

# Kier BAM JV | HPC Earthworks



Hinkley Point C – Earthworks and Material Handling  
Bulk-ex 2021



**KIER | BAM**



# Introduction

Craig Small – Operation Director for Kier Infrastructure  
Project Director for Kier Bam at HPC

- 26 Years Experience in construction industry
- 15 Years in the Nuclear Sector – Rosyth Royal Dockyard, Faslane, Devonport Royal Dockyard, AWE and HPC
- 8 Years involvement at HPC



Photo from 2019



# Brief Overview of HPC





# Brief Overview of HPC

- EPR design capable of generating **7% of the UK's electricity**.
- Avoids the emission of **9 million tonnes** of CO<sub>2</sub> a year.
- At least **25,000 different job opportunities**.
- **Almost £4bn** into regional economy over lifetime of the project
- UK Businesses set to secure **64%** of the total construction spend

HPC's Project values

> Humility  
> Clarity  
> Respect  
> Positivity  
> Solidarity

# Overview - KierBam JV Earthworks

Kier Infrastructure & BAM Nuttall share **80 years** of JV history working together

Delivered OH2001 Earthworks contract

Delivering the Civils Framework contract

**Nuclear excellence** based on **right first time** delivery



# Overview - KierBam JV Earthworks



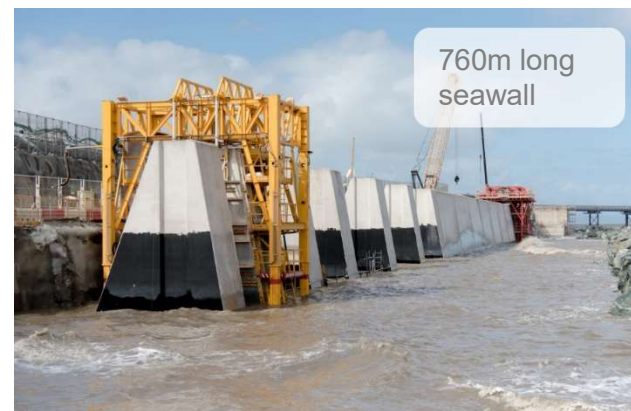
EARTHWORKS



ROADS & NETWORKS



DEEP DIG



STRUCTURES



# 2013



HPC 15/01/2013



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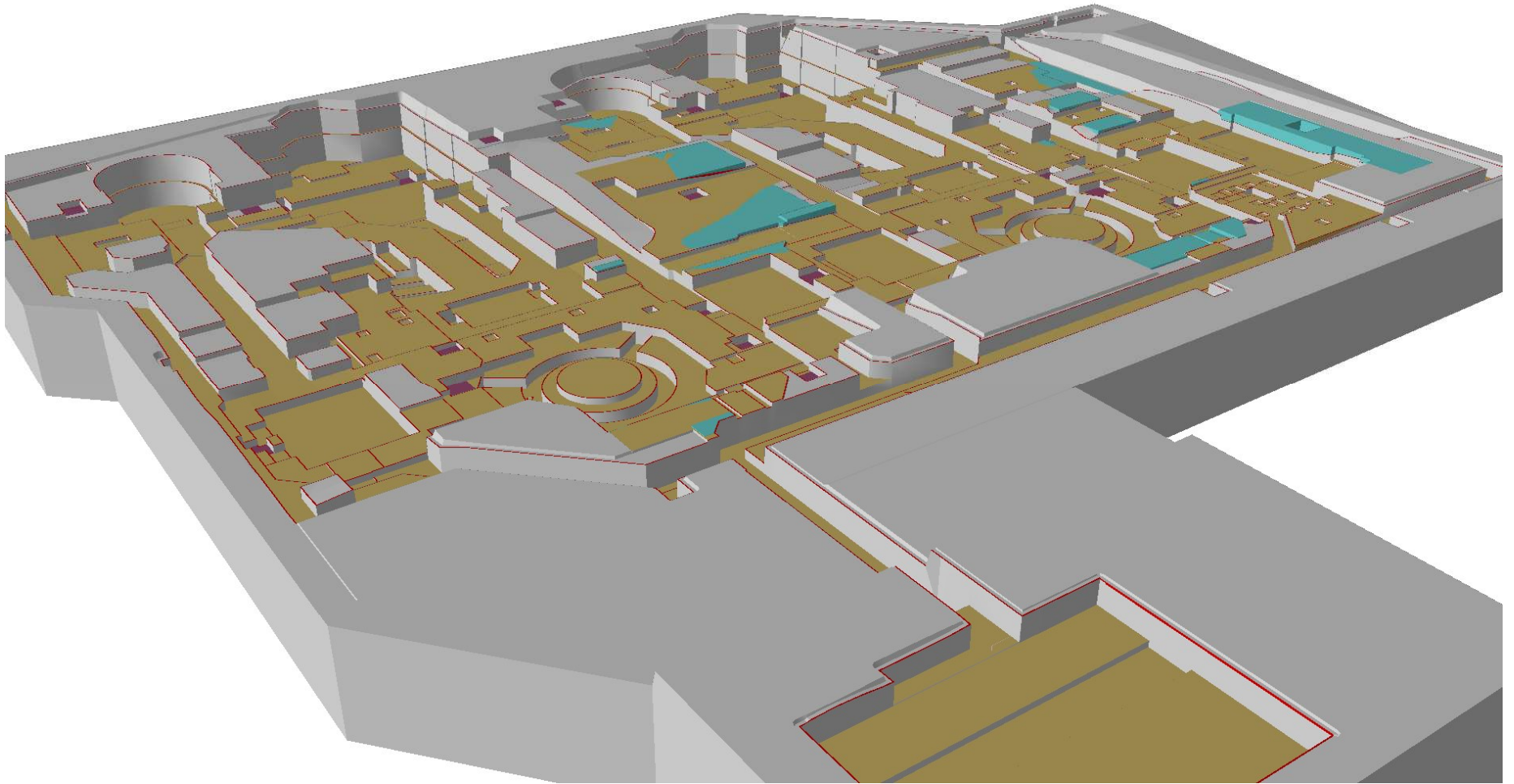
HPC Site Footprint  
~ 1.3km x 1.8km

# 2021



# Construction sequence

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# Deep Dig - Facts

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- The biggest excavator used in the deep dig was the PC3000, a 300t excavator.
- The ground water level was reduced by the installation of 130 dewatering wells, in total we have discharged over 1,000,000m<sup>3</sup> of ground water off site.
- Installation of over 350 slope monitoring installations from Inclinometers, Piezometers to Dynaforce sensors. These measure any movement in the slopes.



# Deep Dig - Facts

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- 140,000m<sup>3</sup> of blinding and substitution concrete poured
- 105,000m<sup>2</sup> of Sprayed Concrete Faces Sprayed
- 202,300 linear meters of ground nails installed
- 2,820,000m<sup>3</sup> of rock excavated
- There are 955 different vertical faces and 480 different platforms
- The deepest excavation is 32m deep, this is the heat sink.
- Ground nails can be up to 20m long and 40mm in diameter



# Construction sequence

1

- Install dewatering system

2

- Install slope monitoring instrumentation

3

- Bulk excavate

4

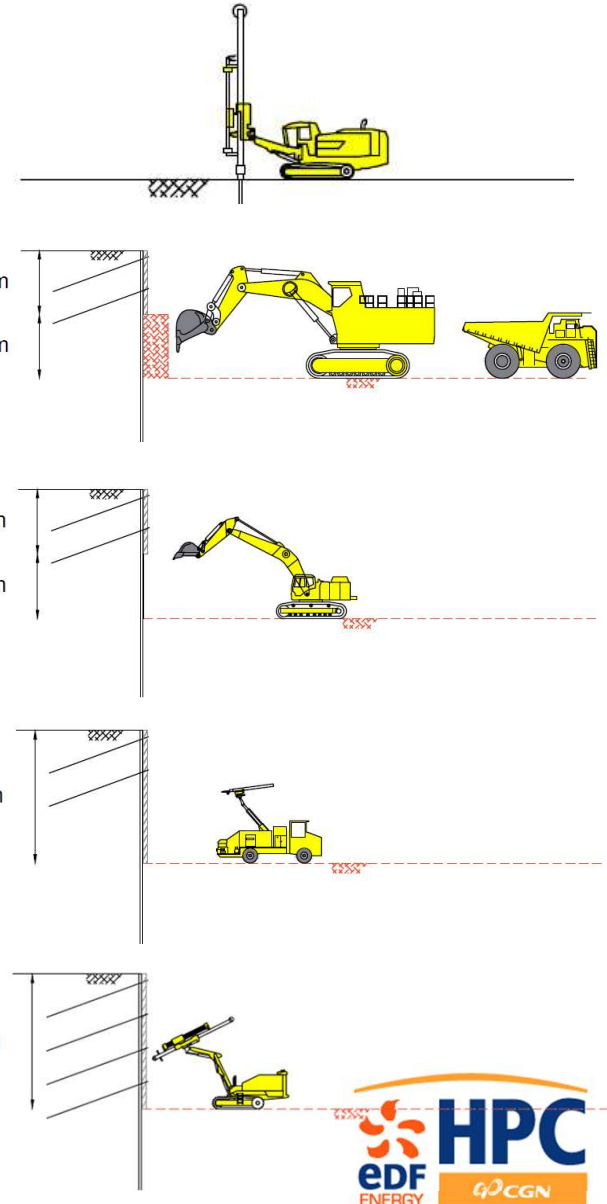
- Trim vertical face

5

- Spray concrete

6

- Install ground nails and test





# Construction sequence

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7

- Trim and clean formation

8

- Pour layer 1 blinding

9

- Install earthing

10

- Pour layer 2 blinding

# Bulk excavation





# Material Processing - Facts

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## Requirements – production of fill materials

There are six main classes of fill on the project;

- Class B1 - non-reinforced concrete to be used below safety critical structures
- Class B4 (Site–won materials, including Layer 2A stabilised with 2% lime, Layer 3, Lilstock), to be used as a site platform levelling fill in Permanent Areas.
- Class B5 (Imported material) surface level capping for platforms
- Class B6 (Site–won materials, including Layer 2A stabilised with 2% lime, Layer 2B, Layer 3, Lilstock), to be used for site platform levelling in the Construction Areas.
- Class B6BIS (Site–won materials, including Overburden/Layer 1 and Layer 2A) to be used in stockpile platforms and bund.
- Class B7 (Site–won materials, including Overburden/Layer 1 and the Westbury Formation) non structural fill

# Material Processing - Facts

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## Requirements

- Materials excavated on site can be classified into layers 1, 2 or 3
- The Materials Management Plan shows where the different classes of materials are expected to be encountered and where and how they will be reused.
- The Contractor shall develop suitable methods to ensure that appropriate layers of materials are excavated, separated and identified in the correct classes
- The Contractor shall ensure that adequately qualified personnel (including engineers/geologists) are used in the supervision of excavations to enable accurate identification of soil and rock types and geological horizons.
- In areas identified for obtaining site–won materials for re–use in the works, the Contractor shall ensure that excavation of the materials is carried out in a manner that will maximise the amount of acceptable material collected.
- The Contractor shall crush (where necessary) and screen Layer 3 excavated material to ensure that a well-graded material is obtained.



# Material Processing - Facts

Kier BAM programme showed the following processed fill requirements:

B4 – 499,358m<sup>3</sup> (B3 – 104,000m<sup>3</sup>), B6 – 459,371m<sup>3</sup>

Total = 1,062,729m<sup>3</sup>

Original Strategy – didn't work!

KBJV procured the following processing equipment:

- 1no. MMD Series 500 sizer. 500 tph processing as-dug material <800mm to <200mm.
- 2no. MMD Series 625 sizers. 1500tph processing as-dug material <800mm to <200mm



# Material Processing - Facts

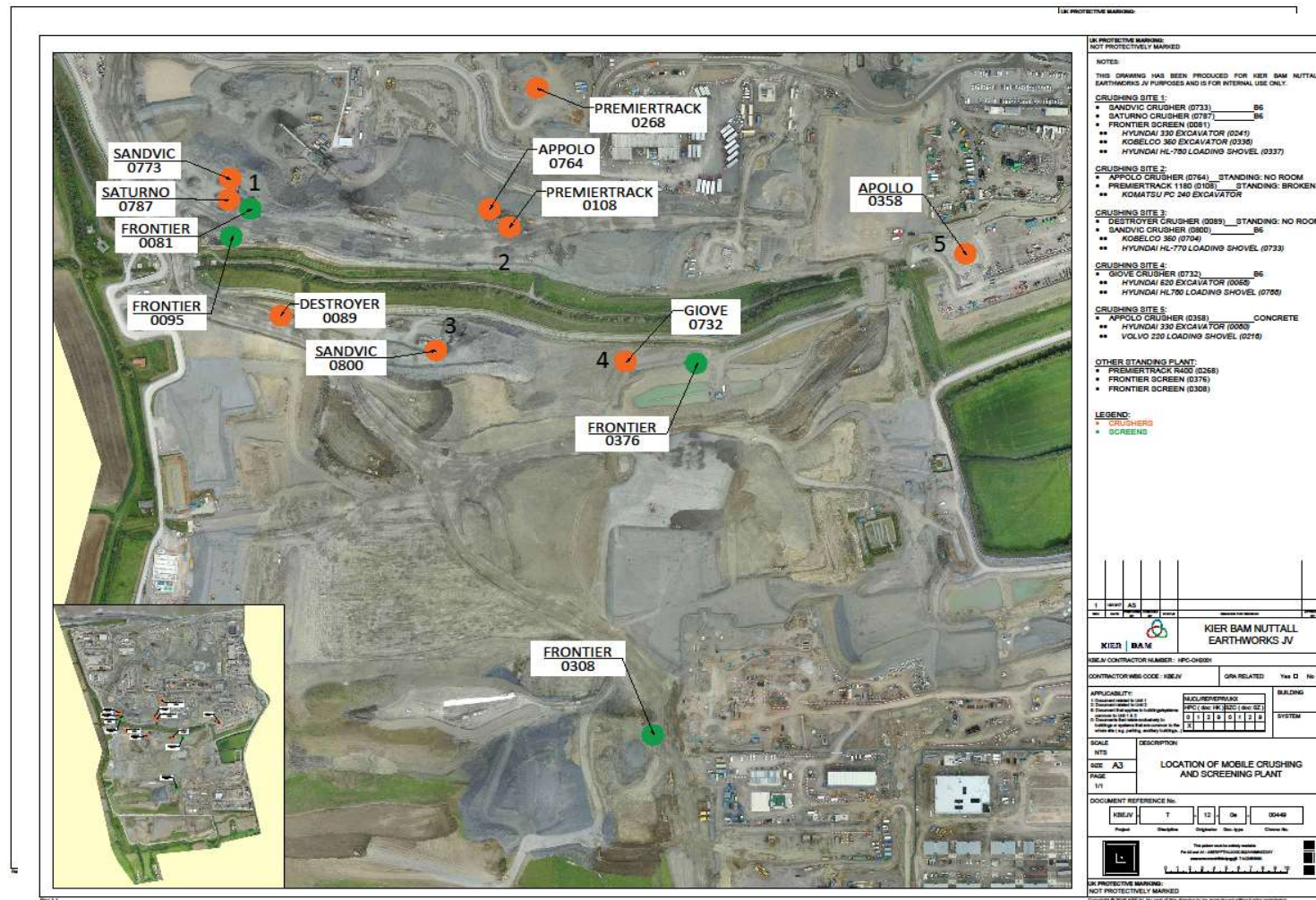
## The Right Strategy – did work!

- Mobile Crushing - B6 ONLY- 8,000t per day (based on 9 units operational + 3 no. resilience)
- 625 Sizer – B6 / B4 / B3 -7000t x 70% = 5,000t per day on a normal day shift operation (9hr day)
- Total tonnage per day of 13,000t.

UN PROTECTIVE MARKING: NOT PROTECTIVELY MARKED	
NOTES:  THIS DRAWING HAS BEEN PRODUCED FOR KIER BAM NUTTALL EARTHWORKS JV PURPOSES AND IS FOR INTERNAL USE ONLY.	
CRUSHING SITE 1:	
• SANDVIC CRUSHER (0733)	B6
• SATURNO CRUSHER (0787)	B6
• FRONTIER SCREEN (0081)	
• HYUNDAI 330 EXCAVATOR (0241)	
• KOBELCO 350 EXCAVATOR (0336)	
• HYUNDAI HL-780 LOADING SHOVEL (0337)	
CRUSHING SITE 2:	
• APPOLO CRUSHER (0764)	STANDING: NO ROOM
• PREMIERTRACK 1180 (0108)	STANDING: BROKEN
• KOMATSU PC 340 EXCAVATOR	
CRUSHING SITE 3:	
• DESTROYER CRUSHER (0089)	STANDING: NO ROOM
• SANDVIC CRUSHER (0800)	B6
• KOBELCO 350 (0704)	
• HYUNDAI HL-770 LOADING SHOVEL (0733)	
CRUSHING SITE 4:	
• GIOVE CRUSHER (0732)	B6
• HYUNDAI 620 EXCAVATOR (0065)	
• HYUNDAI HL780 LOADING SHOVEL (0785)	
CRUSHING SITE 5:	
• APPOLO CRUSHER (0358)	CONCRETE
• HYUNDAI 330 EXCAVATOR (0080)	
• VOLVO 220 LOADING SHOVEL (0216)	
OTHER STANDING PLANT:	
• PREMIERTRACK R400 (0268)	
• FRONTIER SCREEN (0376)	
• FRONTIER SCREEN (0308)	
LEGEND:	
• CRUSHERS	
• SCREENS	



# Material Processing - Facts



# Challenges – Surface water

- **Challenges:**

- Degradation of bedrock
- Degradation of material (changing its reuse properties)
- Poor ground conditions
- Unmanageable volumes of water



- **Solutions:**

- Additional preparation
- Construction of large surface water sumps
- Short tipping
- Drying materials
- Delaying excavation

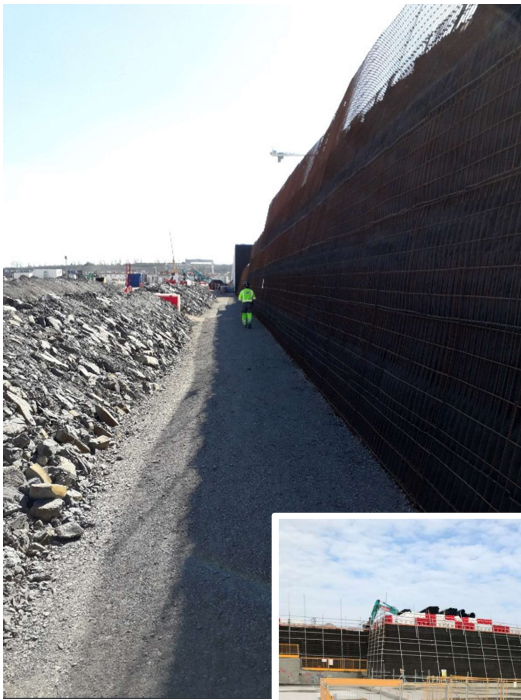




# Challenges – Ground conditions

- Challenges:

- Unexpected ground conditions where geology didn't meet the design levels from the geological model



- Solutions:

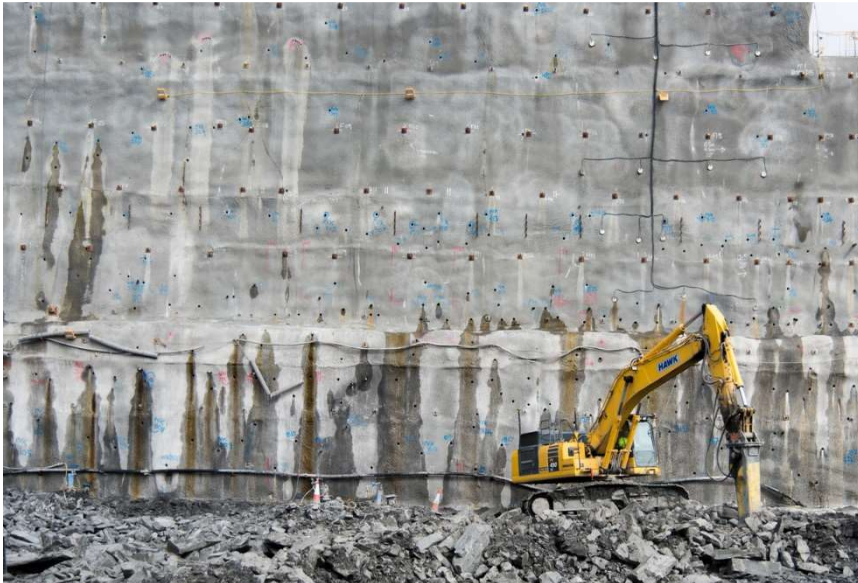
- Excavate to the specified weathering grade and make up to level with mass fill substitution concrete (QRA areas), reinforced earth fill or standard fill materials



# Challenges – Slope movements

- Challenges:

- Slope movements during excavation outside of design parameters.



- Solutions:

- An overall design review of the deep dig trigger limits was also undertaken to ensure the design expectations matched construction reality, in some instances it was possible to increase trigger levels
- Plotted movement trends to predict the projected rate of movement.
- Installed larger or additional nails or ground anchors.
- Reduced excavation lift heights to reduce movement





# Thank you



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**ONE TEAM ONE DREAM**

