

# WORKING ON STEEP SLOPES

TANAP NATURAL GAS PIPELINE LOT3 CONSTRUCTION TURKEY



TEKFEN CONSTRUCTION



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# ABOUT TEKFEN CONSTRUCTION

Tekfen Construction, a leading corporation in challenging fields of contracting but also a studious environmentalist, traces its roots to an engineering consulting company established in 1956 in Turkey.

An affiliate of Tekfen Holding, Tekfen Construction is a respectable name in the international contracting arena with over 300 projects successfully completed in Turkey, the Middle East, North Africa, Caucasia & Central Asia, and East & Central Europe. Its wide span of activities range from heavy civil works to refineries and petrochemical plants; from satellite towns to large industrial processing plants; from pipelines and marine structures to power plants, electrical and communication works.

With its sister companies in engineering and steel manufacturing as well as strategic partnerships, Tekfen is a dynamic and sought-after EPC contractor, specialising in oil&gas, pipeline, infrastructure and civil works.

As an ISO 9001, ISO 14001 and OHSAS 18001 certified company, Tekfen is dedicated to the highest quality standards, aiming excellence through "continual improvement" and strict belief in "teamwork".

Tekfen Construction is a large family of 20,000 employees, including subcontractors' personnel.



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# TANAP TRANS ANATOLIAN NATURAL GAS PIPELINE PROJECT



The TANAP starts from the Georgian-Turkish border where it connects to the South Caucasus Pipeline (SCP) and ends at the Turkish - Greek border, where it feeds into the Trans Adriatic Pipeline (TAP). There are two compressor stations and 3 metering stations on the line.



# PROJECT SUMMARY



**48-56"**



TANAP Project is a 56" and 48" pipeline system of 1,850 km, and will transport natural gas as to the required specifications and quantity.

**1,850  
KM**

The initial capacity of TANAP will be 16 billion cubic meters (bcm) per year, gradually increasing to 31 bcm. 6 bcma will be delivered to consumers in Turkey via off-take stations by Gas Transport Agreement (GTA).

**31  
BCM**



# TEKFEN'S SCOPE OF WORK (LOT 3)



LOT 1 = 375 KM    LOT 2 = 450 KM    **LOT 3 = 513 KM**    LOT 4 = 512 KM

- Total pipe length: **513 km**
- Pipe diameter: **56"**
- Nominal capacity: **31 bcma in high-flow case**
- Design pressure: **95.5 barg**
- Total FOC conduit length to be laid: **2 x 513 km**
- Pig Launcher & Receiver Stations: **2 nos**
- Block Valve Stations: **14 nos**
- Total Provinces/Towns/Villages on the Pipeline Route: **6 provinces / 21 towns / 146 villages**
- Total Road Crossing: **814 nos**
- Total River Crossing: **548 nos**
- HDD River Crossing: **2 nos (655m/657m)**
- Total Excavation: **6.6 mio. m<sup>3</sup>**



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# WORKING ON INCLINED SURFACES

Within the scope of the TANAP Project, Tekfen's Health&Safety team has been working towards minimizing the incidents and occupational illness.

This presentation summarizes the actions taken to prevent and/or minimize potential incidents at the site where heavy machineries and vehicles are working on slopes and steep-slopes along the right of way.



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# AT THE BEGINNING OF THE PROJECT

Operators were not sure of the angles of the slopes.  
Nor were they knowledgeable about the working limits of their machinery / equipment on the slopes & steep slopes.

There was no slope information signage through the RoW.



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# INCIDENTS / NEAR MISSES

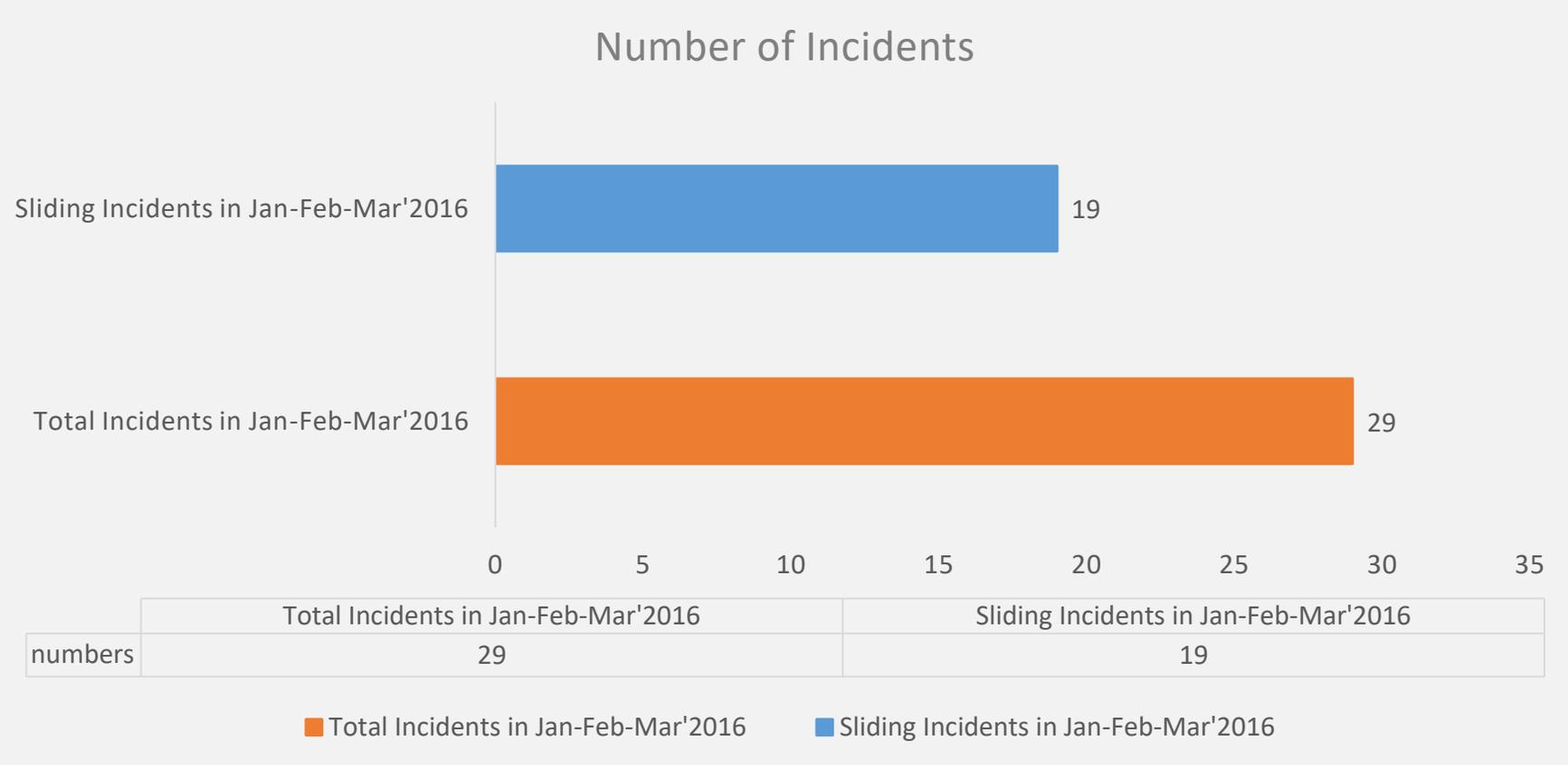
Several incidents occurred on steep slopes at beginning stage. Due to tough weather conditions and the nature of the slopes, machinery, equipment, and containers slid, and caused material damage incidents and near misses.

Tekfen's management established an investigation team to identify the root causes of the reoccurring slide incidents and held workshops for preventive solutions.





# INCIDENTS



Statistics show total incidents & sliding / slippery incidents on inclined surfaces during the winter season (Jan-Feb-Mar) in year 2016. %65 of total incidents were related to sliding & slippery.



# ACTIONS TAKEN

- ❖ Risk Assessment study reviewed with all site engineers & operators to determine the right control measures.
- ❖ All slopes & steep-slopes were spotted through the pipeline corridor.
- ❖ Warning & information signage was placed at both sides of the slopes.





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# ACTIONS TAKEN

The working capacities of heavy plants were checked from the plant's working manuals and placed in the operator's cabin.

A Specific Method Statement was prepared and all operators/drivers received trainings on how to work on inclined surfaces.



# Attachment 1 - Equipment Maximum Allowable Inclinations and Slope List

## LOT 3 SLOPE SECTIONS



16.12.2016

No	FROM KP	TO KP	LENGTH (m)	SLOPE (%)
1	1003+220.00	1004+100.00	120.00	17.50
2	1003+220.00	1004+100.00	120.00	16.00
3	1003+220.00	1004+100.00	120.00	15.00
4	1073+600.00	1074+500.00	100.00	9.09
5	1073+600.00	1074+500.00	100.00	15.00
6	1077+600.00	1077+600.00	0.00	15.00
7	1080+400.00	1081+100.00	70.00	17.14
8	1080+400.00	1081+100.00	70.00	18.75
9	1080+400.00	1081+100.00	70.00	14.29
10	1080+400.00	1081+100.00	70.00	20.00
11	1101+825.00	1101+825.00	0.00	32.00
12	1101+825.00	1101+825.00	0.00	30.67
13	1112+018.00	1112+018.00	0.00	11.11
14	1112+018.00	1112+018.00	0.00	11.11
15	1112+018.00	1112+018.00	0.00	11.11
16	1112+018.00	1112+018.00	0.00	11.11
17	1112+018.00	1112+018.00	0.00	11.11
18	1112+018.00	1112+018.00	0.00	11.11
19	1112+018.00	1112+018.00	0.00	11.11
20	1112+018.00	1112+018.00	0.00	11.11
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99	1112+018.00	1112+018.00	0.00	11.11
100	1112+018.00	1112+018.00	0.00	11.11

## TANAP LOT 3 Maximum Operating Slope

Equipment	Max. Operating Slope TANAP LOT 3	Max. Operating Slope (Catalogue Value)
1 Dozer	44%	50%
2 Excavator	55%	70%
3 Loader	34%	44%
4 Roller Compactor	26%	36%
5 Trailer	23%	30%
6 Padder	35%	35%
7 Pipe Bender	65%	55%
8 Peywelder	44%	50%
9 Pipelayer	44%	36%
10 Ambulance	45%	45%
11 Minibus	45%	40%
12 Becho - Loader	34%	44%
13 Farm Tractor	34%	44%
14 Pick-up	45%	40%
15 Boom Truck	57%	70%
16 Diesel Tanker	57%	70%
17 Water Tanker	57%	70%

## LOT 3 STEEP SLOPE SECTIONS

No	FROM KP	TO KP	LENGTH (m)	SLOPE (%)
1	1101+825	1101+825.00	100.00	32.00
2	1155+110	1155+150.00	40.00	30.25
3	1162+200	1162+250.00	50.00	35.20
4	1188+180	1188+240.00	60.00	33.94
5	1188+240	1188+290.00	50.00	32.58
6	1188+380	1188+374.00	14.00	41.21
7	1267+830	1267+856.00	26.00	32.08
8	1267+856	1267+810.00	46.00	17.29
9	1267+810	1267+830.00	20.00	20.00
10	1278+275	1278+290.00	15.00	42.80

## Slope Lists for LOT 3

	KP	Slope Inclination	Spread
1	832+163 - 832+300	33.45%	Spread 5
2	832+513 - 832+548	32.02%	Spread 5
3	832+905 - 832+971	38.06%	Spread 5
4	832+971 - 883+005	43.43%	Spread 5
5	883+005 - 883+032	33.19%	Spread 5
6	884+623 - 884+804	31.74%	Spread 5
7	1094+375 - 1094+420	31.11%	Spread 6
8	1101+825 - 1101+925	32%	Spread 6
9	1123+250 - 1123+325	30.67%	Spread 6
10	1188+160 - 1188+290	34.34%	Spread 6
11	1215+750 - 1215+810	38.31%	Spread 6
12	1256+070 - 1256+100	32.29%	Spread 6
13	1267+910 - 1267+960	29.91%	Spread 6

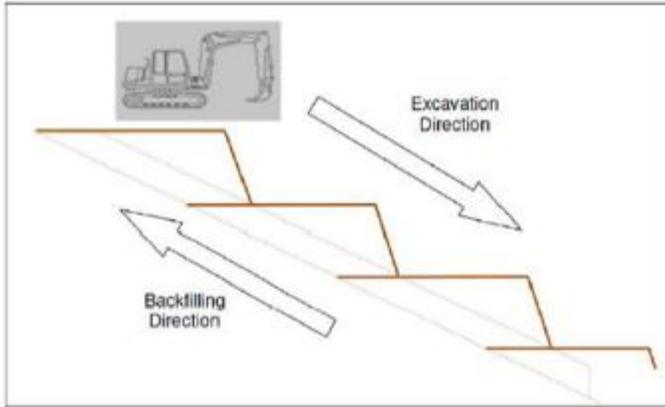
	Equipment	Max. Operating Slope (Catalogue Value)	Max. Operating Slope (Will be implemented in LOT 3)
1	Dozer - Pipelayer - Peywelder	47%	44%
2	Excavator	45%	40%
3	Loader - Grader	37%	30%
4	Padder	35%	35%
5	Pipe Bender	47%	40%
6	Becho - Loader / Farm Tractor(with trailer)	35%	20%
7	Farm Tractor(without trailer)	35%	30%
8	Pick-up 4x4	45%	40%
9	Trailer	12%	12%
10	Truck (Boom Truck / Diesel Tanker)	30%	20%
11	Ambulance / Minibus	45%	40%
12	Roller Compactor	36%	16%



# TRAININGS



Method Statement For Working On Inclined Surfaces			TKF-MS-F-PPL-PL3-019
Revision: 01/0	Status: 15/5	Date: 18.03.2016	Page 1 of 23

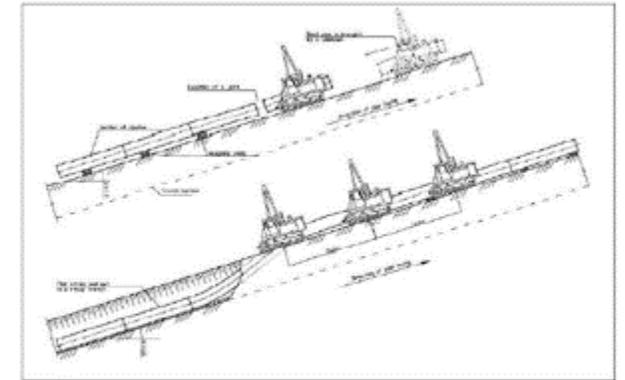


Trenching of slopes and steep slopes

	<b>TANAP</b> TRANS ANATOLIAN NATURAL GAS PIPELINE PROJECT LOT 3	
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METHOD STATEMENT FOR WORKING ON INCLINED SURFACES

**Trainings were held for all plant/equipment operators.**

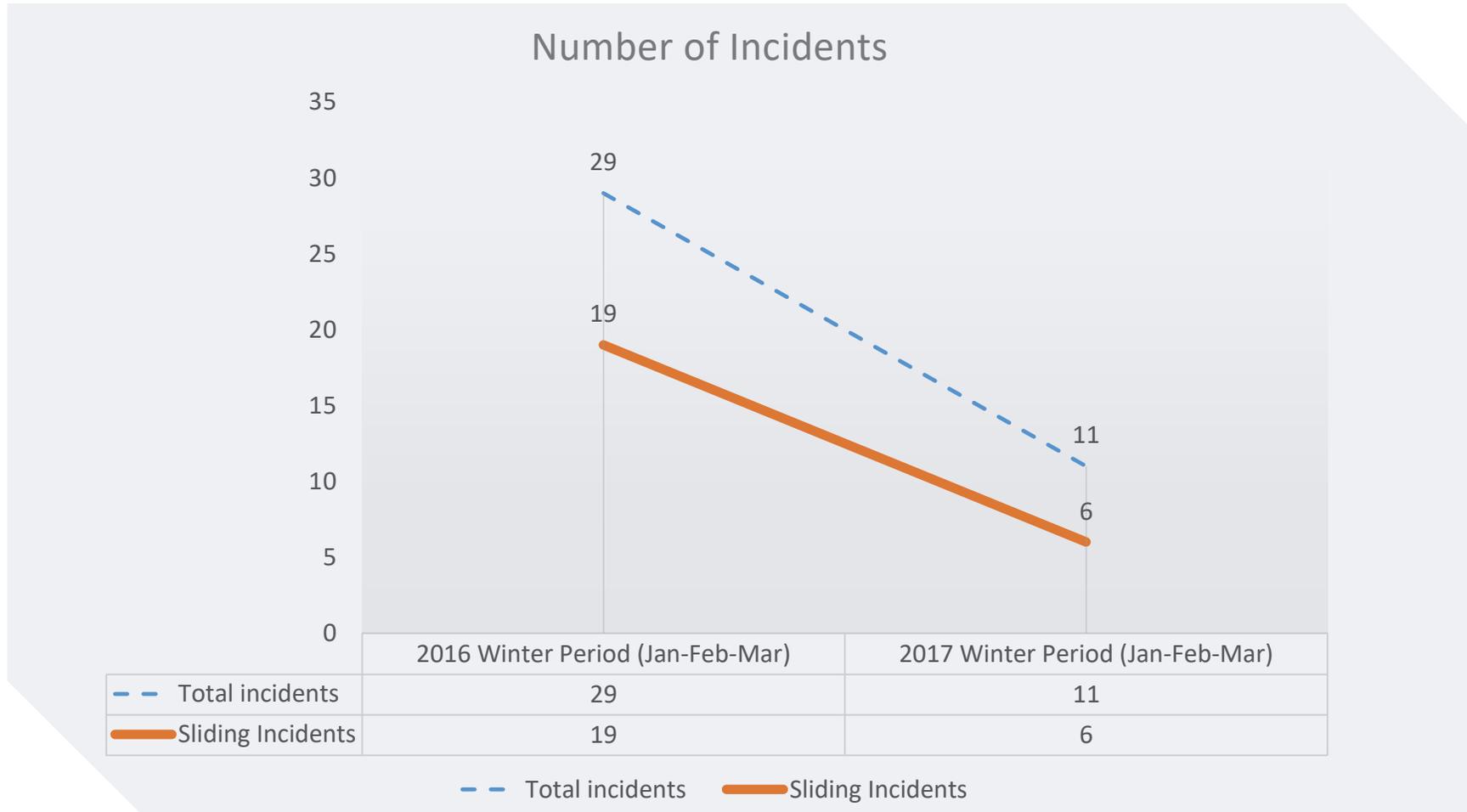


Lowering in mountainous area up to 32% (18°)



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# RESULT



Following the implementation of preventive measures, the number of the sliding incidents decreased by **68%** on the same period in year 2017.



# LONG TERM BENEFIT

Tekfen Construction revised its safety procedures regarding inclined surfaces.

The newly developed method is now described as «mandatory site rule for pipeline projects.»

In addition, TEKFEN spreaded the project to the nearby community, as the village residents use tractors for agriculture and they face with sliding incidents while they work on slopes. TEKFEN provided support to the villagers to measure the slopes and analysing the technical capabilities of their tractors to identify working capabilities on the slopes.



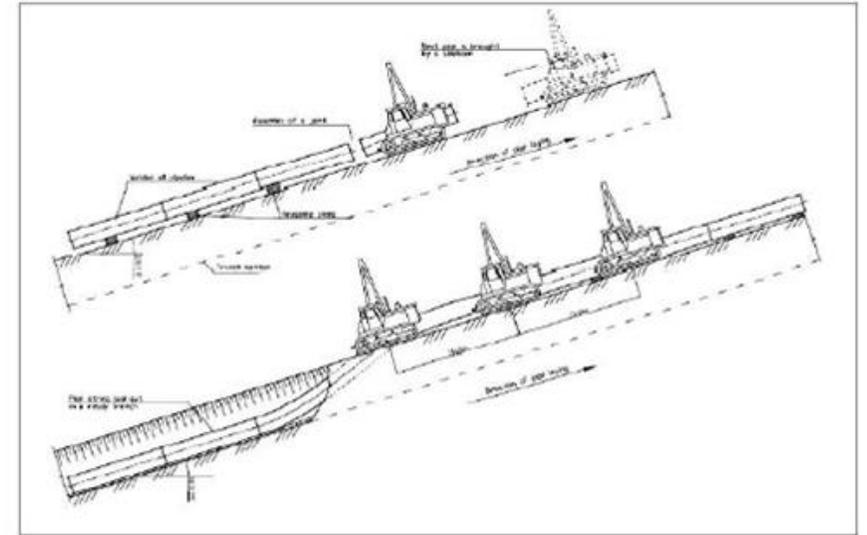
**Attachment 1 - Equipment Maximum Allowable Inclinations and Slope List**

**LOT 3 SLOPE SECTIONS**

16.12.2016

No	FROM OP	TO OP	LENGTH (m)	SLOPE (%)	Equipment	Maximum Slope (%)	Maximum Slope (Degree)
1	1000-1000.00	1000-1000.00	0.00	0.00	1 Dozer	44%	5°
2	1000-1000.00	1000-1000.00	0.00	0.00	2 Excavator	50%	6°
3	1000-1000.00	1000-1000.00	0.00	0.00	3 Loader	34%	4°
4	1000-1000.00	1000-1000.00	0.00	0.00	4 Roller Compactor	28%	3°
5	1000-1000.00	1000-1000.00	0.00	0.00	5 Trailer	25%	3°
6	1000-1000.00	1000-1000.00	0.00	0.00	6 Padder	35%	4°
7	1000-1000.00	1000-1000.00	0.00	0.00	7 Pipe Bender	55%	6°
8	1000-1000.00	1000-1000.00	0.00	0.00	8 Pyowelder	44%	5°
9	1000-1000.00	1000-1000.00	0.00	0.00	9 Pipelayer	44%	5°
10	1000-1000.00	1000-1000.00	0.00	0.00	10 Ambulance	45%	5°
11	1000-1000.00	1000-1000.00	0.00	0.00	11 Minibus	45%	5°
12	1000-1000.00	1000-1000.00	0.00	0.00	12 Becho - Loader	34%	4°
13	1000-1000.00	1000-1000.00	0.00	0.00	13 Farm Tractor	34%	4°
14	1000-1000.00	1000-1000.00	0.00	0.00	14 Pick-up	45%	5°
15	1000-1000.00	1000-1000.00	0.00	0.00	15 Boom Truck	57%	7°
16	1000-1000.00	1000-1000.00	0.00	0.00	16 Diesel Tanker	57%	7°
17	1000-1000.00	1000-1000.00	0.00	0.00	17 Water Tanker	50%	6°

**TANAP LOT 3 Maximum Operating Slope**



Lowering in mountainous area up to 32% (18°)





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