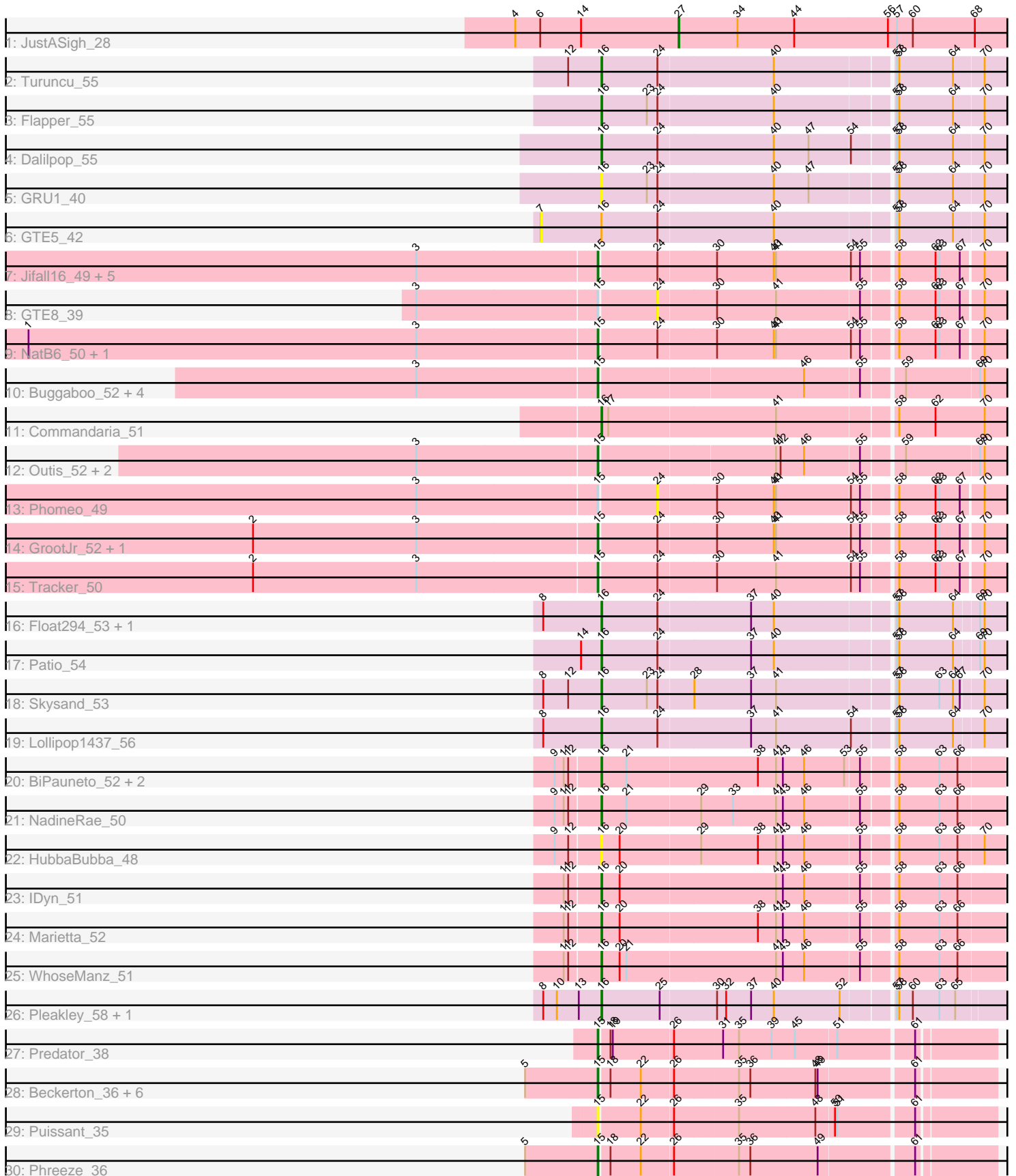


Pham 194068



Note: Tracks are now grouped by subcluster and scaled. Switching in subcluster is indicated by changes in track color. Track scale is now set by default to display the region 30 bp upstream of start 1 to 30 bp downstream of the last possible start. If this default region is judged to be packed too tightly with annotated starts, the track will be further scaled to only show that region of the ORF with annotated starts. This action will be indicated by adding "Zoomed" to the title. For starts, yellow indicates the location of called starts comprised solely of Glimmer/GeneMark auto-annotations, green indicates the location of called starts with at least 1 manual gene annotation.

Pham 194068 Report

This analysis was run 11/02/24 on database version 579.

Pham number 194068 has 53 members, 6 are drafts.

Phages represented in each track:

- Track 1 : JustASigh_28
- Track 2 : Turuncu_55
- Track 3 : Flapper_55
- Track 4 : Dalilpop_55
- Track 5 : GRU1_40
- Track 6 : GTE5_42
- Track 7 : Jifall16_49, Emianna_50, Kurt_50, KidneyBean_50, Arti_50, Foxboro_51
- Track 8 : GTE8_39
- Track 9 : NatB6_50, Wheezy_50
- Track 10 : Buggaboo_52, Kabluna_54, SuperSulley_52, Bonum_54, NosilaM_54
- Track 11 : Commandaria_51
- Track 12 : Outis_52, MerCougar_52, StarStruck_52
- Track 13 : Phomeo_49
- Track 14 : GrootJr_52, NovumRegina_50
- Track 15 : Tracker_50
- Track 16 : Float294_53, Ennea_57
- Track 17 : Patio_54
- Track 18 : Skysand_53
- Track 19 : Lollipop1437_56
- Track 20 : BiPauneto_52, Sukkupi_51, Yndexa_51
- Track 21 : NadineRae_50
- Track 22 : HubbaBubba_48
- Track 23 : IDyn_51
- Track 24 : Marietta_52
- Track 25 : WhoseManz_51
- Track 26 : Pleakley_58, Fury_58
- Track 27 : Predator_38
- Track 28 : Beckerton_36, Oaker_36, Cborch11_37, Damien_36, Thumb_36, Megatron06_38, Konstantine_41
- Track 29 : Puissant_35
- Track 30 : Phreeze_36

Summary of Final Annotations (See graph section above for start numbers):

The start number called the most often in the published annotations is 15, it was called in 28 of the 47 non-draft genes in the pham.

Genes that call this "Most Annotated" start:

- Arti_50, Beckerton_36, Bonum_54, Buggaboo_52, Cborch11_37, Damien_36, Emianna_50, Foxboro_51, GrootJr_52, Jifall16_49, Kabluna_54, KidneyBean_50, Konstantine_41, Kurt_50, Megatron06_38, MerCougar_52, NatB6_50, NosilaM_54, NovumRegina_50, Oaker_36, Outis_52, Phreeze_36, Predator_38, Puissant_35, StarStruck_52, SuperSulley_52, Thumb_36, Tracker_50, Wheezy_50,

Genes that have the "Most Annotated" start but do not call it:

- GTE8_39, Phomeo_49,

Genes that do not have the "Most Annotated" start:

- BiPauneto_52, Commandaria_51, Dalilpop_55, Ennea_57, Flapper_55, Float294_53, Fury_58, GRU1_40, GTE5_42, HubbaBubba_48, IDyn_51, JustASigh_28, Lollipop1437_56, Marietta_52, NadineRae_50, Patio_54, Pleakley_58, Skysand_53, Sukkupi_51, Turuncu_55, WhoseManz_51, Yndexa_51,

Summary by start number:

Start 7:

- Found in 1 of 53 (1.9%) of genes in pham
- No Manual Annotations of this start.
- Called 100.0% of time when present
- Phage (with cluster) where this start called: GTE5_42 (CR1),

Start 15:

- Found in 31 of 53 (58.5%) of genes in pham
- Manual Annotations of this start: 28 of 47
- Called 93.5% of time when present
- Phage (with cluster) where this start called: Arti_50 (CR2), Beckerton_36 (H1), Bonum_54 (CR2), Buggaboo_52 (CR2), Cborch11_37 (H1), Damien_36 (H1), Emianna_50 (CR2), Foxboro_51 (CR2), GrootJr_52 (CR2), Jifall16_49 (CR2), Kabluna_54 (CR2), KidneyBean_50 (CR2), Konstantine_41 (H1), Kurt_50 (CR2), Megatron06_38 (H1), MerCougar_52 (CR2), NatB6_50 (CR2), NosilaM_54 (CR2), NovumRegina_50 (CR2), Oaker_36 (H1), Outis_52 (CR2), Phreeze_36 (H1), Predator_38 (H1), Puissant_35 (H1), StarStruck_52 (CR2), SuperSulley_52 (CR2), Thumb_36 (H1), Tracker_50 (CR2), Wheezy_50 (CR2),

Start 16:

- Found in 21 of 53 (39.6%) of genes in pham
- Manual Annotations of this start: 18 of 47
- Called 95.2% of time when present
- Phage (with cluster) where this start called: BiPauneto_52 (CR4), Commandaria_51 (CR2), Dalilpop_55 (CR1), Ennea_57 (CR3), Flapper_55 (CR1), Float294_53 (CR3), Fury_58 (CR5), GRU1_40 (CR1), HubbaBubba_48 (CR4), IDyn_51 (CR4), Lollipop1437_56 (CR3), Marietta_52 (CR4), NadineRae_50 (CR4), Patio_54 (CR3), Pleakley_58 (CR5), Skysand_53 (CR3), Sukkupi_51 (CR4), Turuncu_55 (CR1), WhoseManz_51 (CR4), Yndexa_51 (CR4),

Start 24:

- Found in 23 of 53 (43.4%) of genes in pham

- No Manual Annotations of this start.
- Called 8.7% of time when present
- Phage (with cluster) where this start called: GTE8_39 (CR2), Phomeo_49 (CR2),

Start 27:

- Found in 1 of 53 (1.9%) of genes in pham
- Manual Annotations of this start: 1 of 47
- Called 100.0% of time when present
- Phage (with cluster) where this start called: JustASigh_28 (AH),

Summary by clusters:

There are 7 clusters represented in this pham: CR2, CR3, CR1, CR4, CR5, AH, H1,

Info for manual annotations of cluster AH:

- Start number 27 was manually annotated 1 time for cluster AH.

Info for manual annotations of cluster CR1:

- Start number 16 was manually annotated 3 times for cluster CR1.

Info for manual annotations of cluster CR2:

- Start number 15 was manually annotated 19 times for cluster CR2.
- Start number 16 was manually annotated 1 time for cluster CR2.

Info for manual annotations of cluster CR3:

- Start number 16 was manually annotated 5 times for cluster CR3.

Info for manual annotations of cluster CR4:

- Start number 16 was manually annotated 7 times for cluster CR4.

Info for manual annotations of cluster CR5:

- Start number 16 was manually annotated 2 times for cluster CR5.

Info for manual annotations of cluster H1:

- Start number 15 was manually annotated 9 times for cluster H1.

Gene Information:

Gene: Arti_50 Start: 38680, Stop: 39186, Start Num: 15

Candidate Starts for Arti_50:

(3, 38449), (Start: 15 @38680 has 28 MA's), (24, 38752), (30, 38827), (40, 38902), (41, 38905), (54, 38998), (55, 39010), (58, 39049), (62, 39097), (63, 39100), (67, 39127), (70, 39154),

Gene: Beckerton_36 Start: 33410, Stop: 33889, Start Num: 15

Candidate Starts for Beckerton_36:

(5, 33317), (Start: 15 @33410 has 28 MA's), (18, 33422), (22, 33461), (26, 33500), (35, 33581), (36, 33596), (48, 33680), (49, 33683), (61, 33797),

Gene: BiPauneto_52 Start: 38203, Stop: 38706, Start Num: 16

Candidate Starts for BiPauneto_52:

(9, 38149), (11, 38161), (12, 38167), (Start: 16 @38203 has 18 MA's), (21, 38236), (38, 38404), (41, 38428), (43, 38437), (46, 38464), (53, 38515), (55, 38533), (58, 38572), (63, 38623), (66, 38647),

Gene: Bonum_54 Start: 39333, Stop: 39842, Start Num: 15

Candidate Starts for Bonum_54:

(3, 39102), (Start: 15 @39333 has 28 MA's), (46, 39591), (55, 39660), (59, 39708), (69, 39801), (70, 39807),

Gene: Buggaboo_52 Start: 39812, Stop: 40321, Start Num: 15

Candidate Starts for Buggaboo_52:

(3, 39581), (Start: 15 @39812 has 28 MA's), (46, 40070), (55, 40139), (59, 40187), (69, 40280), (70, 40286),

Gene: Cborch11_37 Start: 32875, Stop: 33354, Start Num: 15

Candidate Starts for Cborch11_37:

(5, 32782), (Start: 15 @32875 has 28 MA's), (18, 32887), (22, 32926), (26, 32965), (35, 33046), (36, 33061), (48, 33145), (49, 33148), (61, 33262),

Gene: Commandaria_51 Start: 39801, Stop: 40316, Start Num: 16

Candidate Starts for Commandaria_51:

(Start: 16 @39801 has 18 MA's), (17, 39810), (41, 40026), (58, 40170), (62, 40218), (70, 40281),

Gene: Dalilpop_55 Start: 40964, Stop: 41473, Start Num: 16

Candidate Starts for Dalilpop_55:

(Start: 16 @40964 has 18 MA's), (24, 41036), (40, 41186), (47, 41231), (54, 41282), (57, 41330), (58, 41333), (64, 41402), (70, 41441),

Gene: Damien_36 Start: 32876, Stop: 33355, Start Num: 15

Candidate Starts for Damien_36:

(5, 32783), (Start: 15 @32876 has 28 MA's), (18, 32888), (22, 32927), (26, 32966), (35, 33047), (36, 33062), (48, 33146), (49, 33149), (61, 33263),

Gene: Emianna_50 Start: 39672, Stop: 40178, Start Num: 15

Candidate Starts for Emianna_50:

(3, 39441), (Start: 15 @39672 has 28 MA's), (24, 39744), (30, 39819), (40, 39894), (41, 39897), (54, 39990), (55, 40002), (58, 40041), (62, 40089), (63, 40092), (67, 40119), (70, 40146),

Gene: Ennea_57 Start: 40686, Stop: 41192, Start Num: 16

Candidate Starts for Ennea_57:

(8, 40611), (Start: 16 @40686 has 18 MA's), (24, 40758), (37, 40878), (40, 40908), (57, 41052), (58, 41055), (64, 41124), (69, 41154), (70, 41160),

Gene: Flapper_55 Start: 40395, Stop: 40904, Start Num: 16

Candidate Starts for Flapper_55:

(Start: 16 @40395 has 18 MA's), (23, 40455), (24, 40467), (40, 40617), (57, 40761), (58, 40764), (64, 40833), (70, 40872),

Gene: Float294_53 Start: 40128, Stop: 40634, Start Num: 16

Candidate Starts for Float294_53:

(8, 40053), (Start: 16 @40128 has 18 MA's), (24, 40200), (37, 40320), (40, 40350), (57, 40494), (58, 40497), (64, 40566), (69, 40596), (70, 40602),

Gene: Foxboro_51 Start: 40178, Stop: 40684, Start Num: 15

Candidate Starts for Foxboro_51:

(3, 39947), (Start: 15 @40178 has 28 MA's), (24, 40250), (30, 40325), (40, 40400), (41, 40403), (54, 40496), (55, 40508), (58, 40547), (62, 40595), (63, 40598), (67, 40625), (70, 40652),

Gene: Fury_58 Start: 38850, Stop: 39359, Start Num: 16

Candidate Starts for Fury_58:

(8, 38775), (10, 38793), (13, 38820), (Start: 16 @38850 has 18 MA's), (25, 38925), (30, 38997), (32, 39009), (37, 39042), (40, 39072), (52, 39156), (57, 39216), (58, 39219), (60, 39237), (63, 39270), (65, 39291),

Gene: GRU1_40 Start: 31942, Stop: 32451, Start Num: 16

Candidate Starts for GRU1_40:

(Start: 16 @31942 has 18 MA's), (23, 32002), (24, 32014), (40, 32164), (47, 32209), (57, 32308), (58, 32311), (64, 32380), (70, 32419),

Gene: GTE5_42 Start: 33174, Stop: 33761, Start Num: 7

Candidate Starts for GTE5_42:

(7, 33174), (Start: 16 @33252 has 18 MA's), (24, 33324), (40, 33474), (57, 33618), (58, 33621), (64, 33690), (70, 33729),

Gene: GTE8_39 Start: 33002, Stop: 33436, Start Num: 24

Candidate Starts for GTE8_39:

(3, 32699), (Start: 15 @32930 has 28 MA's), (24, 33002), (30, 33077), (41, 33155), (55, 33260), (58, 33299), (62, 33347), (63, 33350), (67, 33377), (70, 33404),

Gene: GrootJr_52 Start: 39054, Stop: 39560, Start Num: 15

Candidate Starts for GrootJr_52:

(2, 38607), (3, 38823), (Start: 15 @39054 has 28 MA's), (24, 39126), (30, 39201), (40, 39276), (41, 39279), (54, 39372), (55, 39384), (58, 39423), (62, 39471), (63, 39474), (67, 39501), (70, 39528),

Gene: HubbaBubba_48 Start: 35218, Stop: 35721, Start Num: 16

Candidate Starts for HubbaBubba_48:

(9, 35164), (12, 35182), (Start: 16 @35218 has 18 MA's), (20, 35242), (29, 35344), (38, 35419), (41, 35443), (43, 35452), (46, 35479), (55, 35548), (58, 35587), (63, 35638), (66, 35662), (70, 35695),

Gene: IDyn_51 Start: 36647, Stop: 37150, Start Num: 16

Candidate Starts for IDyn_51:

(11, 36605), (12, 36611), (Start: 16 @36647 has 18 MA's), (20, 36671), (41, 36872), (43, 36881), (46, 36908), (55, 36977), (58, 37016), (63, 37067), (66, 37091),

Gene: Jifall16_49 Start: 39326, Stop: 39832, Start Num: 15

Candidate Starts for Jifall16_49:

(3, 39095), (Start: 15 @39326 has 28 MA's), (24, 39398), (30, 39473), (40, 39548), (41, 39551), (54, 39644), (55, 39656), (58, 39695), (62, 39743), (63, 39746), (67, 39773), (70, 39800),

Gene: JustASigh_28 Start: 27518, Stop: 27970, Start Num: 27

Candidate Starts for JustASigh_28:

(4, 27302), (6, 27335), (14, 27389), (Start: 27 @27518 has 1 MA's), (34, 27596), (44, 27671), (56, 27794), (57, 27806), (60, 27827), (68, 27908),

Gene: Kabluna_54 Start: 38748, Stop: 39257, Start Num: 15

Candidate Starts for Kabluna_54:

(3, 38517), (Start: 15 @38748 has 28 MA's), (46, 39006), (55, 39075), (59, 39123), (69, 39216), (70, 39222),

Gene: KidneyBean_50 Start: 39450, Stop: 39956, Start Num: 15

Candidate Starts for KidneyBean_50:

(3, 39219), (Start: 15 @39450 has 28 MA's), (24, 39522), (30, 39597), (40, 39672), (41, 39675), (54, 39768), (55, 39780), (58, 39819), (62, 39867), (63, 39870), (67, 39897), (70, 39924),

Gene: Konstantine_41 Start: 34077, Stop: 34556, Start Num: 15

Candidate Starts for Konstantine_41:

(5, 33984), (Start: 15 @34077 has 28 MA's), (18, 34089), (22, 34128), (26, 34167), (35, 34248), (36, 34263), (48, 34347), (49, 34350), (61, 34464),

Gene: Kurt_50 Start: 39687, Stop: 40193, Start Num: 15

Candidate Starts for Kurt_50:

(3, 39456), (Start: 15 @39687 has 28 MA's), (24, 39759), (30, 39834), (40, 39909), (41, 39912), (54, 40005), (55, 40017), (58, 40056), (62, 40104), (63, 40107), (67, 40134), (70, 40161),

Gene: Lollipop1437_56 Start: 40674, Stop: 41180, Start Num: 16

Candidate Starts for Lollipop1437_56:

(8, 40599), (Start: 16 @40674 has 18 MA's), (24, 40746), (37, 40866), (41, 40899), (54, 40992), (57, 41040), (58, 41043), (64, 41112), (70, 41148),

Gene: Marietta_52 Start: 36541, Stop: 37044, Start Num: 16

Candidate Starts for Marietta_52:

(11, 36499), (12, 36505), (Start: 16 @36541 has 18 MA's), (20, 36565), (38, 36742), (41, 36766), (43, 36775), (46, 36802), (55, 36871), (58, 36910), (63, 36961), (66, 36985),

Gene: Megatron06_38 Start: 33409, Stop: 33888, Start Num: 15

Candidate Starts for Megatron06_38:

(5, 33316), (Start: 15 @33409 has 28 MA's), (18, 33421), (22, 33460), (26, 33499), (35, 33580), (36, 33595), (48, 33679), (49, 33682), (61, 33796),

Gene: MerCougar_52 Start: 39950, Stop: 40459, Start Num: 15

Candidate Starts for MerCougar_52:

(3, 39719), (Start: 15 @39950 has 28 MA's), (41, 40172), (42, 40178), (46, 40208), (55, 40277), (59, 40325), (69, 40418), (70, 40424),

Gene: NadineRae_50 Start: 35788, Stop: 36291, Start Num: 16

Candidate Starts for NadineRae_50:

(9, 35734), (11, 35746), (12, 35752), (Start: 16 @35788 has 18 MA's), (21, 35821), (29, 35914), (33, 35956), (41, 36013), (43, 36022), (46, 36049), (55, 36118), (58, 36157), (63, 36208), (66, 36232),

Gene: NatB6_50 Start: 38744, Stop: 39250, Start Num: 15

Candidate Starts for NatB6_50:

(1, 38000), (3, 38513), (Start: 15 @38744 has 28 MA's), (24, 38816), (30, 38891), (40, 38966), (41, 38969), (54, 39062), (55, 39074), (58, 39113), (62, 39161), (63, 39164), (67, 39191), (70, 39218),

Gene: NosilaM_54 Start: 39645, Stop: 40154, Start Num: 15

Candidate Starts for NosilaM_54:

(3, 39414), (Start: 15 @39645 has 28 MA's), (46, 39903), (55, 39972), (59, 40020), (69, 40113), (70, 40119),

Gene: NovumRegina_50 Start: 39053, Stop: 39559, Start Num: 15

Candidate Starts for NovumRegina_50:

(2, 38606), (3, 38822), (Start: 15 @39053 has 28 MA's), (24, 39125), (30, 39200), (40, 39275), (41, 39278), (54, 39371), (55, 39383), (58, 39422), (62, 39470), (63, 39473), (67, 39500), (70, 39527),

Gene: Oaker_36 Start: 33133, Stop: 33612, Start Num: 15

Candidate Starts for Oaker_36:

(5, 33040), (Start: 15 @33133 has 28 MA's), (18, 33145), (22, 33184), (26, 33223), (35, 33304), (36, 33319), (48, 33403), (49, 33406), (61, 33520),

Gene: Outis_52 Start: 39644, Stop: 40153, Start Num: 15

Candidate Starts for Outis_52:

(3, 39413), (Start: 15 @39644 has 28 MA's), (41, 39866), (42, 39872), (46, 39902), (55, 39971), (59, 40019), (69, 40112), (70, 40118),

Gene: Patio_54 Start: 39910, Stop: 40416, Start Num: 16

Candidate Starts for Patio_54:

(14, 39883), (Start: 16 @39910 has 18 MA's), (24, 39982), (37, 40102), (40, 40132), (57, 40276), (58, 40279), (64, 40348), (69, 40378), (70, 40384),

Gene: Phomeo_49 Start: 39394, Stop: 39828, Start Num: 24

Candidate Starts for Phomeo_49:

(3, 39091), (Start: 15 @39322 has 28 MA's), (24, 39394), (30, 39469), (40, 39544), (41, 39547), (54, 39640), (55, 39652), (58, 39691), (62, 39739), (63, 39742), (67, 39769), (70, 39796),

Gene: Phreeze_36 Start: 32876, Stop: 33355, Start Num: 15

Candidate Starts for Phreeze_36:

(5, 32783), (Start: 15 @32876 has 28 MA's), (18, 32888), (22, 32927), (26, 32966), (35, 33047), (36, 33062), (49, 33149), (61, 33263),

Gene: Pleakley_58 Start: 38851, Stop: 39360, Start Num: 16

Candidate Starts for Pleakley_58:

(8, 38776), (10, 38794), (13, 38821), (Start: 16 @38851 has 18 MA's), (25, 38926), (30, 38998), (32, 39010), (37, 39043), (40, 39073), (52, 39157), (57, 39217), (58, 39220), (60, 39238), (63, 39271), (65, 39292),

Gene: Predator_38 Start: 32067, Stop: 32546, Start Num: 15

Candidate Starts for Predator_38:

(Start: 15 @32067 has 28 MA's), (18, 32079), (19, 32082), (26, 32157), (31, 32217), (35, 32238), (39, 32280), (45, 32310), (51, 32361), (61, 32454),

Gene: Puissant_35 Start: 33364, Stop: 33843, Start Num: 15

Candidate Starts for Puissant_35:

(Start: 15 @33364 has 28 MA's), (22, 33415), (26, 33454), (35, 33535), (48, 33634), (50, 33655), (51, 33658), (61, 33751),

Gene: Skysand_53 Start: 40130, Stop: 40636, Start Num: 16

Candidate Starts for Skysand_53:

(8, 40055), (12, 40088), (Start: 16 @40130 has 18 MA's), (23, 40190), (24, 40202), (28, 40247), (37, 40322), (41, 40355), (57, 40496), (58, 40499), (63, 40550), (64, 40568), (67, 40577), (70, 40604),

Gene: StarStruck_52 Start: 39644, Stop: 40153, Start Num: 15

Candidate Starts for StarStruck_52:

(3, 39413), (Start: 15 @39644 has 28 MA's), (41, 39866), (42, 39872), (46, 39902), (55, 39971), (59, 40019), (69, 40112), (70, 40118),

Gene: Sukkupi_51 Start: 38094, Stop: 38597, Start Num: 16

Candidate Starts for Sukkupi_51:

(9, 38040), (11, 38052), (12, 38058), (Start: 16 @38094 has 18 MA's), (21, 38127), (38, 38295), (41, 38319), (43, 38328), (46, 38355), (53, 38406), (55, 38424), (58, 38463), (63, 38514), (66, 38538),

Gene: SuperSulley_52 Start: 39812, Stop: 40321, Start Num: 15

Candidate Starts for SuperSulley_52:

(3, 39581), (Start: 15 @39812 has 28 MA's), (46, 40070), (55, 40139), (59, 40187), (69, 40280), (70, 40286),

Gene: Thumb_36 Start: 32873, Stop: 33352, Start Num: 15

Candidate Starts for Thumb_36:

(5, 32780), (Start: 15 @32873 has 28 MA's), (18, 32885), (22, 32924), (26, 32963), (35, 33044), (36, 33059), (48, 33143), (49, 33146), (61, 33260),

Gene: Tracker_50 Start: 38471, Stop: 38977, Start Num: 15

Candidate Starts for Tracker_50:

(2, 38024), (3, 38240), (Start: 15 @38471 has 28 MA's), (24, 38543), (30, 38618), (41, 38696), (54, 38789), (55, 38801), (58, 38840), (62, 38888), (63, 38891), (67, 38918), (70, 38945),

Gene: Turuncu_55 Start: 40057, Stop: 40566, Start Num: 16

Candidate Starts for Turuncu_55:

(12, 40015), (Start: 16 @40057 has 18 MA's), (24, 40129), (40, 40279), (57, 40423), (58, 40426), (64, 40495), (70, 40534),

Gene: Wheezy_50 Start: 38676, Stop: 39182, Start Num: 15

Candidate Starts for Wheezy_50:

(1, 37932), (3, 38445), (Start: 15 @38676 has 28 MA's), (24, 38748), (30, 38823), (40, 38898), (41, 38901), (54, 38994), (55, 39006), (58, 39045), (62, 39093), (63, 39096), (67, 39123), (70, 39150),

Gene: WhoseManz_51 Start: 36154, Stop: 36657, Start Num: 16

Candidate Starts for WhoseManz_51:

(11, 36112), (12, 36118), (Start: 16 @36154 has 18 MA's), (20, 36178), (21, 36187), (41, 36379), (43, 36388), (46, 36415), (55, 36484), (58, 36523), (63, 36574), (66, 36598),

Gene: Yndexa_51 Start: 38094, Stop: 38597, Start Num: 16

Candidate Starts for Yndexa_51:

(9, 38040), (11, 38052), (12, 38058), (Start: 16 @38094 has 18 MA's), (21, 38127), (38, 38295), (41, 38319), (43, 38328), (46, 38355), (53, 38406), (55, 38424), (58, 38463), (63, 38514), (66, 38538),