Request for Proposal

1st January 2077

***Astoria* Space Settlement Contract**

INTRODUCTION

This is a request by the Foundation Society for contractors to propose design and development of a crewed base for the purposes of the complete mining of small asteroids (< 1 km diameter) and their processing into usable products. The base must be reusable on new bodies after the completion of operations in one location. The main bodies of interest are icy, C, S, and X-type asteroids under the SMASS classification. All stable elements are of interest, as well as those compounds or alloys in widespread use.

STATEMENT OF WORK

1. Basic Requirements- The contractor will describe the design, development, and construction of the Astoria mining and processing base and supplementary facilities pertaining thereto.

2. Structural Design- The bases must provide safe and habitable working environments for a total of 200 occupants and a temporary, transient population not to exceed 20 people.

2.1 Overall design drawings must identify all enclosed volumes and their uses, show base features, and clearly show dimensions of major structural features in metric units.
Minimum requirement: overall views of the base and associated features, showing the locations of, and sizes for habitable, rotating, and pressurized volumes alongside entry/exit locations, and locations of propulsion and mining systems.

2.2 The base design must specify uses of interior down surfaces experiencing spin gravity of at least 0.3 g, with areas designated and drawings clearly labelled and dimensioned to show residential, commercial, industrial and other uses. Design for functionality of the whole base both under spin and zero-gravity conditions.
Minimum requirement: overall maps of interior land areas, showing usage and size of those areas.

2.3 Describe the processes and facilities required to construct the base, by showing the sequence in which major structural components will be assembled, and capabilities available at intermediate phases. CASSSCs may be converted for use in base construction.
Minimum requirement: drawings showing at least four intermediate steps of base construction.

2.4 Design for physical isolation between volumes to protect occupants from abrupt pressure loss in one part of Astoria. Design volumes for safety of residents from environmental and industrial hazards.
Minimum requirement: descriptions of regions of atmospheric continuity, of locations for ‘shirtsleeves’ movement between isolated volumes and provisions made therefor, and of structural safety elements included.

3. Operations and Infrastructure- Describe facilities and infrastructure necessary to operate the base. Specify methods for the industrial mining and processing functions of the settlement. Show locations of systems and locations of storage for all materials and substances.

3.1 Identify sources of materials and equipment for construction and operations of the bases and means for transporting those materials and assets to the bases' location. List and specify initial quantities and the duration between replenishing of water, oxygen, mixture gases, and other consumables to be supplied in CASSSCs.
Minimum requirement: chart or table quantifying materials and equipment required for the base construction process and operation showing from where and how those assets are shipped.

3.2 The settlement design will describe elements of basic infrastructure needed for the functioning of the settlement, including, but not limited to:

- Food production and distribution.
- Atmospheric regulation, including composition and monitoring. The pressure in the settlement should be maintained at a minimum of 0.65 Earth atmospheres. Specify humidity.
- Electrical power generation. Specify the peak and continuous requirement.
- Internal communication networks and describe methods for connecting to cislunar networks, specifying time delay with communication with cislunar internet.
- Temperature regulation. Specify total heat dissipation.
- Liquid and solid waste recycling. Specify total daily water usage, and methods for relocating irreducible waste.
- Facilities to interact with external spacecraft for the transportation of people, and the import and export of materials via CASSSCs.

Minimum requirement: drawing(s) showing locations if systems which provide infrastructure, and, as appropriate, their configurations (e.g., show routings of water and waste services).

3.3 Describe methods for resource extraction and storage of harvested and refined materials. Astoria will collect 9.5×10^9 kg (~3.8×10^6 m^3) of material per 28 Earth days while on site at a target asteroid. CASSSCs for and containing materials will be delivered to and collected from the vicinity (200 metre radius) of Astoria every 7 Earth days by supply ships run by an external contractor.
Minimum requirement: drawings showing harvesting equipment/operations, descriptions of processing technologies, specified locations of product storage, and procedures for collection and placement for collection of delivery CASSSCs.

3.4 Astoria must be able to act upon new bodies. Describe how target asteroids are manoeuvred to the mining facility either by their movement or by moving Astoria with minimal expenditure of propellant. Show how profitable metallic targets above 1 km in any dimension can be reduced to a workable size.
Minimum requirement: diagrams of the target manoeuvring and size management systems, and a chart or table listing expendables associated with these and mining operations.

4. Human Factors- The base will offer amenities typically available to crews of comparably-sized ships and provide opportunities for residents to enjoy views of outer space. People are expected to arrive and leave the settlement via regularly scheduled spacecraft.

4.1 Astoria will provide services that occupants could expect from comfortable settlements (e.g. personal quarters, medical, recreation, access to good food and entertainment), variety and quantity of consumables and other supplies, and pleasant public areas. Show methods of distributing daily consumables to occupants.
Minimum requirement: map(s) and or illustrations depicting overall interior designs and locations of amenity services in the bases, with dimensioning or a distance scale. Correlate designs with expected resident status as described in the Population Overview table.

Population Overview	
Resident Status	Number of Individuals
Single Men	80
Single Women	80
Married Couples	40
Children (Under 18)	0

4.2 Provide interior designs of typical permanent and temporary occupant quarters. Describe how provision is made for quarters to be fully customised quickly and with minimum disturbance to lifestyle to each individual occupant's requirements. Specify recreational facilities available for occupant's use in quarters and public spaces.
Minimum requirement: interior floor plans for three variants of occupant quarters, description of facilities available for convenient personalisation, and a chart or table detailing recreational facilities available on Astoria.

4.3 Describe human interaction with the mining processes and measures put in place for resident safety. Specify positions and employment on board the station to fulfill an effective operational hierarchy.
Minimum requirement: table of jobs in mining operations and other services detailing the number of people assigned to each role and a table of safety measures put in place.

4.4 Propose mechanisms by which to minimise passive noise from settlement operations in living areas by settlement layout, material choice and/or active systems. Residential and public recreational areas should not exceed low noise levels (30 dB). Specify multifaceted methods for hearing protection for workers in stated areas prone to high levels of noise.
Minimum requirement: A map of expected noise intensity across the settlement, showing areas where hearing protection is required, and locations where noise isolation methods are installed. Give details of method(s) employed.

5. Automation Design and Services- Specify numbers, dimensions, and types of computing and information processing devices, multifunctional personal electronic tools, servers, and/or networks required for community and industrial operations across the settlement.

5.1 Describe uses of automation for construction, ongoing harvesting operations, and repair of incidental and major damage. Describe automated facilities for major industrial processes. Show which tasks are and are not automated with stated reasoning for these choices.
Minimum requirement: chart or table describing automated construction and assembly devices, operational aides, and ongoing maintenance devices.

5.2 Specify computer systems for industrial, maintenance, repair, and safety functions, including redundant systems. Define physical locations and protection of computers for critical functions. Show internal networking system(s) schematic(s) enabling industrial and recreational functions across the settlement. Describe means for authorized personnel to access data and command computer and robot systems; include security to ensure access only for authorized personnel, and only for authorized purposes. Define local internet contents and connection to the Cislunar Internet.

Minimum requirement: chart or table listing computers for operation of the settlement; specifying number and cost individually.

5.3 Specify automated systems to enhance livability in the community and convenience in residences. Emphasize use of automation to reduce the need for manual labor. Show which daily tasks are and are not automated with stated reasoning for these choices. Specify which automated systems operate in each artificial gravity level.
Minimum requirement: chart or table listing each robot for operation of the settlement; specifying number and individual cost.

5.4 Describe and specify contingencies for all major disaster scenarios including but not limited to: fire, hull breach/atmospheric pressure loss, loss of power generation, computer system failure, and virus or other highly infectious disease outbreak. Describe the expected recovery of the station from such an event.
Minimum requirement: charts or tables, showing redundancy and backup systems for all critical life support systems, and contingency plans for all mentioned disaster scenarios.

6. Schedule and Cost- Include a schedule for development and occupation of Astoria, and costs for design through construction phases of the schedule.

6.1 The schedule must describe contractor tasks from contract award (1 January 2077) until the customer assumes responsibility for the completed settlement.
Minimum requirement: durations and completion dates of major design, construction, and occupation tasks, depicted in a visual format (e.g., Gantt Chart) with milestones including, but not limited to, beginning of assembly, initial operating capacity (IOC), and the first introduction of permanent residents to the station..

6.2 Specify costs for Astoria design through construction in U.S. dollars, without accounting for economic inflation. Show estimates of numbers of workers associated with each phase of design and construction in the justification for contract costs.
Minimum requirement: chart(s) or table(s) listing separate costs associated with different phases of construction, amounts paid to each subcontractor used, and clearly showing the total cost that will be billed to the Foundation Society.