	$ 566,800
Harmony	$ 776,600
Harvest	$ 776,600
Henry	$ 566,800
Heritage	$ 776,600
Hermosa	$ 776,600
Hidalgo	$ 776,600
Hillhouse	$ 566,800
Hogan	$ 566,800
Hondo	$ 776,600
Houchin	$ 566,800
Irene	$ 566,800
Total	**$ 14,924,600**

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Appendix A Total Costs By Decommissioning Category

Table A.1 Total Cost by Decommissioning Category

Platform	Platform Removal	Platform Preparation	Well/Slot P&A	Pipeline Decommissioning	Power Cable Removal	Site Clearance	Permitting and Regulatory	Mob/Demob of Derrick Barge	Materials Disposal	Weather Contingency	Miscellaneous Work Provision	PMEP	Total
A	$ 6,983,100	$ 1,653,500	$ 18,748,400	$ 3,125,100	$ 164,100	$ 566,800	$ 657,000	$ 1,704,400	$ 5,808,600	$ 1,562,100	$ 5,656,000	$ 3,016,500	$ 49,645,600
B	$ 6,988,800	$ 1,659,800	$ 20,652,200	$ 1,000,800	$ 164,100	$ 566,800	$ 657,000	$ 1,704,400	$ 5,546,300	$ 1,551,600	$ 5,585,400	$ 2,978,900	$ 49,056,100
C	$ 6,994,400	$ 1,610,200	$ 12,877,700	$ 611,200	$ 829,400	$ 566,800	$ 657,000	$ 1,704,400	$ 5,572,700	$ 1,174,500	$ 4,457,900	$ 2,377,600	$ 39,433,800
Edith	$ 10,532,400	$ 2,613,500	$ 8,123,300	$ 368,400	$ 1,093,500	$ 566,800	$ 657,000	$ 1,704,400	$ 9,058,900	$ 1,164,900	$ 4,952,100	$ 2,641,100	$ 43,476,300
Ellen	$ 10,378,700	$ 2,476,400	$ 24,743,600	$ -	$ -	$ 566,800	$ 657,000	$ 1,704,400	$ 10,225,400	$ 1,908,300	$ 7,357,200	$ 3,923,800	$ 63,941,600
Elly	$ 11,631,200	$ 2,411,600	$ -	$ 1,770,400	$ -	$ 566,800	$ 657,000	$ 1,704,400	$ 8,895,500	$ 819,000	$ 3,889,900	$ 2,074,600	$ 34,420,400
Eureka	$ 32,457,600	$ 4,685,600	$ 27,042,400	$ 4,753,000	$ 313,100	$ 776,600	$ 657,000	$ 1,704,400	$ 20,140,100	$ 3,501,400	$ 13,623,800	$ 7,266,000	$ 116,921,000
Gail	$ 32,941,700	$ 3,885,900	$ 14,941,400	$ 2,858,800	$ -	$ 776,600	$ 702,000	$ 1,833,700	$ 18,898,800	$ 5,540,400	$ 11,250,800	$ 6,000,400	$ 99,630,500
Gilda	$ 10,305,500	$ 2,030,900	$ 24,717,000	$ 5,474,400	$ 1,093,500	$ 566,800	$ 657,000	$ 1,704,400	$ 9,800,900	$ 4,418,800	$ 8,196,900	$ 4,371,700	$ 73,337,800
Gina	$ 3,302,000	$ 705,100	$ 4,317,000	$ 547,100	$ 208,600	$ 566,800	$ 657,000	$ 1,704,400	$ 3,508,800	$ 482,300	$ 2,071,900	$ 1,105,000	$ 19,176,000
Grace	$ 12,030,900	$ 2,909,900	$ 10,145,800	$ 2,935,000	$ -	$ 776,600	$ 702,000	$ 1,833,700	$ 9,764,700	$ 2,879,800	$ 5,889,700	$ 3,141,200	$ 53,009,300
Habitat	$ 8,823,500	$ 1,851,200	$ 10,431,300	$ 1,082,400	$ 695,700	$ 566,800	$ 702,000	$ 1,833,700	$ 9,381,000	$ 1,172,500	$ 5,030,100	$ 2,682,700	$ 44,252,900
Harmony	$ 74,382,900	$ 5,108,700	$ 23,395,100	$ 3,183,100	$ 980,000	$ 776,600	$ 1,437,000	$ 5,153,600	$ 28,865,700	$ 10,782,600	$ 20,719,400	$ 11,050,300	$ 185,835,000
Harvest	$ 31,034,400	$ 5,066,400	$ 10,838,100	$ 1,847,300	$ -	$ 776,600	$ 702,000	$ 1,833,700	$ 18,774,900	$ 7,434,400	$ 10,356,000	$ 5,523,200	$ 94,187,000
Henry	$ 5,123,400	$ 1,583,000	$ 9,492,800	$ 573,400	$ 499,200	$ 566,800	$ 657,000	$ 1,704,400	$ 5,449,500	$ 891,900	$ 3,591,800	$ 1,915,600	$ 32,048,800
Heritage	$ 61,088,800	$ 5,111,500	$ 33,892,500	$ 1,610,700	$ 4,059,900	$ 776,600	$ 1,437,000	$ 5,153,600	$ 28,271,300	$ 15,981,000	$ 20,437,200	$ 10,899,900	$ 188,720,000
Hermosa	$ 30,724,600	$ 4,593,200	$ 7,363,600	$ 2,465,600	$ -	$ 776,600	$ 702,000	$ 1,833,700	$ 18,442,400	$ 6,888,500	$ 9,760,200	$ 5,205,400	$ 88,755,800
Hidalgo	$ 20,957,200	$ 4,650,000	$ 9,775,100	$ 1,889,000	$ -	$ 776,600	$ 702,000	$ 1,833,700	$ 16,597,500	$ 5,707,200	$ 8,302,100	$ 4,427,800	$ 75,618,200
Hillhouse	$ 5,893,100	$ 1,572,200	$ 19,526,100	$ 815,600	$ 618,000	$ 566,800	$ 657,000	$ 1,704,400	$ 5,686,400	$ 1,449,600	$ 5,300,300	$ 2,826,800	$ 46,616,300
Hogan	$ 8,404,300	$ 1,694,300	$ 11,647,500	$ 1,151,400	$ 325,900	$ 566,800	$ 702,000	$ 1,833,700	$ 9,488,500	$ 1,189,500	$ 5,097,100	$ 2,718,500	$ 44,819,500
Hondo	$ 25,795,800	$ 4,582,400	$ 16,222,000	$ 1,928,200	$ 828,100	$ 776,600	$ 1,437,000	$ 5,153,600	$ 19,070,300	$ 5,013,300	$ 10,596,100	$ 5,651,200	$ 97,054,600
Houchin	$ 7,624,300	$ 2,205,300	$ 9,242,700	$ 704,900	$ 302,100	$ 566,800	$ 702,000	$ 1,833,700	$ 9,470,300	$ 1,032,300	$ 4,622,800	$ 2,465,500	$ 40,772,700
Irene	$ 9,209,000	$ 2,238,400	$ 12,652,200	$ 3,494,200	$ 576,900	$ 566,800	$ 702,000	$ 1,833,700	$ 9,409,500	$ 4,310,600	$ 5,827,400	$ 3,107,900	$ 53,928,600
Total	**$ 433,607,600**	**$ 66,899,000**	**$ 340,787,800**	**$ 44,190,000**	**$ 12,752,100**	**$ 14,924,600**	**$ 17,856,000**	**$ 50,712,500**	**$ 286,128,000**	**$ 86,856,500**	**$ 182,572,100**	**$ 97,371,600**	**$ 1,634,657,800**

Appendix B Platform Removal Weights

Table B.1 Platform Removal Weights

Platform	Water Depth (feet)	Jacket (tons)	Conductors (tons)	Topside (tons)	Total Weight* (tons)
A	188	1,500	1,343	1,357	4,200
B	190	1,500	1,439	1,357	4,296
C	192	1,500	1,354	1,357	4,211
Edith	161	3,454	381	4,134	7,969
Ellen	265	3,200	6,299	5,300	14,799
Elly	255	3,300	0	8,000	11,300
Eureka	700	19,000	12,185	4,700	35,885
Gail	739	18,300	7,519	7,693	33,512
Gilda	205	3,220	3,190	3,792	10,202
Gina	95	434	373	447	1,254
Grace	318	3,090	4,006	3,800	10,896
Habitat	290	2,550	2,063	3,514	8,127
Harmony	1,198	42,900	15,281	9,839	68,020
Harvest	675	16,633	5,051	9,024	30,708
Henry	173	1,311	845	1,371	3,527
Heritage	1,075	32,420	12,901	9,826	55,147
Hermosa	603	17,000	3,051	7,830	27,881
Hidalgo	430	10,950	2,311	8,100	21,361
Hillhouse	190	1,500	1,893	1,200	4,593
Hogan	154	1,263	1,410	2,259	4,932
Hondo	842	12,200	5,885	8,450	26,535
Houchin	163	1,486	1,370	2,591	5,447
Irene	242	3,100	1,801	2,500	7,401

*Total Weight is the estimated platform removal weight and includes the weights of the jacket, deck, and conductors, assuming that they are removed to a depth of 15 feet below the mud line. Pile weight is not included.

Appendix C Platform, Deck, and Jacket Removal Details

Table C.1 Platform Details by Campaign

CAMPAIGN 1									
Platform Name	**Hogan**	**Houchin**	**Habitat**	**Irene**	**Grace**	**Gail**	**Harvest**	**Hermosa**	**Hidalgo**
Water Depth, feet	154	163	290	242	318	739	675	603	430
Deck Weight, tons	2259	2591	3514	2500	3800	7693	9024	7830	8100
Number of Modules	8	9	6	5	6	8	10	8	9
Max Weight per Module, tons	282	288	586	500	633	962	902	979	900
Jacket Weight, tons	1263	1486	2550	3100	3090	18300	16633	17000	10950
Jacket Sections	4	4	3	4	4	19	17	17	11
Max Weight per Section, tons	316	372	850	775	773	963	978	1000	995
Number of Piles	12	8	8	8	12 main 8 skirt	8 main 12 skirt	8 main 20 skirt	8 main 20 skirt	8 main 8 skirt

Note that State Platform Holly shares in some Project 1 costs for equipment mob/demob/retrofit.

CAMPAIGN 2											
Platform Name	**A**	**B**	**C**	**Henry**	**Hillhouse**	**Gina**	**Gilda**	**Edith**	**Elly**	**Ellen**	**Eureka**
Water Depth, feet	188	190	192	173	190	95	205	161	255	265	700
Deck Weight, tons	1357	1357	1357	1371	1200	447	3792	4134	8000	5300	4700
Number of Modules	4	4	4	4	4	2	6	12	10	12	10
Max Weight per Module, tons	339	339	339	343	300	224	632	345	800	442	470
Jacket Weight, tons	1500	1500	1500	1311	1500	434	3220	3454	3300	3200	19000
Jacket Sections	3	3	3	2	3	1	4	4	4	4	20
Max Weight per Section, tons	500	500	500	656	500	434	805	864	825	800	950
Number of Piles	12	12	12	6	8	6	12	12 main 24 skirt	12	8	24 Skirt

CAMPAIGN 3			
Platform Name	**Hondo**	**Heritage**	**Harmony**
Water Depth, feet	842	1075	1198
Deck Weight, tons	8450	9826	9839
Number of Modules	13	13	13
Max Weight per Module, tons	650	756	757
Jacket Weight, tons	12200	32420	42900
Jacket Sections	13	33	43
Max Weight per Section, tons	938	982	998
Number of Piles	8 main 12 skirt	8 main 26 skirt	8 main 20 skirt

Appendix D Deck and Jacket Specifications

Table D.1 Deck and Jacket Specifications

Platform	Module Weights or Lift Weights (tons)		Number of Jacket legs	Number of Piles & Size	Number of Lifts to Install Decks
A	Drilling Deck Structure Drilling Rig Production Deck Pipe Rack	425 237 325 370	12	12/40" to 80' BML	4 main lifts
B			12		
C			12		
Edith	Mod 1-471 Piperacks Helipad Quarters Cap Trusses Flare	246 118 438 341 19	12	12/54" 200' to 280' BML	6 modules 2 Cap Trusses misc. other lifts
Ellen	E Deck W Deck C Deck Substructure 1 Substructure 2	867 816 813 445 445	12	4/66" to 260' BML 4/48" to interior 230' BML	17 main lifts 12 modules
Elly	Cap Trusses SW Deck NW Deck E Deck Control Building C Deck Others Production Skid	395 697 260 418	12	4-48" to 250' BML 2-42" interior to 220' BML 6-48" exterior to 220' BML	16 main lifts 10modules
Eureka	Modules up to 1,200 tons		8	Main 0 Skirt 24/60"	10 Modules
Gail	East Deck West Deck Drilling Mod. Comp. Mod Gen. SG Mod Flare Crew Quarters	1894 1850 953 869 1178 77 873	8	Main 8/60" Skirt 12/72"	9 main lifts
Gilda	Drill Deck Equip. Drill Deck Steel Drill Rig Prod. Deck Equip. Prod. Deck Steel Vert. added mass	1004 260 227 798 305 1192	12	12/48" 150' to 190' BML	6 main lifts
Gina	Deck Helideck	418 29	6	6/42" to 140' BML *	2 main lifts
Grace			12	12/42" Main 8/48" Skirt	

Platform	Module Weights or Lift Weights (tons)				Number of Jacket legs	Number of Piles & Size	Number of Lifts to Install Decks
Habitat	Skid Base	70			8		6 main lifts
	Derrick w/ Sub.	562					
	Pump Package	1363					
	Engine Package	639					
	Quarters	200					
	Reserve Mud/P Tank	680					
Harmony	WMSF	509	AU	1025	8	Main 8/72" Skirt 20/84"	13 main lifts
	EMSF	403	CU	804			
	AI Mod.	896	Quarters	957			
	CL	866	BU	1310			
	BL	1046	DU	800			
	DL	854	BX	242			
Harvest	N Deck	1698	Flare #1	127	8	Main 8/60" to 255' BML Skirt 20/72" to 235' BML	10 main lifts
	S Deck	1425	Flare #2	50			
	G/SG	1429	Comp.	1445			
	C/U	931	Quarters	921			
	Prod.	1125					
Henry	Drilling Deck	465			8	8/42" w/ 36" inserts to 170' BML	3 main lifts
	Production Deck #1	356					
	Production Deck #2	550					
Heritage	WMSF	509	AU Mod.	1040	8	Main 8/72" Skirt 20/72" to 235' BML	13 main lifts
	EMSF	403	Quarters	947			
	AI Mod.	886	CU/DU	04/80			
	CL Mod.	861	BU	1310			
	BL	1050	BX	237			
Hermosa	W/H Module	1203			8	Main 8/60" Skirt 12/72"	9 main lifts
	Production Module	1269					
	Compressor Module	1113					
	Utility Module	1150					
	Power Module	1297					
	Pipe Rack	320					
	Cap Trusses	777					
	Crew Quarters	700					
Hidalgo	W/H Module	1378			8	Main 8/60" Skirt 12/72"	8 main lifts
	Production Module	1254					
	Compressor Module	1171					
	Utility Module	955					
	Power Module	1233					
	Pipe Rack	266					
	Cap Trusses	1071					
	Crew Quarters	-					
	DL	854					
	Flare	125					
Hillhouse					8		
Hogan	Drilling Deck & Equip.	302			12	12/36"	12 main lifts
	Workover Rig	315					
	Deck Structure	997					
Hondo					8	inserts to 340' BML Skirt 12/54" & 48" to 250' BML	30 lifts
Houchin	Drilling Deck Structure	432			8	8	9 main lifts
	Production Deck Structure	314					
	Drilling Rig	220					
	Piperacks & Equipment	289					
Irene	West Section	1000			8	8/60"	2 main lifts
	East Section	860					
	Cranes	0					
	Flare	25					

Appendix E Well Count and Categorizations

Table E.1 Well/Slot Count and Categorizations

Platform	Water Depth	Average Well Depth	Slots Only Count	Well Count	Well Count by Category				
					TA-Low	Low	Medium-Low	Medium	High
A	188	2,517	5	50	0	14	0	36	0
B	190	3,123	3	54	0	12	4	37	1
C	192	2,841	2	35	0	11	0	24	0
Edith	161	5,371	9	20	0	2	3	15	0
Ellen	265	6,680	1	63	0	2	18	43	0
Elly	255	N/A	0	0	0	0	0	0	0
Eureka	700	6,369	10	50	0	2	14	33	1
Gail	739	8,470	0	29	0	0	3	26	0
Gilda	205	7,855	0	63	0	4	16	41	2
Gina	95	6,474	0	12	0	0	6	6	0
Grace	318	3,838	10	28	0	12	10	6	0
Habitat	290	12,026	1	20	0	0	3	13	4
Harmony	1,198	12,908	8	35	0	0	0	28	7
Harvest	675	9,411	6	19	0	1	1	17	0
Henry	173	4,142	0	24	0	1	1	22	0
Heritage	1,075	15,098	0	49	0	0	0	33	16
Hermosa	603	8,592	3	13	0	0	0	13	0
Hidalgo	430	12,512	0	14	0	1	0	8	5
Hillhouse	190	3,434	0	50	0	6	5	38	1
Hogan	154	3,677	0	39	10	6	5	17	1
Hondo	842	13,064	0	28	0	0	0	25	3
Houchin	163	3,664	0	36	10	9	14	2	1
Irene	242	9,883	1	28	0	1	7	17	3
Total			**59**	**759**	**20**	**84**	**110**	**500**	**45**

- Beta platforms', Ellen and Eureka, well count verified by operator.
- DCOR platforms' well count verified by operator.
  - Platform "A" well count was reduced by 2 since the 2016 reporting.
  - Platform "B" well count was reduced by 3 since the 2016 reporting.
  - Platform "C" well count was reduced by 3 since the 2016 reporting.
  - Platform Edith well count was increased by 2 since the 2016 reporting.
  - Platform Henry well count was increased by 1 since the 2016 reporting.
  - Platform Hillhouse well count was increased by 3 since the 2016 reporting.
- Beacon West's Platform Gail well count was increased by 2 since the 2016 reporting.
- Exxon-Mobil platforms' Harmony and Heritage well count was increased each by 1 since the 2016 reporting.
- POOI's Platform Houchin well count was increased by 1 since the 2016 reporting.
- FMOG's Platform Irene well count was increased by 2 since the 2016 reporting.
- There are two subsea wells in the POCSR which are outside the scope of this study. One subsea well, located in the Dos Cuadras Field near Platform "B", has no API number and is included as a medium category well per BSEE. The second well is the Noble Sword well

(API: 043112060600) and is not included in this study. In acknowledging these wells, InterAct is providing BSEE with a full accounting of wells to be addressed during decommissioning operations.

Appendix F Inflation Trends & Recommendations for Updates

Several economic indices were used to evaluate inflation trend data and generate recommendations for the 5-year interval between decommissioning cost updates. The following discussion and graphical representations illustrate how construction, relevant industry products, and consumer price data were used to calculate an appropriate inflation factor for POCSR decommissioning project estimates. The datasets used to calculate inflation trends in this update are largely the same as those used in prior reports and include the last 10 years of data to overlap with the end of the previous reporting cycle.

Recommended Inflation Rate for POCSR Decommissioning Projects

The various economic indices and product prices evaluated in this study display different levels of volatility based on their specific markets, but generally follow the steady upward trend of the Consumer Price Index (CPI) when viewed over a 10-year-plus time period. We therefore propose an annual inflation factor of 1.8% (CPI Average 2010 – 2019) be applied to decommissioning cost adjustments in the 5-year interval between this report and the next update.

Table F.1 POCSR Decommissioning Projects Cost Adjustment Factor

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	**Average**
Consumer Price Index (%)	1.64%	3.16%	2.07%	1.46%	1.62%	0.12%	1.26%	2.13%	2.44%	1.81%	**1.8%**

COVID-19 Impact

This update is being prepared during the COVID-19 pandemic and is prone to error due to the economic uncertainty caused by this global crisis. The local and global economic impact of COVID-19 cannot be fully realized at this time but suggests a significant downturn that will likely show the proposed 1.8% inflation factor to be greater than actuality in the short-term. The long-term impact is difficult to predict, as there are many factors that could both restrict and inflate economic growth over the next 5 years. POCSR decommissioning campaigns will require long lead times to initiate, particularly in the acquisition of necessary offshore vessels, with prices that will likely differ drastically from current rates. With market stability however, vessel rates should follow CPI inflation as previously reported.

Construction Inflation

From 2009 through 2019, the U.S. Consumer Price Index (CPI) has risen 19% on a relatively stable trend with an average annual rate of 1.772%. General construction rates over the same time period have increased slightly faster, though shown more volatility, rising 21% with an average annual rate of 2.1%. When normalized to Dec-2014 however, the Construction Price Index shows a slower increase (8%) relative to CPI (9%) and responds more drastically to changing market conditions.

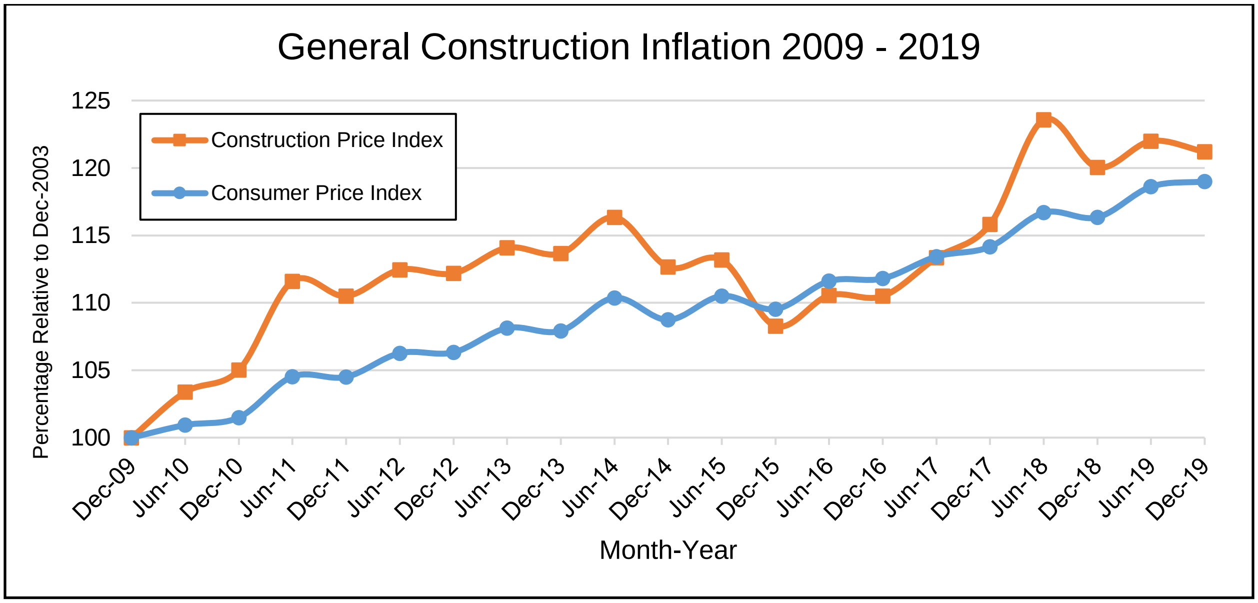


Figure F.1 General Construction Inflation, Normalized to Dec-2009 Values (1

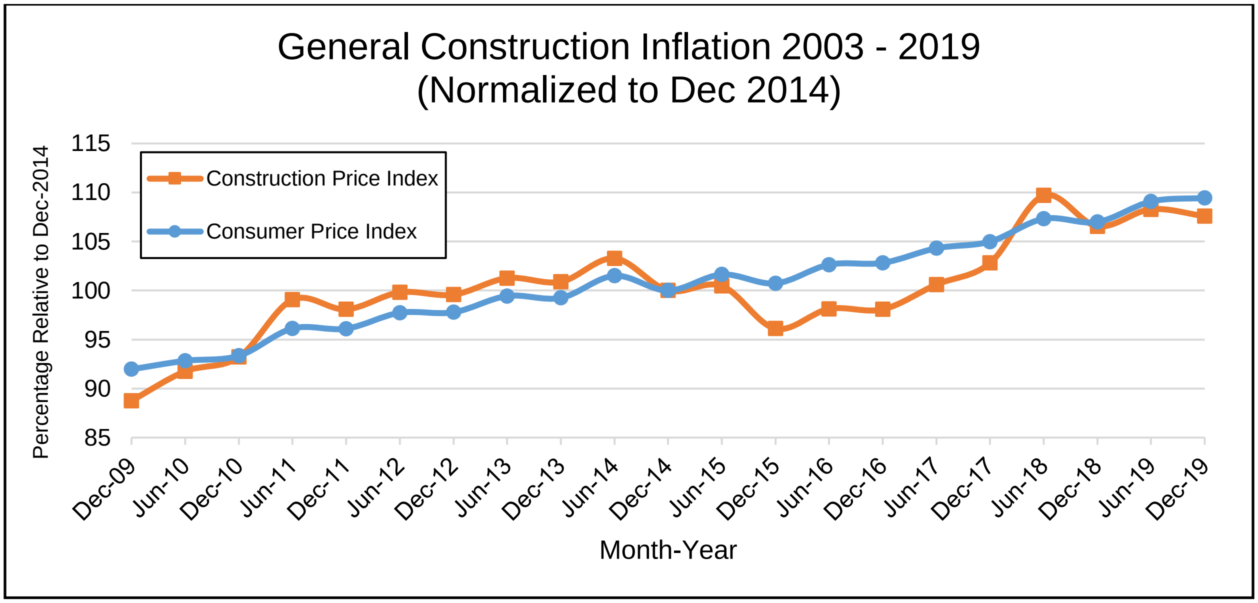


Figure F.2 General Construction Inflation, Normalized to Dec-2014 Values (1)

Non-residential construction, which includes oilfield construction, follows the same trend as general construction, but with larger relative swings due to market changes since 2009. Since 2014, the two indices have nearly identical trends and values.

The Non-Residential Construction Price Index reported in this update reflects the combination pre-Jun-2010 data from the discontinued Heavy Construction Index (BHVY) and the Other Non-Residential Construction Index (formerly BONS Index).

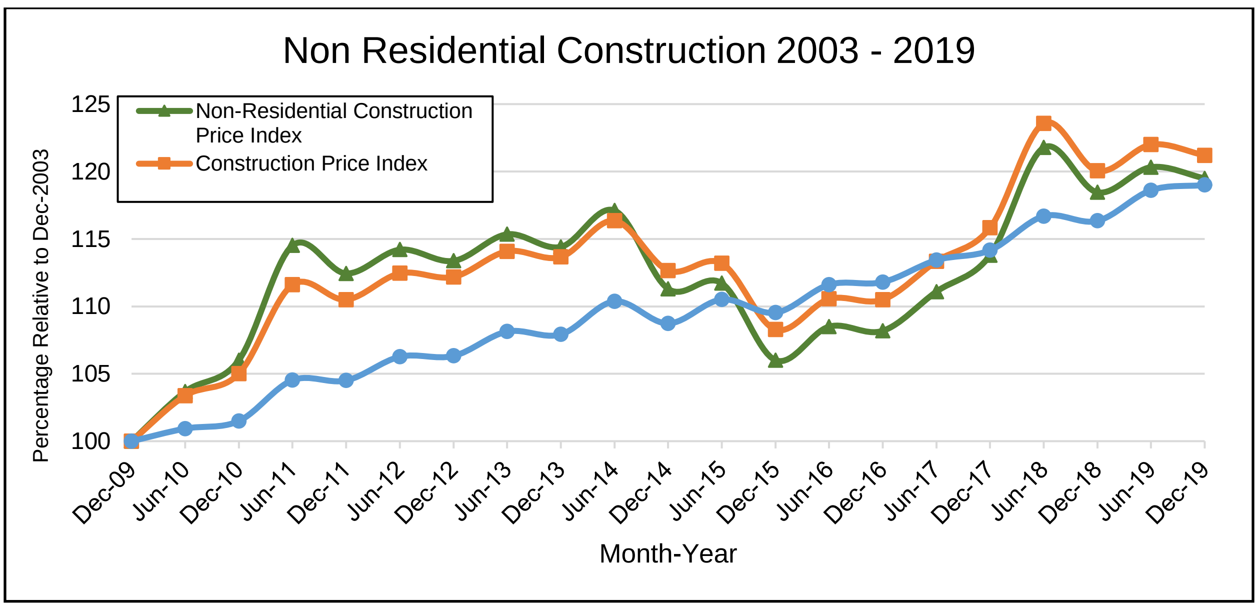


Figure F.3 Non-Residential Construction Inflation, Normalized to Dec-2009 Values (1)

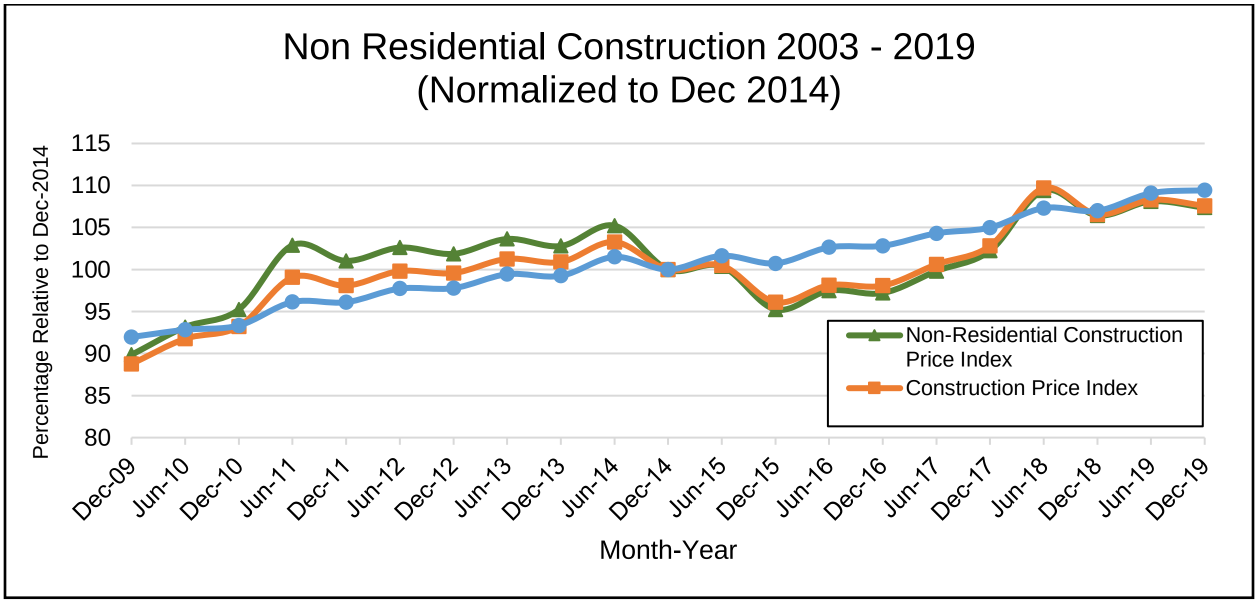


Figure F.4 Non-Residential Construction Inflation, Normalized to Dec-2014 Values (1)

Construction Inflation Components

Several construction components contributed to the volatile nature of the Construction Price Index, including diesel, steel mill, copper and brass mill, and oilfield and drilling equipment products. These products show a similar downward trend reflecting the drop in diesel price towards the end of 2014, and rebounding back toward CPI values following this downturn, with the exception of oilfield and drilling equipment, which shows a similar rate of increase as CIP but without the rebound seen in other product prices. Other components like gypsum and concrete products were less susceptible to the large swings seen in diesel price. These trends illustrate the products more impacted by economic shifts in the oil and gas industry, and those with broader applications that may stabilize the general construction price against large swings in diesel price. These relationships are even more apparent when the data is normalized to Dec-2014, during the downturn in diesel price.

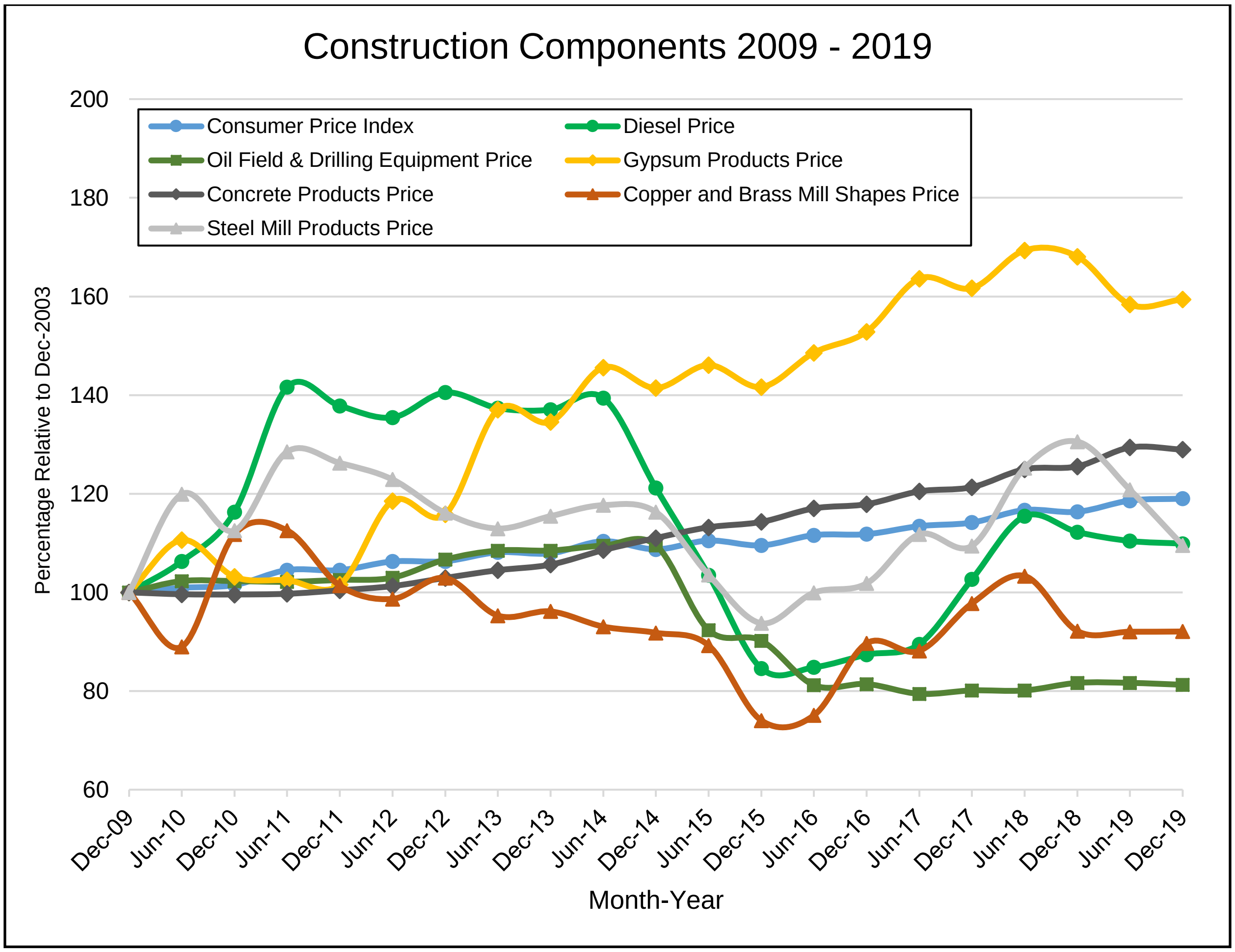


Figure F.5 Construction Inflation Components, Normalized to Dec-2009 Values (1

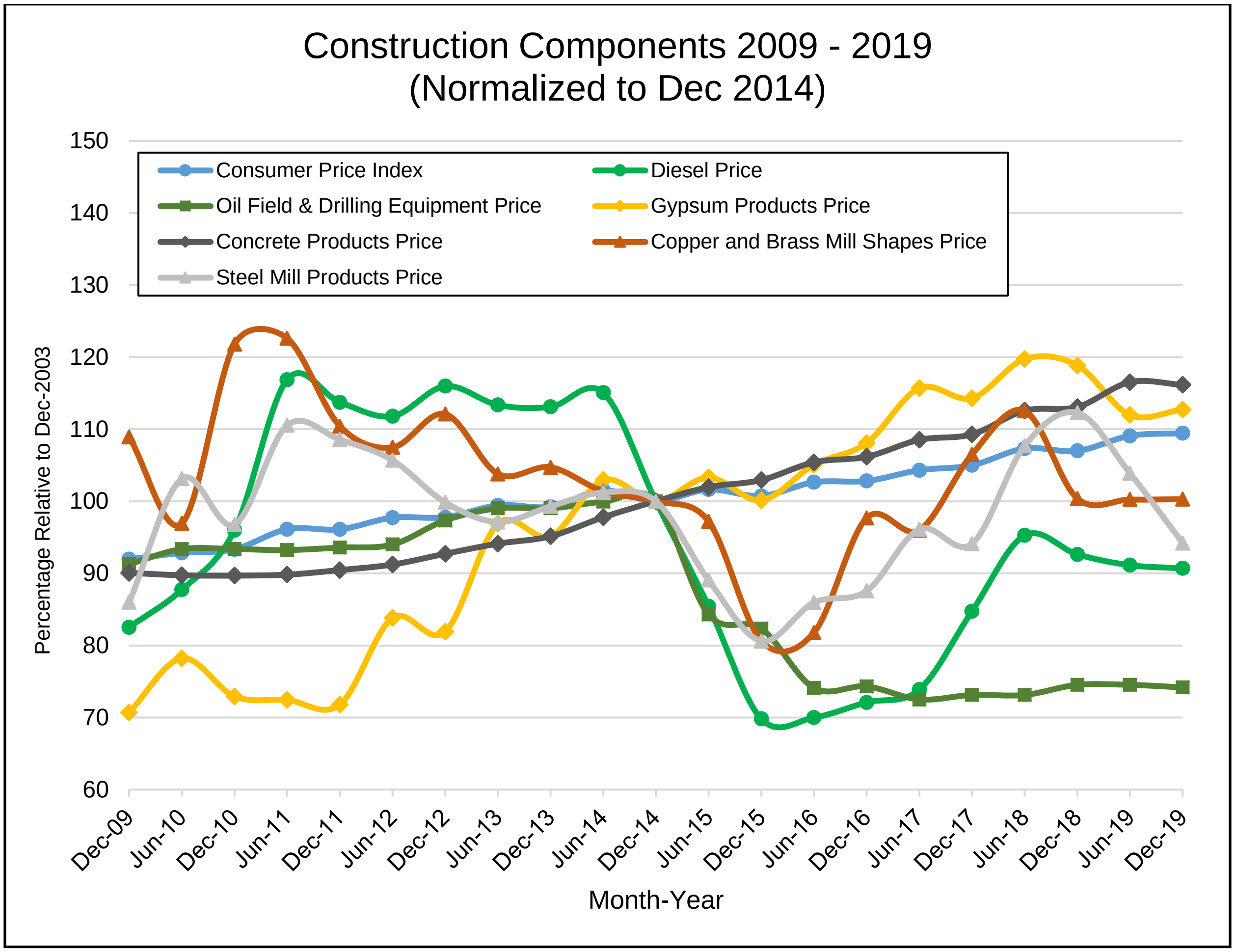


Figure F.6 Construction Inflation Components, Normalized to Dec-2014 Values (1

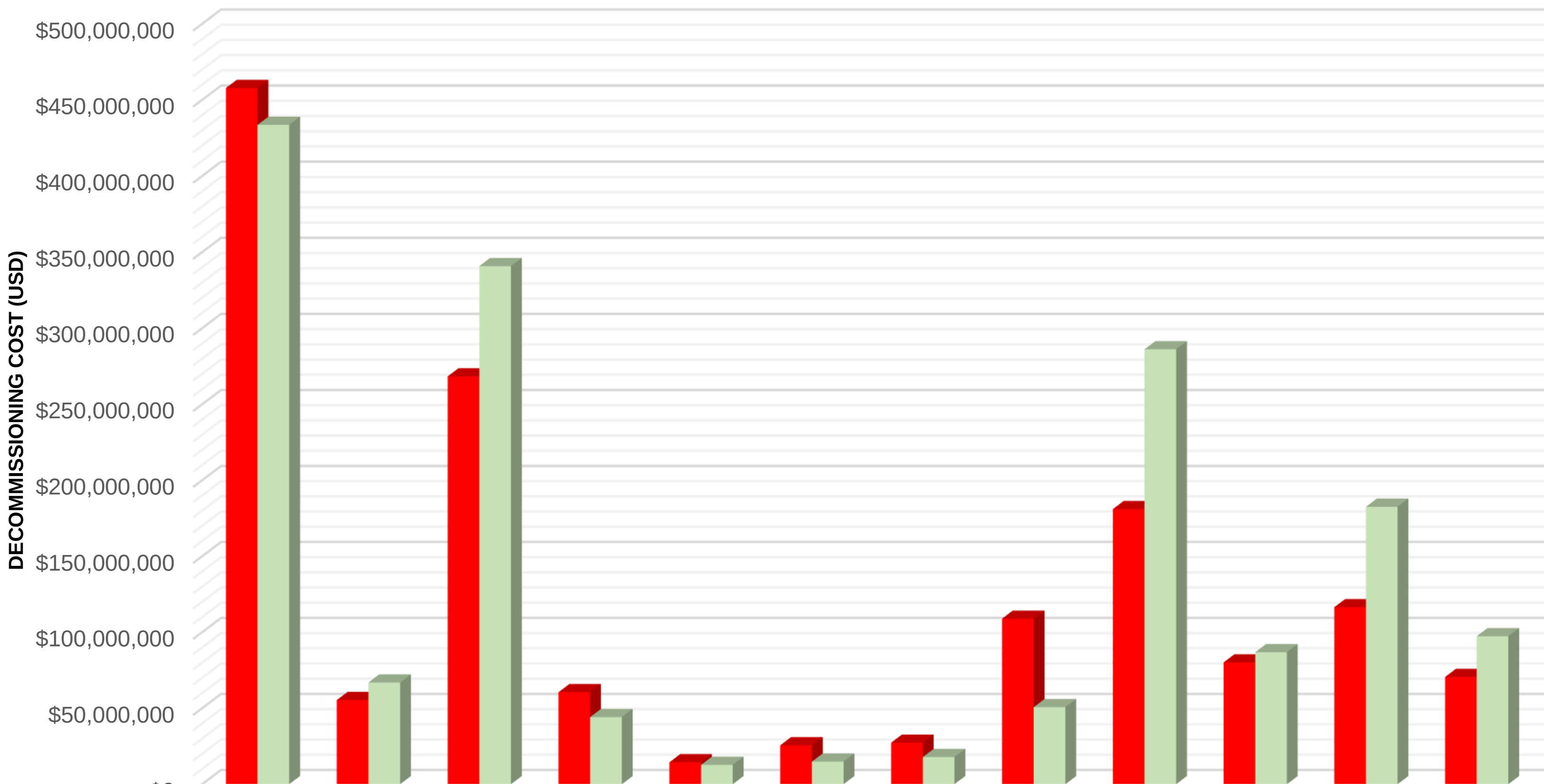
Vessel Price Inflation

Vessel rates are a large contributor to overall offshore construction prices and are therefore an important consideration in determining the inflation rate recommendation for POCSR decommissioning projects. The vessel rates presented in prior reports were largely derived from Gulf of Mexico price data and identified as being strongly dependent on weather related market impacts. The previous update also indicated the diesel fuel price as a major factor in vessel rate trends. While the POCSR region is not directly impacted by the types of large storm events as the Gulf of Mexico, it lacks a similar vessel inventory, particularly regarding larger derrick barge and lift vessels. There is a POCSR market for smaller vessels like dive boats and work boats, but their rates lack the same significant impact on overall offshore decommissioning costs. For these reasons, Gulf of Mexico and overseas market values will likely continue to drive vessel rates for POCSR projects. Due to the long lead-time planning POCSR decommissioning projects and acquiring the necessary vessels, and the current uncertainty of vessel prices in the COVID-19 market, we recommend that vessel inflation rates follow the CPI inflation factor once market stability is reached, matching the recommendation from previous reports.

Inflation Reference: **Bureau of Labor Statistics: https://www.bls.gov**

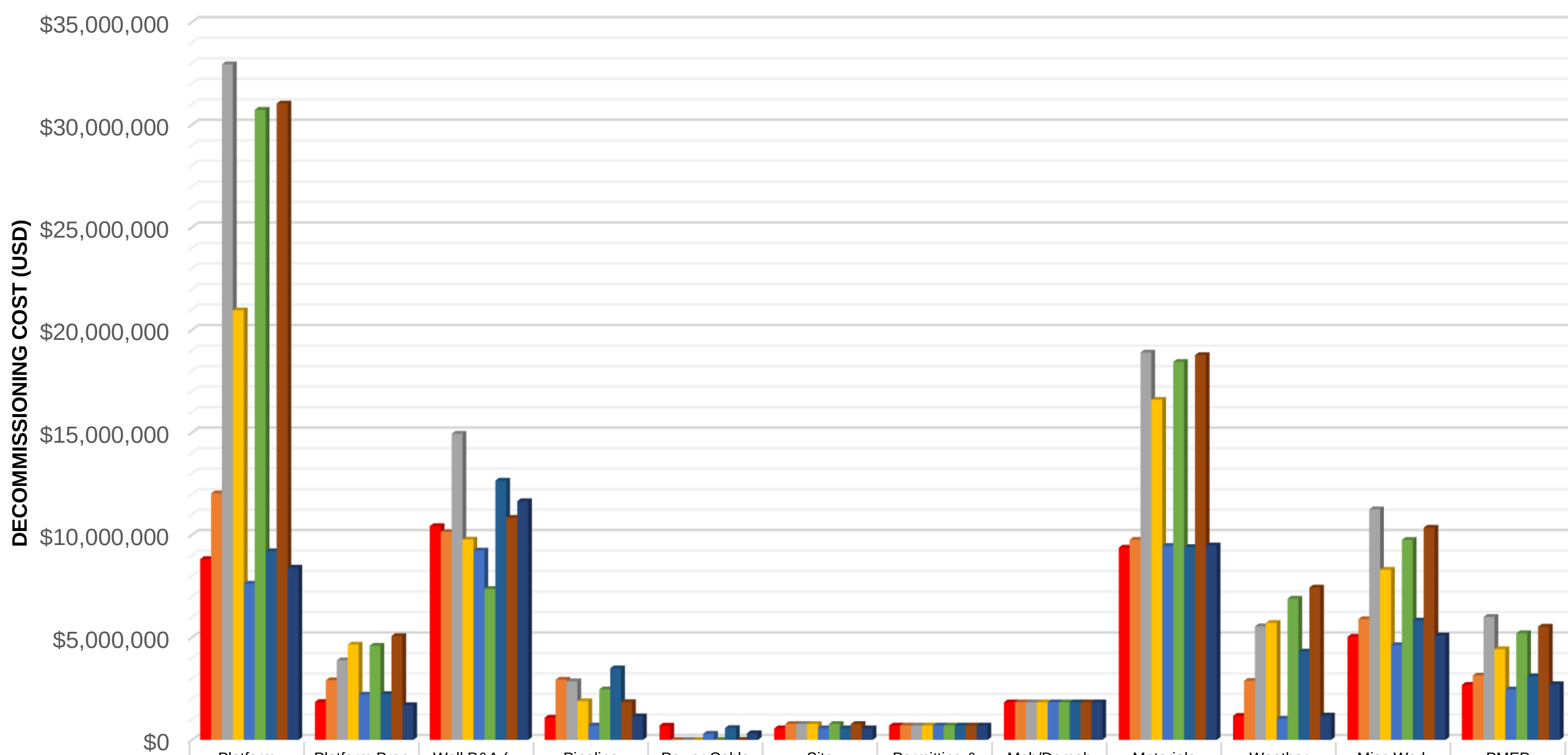
Appendix G Decommissioning Costs and Graphical Analysis

Total Decommissioning Costs by Task and Year All Platforms



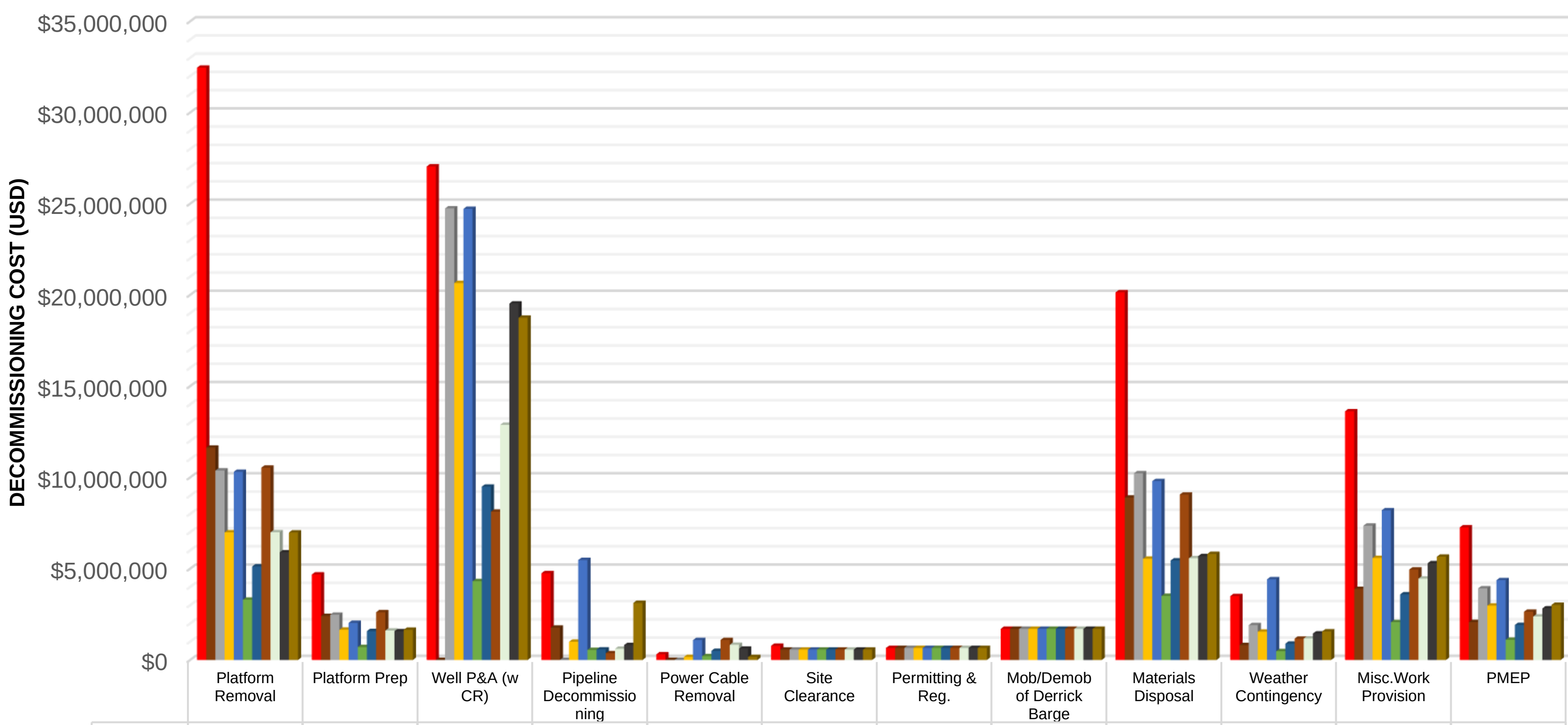
	Platform Removal	Platform Prep	Well P&A (w CR)	Pipeline Decommissioning	Power Cable Removal	Site Clearance	Permitting & Reg.	Mob/Demob of Derrick Barge	Materials Disposal	Weather Contingency	Misc.Work Provision	PMEP
2016	$457,815,614	$55,393,271	$268,359,297	$60,589,002	$14,444,841	$25,624,000	$27,300,000	$108,900,000	$181,064,473	$80,132,629	$116,472,620	$70,578,081
2020	$433,607,600	$66,899,000	$340,787,800	$44,190,000	$12,752,100	$14,924,600	$17,856,000	$50,712,500	$286,128,000	$86,856,500	$182,572,100	$97,371,600

Campaign 1: 2020 Decommissioning Costs



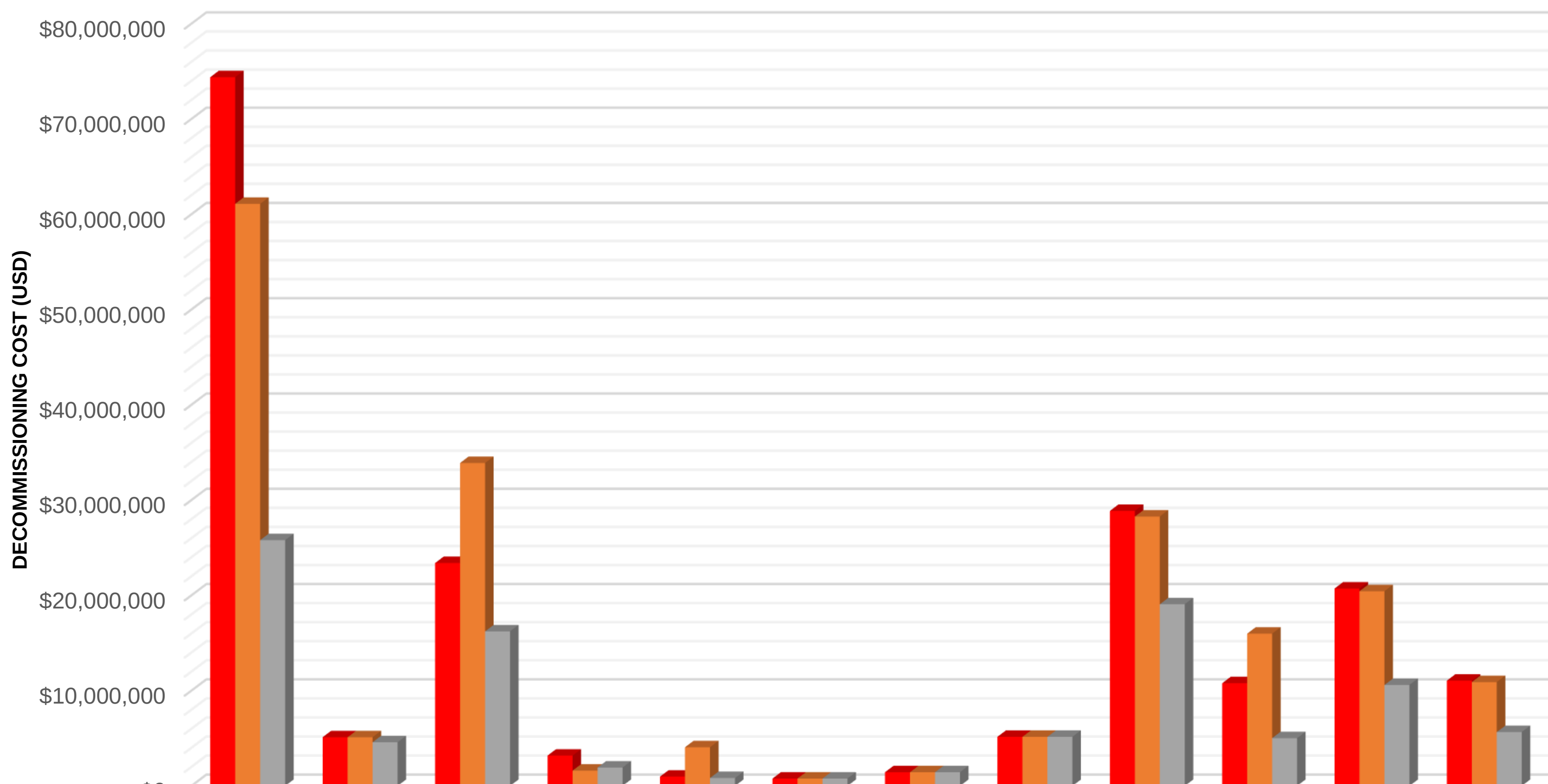
	Platform Removal	Platform Prep	Well P&A (w CR)	Pipeline Decommissioning	Power Cable Removal	Site Clearance	Permitting & Reg.	Mob/Demob of Derrick Barge	Materials Disposal	Weather Contingency	Misc.Work Provision	PMEP
Habitat	$8,823,500	$1,851,200	$10,431,300	$1,082,400	$695,700	$566,800	$702,000	$1,833,700	$9,381,000	$1,172,500	$5,030,100	$2,682,700
Grace	$12,030,900	$2,909,900	$10,145,800	$2,935,000	$-	$776,600	$702,000	$1,833,700	$9,764,700	$2,879,800	$5,889,700	$3,141,200
Gail	$32,941,700	$3,885,900	$14,941,400	$2,858,800	$-	$776,600	$702,000	$1,833,700	$18,898,800	$5,540,400	$11,250,800	$6,000,400
Hidalgo	$20,957,200	$4,650,000	$9,775,100	$1,889,000	$-	$776,600	$702,000	$1,833,700	$16,597,500	$5,707,200	$8,302,100	$4,427,800
Houchin	$7,624,300	$2,205,300	$9,242,700	$704,900	$302,100	$566,800	$702,000	$1,833,700	$9,470,300	$1,032,300	$4,622,800	$2,465,500
Hermosa	$30,724,600	$4,593,200	$7,363,600	$2,465,600	$-	$776,600	$702,000	$1,833,700	$18,442,400	$6,888,500	$9,760,200	$5,205,400
Irene	$9,209,000	$2,238,400	$12,652,200	$3,494,200	$576,900	$566,800	$702,000	$1,833,700	$9,409,500	$4,310,600	$5,827,400	$3,107,900
Harvest	$31,034,400	$5,066,400	$10,838,100	$1,847,300	$-	$776,600	$702,000	$1,833,700	$18,774,900	$7,434,400	$10,356,000	$5,523,200
Hogan	$8,404,300	$1,694,300	$11,647,500	$1,151,400	$325,900	$566,800	$702,000	$1,833,700	$9,488,500	$1,189,500	$5,097,100	$2,718,500

Campaign 2: 2020 Decommissioning Costs



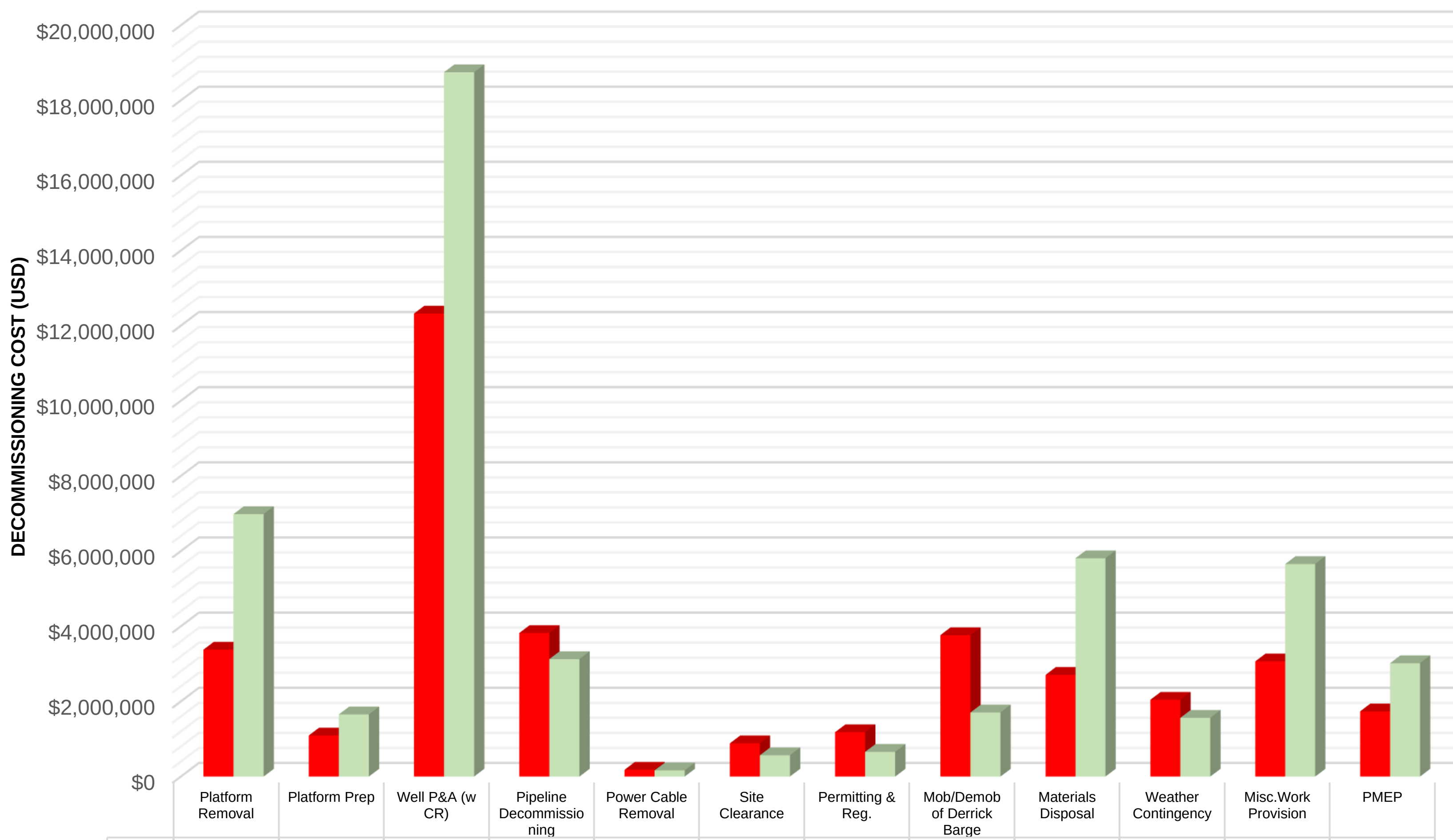
	Platform Removal	Platform Prep	Well P&A (w CR)	Pipeline Decommissioning	Power Cable Removal	Site Clearance	Permitting & Reg.	Mob/Demob of Derrick Barge	Materials Disposal	Weather Contingency	Misc.Work Provision	PMEP
Eureka	$32,457,600	$4,685,600	$27,042,400	$4,753,000	$313,100	$776,600	$657,000	$1,704,400	$20,140,100	$3,501,400	$13,623,800	$7,266,000
Elly	$11,631,200	$2,411,600	$-	$1,770,400	$-	$566,800	$657,000	$1,704,400	$8,895,500	$819,000	$3,889,900	$2,074,600
Ellen	$10,378,700	$2,476,400	$24,743,600	$-	$-	$566,800	$657,000	$1,704,400	$10,225,400	$1,908,300	$7,357,200	$3,923,800
B	$6,988,800	$1,659,800	$20,652,200	$1,000,800	$164,100	$566,800	$657,000	$1,704,400	$5,546,300	$1,551,600	$5,585,400	$2,978,900
Gilda	$10,305,500	$2,030,900	$24,717,000	$5,474,400	$1,093,500	$566,800	$657,000	$1,704,400	$9,800,900	$4,418,800	$8,196,900	$4,371,700
Gina	$3,302,000	$705,100	$4,317,000	$547,100	$208,600	$566,800	$657,000	$1,704,400	$3,508,800	$482,300	$2,071,900	$1,105,000
Henry	$5,123,400	$1,583,000	$9,492,800	$573,400	$499,200	$566,800	$657,000	$1,704,400	$5,449,500	$891,900	$3,591,800	$1,915,600
Edith	$10,532,400	$2,613,500	$8,123,300	$368,400	$1,093,500	$566,800	$657,000	$1,704,400	$9,058,900	$1,164,900	$4,952,100	$2,641,100
C	$6,994,400	$1,610,200	$12,877,700	$611,200	$829,400	$566,800	$657,000	$1,704,400	$5,572,700	$1,174,500	$4,457,900	$2,377,600
Hillhouse	$5,893,100	$1,572,200	$19,526,100	$815,600	$618,000	$566,800	$657,000	$1,704,400	$5,686,400	$1,449,600	$5,300,300	$2,826,800
A	$6,983,100	$1,653,500	$18,748,400	$3,125,100	$164,100	$566,800	$657,000	$1,704,400	$5,808,600	$1,562,100	$5,656,000	$3,016,500

Campaign 3: 2020 Decommissioning Costs

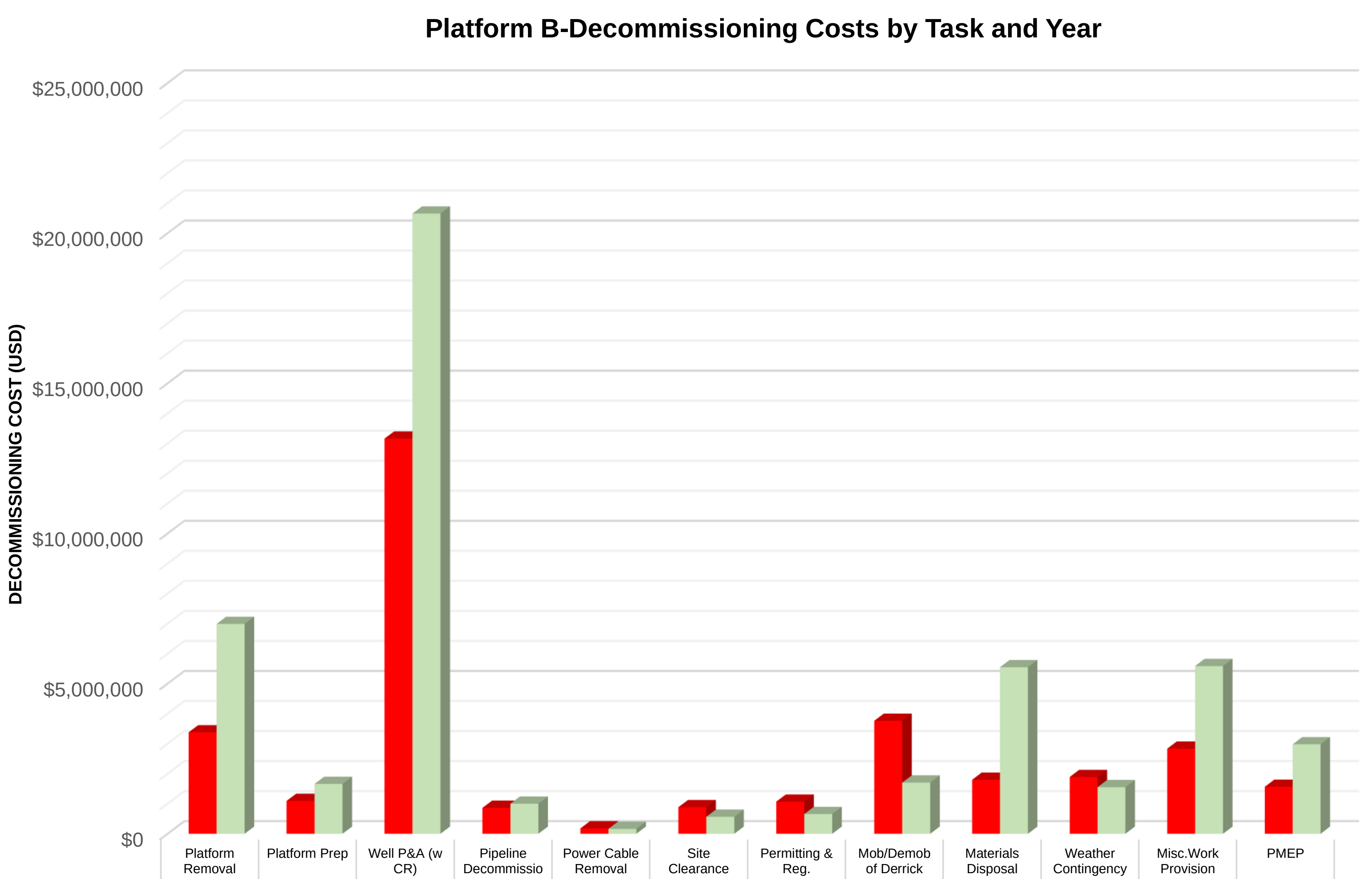


	Platform Removal	Platform Prep	Well P&A (w CR)	Pipeline Decommissioning	Power Cable Removal	Site Clearance	Permitting & Reg.	Mob/Demob of Derrick Barge	Materials Disposal	Weather Contingency	Misc.Work Provision	PMEP
Harmony	$74,382,900	$5,108,700	$23,395,100	$3,183,100	$980,000	$776,600	$1,437,000	$5,153,600	$28,865,700	$10,782,600	$20,719,400	$11,050,300
Heritage	$61,088,800	$5,111,500	$33,892,500	$1,610,700	$4,059,900	$776,600	$1,437,000	$5,153,600	$28,271,300	$15,981,000	$20,437,200	$10,899,900
Hondo	$25,795,800	$4,582,400	$16,222,000	$1,928,200	$828,100	$776,600	$1,437,000	$5,153,600	$19,070,300	$5,013,300	$10,596,100	$5,651,200

Platform A-Decommissioning Costs by Task and Year

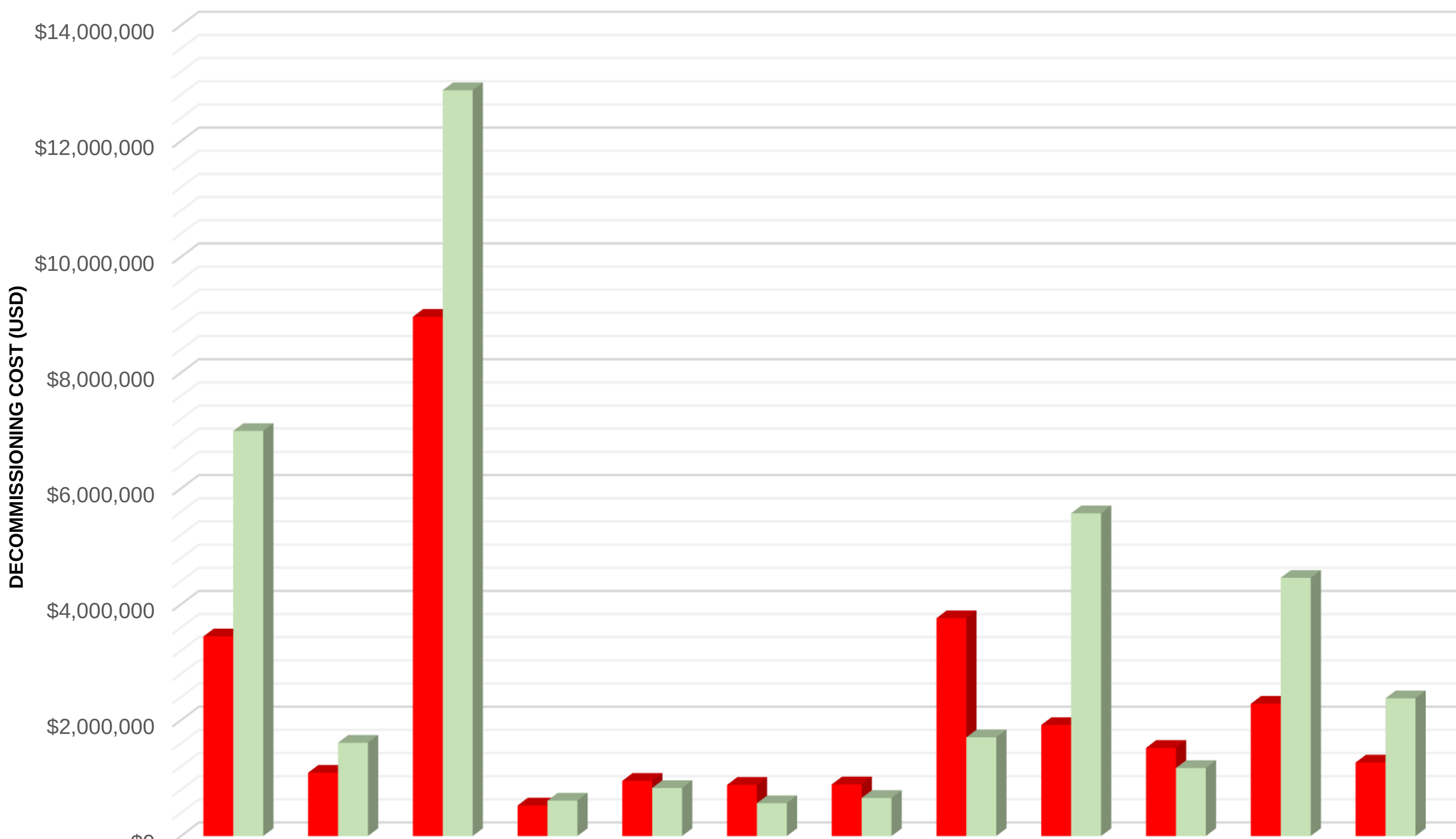


	Platform Removal	Platform Prep	Well P&A (w CR)	Pipeline Decommissioning	Power Cable Removal	Site Clearance	Permitting & Reg.	Mob/Demob of Derrick Barge	Materials Disposal	Weather Contingency	Misc.Work Provision	PMEP
A 2016	$3,377,304	$1,093,371	$12,322,021	$3,819,491	$180,575	$884,000	$1,180,645	$3,762,000	$2,705,838	$2,043,837	$3,065,755	$1,734,141
A 2020	$6,983,100	$1,653,500	$18,748,400	$3,125,100	$164,100	$566,800	$657,000	$1,704,400	$5,808,600	$1,562,100	$5,656,000	$3,016,500



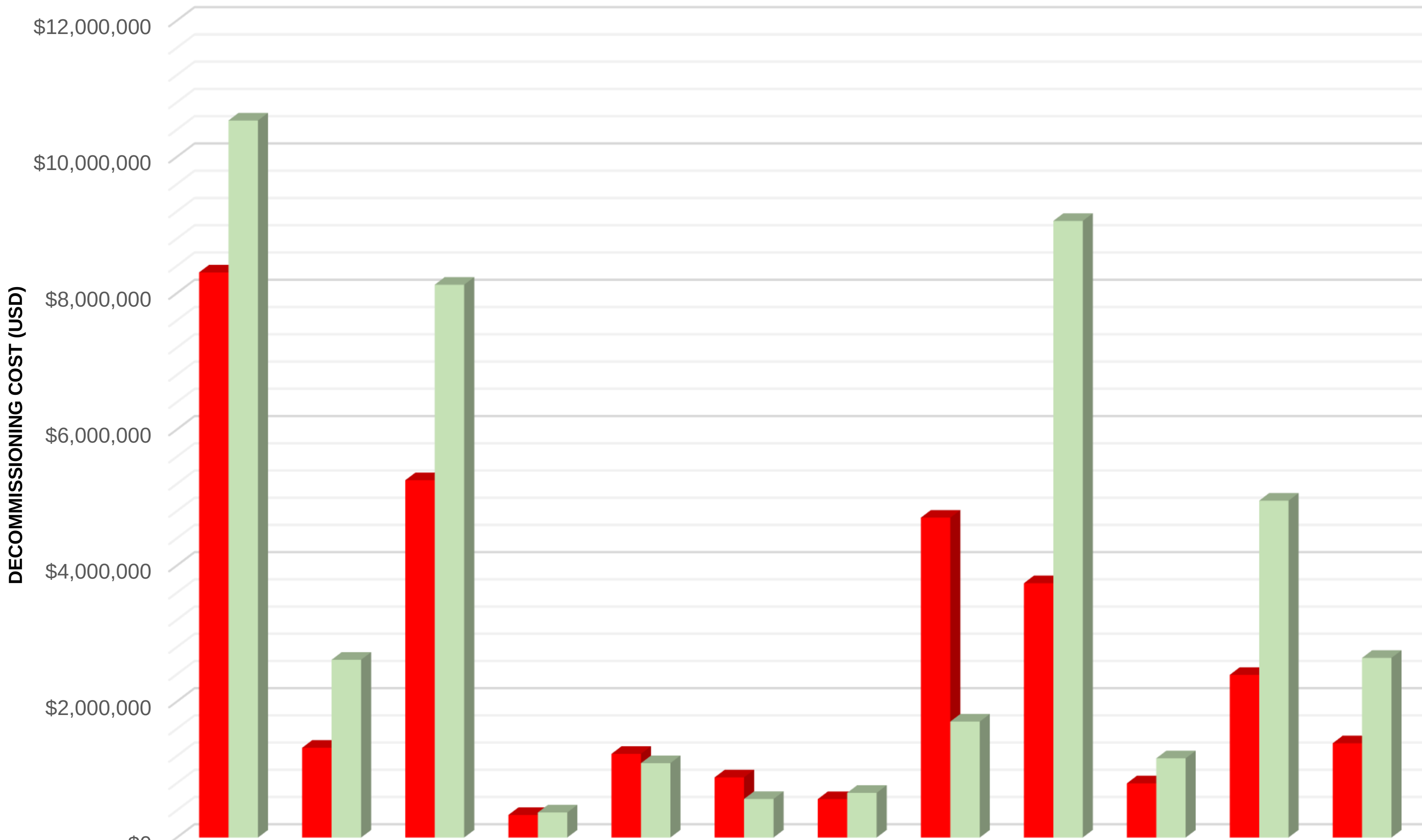
	Platform Removal	Platform Prep	Well P&A (w CR)	Pipeline Decommissioning	Power Cable Removal	Site Clearance	Permitting & Reg.	Mob/Demob of Derrick Barge	Materials Disposal	Weather Contingency	Misc.Work Provision	PMEP
B 2016	$3,377,304	$1,093,371	$13,159,313	$864,193	$180,575	$884,000	$1,069,808	$3,762,000	$1,798,393	$1,889,992	$2,834,988	$1,564,700
B 2020	$6,988,800	$1,659,800	$20,652,200	$1,000,800	$164,100	$566,800	$657,000	$1,704,400	$5,546,300	$1,551,600	$5,585,400	$2,978,900

Platform C-Decommissioning Costs by Task and Year



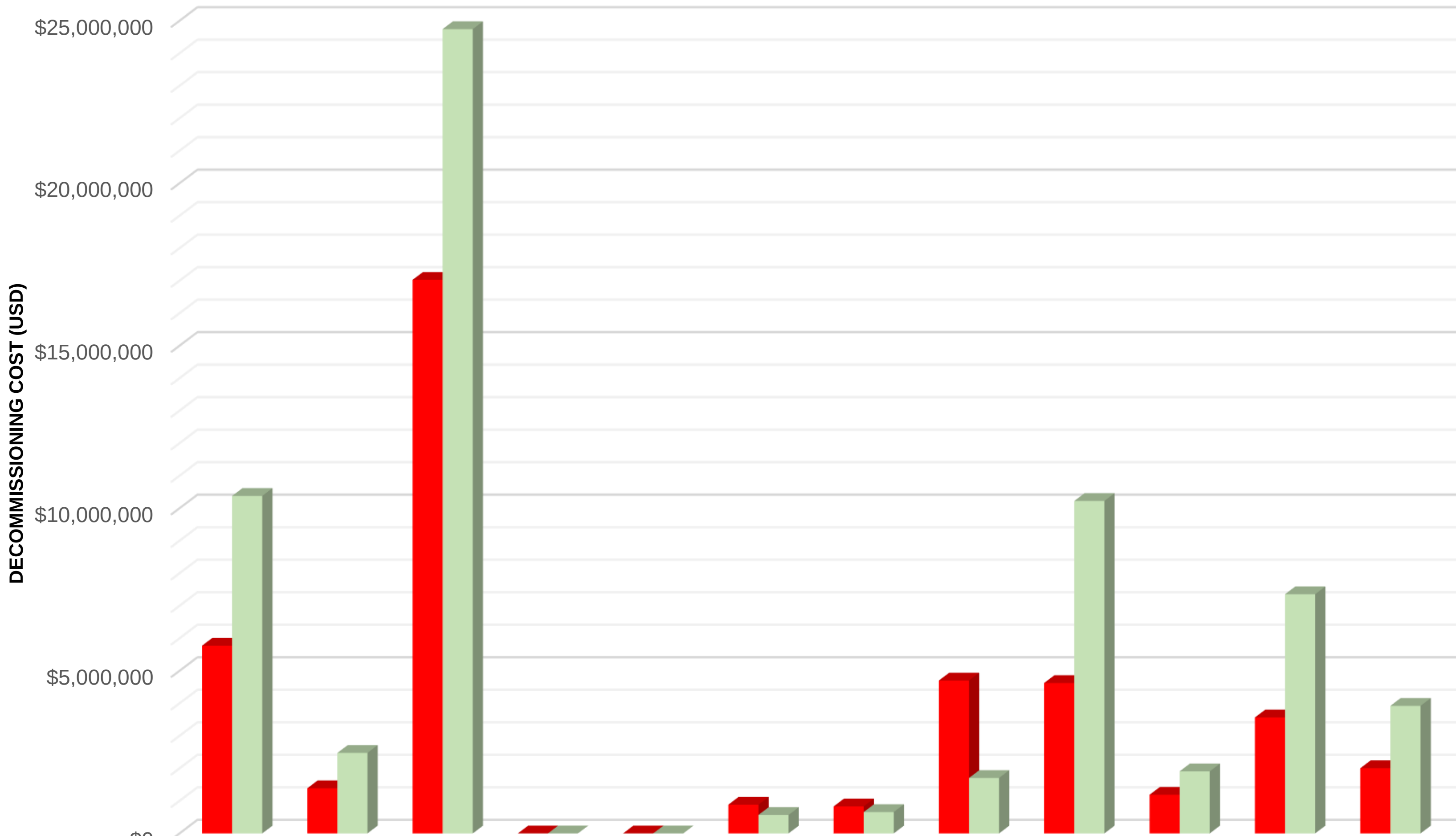
	Platform Removal	Platform Prep	Well P&A (w CR)	Pipeline Decommissioning	Power Cable Removal	Site Clearance	Permitting & Reg.	Mob/Demob of Derrick Barge	Materials Disposal	Weather Contingency	Misc.Work Provision	PMEP
C 2016	$3,446,640	$1,093,371	$8,966,362	$528,022	$953,587	$884,000	$891,505	$3,762,000	$1,916,888	$1,522,691	$2,284,036	$1,269,759
C 2020	$6,994,400	$1,610,200	$12,877,700	$611,200	$829,400	$566,800	$657,000	$1,704,400	$5,572,700	$1,174,500	$4,457,900	$2,377,600

Platform Edith-Decommissioning Costs by Task and Year

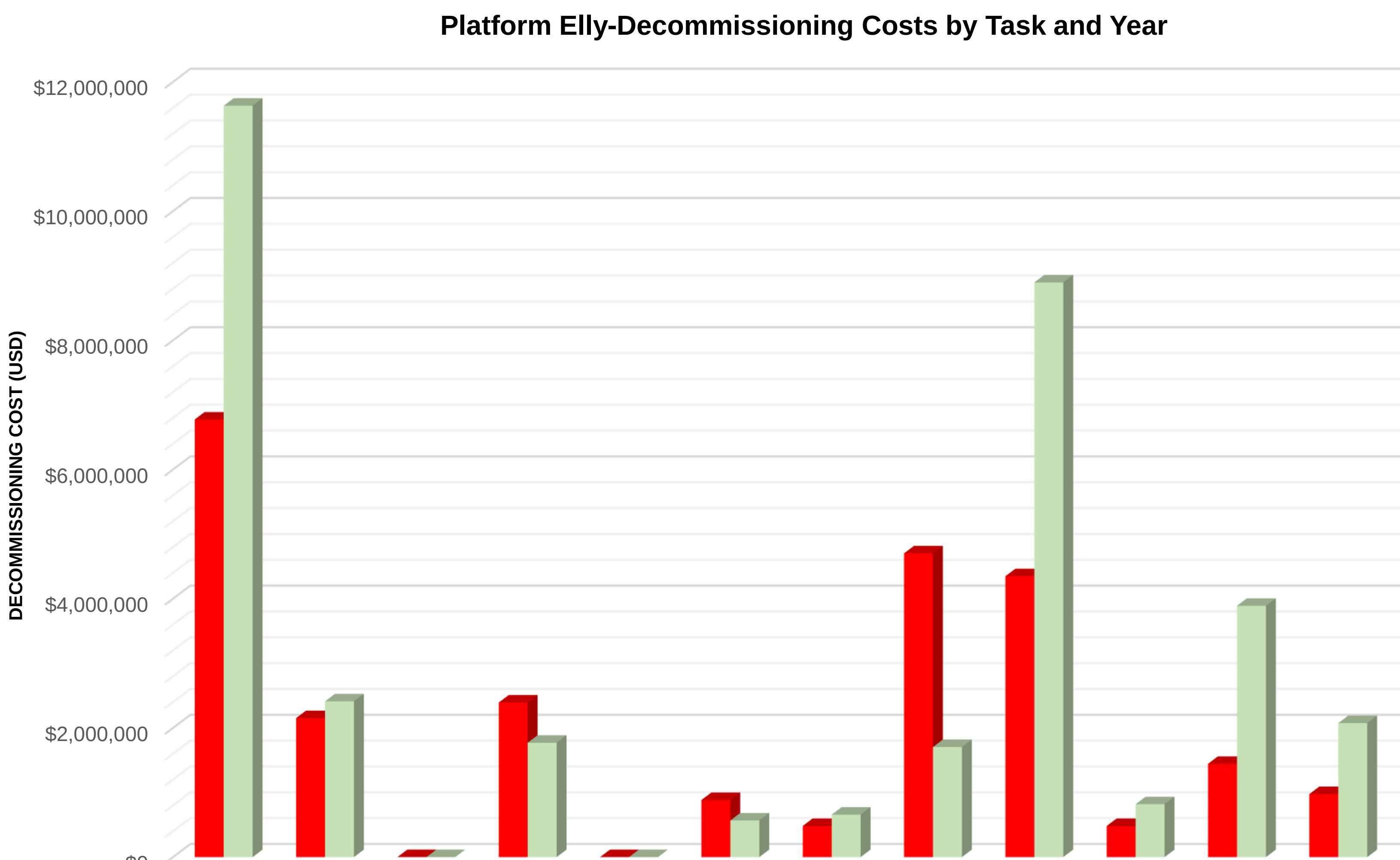


	Platform Removal	Platform Prep	Well P&A (w CR)	Pipeline Decommissioning	Power Cable Removal	Site Clearance	Permitting & Reg.	Mob/Demob of Derrick Barge	Materials Disposal	Weather Contingency	Misc.Work Provision	PMEP
Edith 2016	$8,302,845	$1,319,700	$5,253,219	$331,960	$1,230,590	$884,000	$564,723	$4,702,500	$3,739,794	$797,075	$2,391,226	$1,385,785
Edith 2020	$10,532,400	$2,613,500	$8,123,300	$368,400	$1,093,500	$566,800	$657,000	$1,704,400	$9,058,900	$1,164,900	$4,952,100	$2,641,100

Platform Ellen-Decommissioning Costs by Task and Year

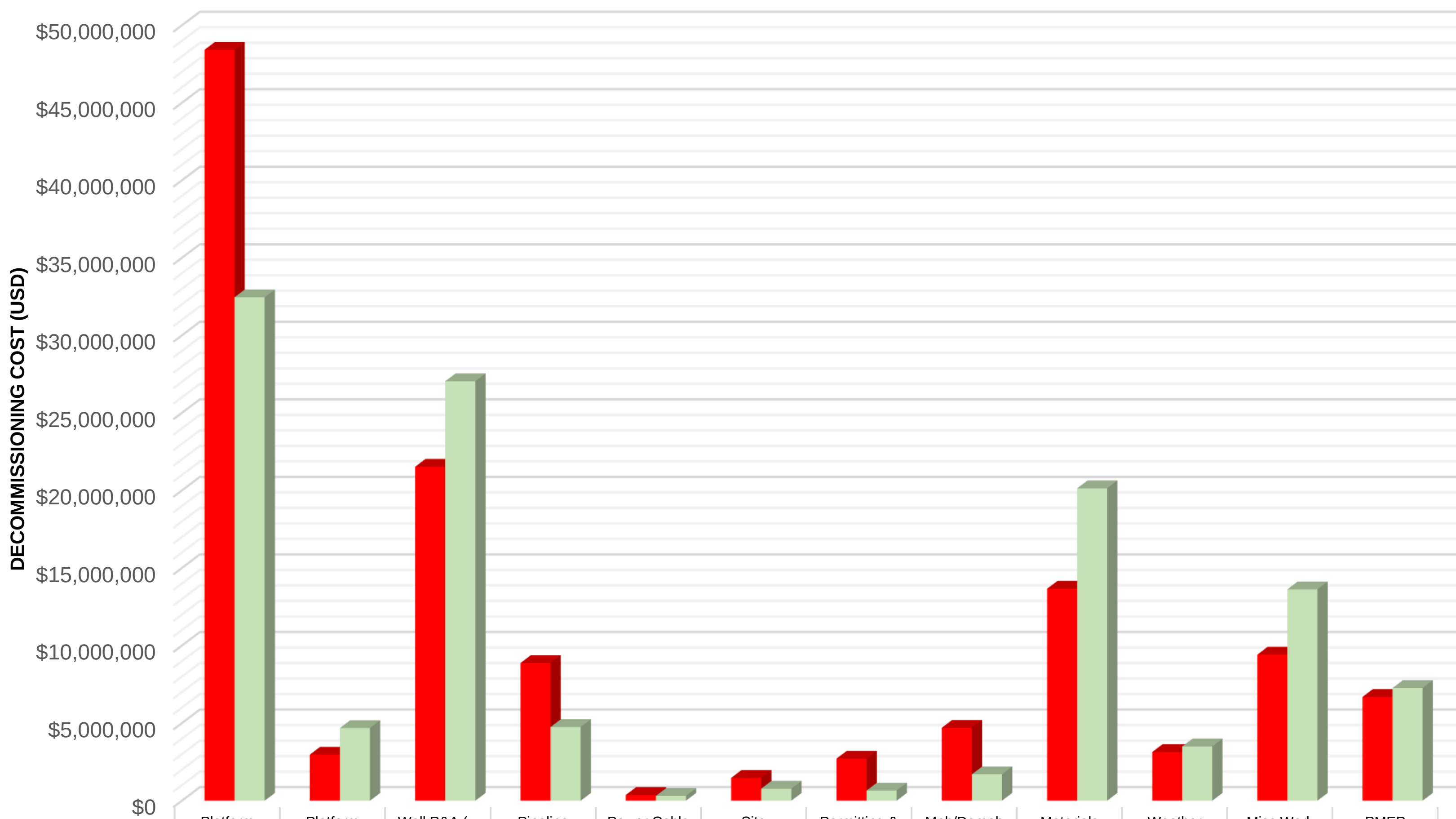


	Platform Removal	Platform Prep	Well P&A (w CR)	Pipeline Decommissioning	Power Cable Removal	Site Clearance	Permitting & Reg.	Mob/Demob of Derrick Barge	Materials Disposal	Weather Contingency	Misc.Work Provision	PMEP
Ellen 2016	$5,773,287	$1,389,820	$17,028,429	$-	$-	$884,000	$830,961	$4,702,500	$4,625,468	$1,189,223	$3,567,670	$2,006,043
Ellen 2020	$10,378,700	$2,476,400	$24,743,600	$-	$-	$566,800	$657,000	$1,704,400	$10,225,400	$1,908,300	$7,357,200	$3,923,800



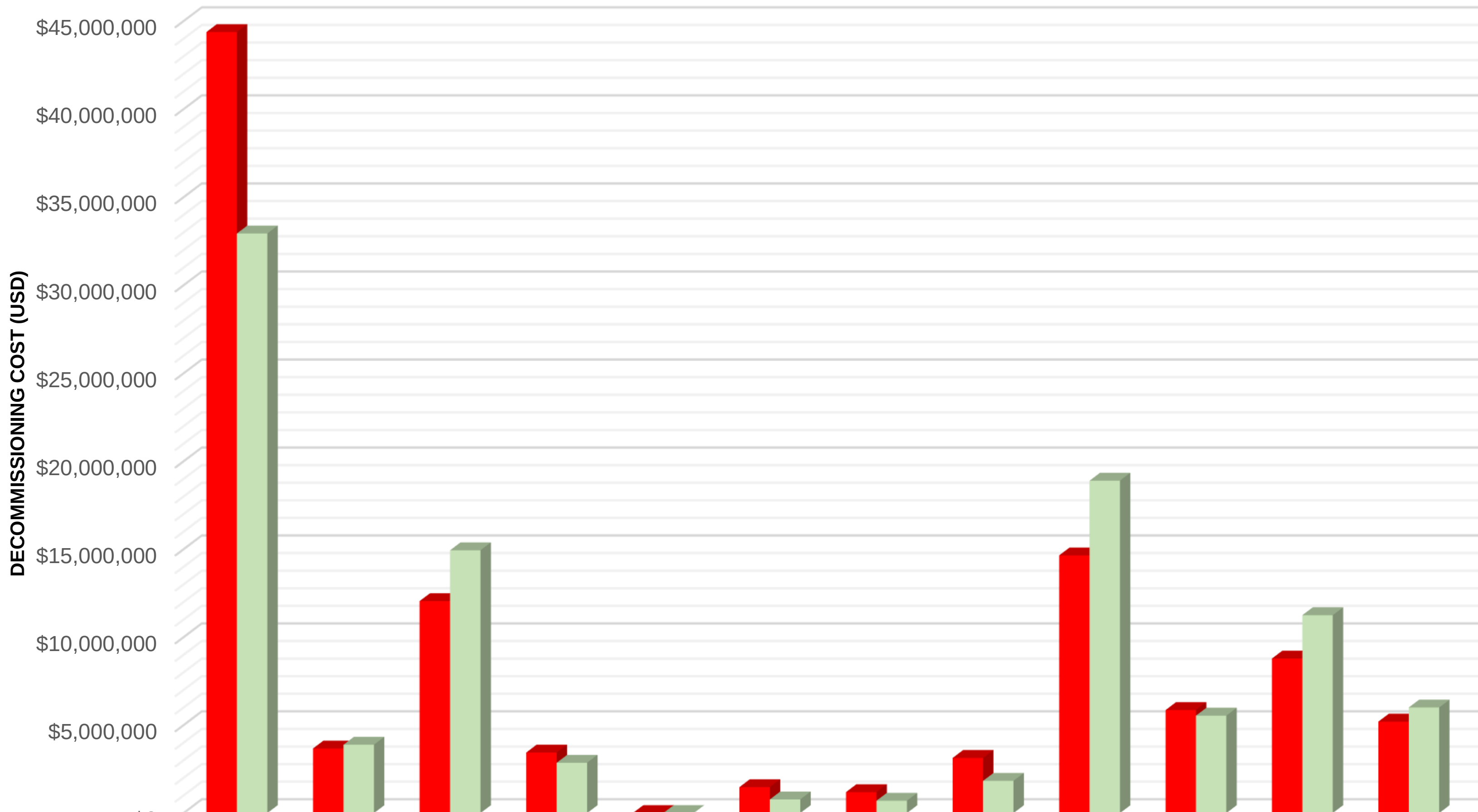
	Platform Removal	Platform Prep	Well P&A (w CR)	Pipeline Decommissioning	Power Cable Removal	Site Clearance	Permitting & Reg.	Mob/Demob of Derrick Barge	Materials Disposal	Weather Contingency	Misc.Work Provision	PMEP
Elly 2016	$6,774,166	$2,151,880	$-	$2,392,826	$-	$884,000	$482,045	$4,702,500	$4,347,786	$481,268	$1,443,804	$976,230
Elly 2020	$11,631,200	$2,411,600	$-	$1,770,400	$-	$566,800	$657,000	$1,704,400	$8,895,500	$819,000	$3,889,900	$2,074,600

Platform Eureka-Decommissioning Costs by Task and Year



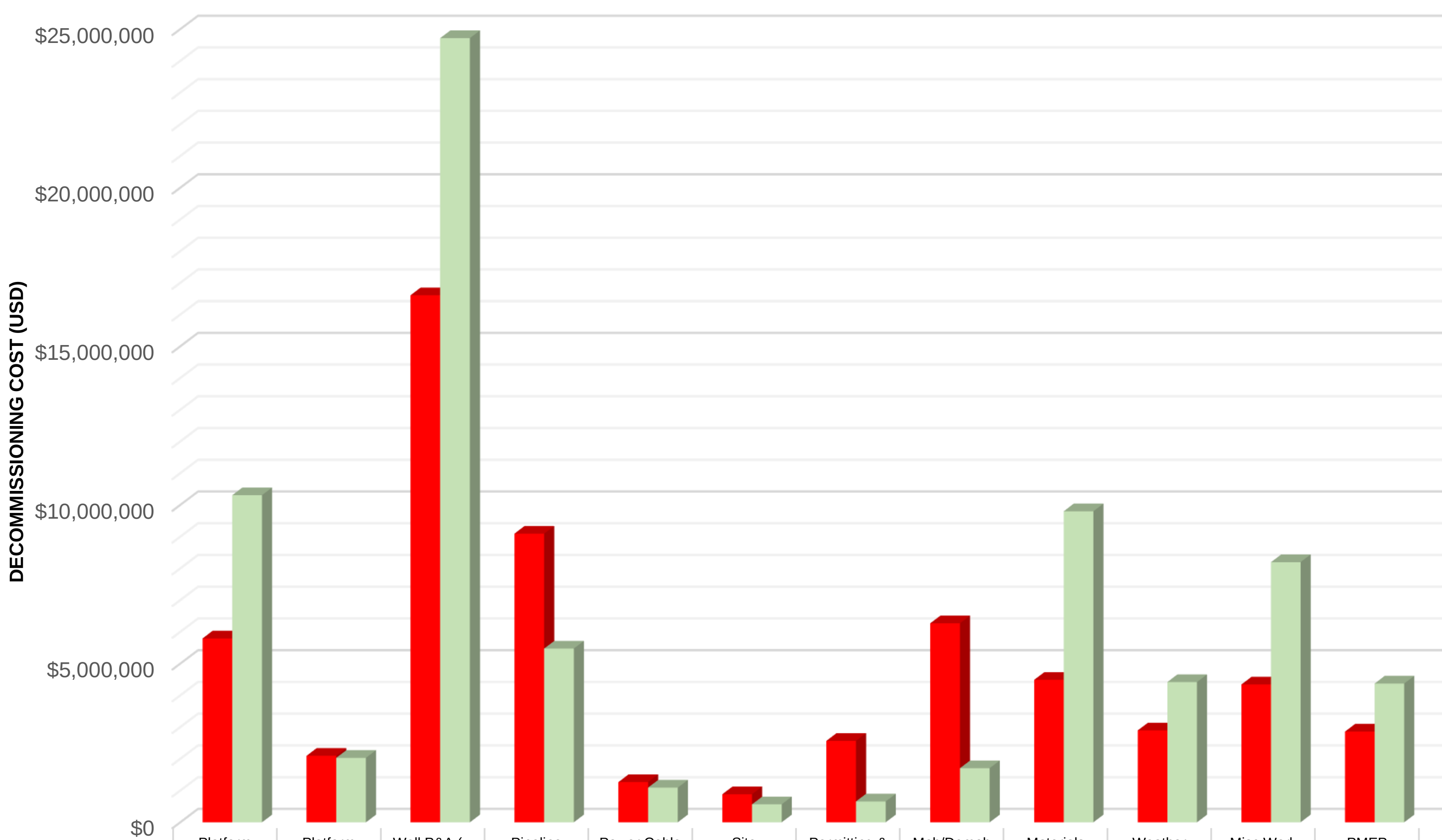
	Platform Removal	Platform Prep	Well P&A (w CR)	Pipeline Decommissioning	Power Cable Removal	Site Clearance	Permitting & Reg.	Mob/Demob of Derrick Barge	Materials Disposal	Weather Contingency	Misc.Work Provision	PMEP
Eureka 2016	$48,420,784	$2,969,203	$21,529,521	$8,876,961	$373,589	$1,472,000	$2,713,271	$4,702,500	$13,668,746	$3,139,331	$9,417,994	$6,691,365
Eureka 2020	$32,457,600	$4,685,600	$27,042,400	$4,753,000	$313,100	$776,600	$657,000	$1,704,400	$20,140,100	$3,501,400	$13,623,800	$7,266,000

Platform Gail-Decommissioning Costs by Task and Year



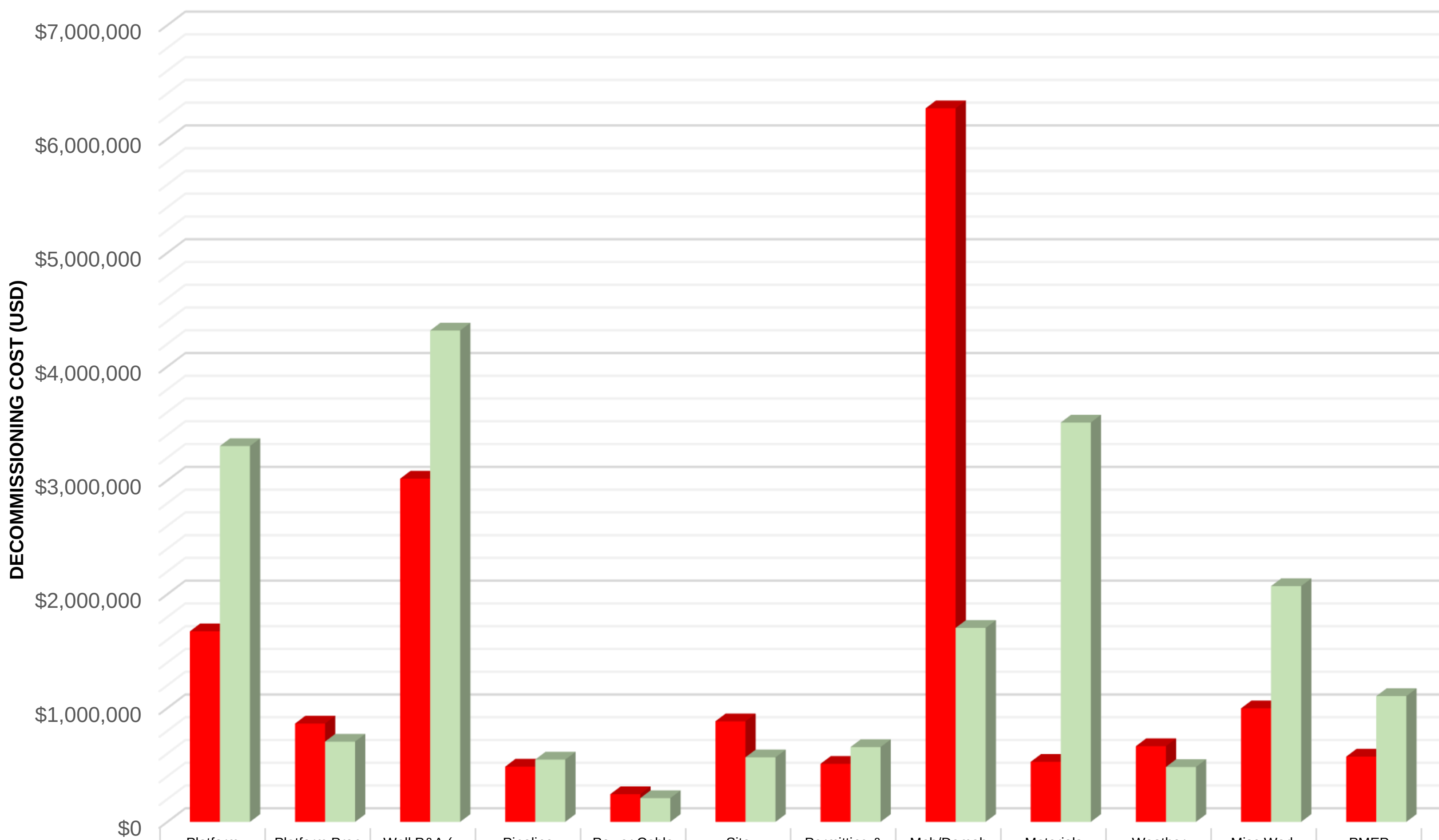
	Platform Removal	Platform Prep	Well P&A (w CR)	Pipeline Decommissioning	Power Cable Removal	Site Clearance	Permitting & Reg.	Mob/Demob of Derrick Barge	Materials Disposal	Weather Contingency	Misc.Work Provision	PMEP
Gail 2016	$44,376,544	$3,669,809	$12,054,028	$3,440,911	$-	$1,472,000	$1,190,846	$3,135,000	$14,650,776	$5,857,546	$8,786,319	$5,201,063
Gail 2020	$32,941,700	$3,885,900	$14,941,400	$2,858,800	$-	$776,600	$702,000	$1,833,700	$18,898,800	$5,540,400	$11,250,800	$6,000,400

Platform Gilda-Decommissioning Costs by Task and Year



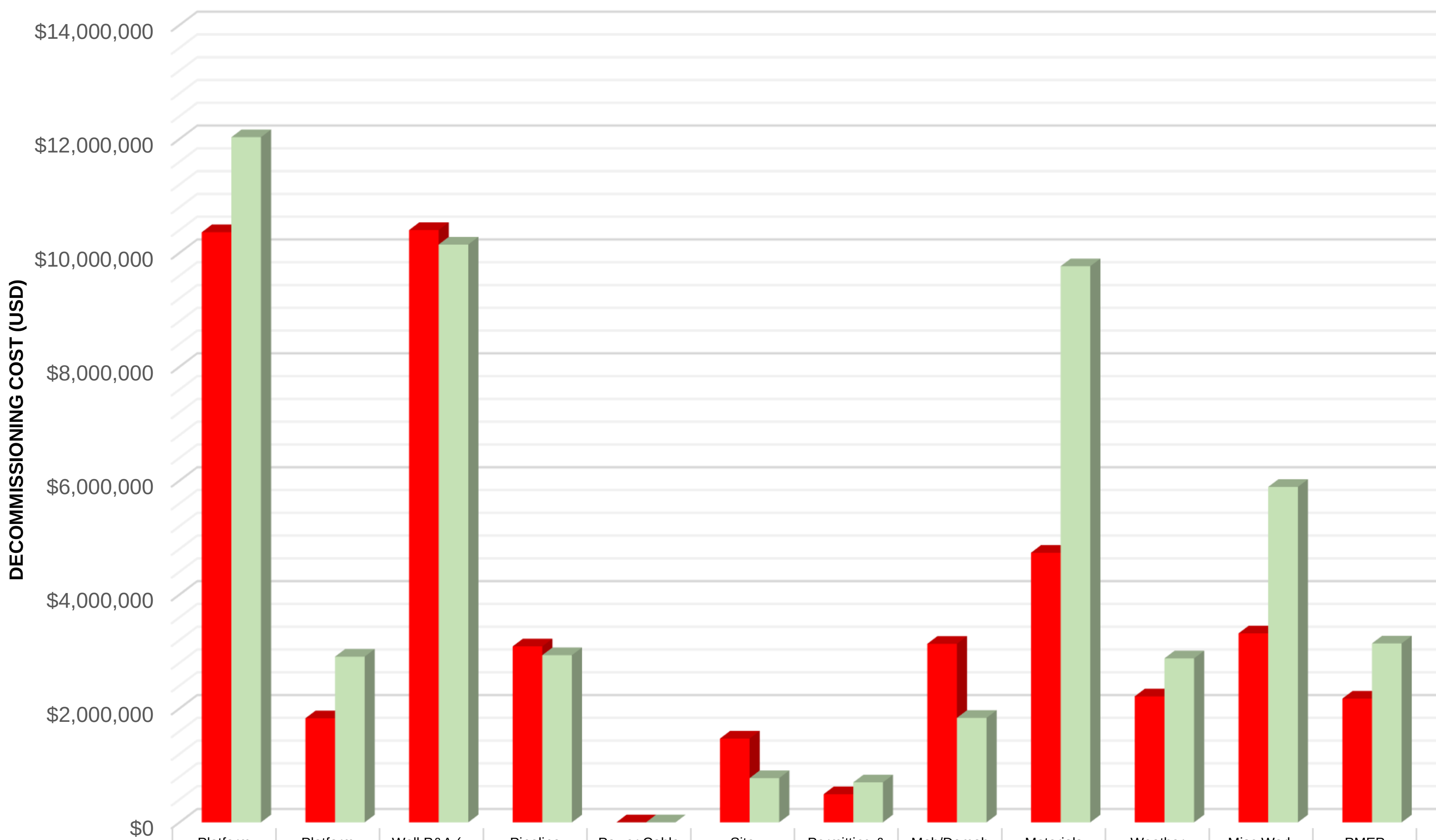
	Platform Removal	Platform Prep	Well P&A (w CR)	Pipeline Decommissioning	Power Cable Removal	Site Clearance	Permitting & Reg.	Mob/Demob of Derrick Barge	Materials Disposal	Weather Contingency	Misc.Work Provision	PMEP
Gilda 2016	$5,793,544	$2,096,094	$16,608,830	$9,094,834	$1,267,549	$884,000	$2,565,674	$6,270,000	$4,489,009	$2,895,640	$4,343,460	$2,859,588
Gilda 2020	$10,305,500	$2,030,900	$24,717,000	$5,474,400	$1,093,500	$566,800	$657,000	$1,704,400	$9,800,900	$4,418,800	$8,196,900	$4,371,700

Platform Gina-Decommissioning Costs by Task and Year



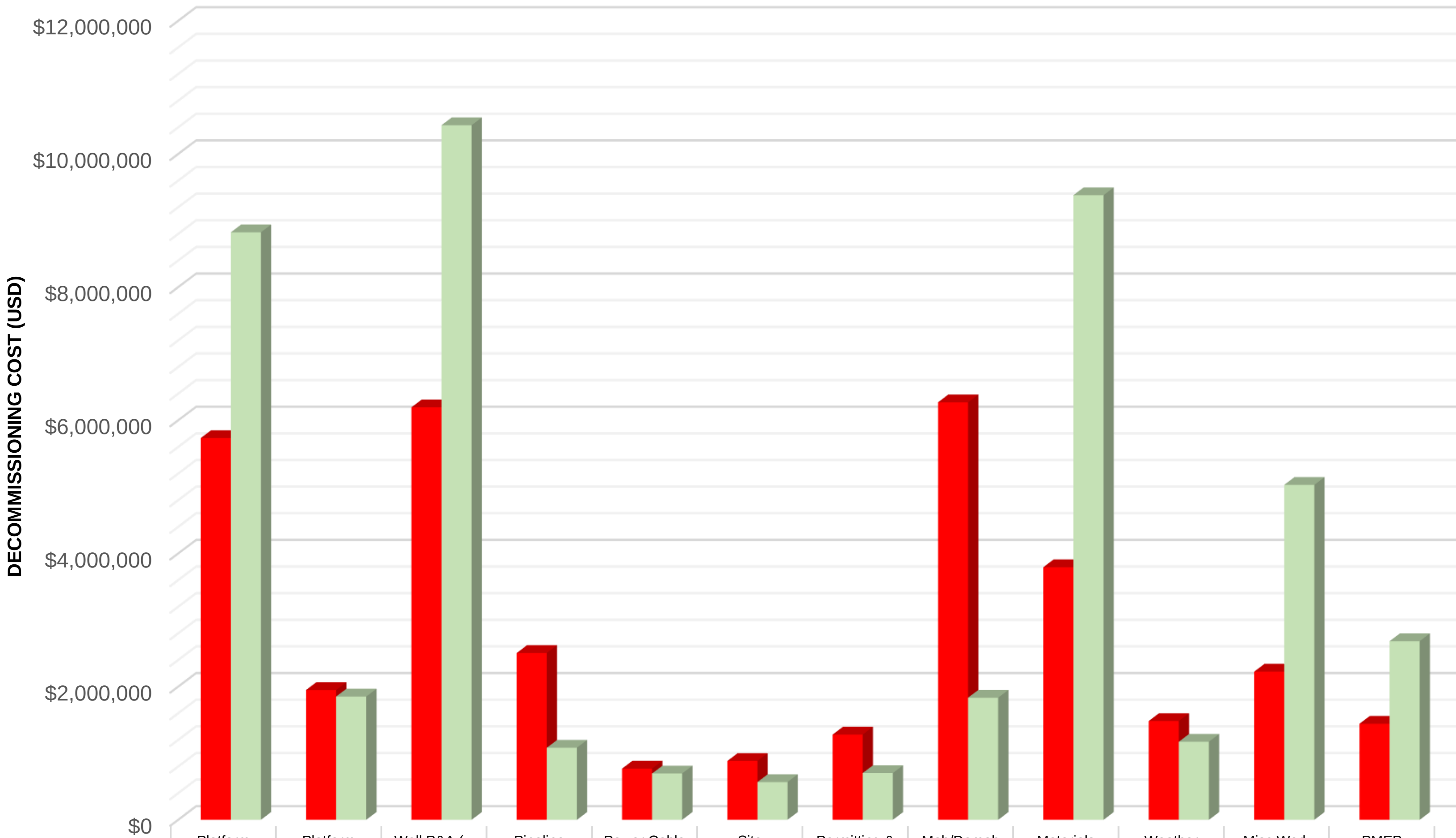
	Platform Removal	Platform Prep	Well P&A (w CR)	Pipeline Decommissioning	Power Cable Removal	Site Clearance	Permitting & Reg.	Mob/Demob of Derrick Barge	Materials Disposal	Weather Contingency	Misc.Work Provision	PMEP
Gina 2016	$1,674,634	$864,100	$3,015,698	$485,330	$243,574	$884,000	$509,672	$6,270,000	$527,913	$665,057	$997,585	$573,387
Gina 2020	$3,302,000	$705,100	$4,317,000	$547,100	$208,600	$566,800	$657,000	$1,704,400	$3,508,800	$482,300	$2,071,900	$1,105,000

Platform Grace-Decommissioning Costs by Task and Year



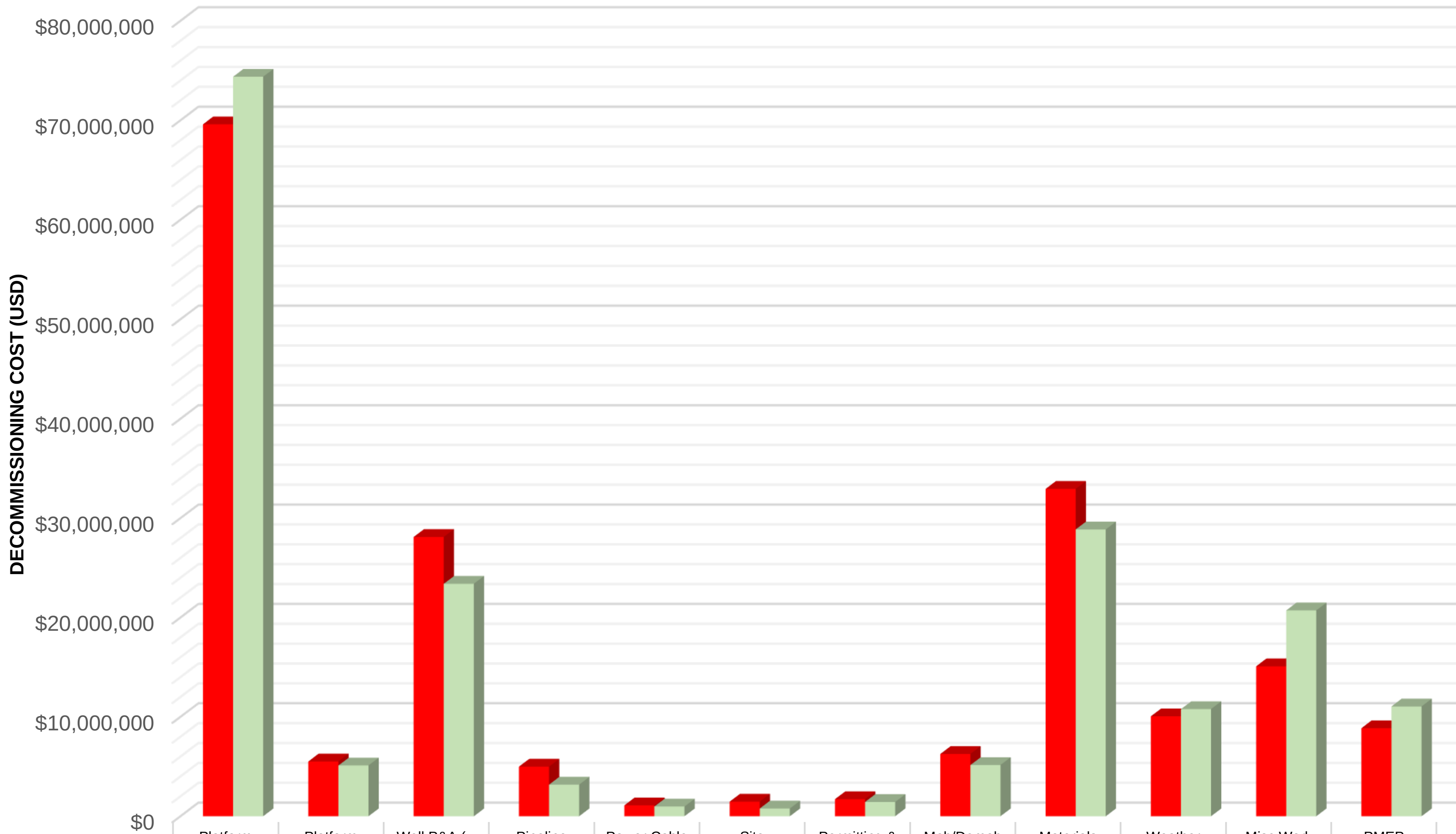
	Platform Removal	Platform Prep	Well P&A (w CR)	Pipeline Decommissioning	Power Cable Removal	Site Clearance	Permitting & Reg.	Mob/Demob of Derrick Barge	Materials Disposal	Weather Contingency	Misc.Work Provision	PMEP
Grace 2016	$10,362,874	$1,826,637	$10,400,751	$3,090,490	$-	$1,472,000	$494,498	$3,135,000	$4,734,088	$2,212,254	$3,318,381	$2,172,220
Grace 2020	$12,030,900	$2,909,900	$10,145,800	$2,935,000	$-	$776,600	$702,000	$1,833,700	$9,764,700	$2,879,800	$5,889,700	$3,141,200

Platform Habitat-Decommissioning Costs by Task and Year



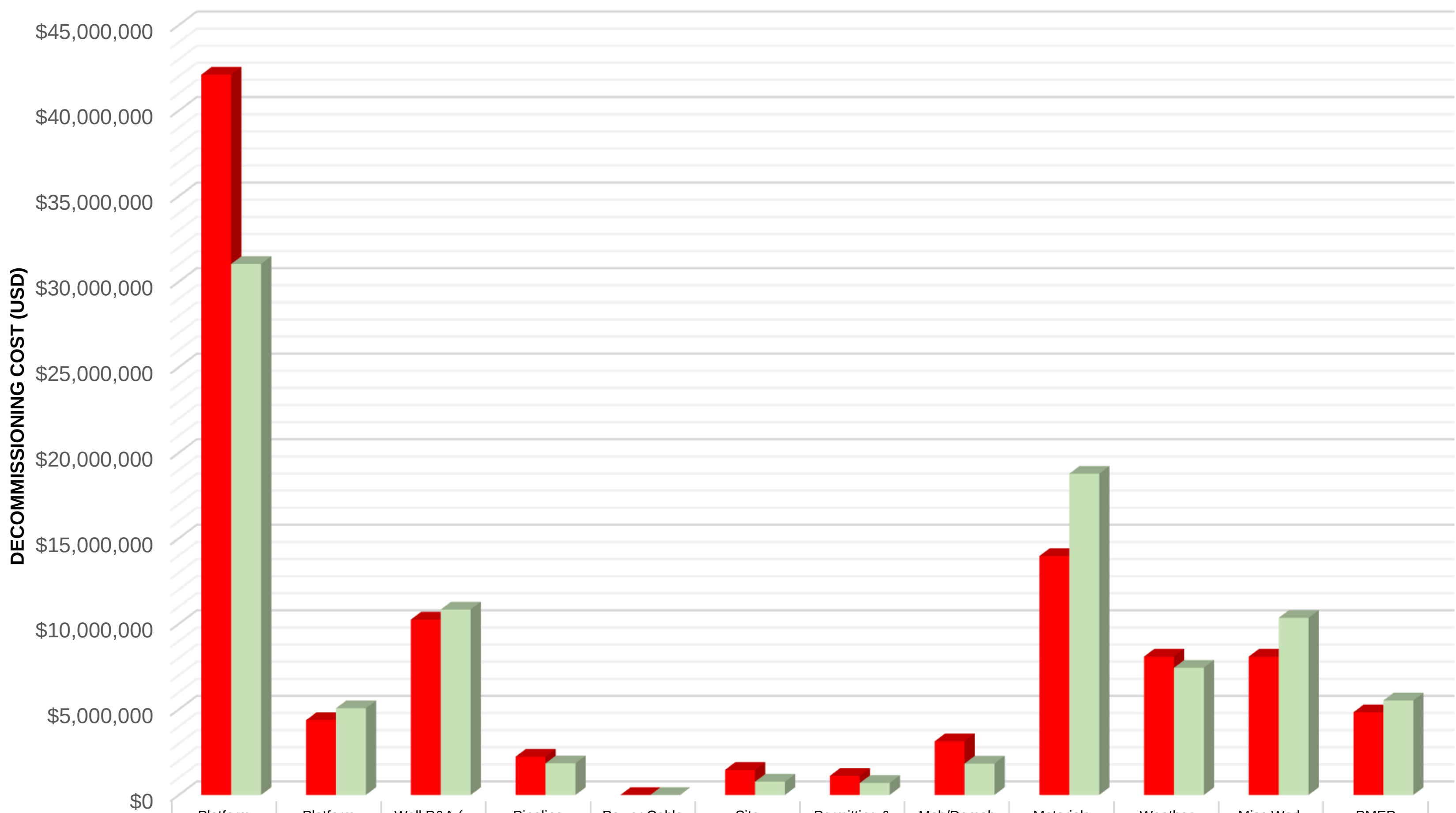
	Platform Removal	Platform Prep	Well P&A (w CR)	Pipeline Decommissioning	Power Cable Removal	Site Clearance	Permitting & Reg.	Mob/Demob of Derrick Barge	Materials Disposal	Weather Contingency	Misc.Work Provision	PMEP
Habitat 2016	$5,733,854	$1,949,544	$6,195,224	$2,506,038	$769,029	$884,000	$1,280,654	$6,270,000	$3,793,458	$1,483,552	$2,225,328	$1,443,015
Habitat 2020	$8,823,500	$1,851,200	$10,431,300	$1,082,400	$695,700	$566,800	$702,000	$1,833,700	$9,381,000	$1,172,500	$5,030,100	$2,682,700

Platform Harmony-Decommissioning Costs by Task and Year



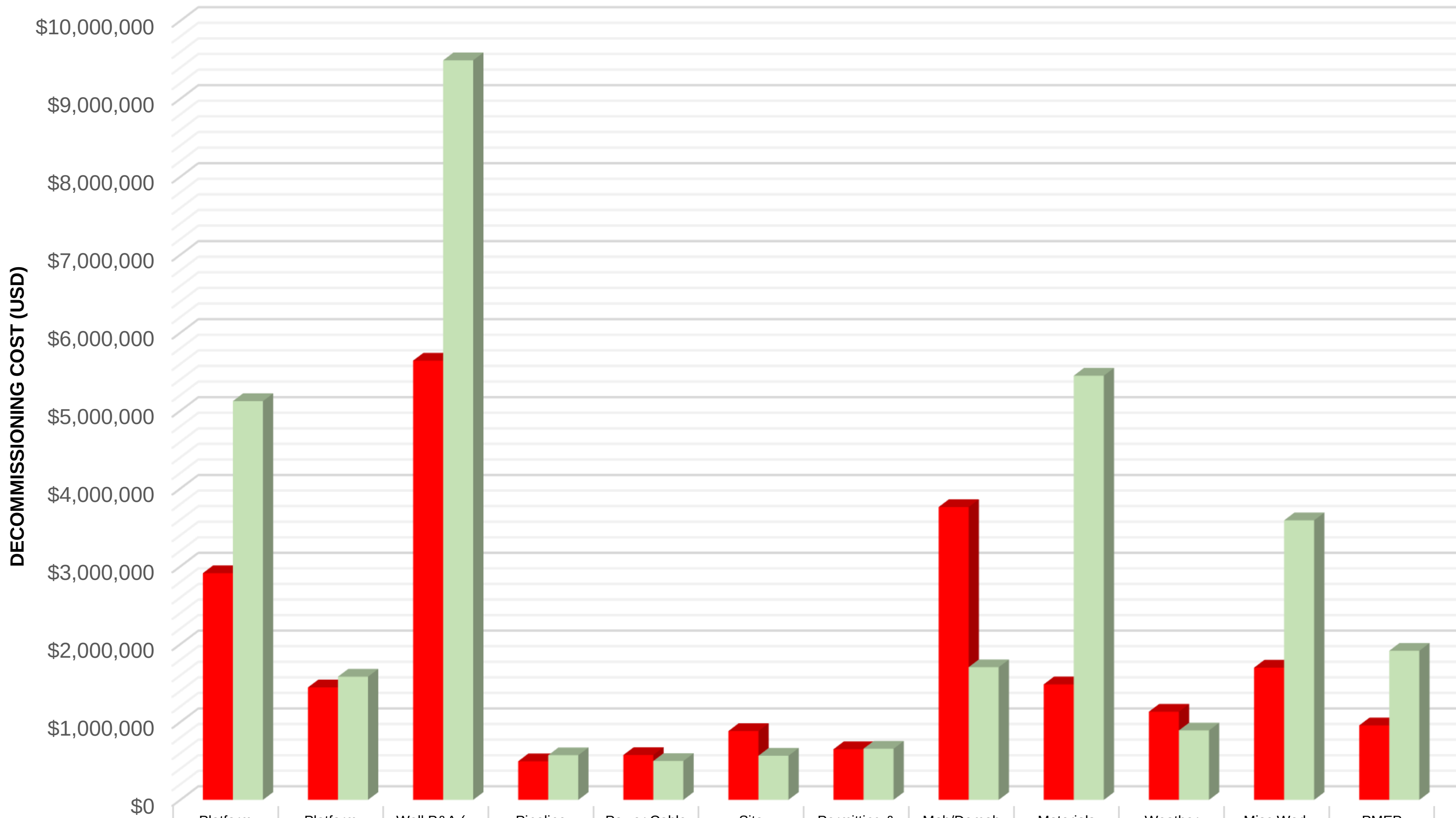
	Platform Removal	Platform Prep	Well P&A (w CR)	Pipeline Decommissioning	Power Cable Removal	Site Clearance	Permitting & Reg.	Mob/Demob of Derrick Barge	Materials Disposal	Weather Contingency	Misc.Work Provision	PMEP
Harmony 2016	$69,600,097	$5,517,050	$28,109,231	$4,993,843	$1,096,054	$1,472,000	$1,720,616	$6,270,000	$32,949,946	$10,059,593	$15,089,390	$8,863,062
Harmony 2020	$74,382,900	$5,108,700	$23,395,100	$3,183,100	$980,000	$776,600	$1,437,000	$5,153,600	$28,865,700	$10,782,600	$20,719,400	$11,050,300

Platform Harvest-Decommissioning Costs by Task and Year



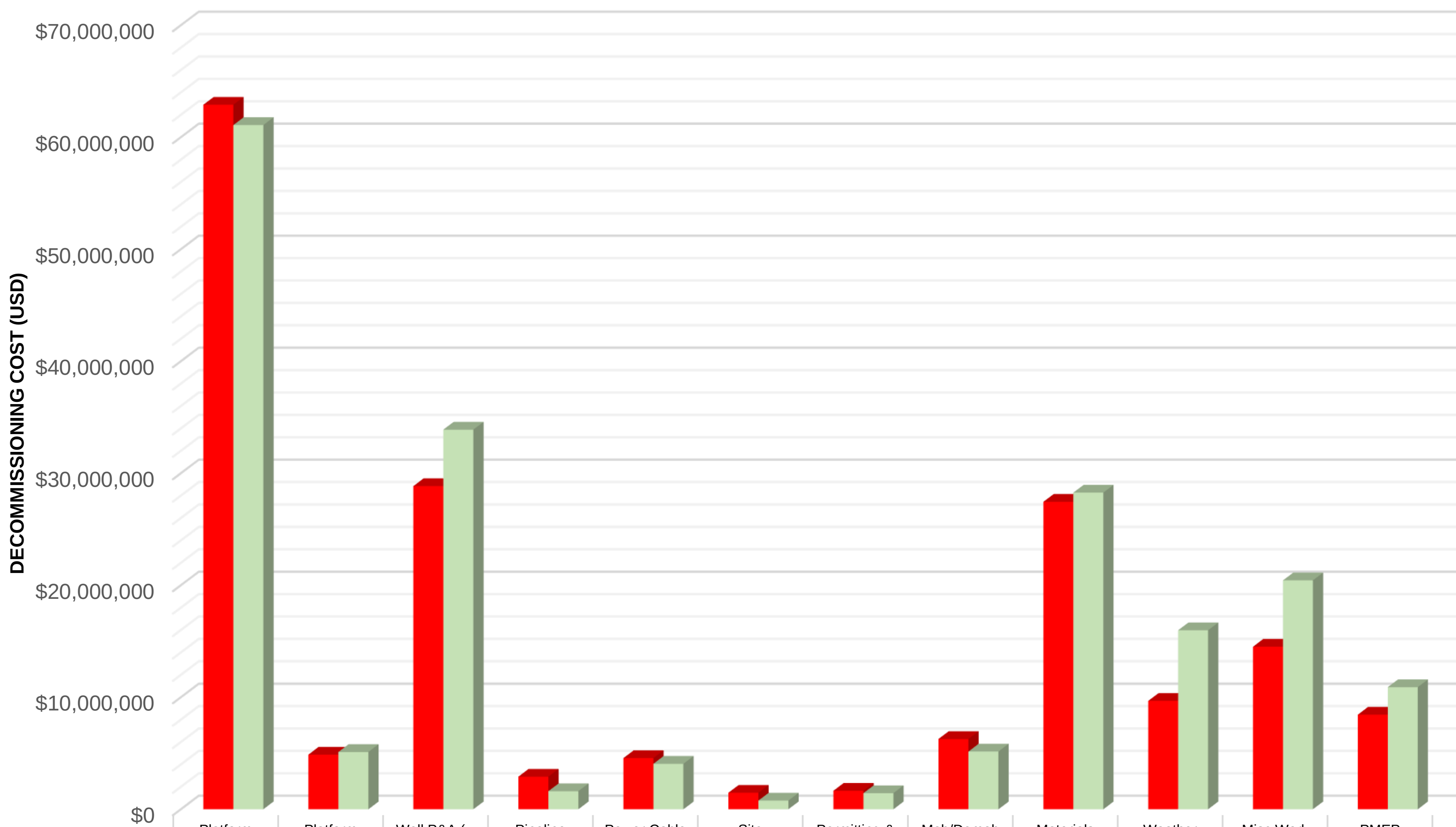
	Platform Removal	Platform Prep	Well P&A (w CR)	Pipeline Decommissioning	Power Cable Removal	Site Clearance	Permitting & Reg.	Mob/Demob of Derrick Barge	Materials Disposal	Weather Contingency	Misc.Work Provision	PMEP
Harvest 2016	$42,101,220	$4,373,249	$10,252,430	$2,240,868	$-	$1,472,000	$1,115,156	$3,135,000	$13,968,013	$8,090,763	$8,090,763	$4,835,181
Harvest 2020	$31,034,400	$5,066,400	$10,838,100	$1,847,300	$-	$776,600	$702,000	$1,833,700	$18,774,900	$7,434,400	$10,356,000	$5,523,200

Platform Henry-Decommissioning Costs by Task and Year

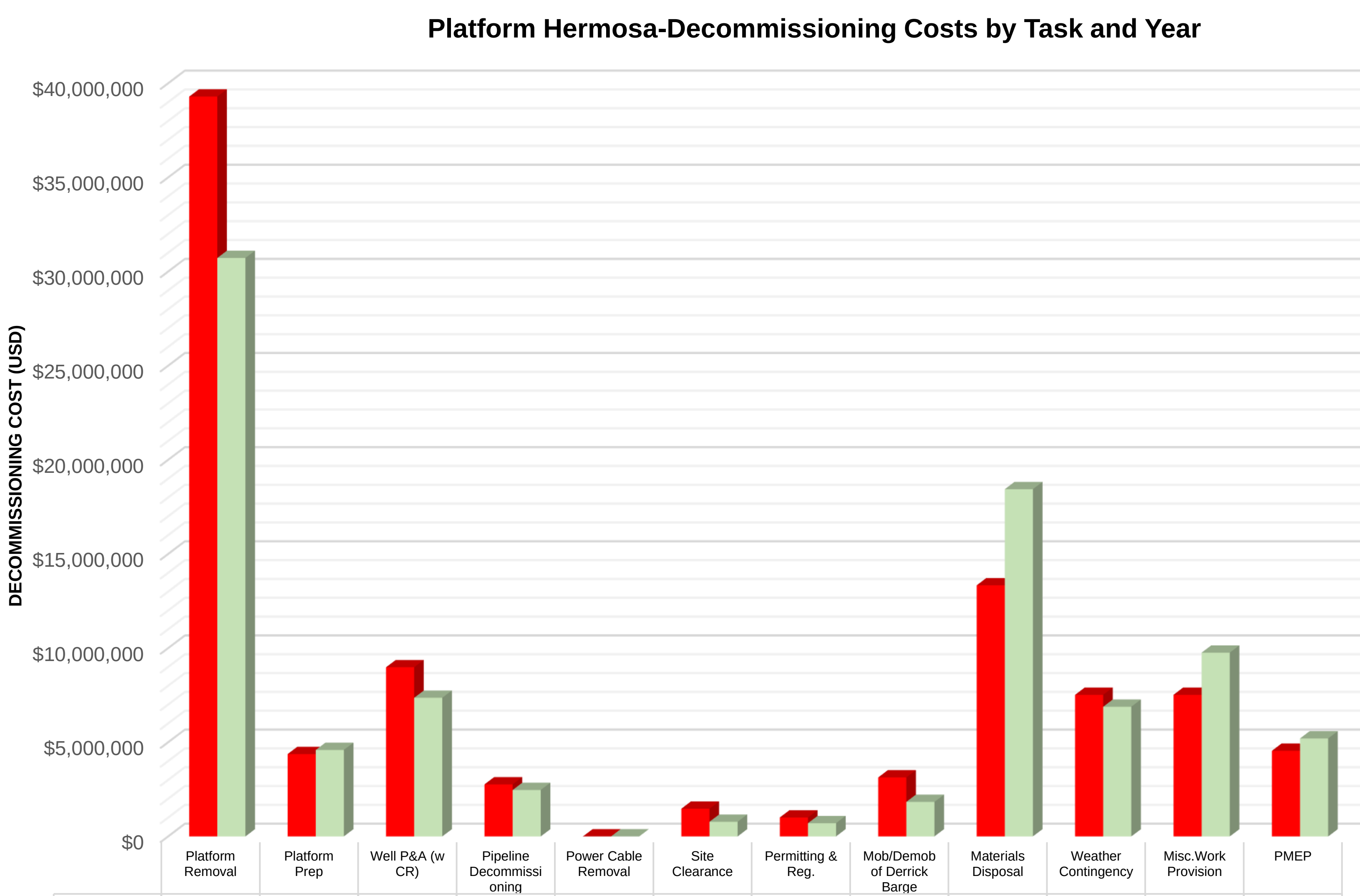


	Platform Removal	Platform Prep	Well P&A (w CR)	Pipeline Decommissioning	Power Cable Removal	Site Clearance	Permitting & Reg.	Mob/Demob of Derrick Barge	Materials Disposal	Weather Contingency	Misc.Work Provision	PMEP
Henry 2016	$2,913,049	$1,445,091	$5,642,716	$495,927	$575,920	$884,000	$650,555	$3,762,000	$1,483,738	$1,132,804	$1,699,207	$956,536
Henry 2020	$5,123,400	$1,583,000	$9,492,800	$573,400	$499,200	$566,800	$657,000	$1,704,400	$5,449,500	$891,900	$3,591,800	$1,915,600

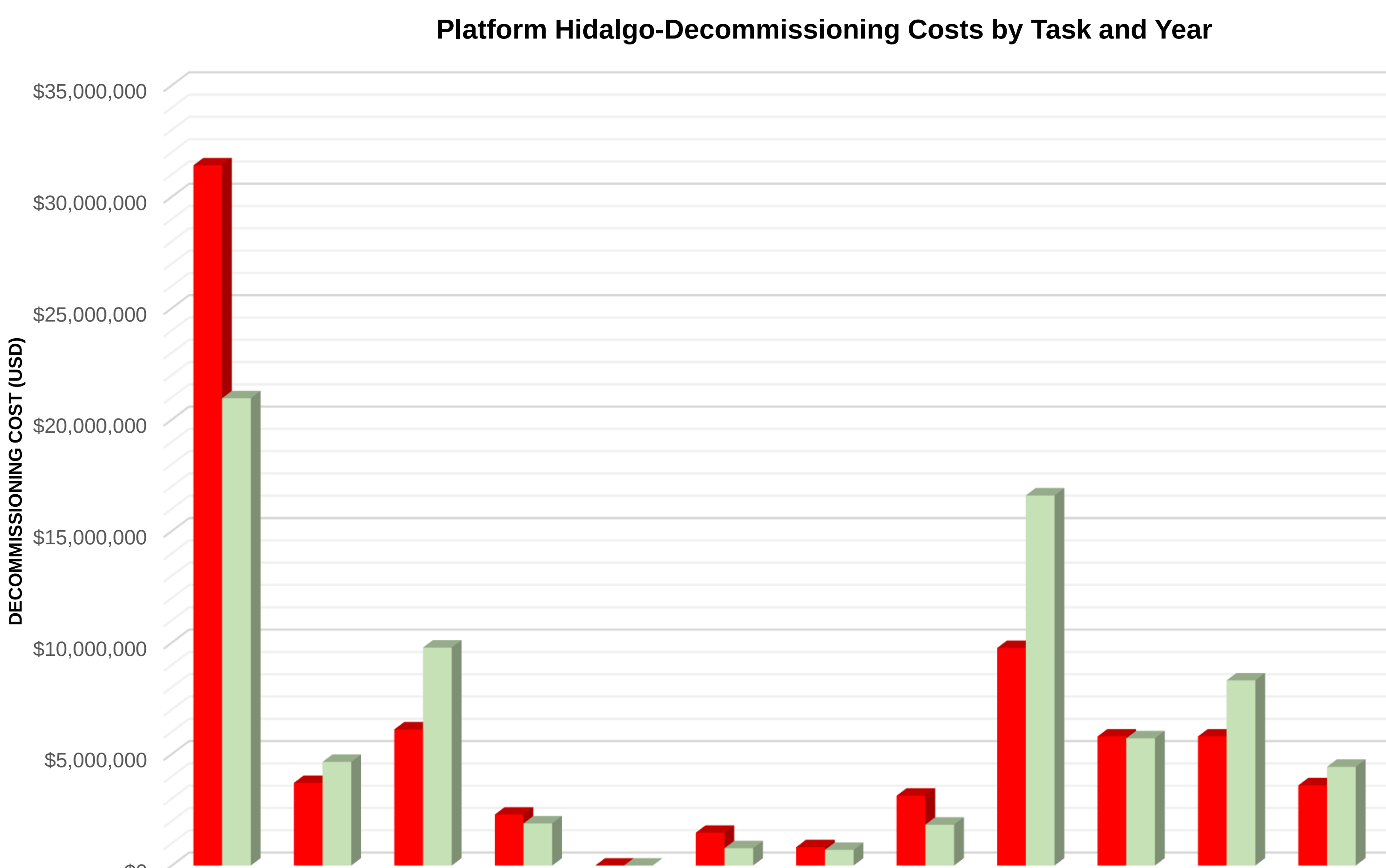
Platform Heritage-Decommissioning Costs by Task and Year



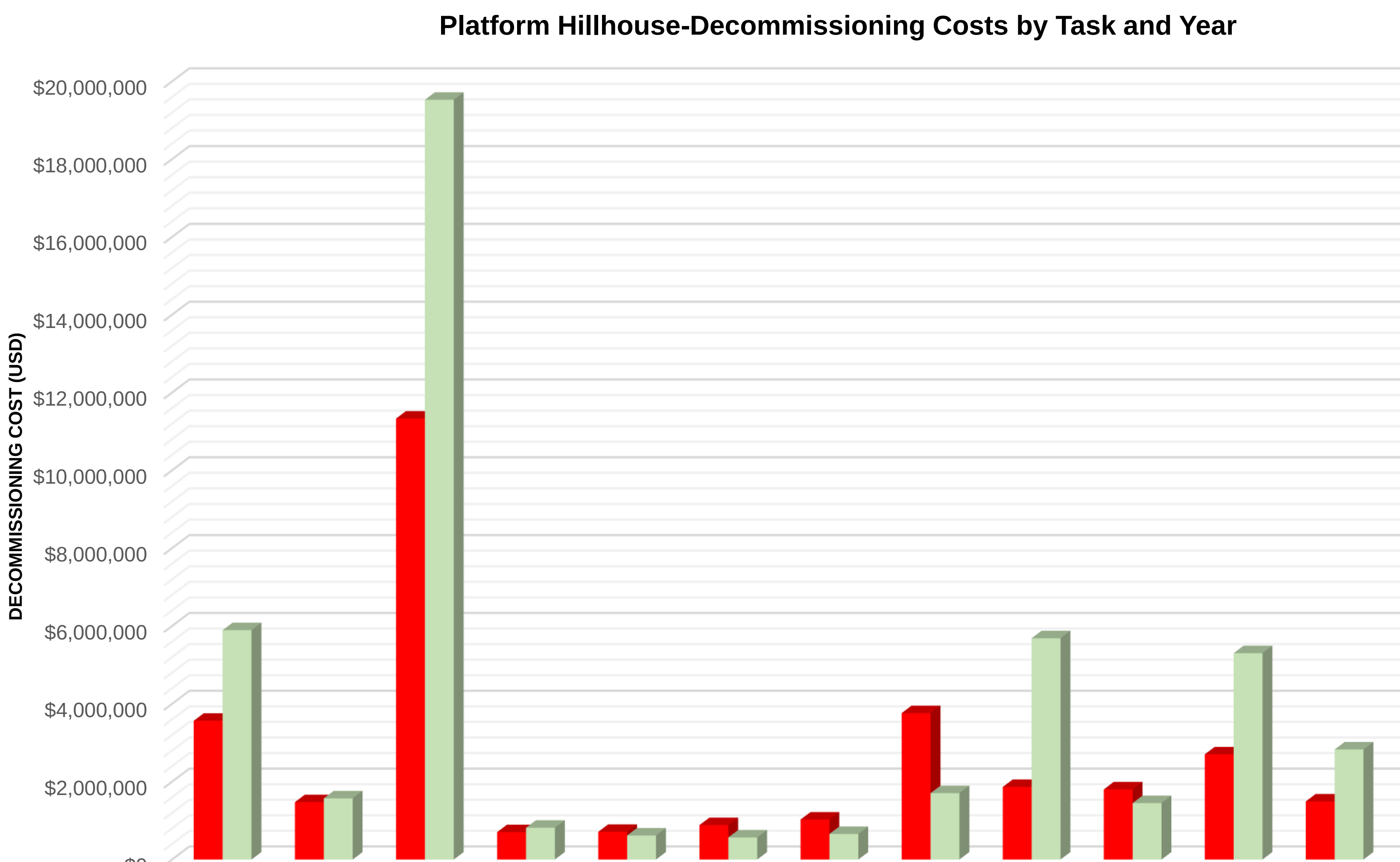
	Platform Removal	Platform Prep	Well P&A (w CR)	Pipeline Decommissioning	Power Cable Removal	Site Clearance	Permitting & Reg.	Mob/Demob of Derrick Barge	Materials Disposal	Weather Contingency	Misc.Work Provision	PMEP
Heritage 2016	$62,903,120	$4,879,143	$28,854,304	$2,909,824	$4,570,411	$1,472,000	$1,650,938	$6,270,000	$27,453,469	$9,677,484	$14,516,226	$8,447,104
Heritage 2020	$61,088,800	$5,111,500	$33,892,500	$1,610,700	$4,059,900	$776,600	$1,437,000	$5,153,600	$28,271,300	$15,981,000	$20,437,200	$10,899,900



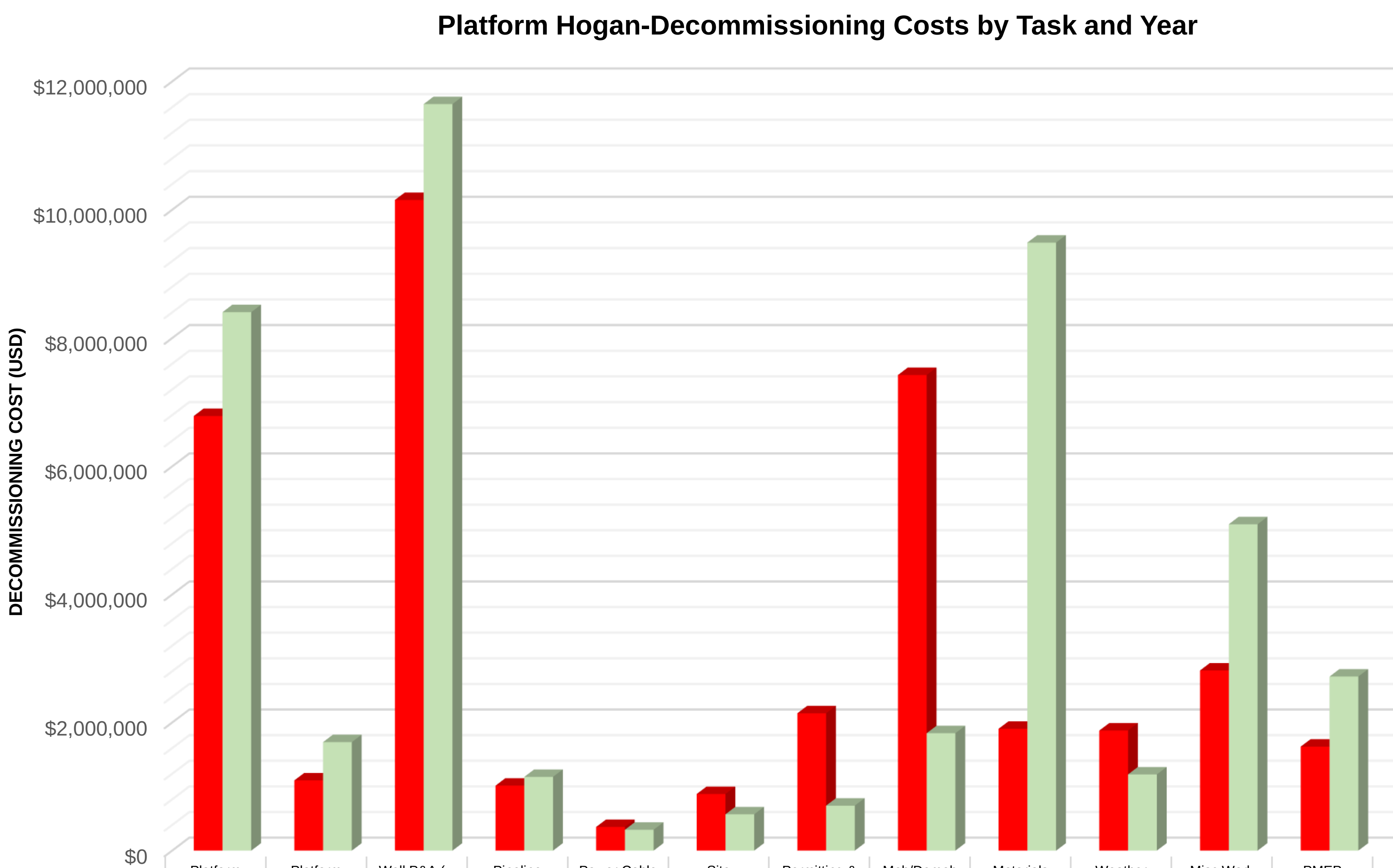
	Platform Removal	Platform Prep	Well P&A (w CR)	Pipeline Decommissioning	Power Cable Removal	Site Clearance	Permitting & Reg.	Mob/Demob of Derrick Barge	Materials Disposal	Weather Contingency	Misc.Work Provision	PMEP
Hermosa 2016	$39,296,869	$4,373,249	$8,985,014	$2,763,334	$-	$1,472,000	$1,004,204	$3,135,000	$13,337,540	$7,521,140	$7,521,140	$4,551,237
Hermosa 2020	$30,724,600	$4,593,200	$7,363,600	$2,465,600	$-	$776,600	$702,000	$1,833,700	$18,442,400	$6,888,500	$9,760,200	$5,205,400



	Platform Removal	Platform Prep	Well P&A (w CR)	Pipeline Decommissioning	Power Cable Removal	Site Clearance	Permitting & Reg.	Mob/Demob of Derrick Barge	Materials Disposal	Weather Contingency	Misc.Work Provision	PMEP
Hidalgo 2016	$31,410,271	$3,707,793	$6,105,698	$2,286,225	$-	$1,472,000	$827,534	$3,135,000	$9,756,575	$5,789,512	$5,789,512	$3,598,559
Hidalgo 2020	$20,957,200	$4,650,000	$9,775,100	$1,889,000	$-	$776,600	$702,000	$1,833,700	$16,597,500	$5,707,200	$8,302,100	$4,427,800

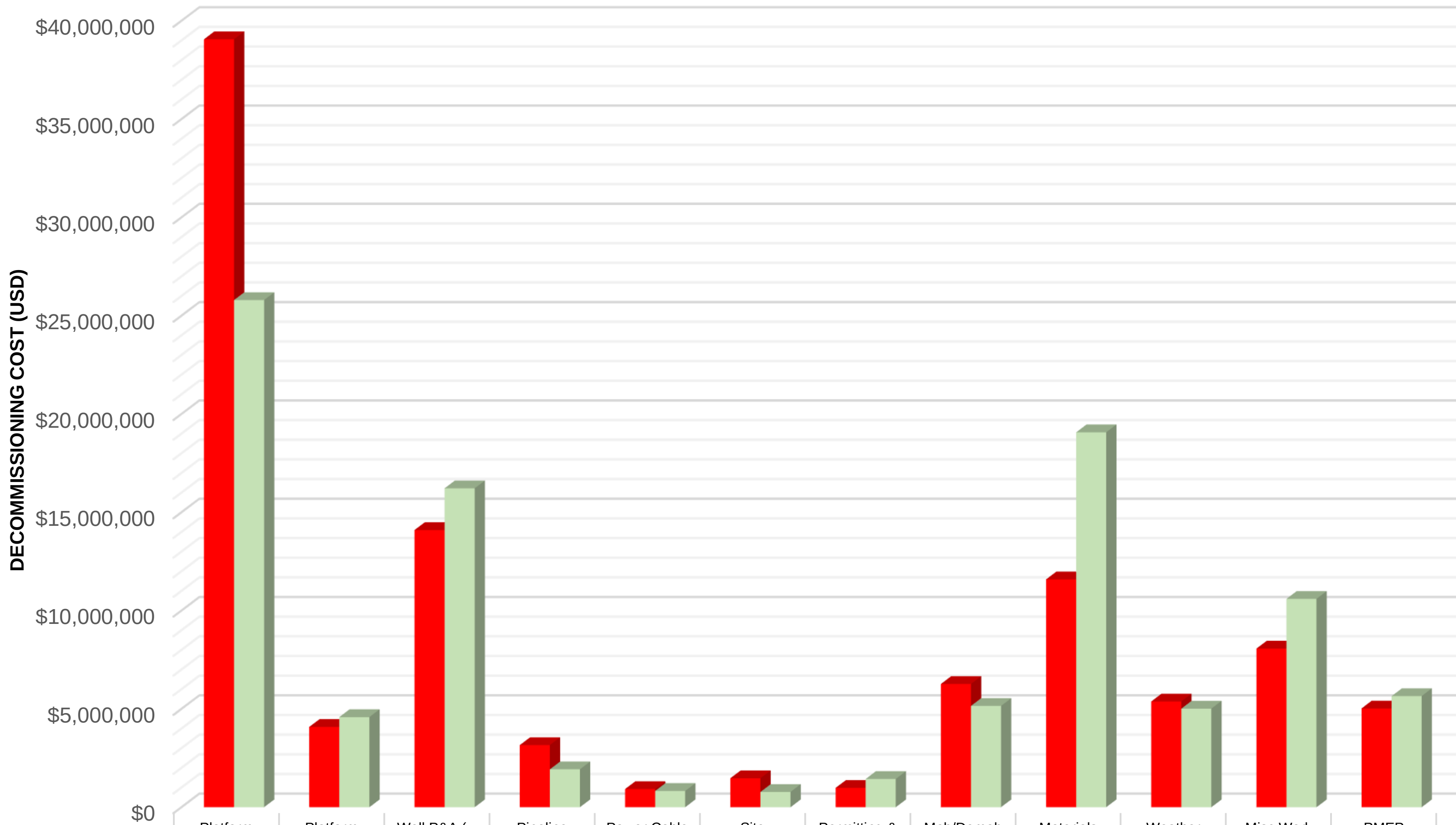


	Platform Removal	Platform Prep	Well P&A (w CR)	Pipeline Decommissioning	Power Cable Removal	Site Clearance	Permitting & Reg.	Mob/Demob of Derrick Barge	Materials Disposal	Weather Contingency	Misc.Work Provision	PMEP
Hillhouse 2016	$3,565,764	$1,474,401	$11,330,300	$704,681	$711,880	$884,000	$1,026,487	$3,762,000	$1,865,735	$1,801,778	$2,702,666	$1,493,682
Hillhouse 2020	$5,893,100	$1,572,200	$19,526,100	$815,600	$618,000	$566,800	$657,000	$1,704,400	$5,686,400	$1,449,600	$5,300,300	$2,826,800



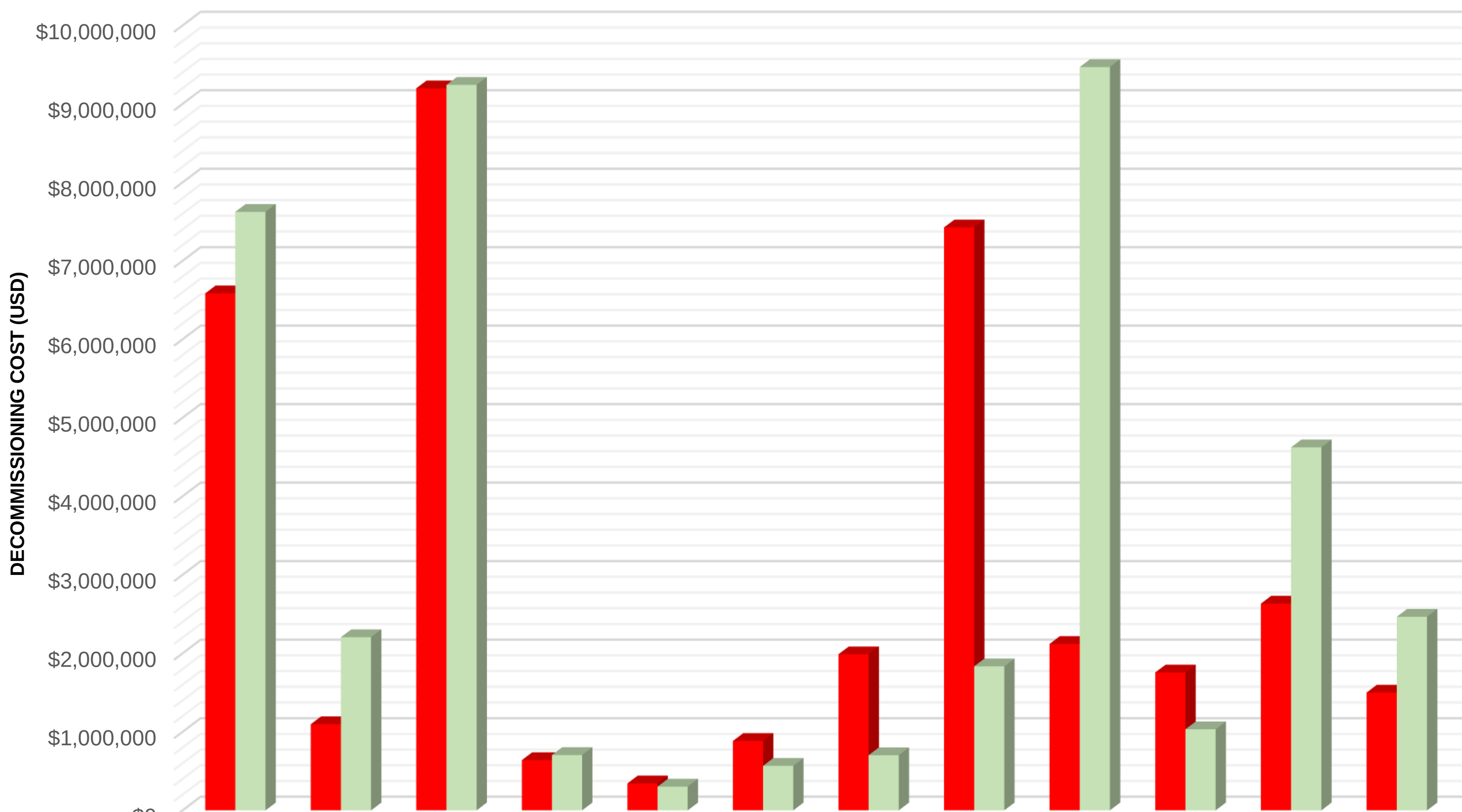
	Platform Removal	Platform Prep	Well P&A (w CR)	Pipeline Decommissioning	Power Cable Removal	Site Clearance	Permitting & Reg.	Mob/Demob of Derrick Barge	Materials Disposal	Weather Contingency	Misc.Work Provision	PMEP
Hogan 2016	$6,786,432	$1,096,971	$10,153,062	$1,014,770	$369,971	$884,000	$2,144,518	$7,425,000	$1,902,952	$1,875,489	$2,813,234	$1,624,417
Hogan 2020	$8,404,300	$1,694,300	$11,647,500	$1,151,400	$325,900	$566,800	$702,000	$1,833,700	$9,488,500	$1,189,500	$5,097,100	$2,718,500

Platform Hondo-Decommissioning Costs by Task and Year

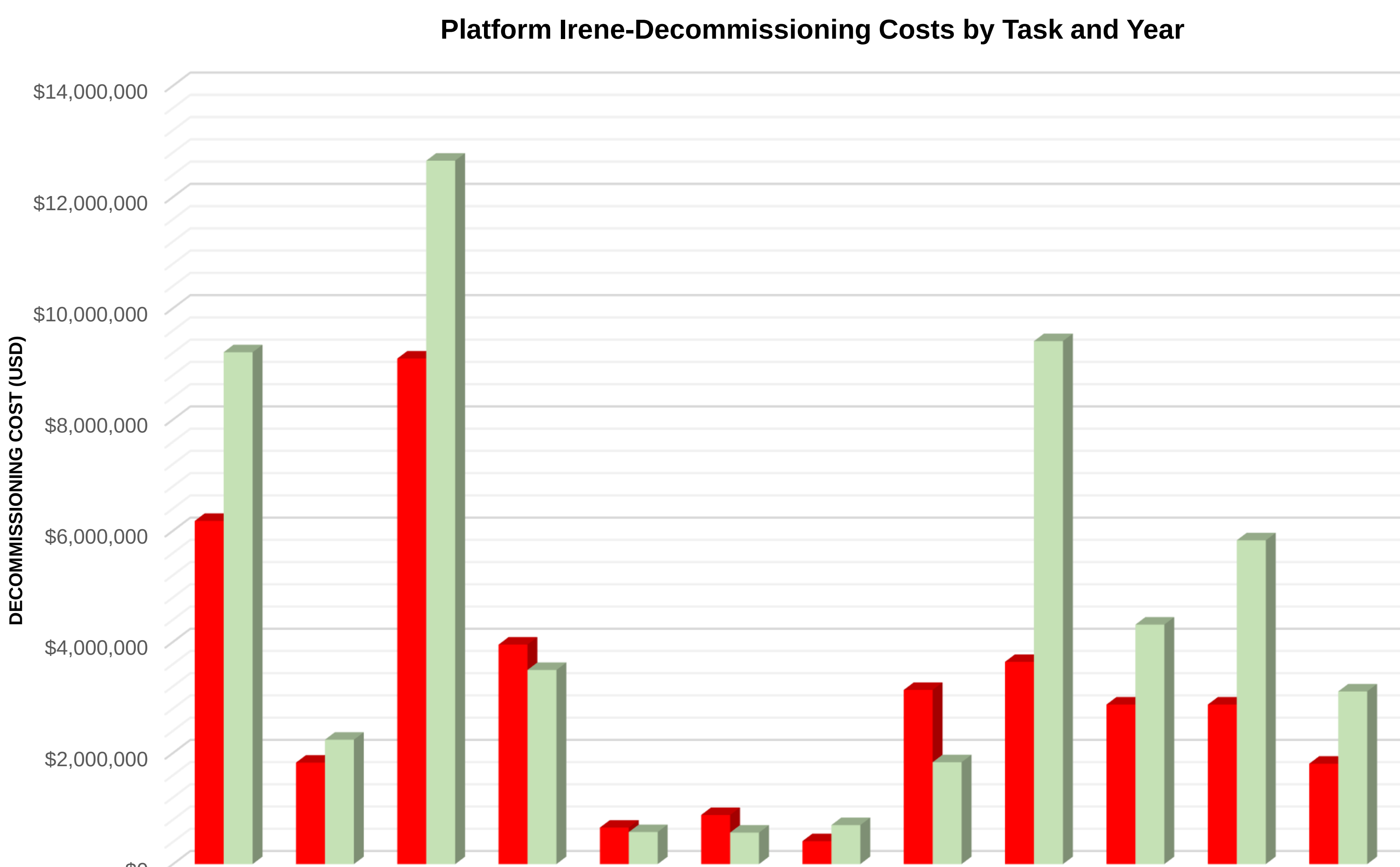


	Platform Removal	Platform Prep	Well P&A (w CR)	Pipeline Decommissioning	Power Cable Removal	Site Clearance	Permitting & Reg.	Mob/Demob of Derrick Barge	Materials Disposal	Weather Contingency	Misc.Work Provision	PMEP
Hondo 2016	$39,062,688	$4,085,816	$14,098,171	$3,158,141	$922,327	$1,472,000	$984,446	$6,270,000	$11,588,796	$5,379,072	$8,068,609	$5,023,931
Hondo 2020	$25,795,800	$4,582,400	$16,222,000	$1,928,200	$828,100	$776,600	$1,437,000	$5,153,600	$19,070,300	$5,013,300	$10,596,100	$5,651,200

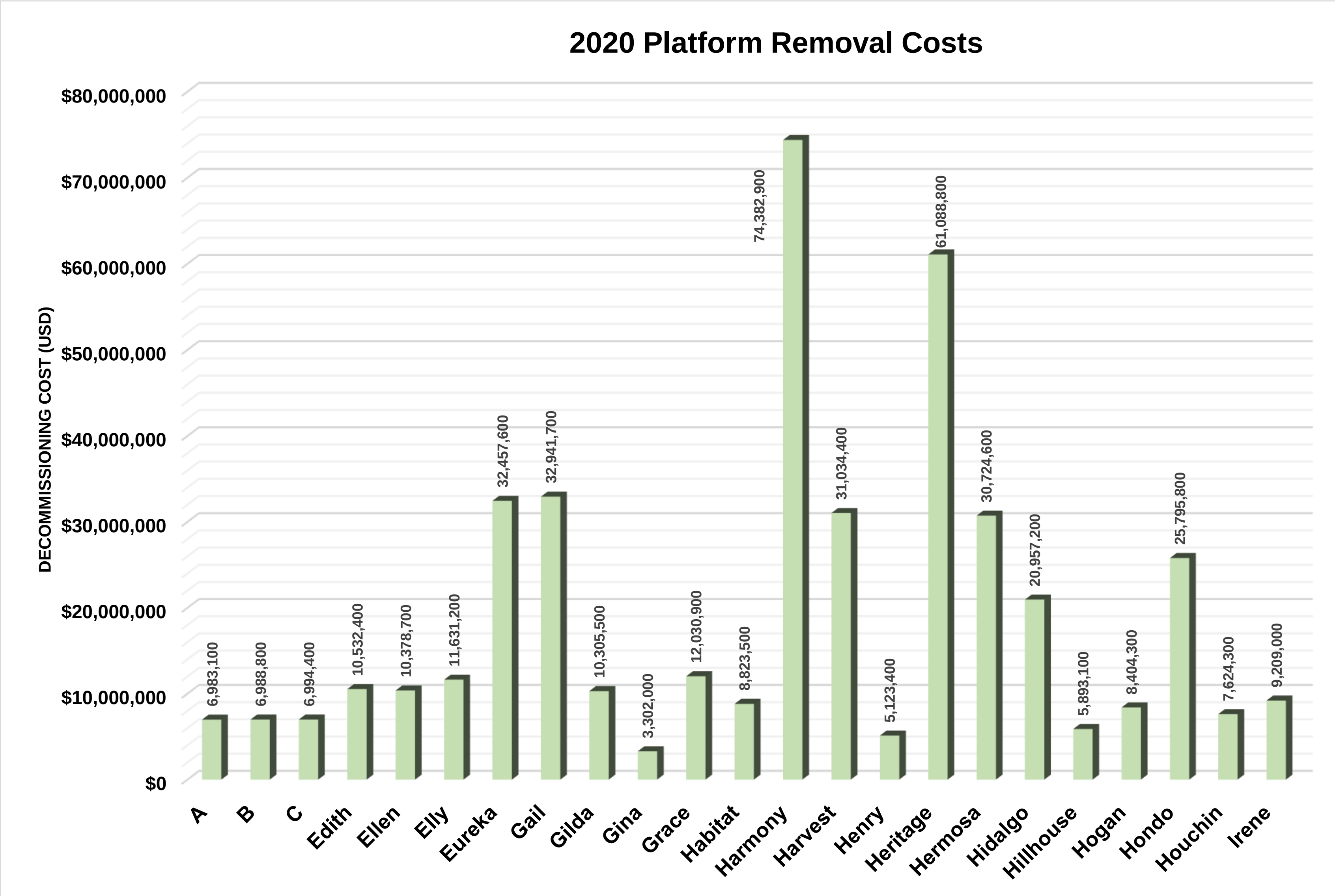
Platform Houchin-Decommissioning Costs by Task and Year

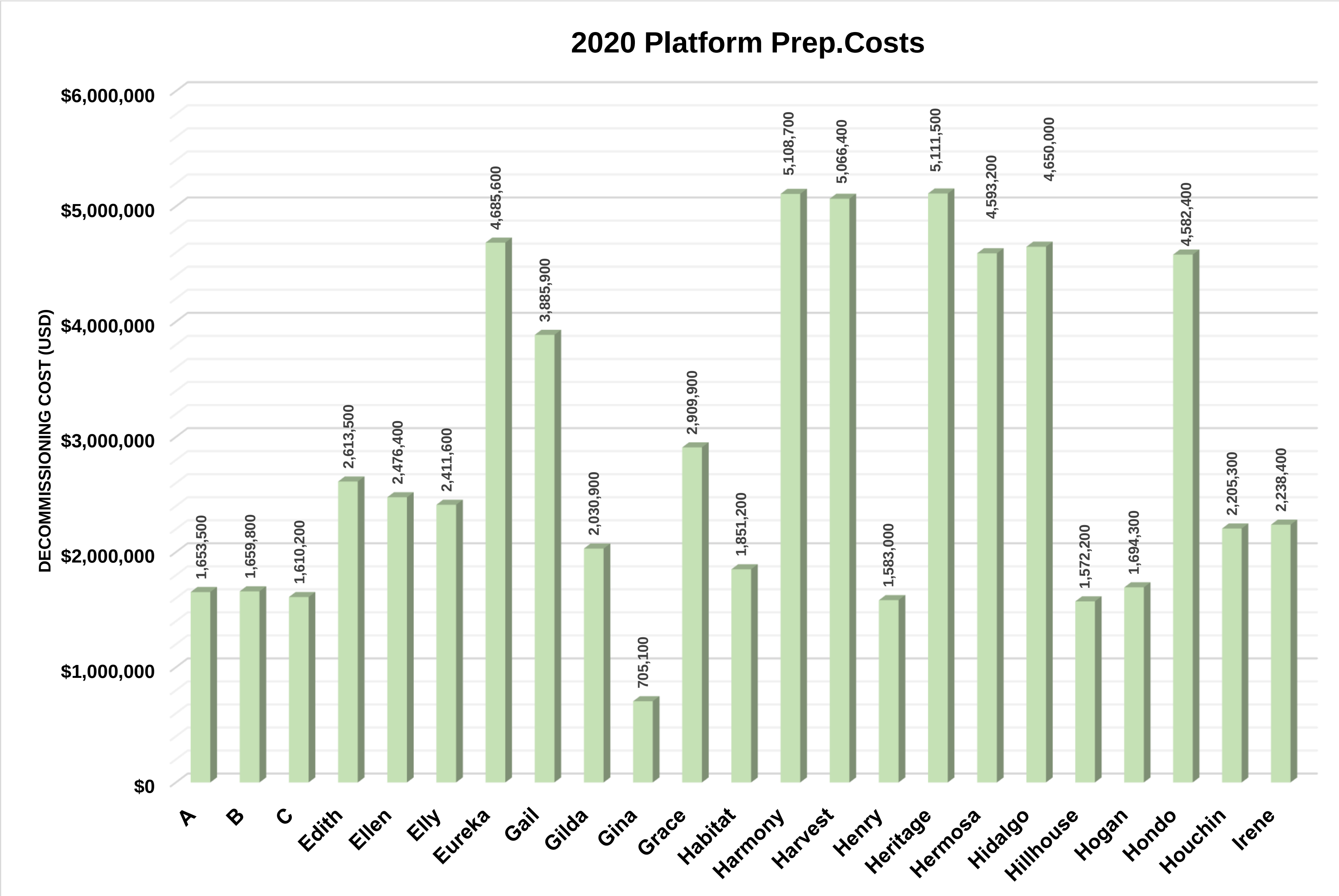


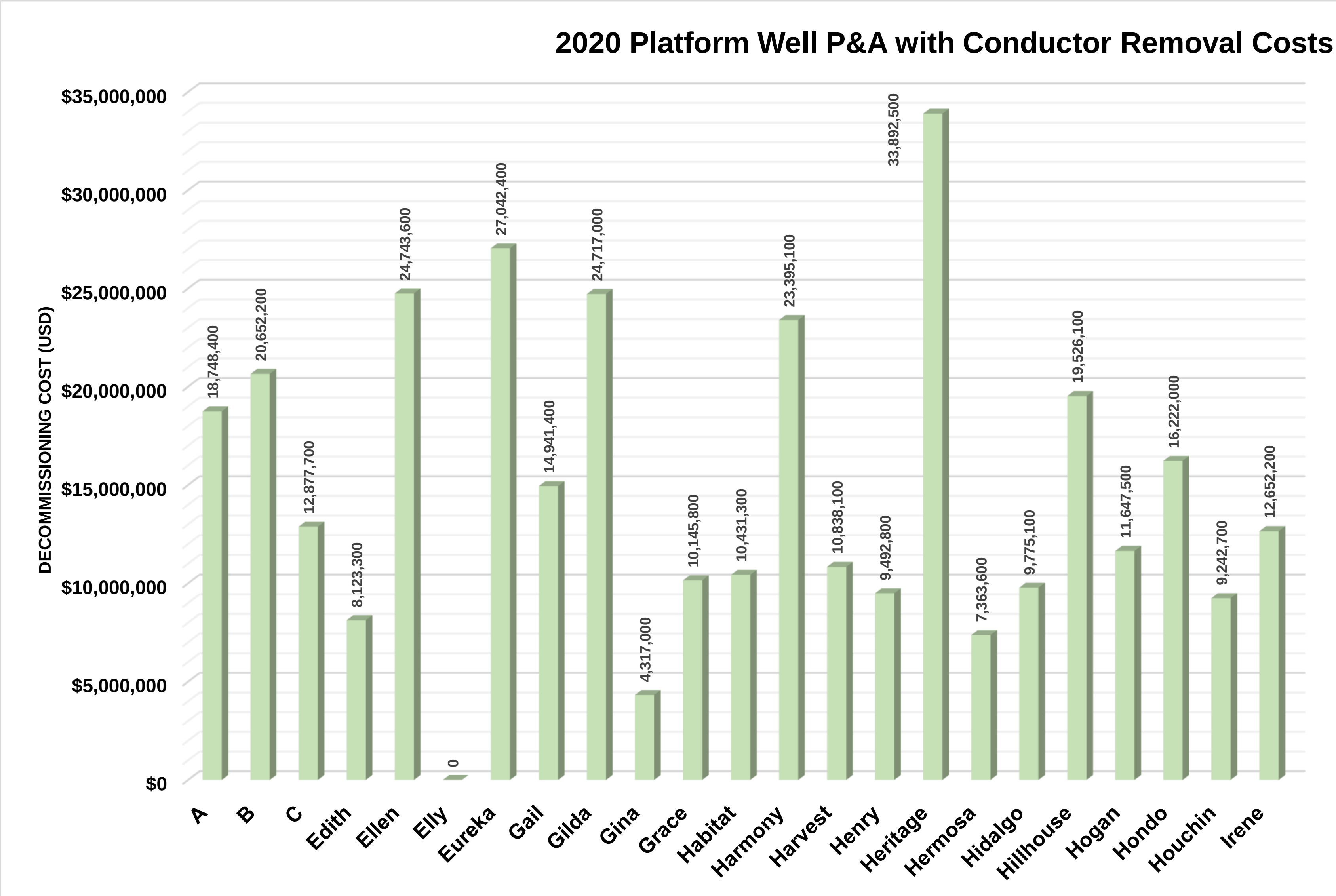
	Platform Removal	Platform Prep	Well P&A (w CR)	Pipeline Decommissioning	Power Cable Removal	Site Clearance	Permitting & Reg.	Mob/Demob of Derrick Barge	Materials Disposal	Weather Contingency	Misc.Work Provision	PMEP
Houchin 2016	$6,585,043	$1,096,971	$9,198,605	$639,259	$342,733	$884,000	$1,987,482	$7,425,000	$2,119,655	$1,755,599	$2,633,398	$1,499,729
Houchin 2020	$7,624,300	$2,205,300	$9,242,700	$704,900	$302,100	$566,800	$702,000	$1,833,700	$9,470,300	$1,032,300	$4,622,800	$2,465,500

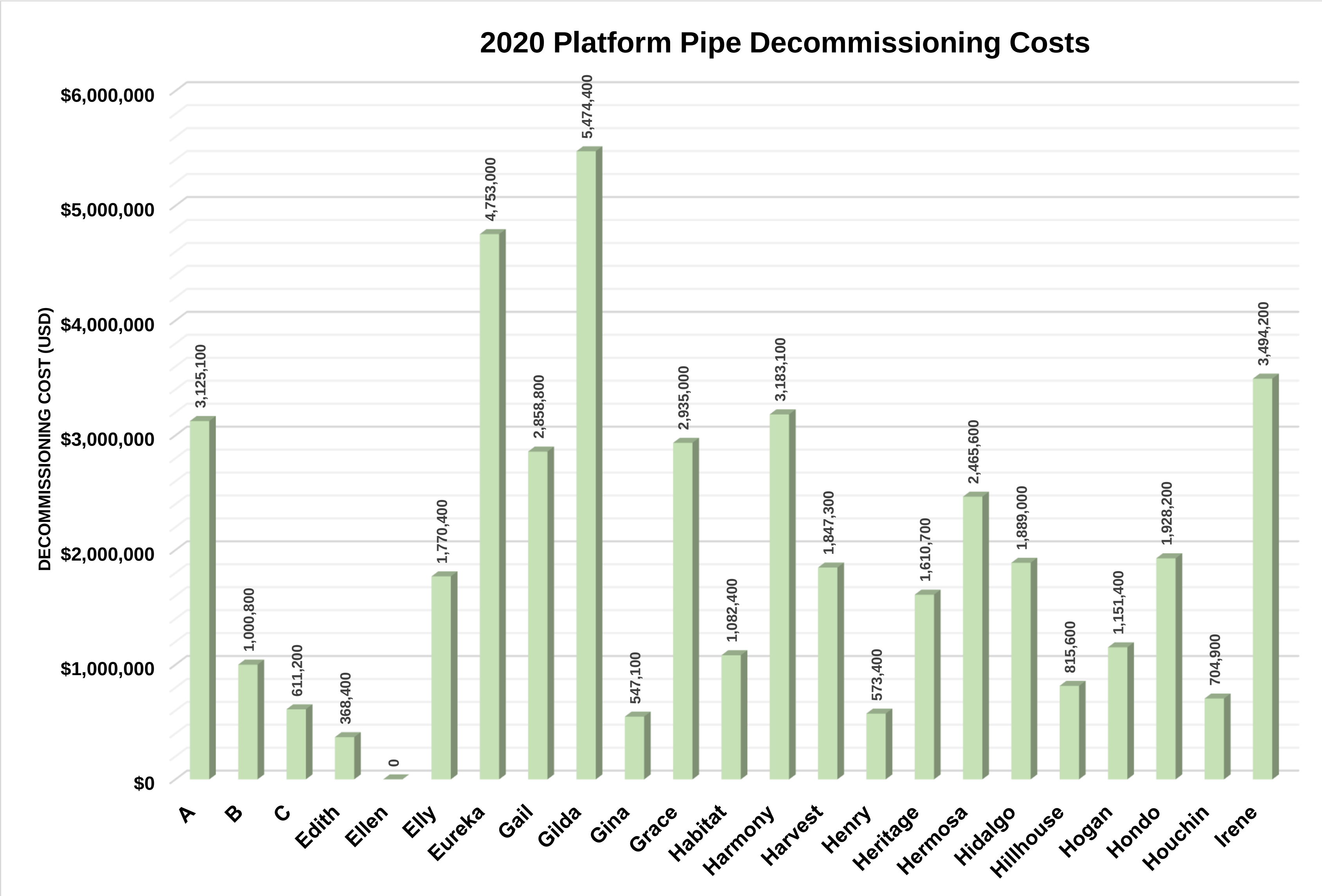


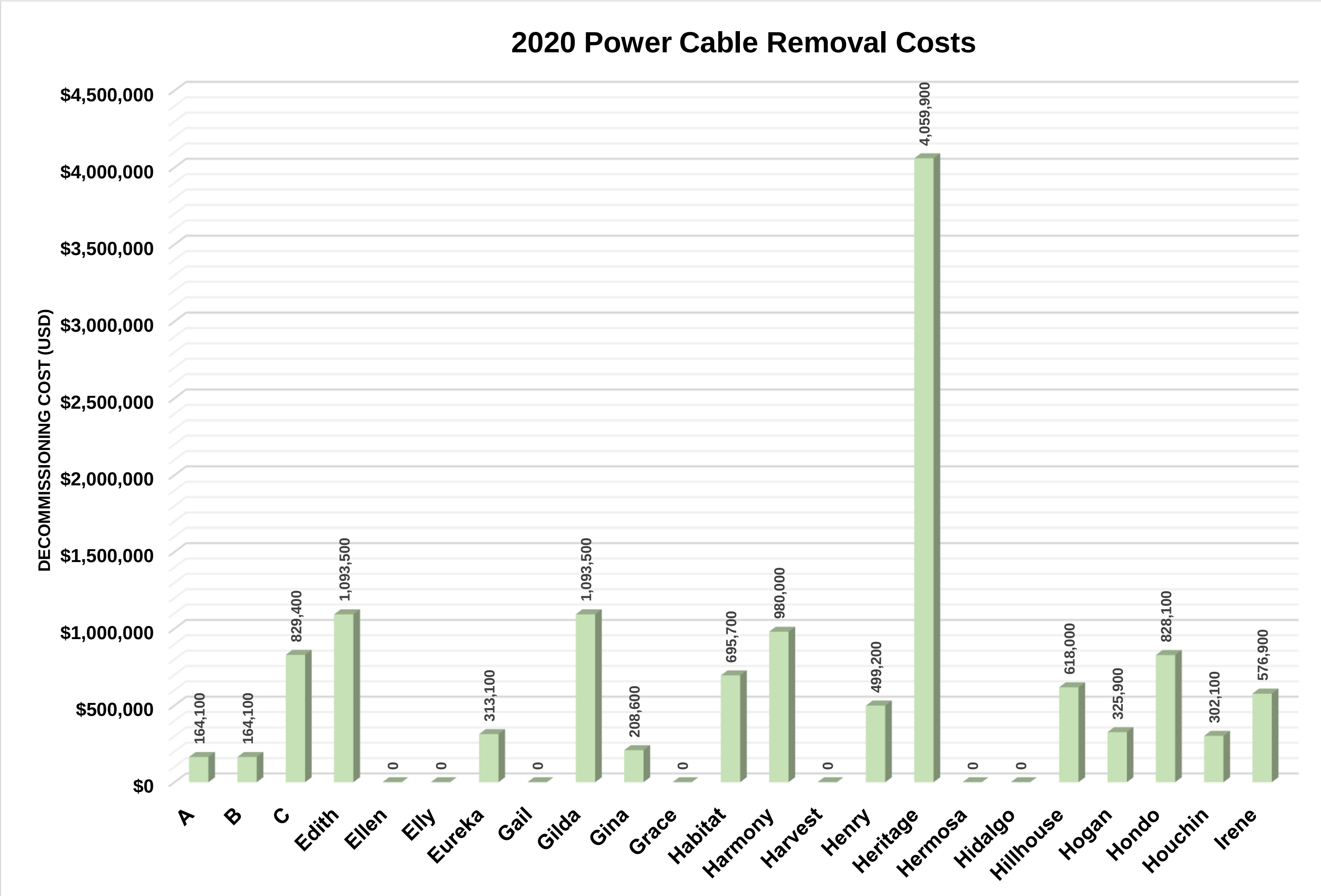
	Platform Removal	Platform Prep	Well P&A (w CR)	Pipeline Decommissioning	Power Cable Removal	Site Clearance	Permitting & Reg.	Mob/Demob of Derrick Barge	Materials Disposal	Weather Contingency	Misc.Work Provision	PMEP
Irene 2016	$6,177,281	$1,826,637	$9,096,370	$3,951,074	$656,477	$884,000	$413,762	$3,135,000	$3,639,897	$2,871,929	$2,871,929	$1,807,347
Irene 2020	$9,209,000	$2,238,400	$12,652,200	$3,494,200	$576,900	$566,800	$702,000	$1,833,700	$9,409,500	$4,310,600	$5,827,400	$3,107,900

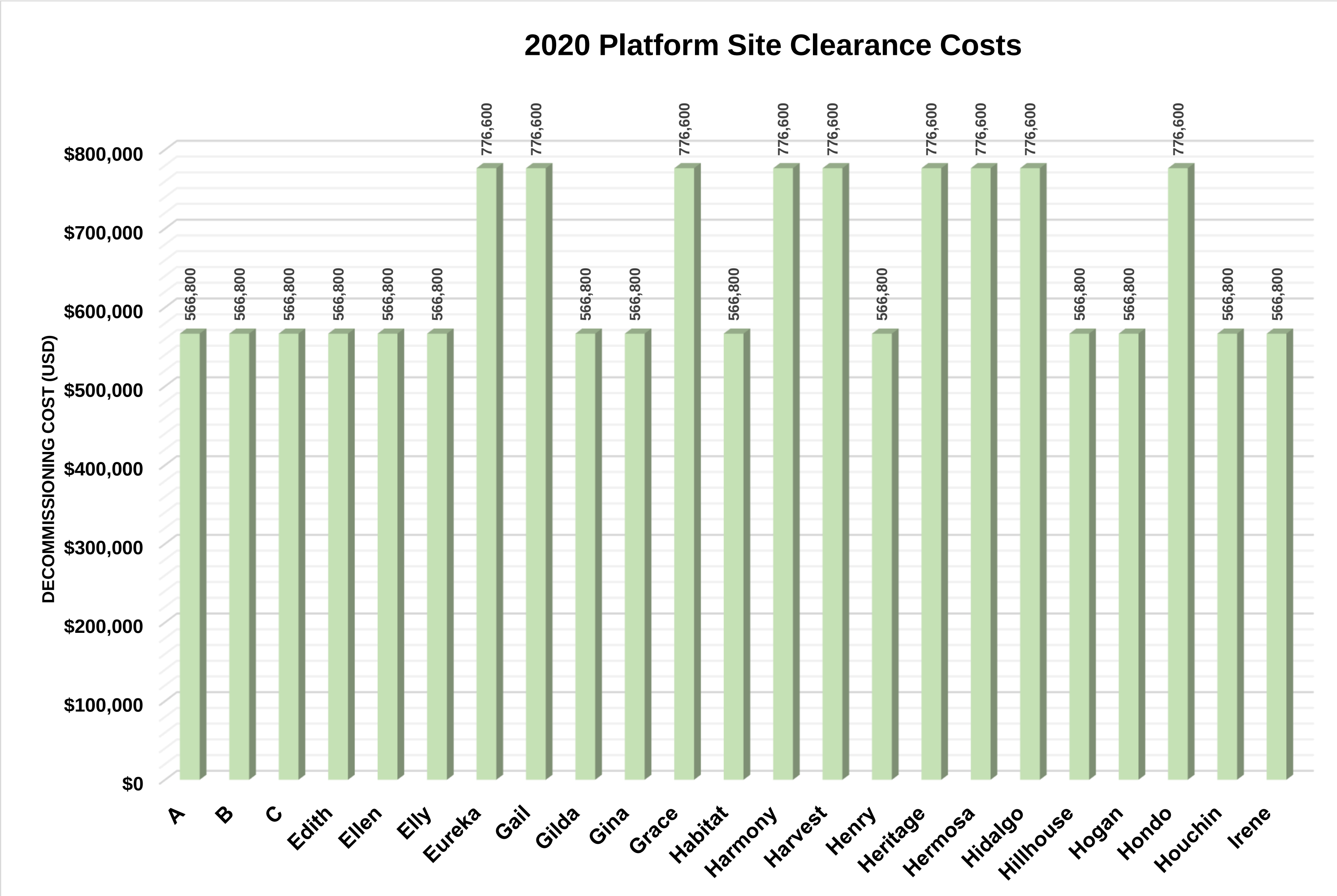

2020 Platform Removal Costs
DECOMMISSIONING COST (USD)
$80,000,000
$70,000,000
$60,000,000
$50,000,000
$40,000,000
$30,000,000
$20,000,000
$10,000,000
$0
A 6,983,100
B 6,988,800
C 6,994,400
Edith 10,532,400
Ellen 10,378,700
Elly 11,631,200
Eureka 32,457,600
Gail 32,941,700
Gilda 10,305,500
Gina 3,302,000
Grace 12,030,900
Habitat 8,823,500
Harmony 74,382,900
Harvest 31,034,400
Henry 5,123,400
Heritage 61,088,800
Hermosa 30,724,600
Hidalgo 20,957,200
Hillhouse 5,893,100
Hogan 8,404,300
Hondo 25,795,800
Houchin 7,624,300
Irene 9,209,000


2020 Platform Prep.Costs
DECOMMISSIONING COST (USD)
$6,000,000
$5,000,000
$4,000,000
$3,000,000
$2,000,000
$1,000,000
$0
A 1,653,500
B 1,659,800
C 1,610,200
Edith 2,613,500
Ellen 2,476,400
Elly 2,411,600
Eureka 4,685,600
Gail 3,885,900
Gilda 2,030,900
Gina 705,100
Grace 2,909,900
Habitat 1,851,200
Harmony 5,108,700
Harvest 5,066,400
Henry 1,583,000
Heritage 5,111,500
Hermosa 4,593,200
Hidalgo 4,650,000
Hillhouse 1,572,200
Hogan 1,694,300
Hondo 4,582,400
Houchin 2,205,300
Irene 2,238,400


2020 Platform Well P&A with Conductor Removal Costs
DECOMMISSIONING COST (USD)
$35,000,000
$30,000,000
$25,000,000
$20,000,000
$15,000,000
$10,000,000
$5,000,000
$0
A 18,748,400
B 20,652,200
C 12,877,700
Edith 8,123,300
Ellen 24,743,600
Elly 0
Eureka 27,042,400
Gail 14,941,400
Gilda 24,717,000
Gina 4,317,000
Grace 10,145,800
Habitat 10,431,300
Harmony 23,395,100
Harvest 10,838,100
Henry 9,492,800
Heritage 33,892,500
Hermosa 7,363,600
Hidalgo 9,775,100
Hillhouse 19,526,100
Hogan 11,647,500
Hondo 16,222,000
Houchin 9,242,700
Irene 12,652,200


2020 Platform Pipe Decommissioning Costs
DECOMMISSIONING COST (USD)
$6,000,000
$5,000,000
$4,000,000
$3,000,000
$2,000,000
$1,000,000
$0
3,125,100
1,000,800
611,200
368,400
0
1,770,400
4,753,000
2,858,800
5,474,400
547,100
2,935,000
1,082,400
3,183,100
1,847,300
573,400
1,610,700
2,465,600
1,889,000
815,600
1,151,400
1,928,200
704,900
3,494,200
A
B
C
Edith
Ellen
Elly
Eureka
Gail
Gilda
Gina
Grace
Habitat
Harmony
Harvest
Henry
Heritage
Hermosa
Hidalgo
Hillhouse
Hogan
Hondo
Houchin
Irene


2020 Power Cable Removal Costs
DECOMMISSIONING COST (USD)
$4,500,000
$4,000,000
$3,500,000
$3,000,000
$2,500,000
$2,000,000
$1,500,000
$1,000,000
$500,000
$0
A 164,100
B 164,100
C 829,400
Edith 1,093,500
Ellen 0
Elly 0
Eureka 313,100
Gail 0
Gilda 1,093,500
Gina 208,600
Grace 0
Habitat 695,700
Harmony 980,000
Harvest 0
Henry 499,200
Heritage 4,059,900
Hermosa 0
Hidalgo 0
Hillhouse 618,000
Hogan 325,900
Hondo 828,100
Houchin 302,100
Irene 576,900


2020 Platform Site Clearance Costs
DECOMMISSIONING COST (USD)
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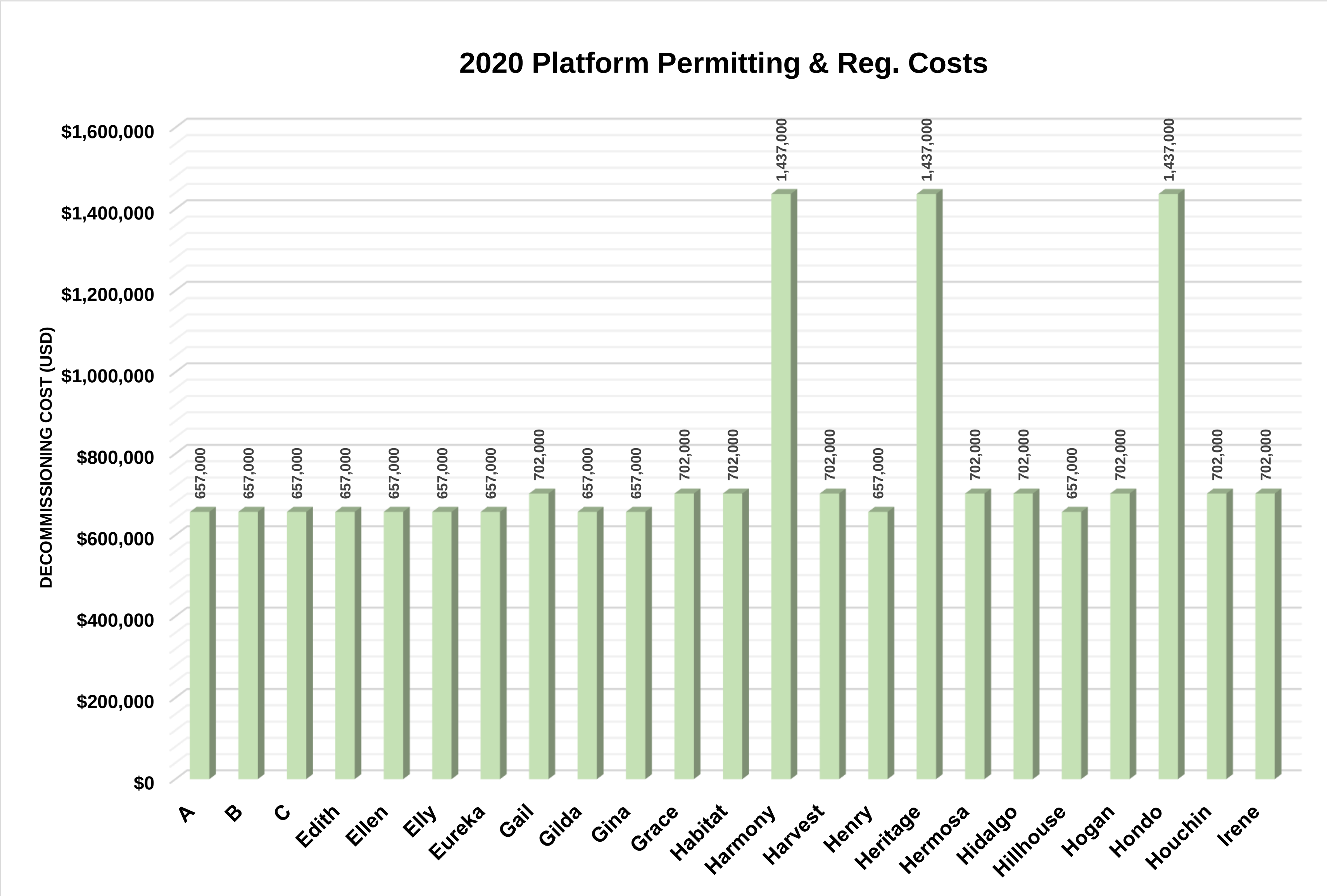
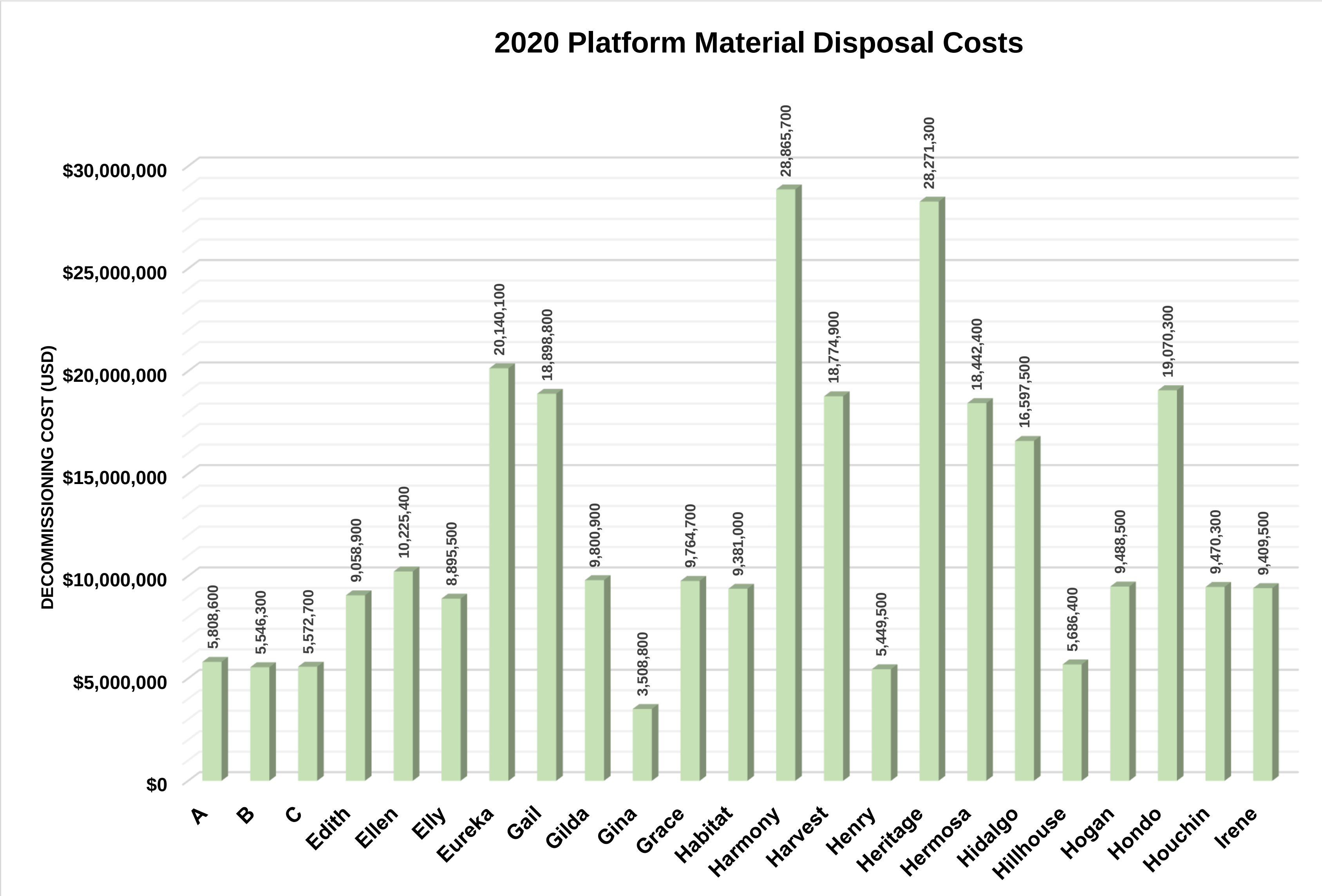
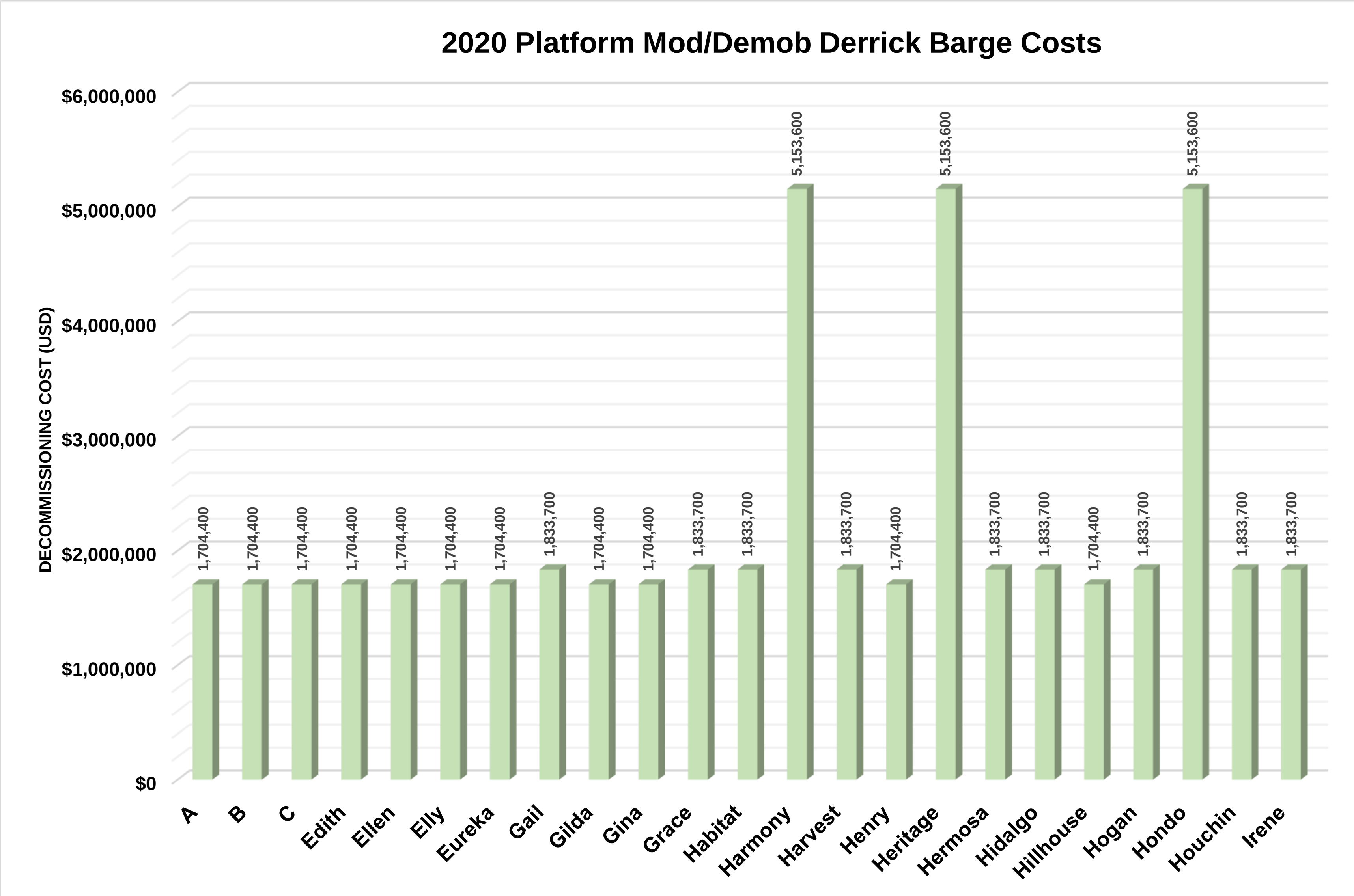
$700,000
$600,000
$500,000
$400,000
$300,000
$200,000
$100,000
$0
566,800
566,800
566,800
566,800
566,800
566,800
776,600
776,600
566,800
566,800
776,600
566,800
776,600
776,600
566,800
776,600
776,600
776,600
566,800
566,800
776,600
566,800
566,800
A
B
C
Edith
Ellen
Elly
Eureka
Gail
Gilda
Gina
Grace
Habitat
Harmony
Harvest
Henry
Heritage
Hermosa
Hidalgo
Hillhouse
Hogan
Hondo
Houchin
Irene


2020 Platform Permitting & Reg. Costs
DECOMMISSIONING COST (USD)
$1,600,000
$1,400,000
$1,200,000
$1,000,000
$800,000
$600,000
$400,000
$200,000
$0
A 657,000
B 657,000
C 657,000
Edith 657,000
Ellen 657,000
Elly 657,000
Eureka 657,000
Gail 702,000
Gilda 657,000
Gina 657,000
Grace 702,000
Habitat 702,000
Harmony 1,437,000
Harvest 702,000
Henry 657,000
Heritage 1,437,000
Hermosa 702,000
Hidalgo 702,000
Hillhouse 657,000
Hogan 702,000
Hondo 1,437,000
Houchin 702,000
Irene 702,000


2020 Platform Material Disposal Costs
DECOMMISSIONING COST (USD)
$0
$5,000,000
$10,000,000
$15,000,000
$20,000,000
$25,000,000
$30,000,000
A 5,808,600
B 5,546,300
C 5,572,700
Edith 9,058,900
Ellen 10,225,400
Elly 8,895,500
Eureka 20,140,100
Gail 18,898,800
Gilda 9,800,900
Gina 3,508,800
Grace 9,764,700
Habitat 9,381,000
Harmony 28,865,700
Harvest 18,774,900
Henry 5,449,500
Heritage 28,271,300
Hermosa 18,442,400
Hidalgo 16,597,500
Hillhouse 5,686,400
Hogan 9,488,500
Hondo 19,070,300
Houchin 9,470,300
Irene 9,409,500


2020 Platform Mod/Demob Derrick Barge Costs
DECOMMISSIONING COST (USD)
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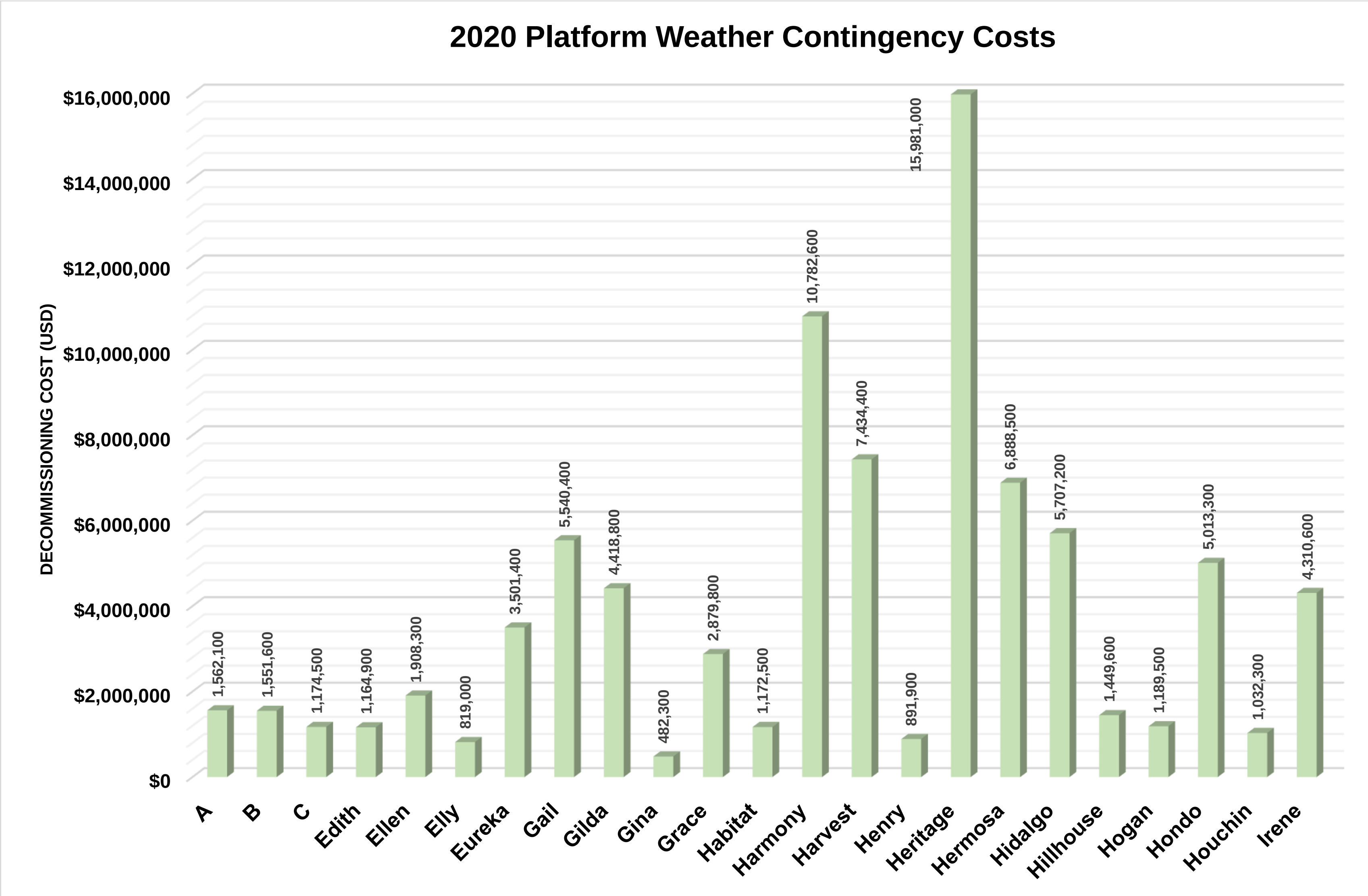
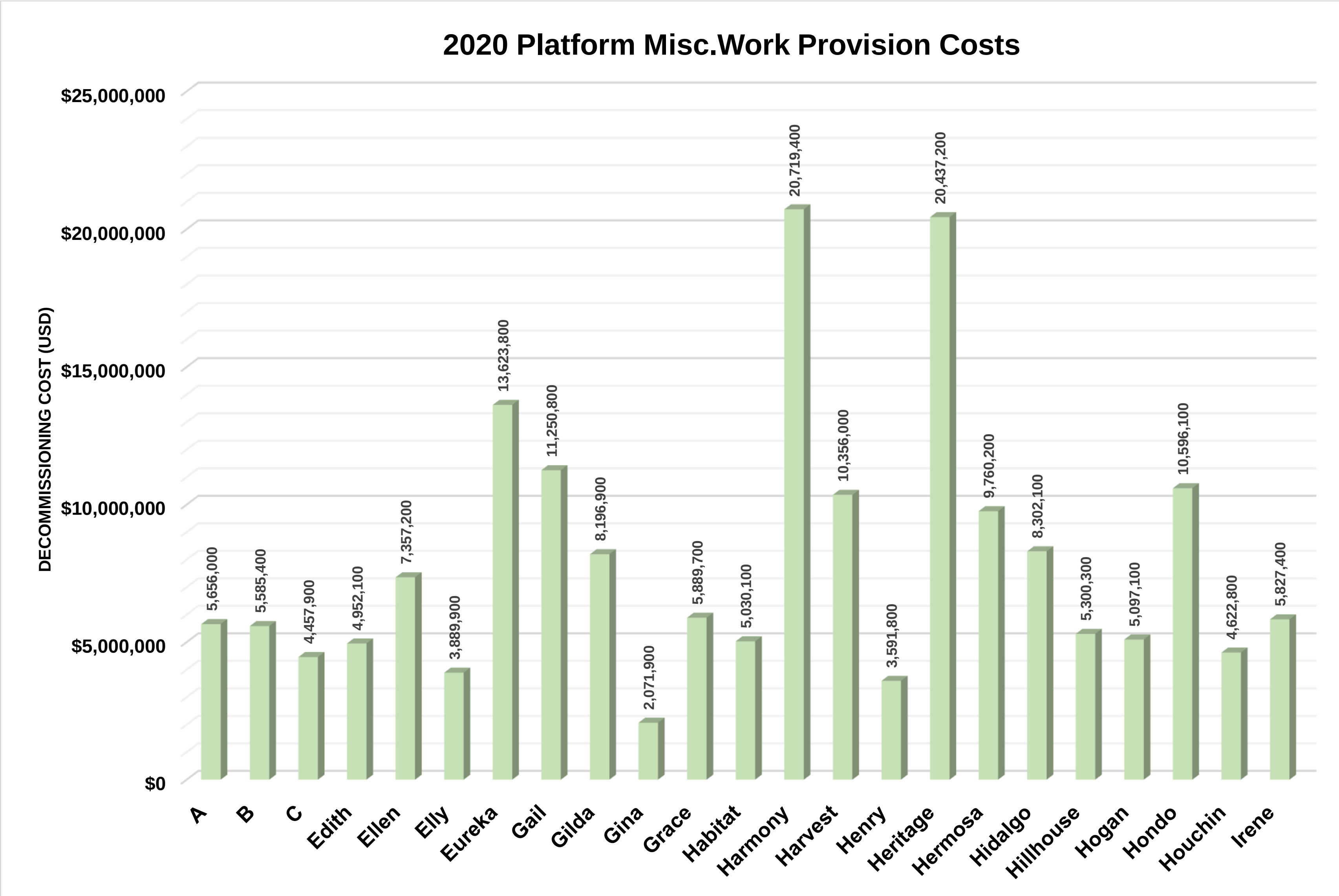
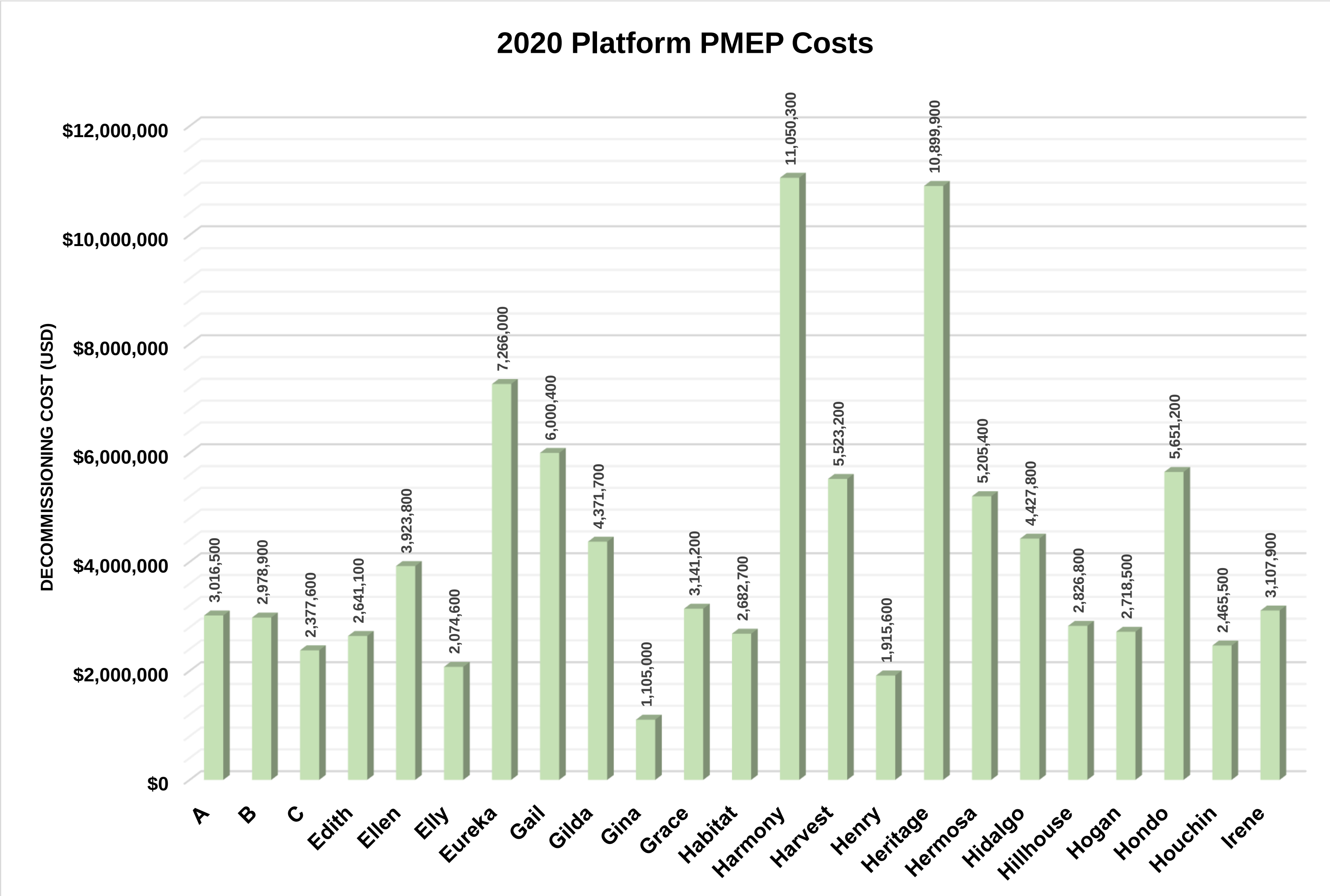
$5,000,000
$4,000,000
$3,000,000
$2,000,000
$1,000,000
$0
A 1,704,400
B 1,704,400
C 1,704,400
Edith 1,704,400
Ellen 1,704,400
Elly 1,704,400
Eureka 1,704,400
Gail 1,833,700
Gilda 1,704,400
Gina 1,704,400
Grace 1,833,700
Habitat 1,833,700
Harmony 5,153,600
Harvest 1,833,700
Henry 1,704,400
Heritage 5,153,600
Hermosa 1,833,700
Hidalgo 1,833,700
Hillhouse 1,704,400
Hogan 1,833,700
Hondo 5,153,600
Houchin 1,833,700
Irene 1,833,700


2020 Platform Weather Contingency Costs
DECOMMISSIONING COST (USD)
$16,000,000
$14,000,000
$12,000,000
$10,000,000
$8,000,000
$6,000,000
$4,000,000
$2,000,000
$0
1,562,100
1,551,600
1,174,500
1,164,900
1,908,300
819,000
3,501,400
5,540,400
4,418,800
482,300
2,879,800
1,172,500
10,782,600
7,434,400
891,900
15,981,000
6,888,500
5,707,200
1,449,600
1,189,500
5,013,300
1,032,300
4,310,600
A
B
C
Edith
Ellen
Elly
Eureka
Gail
Gilda
Gina
Grace
Habitat
Harmony
Harvest
Henry
Heritage
Hermosa
Hidalgo
Hillhouse
Hogan
Hondo
Houchin
Irene


2020 Platform Misc.Work Provision Costs
DECOMMISSIONING COST (USD)
$25,000,000
$20,000,000
$15,000,000
$10,000,000
$5,000,000
$0
A 5,656,000
B 5,585,400
C 4,457,900
Edith 4,952,100
Ellen 7,357,200
Elly 3,889,900
Eureka 13,623,800
Gail 11,250,800
Gilda 8,196,900
Gina 2,071,900
Grace 5,889,700
Habitat 5,030,100
Harmony 20,719,400
Harvest 10,356,000
Henry 3,591,800
Heritage 20,437,200
Hermosa 9,760,200
Hidalgo 8,302,100
Hillhouse 5,300,300
Hogan 5,097,100
Hondo 10,596,100
Houchin 4,622,800
Irene 5,827,400


2020 Platform PMEP Costs
DECOMMISSIONING COST (USD)
$12,000,000
$10,000,000
$8,000,000
$6,000,000
$4,000,000
$2,000,000
$0
A 3,016,500
B 2,978,900
C 2,377,600
Edith 2,641,100
Ellen 3,923,800
Elly 2,074,600
Eureka 7,266,000
Gail 6,000,400
Gilda 4,371,700
Gina 1,105,000
Grace 3,141,200
Habitat 2,682,700
Harmony 11,050,300
Harvest 5,523,200
Henry 1,915,600
Heritage 10,899,900
Hermosa 5,205,400
Hidalgo 4,427,800
Hillhouse 2,826,800
Hogan 2,718,500
Hondo 5,651,200
Houchin 2,465,500
Irene 3,107,900

Appendix H POCSR Decommissioning Cost Study Presentation

Agenda

1. ***Introductions***
2. ***Project Overview and Schedule***
3. ***Decommissioning Cost Estimate Results***
   - Key Changes from 2016 Report
   - Cost Model Inputs
   - Results by Activity
4. ***Summary***
5. ***Discussion***

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Introductions

InterAct PMTI
260 Maple Ct., Suite 210
Ventura, CA 93003
www.InterActPMTI.com

U.S. Department of the Interior
Bureau of Safety and Environmental Enforcement
45600 Woodland Road, VAE-AMD, Sterling, VA 20166

Michelle Pasini, President, Principal Consultant
Val Lerma, P.E., Project Manager
Allen Scoging, Sr. Engineer
Harry Barnum, P.G., Environmental Services Manager

U.S. Department of the Interior
Bureau of Safety and Environmental Enforcement
760 Paseo Camarillo, Suite 102
Camarillo, CA 93010

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Project Overview

Every five years, BSEE commissions a thorough decommissioning cost estimate in the Pacific Outer Continental Shelf Region (POCSR) to determine and make available an accurate, updated estimate. If the financial strength of a lessee does not meet standards, the estimate is used to assist BOEM in determining **supplemental bond** requirements.

Purpose of the Report

- To develop updated benchmark costs for decommissioning POCSR oil and gas facilities and wells to provide guidance regarding decisions on supplemental bonds.
- Most recent prior report was issued in 2014 and updated in 2016.
- This 2020 cost study was updated to reflect:
  - ✓ current status of platforms in the POCSR
  - ✓ recent innovations in technology and transportation routes
  - ✓ available local, regional, and national support service companies and current market rates
  - ✓ updated vendor pricing as available and appropriate for each phase of decommissioning for cost estimating purposes

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Project Overview - Schedule

Task	Description	Estimated Duration	Beginning Week	Ending Week
0	Project Award			3/5/20
1	Kick-Off Mtg w/BSEE	1	3/12/19	3/19/20
2	Update Decom Scenarios - Progress Report 1	4	3/19/20	4/23/20
3	Update Assumptions & Methods - Progress Report 2	4	4/23/20	5/21/20
4	Update Cost Each Phase - Progress Report 3	8	4/23/20	6/18/20
5	Prepare & Submit Draft Report	4*	6/18/20	7/9/20
6	Present Draft to BSEE / Discuss Findings	1		7/9/20
7	BSEE Review of Draft	3	7/9/20	7/30/20
8	Finalize Report per Comments	2	7/30/20	8/13/20
9	Total	23		

* Timeline was extended by 2 weeks for report due to Covid-19, oil price collapse, operator/vendor input delays

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Decommissioning Cost Estimate Results
Summary of Key Changes

BSEE InterAct PMTI

Summary of Key Changes from 2016 Report

- Project groupings changed, providing substantial cost savings
- Well Plug and Abandon (P&A) methods incorporated use of existing rigs, created category for wells already plugged, revised criteria for well categorization
- Conductor removal costs combined with well P&A
- Derrick barges assumed local and from Gulf of Mexico (GOM), to be mobilized through Panama Canal which was widened in 2016, providing substantial cost savings
- Jacket removal uses a winch system attached to GOM vessel providing substantial cost savings
- Material disposal for piece large or modular lifts to be handled in existing GOM yards through Panama Canal, increasing costs
- Site clearance does not include any diving; verification for platforms in water depths >300' to be combined with ROV clearance operations, providing cost savings
- **Total POCSR decommissioning costs increased from $1.47 billion to $1.63 billion (+11.5%)**

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Decommissioning Cost Estimate Results
Cost Summary by Platform

BSEE InterAct PMTI

Costs for all platforms increased except for five:

Eureka
Gail
Harvest
Hermosa
Hondo

Platform Name	2016 Costs for Decommissioning $Million	2020 Costs for Decommissioning $Million	2020 vs. 2016 Change
A	$ 36.2	$ 49.6	37.1%
B	$ 32.5	$ 49.1	50.9%
C	$ 27.5	$ 39.4	43.4%
Edith	$ 30.9	$ 43.5	40.7%
Ellen	$ 42.0	$ 63.9	52.2%
Elly	$ 24.6	$ 34.4	39.9%
Eureka	$ 124.0	$ 116.9	-5.7%
Gail	$ 103.8	$ 99.6	-4.0%
Gilda	$ 59.2	$ 73.3	23.9%
Gina	$ 16.7	$ 19.2	14.8%
Grace	$ 43.2	$ 53.0	22.7%
Habitat	$ 34.5	$ 44.3	28.3%
Harmony	$ 185.7	$ 185.8	0.1%
Harvest	$ 99.7	$ 94.2	-5.5%
Henry	$ 21.6	$ 32.0	48.4%
Heritage	$ 173.6	$ 188.7	8.7%
Hermosa	$ 94.0	$ 88.8	-5.6%
Hidalgo	$ 73.9	$ 75.6	2.3%
Hillhouse	$ 31.3	$ 46.6	48.9%
Hogan	$ 38.1	$ 44.8	17.6%
Hondo	$ 100.1	$ 97.1	-3.0%
Houchin	$ 36.2	$ 40.8	12.6%
Irene	$ 37.3	$ 53.9	44.6%
Total	**$1,466.6**	**$1,634.7**	**11.5%**

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Decommissioning Cost Estimate Results
Cost Model Inputs

BSEE InterAct PMTI

- Costs are estimated in 2020 U.S. Dollars
- Existing platform rigs are assumed to remain operational for well P&A activities
- Condition of platform infrastructure remains in operating condition (i.e., no major rebuilds)
- Well categories and methods were changed to better reflect the anticipated requirements and costs to decommission existing wells
- Conventional best practices technology are assumed to remove all the decks (piece small/large, reverse installation) using domestic vessels
- Mobilization, demobilization, and retrofit engine costs of GOM vessels are shared across the platforms in each project grouping
- Pipelines routed to shore in less than 200' water depth level and all power cables are assumed removed to the state tidelands boundary; all pipelines between platform and pipelines in greater than 200' water depth are assumed decommissioned in place
- No explosives or rigs to reef options were considered

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Decommissioning Cost Estimate Results
Cost Model Inputs (continued)

BSEE InterAct PMTI

- Only existing domestic waste handling facilities were considered where costs could be obtained, and projects are not subject to international trade volatility
- No salvage or resale value is included, though salvage value assumed by GOM vendors providing material handling/disposal costs
- Piece small lifts are assumed to be transported to local waste facilities
- Piece large/modular lifts are assumed to be transported to GOM waste facilities; round trip to the GOM sites is estimated at 75 days
- No downtime is assumed due to presence of marine mammals or catastrophic events such as earthquakes
- Weather contingency downtimes vary from 5-15% based on three-year historical data from weather buoys in the vicinity of each platform and input from local crane operators
- Engineering/planning and the general work provision adjustments remain unchanged from the prior report, although cost basis was revised

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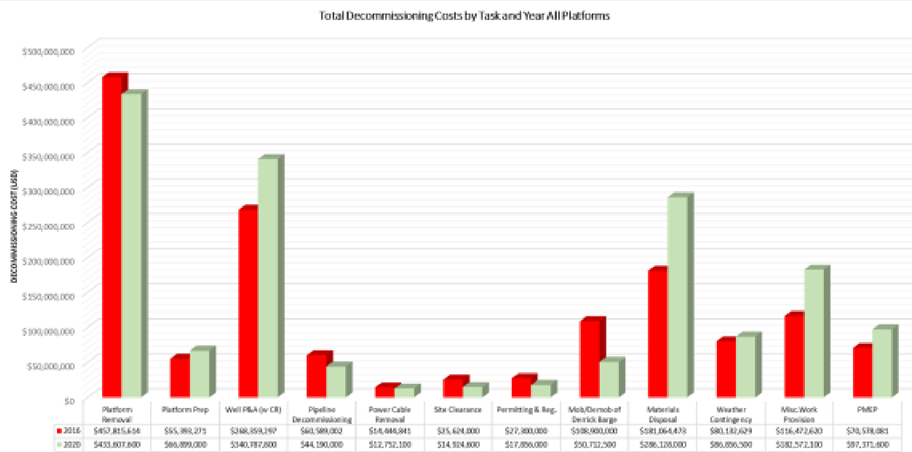
Decommissioning Cost Estimate Results
Cost Comparison



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Decommissioning Cost Estimate Results
Project Groupings

Platform	Year Installed	Water Depth (feet)	Topside Weight (tons)	Jacket Weight (tons)
Campaign 1				
Holly*	*State Platform			
Hogan	1967	154	2,259	1,263
Houchin	1968	163	2,591	1,486
Habitat	1981	290	3,514	2,550
Irene	1985	242	2,500	3,100
Grace	1979	318	3,800	3,090
Gail	1987	739	7,693	18,300
Harvest	1985	675	9,024	16,633
Hermosa	1985	603	7,830	17,000
Hidalgo	1986	430	8,100	10,950
Campaign 2				
A	1968	188	1,357	1,500
B	1968	190	1,357	1,500
C	1977	192	1,357	1,500
Henry	1979	173	1,371	1,311
Hillhouse	1969	190	1,200	1,500
Gina	1980	95	447	434
Gilda	1981	205	3,792	3,220
Edith	1983	161	4,134	3,454
Elly	1980	255	8,000	3,300
Ellen	1980	265	5,300	3,200
Eureka	1984	700	4,700	19,000
Campaign 3				
Harmony	1989	1,198	9,839	42,900
Heritage	1989	1,075	9,826	32,420
Hondo	1976	842	8,450	12,200

Campaign 1: Platforms currently out of service or operator indicated they would be ready to decommission in Campaign 1

Campaign 2: Currently producing; operators expect to be in production for at least 10 years

Campaign 3: Operator expects to be in production for at least 20 years

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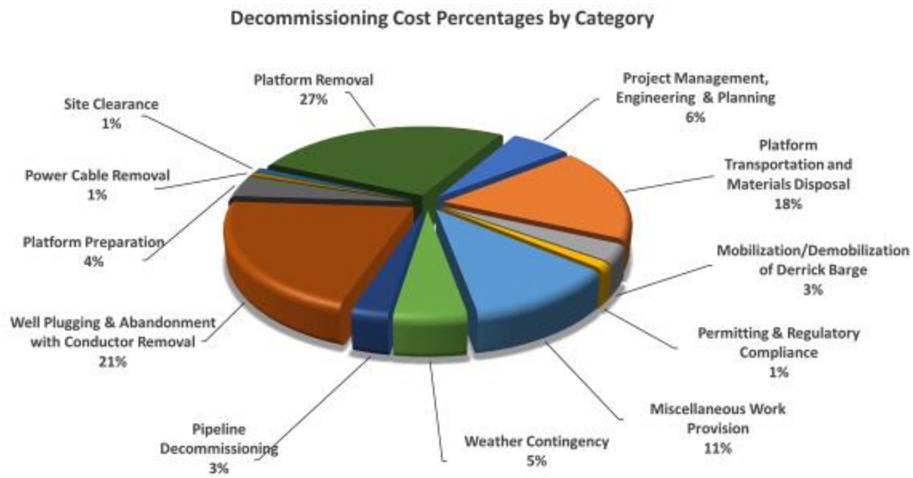
Decommissioning Cost Estimate Results
Cost Percentage by Category



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Decommissioning Cost Estimate Results
Well P&A

Incorporates Use of Existing Rigs

- Rigs used to pull ESP and rod pumps, C/O well, set bottom plug
- Rigs used to recover cut pipe
- Assume hoisting system such as casing jacks to be similar in cost

Well Categories Changed

- Incorporates TA'd wells
- Rigorous well review impacted well categories significantly
- Added depth criteria, modified other criteria

Cut and Recovery of Conductors

- Those with inside well casings included in P&A Cost
- Empty conductor slot P&A cost combined with well P&A cost

Methods Meet all BSEE Requirements

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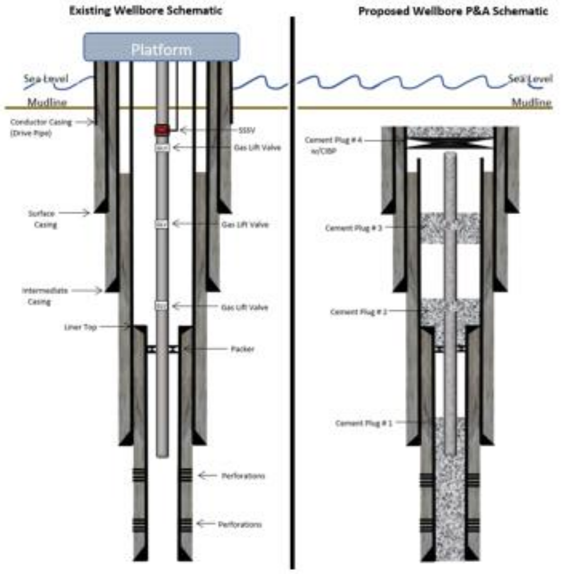
Decommissioning Cost Estimate Results
Well P&A Schematics

BSEE Bureau of Safety and Environmental Enforcement | InterAct PMTI



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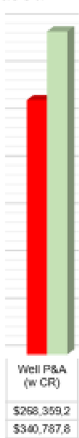
Decommissioning Cost Estimate Results
Well P&A + Conductor Removal Costs

BSEE Bureau of Safety and Environmental Enforcement | InterAct PMTI

Note that well P&A includes conductor removal costs; cost increased



Platform	Wells and Slots to P&A	Average Well Depth (feet)	Well P&A Costs	Slot P&A Costs	Total P&A Costs
A	55	2,517	$18,439,400	$ 309,000	$18,748,400
B	57	3,120	$20,466,800	$ 185,400	$20,652,200
C	37	2,840	$12,754,100	$ 123,600	$12,877,700
Edith	29	5,370	$ 7,567,100	$ 556,200	$ 8,123,300
Ellen	64	6,680	$24,665,200	$ 78,400	$24,743,600
Eureka	60	6,370	$25,225,400	$1,817,000	$27,042,400
Gail	29	8,470	$14,941,400		$14,941,400
Gilda[1]	63	7,850	$24,717,000		$24,717,000
Gina	12	6,470	$ 4,317,000		$ 4,317,000
Grace	38	3,840	$ 9,361,800	$ 784,000	$ 10,145,800
Habitat[2]	21	12,030	$ 10,352,900	$ 78,400	$ 10,431,300
Harmony	43	12,910	$21,941,500	$ 1,453,600	$23,395,100
Harvest	25	9,410	$ 9,747,900	$ 1,090,200	$ 10,838,100
Henry	24	4,140	$ 9,492,800		$ 9,492,800
Heritage	49	15,100	$33,892,500		$33,892,500
Hermosa	16	8,590	$ 6,818,500	$ 545,100	$ 7,363,600
Hidalgo	14	12,510	$ 9,775,100		$ 9,775,100
Hillhouse	50	3,430	$19,526,100		$19,526,100
Hogan	39	3,680	$11,647,500		$11,647,500
Hondo	28	13,060	$16,222,000		$16,222,000
Houchin	36	3,660	$ 9,242,700		$ 9,242,700
Irene	29	9,880	$ 12,573,800	$ 78,400	$ 12,652,200
Total	**818**		**$333,688,500**	**$7,099,300**	**$340,787,800**
Average per well		6,900			$ 416,600
Average per platform	37	7,360			$ 15,167,700

[1] Gilda has an additional $150,000 added to the P&A cost to account for Rig Mobilization.

[2] Habitat has an additional $150,000 added to the P&A cost to account for Rig Mobilization.

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Decommissioning Cost Estimate Results Well P&A Categories, includes Conductor Removal Costs

BSEE InterAct PMTI

Well Category	Number of Wells	Well P&A Cost[1]
TA-Low	20	$ 61,800
Low	84	$ 285,400
Medium-Low	110	$ 340,300
Medium	500	$ 451,100
High	45	$ 1,004,400
Average Well P&A Cost		**$ 439,200**

[1] Does not include $300,000 for Rig Mob on Gilda and Habitat.

7.2a. Typical Well P&A Cost without PMEP or Contingency.

Conductor Length	Number of Slots	Slot P&A Cost[1]
< 300'	19	$ 61,800
< 500'	13	$ 78,400
< 1,300'	27	$ 181,700
Average Slot C&R Cost		**$ 120,300**

[1] Does not include $150,000 for Rig Mob on Habitat.

7.2b. Average Slot C&R Cost without PMEP or Contingency.

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Decommissioning Cost Estimate Results Permitting Costs

BSEE InterAct PMTI

Assumption of larger campaigns (shared costs over 3 EIS/EIRs vs. 6) significantly decreased costs; policy guidance through Programmatic EIS

Platform	Permitting & Reg Cost
A	$ 657,000
B	$ 657,000
C	$ 657,000
Edith	$ 657,000
Ellen	$ 657,000
Elly	$ 657,000
Eureka	$ 657,000
Gail	$ 702,000
Gilda	$ 657,000
Gina	$ 657,000
Grace	$ 702,000
Habitat	$ 702,000
Harmony	$ 1,437,000
Harvest	$ 702,000
Henry	$ 657,000
Heritage	$ 1,437,000
Hermosa	$ 702,000
Hidalgo	$ 702,000
Hillhouse	$ 657,000
Hogan	$ 702,000
Hondo	$ 1,437,000
Houchin	$ 702,000
Irene	$ 702,000
Total	$ 17,856,000

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Decommissioning Cost Estimate Results Platform Prep and Underwater Inspection Costs

BSEE InterAct PMTI

Platform Preparation

- Includes initial preparation and safety inspections
- Includes removal of salvageable equipment such as rig
- Includes cost to prepare 1000-ton or 500-ton lifts for each platform
- Prior report used Spread Rate x Days

Underwater Inspection

- Assumed to be Level II Inspection
- Inspection to be used to validate platform removal plans

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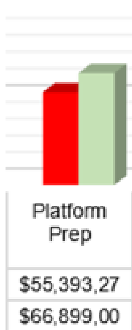
Decommissioning Cost Estimate Results Platform Prep Costs

BSEE InterAct PMTI

More detailed analysis resulted in increased costs



PLATFORM	Topside Weight (Tons)	Under Water Inspection Cost	Total Topside Prep Cost	Total Topside Prep Time (days)	Total Cost
A	1,357	$ 28,100	$ 1,625,400	22	$ 1,653,500
B	1,357	$ 28,100	$ 1,631,700	22	$ 1,659,800
C	1,357	$ 28,100	$ 1,582,100	20	$ 1,610,200
Edith	4,134	$ 28,700	$ 2,584,800	41	$ 2,613,500
Ellen	5,300	$ 40,900	$ 2,435,500	45	$ 2,476,400
Elly	4,700	$ 40,900	$ 2,370,700	35	$ 2,411,600
Eureka	8,000	$ 40,900	$ 4,644,700	80	$ 4,685,600
Gail	7,693	$ 37,900	$ 3,848,000	60	$ 3,885,900
Gilda	3,792	$ 43,900	$ 1,987,000	35	$ 2,030,900
Gina	447	$ 29,800	$ 675,300	10	$ 705,100
Grace	3,800	$ 37,900	$ 2,872,000	40	$ 2,909,900
Habitat	3,514	$ 43,900	$ 1,807,300	30	$ 1,851,200
Harmony	9,839	$ 43,900	$ 5,064,800	78	$ 5,108,700
Harvest	9,024	$ 37,900	$ 5,028,500	67	$ 5,066,400
Henry	1,371	$ 28,100	$ 1,554,900	18	$ 1,583,000
Heritage	9,826	$ 43,900	$ 5,067,600	78	$ 5,111,500
Hermosa	7,830	$ 37,900	$ 4,555,300	58	$ 4,593,200
Hidalgo	8,100	$ 37,900	$ 4,612,100	59	$ 4,650,000
Hillhouse	1,200	$ 28,100	$ 1,544,100	20	$ 1,572,200
Hogan	2,259	$ 31,900	$ 1,662,400	24	$ 1,694,300
Hondo	8,450	$ 43,900	$ 4,538,500	66	$ 4,582,400
Houchin	2,591	$ 31,900	$ 2,173,400	30	$ 2,205,300
Irene	2,500	$ 37,900	$ 2,200,500	23	$ 2,238,400
		$ 832,400	$ 66,066,600		$ 66,899,000

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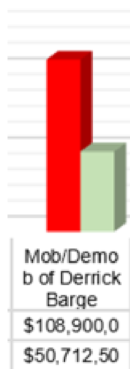
Decommissioning Cost Estimate Results
DB Mob and Demob Costs

BSEE InterAct PMTI

Costs are significantly less due to larger campaign groupings, lower day rates and vessels from GOM



Platform	HLV Mob/Demob
A	$ 1,704,400
B	$ 1,704,400
C	$ 1,704,400
Edith	$ 1,704,400
Ellen	$ 1,704,400
Elly	$ 1,704,400
Eureka	$ 1,704,400
Gail	$ 1,833,700
Gilda	$ 1,704,400
Gina	$ 1,704,400
Grace	$ 1,833,700
Habitat	$ 1,833,700
Harmony	$ 5,153,600
Harvest	$ 1,833,700
Henry	$ 1,704,400
Heritage	$ 5,153,600
Hermosa	$ 1,833,700
Hidalgo	$ 1,833,700
Hillhouse	$ 1,704,400
Hogan	$ 1,833,700
Hondo	$ 5,153,600
Houchin	$ 1,833,700
Irene	$ 1,833,700
	$ 50,712,500

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Decommissioning Cost Estimate Results
DB Mob and Demob Costs-GOM Vessels

BSEE InterAct PMTI

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Decommissioning Cost Estimate Results
Platform Removal

BSEE Bureau of Safety and Environmental Enforcement
InterAct PMTI

Used TSB data as basis for the number of lifts required
Modified where appropriate to meet vessel capacity

CAMPAIGN 1									
Platform Name	Hogan	Houchin	Habitat	Irene	Grace	Gail	Harvest	Hermosa	Hidalgo
Water Depth, feet	154	163	290	242	318	739	675	603	430
Deck Weight, tons	2259	2591	3514	2500	3800	7693	9024	7830	8100
Number of Modules	8	9	6	5	6	8	10	8	9
Max Weight per Module, tons	282	288	586	500	633	962	902	979	900
Jacket Weight, tons	1263	1486	2550	3100	3090	18300	16633	17000	10950
Jacket Sections	4	4	3	4	4	19	17	17	11
Max Weight per Section, tons	316	372	850	775	773	963	978	1000	995
Number of Piles	12	8	8	8	12 main 8 skirt	8 main 12 skirt	8 main 20 skirt	8 main 20 skirt	8 main 8 skirt

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Decommissioning Cost Estimate Results
Platform Removal (continued)

BSEE Bureau of Safety and Environmental Enforcement
InterAct PMTI

CAMPAIGN 2											
Platform Name	A	B	C	Henry	Hillhouse	Gina	Gilda	Edith	Elly	Ellen	Eureka
Water Depth, feet	188	190	192	173	190	95	205	161	255	265	700
Deck Weight, tons	1357	1357	1357	1371	1200	447	3792	4134	8000	5300	4700
Number of Modules	4	4	4	4	4	2	6	12	10	12	10
Max Weight per Module, tons	339	339	339	343	300	224	632	345	800	442	470
Jacket Weight, tons	1500	1500	1500	1311	1500	434	3220	3454	3300	3200	19000
Jacket Sections	3	3	3	2	3	1	4	4	4	4	20
Max Weight per Section, tons	500	500	500	656	500	434	805	864	825	800	950
Number of Piles	12	12	12	6	8	6	12	12 main 24 skirt	12	8	24 Skirt

CAMPAIGN 3			
Platform Name	Hondo	Heritage	Harmony
Water Depth, feet	842	1075	1198
Deck Weight, tons	8450	9826	9839
Number of Modules	13	13	13
Max Weight per Module, tons	650	756	757
Jacket Weight, tons	12200	32420	42900
Jacket Sections	13	33	43
Max Weight per Section, tons	938	982	998
Number of Piles	8 main 12 skirt	8 main 26 skirt	8 main 20 skirt

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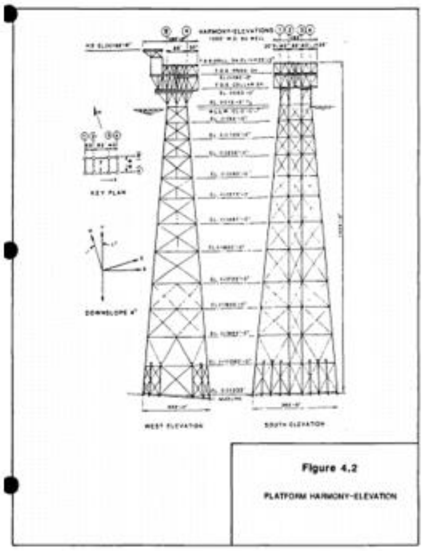
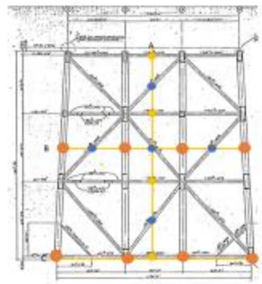
Decommissioning Cost Estimate Results
Platform Removal - Jacket and Piles

BSEE InterAct PMTI



Used basic jacket schematics available for Harmony and Edith to develop conceptual jacket sectioning plans

Platform-specific cutting plans could change costs considerably



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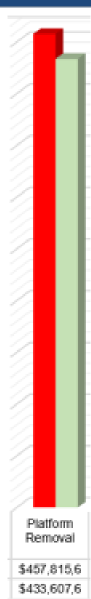
Decommissioning Cost Estimate Results
Platform Removal

BSEE InterAct PMTI



Platform	Topside Removal	Jacket Removal	TOTAL
A	$ 1,233,500	$ 5,749,600	$ 6,983,100
B	$ 1,233,500	$ 5,755,300	$ 6,988,800
C	$ 1,233,500	$ 5,760,900	$ 6,994,400
Edith	$ 2,120,100	$ 8,412,300	$ 10,532,400
Ellen	$ 2,123,800	$ 8,254,900	$ 10,378,700
Elly	$ 1,856,200	$ 9,775,000	$ 11,631,200
Eureka	$ 1,775,300	$ 30,682,300	$ 32,457,600
Gail	$ 1,683,300	$ 31,258,400	$ 32,941,700
Gilda	$ 1,456,300	$ 8,849,200	$ 10,305,500
Gina	$ 893,300	$ 2,408,700	$ 3,302,000
Grace	$ 1,465,500	$ 10,565,400	$ 12,030,900
Habitat	$ 1,483,800	$ 7,339,700	$ 8,823,500
Harmony	$ 2,479,700	$ 71,903,200	$ 74,382,900
Harvest	$ 2,154,600	$ 28,879,800	$ 31,034,400
Henry	$ 1,226,200	$ 3,897,200	$ 5,123,400
Heritage	$ 2,490,800	$ 58,598,000	$ 61,088,800
Hermosa	$ 1,882,700	$ 28,841,900	$ 30,724,600
Hidalgo	$ 2,083,400	$ 18,873,800	$ 20,957,200
Hillhouse	$ 1,231,700	$ 4,661,400	$ 5,893,100
Hogan	$ 1,741,400	$ 6,662,900	$ 8,404,300
Hondo	$ 2,468,700	$ 23,327,100	$ 25,795,800
Houchin	$ 1,870,200	$ 5,754,100	$ 7,624,300
Irene	$ 1,507,000	$ 7,702,000	$ 9,209,000
			$ 433,607,600

Lower day rates and no barge offloading fees represent a significant overall cost saving

Assumes use of anchored Derrick Barge

Includes vessel based marine growth removal for top 100' of jacket; GOM yards can handle marine growth on remaining structure

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Decommissioning Cost Estimate Results
Platform Transport and Disposal

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Decommissioning Cost Estimate Results
Platform Transport and Disposal

MARS Yard in Gibson has all crews, equipment, and capability to handle waste

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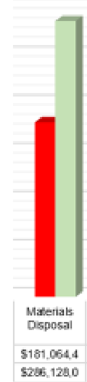
Decommissioning Cost Estimate Results Platform Transport and Disposal

InterAct PMTI

Platform	Topsides and Jacket Disposal Costs	Conductor Disposal Costs	Power Cable Disposal Costs	Pipeline Disposal Costs	Total Disposal Costs
A	$ 5,181,800	$ 338,500	$ 4,900	$ 283,400	$ 5,808,600
B	$ 5,181,800	$ 359,600	$ 4,900	$ -	$ 5,546,300
C	$ 5,181,800	$ 342,300	$ 48,600	$ -	$ 5,572,700
Edith	$ 8,846,300	$ 144,600	$ 68,000	$ -	$ 9,058,900
Ellen	$ 8,846,300	$ 1,329,900	$ -	$ 49,200	$ 10,225,400
Elly	$ 8,846,300	$ -	$ -	$ 49,200	$ 8,895,500
Eureka	$ 17,692,500	$ 2,419,500	$ 28,100	$ -	$ 20,140,100
Gail	$ 17,692,500	$ 1,206,300	$ -	$ -	$ 18,898,800
Gilda	$ 8,846,300	$ 712,300	$ 68,000	$ 174,300	$ 9,800,900
Gina	$ 3,349,500	$ 149,000	$ 2,900	$ 7,400	$ 3,508,800
Grace	$ 8,846,300	$ 839,600	$ -	$ 78,800	$ 9,764,700
Habitat	$ 8,846,300	$ 483,300	$ 35,900	$ 15,500	$ 9,381,000
Harmony	$ 25,651,500	$ 3,077,000	$ 109,800	$ 27,400	$ 28,865,700
Harvest	$ 17,692,500	$ 1,082,400	$ -	$ -	$ 18,774,900
Henry	$ 5,181,800	$ 243,400	$ 24,300	$ -	$ 5,449,500
Heritage	$ 25,651,500	$ 2,355,500	$ 264,300	$ -	$ 28,271,300
Hermosa	$ 17,692,500	$ 707,200	$ -	$ 42,700	$ 18,442,400
Hidalgo	$ 16,017,800	$ 579,700	$ -	$ -	$ 16,597,500
Hillhouse	$ 5,181,800	$ 471,600	$ 33,000	$ -	$ 5,686,400
Hogan	$ 8,846,300	$ 625,200	$ 8,700	$ 8,300	$ 9,488,500
Hondo	$ 17,692,500	$ 1,280,000	$ 87,400	$ 10,400	$ 19,070,300
Houchin	$ 8,846,300	$ 617,000	$ 7,000	$ -	$ 9,470,300
Irene	$ 8,846,300	$ 451,000	$ 27,200	$ 85,000	$ 9,409,500
Total	**$ 264,658,500**	**$ 19,814,900**	**$ 823,000**	**$ 831,600**	**$ 286,128,000**

Disposal costs increased due to transport to GOM



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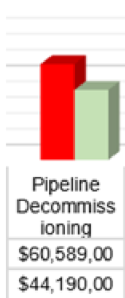
Decommissioning Cost Estimate Results Pipeline Removal Costs

InterAct PMTI

- Costs decreased
- Larger campaign saved mob/demob costs



Platform	Water Depth, feet	Total Length of OCS Pipeline, mi	Length of Pipeline to be removed, mi	Total Pipeline Cost
A	188	35.9	20.2	$ 3,125,100
B	200	1.5	0	$ 1,000,800
C	193	1.5	0	$ 611,200
Edith	150	7.8	0	$ 368,400
Ellen	265	0	0	$ -
Elly	265	15.2	4.5	$ 1,770,400
Eureka	700	4.8	0	$ 4,753,000
Gail	739	18.5	0	$ 2,858,800
Gilda	205	29.5	12.5	$ 5,474,400
Gina	90	12	0.6	$ 547,100
Grace	308	30.5	4.6	$ 2,935,000
Habitat	292	8.3	0.9	$ 1,082,400
Harmony	1200	22.2	1.1	$ 3,183,100
Harvest	675	5.8	0	$ 1,847,300
Henry	170	7.3	0	$ 573,400
Heritage	1075	13.5	0	$ 1,610,700
Hermosa	603	20.8	1.1	$ 2,465,600
Hidalgo	430	9.6	0	$ 1,889,000
Hillhouse	189	1.5	0	$ 815,600
Hogan	154	22.9	0.6	$ 1,151,400
Hondo	842	9.8	0.6	$ 1,928,200
Houchin	176	2.9	0	$ 704,900
Irene	242	30.1	4.6	$ 3,494,200
Total	-	**311.9**	**51.29**	**$ 44,190,000**
Average Cost per mile				$ 861,600

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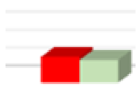
Decommissioning Cost Estimate Results
Power Cable Removal Costs

BSEE InterAct PMTI

- Costs decreased
- Used cut/recover option rather than cable reel due to high mob/demob costs for reel vessel



Power Cable Removal
$14,444,84
$12,752,10

Cable Origin	Cable Terminus	Length (feet)	Total Removal Costs
A	B	2,640	$ 164,100
B	C	2,640	$ 164,100
C	Shore	26,400	$ 829,400
Edith	Shore	36,960	$ 1,093,500
Ellen**		-	
Elly		-	
Eureka*	Ellen (2 cables)	15,297	$ 313,100
Gail		-	
Gilda	Shore	36,960	$ 1,093,500
Gina	Shore	1,584	$ 208,600
Grace		-	
Habitat	P/FA	19,536	$ 695,700
Harmony*	Shore (2 cables)	59,664	$ 980,000
Harvest		-	
Henry	Hillhouse	13,200	$ 499,200
Heritage	Harmony	39,072	$ 1,211,100
Heritage	Shore	104,544	$ 2,848,800
Hermosa		-	
Hidalgo		-	
Hillhouse	Shore	17,952	$ 618,000
Hogan	Shore	4,752	$ 325,900
Hondo*	Harmony (2 cables)	47,520	$ 828,100
Houchin	Hogan	3,800	$ 302,100
Irene	Shore	14,784	$ 576,900
Total			$ 12,752,100

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Decommissioning Cost Estimate Results
Site Clearance

BSEE InterAct PMTI

Platform Water Depth (< 300 feet)		Platform Water Depth (> 300 feet)	
Pre-Decommissioning SSS	$72,000	Pre-Decommissioning SSS	$72,000
Mob/Demob	$33,000	Mob/Demob	$33,000
Data Analysis	$6,000	Data Analysis	$6,000
Subtotal	$111,000	Subtotal	$111,000
ROV Deployment Debris Removal	$142,800	ROV Deployment Debris Removal	$285,600
Site Clearance Verification Trawling (7 days x $5,000)	$35,000	Site Clearance Verification ROV Survey (5 days x $20,400)	$102,000
Shell Mound Survey Geotechnical &	$278,000	Shell Mound Survey Geotechnical &	$278,000
Total Cost	**$566,800**	**Total Cost**	**$776,600**

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Decommissioning Cost Estimate Results
Site Clearance

Significant cost savings by eliminating divers and by combining debris clean up with verification ROV operation

Platform	Site Clearance
A	$ 566,800
B	$ 566,800
C	$ 566,800
Edith	$ 566,800
Ellen	$ 566,800
Elly	$ 566,800
Eureka	$ 776,600
Gail	$ 776,600
Gilda	$ 566,800
Gina	$ 566,800
Grace	$ 776,600
Habitat	$ 566,800
Harmony	$ 776,600
Harvest	$ 776,600
Henry	$ 566,800
Heritage	$ 776,600
Hermosa	$ 776,600
Hidalgo	$ 776,600
Hillhouse	$ 566,800
Hogan	$ 566,800
Hondo	$ 776,600
Houchin	$ 566,800
Irene	$ 566,800
Total	$ 14,924,600

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Decommissioning Cost Estimate Results
PMEP & Other Contingency Costs

Costs increased due to cost basis modifications

Platform	PMEP	Weather Contingency	Misc.Work Provision	Total Contingencies
A	$ 3,016,500	$ 1,562,100	$ 5,656,000	$ 10,234,600
B	$ 2,978,900	$ 1,551,600	$ 5,585,400	$ 10,115,900
C	$ 2,377,600	$ 1,174,500	$ 4,457,900	$ 8,010,000
Edith	$ 2,641,100	$ 1,164,900	$ 4,952,100	$ 8,758,100
Ellen	$ 3,923,800	$ 1,908,300	$ 7,357,200	$ 13,189,300
Elly	$ 2,074,600	$ 819,000	$ 3,889,900	$ 6,783,500
Eureka	$ 7,266,000	$ 3,501,400	$ 13,623,800	$ 24,391,200
Gail	$ 6,000,400	$ 5,540,400	$ 11,250,800	$ 22,791,600
Gilda	$ 4,371,700	$ 4,418,800	$ 8,196,900	$ 16,987,400
Gina	$ 1,105,000	$ 482,300	$ 2,071,900	$ 3,659,200
Grace	$ 3,141,200	$ 2,879,800	$ 5,889,700	$ 11,910,700
Habitat	$ 2,682,700	$ 1,172,500	$ 5,030,100	$ 8,885,300
Harmony	$ 11,050,300	$ 10,782,600	$ 20,719,400	$ 42,552,300
Harvest	$ 5,523,200	$ 7,434,400	$ 10,356,000	$ 23,313,600
Henry	$ 1,915,600	$ 891,900	$ 3,591,800	$ 6,399,300
Heritage	$ 10,899,900	$ 15,981,000	$ 20,437,200	$ 47,318,100
Hermosa	$ 5,205,400	$ 6,888,500	$ 9,760,200	$ 21,854,100
Hidalgo	$ 4,427,800	$ 5,707,200	$ 8,302,100	$ 18,437,100
Hillhouse	$ 2,826,800	$ 1,449,600	$ 5,300,300	$ 9,576,700
Hogan	$ 2,718,500	$ 1,189,500	$ 5,097,100	$ 9,005,100
Hondo	$ 5,651,200	$ 5,013,300	$ 10,596,100	$ 21,260,600
Houchin	$ 2,465,500	$ 1,032,300	$ 4,622,800	$ 8,120,600
Irene	$ 3,107,900	$ 4,310,600	$ 5,827,400	$ 13,245,900
Total	**$ 97,371,600**	**$ 86,856,500**	**$ 182,572,100**	**$ 366,800,200**

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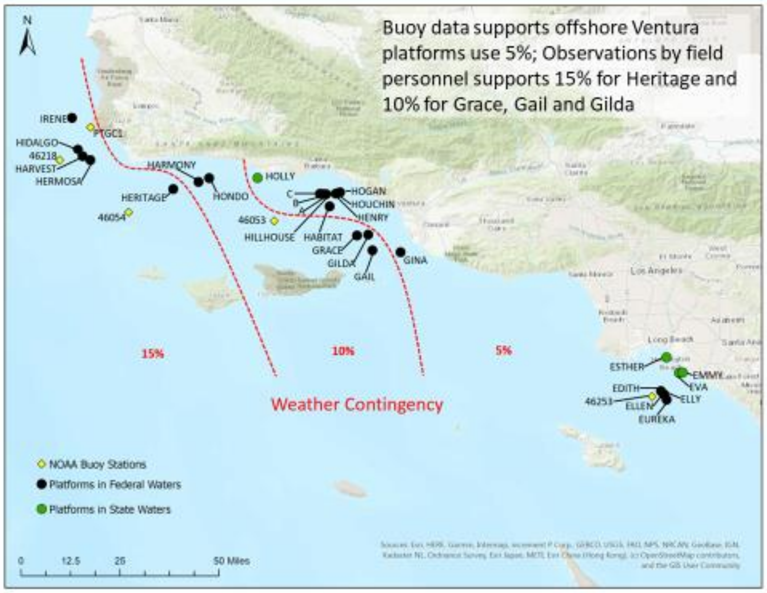
Decommissioning Cost Estimate Results
Weather Contingency Costs

BSEE Bureau of Safety and Environmental Enforcement — InterAct PMTI



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Decommissioning Cost Estimate Results
Total Costs

BSEE Bureau of Safety and Environmental Enforcement — InterAct PMTI

Platform	Platform Removal	Platform Preparation	Well/Slot P&A	Pipeline Decommissioning	Power Cable Removal	Site Clearance	Permitting and Regulatory	Mob/Demob of Derrick Barge	Materials Disposal	Weather Contingency	Miscellaneous Work Provision	PMEP	Total
A	$ 6,983,100	$ 1,651,500	$ 18,746,400	$ 5,125,100	$ 164,100	$ 566,800	$ 657,000	$ 1,704,400	$ 5,808,600	$ 1,562,100	$ 5,656,000	$ 3,018,500	$ 49,645,600
B	$ 6,988,800	$ 1,659,800	$ 20,652,200	$ 1,000,800	$ 164,100	$ 566,800	$ 657,000	$ 1,704,400	$ 5,546,300	$ 1,551,600	$ 5,385,400	$ 2,978,900	$ 49,056,100
C	$ 6,994,400	$ 1,618,200	$ 12,877,700	$ 611,200	$ 829,400	$ 566,800	$ 657,000	$ 1,704,400	$ 5,572,700	$ 1,174,500	$ 4,457,900	$ 2,377,600	$ 39,441,800
Edith	$ 10,532,400	$ 2,613,500	$ 8,123,300	$ 368,400	$ 1,093,500	$ 566,800	$ 657,000	$ 1,704,400	$ 9,058,900	$ 1,164,900	$ 4,952,100	$ 2,641,100	$ 43,476,300
Ellen	$ 10,378,700	$ 2,476,400	$ 24,743,600	$ -	$ -	$ 566,800	$ 657,000	$ 1,704,400	$ 10,225,400	$ 1,908,300	$ 7,357,200	$ 3,923,800	$ 63,941,600
Elly	$ 11,631,200	$ 2,411,600	$ -	$ 1,770,400	$ -	$ 566,800	$ 657,000	$ 1,704,400	$ 8,895,500	$ 819,000	$ 3,889,900	$ 2,074,600	$ 34,420,400
Eureka	$ 32,457,800	$ 4,665,600	$ 27,042,400	$ 4,793,000	$ 313,100	$ 776,600	$ 657,000	$ 1,704,400	$ 20,340,100	$ 3,501,400	$ 15,623,800	$ 7,268,000	$ 116,521,000
Gail	$ 32,941,700	$ 3,885,900	$ 14,941,400	$ 2,898,800	$ -	$ 776,600	$ 782,000	$ 1,833,700	$ 18,898,800	$ 5,540,400	$ 11,250,800	$ 6,000,400	$ 99,650,500
Gilda	$ 10,305,500	$ 2,030,900	$ 24,717,000	$ 5,478,400	$ 1,093,500	$ 566,800	$ 657,000	$ 1,704,400	$ 9,800,900	$ 4,418,800	$ 8,196,900	$ 4,371,700	$ 71,357,800
Gina	$ 3,302,000	$ 705,100	$ 4,317,000	$ 547,100	$ 208,600	$ 566,800	$ 657,000	$ 1,704,400	$ 3,508,800	$ 482,300	$ 2,071,900	$ 1,105,000	$ 19,176,000
Grace	$ 12,030,900	$ 2,909,900	$ 10,145,800	$ 2,935,000	$ -	$ 776,600	$ 782,000	$ 1,833,700	$ 9,764,700	$ 2,879,800	$ 5,889,700	$ 3,141,200	$ 53,009,300
Habitat	$ 8,823,500	$ 1,851,200	$ 10,431,300	$ 1,082,400	$ 695,700	$ 566,800	$ 782,000	$ 1,833,700	$ 9,301,000	$ 1,172,500	$ 5,030,100	$ 2,682,700	$ 44,252,900
Harmony	$ 74,382,900	$ 5,308,700	$ 23,395,100	$ 3,183,100	$ 900,000	$ 776,600	$ 1,437,000	$ 5,153,600	$ 28,865,700	$ 10,782,600	$ 20,719,400	$ 11,050,300	$ 185,835,000
Harvest	$ 31,034,400	$ 5,066,400	$ 10,838,100	$ 1,847,300	$ -	$ 776,600	$ 782,000	$ 1,833,700	$ 18,774,900	$ 7,434,400	$ 10,356,000	$ 5,523,200	$ 94,187,000
Henry	$ 5,123,400	$ 1,583,000	$ 9,492,800	$ 575,400	$ 499,200	$ 566,800	$ 657,000	$ 1,704,400	$ 5,449,500	$ 891,900	$ 3,591,800	$ 1,915,600	$ 32,048,800
Heritage	$ 61,088,800	$ 5,111,500	$ 93,892,300	$ 1,630,700	$ 4,059,900	$ 776,600	$ 1,437,000	$ 5,153,600	$ 28,271,300	$ 15,981,000	$ 20,437,200	$ 10,899,900	$ 188,720,000
Hermosa	$ 30,724,600	$ 4,591,200	$ 7,363,600	$ 2,465,600	$ -	$ 776,600	$ 782,000	$ 1,833,700	$ 18,442,400	$ 6,888,500	$ 9,760,200	$ 5,205,400	$ 88,755,800
Hidalgo	$ 20,957,200	$ 4,650,000	$ 9,775,100	$ 1,889,000	$ -	$ 776,600	$ 782,000	$ 1,833,700	$ 16,597,500	$ 5,787,200	$ 8,302,100	$ 4,427,800	$ 75,618,200
Hillhouse	$ 5,893,100	$ 1,572,200	$ 19,526,100	$ 815,600	$ 618,000	$ 566,800	$ 657,000	$ 1,704,400	$ 5,686,400	$ 1,449,600	$ 5,300,300	$ 2,826,800	$ 46,616,300
Hogan	$ 8,404,300	$ 1,894,300	$ 11,647,500	$ 1,151,400	$ 325,900	$ 566,800	$ 782,000	$ 1,833,700	$ 9,408,500	$ 1,189,500	$ 5,097,100	$ 2,718,500	$ 44,819,500
Hondo	$ 25,795,800	$ 4,582,400	$ 16,222,000	$ 1,928,200	$ 828,300	$ 776,600	$ 1,437,000	$ 5,153,600	$ 19,070,300	$ 5,013,300	$ 10,596,100	$ 5,651,200	$ 97,054,600
Houchin	$ 7,624,500	$ 2,205,300	$ 9,242,700	$ 704,900	$ 302,300	$ 566,800	$ 782,000	$ 1,833,700	$ 9,470,300	$ 1,032,300	$ 4,622,800	$ 2,465,500	$ 40,772,700
Irene	$ 9,209,000	$ 2,238,400	$ 12,652,200	$ 5,494,200	$ 576,900	$ 566,800	$ 782,000	$ 1,833,700	$ 9,409,500	$ 4,310,600	$ 5,827,400	$ 3,107,900	$ 51,928,600
Total	$ 433,607,600	$ 66,899,000	$ 380,787,800	$ 44,190,000	$ 12,752,300	$ 14,924,600	$ 17,856,000	$ 50,712,500	$ 286,128,000	$ 86,856,500	$ 182,572,100	$ 97,371,600	$ 1,634,657,800

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Summary

- Cumulative costs increased 11.5% from prior report primarily due to changes in methodology.
- All but five platforms increased cost.
- Increased costs are due primarily to:
  - Methodology changes in platform transportation and material disposal
  - Revised well P&A categorization criteria and methodology
  - More detailed review of platform preparation and removal costs
  - Revised cost basis for contingency factors
- Some costs decreased due primarily to:
  - Platform groupings in larger campaigns (shared costs)
  - Some well P&A (TA) has occurred since 2016
  - Lower HLV rates and mob/demob costs using GOM vessels
  - More streamlined site clearance procedure

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Discussion

Questions / Comments

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